BREEDING POPULATIONS OF SEABIRDS IN CALIFORNIA, 1989-1991

VOLUME I - POPULATION ESTIMATES

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TABLE OF CONTENTS: VOLUME I - POPULATION ESTMATES

Page

ACKNOWLEDGEMENTS.....i
ABSTRACT.....iii
LIST OF FIGURES.....iv
LIST OF TABLES.....xi
INTRODUCTION.....1
METHODS.....9
SURVEY TECHNIQUES.....11
Boat surveys.....11
Boat transects.....11
Mainland surveys.....12
Landings and burrow/crevice counts.....12
Aerial surveys.....13
MISTNETTING.....14
Tape luring.....15
Banding.....15
Incubation patch.....16
BREEDING PHENOLOGY, ATTENDANCE PATTERNS AND CORRECTION FACTORS.....17
Timing of surveys.....17
Breeding phenology.....18
Attendance patterns.....19
Correction factors.....19
ADJUSTED BREEDING POPULATION ESTIMATES.....21
J and K adjustments.....21
L adjustments.....23
Other considerations.....24
CAPTURE-RECAPTURE POPULATION ESTIMATES.....24
DISCUSSION.....47
SPECIES ACCOUNTS.....59
Fork-tailed Storm-petrel.....59
Leach's Storm-petrel.....64
Ashy Storm-petrel.....77
Black Storm-petrel.....89
American White Pelican.....94
Brown Pelican.....96
Double-crested Cormorant.....106
Brandt's Cormorant.....120
Pelagic Cormorant.....131
American Oystercatcher.....143
Black Oystercatcher.....144
Heermann's Gull.....154
Ring-billed Gull.....155
California Gull.....156
Western Gull.....159
Glaucous-winged Gull.....171
Black Tern.....172
Gull-billed Tern.....172
Caspian Tern.....174
Forster's Tern.....179
Least Tern.....183

Page

Royal Tern.....187
Elegant Tern.....189
Black Skimmer.....191
Common Murre.....193
Pigeon Guillemot.....200
Marbled Murrelet.....211
Xantus' Murrelet.....219
Cassin's Auklet.....235
Rhinoceros Auklet.....257
Tufted Puffin.....269
HOW TO USE MAPS AND TABLES.....276
Colony Numbering Systems.....276
Tables: Estimates of numbers of breeding birds by species and colony.....278
Maps: Summary, colony, and subcolony.....279
POPULATION ESTIMATES
USFWS MAP BLOCK 325 (North) Eureka.....284
Summary map.....285
Tables.....286
USFWS MAP BLOCK 325 (South) Eureka.....301
Summary map.....302
Tables.....303
USFWS MAP BLOCK 379 Ukiah.....306
Summary map.....307
Tables.....308
USFWS MAP BLOCK 404 (West) Santa Rosa.....320
Summary map.....321
Tables.....322
USFWS MAP BLOCK 429 (West) San Francisco.....334
Summary map.....335
Tables.....336
SAN FRANCISCO BAY [USFWS MAP BLOCKS 404 (East) Santa Rosa, 405 (West) Sacramento, 429 (East) San Francisco, 430 (West) San Jose].....345
Summary map.....346
Tables.....347
USFWS MAP BLOCK 454 Monterey.....371
Summary map.....372
Tables.....373
USFWS MAP BLOCK 477 San Luis Obispo.....388
Summary map.....389
Tables.....390
SANTA BARBARA AND VENTURA COUNTIES MAINLAND AREA [USFWS MAP BLOCKS 501 (North) Santa Maria, 502 (North) Los Angeles..403
Summary maps.....404
Tables.....406
CHANNEL ISLANDS NATIONAL PARK AREA [USFWS MAP BLOCKS 501 (Islands) Santa Maria, 502 (Islands) Los Angeles, and 524 (Islands) Long Beach].....411
Summary map.....412
Tables.....413

Page

SOUTHERN CHANNEL ISLANDS [USFWS MAP BLOCK 524 (South Islands) Long Beach....432
Summary map....433
Tables....434
LOS ANGELES AND ORANGE COUNTIES MAINLAND [USFWS MAP BLOCKS 524 (Mainland) Long Beach and 525 Santa Ana....443
Summary map....444
Tables....445
USFWS MAP BLOCK 545 San Diego....446
Summary Map....447
Tables....448
REFERENCES....450
INDICES....468

LIST OF FIGURES

Page

Figure 1. Map of California indicating place names referred to in the text.....7

Figure 2. Breeding phenology of 10 seabird species at the South Farallon Islands (National Wildlife Refuge) in 1989 (PRBO, unpubl. data). Numbers of clutches with eggs laid, chicks hatched, and chicks fledged are indicated by five-day period. Fledging dates were not available for DCCO, WEGU, and BLOY whereas, for ASSP, chicks fledged after August. See Table 1 for species abbreviations.....27

Figure 3. Percent of egg-laying sites (sample sizes of monitored sites in parentheses) with eggs, chicks, failed, or chicks fledged/away from nests by 15-day period for 10 seabird species at the South Farallon Islands (National Wildlife Refuge) in 1989.....28

Figure 4. Estimated timing of breeding of Marbled Murrelets in California in 1989, based on nest records and grounded young in central California (Naslund 1990; Singer et al. 1991). In the top portion of the figure, the thick bars indicate definite dates and the thin bars indicate extrapolated dates for each record. In the bottom portion of the figure, the ranges of different stages of the nesting cycle are presented.....30

Figure 5. Correction factor K (number of breeding birds per bird counted) values for five seabird species at four times of day for eight 15-day periods from 15 April to 31 July 1989 at the South Farallon Islands (National Wildlife Refuge). Times of day are coded: early morning (0600-0800), late morning (1000-1200), afternoon (1400-1600), and evening (1800-2000). Fifteen day periods occurred at the beginning and midpoint of each month (i.e. 1, 15 April; 2, 30 April; 3, 15 May; etc.).....30

Figure 6. Correction factor K values for Pigeon Guillemots and counts of birds at sea staging/foraging near the South Farallon Islands (National Wildlife Refuge) at four times of day for eight 15-day periods from 15 April to 31 July 1989 (coded as in Figure 5). Counts of staging birds are expressed as a percentage of the peak staging count of 1867 birds recorded at dusk on 9 April 1989.....31

Figure 7. Numbers of Pigeon Guillemots and Tufted Puffins observed at different times of day at Green Rock (GR), Puffin Rock (PR) and Little River Rock (LRR) (California Islands Wildlife Sanctuary), Humboldt County, April-June 1989.....32

Figure 8. Attendance patterns of Rhinoceros Auklets and Tufted Puffins at the South Farallon Islands (National Wildlife Refuge) in 1989. In the top portion of the figure, dusk counts of Rhinoceros Auklets flying by (open bars) and landing at (solid bars) two nesting areas on Southeast Farallon Island (1, Rabbit Cave Catacombs; 2, Coast Guard House Catacombs) are presented by 15-day period from 15 April to 16 July. In the bottom portion of the figure, mean numbers of Tufted Puffins sitting on land in a plot on "Maintop", West End Island, determined from three consecutive counts at four times of day for eight 15-day periods from 15 April to 31 July (coded as in Figure 5) are presented.....33

Figure 9. Incubation patch scores of Leach's Storm-petrels at Trinidad Bay colonies (including Prisoner, Button and Little River rocks [California Islands Wildlife Sanctuary]), Humboldt County, in 1989.....34

Figure 10. Incubation patch scores of Ashy Storm-petrels at Bird Rock (Point Reyes National Seashore), Marin County, and Leach's Storm-petrels at Prince Island (Tolowa Tribe), Del Norte County, 1989.....35

Figure 11. Locations of mist-netting sites on Santa Barbara and Sutil islands (Channel Islands National Park), Santa Barbara County, 1991 (see Appendix 4).....36

Figure 12. Incubation patch scores of Ashy Storm-petrels at Santa Cruz Island colonies, including Scorpion Rocks (Channel Islands National Park) and Willows Anchorage Rocks (Nature Conservancy), and at Prince Island (Channel Islands National Park), Santa Barbara County, 1991.....37

Figure 13. Incubation patch scores of Black and Ashy storm-petrels at Santa Barbara Island area colonies, including Santa Barbara and Sutil islands (Channel Islands National Park), Santa Barbara County, 1991.....38

Figure 14. Estimated timing of breeding of Leach's Storm-petrels in northern California in 1989, based on incubation patch condition of 819 birds captured in mist nets at 3 colonies in Trinidad Bay, Humboldt County (see Appendix 3). Thick bars indicate when over 25% of birds occurred or were projected to occur in respective nesting periods. Thin lines indicate observed or projected ranges. Dashed lines indicate that ranges may be greater than shown....39

Figure 15. Estimated timing of breeding of Ashy Storm-petrels in southern California in 1991, based on incubation patch condition of 820 birds captured in mist nets at 6 colonies between 8 January and 21 October (see Appendix 4) and nests found at 5 colonies. Symbols as in Figure 14.....40

Figure 16. Estimated timing of breeding of Black Storm-petrels in southern California in 1991, based on incubation patch condition of 91 birds captured in mist nets at 2 colonies (see Appendix 4). Symbols as in Figure 14.....41

Figure 17. Estimated timing of breeding of Cassin's Auklets in southern California in 1991, based on incubation patch condition of 141 birds captured in mist nets at 4 colonies (see Appendix 3). Symbols as in Figure 14.....42

Figure 18. Estimated timing of breeding of Brown Pelicans in southern California in 1991 (Gress 1992). Symbols as in Figure 14.....43

Figure 19. Percentage of total seabird breeding population for all seabird species combined in coastal regions of California, 1989-1991. Regions were defined as one degree of latitude (after Sowls et al. [1980]), except for Castle Rock NWR, Farallon Islands NWR, San Francisco Bay, Channel Islands National Park, and Southern Channel Islands which are indicated separately with arrows. The total number of breeding birds is indicated in smaller text (total number of nesting areas in parentheses) above the percent presented for each region. H and PH refer to historical and possible historical nesting, respectively. Terns nesting on the southern mainland coast must still be included (I, incomplete).....56

Figure 20. Percentage of state breeding population of Fork-tailed Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.....62

Figure 21. Percentage of state breeding population of Leach's Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.....72

Figure 22. Percentage of state breeding population of Ashy Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.....86

Figure 23. Percentage of state breeding population of Black Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.....92

Figure 24. Percentage of state breeding population of Brown Pelican in coastal regions of California, 1989-1991. Symbols as in Figure 19.....102

Figure 25. Locations of nesting areas of Brown Pelicans at West Anacapa Island (Channel Islands National Park), Ventura County (see Gress 1992). Darkened inland slopes show nesting areas used in 1991 (see Table 18).....103

Figure 26. Percentage of marine and estuarine breeding population of Double-crested Cormorant in coastal regions of California, 1989-1991. Symbols as in Figure 19.....118

Figure 27. Percentage of state breeding population of Brandt's Cormorant in coastal regions of California, 1989-1991. Symbols as in Figure 19.....127

Figure 28. Percentage of state breeding population of Pelagic Cormorant in coastal regions of California, 1989-1991. Symbols as in Figure 19.....137

Figure 29. Percentage of state breeding population of Black Oystercatcher in coastal regions of California, 1989-1991. Symbols as in Figure 19.....148

Figure 30. Percentage of state breeding population of hybrid Black X American Oystercatchers in coastal regions of California, 1989-1991. Symbols as in Figure 19.....149

Figure 31. Percentage of state breeding population of Western Gull in coastal regions of California, 1989-1991. Symbols as in Figure 19.....164

Figure 32. Percentage of marine and estuarine breeding population of California Gull in coastal regions of California, 1989-1991. Symbols as in Figure 19.....158

Figure 33. Percentage of marine and estuarine breeding population of Gull-billed Tern in coastal regions of California, 1989-1991. Symbols as in Figure 19.....173

Figure 34. Percentage of marine and estuarine breeding population of Forster's Tern in coastal regions of California, 1989-1991. Symbols as in Figure 19.....181

Figure 35. Percentage of state breeding population of Least Tern in coastal regions California, 1989-1991. Symbols as in Figure 19.....185

Figure 36. Percentage of state breeding population of Royal Tern in coastal regions California, 1989-1991. Symbols as in Figure 19.....188

Figure 37. Percentage of state breeding population of Elegant Tern in coastal regions California, 1989-1991. Symbols as in Figure 19.....190

Figure 38. Percentage of marine and estuarine breeding population of Caspian Tern in coastal regions of California, 1989-1991. Symbols as in Figure 19.....177

Figure 39. Percentage of marine and estuarine breeding population of Black Skimmer in coastal regions of California, 1989-1991. Symbols as in Figure 19.....192

Figure 40. Percentage of state breeding population of Common Murre in coastal regions of California, 1989-1991. Symbols as in Figure 19.....198

Figure 41. Percentage of state breeding population of Pigeon Guillemot in coastal regions of California, 1989-1991. Symbols as in Figure 19.....205

Figure 42. Percentage of state breeding population of Marbled Murrelet in coastal regions of California, 1989-1991. Symbols as in Figure 19.....216

Figure 43. At-sea areas along the coasts of northern and central California where foraging Marbled Murrelets were observed in 1989 (see Table 29). Darkened

inland areas refer to old-growth redwood-dominated forests where murrelets nest.....217

Figure 44. Percentage of state breeding population of Xantus' Murrelet in coastal regions of California,1989-1991. Symbols as in Figure 19.....227

Figure 45. Location of nesting areas of Xantus' Murrelets at Santa Barbara Island (Channel Islands National Park), Santa Barbara County, California. See Tables 31 and 34 for breakdowns by numbered subareas....228

Figure 46. Timing of nocturnal vocalizations of Xantus' Murrelets heard while mist netting at several colonies in southern California, 1991. Thick bars indicate that one or more vocalizations were heard. Thin lines indicate that no vocalizations were heard. Dashed lines indicate that no vocalizations were heard but strong winds may have prevented effective hearing.....229

Figure 47. Percentage of state breeding population of Cassin's Auklet in coastal regions of California, 1989-1991. Symbols as in Figure 19.....246

Figure 48. Locations of nesting areas of Cassin's and Rhinoceros auklets at Castle Rock (National Wildlife Refuge), Del Norte County, California. See Tables 36 and 43 for breakdowns by numbered subareas. A and B refer to mist-net sites 1 and 2, respectively.....247

Figure 49. Locations of nesting areas of Cassin's and Rhinoceros auklets at the South Farallon Islands (National Wildlife Refuge), San Francisco County, California. See Tables 37, 38, 44 and 45 for breakdowns by numbered subareas.....248

Figure 50. Locations of nesting areas of Cassin's Auklets at Castle Rock and Prince Island (Channel Islands National Park), Santa Barbara County, California. See Tables 39 and 40 for breakdowns by numbered subareas. A and B refer to mist-net sites 1 and 2, respectively.....249

Figure 51. Percentage of breeding population of Rhinoceros Auklet in coastal regions of California, 1989-1991. Symbols as in Figure 19.....263

Figure 52. Percentage of breeding population of Tufted Puffin in coastal regions of California, 1989-1991. Symbols as in Figure 19.....274

Figure 53. Index to map block areas for the USFWS colony numbering system (after Sowls et al. 1980).....281

Figure 54. Index to map block areas for the California (CA) colony numbering system.....282

LIST OF TABLES

Page

Table 1. Species abbreviations used in this report.....8

Table 2. Mean correction factors used to adjust raw counts of nests, birds, or sites to obtain estimates of the total number of breeding birds at a nesting area. J and K factors were derived from data collected at the South Farallon Islands (National Wildlife Refuge), San Francisco County, 1989 (see Emslie and Sydeman 1989). The L factor was rough and mainly derived from the literature (see text).....44

Table 3. K correction factor used to adjust peak counts of the number of Caspian and Forster's terns at nesting areas in San Francisco Bay. All data were derived from five Caspian Tern colonies (San Francisco Bay Bird Observatory, unpubl. data).....45

Table 4. J Correction factors for 3 cormorant species derived from data collected at West Anacapa Island (Channel Islands National Park), Ventura County, 1991 (F. Gress, unpubl. data).....46

Table 5. Comparison of the number of nesting areas of 27 seabird species in northern (NCA), central (CCA) and southern (SCA) California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1989-1991 (This Study).....57

Table 6. Summary of California breeding populations of 27 seabird species in 1989-1991.....58

Table 7. Numbers of breeding Fork-tailed Storm-petrels at each colony in California in 1979-1980 (Sowls et al. 1980) and in 1991 (This Study).....63

Table 8. Numbers of breeding Leach's Storm-petrels at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....73

Table 9. Numbers of 4 storm-petrel and 2 alcid species captured in mist nets at 13 colonies in California, 1989-1991.....74

Table 10. Numbers of potential storm-petrel sites at several colonies.....75

Table 11. Program CAPTURE breeding population estimates for Leach's Storm-petrels at 2 colonies in northern California, 1989.....76

Table 12. Program JOLLY breeding population estimates for Leach's Storm-petrel at 2 colonies in northern California, 1989.....76

Table 13. Numbers of breeding Ashy Storm-petrels at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....87

Table 14. Program CAPTURE breeding population estimates for Ashy Storm-petrels at 3 colonies in southern California, 1991.....88

Table 15. Program JOLLY breeding population estimates for Leach's Storm-petrel at 3 colonies in southern California, 1991.....88

Table 16. Numbers of breeding Black Storm-petrels at each colony in California in 1975-1978 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....93

Table 17. Numbers of breeding Brown Pelicans at each colony in California in 1975-1978 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....104

Table 18. Numbers of Brown Pelican nests in different subareas of West Anacapa Island (Channel Islands National Park), Ventura County, 1991 (from Gress 1992)....105

Table 19. Numbers of breeding Double-crested Cormorants at each colony in marine and estuarine habitats in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....119

Table 20. Numbers of breeding Brandt's Cormorants at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....128

Table 21. Numbers of breeding Pelagic Cormorants at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....138

Table 22. Numbers of breeding Black Oystercatchers at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....150

Table 23. Numbers of breeding Western Gulls at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....165

Table 24. Numbers of breeding Forster's Terns at each colony in California in 1979-1980 (Sowls et al. 1980) and in 1991 (This Study).....182

Table 25. Numbers of breeding Least Terns at each colony in California in 1979-1980 (Sowls et al. 1980) and in 1991 (This Study).....186

Table 26. Numbers of breeding Caspian Terns at each colony in California in 1979-1980 (Sowls et al. 1980) and in 1991 (This Study).....178

Table 27. Numbers of breeding Common Murres at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....199

Table 28. Numbers of breeding Pigeon Guillemots at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....206

Table 29. Summary of Marbled Murrelet observations in northern and central California in 1989, used in determining the breeding population estimate. See Appendix 5 for a listing of all records in 1989.....218

Table 30. Numbers of breeding Xantus' Murrelets at each colony in southern California in 1975-1978 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).....230

Table 31. Numbers of potential Xantus' Murrelet nest sites in various areas and habitats on Santa Barbara Island (Channel Islands National Park), Santa Barbara County, 1991.....231

Table 32. Nesting habitat types used by Xantus' Murrelets on Santa Barbara Island (Channel Islands National Park), Santa Barbara County, in 1976-1978 and 1991.....232

Table 33. Occupancy of potential crevice nest sites by Xantus' Murrelets in the Cat Canyon Study Area and occupancy of potential bush nest sites in the Tent Slopes Study Area on Santa Barbara Island (Channel Islands National Park), Santa Barbara County, 1991.....233

Table 34. Numbers of active Xantus' Murrelet nest sites in accessible and inaccessible areas of Santa Barbara Island (Channel Islands National Park), Santa Barbara County, in 1977 and 1991.....234

Table 35. Numbers of breeding Cassin's Auklets at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1989-1991 (This Study).....250

Table 36. Numbers of potential nest sites of Cassin's Auklets in various habitats at Castle Rock (National Wildlife Refuge), Del Norte County, 1989.....251

Table 37. Numbers of potential nest sites of Cassin's Auklets in various habitats at the Southeast Farallon Island subcolony of the South Farallon Islands (National Wildlife Refuge), San Francisco County, 1989. Natural and artifical habitat sites are indicated by N and A, respectively.....252

Table 38. Numbers of potential nest sites of Cassin's Auklets in various habitats at West End Island, North Islets, and Saddle Rock subcolonies at the South Farallon Islands (National Wildlife Refuge), San Francisco County, 1989.....253

Table 39. Numbers of potential nest sites of Cassin's Auklets in various habitats at Castle Rock (Channel Islands National Park), Santa Barbara County, 1991.....254

Table 40. Numbers of potential nest sites of Cassin's Auklets in various habitats at Prince Island (Channel Islands National Park), Santa Barbara County, 1991.....255

Table 41. Availability of different nest sites for Cassin's Auklets in different regions of California. Predominant nest site types are underlined to demonstrate the preogression from burrow to crevice nesting as colonies occur farther south.....256

Table 42. Numbers of breeding Rhinoceros Auklets at each colony in California in 1979-1980 (Sowls et al. 1980) and in 1989-1991 (This Study).....264

Table 43. Numbers of potential nest sites of Rhinoceros Auklets, Tufted Puffins, and Pigeon Guillemots at Castle Rock (National Wildlife Refuge), Del Norte County, 1989. Burrow, burrow/crevice, and crevice sites are indicated by B, B/C, and C, respectively.....265

Table 44. Numbers of potential nest sites of Rhinoceros Auklets, Tufted Puffins, and Pigeon Guillemots at the Southeast Farallon Island subcolony of the South Farallon Islands (National Wildlife Refuge), San Francisco County, 1989. Burrow, burrow/crevice, crevice and nest box sites are indicated by B, B/C, C, and NB, respectively.....266

Table 45. Numbers of potential nest sites of Rhinoceros Auklets, Tufted Puffins, and Pigeon Guillemots at the West End Island, North Islets and Saddle Rock subcolonies of the South Farallon Islands (National Wildlife Refuge), San Francisco County, 1989. Burrow, burrow/crevice, crevice and nest box sites are indicated by B, B/C, C, and NB, respectively.....267

Table 46. At-sea sightings of Rhinoceros Auklets in the Southern California Bight, 1991. Observations were made from the M/V Instinct.....268

Table 47. Numbers of breeding Tufted Puffins at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1989-1991 (This Study).....275

Table 48. County abbreviations used in the California Colony Number.....283

Table 49. Summary of methods used to census seabird colonies in California, 1989-1991.....283

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D. G. Ainley, T. Simons, and C. A. Drost provided storm-petrel vocalizations on cassette tapes.

F. Gress (University of California Davis and California Institute of Environmental Studies) conducted detailed surveys at West Anacapa Island.

Unpublished data on seabird colonies in San Francisco Bay and on the south-central coast were provided by: P. Woodin and the San Francisco Bay Bird Observatory (SFBBO), R. P. Henderson (PRBO), T. Harvey and D. Brewer (USFWS), R. Jurek (CDFG), J. Kelly, S. F. Bailey, D. Bell, H. Cogswell, L. Collins, R. A. Erickson, L. Feeney, R. Leong, J. Lidberg, F. McCollom, P. Metropolis, B. Sauppe, M. Taylor and J. Warriner. N. Naslund of the University of California Santa Cruz provided information on Marbled Murrelets.

Unpublished data on seabird colonies in the Channel Islands and on the southern California mainland coast were provided by: C. A. Drost, W. T. Everett, F. Gress, D. B. Lewis, T. Ingram, R. Delong, G. W. Page, R. L. Pitman, S. M. Speich and C. Winchell.

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ABSTRACT

In 1989-1991, the U. S. Fish and Wildlife Service surveyed breeding populations of seabirds on the entire California coast. This study was sponsored by the Minerals Management Service in relation to outer continental shelf oil and gas leasing. At 483 nesting sites (excluding terns and skimmers in southern California), we estimated 643,307 breeding birds of 21 seabird species including: 410 Fork-tailed Storm-petrel (Oceanodroma furcata); 12,551 Leach's Storm-petrel (O. leucorhoa); 7,209 Ashy Storm-petrel (O. homochroa); 274 Black Storm-petrel (O. melania); 11,916 Brown Pelican (Pelecanus occidentalis); 10,037 Double-crested Cormorant (Phalacrocorax auritus); 83,394 Brandt's Cormorant (P. penicillatus); 14,345 Pelagic Cormorant (P. pelagicus); 888 Black Oystercatcher (Haemotopus bachmani); 4,764 California Gull (Larus californicus); 61,760 Western Gull (L. occidentalis); 2,838 Caspian Tern (Sterna caspia)(excluding southern California); 3,550 Forster's Tern (S. forsteri) (excluding southern California); 272 Least Tern (S. albifrons) (excluding southern California); 351,336 Common Murre (Uria aalge); 15,470 Pigeon Guillemot (Cepphus columba); 1,821 Marbled Murrelet (Brachyramphus marmoratus); 1,760 Xantus' Murrelet (Endomychura hypoleuca); 56,562 Cassin's Auklet (Ptychoramphus aleuticus); 1,769 Rhinoceros Auklet (Cerorhinca monocerata); and 276 Tufted Puffin (Fratercula cirrhata). The inland, historical or hybrid breeding status of American White Pelican (P. erythrorynchus), American Oystercatcher (H. palliatus), Heermann's Gull (L. heermanni), Ring-billed Gull (L. delawarensis), Glaucous-winged Gull (L. glaucescens) and Black Tern (Chlidonias niger) are discussed. Estimates for Gull-billed Tern (S. nilotica), Royal Tern (S. maxima), Elegant Tern (S. elegans) and Black Skimmer (Rhynchops niger) will be included in the final draft of this report.

Overall numbers were slightly lower than reported in 1975-1980 surveys (summarized in Sowls et al. 1980. Catalog of California seabird colonies. U.S. Dept. Int., Fish Wildl. Serv., Biol. Serv. Prog., FWS/OBS 37/80). Recent declines were found or suspected for Fork-tailed Storm-petrel, Leach's Storm-petrel, White Pelican, Black Tern, Caspian Tern, Least Tern, Common Murre and Marbled Murrelet. Recent increases were found or suspected for Brown Pelican, Double-crested Cormorant, California Gull, Western Gull, Forster's Tern and Rhinoceros Auklet. Similar numbers were found for other species or trends could not be determined without additional surveys, studies and/or more in-depth comparisons with previous surveys. The status of terns and skimmers in southern California has not yet been finalized.

INTRODUCTION

In this report, we have summarized the results of an extensive U. S. Fish and Wildlife Service (USFWS) survey of breeding seabird populations in California in 1989-1991. We have documented the location, number of breeding birds, and species composition of 483 nesting areas of 23 seabird species in coastal marine and estuarine habitats. In addition, we have summarized information but not provided current population estimates for inland nesting areas of 4 species which nest on the coast and in interior California as well as 3 species which only nest in interior California. The total estimated population of breeding seabirds on the coast of California exceeded 643,000 breeding birds in 1989-1991. Species examined in this report are listed in Table 1. In Volume I, we have provided: research methods, species accounts, population estimates for each species at each colony, summary maps of colony locations, literature cited and indices to data on colonies (alphabetical by colony name or numerically by California and USFWS colony numbers). In Volume II, we have provided: detailed colony and subcolony locations indicated on sections of 7.5-minute topographic maps and various appendices providing summarized raw data.

In 1989, we surveyed the outer coastal region of northern California (Oregon border to Point Reyes, Marin County) and central California (Point Reyes to Point Conception, Santa Barbara County)(Fig. 1). These coastal areas had been surveyed completely for the first time in 1979-1980 (Sowls et al. 1980). In 1990, we surveyed the coasts of San Francisco, San Pablo and Suisun bays, an area that was not surveyed previously. In 1991, we surveyed the Channel Islands off the coast of southern California in addition to most of the outer mainland coast (excluding many estuaries and beaches). The Channel Islands had been surveyed completely for the first time in 1975-1978 (Hunt et al. 1979, 1980) although the outer mainland coast had not been surveyed previously. We supplemented our surveys with information on nesting areas of certain species (mainly terns and skimmers and interior nesting areas) provided by other researchers.

Our main goals were to provide current estimates of the numbers of breeding birds at each colony in California and to compare the size of breeding seabird populations to numbers reported from 1975-1980 in the Catalog of California Seabird Colonies (Sowls et al. 1980). In 1989-1991, we aimed:

1) to determine the sizes of breeding populations for all nesting areas at which estimates were obtained in 1975-1980;

2) to determine the sizes of breeding populations at other nesting areas that were known to exist (based on earlier

historical information) but at which estimates were not obtained in 1975-1980;

3) to search for and determine the sizes of breeding populations at "newly-discovered" nesting areas which had been established recently or overlooked in previous surveys;

4) to summarize data from other researchers on seabird populations for species or areas that were not surveyed in 1989-1991;

5) to provide additional historical data on the locations of nesting areas and numbers of breeding seabirds than already provided in summaries found in Hunt et al. (1979) and Sowls et al. (1980); and

6) to document our methods and results in detail to facilitate comparisons to 1989-1991 data in the future.

Current estimates of breeding seabird populations were needed by Minerals Management Service (MMS) and USFWS for evaluation of possible offshore oil and gas leases in California, on-going offshore oil production in southern California and transportation of oil in coastal waters throughout the state. Marine bird populations have been one of the most visibly-affected of all marine resources by marine oil spills in California (Dawson 1911, 1923; Aldrich 1938; Moffitt and Orr 1938; Smail et al. 1971; Straughan 1971; Ainley and Lewis 1974; Sowls et al. 1980; PRBO 1985; Ford et al. 1987; Stenzel et al. 1988; Page et al. 1990; and see Piatt et al. 1990, 1991). In addition, USFWS has required current information for the overall management and monitoring of seabird populations in California over time. Many anthropogenic threats have confronted seabirds in California besides oil pollution, including: loss of nesting habitat, toxic chemicals, fisheries, and many forms of human disturbance (see summary in Sowls et al. 1980). Despite many problems, there has never been a coordinated program at the federal or state level to study and protect seabirds and their habitats in California.

This report also will be valuable for other federal and state agencies responsible for the welfare of seabirds and their habitats (e.g. National Oceanic and Atmospheric Administration, National Park Service, U. S. Navy, U. S. Air Force, U. S. Coast Guard, U. S. Forest Service, California Department of Fish and Game, California Department of Parks and Recreation, California Department of Transportation, California Department of Forestry, Caliornia State Coastal Commission, California State Lands Commission). The information contained in this report also will be used extensively by researchers interested in the population sizes and status of seabirds in California and on the west coast

of North America and those interested in surveying and monitoring seabird populations and their habitats over time (e.g. Point Reyes Bird Observatory, San Francisco Bay Bird Observatory, Pacific Seabird Group, University of California [e.g. Davis, Santa Cruz and Irvine], and California State Universities [e.g. Humboldt, San Francisco, Sacramento, Hayward, and San Jose]). Other coastal managers and planners, private land owners, environmental groups and the interested public (especially the bird watching community) also will find this report to be a useful reference.

There has been a long history of exploitation, disturbance and impacts to populations of nesting seabirds in California, especially on offshore islands. Permanent human occupation of most of the Channel Islands and the South Farallon Islands began in the 1800's and led to the decimation or elimination of many species (Ainley and Lewis 1974; Hunt et al. 1979, 1980; Sowls et al. 1980; Ainley and Boekelheide 1990). Common Murre eggs were harvested for human consumption for many years during the late 1800's on the South Farallon Islands and at other colonies along the mainland coast (e.g. San Pedro Rock)(Ray 1909, Doughty 1971; see summaries in Ainley and Lewis 1974, Takekawa et al. 1990). In the mid 1800's, commercial logging began in old-growth coniferous forests in central and northern California which by the 1980's had removed over 90% of the potential nesting habitat of the Marbled Murrelet (Carter and Erickson 1992). Coastal development in central and southern California during the 1900's has reduced available nesting habitat and heavily-disturbed Least Terns (Atwood et al. 1979, Erickson 1985). The construction of the Crescent City breakwater in the 1930's eliminated the largest colony of Fork-tailed and Leach's storm-petrels in the state (Osborne 1972, Sowls et al. 1980). Dumping of toxic chemicals in southern California led to a well-documented decline in Brown Pelicans and Double-crested Cormorants in the 1960's and early 1970's (Anderson and Gress 1983, Gress and Anderson 1983). In interior California, a dramatic change in freshwater habitats for nesting seabirds has occurred due to the massive agricultural and water developments of almost the entire central and coastal vallies, Great Basin parts of the Sierra Nevada Mountains area and most of southern California since the early 1800's, impacting especially White Pelicans, Double-crested Cormorants, Black Terns, Caspian Terns and Forster's Terns (Grinnell and Miller 1944, Remsen 1978).

As a result of declining or very low populations, 3 species of seabirds have been classified as endangered species (Brown Pelican, Least Tern and Marbled Murrelet) and 11 species have been classified as Species of Special Concern in California (Fork-tailed Storm-petrel, Ashy Storm-petrel, Black Storm-petrel, White Pelican, Double-crested Cormorant, California Gull, Gull-billed Tern, Elegant Tern, Black Skimmer, Rhinoceros Auklet and Tufted Puffin)(Remsen 1978, Steinhart 1990). Since surveys in

1975-1980, new or continued declines in some populations (especially Common Murres, Marbled Murrelets, California Gulls and White Pelicans) had been noted or could be expected as a result of changes in nesting habitat and substantial mortality of many seabirds due to gill-net fishing, oil spills and the intense 1982-1983 El Niño-Southern Oscillation (ENSO) event (Atkins and Heneman 1987; Ford et al. 1987; Carter and Erickson 1988, 1992; Stenzel et al. 1988; Ainley and Boekelheide 1990; Page et al. 1990; Takekawa et al. 1990). On the other hand, increases in certain populations also have been noted, especially Brown Pelicans, Double-crested Cormorants, Caspian Terns and Rhinoceros Auklets (Gill and Mewaldt 1983, Ainley and Boekelheide 1990, Stenzel et al. 1991, Ingram 1992). Clearly, the numbers of breeding seabirds have changed over time due to natural and human-related factors. Periodic updates of their status are required over large geographic areas to identify and determine the degree of such changes as well as to manage prudently for their welfare in many areas over time.

It has been difficult to describe and interpret declines and increases for many seabird populations in California, especially when most populations have not been monitored annually. Only four major long-term monitoring programs have existed for some time in California: 1) since the late 1960's, annual monitoring of all colonies of Brown Pelicans has been conducted by the University of California Davis and Channel Islands National Park; 2) since the late 1960's, all colonies of the Least Tern have been monitored through a program coordinated by the California Department of Fish and Game; 3) since 1972, the Point Reyes Bird Observatory has monitored all seabird populations at the Farallon Islands National Wildlife Refuge under a cooperative agreement and funding from the U. S. Fish and Wildlife Service (through the San Francisco Bay National Wildlife Refuge Complex); and 4) since 1985, an annual monitoring program for certain species in the Channel Islands (including Brown Pelicans) has been conducted by Channel Islands National Park. Smaller monitoring programs have existed for: 1) several tern species and California Gulls in southern San Francisco Bay (San Francisco Bay Bird Observatory through agreement with the San Francisco Bay National Wildlife Refuge Complex); 2) California Gulls at Mono Lake (Point Reyes Bird Observatory and Mono Lake Committee); and 3) species found on other National Wildlife Refuges throughout the state. These long-term monitoring programs have been instrumental in documenting trends in seabird populations throughout the state. In addition, studies conducted in association with monitoring programs have helped to explain how sizes of seabird populations respond over time in relation to prey resources, interactions with other species and human impacts. However, trends observed from these programs must be interpreted with caution and have limited application to other species or other parts of the state. Many species and coastal areas have not been examined regularly or in a standardized fashion. For most nesting areas, our

knowledge of breeding populations has been derived mainly (or solely) from information obtained through detailed or broad-scale surveys in 1965-1970 (Delong 1967; Crossin and Brownell 1968; Delong and Crossin 1968; Huber 1968; Osborne and Reynolds 1971; Osborne 1971, 1972) and 1975-1980 (Hunt et al. 1979, Sowls et al. 1980).

The description of trends from data that have not been obtained annually can be difficult depending on: the degree of standardization of population estimates (census methods, data collection effort and method of data handling), amount of population change that has actually occurred, amount of annual variation in population size, the length of time that has elapsed between survey periods and the amount and quality of other data that support or refute a particular trend. Such trend assessments often require specific studies and analyses beyond the scope of this report. Annual variation in population size has been of particular focus to many researchers. It has been shown to occur in the size of many seabird populations at the South Farallon Islands due to the varying nature of prey resources (especially rockfish Sebastes sp.) dependent on the California Current Upwelling System (Briggs et al. 1987, Ainley and Boekelheide 1990). Periodic ENSO events have been shown to impact the numbers of breeding birds and breeding success there. Breeding attempts and/or success (and hence future recruitment) as well as adult and/or subadult mortality levels can be relatively high or low for some species (Stenzel et al. 1988; Ainley and Boekelheide 1990). Such variation also has existed in the outer Channel Islands where a rockfish diet has predominated (Hunt et al. 1979) as well as in the inner Channel Islands for Brown Pelicans where the prey base was composed of Northern Anchovy, Engraulis mordax (Anderson et al. 1982).

Despite annual variation in the population size of some species in some areas, longer-term changes in populations have been shown to result from particular series of years of above-average or below-average reproduction, large-scale changes in prey resources, significant changes in nesting habitat and human impacts (Ainley and Lewis 1974, Sowls et al. 1980, Anderson and Gress 1983, Spear et al. 1987, Carter and Erickson 1988, Boekelheide and Ainley 1989, Hunt et al. 1979, Ainley and Boekelheide 1990, Takekawa et al. 1990). Such changes should be most evident and frequent for species that occur near or at the end of their breeding ranges on the California coast.

In this report, we have determined and provided current population estimates for breeding seabirds, discussed census difficulties in recent and past surveys, made brief comparisons with previous data to identify possible trends and cited other data which support, refute or confuse these trends. In 1989-1991, we conducted surveys and treated raw data in a standardized fashion to achieve breeding population estimates that were

similar in nature but were not exactly comparable to estimates provided in Hunt et al. (1979) and Sowls et al. (1980). Surveys of seabird colonies over large coastal areas in one year only permitted rough estimates of the number of breeding birds for many species at most colonies in the survey year. We have presented our methods in detail, presented raw data along with the non-rounded breeding population estimate (i.e. rounded only to the nearest breeding bird), provided more specific maps of nesting areas, entered data in databases and archived data in detail. It is our hope that future researchers will be better able to reconstruct how we derived estimates for more direct comparisons with their future surveys.

Figure 1. Map of California indicating place names referred to in the text.

Table 1. Species of breeding seabirds in California and abbreviations used in this report.

Scientific Name and Family	Common Name	Abbreviation
Storm-petrels (Family Hydrobatidae)		
Oceanodroma furcata	Fork-tailed Storm-petrel	FTSP
O. leucorhoa	Leach's Storm-petrel	LHSP
O. homochroa	Ashy Storm-petrel	ASSP
O. melania	Black Storm-petrel	BLSP
Pelicans (Family Pelecanidae)		
Pelecanus erythrorynchus	American White Pelican	WHPE
P. occidentalis	Brown Pelican	BRPE
Cormorants (Family Phalacrocoracidae)		
Phalacrocorax auritus	Double-crested Cormorant	DCCO
P. penicillatus	Brandt's Cormorant	BRCO
P. pelagicus	Pelagic Cormorant	PECO
Oystercatchers (Family Haemotopodidae)		
Haemotopus palliatus	American Oystercatcher	AMOY
H. bachmani	American Black Oystercatcher	BLOY
H. bachmani x H. palliatus	Black X American Oystercatcher Hybrid	BAOY
Gulls (Family Laridae; Sub-family Larinae)		
Larus heermanni	Heermann's Gull	HEEG
L. delawarensis	Ring-billed Gull	RBGU
L. californicus	California Gull	CAGU
L. occidentalis	Western Gull	WEGU
L. glaucescens	Glaucous-winged Gull	GWGU
Terns (Family Laridae; Sub-family Sternidae)		
Chlidonias niger	Black Tern	BLTE
Sterna nilotica	Gull-billed Tern	GBTE
S. caspia	Caspian Tern	CATE
S. forsteri	Forster's Tern	FOTE
S. albifrons	Least Tern	LETE
S. maxima	Royal Tern	ROTE
S. elegans	Elegant Tern	ELTE
Skimmers (Family Rynchopidae)		
Rynchops niger	Black Skimmer	BLSK
Auks (Family Alcidae)		
Uria aalge	Common Murre	COMU
Cepphus columba	Pigeon Guillemot	PIGU
Brachyramphus marmoratus	Marbled Murrelet	MAMU
Synthliboramphus hypoleuca	Xantus' Murrelet	XAMU
Ptychoramphus aleuticus	Cassin's Auklet	CAAU
Cerorhinca monocerata	Rhinoceros Auklet	RHAU
Fratercula cirrhata	Tufted Puffin	TUPU

METHODS

Surveys of nesting seabirds in California were conducted over a three-year period from 1989 to 1991. However, each part of the coast was surveyed in only one year each:

1989 Surveys in Northern and Central California

1) mid April to mid May - USFWS conducted Pigeon Guillemot and Marbled Murrelet boat surveys and transects, Leach's Storm-petrel mistnetting, and mainland surveys between the Oregon border and Eureka;

2) mid May to late June - USFWS conducted a complete survey of all colonies on the outer coast (including Castle Rock and the Farallon Islands National Wildlife Refuges), using boat, mainland, and/or aerial photograph surveys between the Oregon border and Point Conception;

3) July to mid September - USFWS conducted Leach's and Ashy storm-petrel mistnetting, burrow/crevice counts, and mainland surveys at selected colonies between the Oregon border and San Francisco, including Castle Rock and the South Farallon Islands National Wildlife Refuges;

4) April to July - Point Reyes Bird Observatory (PRBO) conducted correction factor counts, breeding phenology, and ground and boat surveys on the South Farallon Islands National Wildlife Refuge; and

5) USFWS surveys were supplemented with population estimates for Least Terns nesting in San Francisco Bay and in San Luis Obispo and Santa Barbara counties.

1990 Surveys in the San Francisco Bay Area

6) June to July - USFWS conducted a complete boat and ground survey of colonies in San Francisco, San Pablo, and Suisun bays, except for colonies located within most salt ponds or certain other restricted areas. In addition, a more complete boat survey of Humboldt and Arcata bays was conducted; and

7) USFWS surveys were supplemented with published and unpublished data for colonies of Double-crested Cormorants, California Gulls, Western Gulls, Caspian Terns, Forster's Terns and Least Terns that were not surveyed by USFWS in the San Francisco Bay area.

1991 Surveys of Southern California

8) January - USFWS conducted a reconnaisance trip in Channel Islands National Park, including mistnetting of Ashy Storm-petrels and Cassin's Auklets at Prince Island;

9) April - USFWS conducted mistnetting of Ashy and Leach's Storm-petrels, conducted Xantus' Murrelet crevice counts and banded adult Xantus' Murrelets in the Channel Islands;

10) May to mid June - USFWS conducted a complete survey of all colonies in the Channel Islands (especially Channel Islands National Park), using boat, ground, mistnetting and aerial photograph surveys;

11) Late June to late July - USFWS conducted a complete survey of the mainland coast from Point Conception to the Mexican border (using boat and ground surveys), except for tern and skimmer colonies. In addition, Leach's, Ashy and Black storm-petrel mistnetting was conducted on the Channel Islands;

12) October - USFWS conducted detailed burrow/crevice counts in the Channel Islands;

13) February to September - University of California Davis conducted detailed ground and boat surveys of Brown Pelicans and Double-crested Cormorants at West Anacapa Island;

14) February to September - Channel Islands National Park conducted ground and boat surveys for certain species at Santa Barbara and East Anacapa islands and assisted USFWS surveys in the Park; and

15) USFWS surveys were supplemented with published and unpublished information on nesting terns and skimmers along the mainland coast.

Interior California

We supplemented information on coastal nesting areas of seabirds from 1989-1991 with general summaries of nesting areas of several species in interior California, including: White Pelican, Double-crested Cormorant, Ring-billed Gull, California Gull, Black Tern, Gull-billed Tern, Caspian Tern, Forster's Tern, and Black Skimmer.

Our basic objectives were to obtain counts of the numbers of nests, birds, and/or potential nest sites at nesting areas using several survey techniques, either at the peak of the breeding season or when peak numbers of breeding birds could be counted.

However, raw counts of nests on a particular census day were usually minimal since they excluded birds that were not nesting that day but did nest at some point during the breeding season (i.e. birds did not lay eggs until after the census day and/or birds laid eggs and underwent nesting failure before the census day). Similarly, raw counts of birds were usually minimal both for the above reason and since they excluded breeding adults that were away from the colony foraging at the time of the count. On the other hand, counts of potential nest sites (usually burrows and crevices) would have produced closer to maximal estimates of numbers of breeding birds since not all potential sites were used. Thus, to derive realistic estimates of the numbers of breeding birds at nesting areas, it was necessary to adjust raw counts of nests, birds or sites with correction factors to account for breeding birds that would be incorrectly included or not included in estimates. The degree of adjustment of raw data varied between species. For some species, numbers of nests or birds were not adjusted, either because it was not necessary or a suitable correction factor was not available.

Below, we have decribed the census techniques used and have discussed how correction factors were applied to derive estimates of the numbers of breeding birds of each species at each colony. We have taken some of the description of census techniques from Sowls et al. (1980) and Takekawa et al. (1990) so that slight differences can be highlighted. In the later section "How to use maps and tables", we have outlined how data have been presented in tables and maps and have discussed the two colony numbering systems used in this report.

SURVEY TECHNIQUES

Boat surveys - All sections of coastline (except for Tomales Bay and certain large sandy beach sections of Monterey Bay and along the mainland of southern California) were surveyed by boat one or more times in 1989-1991. Counts were made using 7X or 10X binoculars or the unaided eye from 14-foot (4.3 m) Zodiac inflatable boats powered with 25 hp outboard engines. These small boats allowed close access to shoreline areas which were often difficult or impossible to view otherwise. Whenever possible, direct counts of nests and individual birds were made. Usually, the boat was slowed or stopped and 1-3 observers counted birds and/or nests at the same or adjacent portions of the colony. Counts were repeated when possible and/or necessary to ensure accuracy. Birds observed flying to or from a colony or those sitting on the water near a colony were also counted for some species. Roosting birds were counted separately from breeding colonies.

Boat transects - Coastal at-sea transects were conducted from inflatable boats between the Oregon border and Humboldt Bay

mainly in late April 1989 and along certain more southerly sections of coast from late May to late June 1989. Fixed-width transects were oriented parallel to and 200-600 m off shore. Birds on the water or flying were counted out to distances of 150-250 m on either side of the boat by one or two observers as the boat moved along at moderate speeds. At times, the boat was slowed or stopped to search with 7X or 10X binoculars or more closely examine distant birds. Transects were conducted primarily to systematically document numbers of Pigeon Guillemots and especially Marbled Murrelets along certain coastal sections (see Appendix 5).

Mainland surveys - Except for the North and South Farallon Islands, Redding Rock and Point Saint George Lighthouse, all islands and offshore rocks in northern and central California are within 1 km of the mainland. Counts of nests and/or birds on nearshore rocks, islands, and mainland cliffs often were made from mainland promontories or overlooks using 7X or 10X binoculars or 60-120X telescopes. Generally, these counts underestimated populations since only the landward sides of colonies were visible. However, these counts were at times higher than those obtained from boats due to better observing conditions, especially on the landward side and tops of tall rocks and islands and in some areas that were inaccessible by boat.

Landings and burrow/crevice counts - When possible, landings were made on some islands and rocks from inflatable boats to obtain more accurate counts, except at colonies of Double-crested and Brandt's cormorants and Common Murres (plus haul-out and breeding rookeries of marine mammals) which were especially sensitive to disturbance. When we landed on an island, we counted cormorant, gull, and oystercatcher nests and burrow/crevice sites of storm-petrels and alcids. Island visits during the breeding season were kept as brief as possible to minimize disturbance to nesting birds.

Extensive counts of burrow/crevice sites mainly for Xantus' Murrelets, Cassin's Auklets and Rhinoceros Auklets were conducted after the breeding season at large colonies at Castle Rock and the South Farallon Islands National Wildlife Refuges and Castle Rock, Prince Island, Gull Island, Santa Barbara Island and Sutil Island in Channel Islands National Park. Since these islands and rocks were fairly small (except for the South Farallon Islands and Santa Barbara Island), we individually counted all burrow/crevice sites and estimated numbers only for very small, inaccessible areas of large colonies. The sizes of burrows and crevices were classified as small (i.e. storm-petrel), medium (i.e. Xantus' Murrelet, Cassin's Auklet) and large (i.e. Pigeon Guillemot, Xantus' Murrelet, Rhinoceros Auklet, Tufted Puffin). At Castle Rock National Wildlife Refuge, Del Norte County, we estimated the number of sites for a portion of area 2. Here,

numbers of sites were estimated using six 10 foot x 10 foot plots. Areas for extrapolations were determined using a map traced from an aerial photograph which was put to scale using ground tape measurements between conspicuous landmarks. In areas 2 and 10-13, numbers of sites were estimated based on numbers (and percentages of different burrow sizes) observed when walking around the northern periphery. These areas on the northeast side had very fragile soil riddled with burrows; in addition, area 13 was very steep.

Aerial surveys - In northern and central California, all known Common Murre colonies and all Double-crested and Brandt's cormorant colonies estimated at 100 or more breeding birds in Sowls et al. (1980) were aerially surveyed once in 1989: 1) central California colonies between Gualala Point Island and Pismo Beach (including the Farallon Islands) were surveyed on 23-24 May; 2) northern California colonies between the Oregon border and Cape Vizcaino were surveyed on 30-31 May; and 3) northern California colonies in between Cape Vizcaino and Gualala Point Island were surveyed on 16 June. In southern California, all known Brown Pelican colonies and Double-crested and Brandt's cormorant colonies estimated at 100 or more birds in Hunt et al. (1979) were aerially surveyed twice in 1991 (16-17 May; 15-22 June). We added some cormorant colonies which appeared larger than 100 breeding birds during flights. At some colonies, we also were able to obtain complete counts of Western Gull and Pelagic Cormorant nests and birds in photographs.

Surveys were conducted in the refined manner developed by Takekawa et al. (1990). Surveys in northern California were flown at 50-90 knots from a single engine, wing-over Cessna 150 or 182 aircraft at altitudes of 400-500 feet (120-150 m). In central and southern California, a twin engine, wing-over Partanavia aircraft was used at altitudes of 400-650 feet (150-200 m). At Point Bennett and Castle Rock in Channel Islands National Park, photographs were taken from altitudes greater than 1,000 feet (300 m) due to concern about possible disturbance to marine mammals. Colonies were photographed completely by two photographers, each using a 35 mm camera set at rapid shutter speeds (1/500 or 1/1000 secs), a 300 mm telephoto lens, and color slide film (ASA 400). To ensure complete coverage, all nesting areas were photographed several times on several passes. Both photographers used powerwinders for faster exposures and one photographer shot through an open window. Overview photos were also taken using a 50 mm lens and color slide film (ASA 64 in 1989, ASA 200 in 1991). We attempted to pass directly over colonies to minimize oblique photographs. However, when surveying the South Farallon Islands, passes were flown farther off the island due to steep topography and to prevent disturbance. Only a few Common Murres at one or two colonies but no cormorants flushed during our surveys.

Slides of the highest quality (closest and clearest) were selected for counting. Overviews aided in identifying and piecing together close-up views of each colony. Slides were projected using a slide projector with a zoom lens (100-150 mm) onto large white paper. Count areas were demarcated using landmarks or colony outlines. Slides were intensively searched by two observers who dotted each bird and nest with a felt tip pen and later tallied them with a hand-held counter. Due to the high resolution of our slides, we had little difficulty counting birds and/or nests. When cormorant species occurred together, we often distinguished species using different body sizes, throat colors, and nest types. However, we usually confirmed identification during boat and ground surveys.

MIST NETTING

Mist netting of nocturnal seabirds (especially storm-petrels) has been used extensively to sample populations for various purposes (Ainley et al. 1974, 1976; Harris 1974; Furness and Baillie 1981; Copestake et al. 1988; Emslie et al. 1990). In 1989, we made several overnight visits to 8 colonies in northern California and conducted nocturnal mist netting to capture storm-petrels (Table 9, Appendix 3). In 1991, overnight visits and mist netting efforts were used to capture storm-petrels and alcids (Xantus' Murrelets and Cassin's Auklets) at 7 colonies in southern California (Table 9, Appendix 4). By capturing birds in mist nets, we determined: 1) which species of storm-petrel were present at colonies; 2) relative numbers of each species captured; 3) breeding phenology of storm-petrels and Cassin's Auklets; and 4) population estimates of certain species of storm-petrels at certain colonies, using capture-recapture analyses. In addition, we noted vocalizations of storm-petrels and alcids that were not captured in mist nets.

We erected 7-foot (2.1 m) high x 30-foot (9.1 m) long nylon mistnets (1.5 inch [3.8 cm] mesh, four shelf) to capture storm-petrels at all colonies in California. One exception occurred at net site 2 on Prince Island (Santa Barbara County) where a 7-foot high x 18-foot long mist net better fitted a 25-foot long rock outcropping. Usually, nets were oriented parallel to shore or on the tops of islands and as near as possible to potential nesting habitats. At all colonies in northern California and some colonies in southern California, mistnetting was conducted on only one night within a 2-week period. However, at Prince, Santa Barbara and Sutil islands (Channel Islands National Park) in 1991, mistnetting was conducted nightly during visits of up to 8 days (Appendix 4). These islands required greater effort to sample due to the large area of potential nesting habitat. One planned 7-day excursion to Prince Island in April was abandoned after 2 short nights of mist netting due to extremely windy conditions. At Santa Barbara and adjacent Sutil Islands, we mist

netted at several sites around the islands to sample as much of the area as possible (Figure 11, Appendix 4). One mist net (site 1) placed in front of a small cave at Elephant Seal Point, Santa Barbara Island, was specifically erected for capturing Cassin's Auklets.

Tape luring - We attracted storm-petrels to net locations by broadcasting recorded vocalizations from small portable cassette tape players placed beside the mist net. This technique has been referred to as "tape luring". Cassette tapes of Ashy Storm-petrel vocalizations recorded at the South Farallon Islands by D. G. Ainley in the early 1970's were provided by the Point Reyes Bird Observatory. Leach's Storm-petrel vocalizations that had been recorded in Maine also were provided by D. G. Ainley. Tapes of Fork-tailed Storm-petrel vocalizations recorded in the Barren Islands, Alaska, were provided by T. R. Simons. Black Storm-petrel vocalizations recorded by D. G. Ainley in Baja California, Mexico, were provided by C. A. Drost.

The amount of broadcast time for each netting night (summarized in Appendices 3 and 4) was not standardized and depended on bird activity and the target species at the colony surveyed. In northern California, we targeted Leach's Storm-petrels, the most abundant species, except at Bird Rock (Marin County) where only Ashy Storm-petrels occurred. In southern California, Ashy Storm-petrels were targeted as the most abundant species, with lesser emphasis on Black and Leach's storm-petrels. When more than one species nested at a colony, we typically broadcasted vocalizations of each species during their respective peak activity periods. For example, Fork-tailed and Black storm-petrels have been shown to be most active at colonies within 1-3 hours after full darkness (Harris 1974, Hunt et al. 1979). For these species, we broadcasted their vocalizations for 1-2 hours after dark and on a more random basis afterwards. Leach's Storm-petrels have been shown to be most active from midnight until dawn (Ainley et al. 1974, Harris 1974). In southern California, we broadcasted Leach's Storm-petrel vocalizations after about 0100 hrs. Ashy Storm-petrels have been shown to be active from 1-2 hours after darkness throughout the night (Ainley et al. 1974, 1976) and we broadcast their vocalizations throughout the night. We also oscillated the broadcast of different vocalizations interspersed with silent periods when birds were not being captured. This action often changed the amount of activity by storm-petrels around the net site.

Banding - Captured storm-petrels were fitted with standard U. S. Fish and Wildlife Service incoloy leg bands. In 1989, stage of incubation patch development (see below) was recorded for all birds whereas primary, retrix and body molt and rump color type (Leach's Storm-petrel only) were recorded for many but not all birds. Rump color type of Leach's Storm-petrels was scored according to Ainley (1980) from a completely-white rump (score=1)

to a completely-dark rump (score=11). For all species of storm-petrels captured in 1991, we systematically recorded: stage of the incubation patch; body, primary and rectrix molt; wing chord, tail, culmen, and tarsus lengths; and rump color type (Leach's Storm-petrel only).

For Cassin's Auklets and Xantus' Murrelets, captured birds were fitted with standard U. S. Fish and Wildlife Service stainless steel leg bands. For Cassin's Auklets, data were collected on stage of the incubation patch (see below), primary molt and iris color (see Manuwal 1972, 1978; Emslie et al. 1990). On Xantus' Murrelets, data were collected on stage of the incubation patch, wing chord, culmen, and tarsus lengths, bill depth, and plumage color morphs. Plumage color morphs followed Jehl and Bond (1975).

Incubation patch - The stage of the incubation patch was scored from 0-5 as follows:

0 - Completely covered with down (i.e. no brood patch).
1 - 5-50% defeathered (i.e. partially downy).
1.5 - 50-95% defeathered (i.e. partially downy).
2 - 95-100% bare, unvascularized.
3 - 95-100% bare, vascularized.
4 - 5-50% refeathered (i.e. refeathering).
4.5 - 50-95% refeathered (i.e. refeathering).
5 - 95-100% refeathered (i.e. no brood patch but careful inspection showed refeathering, the bird regurgitated prey or stomach oil intended for its young or the bird showed the regular molt pattern of adults).

In 1991, these scores were better standardized for storm-petrels. In 1989, 4.5 scores were sometimes lumped with scores of 4, respectively.

The stage of the incubation patch was used to determine the breeding status of each captured bird. Inspection of incubation patches has been a common method of separating breeding birds from non-breeding birds, used widely in studies of seabirds and other birds. In all well studied avian species, only breeding birds develop incubation patches (Jones 1971), although pre-breeding, failed and post-breeding birds may have an incubation patch for some period of time when they are not actively incubating or raising chicks. In storm-petrels, several researchers have reported that nonbreeding birds at times will develop an incubation patch (Furness and Baillie 1969, Harris 1969, Wilbur 1969, Scott 1970). While this assertion has not been proven, most researchers have avoided the use of incubation patch stage as the sole indicator of breeding versus non-breeding status. Another unusual feature of storm-petrels incubation patch cycle is that defeathering can begin far ahead of egglaying (Ainley et al. 1974, 1976). Thus, the presence of an incubation

patch in storm-petrels did not necessarily indicate that eggs had been laid already. Other researchers have grouped birds into breeders and nonbreeders based on average wing lengths and whether or not captured birds regurgitated (Ainley et al. 1974, Furness and Baillie 1969). These methods also have not been proven for separating breeders from non-breeders. Although these methods may be adequate for analyzing groups of captured birds, these criteria were not adequate for establishing the breeding status of each bird. Given these difficulties and our desire for a repeatable technique that could be used in the future, we used stage of the incubation patch as the sole determining factor of breeding status in storm-petrels.

The use of incubation patch stage to determine breeding status of a captured bird depended on the time of year and the species considered. For Leach's Storm-petrels, all birds with an incubation patch score of 0, as well as birds with a score of 1 after mid-May (Figures 9, 10), were considered to be not breeding. For Ashy Storm-petrels, all birds captured in January and April were considered to be breeders that were visiting the colony early in the year. After April, all birds with a brood patch score of 0 or 1 were considered nonbreeders (Figures 10, 12, 13). For Black Storm-petrels, all birds captured in May were considered breeders since these birds arrived later to the colony than did other species (Everett 1991) and some breeders may not have developed incubation patches yet (Figure 13). After May, birds with a score of 0 or 1 were considered to be nonbreeders. We also used incubation patch data to estimate timing of breeding in storm-petrels in northern and southern California (Figures 14-16) and in Cassin's Auklets in southern California (Figure 17).

BREEDING PHENOLOGY, ATTENDANCE PATTERNS AND CORRECTION FACTORS

Information on breeding phenology and attendance patterns of seabirds at their breeding colonies in California were important for: 1) conducting counts at the peak of the breeding season or when peak numbers of birds could be counted; and 2) developing adequate correction factors for adjusting raw counts of nests, birds and sites to derive population estimates.

Timing of surveys - We scheduled surveys along different sections of the California coast in 1989-1991, based on past information on breeding phenology, information from monitoring programs early in the survey year and our observations early in the breeding season. Our goal was to survey colonies when peak numbers of nests and birds could be counted at colonies which usually occurred between the end of egglaying and before fledging had occurred. It was impossible to survey each species at each colony during this narrow window of time due to different phenologies between species and the large numbers of colonies and large sections of coast that were surveyed. However, based on

our examination of breeding phenology in California, there was a period of about a month where it was possible to survey most colonies and species at the appropriate time, given good weather conditions and almost continuous surveying efforts. Certain species in some areas were surveyed earlier because bird counts were higher and/or time consuming (Marbled Murrelets and Pigeon Guillemots), mist netting was conducted over the entire breeding season (storm-petrels) and burrow/crevice counts at large colonies were conducted after the breeding season when necessary to prevent disturbance to nesting seabirds and marine mammals. Based on diurnal attendance patterns known at the South Farallon Islands (Ainley and Boekelheide 1990) and the experience of previous researchers (Sowls et al. 1980), we conducted many surveys (especially boat and ground surveys) as early in the day as possible when numbers of birds attending colonies were highest. Fortunately, the best weather conditions for obtaining accurate counts and covering long distances by boat also occurred in the early part of the day.

Breeding phenology - Most knowledge of the timing of breeding of seabirds in California has come from studies at the South Farallon Islands (summarized in Ainley and Boekelheide 1990) and in the Channel Islands (summarized in Hunt et al. 1979). Sowls et al. (1980) summarized data on breeding phenology and depicted variation between different areas of the California coast. Point Reyes Bird Observatory has annually determined the breeding phenology and colony attendance patterns of several species at the South Farallon Islands since 1972. The University of California (Davis) has studied timing of breeding in Brown Pelicans and Double-crested Cormorants since the late 1960's (e.g. Anderson and Gress 1983). The University of California (Irvine) conducted many studies of several species in the Channel Islands during the 1970's. Since 1985, Channel Islands National Park has monitored breeding phenology in certain species (Brown Pelicans, Double-crested Cormorants, Western Gulls, Xantus' Murrelets and Cassin's Auklets).

In 1989, the timing of breeding of 10 seabird species (Ashy Storm-petrels; Double-crested, Brandt's and Pelagic cormorants; Western Gulls; Black Oystercatchers; Common Murres; Pigeon Guillemots; and Cassin's and Rhinoceros Auklets) was determined at the South Farallon Islands (Figure 2; Emslie and Sydeman 1989). Samples of nest sites ($n > 30$, except for Ashy Storm-petrels and Black Oystercatchers) were monitored every 1-5 days to determine the number and timing of first clutches initiated, hatched, and fledged, as well as second and replacement clutches (Figures 2, 3). For Marbled Murrelets which nest in old-growth forests along the coast, information on breeding phenology in 1989 (Figure 4) was derived from studies by the University of California (Santa Cruz) and others in central California (Naslund 1990, Singer et al. 1991).

In 1991, breeding phenology in southern California was determined for only a few species in Channel Islands National Park (T. Ingram, unpubl. data). Detailed monitoring of Brown Pelicans at West Anacapa Island provided data on breeding phenology at this colony (Figure 18; Gress 1992).

Attendance patterns - Diurnal attendance patterns have been studied in detail previously at the South Farallon Islands (Ainley and Boekelheide 1990). In 1989, attendance patterns of 7 seabird species (Double-crested, Brandt's and Pelagic cormorants; Western Gulls; Common Murres; Pigeon Guillemots; and Tufted Puffins) were determined there (Figures 5, 6; Emslie and Sydeman 1989). Attendance patterns of Pigeon Guillemots and Tufted Puffins also were examined by USFWS at 3 colonies in northern California in 1989 (Figure 7). At the South Farallon Islands, plot attendance by breeding and non-breeding adults was determined for four periods (0600-0800, 1000-1200, 1400-1600, 1800-2000 hrs PDT) throughout one day at 15-day intervals from 15 April to 31 July (Figures 5, 6, and 8). In addition, Pigeon Guillemots rafting around the South Farallon Islands were counted on the same schedule (Figure 6) and Rhinoceros Auklets arriving at dusk at two nesting areas on Southeast Farallon Island were counted on the same 15-day schedule (Figure 8). In 1991, diurnal attendance patterns were not examined in southern California.

Correction factors - Over many years of seabird monitoring around the world, seabird researchers have recognized that correction factors were required to derive population estimates from raw counts for many species (e.g. Ainley and Boekelheide 1990). Such correction factors required specific knowledge of breeding phenology and colony attendance patterns. In addition to annual monitoring work, PRBO conducted specific counts of the numbers of nests and birds in various plots and areas on the South Farallon Islands in 1989 (Emslie and Sydeman 1989). From these counts, we calculated 2 types of correction factors (J and K) for use in adjusting raw counts of nests and birds to obtain breeding population estimates where:

J = the total number of active nests over the breeding season divided by the number of active nests that would be counted on a single census day. J was calculated every 15 days from April to July 1989 from samples of monitored nests at the South Farallon Islands (Figure 3; Table 2).

K = the total number of breeding birds over the breeding season divided by the number of birds (breeding and non-breeding) that would be counted at a particular time on a single census day. K was calculated for four periods of day every 15 days from April to July 1989 for samples of monitored nests in plots at the South Farallon Islands (Figures 5, 6; Table 2).

We applied J and K correction factors to raw counts of nests and birds to derive estimates of the numbers of breeding birds in a standardized fashion. Thus, future researchers could either repeat our technique or modify it as necessary, allowing for more direct comparisons. Without the large additional effort required to evaluate previous surveys, we were unable to directly compare our results to those of 1975-1980 surveys. It was not always clear how their raw counts were adjusted to derive population estimates and such adjustments varied between colonies and investigators. In northern and central California, this less-standardized approach was adopted because of highly-variable observation conditions during counts in 1979-1980 at many colonies (A. L. Sowls, pers. comm.). In 1989-1990, we collected data in a highly standardized fashion under mostly-excellent observation conditions, making it possible and appropriate to then adjust raw counts with standardized correction factors.

We calculated "approximate" J and K correction factors by averaging from 2-6 daily values during the peak of the breeding season (between the dates of median laying and median fledging) on the South Farallon Islands (Table 2). We felt that mean values would be better to apply to raw counts at other colonies where the exact timing of breeding was not known and may have been somewhat different from the South Farallon Islands. In northern and central California, most surveys were conducted from mid May to mid June 1989. Even if the timing of breeding was two weeks earlier or later than at study plots at the South Farallon Islands (see Sowls et al. 1980), censuses would still occur during the peak of the breeding season. In southern California, surveys were similarly conducted from early May to mid June for the same reason. Also, J and K correction factor values were lowest and least variable at this time which allowed for lower and more reliable adjustments.

We prioritized the use of correction factors based on the degree of variability inherent in these factors. The J factor was used wherever an accurate nest count was available because it was not affected much by daily variation. The K factor was used when an accurate nest count was not available but the number of birds were counted. K values were determined for four periods of day because K often varies regularly over the day based on the daily foraging and roosting behavior of breeding adults and attendance by non-breeders at the colony (see Ainley and Boekelheide 1990, Takekawa et al. 1990). In addition, K values can vary between days depending on weather conditions, food availability, and other factors. Thus, K values were considered rougher (i.e. there was more inherent error) than J values.

The L correction factor was used to roughly adjust direct counts of potential burrows and/or crevices on certain colonies to obtain breeding population estimates of Leach's Storm-petrels,

Xantus' Murrelets, Cassin's Auklets and Rhinoceros Auklets (see Table 2):

L = the proportion of potential burrow and crevice nest sites in which eggs were laid over the breeding season or "burrow occupancy". Rough L values were derived mainly from the literature.

L correction factors were not directly determined at the South Farallon Islands in 1989. Little past information was available on which to base L values in California. In early May 1989, two Cassin's Auklet plots at the South Farallon Islands were briefly examined; 93% of 47 burrows and 76% of 56 crevices were found to be actively visited (i.e. toothpicks were knocked over) on at least two of three nights (Emslie and Sydeman 1989). However, burrows and crevices can be visited by birds without eggs being laid in them (especially by non-breeding adults) such that these percentages probably are slightly high. Lower values may truly apply to crevice sites since we were less sure that all of these were in fact suitable nest sites than we were for burrows (which had to be dug out by birds). Since other data were not available, we used a very rough L value of 75%) for Cassin's Auklets. We also used rough L values derived from the literature of 75% for Leach's Storm-petrels (Morse and Buchheister 1979, Nelson et al. 1987, Sklepkovych and Montevecchi 1989) and 50% for Rhinoceros Auklets (Wilson and Manuwal 1986). For Xantus' Murrelets (which nested only in crevices and under bushes), we were able to derive specific L correction factors, using data from plots monitored by Channel Islands National Park on Santa Barbara Island in 1991 (see species account).

ADJUSTED BREEDING POPULATION ESTIMATES

Detailed presentations of how we calculated the numbers of breeding birds at specific colonies can be found in species accounts. Below, we have provided several examples of how correction factors were applied to raw counts to derive breeding population estimates.

<u>J and K adjustments</u> - To demonstrate how J and K correction factors were applied, we have explained below how 422 breeding Double-crested Cormorants were estimated at the Russian River Rocks colony in 1989:

1) A total of 176 nests and 198 birds were counted using the highest counts at five subcolonies including: 119 nests and 131 birds at three subcolonies from an aerial survey on 23 May at 1524 hrs; 52 nests and 63 birds at one subcolony from a mainland survey on 5 June at 1000-1057 hrs; and five nests and six birds at one subcolony from a boat survey on 5 June at 1211-1303 hrs.

2) We multiplied the 176 nests by a J value of 1.2 (see Table 2) to account for nests that were not active during censuses, resulting in an adjusted total of 211 nests.

3) Two breeding adults (per mated pair) were applied to each of the 211 nests, resulting in an estimate of 422 breeding birds.

If it had been possible only to obtain a complete count of all birds at all known subcolonies, we would have calculated an estimate of 433 breeding birds at Russian River Rocks in 1989 as follows:

1) 69 birds were counted at 2 subcolonies between 1000-1303 hrs on 5 June. We multiplied the 69 birds by a K value of 2.1 (see Table 2) to account for breeding birds that were not present and nonbreeders present at that time on the census day, resulting in a partial adjusted total of 145 breeding birds.

2) 131 birds were counted at 3 other subcolonies at 1524 hrs on 23 May. We multiplied the 131 birds by a K value of 2.2 (see Table 2) as above, resulting in a partial adjusted total of 288 breeding birds.

3) The sum of 145 and 288 birds above equaled the total of 433 breeding birds.

For Double-crested and Brandt's cormorant colonies, Pelagic Cormorant colonies (south of Del Norte and Humboldt counties in northern California) and Western Gulls, almost all population estimates were derived directly as above using J correction factors. K factors were used only in a few cases where necessary. For Pelagic Cormorants, J and K correction factors at the South Farallon Islands were affected to some degree by the early abandonment of nests there in 1989 whereas such abandonment was not noted to the same extent elsewhere. We felt more comfortable substituting Brandt's Cormorants factors instead which were significantly lower for J but similar for K factors. For Common Murres, Pigeon Guillemots (south of Del Norte and Humbodlt counties in northern California) and Tufted Puffins, almost all population estimates were derived using K correction factors since we could not directly count nests but could count numbers of birds at and in the vicinity of nesting areas. Previous work on Common Murres at the South Farallon Islands (Ainley and Boekelheide 1990, Takekawa et al. 1990) resulted in more specific information on K values than in other species. Instead of using the K value of 1.8 for the period between 0900-1300 hrs (Table 2), we used a mean K value of 1.68 (derived from four years of data) to adjust all counts of Common Murres (see Takekawa et al. 1990). We felt that K values in any one year may vary between colonies and that using a mean value was more

appropriate for application to other colonies. Also, the 1.68 value was more comparable with the 1.67 value used by Sowls et al. (1980). For Pigeon Guillemots (south of Del Norte and Humboldt counties) and Tufted Puffins, we also did not use K values directly from those calculated at the South Farallon Islands because Farallon counts only dealt with nesting areas (i.e. birds on land) whereas USFWS surveys included birds on the water, flying nearby, roosting on intertidal rocks, and/or at nesting areas. Since we had no other reliable way of adjusting counts, we roughly reduced the K values by half before use since, by including all birds in the vicinity of colonies, we had already accounted for some breeding birds that were not present and visible on land at nesting areas.

For Pelagic Cormorant and Pigeon Guillemot colonies in Del Norte and Humboldt counties in northern California, we decided not to use Farallon Island correction factors because we had better local information to adjust counts. For Pelagic Cormorants, May and late June-early July counts were compared:

1) if the late June-early July (late incubation-early chick period) nest counts were higher, we used these numbers without adjustment and assumed that all nests were counted; and,

2) if the May (early-incubation) counts were higher, we used a J factor of 4.8 or a K factor of 2.8 to adjust counts. These values were derived from mean differences observed at 19 colonies in this area. Our assumption was that all nests were not counted in May and by late June-early July some nests had failed (see Carter et al. 1984).

For Pigeon Guillemots, April and May counts were compared:

1) if the April (pre-breeding) bird count was higher, we used this number without adjustment and assumed that all breeding birds were counted during morning censuses and that non-breeding birds were not present; and,

2) if the May (incubation) bird count was higher, we used a K factor of 1.3. This value was derived from mean differences observed at 16 colonies in this area. Our assumption was that all birds had not been present or counted in April and that by May not all birds were present and countable at colonies in the morning.

<u>L adjustments</u> - To demonstrate how L correction factors were applied to raw counts of potential sites, we have explained below how 5,638 breeding Cassin's Auklets were determined at the Castle Rock National Wildlife Refuge in 1989:

1) A total of 3,166 potential medium-sized burrows and/or crevices were counted on 12-13 September. These sites were all considered to be Cassin's Auklet sites because they were too small for use by other alcids and burrows probably were too large to have been dug by storm-petrels.

2) A total of 1,300 potential large-sized burrows and/or crevices also were counted. Only 593 sites were considered not to be used by larger alcids (Pigeon Guillemots, Rhinoceros Auklets or Tufted Puffins) based on separate correction factors and thus were available for use by Cassin's Auklets.

3) By applying a L correction factor of 0.75 to the total of 3,759 potential sites, we estimated 2,819 active sites.

4) Two breeding adults (per mated pair) were applied to each active site, resulting in an overall population estimate of 5,638 breeding birds.

Other considerations - For Black Oystercatchers and Rhinoceros Auklets observed only near colonies during the day, there were no suitable correction factors known. Thus, unadjusted raw counts were used for minimal breeding population estimates. We did not adjust estimates of the numbers of breeding Brown Pelicans and Least Terns at colonies that were provided by other researchers. These estimates were determined through detailed and specific monitoring programs and all nests were assumed to be accounted for in estimates. We either used the number of nests multiplied by two adults/nest or, if it appeared that second or replacement nests were included in Least Tern nest counts, we used the high end of the range of numbers of breeding pairs. Similarly, whenever counts of nests were provided by other researchers (e.g. the South Farallon Islands, San Francisco Bay), we assumed that all nests had been counted and we did not adjust these numbers. One exception was Double-crested Cormorants in San Francisco Bay where we had sufficient information about when and how counts were conducted to adjust numbers at all colonies except the Richmond-San Rafael Bridge colony. For many Forster's and Caspian tern colonies in San Francisco Bay, only peak numbers of birds present at colonies have been counted by the San Francisco Bay Bird Observatory in recent years to prevent investigator disturbance. It was necessary to adjust these counts using an approximate K correction factor of 1.25 based on data available for Caspian Terns from five colonies between 1984-1990 (Table 3).

CAPTURE-RECAPTURE POPULATION ESTIMATES

For certain colonies of storm-petrels, we calculated population estimates from mist netting data. We used 3 different

analytical methods based on capture-recapture techniques: 1) Lincoln-Petersen method; 2) computer program CAPTURE; and 3) computer program JOLLY.

The Lincoln-Petersen model was designed for closed populations (i.e. no emmigration or immigration) and for data sets with 2 capture periods only. When using the Lincon-Petersen method, we used Chapman's (1951) less biased version as follows:

$$N(hat) = \frac{(n_1 + 1)(n_2 + 1)}{(m_2 + 1)} - 1$$

where N(hat) is the population estimate, n_1 is the number of birds captured at time period 1, n_2 is the number of birds captured at time period 2 and m_2 is the number of birds recaptured at time period 2. Variance was calculated by Seber's (1970, 1982) unbiased estimate:

$$var\ N(hat) = \frac{(n_1 + 1)(n_2 + 1)(n_1 - m_2)(n_2 - m_2)}{(m_2 + 1)^2(m_2 + 2)}$$

The computer program CAPTURE (Otis et al. 1978) was designed to analyze capture data for closed populations with 3 or more capture periods. Several models were included in the program:

The Null Model, M(o), assumed all birds have equal capture probabilities on each occasion and capture probabilities did not vary with time.

The Heterogenity Model, M(h), assumed heterogenity of capture probabilities in the population.

The Behaviorial Model, M(b), assumed that capture probabilities change due to behaviorial response from first capture (i.e. "trap-happy" or "trap-shy").

The Time Model, M(t), assumed time specific changes in capture probabilities.

Other models, including M(bh), M(th), M(tb), and M(tbh), were combinations of the above models.

Models have associated population estimators, except the M(th), M(tb), and M(tbh) models. After putting the capture data through a series of chi-square goodness of fit tests, the program selected the model which best fitted the attributes of the data. However, the model selected was not always correct and it may be necessary for the researcher to use a subjective approach when choosing a model (Otis et al. 1978).

The computer program JOLLY (Pollock et al. 1990) was designed to analyze capture data for open populations (i.e. when immigration and/or emmigration occur) with 3 or more capture periods. Several models were included in the program, including:

Model A - Standard Jolly-Seber model;

Model B - Jolly-Seber model with survival rate assumed constant per unit time and time-specific capture probability; and

Model D - Jolly-Seber model with both survival rate and capture probability assumed contant per unit time.

For all capture-recapture analyses with more than 2 capture periods, we analyzed data with both CAPTURE and JOLLY for comparison. If mist netting was conducted one night at a time, each night was considered a capture period. If mist netting was conducted for several nights at a time, the entire visit was considered a capture period. For mist netting in the Santa Barbara Island area in 1991, mist netting data from May at Santa Barbara Island and on 4-5 June at Sutil Island were lumped into one capture period.

It was not clear which capture-recapture method and model was best to use at any colony. Storm-petrel colonies were not closed populations, even over relatively short periods of time. Nonbreeders occassionally visited colonies, some breeders arrived later than other breeders, failed breeders may depart from the colony and a small number of birds may die during the study period. Visitation by nonbreeders was most likely to introduce the most bias. However, we were interested only in breeding population estimates and excluded nonbreeders from analyses. On the other hand, none of the models in program JOLLY account for heterogeneity of capture probabilities which also can introduce serious bias (Pollock et al. 1990). Due to the often large number of captures and small number of recaptures, goodness of fit tests in both programs often failed, as did some estimation models. Since it was difficult to choose a particular model and we desired a repeatable technique that could be used in the future, we took a mean of the estimates available to derive population estimates (e.g. see Ashy Storm-petrel account).

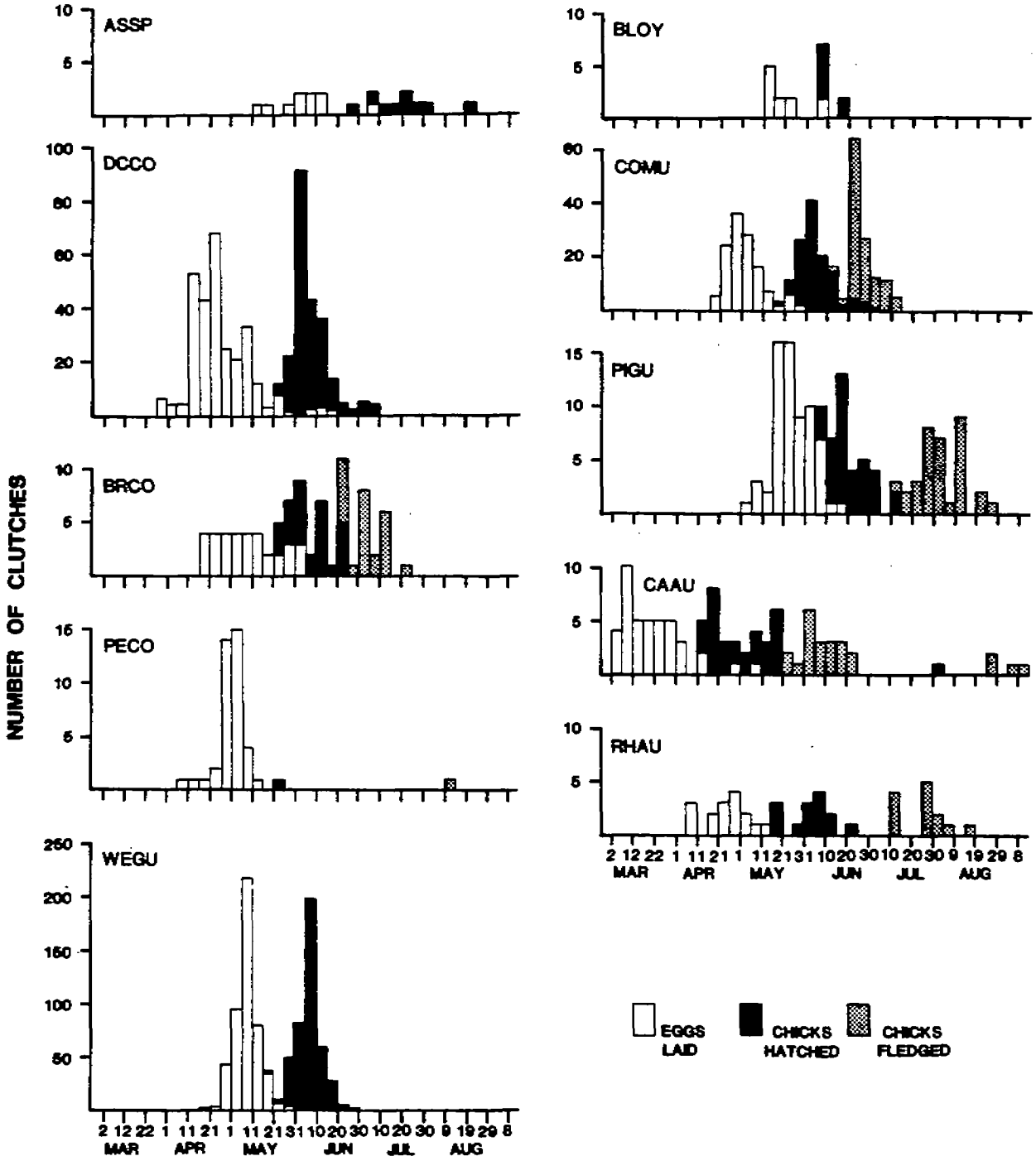


Figure 2. Breeding phenology of 10 seabird species at the South Farallon Islands (National Wildlife Refuge) in 1989 (PRBO, unpubl. data). Numbers of clutches with eggs laid, chicks hatched, and chicks fledged are indicated by five-day period. Fledging dates were not available for DCCO, WEGU, and BLOY whereas, for ASSP, chicks fledged after August. See Table 1 for species abbreviations.

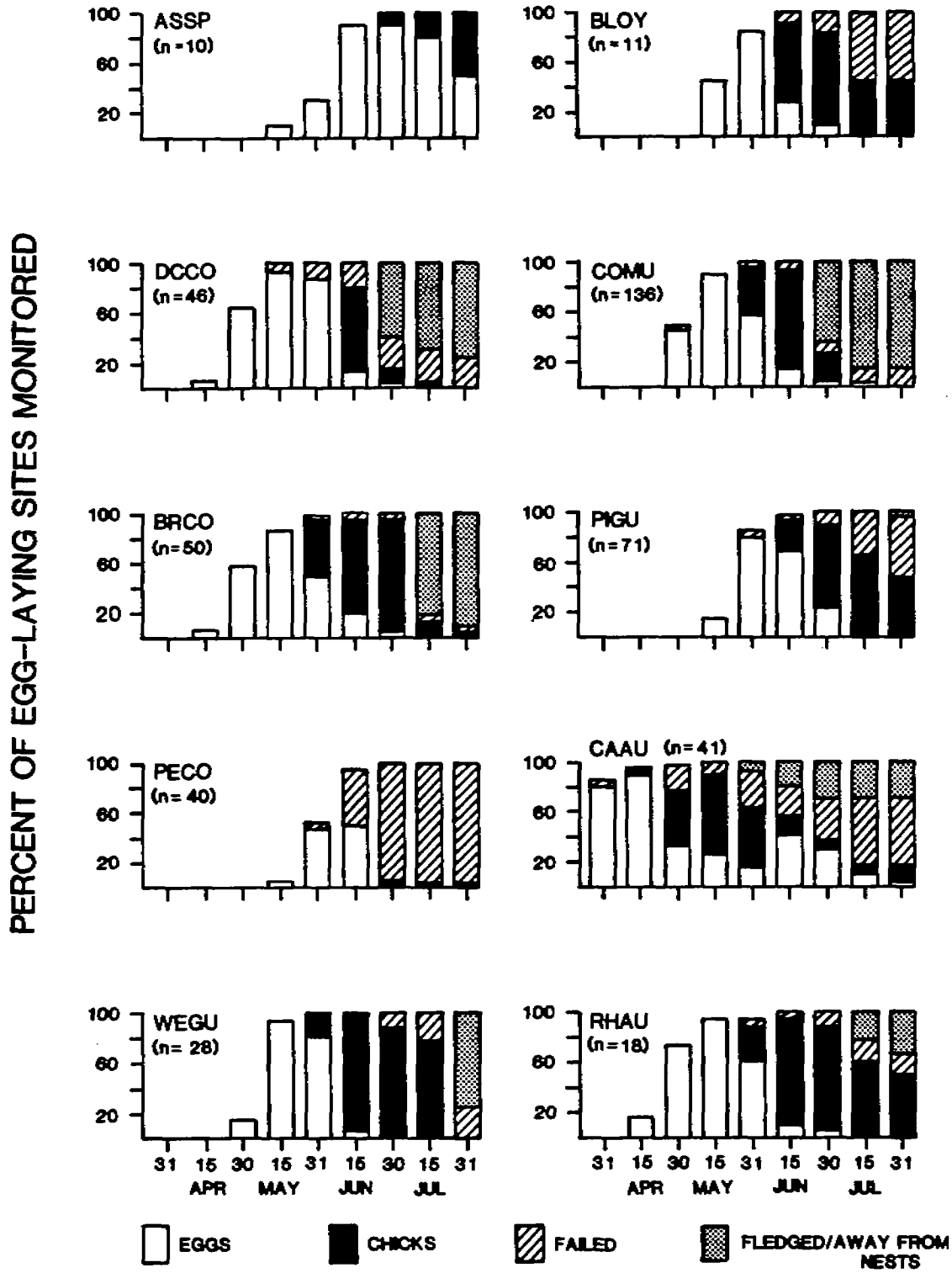


Figure 3. Percent of egg-laying sites (sample sizes of monitored sites in parentheses) with eggs, chicks, failed, or chicks fledged/away from nests by 15-day period for 10 seabird species at the South Farallon Islands (National Wildlife Refuge) in 1989.

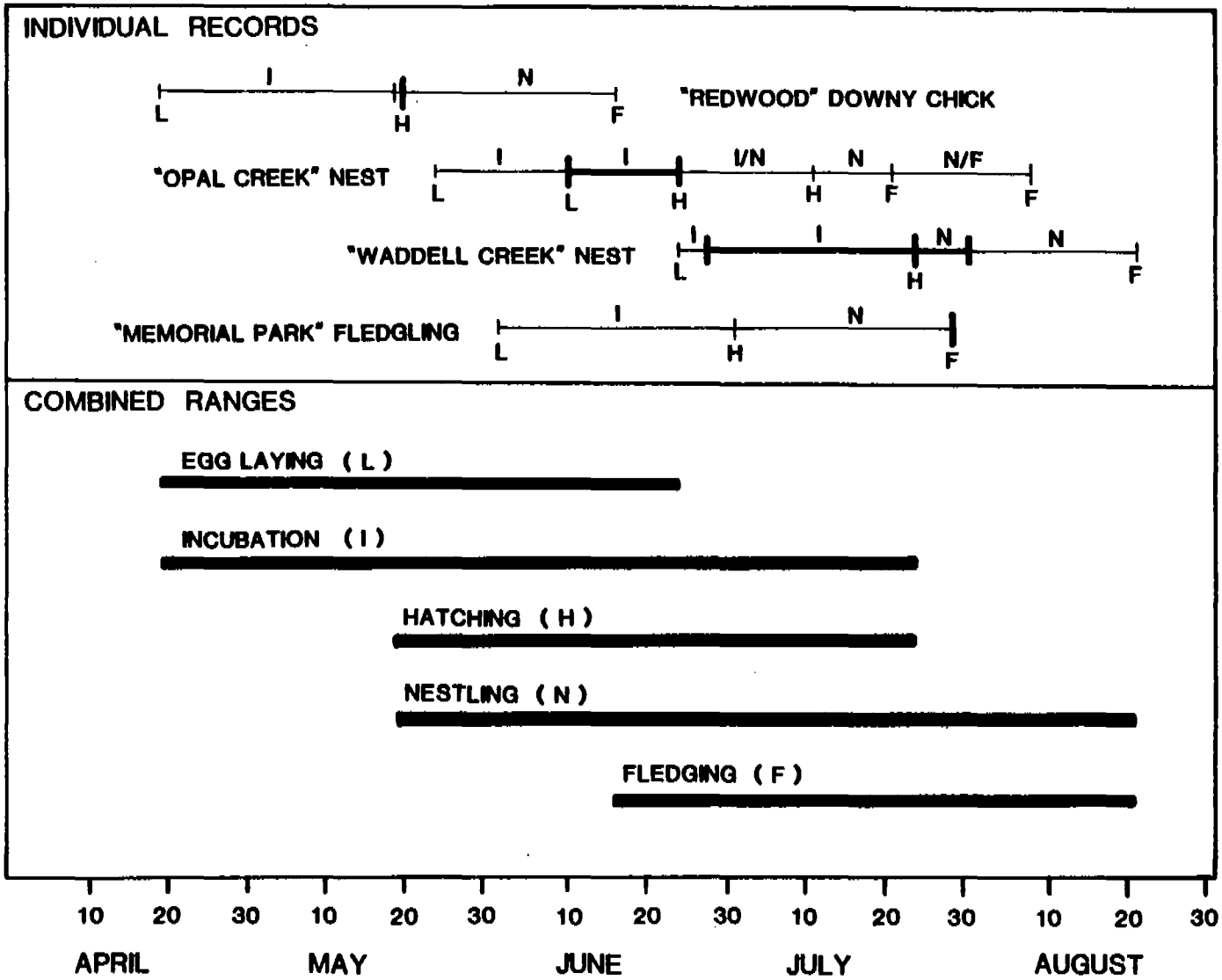


Figure 4. Estimated timing of breeding of Marbled Murrelets in California in 1989, based on nest records and grounded young in central California (Naslund 1990; Singer et al. 1991). In the top portion of the figure, the thick bars indicate definite dates and the thin bars indicate extrapolated dates for each record. In the bottom portion of the figure, the ranges of different stages of the nesting cycle are presented.

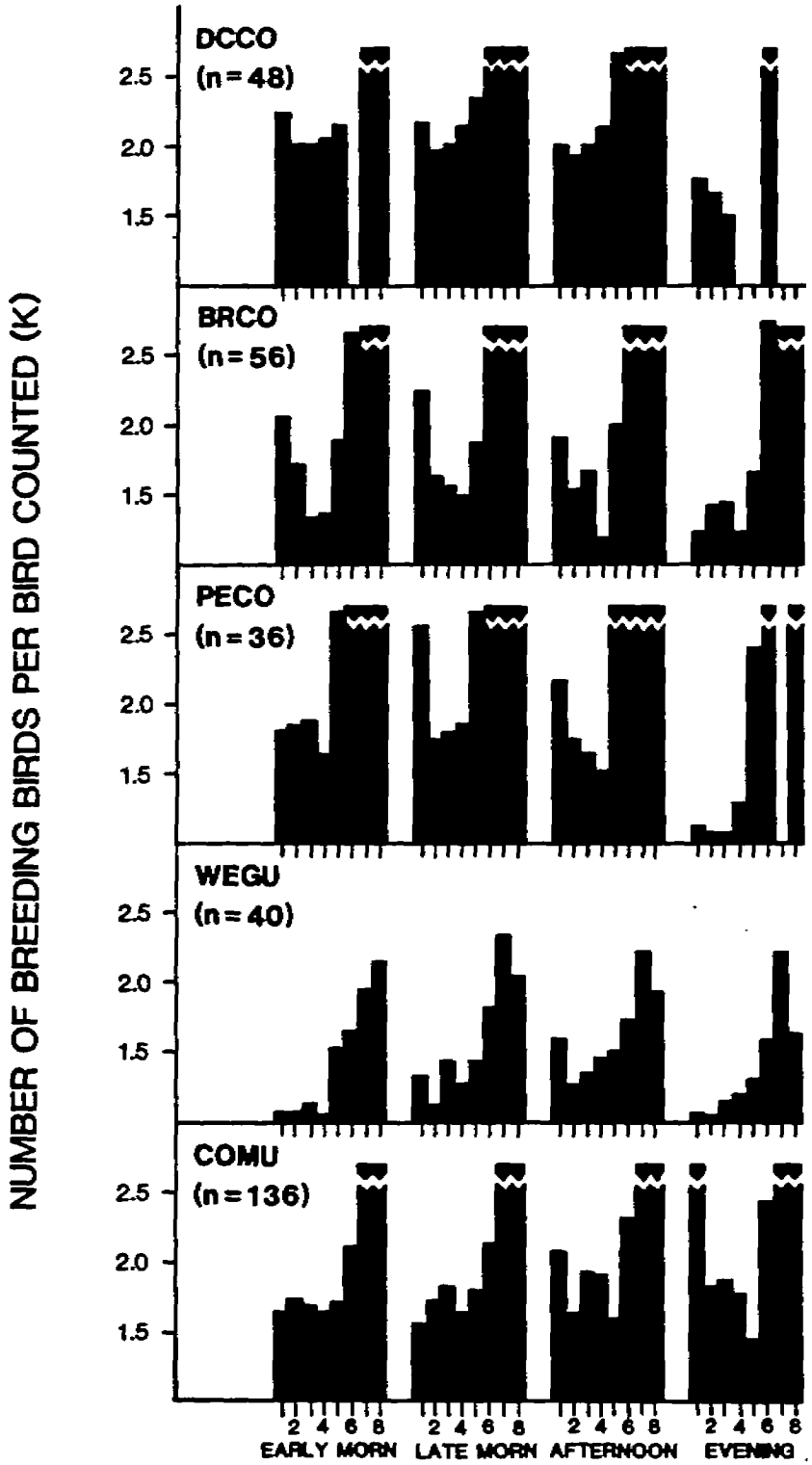


Figure 5. Correction factor K (number of breeding birds per bird counted) values for five seabird species at four times of day for eight 15-day periods from 15 April to 31 July 1989 at the South Farallon Islands (National Wildlife Refuge). Times of day are coded: early morning (0600-0800), late morning (1000-1200), afternoon (1400-1600), and evening (1800-2000). Fifteen day periods occurred at the beginning and midpoint of each month (i.e. 1, 15 April; 2, 30 April; 3, 15 May; etc.).

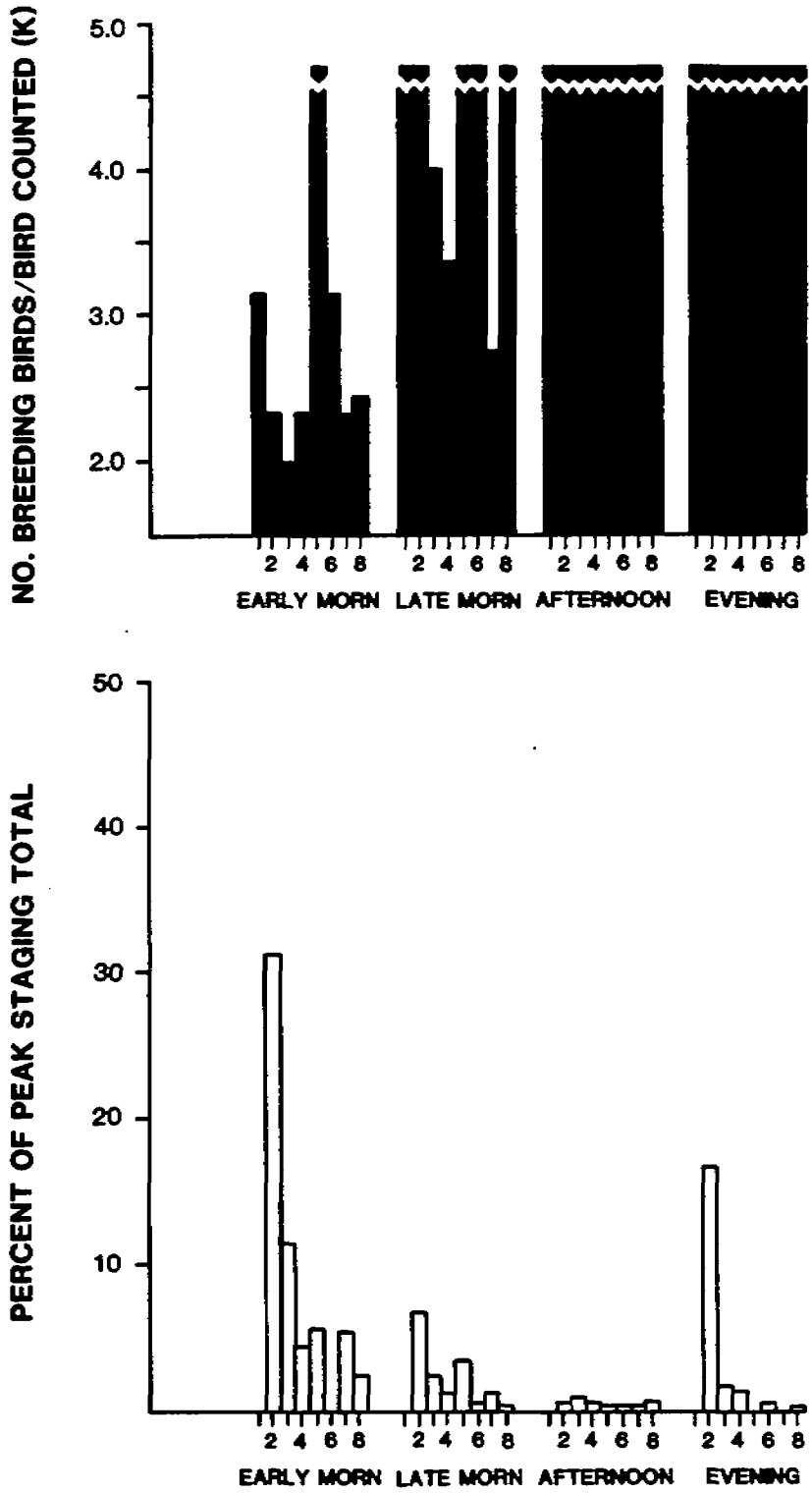


Figure 6. Correction factor K values for Pigeon Guillemots and counts of birds at sea staging/foraging near the South Farallon Islands (National Wildlife Refuge) at four times of day for eight 15-day periods from 15 April to 31 July 1989 (coded as in Figure 5). Counts of staging birds are expressed as a percentage of the peak staging count of 1867 birds recorded at dusk on 9 April 1989.

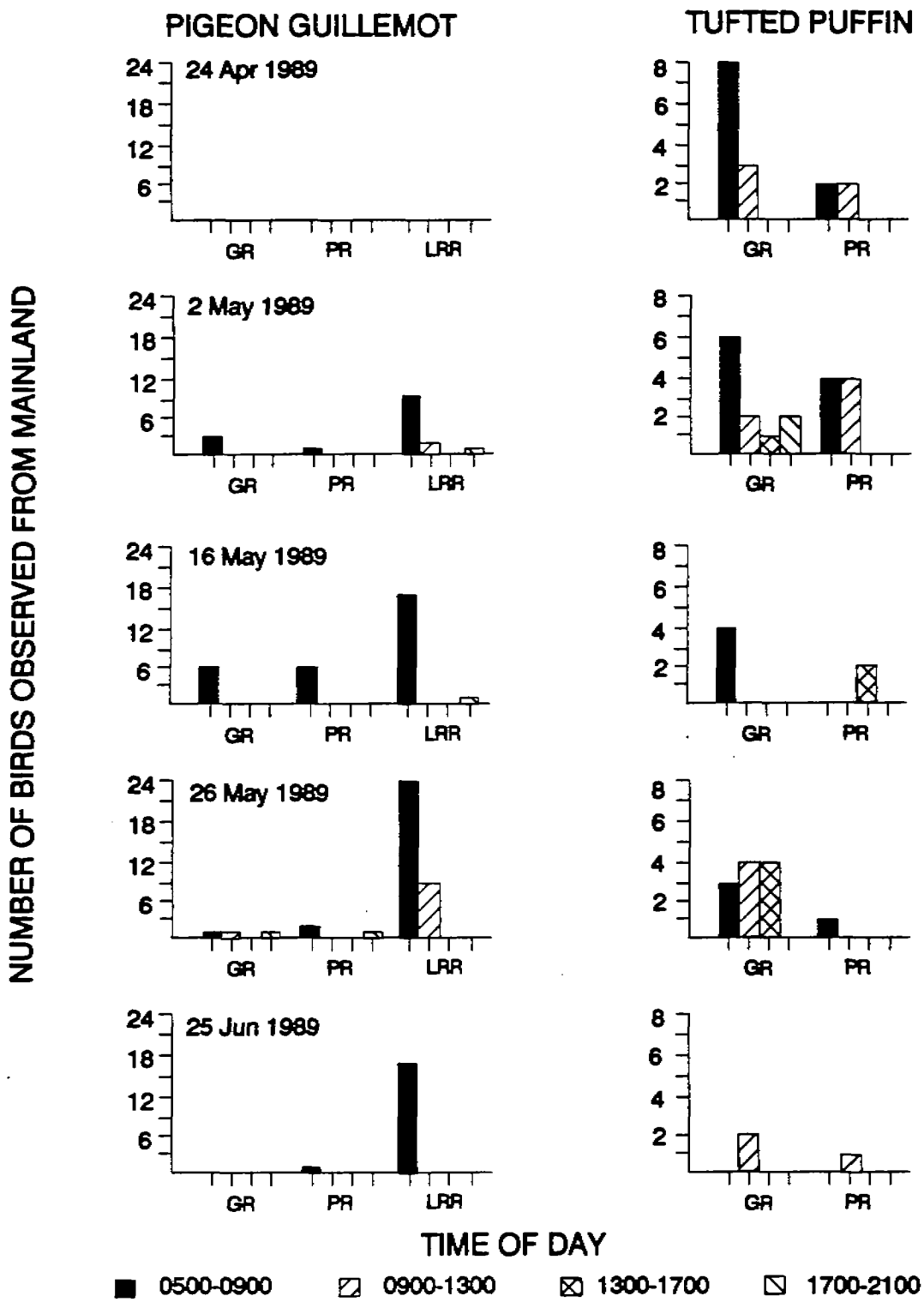


Figure 7. Numbers of Pigeon Guillemots and Tufted Puffins observed at different times of day at Green Rock (GR), Puffin Rock (PR) and Little River Rock (LRR) (California Islands Wildlife Sanctuary), Humboldt County, April-June 1989.

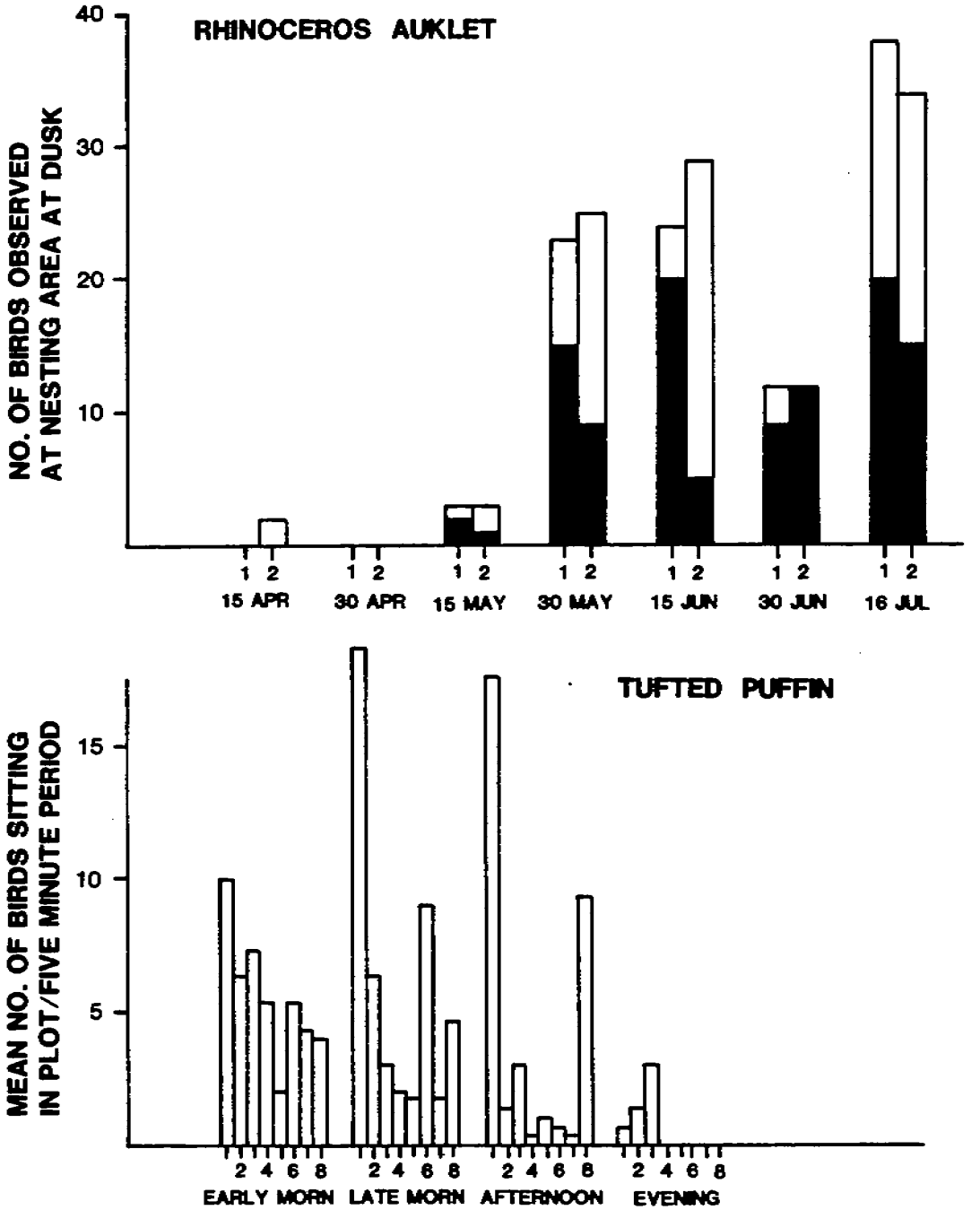


Figure 8. Attendance patterns of Rhinoceros Auklets and Tufted Puffins at the South Farallon Islands (National Wildlife Refuge) in 1989. In the top portion of the figure, dusk counts of Rhinoceros Auklets flying by (open bars) and landing at (solid bars) two nesting areas on Southeast Farallon Island (1, Rabbit Cave Catacombs; 2, Coast Guard House Catacombs) are presented by 15-day period from 15 April to 16 July. In the bottom portion of the figure, mean numbers of Tufted Puffins sitting on land in a plot on "Maintop", West End Island, determined from three consecutive counts at four times of day for eight 15-day periods from 15 April to 31 July (coded as in Figure 5) are presented.

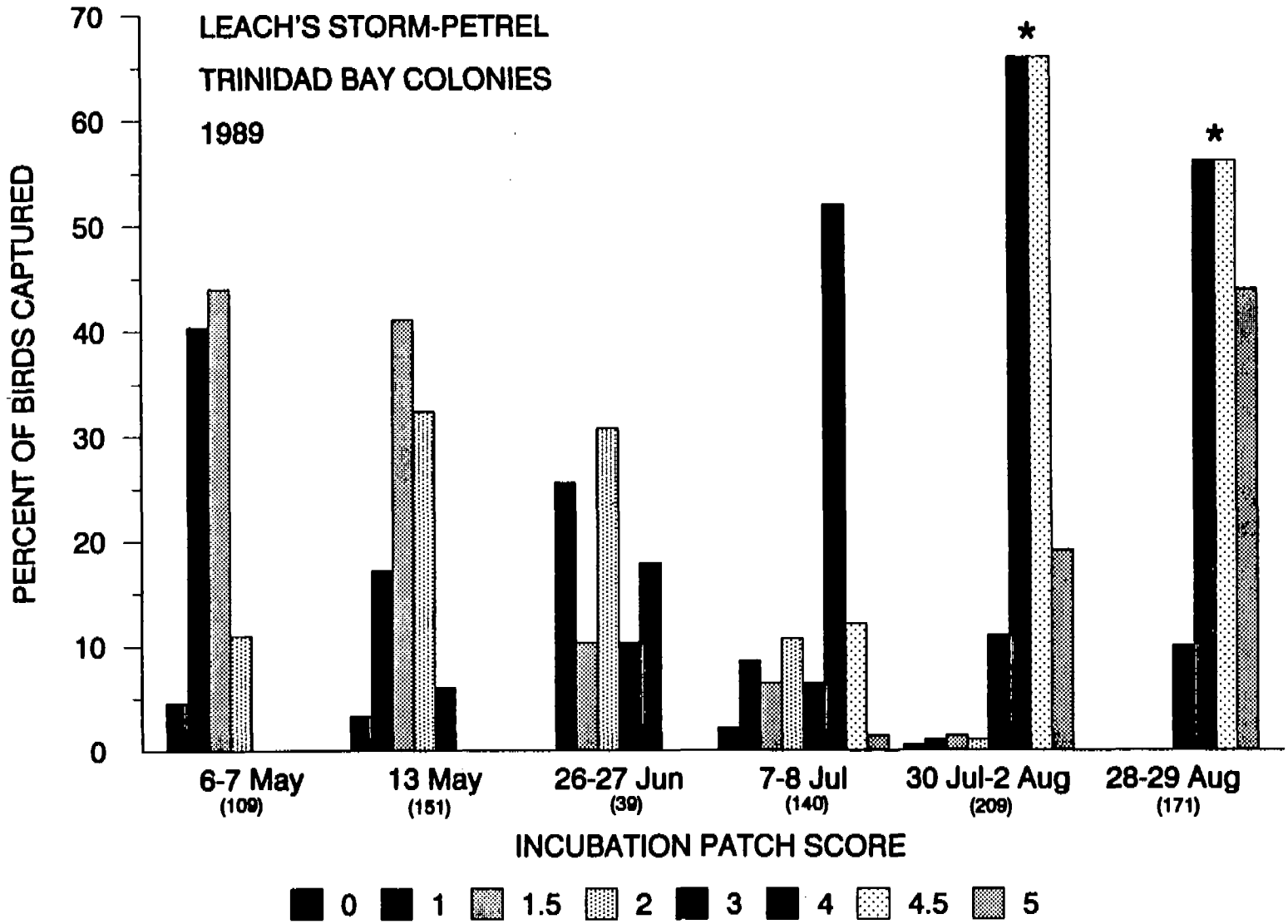


Figure 9. Incubation patch scores of Leach's Storm-petrels at Trinidad Bay colonies (including Prisoner, Button and Little River rocks [California Islands Wildlife Sanctuary]), Humboldt County, in 1989.

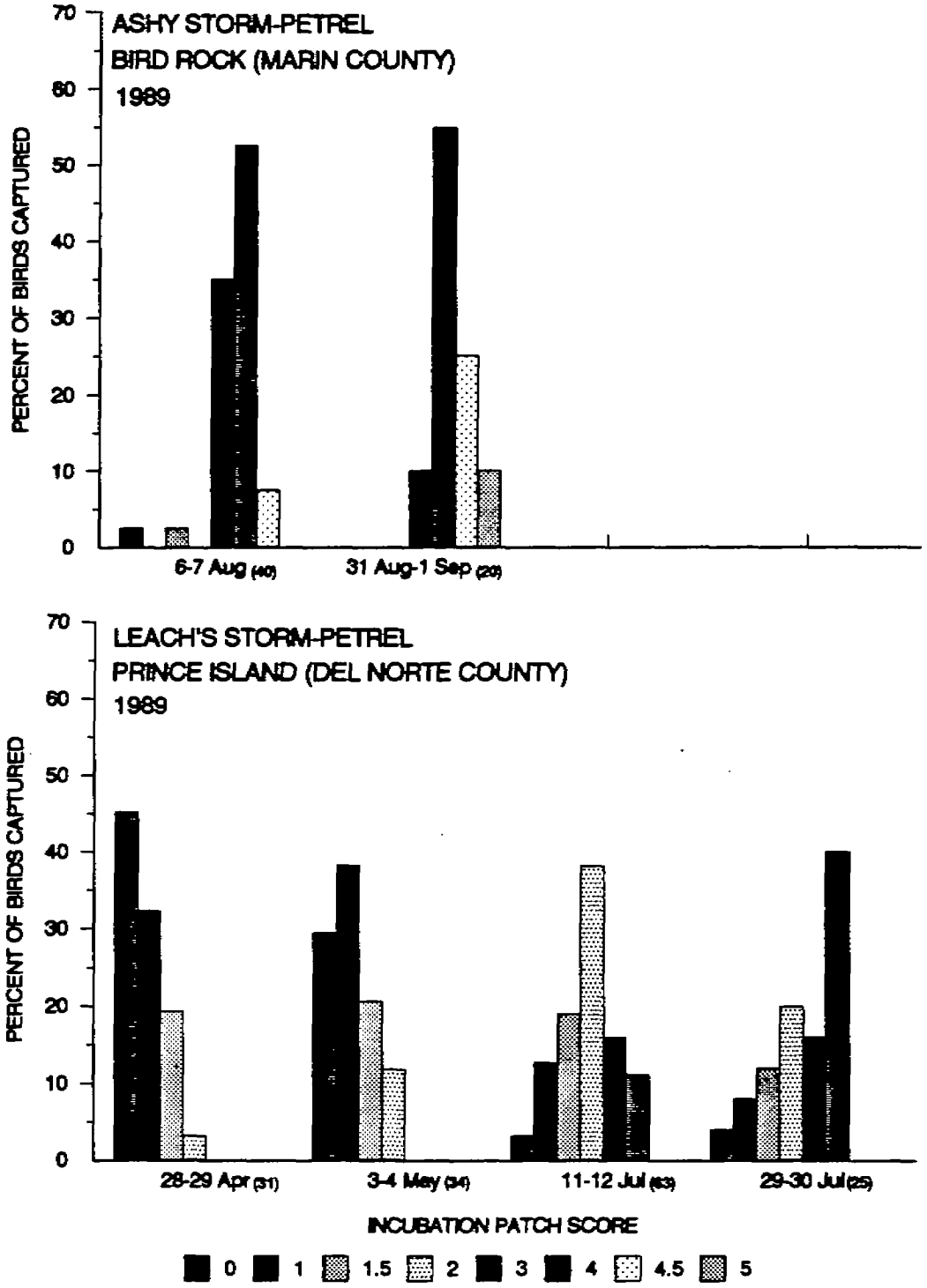


Figure 10. Incubation patch scores of Ashy Storm-petrels at Bird Rock (Point Reyes National Seashore), Marin County, and Leach's Storm-petrels at Prince Island (Tolowa Tribe), Del Norte County, 1989.

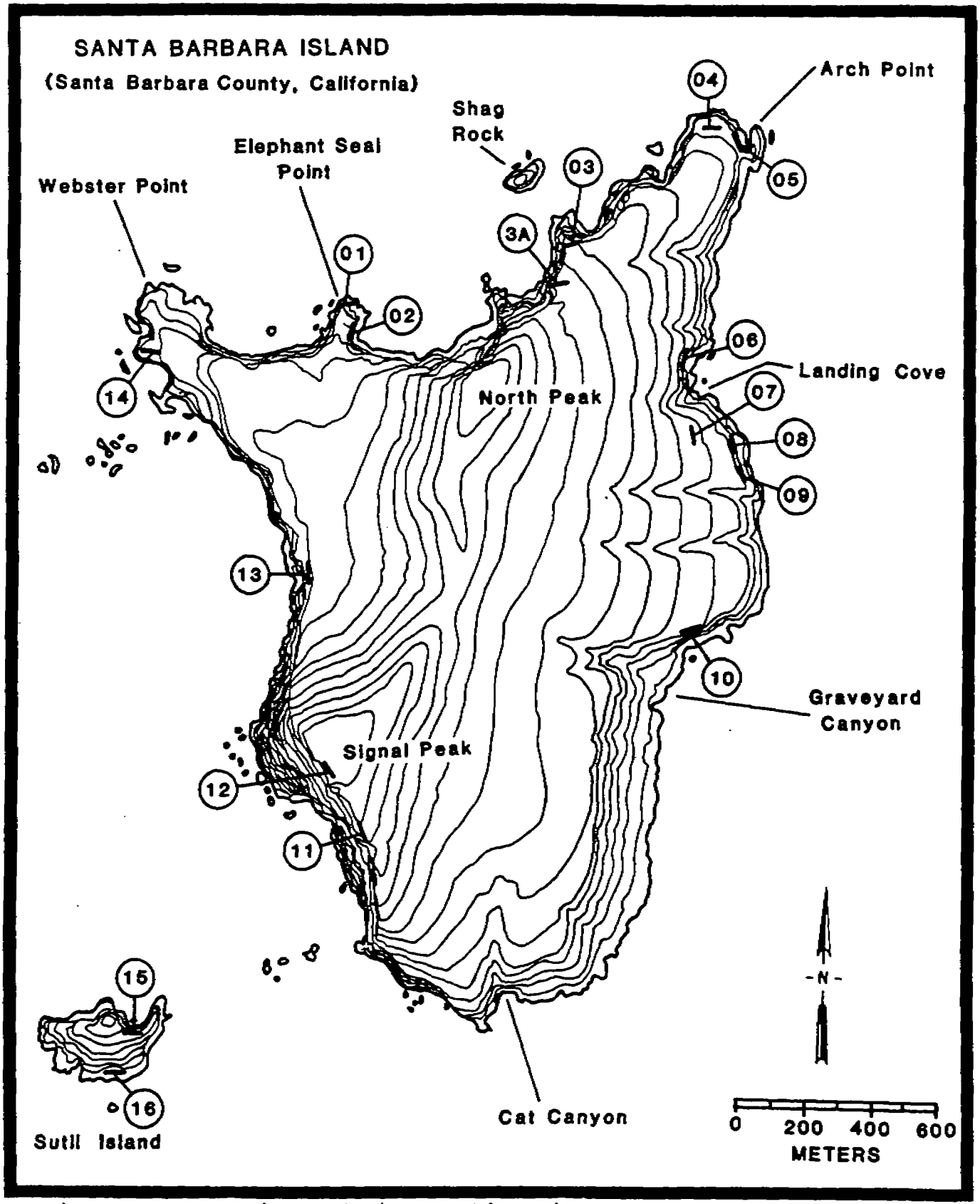


Figure 11. Locations of mist-netting sites on Santa Barbara and Sutil islands (Channel Islands National Park), Santa Barbara County, 1991 (see Appendix 4).

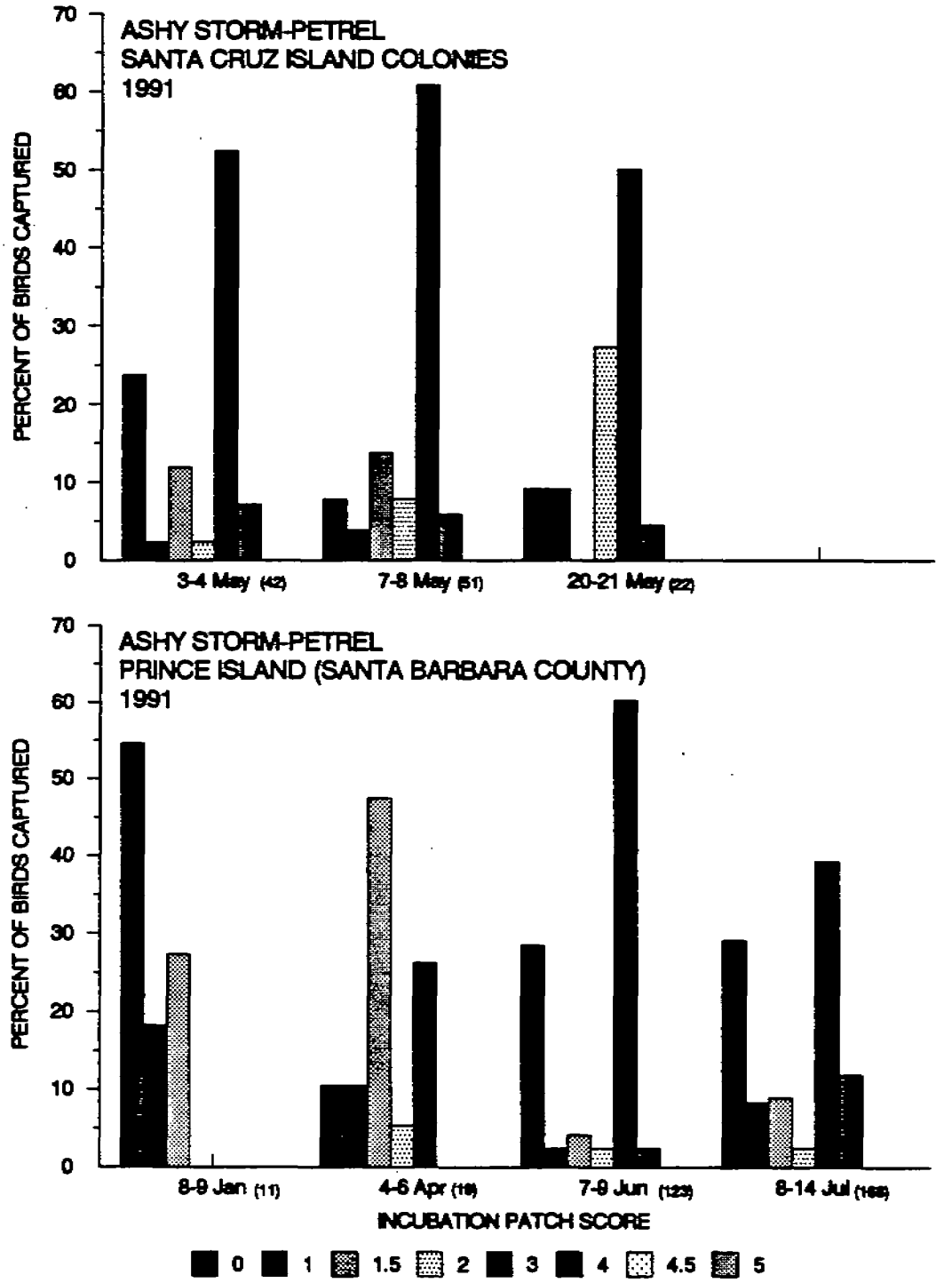


Figure 12. Incubation patch scores of Ashy Storm-petrels at Santa Cruz Island colonies, including Scorpion Rocks (Channel Islands National Park) and Willows Anchorage Rocks (Nature Conservancy), and at Prince Island (Channel Islands National Park), Santa Barbara County, 1991.

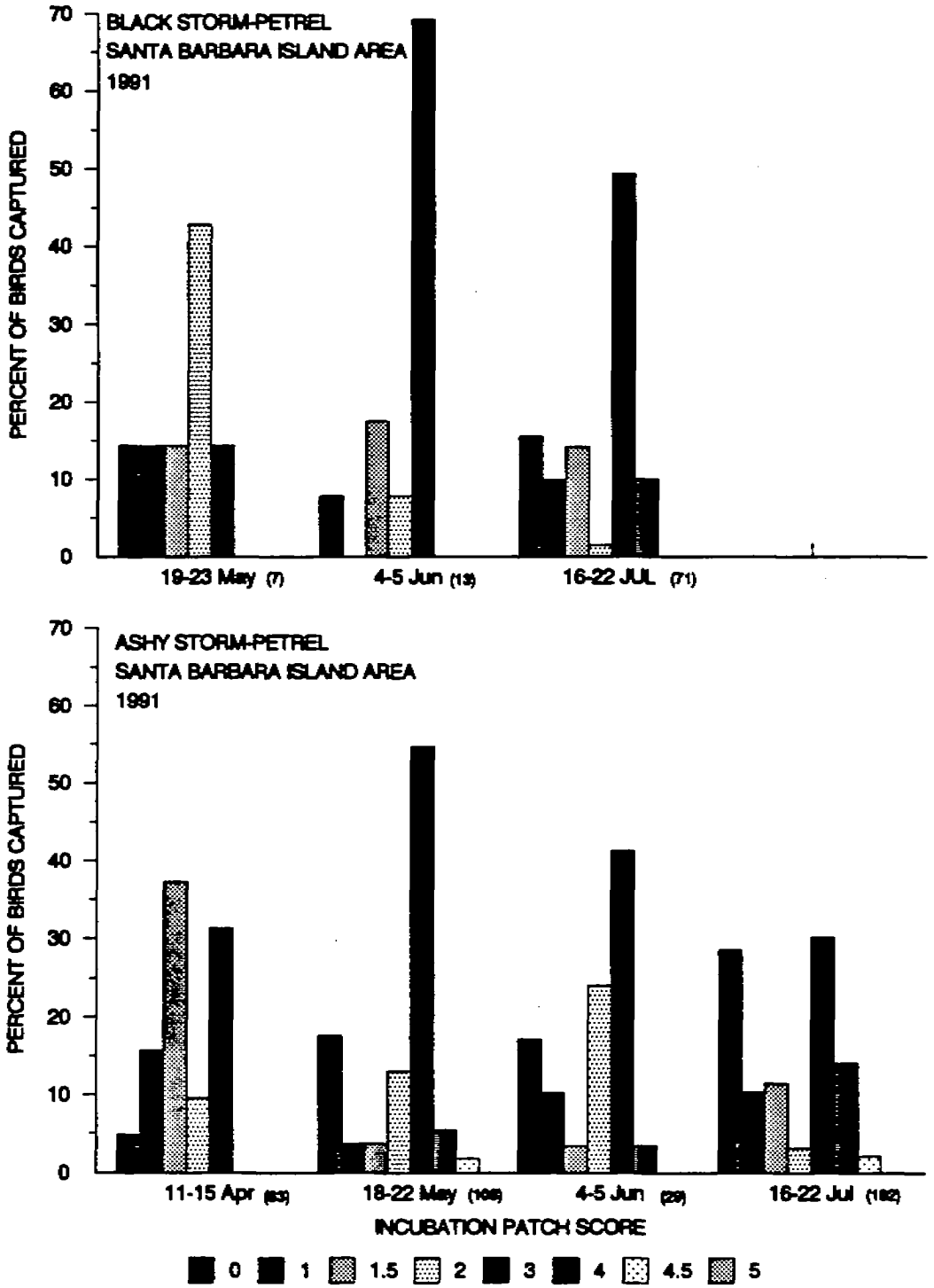


Figure 13. Incubation patch scores of Black and Ashy storm-petrels at Santa Barbara Island area colonies, including Santa Barbara and Sutil islands (Channel Islands National Park), Santa Barbara County, 1991.

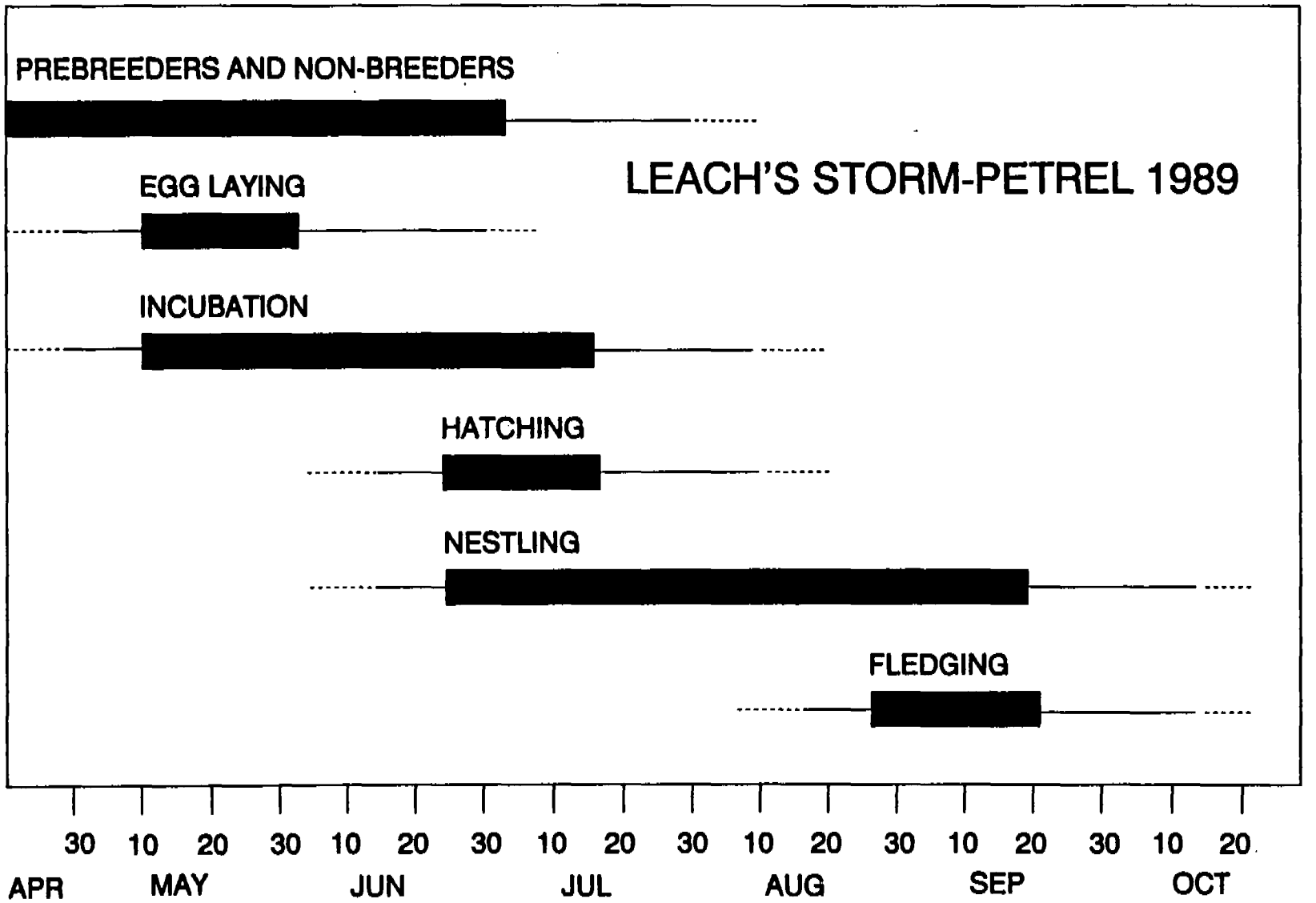


Figure 14. Estimated timing of breeding of Leach's Storm-petrels in northern California in 1989, based on incubation patch condition of 819 birds captured in mist nets at 3 colonies in Trinidad Bay, Humboldt County (see Appendix 3). Thick bars indicate when over 25% of birds occurred or were projected to occur in respective nesting periods. Thin lines indicate observed or projected ranges. Dashed lines indicate that ranges may be greater than shown.

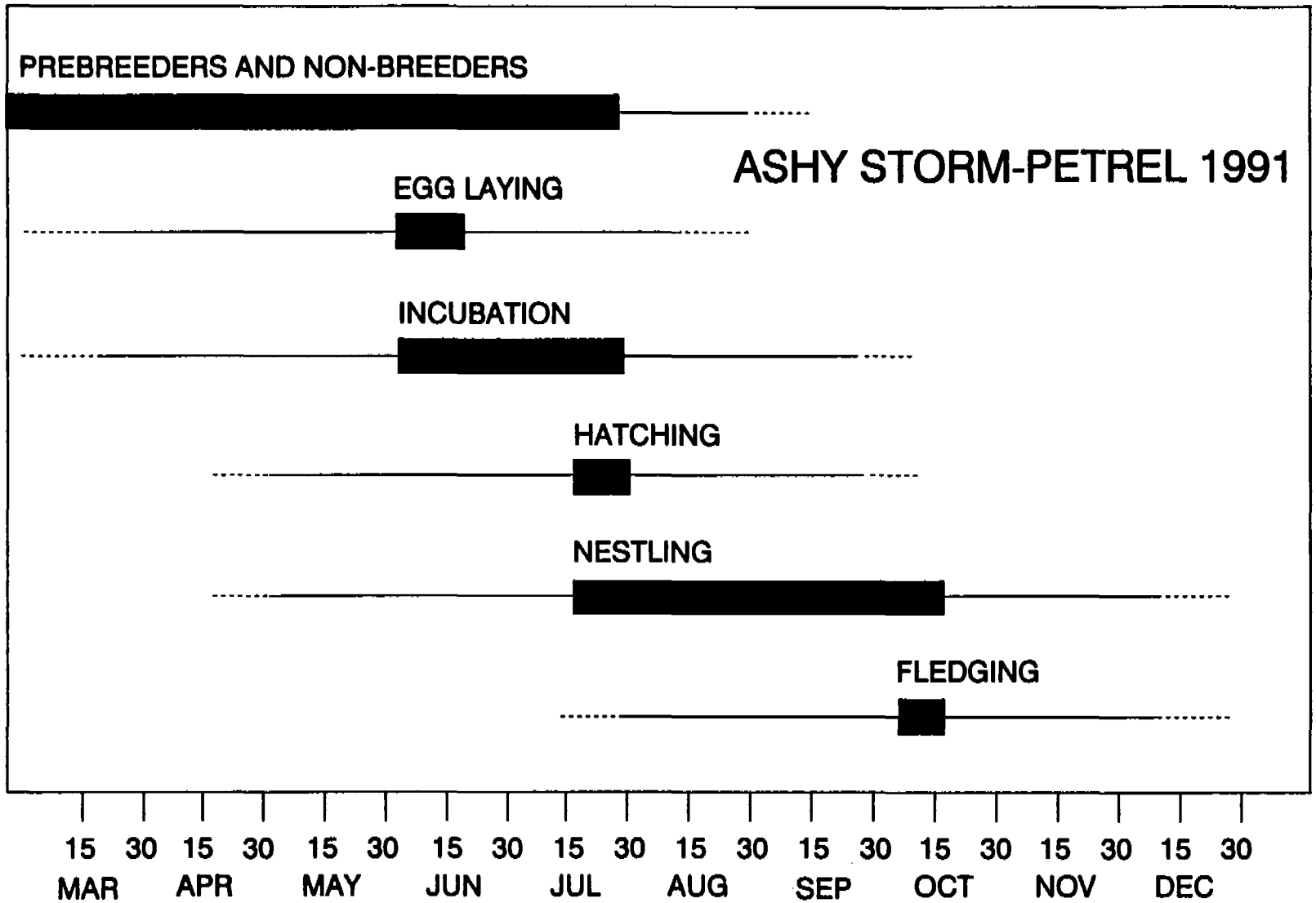


Figure 15. Estimated timing of breeding of Ashy Storm-petrels in southern California in 1991, based on incubation patch condition of 820 birds captured in mist nets at 6 colonies between 8 January and 21 October (see Appendix 4) and nests found at 5 colonies. Symbols as in Figure 14.

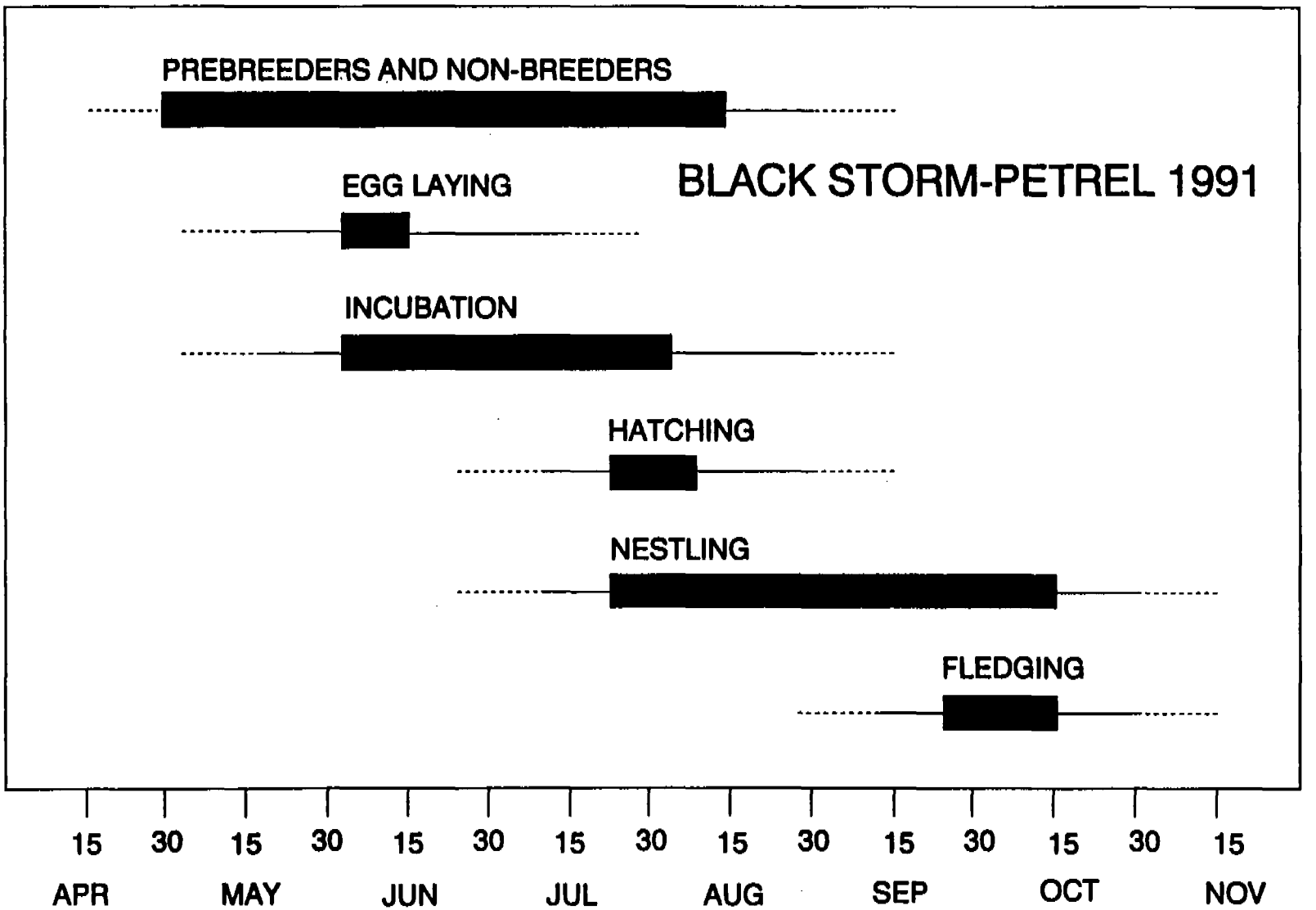


Figure 16. Estimated timing of breeding of Black Storm-petrels in southern California in 1991, based on incubation patch condition of 91 birds captured in mist nets at 2 colonies (see Appendix 4). Symbols as in Figure 14.

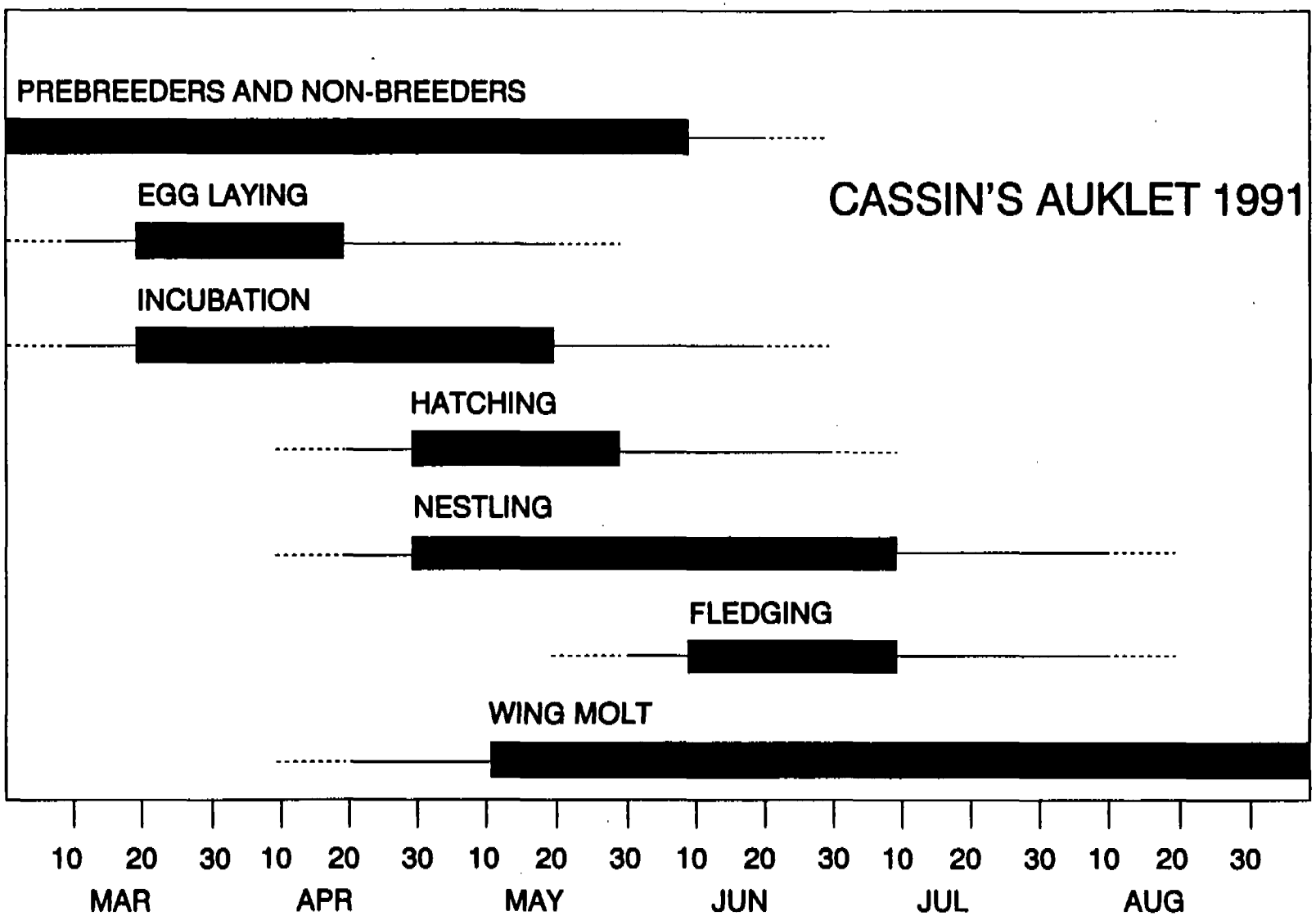


Figure 17. Estimated timing of breeding of Cassin's Auklets in southern California in 1991, based on incubation patch condition of 141 birds captured in mist nets at 4 colonies (see Appendix 3). Symbols as in Figure 14.

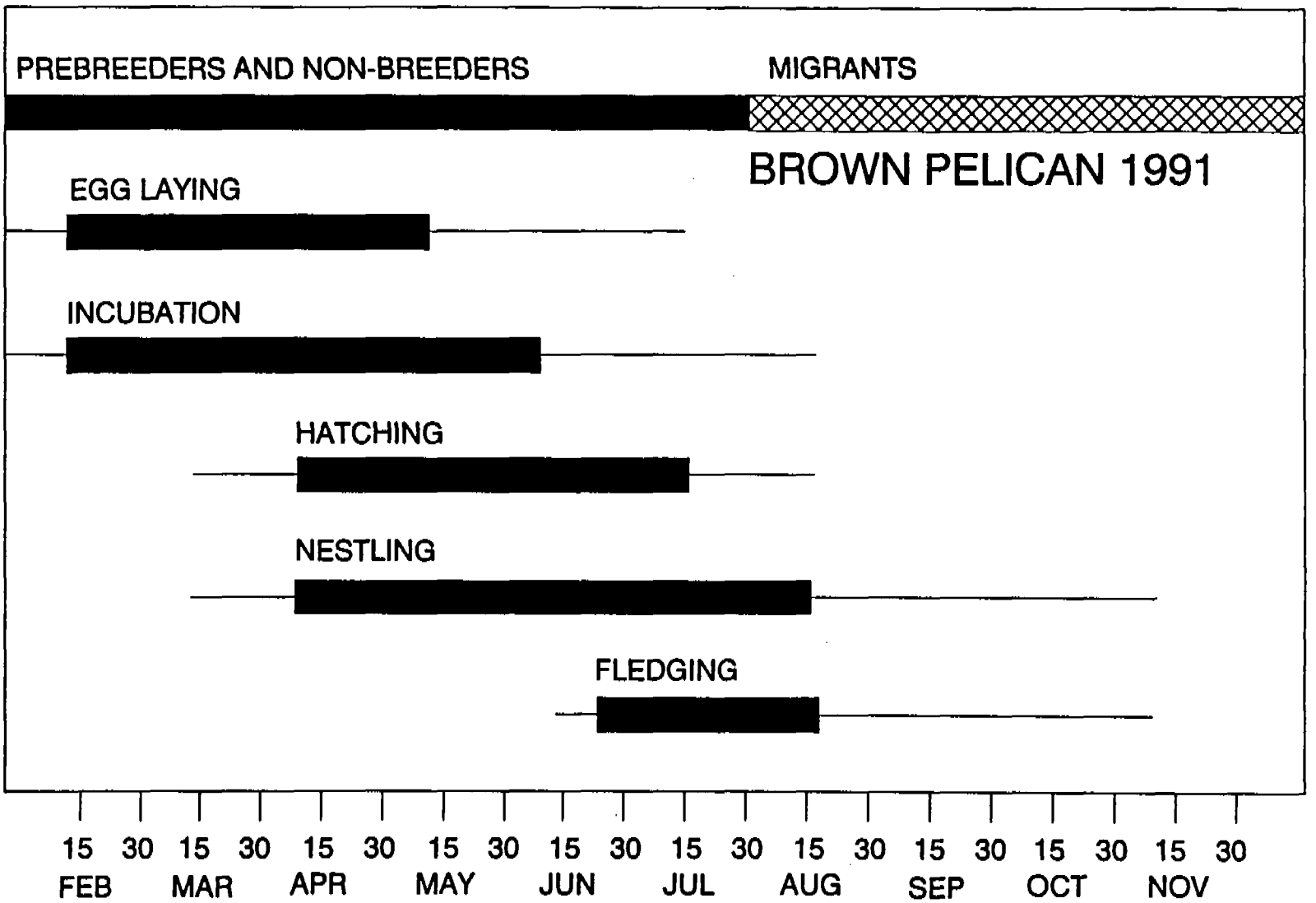


Figure 18. Estimated timing of breeding of Brown Pelicans in southern California in 1991 (Gress 1992). Symbols as in Figure 14.

Table 2. Mean correction factors used to adjust raw counts of nest, birds, or sites to obtain estimates of the total number of breeding birds at a nesting area. J and K factors and median dates were derived from data collected at the South Farallon Islands. The L factor was derived mainly from the literature (see text).

	MEDIAN DATE			CORRECTION FACTORS					
					K				
					Time of day (PDT)				
SPECIES	Lay	Hatch	Fledge	J	<0900	0900-1300	1300-1700	>1700	L
ASSP	5 Jun	21 Jul	-	1.0(4)[1]	-[2]	-	-	-	-
LHSP	-	-	-	-	-	-	-	-	0.75
DCCO	22 Apr	3 Jun	-	1.2(4)	2.0(4)	2.1(4)	2.2(4)	1.6(3)	-
BRCO	7 May	7 Jun	3 Jul	1.1(4)	1.8(4)	2.2(4)	2.4(4)	1.8(4)	-
PECO	31 May	-	-	2.0(2)	2.2(2)	2.3(2)	2.3(2)	1.9(2)	-
WEGU	8 May	7 Jun	-	1.0(3)	1.2(3)	1.4(3)	1.5(3)	1.2(3)	-
BLOY	17 May	8 Jun	-	1.2(2)	-	-	-	-	-
COMU	30 Apr	3 Jun	24 Jun	1.1(3)	1.7(3)	1.8(3)	1.8(3)	1.7(3)	-
PIGU	24 May	21 Jun	6 Aug	1.4(5)	3.3(5)[3]	5.0(4)[3]	-	-	-
CAAU	18 Mar	28 Apr	6 Jun	1.3(5)	-	-	-	-	0.75
RHAU	26 Apr	5 Jun	27 Jul	1.2(6)	-	-	-	-	0.50
TUPU	-	-	-	-	4.7(6)[3]	7.6(6)[3]	-	-	-

[1] Mean value between median laying and median fledging with sample size in parentheses.
[2] When values are not presented, insufficient or no data were available.
[3] These values were reduced roughly by half (50%) before use.

Table 3. Data used to calculate the K correction factor for adjusting peak counts of the number of Caspian and Forster's terns at nesting areas in San Francisco Bay. All data were derived from five Caspian Tern colonies.

CA Colony Number[1]	Census Year	Peak counts Adults	Peak counts Nests	K[2]	Adjusted K[3]	Total breeding birds[4]
SFB-AL-21	1986	365	125	0.68	1.16	456
SFB-AL-32	1984	400	220	1.10	1.10	500
" " "	1985	600	373	1.24	1.24	750
" " "	1986	650	453	1.39	1.39	813
" " "	1989	450	289	1.28	1.28	563
SFB-SM-06	1986	600	171	0.57	1.15	750
" " "	1988	1700	200	<0.01	1.22	2125
" " "	1989	600	400	1.33	1.33	750
SFB-SM-04	1990	133	38	0.57	1.20	166
SFB-CC-17	1990	350	60	0.34	1.25	438
Mean (n=10)	-	-	-	0.85	1.23	-
Mean (n=5)[5]	-	-	-	1.27	-	-

[1] Data for SFB-AL-21, SFB-AL-32, and SFB-SM-06 were provided by P. Woodin (SFBBO, unpubl. data); SFB-SM-04 by R. Leong (unpubl. data); and SFB-CC-17 by F. McCollom (unpubl. data).

[2] Number of breeding birds (based on nest count) per bird counted.

[3] Where more birds were present then could be accounted for by the nest count (i.e. K < 1.0), we assumed that additional birds were "displaced" breeders.

[4] Estimates of the total number of breeding birds were derived by multiplying the peak adult count by 1.25 (average of means 1.23 and 1.27).

[5] Uses K > 1.0 only.

Table 4. Monthly J and K correction factors for Double-crested, Brandt's and Pelagic cormorants at Anacapa Island (Channel Islands National Park), Ventura County, in 1991 (calculated from F. Gress [unpubl. data]).

			Census Date									
	No. of nesting	Total No.	29-30 Mar		27-30 Apr		21-27 May		20-27 Jun		30 Jul	
Colony Name	Areas	Nests[1]	J	K	J	K	J	K	J	K	J	K
Double-crested Cormorant												
Anacapa Island - West	22	360	11.3	12.2	2.1	3.5	1.2	-	1.1	-	1.8[2]	-
Brandt's Cormorant												
Anacapa Island - West	4	20	-	-	2.9	2.2	-	-	1.0	-	1.5	-
Pelagic Cormorant												
Anacapa Island - West	8	57	1.7	1.8	1.6	2.5	1.3	1.7	1.5	3.0	-	-
Anacapa Island - East	6	35	1.4	1.8	1.3	2.0	1.1	1.7	1.3[2]	1.2	-	-
Total	14	92	1.6	1.8	1.4	2.3	1.2	1.7	1.4	2.7	-	-

[1] Total number of nests noted over the entire breeding season.
[2] Used a sample of nesting areas.

DISCUSSION

In 1989-1991, 643,307 breeding birds of 21 species were estimated on the coast of California (Figure 19; Tables 5, 6). However, terns and skimmers in southern california have yet to be added to this total. Once information has been completely summarized, it will be included in the final draft. Totals of 312,106, 232,661 and 96,016 breeding birds were found in northern, central and southern California, respectively, and corresponded to 49%, 36% and 15% of the state total, respectively. We have excluded about 50,000-60,000 seabirds breeding at inland colonies, including White Pelicans (@ 2000), Double-crested Cormorants (@ 1,000-3,000), California Gulls (45,000-50,000), Black Terns (@ 100-300), Caspian Terns (@ 1,000-1,200) and Forster's Terns (@ 1,000-1,500)(Gill and Medwaldt 1983; Dierks 1990; P. Moreno, unpubl. data; see species accounts).

Overall, current population estimates were slightly lower than reported from 1975-1980 surveys (Sowls et al. 1980). However, there were many reasons for differences between 1989-1991 and earlier population estimates besides true increases and decreases in numbers, including: 1) inclusion of newly-founded or overlooked colonies in areas surveyed previously; 2) inclusion of coastal areas (especially San Francisco Bay) that were not surveyed previously; 3) more extensive and refined use of aerial photographs to count large numbers of nesting murres and cormorants; 4) more extensive boat surveys of the Channel Islands and certain parts of the northern and central California coasts; 5) more extensive mistnetting of storm-petrels; 6) use of detailed burrow/crevice counts; 7) use of correction factors to adjust counts in 1989-1991; 8) refinement of previous estimates at the South Farallon Islands by PRBO; 9) detailed ground counts of Western Gull colonies in the Channel Islands; and 10) a variety of other differences between surveys. We have addressed census differences and trends in the species account sections. However, in general, most species still nested where they had been documented earlier, major colonies had not been omitted in previous surveys and there were not tremendous differences between 1989-1991 and 1975-1980 surveys that could not be accounted for by census differences or changing status of species. Recent declines were found or suspected for Fork - tailed Storm-petrel, Leach's Storm-petrel, White Pelican, Black Tern, Caspian Tern, Least Tern, Common Murre and Marbled Murrelet. Recent increases were found or suspected for Brown Pelican, Double-crested Cormorant (coastal population only), California Gull, Western Gull, Forster's Tern (coastal population only) and Rhinoceros Auklet. Similar numbers were found for other species or trends could not be determined without additional surveys, studies and/or more in-depth comparisons with previous surveys.

Nesting areas of special importance

We have identified several nesting areas of special importance in California, based on the concentration of large numbers of breeding birds and/or involving several species in relation to other nearby coastal areas. We have pointed out and discussed research needs at 4 exceptional colonies and listed other important nesting areas.

Farallon Islands (National Wildlife Refuge) - In 1989, these 2 colonies (North and South Farallon islands) contained the largest populations in California, totalling 155,550 breeding birds of 12 species (plus 1 possibly breeding species). This total corresponded to 24% of the state total, including substantial relative numbers of 10 species: Leach's Storm-petrel (11%), Ashy Storm-petrel (55%), Double-crested Cormorant (11%), Brandt's Cormorant (20%), Western Gull (36%), Common Murre (19%), Pigeon Guillemot (12%), Cassin's Auklet (68%), Rhinoceros Auklet (29%) and Tufted Puffin (25%). These colonies hosted the world's largest colonies of Ashy Storm-petrel, Brandt's Cormorant and Western Gull as well as the most southernly colonies of significant size for Rhinoceros Auklets and Tufted Puffins on the west coast of North America.

The relative importance of this colony was lower than indicated by Sowls et al. (1980). Lower numbers at this colony resulted from: 1) revisions of 1979-1980 population estimates for several species by PRBO (see Ainley and Boekelheide 1990); 2) lower numbers of certain species after the 1982-1983 ENSO event; 3) declines in certain species due to gill-net and oil mortality (especially Common Murres); and 4) much lower estimates of Cassin's Auklets in 1989 (see species accounts). Annual monitoring and various studies by PRBO and other researchers have been conducted since 1972 and have greatly improved our understanding of seabird population trends and biology in the center of the California Upwelling System. Changes in soil depth and consistency have been reported by PRBO on Southeast Farallon Island which may have led to decline in numbers of Cassin's Auklets on the southwest marine terrace (see species account). Preliminary descriptions of plant communities and sporadic vegetation monitoring has been conducted since the late 1960's by M. Coulter (unpubl. data). Since the mid 1980's, USFWS has controlled certain exotic plants. A better system of monitoring vegetation and soils should be implemented by USFWS and PRBO. Also, accurate estimates of population sizes have received less attention than have relative measures of population change. More effort and better estimation techniques are required for many species for better long-term monitoring of these important populations (see Takekawa et al. 1990).

Castle Rock (National Wildlife Refuge) - In 1989, this single colony held the second largest population of breeding seabirds in

California, totalling 122,150 birds of 11 species. This total corresponded to 19% of the state total, including substantial relative numbers of 6 species: Fork-tailed Storm-petrel (24%), Leach's Storm-petrel (19%), Common Murre (31%), Cassin's Auklet (10%), Rhinoceros Auklet (58%) and Tufted Puffin (30%). The relative importance of this colony has increased due to lower numbers at the Farallon Islands, despite lower reported numbers of Common Murres (see species account). Despite a long history of visits by naturalists (summarized in Osborne 1972), this colony has not been studied extensively, except for recent surveys of Common Murres (summarized in Takekawa et al. 1990). Nesting habitats (vegetation and soil) have changed dramatically on this colony since the 1930's but this change has been poorly documented (see Osborne 1972). More effort and better techniques for monitoring vegetation, soil and burrow/crevice nesting species are required although access to this large rock has been difficult due to potential disturbance to nesting Brandt's Cormorants and Common Murres plus marine mammals.

San Miguel Island Area (U. S. Navy and Channel Islands National Park) - In 1991, this collection of 12 colonies contained 33,250 breeding birds of 12 species (plus 1 possible and 2 historical species). Most birds and species nested at Prince Island and Castle Rock (15,812 and 7,622 breeding birds, respectively). This total corresponded to 5% of the state total but 40% of the total for the Channel Islands National Park area (CINP). Substantial relative numbers of 3 species were found, including: Ashy Storm-petrels (19% state; 43% CINP), Brandt's Cormorants (19% state; 65% CINP) and Cassin's Auklets (22% state; 92% CINP). In addition, Rhinoceros Auklets, Tufted Puffins and historically Common Murres reached the southern end of their range on the west coast of North America here. Similarly, Xantus' Murrelets and possibly Black Storm-petrels reached the northern end of their range in this area.

The relative importance of this area on the state level has increased due to increases in the numbers of Brandt's Cormorants (especially large new colonies at Point Bennett and Bay Point) and lower numbers at the Farallon Islands. Lower numbers of Cassin's Auklets mirrored lower numbers at the Farallon Islands (see species account). Studies at Prince Island have helped our understanding of how seabirds have responded to the complex and productive marine environment in the vicinity of Point Conception (Hunt et al. 1979, Briggs et al. 1987). At present, we could not assess whether nesting habitats have changed significantly at Castle Rock and Prince islands (although see Hunt et al. 1979). To our knowledge, these habitats have never been adequately described and have not been monitored. This difficult and time-consuming task should be conducted by Channel Islands National Park. The size of seabird populations in the San Miguel Island area should be monitored much more extensively by Channel Islands National Park, especially Ashy Storm-petrels, Brandt's Cormorants

and Cassin's Auklets. Currently, only the population size of Double-crested Cormorants and breeding success of Cassin's Auklets at Prince Island has been included in this monitoring program (Lewis et al. 1988, Ingram 1992).

Santa Barbara Island Area (Channel Islands National Park) - In 1991, this collection of 3 colonies contained 14,864 breeding birds of 12 species (plus 1 definite and 2 possible historical species). Most birds nested on Santa Barbara Island proper (13,174 breeding birds). Over time, this nesting area has had the most diverse assemblage of breeding species anywhere in California. This total corresponded to 2% of the state total and 18% of the CINP area. Substantial relative numbers of 5 species were found, including: Ashy Storm-petrels (20% state; 47% CINP), Black Storm-petrel (100% state/CINP), Brown Pelican (10% state/CINP), Western Gull (12% state; 36% CINP) and Xantus' Murrelet (88% state/CINP).

The relative importance of these colonies has increased due to higher numbers of storm-petrels, Brown Pelicans and Western Gulls, despite lower numbers of Xantus' Murrelets (see species account). Studies at this colony have helped our understanding seabird biology (especially Brown Pelicans, Western Gulls and Xantus' Murrelets) in southern California and how seabird populations have responded in non-upwelling based prey resources (summarized in Hunt et al. 1979, Lewis et al. 1988, Ingram 1992). Periodic monitoring of the population size of storm-petrels and Xantus' Murrelets should be conducted by Channel Islands National Park. The low size of the Xantus' Murrelet population at this colony (the most important well-documented colony known on the west coast of North America, including Baja California) nessecitates intensive studies of the status of this rare species in the future.

Other important nesting areas - The following 14 nesting areas contained large numbers of breeding birds, had high species diversity or were otherwise unique, given their geographic location in the state:

1) False Klamath Rock, Del Norte County;
2) Trinidad Area (Green, Puffin, Flatiron, Blank, Pilot, Trinidad Bay and Little River rocks), Humboldt County;
3) Cape Mendocino Area (False Cape Rocks, Sugarloaf Island and Steamboat Rock), Humboldt County;
4) Cape Vizcaino and Rockport Rocks, Mendocino County;
5) Point Reyes National Seashore (Point Reyes, Bird Rock, Point Resistance, Miller's Point Rocks and Double Point Rocks), Marin County;
6) San Francisco Bay Area (including the San Francisco Bay National Wildlife Refuge);
7) Carmel Bay Area (Bird Rock and Bird Island), Monterey County;
8) Anacapa Islands (West, Middle and East), Ventura County;

9) San Nicolas Island, Ventura County;
10) Bolsa Chica Ecological Reserve, Orange County;
11) South San Diego Bay, San Diego County;
12) Old-growth forests in Del Norte, Humboldt, San Mateo and Santa Cruz counties;
13) Klamath Basin Area (Lower Klamath, Clear Lake and Tule Lake National Wildlife Refuges), Siskiyou and Modoc counties; and
14) Mono Lake, Mono County.

This list did not include all important nesting areas in the state. Long sections of coast in Mendocino, Sonoma, San Mateo, Santa Cruz, San Luis Obispo and Santa Barbara counties contained significant numbers of breeding birds dispersed at several small and medium-sized colonies.

Distribution patterns of 4 dominant species - In 1989-1991, 4 species (Brandt's Cormorant, Western Gull, Common Murre and Cassin's Auklet) accounted for 86% of the breeding seabirds on the California coast. In northern, central and southern California, they accounted for 91%, 86% and 73%, respectively. Common Murres bred in the largest numbers, constituting 83% and 40% of the breeding seabirds of northern and central California, respectively, and 55% of the state total. Very small numbers of Common Murres bred historically in southern California at Prince Island, just south of Point Conception. Lower overall numbers of seabirds in southern California (compared to farther north) resulted from the lack of Common Murres breeding there. Brandt's Cormorants were the second most abundant nesting species, comprising 13% of the state total. Highest numbers were found in central California (38,529 breeding birds or 17% of breeding seabirds there) but this species became the dominant species in southern California (29,365 breeding birds or 31% of breeding seabirds there). Western Gulls and Cassin's Auklets were the third and fourth most abundant (10% and 9% of the state total, respectively). As for Brandt's Cormorants, they bred in highest numbers in central California (28,837 [12%] and 38,274 [16%], respectively) but were more dominant in southern California (29% and 13%, respectively). All 3 of the latter species bred in lower numbers in northern California.

Lower numbers of 3 species and high numbers of Common Murres in northern California reflected the limited availability of suitable nesting habitats in most areas. Almost all offshore rocks were small and close to shore in this area. Common Murres have well utilised these limited nesting habitats by crowding onto most of the available larger rocks from Cape Vizcaino north where they foraged over broad portions of the continental shelf usually within 40 km of colonies (Briggs et al. 1987). Suitable burrowing habitat for large numbers of nesting Cassin's Auklets (and many other burrowing species) was found only at Castle Rock. Small and medium-sized colonies of Brandt's Cormorants and

Western Gulls were spread more evenly on small rocks all along the coasts of northern California.

Larger numbers of Brandt's Cormorants, Western Gulls and especially Cassin's Auklets in central California reflected the existence of the South Farallon Islands which provided a large amount of nesting space, excellent breeding habitats for all 3 species (plus Common Murres) and better access to foraging areas on the continental shelf as well as coastal waters. However, seabird populations there have been disrupted by human activities for over a century (see summaries in Ainley and Lewis 1974, Ainley and Boekelheide 1990). Western Gull populations at the Farallon Islands and at other colonies in this area since the 1950's have been higher than they had been since the mid 1800's when they underwent a decline due to persecution and human occupation of the islands. Also, these islands were located near supplementary human food sources in the San Francisco Bay area, especially refuse dumps. Common Murres underwent a large decline due to egging at the Farallon Islands in the late 1800's and remained at low levels (apparently due to mortality from oil pollution) until the 1960's. Murres increased constantly until 1982 when they underwent another decline due mainly to gillnetting and oil spill mortality (Takekawa et al. 1990). Thus, murres were less represented in central California in 1989 than a decade ago but were more represented than most of this century. Egging also affected Brandt's Cormorants which were not a target species but nested in the same habitats as Common Murres. Recovery of the Brandt's Cormorant nesting population at the South Farallon Islands was not reported until the 1950's. Numbers of Cassin's Auklets increased in the late 1800's (possibly due to natural changes in the marine environment) and have been high since then. The Farallon Islands provided the only suitable nesting habitat for large numbers of nesting Cassin's Auklets in central California.

Elsewhere on the outer coast of central California, there was limited availability of nesting islands as in northern California. Common Murres were found nesting on small rocks and mainland cliffs only between Point Reyes and Point Sur where they foraged over the broad shelf in this area (Briggs et al. 1987, Ainley and Boekelheide 1990). Brandt's Cormorants nested in large numbers on small islands located close to shore in the Carmel Bay area (Bird Island and Bird Rock) and in moderate numbers elsewhere. Western Gulls nested in large numbers on Ano Nuevo Island and small to moderate numbers elsewhere.

In southern California, substantial numbers of each of 3 species (minus Common Murres) have bred in the Channel Islands (especially the northern islands) which provided much suitable nesting habitat and access to offshore, shelf and coastal foraging habitats (Hunt et al. 1979, Briggs et al. 1987). However, seabird populations were lower than they could be based

on available nesting habitat. The Chumash, Shoshonean and Nicoleno indians had lived on the Channel Islands for about 30,000 years before the few survivors of disease were evacuated between 1787-1816 (Dowty 1984). Their diet included many species of seabirds (Bleitz 1990). In addition, these indians brought the Island Fox (Urocyon littoralis), a predator of seabird eggs, to San Nicolas, San Clemente and Santa Catalina islands whereas fox occurred naturally on San Miguel, Santa Rosa and Santa Cruz islands. It was unclear to what extent indians and fox have limited nesting seabirds. However, as found at the Farallon Islands, seabird populations have been disrupted by human activities at least since the early 1800's (see summary in Hunt et al. 1979). Brandt's Cormorants have been most affected in the southern Channel Islands where small colonies have been eliminated from Santa Catalina, San Clemente and San Nicolas islands, probably due to human disturbance. These islands and their seabirds have suffered from continual disturbance from the establishment of U. S. Navy bases on San Clemente and San Nicolas islands and the intensive development and tourism at Santa Catalina Island. Cassin's Auklets underwent large documented declines at Prince Island in the 1910's, East Anacapa Island (after 1910) and Santa Barbara Island (between 1890-1908). Auklets appeared to recover at Prince Island but the degree of past decline was also less clear there. They were exterminated from East Anacapa Island, perhaps by cats or rats. Cassin's Auklets bred in very large numbers at Santa Barbara Island in the late 1800's. Cats were blamed for essentially exterminating auklets there (Willett 1912, Sumner 1939), although small numbers still breed in inaccessible cliffs and caves on the main island and on nearby Sutil Island. Western Gulls appeared to have been less affected by human activities or they have recovered dramatically from any declines. Current numbers have probably been increased by use of human refuse at some colonies.

Along the southern California mainland coast, there was a complete lack of nesting islands and few suitable cliff nesting areas. Brandt's Cormorants have nested on cliffs at La Jolla and Western Gulls have used cliffs in the same area plus artifical habitats in San Diego Bay.

Global significance of California populations - Using 1989-1991 estimates, California populations of Brandt's Cormorants and Western Gulls accounted for 78% and 66% of the world population of these species, respectively (see Ainley and Boekelheide 1990). On the other hand, Common Murres and Cassin's Auklets occurred in much greater numbers in Alaska and British Columbia. However, the "significance" of populations can be measured in many ways besides raw numbers of breeding birds. Although only 7,209 Ashy Storm-petrels nested in California, this total accounted for essentially 100% of the world population because only 1 very small colony was known in Baja California, Mexico. California also hosted important populations of the endangered

Brown Pelican, Least Tern and Marbled Murrelet. Elegant Terns are known to recently nest at only 3 colonies in the world (2 colonies in California and 1 colony in the Gulf of California, Mexico). Much of the world population of Xantus' Murrelet, particularly the subspecies S. h. scrippsi, bred in the Channel Islands. Separate from population sizes was the great diversity of the 31 species of 8 different families that have nested in California. Certainly, California serves as a junction between northern communities, southern communities and the community of breeding seabirds adapted specifically to conditions along the California coast.

Summary - The distribution of the bulk of the nesting seabird population (especially the 4 dominant species) of California has been determined largely by the availability of suitable nesting habitat on offshore islands, human activities at nesting islands, and the availability of prey resources. Briggs et al. (1987) have examined the preferred marine habitats used for foraging by seabirds in California although they did not adequately assess the affect of availability of nesting habitat and size of breeding populations on observed patterns. Ainley and Boekelheide (1990) pointed out that breeding populations of seabirds at the Farallon Islands were limited by nest-site availability and winter food supply as affected by periodic ENSO events. However, the effects of ENSO events probably were greater at offshore colonies where the prey base can be expected to be upwelling-based. For instance, rockfish (Sebastes sp.) predominated in seabird diets at the Farallon Islands, San Miguel Island and San Nicolas Island (see summaries in Hunt et al. 1979, Ainley and Boekelheide 1990). On the other hand, colonies in the inner Channel Islands appeared to have different prey bases (e.g. Northern Anchovy Engraulis mordax) and other inshore colonies also probably had different prey bases. Thus, these colonies probably were less affected by ENSO events (e.g. Hunt et al. 1979, Anderson and Gress 1983, Ingram 1992; and see species accounts for Brown Pelicans, Brandt's and Pelagic Cormorants and Pigeon Guillemots).

Limited nesting habitats on the California coast have required seabirds to nest at many small and medium-sized colonies as well as a few large colonies. These colonies were distributed all along the coast where seabirds utilized small nearshore rocks, mainland cliffs and artifical habitats to an extent unparalleled elsewhere on the west coast of North America. This nesting distribution has indicated that adequate prey resources have existed all along the coast, especially in northern and central California and in the vicinity of the Channel Islands. The continuous nature of seabird colonies and their close proximity to heavily-populated shores in California also has increased human interactions with seabirds. These interactions have produced only positive impacts for human populations through increased opportunities: 1) to study their incredible adaptations

for survival and reproduction in the harsh marine environment; 2) to use this knowledge to further understand the structure and function of the marine environment; 3) to use seabirds as indicators of the health of the marine environment; and 4) to appreciate their vast aesthetic value as a marine wonder in a non-consumptive fashion. In contrast, human interactions have had mostly negative impacts for most seabird species. Some examples of these negative impacts were: 1) loss of nesting habitats due to human occupation of nesting islands, physical development of coastal habitats, logging of old-growth forests, agricultural and water developments and human disturbance related to commercial and recreational activities; 2) introduction of predators to nesting islands; 3) at-sea mortality due to oil pollution and gillnetting; and 4) reduced breeding success due to chemical pollution, changes in prey resources (related to fisheries and other human activities) and human disturbance (related to commercial and recreational activities). The use of artifical nesting habitats has reduced the effects of other negative impacts for some species. The protection of nesting and foraging habitats in the recent past have slowed the rate of change due to negative impacts of human interactions on seabirds in California. However, much more work will be required to prevent certain species with small or highly-restricted populations and threatened by human interactions from declining to extinction in the state in the future (e.g. Ashy and Black storm-petrels, White Pelican, Brown Pelican, Ring-billed Gull, California Gull, Black Tern, Gull-billed Tern, Elegant Tern, Least Tern, Black Skimmer, Marbled Murrelet, Xantus' Murrelet and Tufted Puffin).

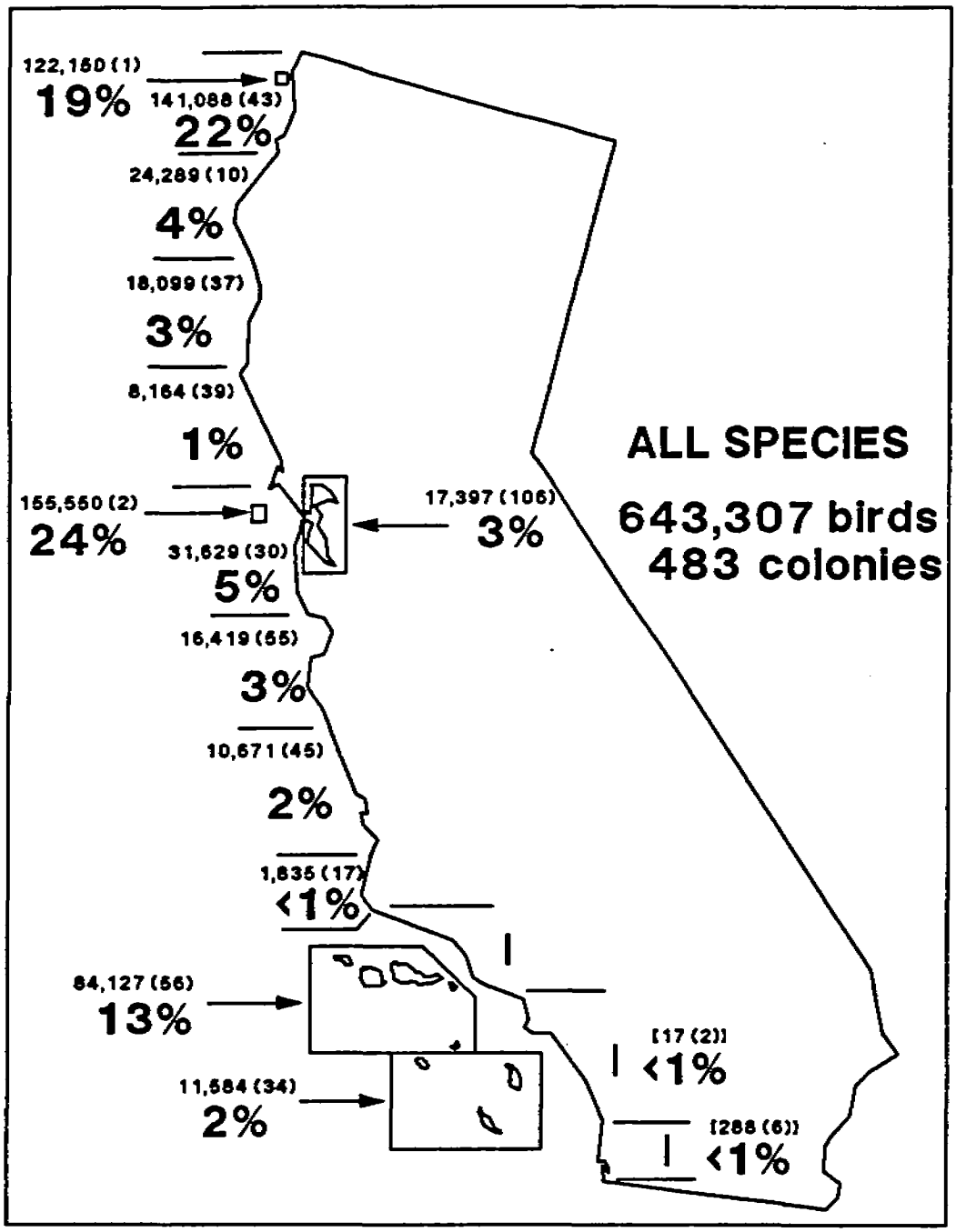


Figure 19. Percentage of total seabird breeding population for all seabird species combined in coastal regions of California, 1989-1991. Regions were defined as one degree of latitude (after Sowls et al. [1980]), except for Castle Rock NWR, Farallon Islands NWR, San Francisco Bay, Channel Islands National Park, and Southern Channel Islands which are indicated separately with arrows. The total number of breeding birds is indicated in smaller text (total number of nesting areas in parentheses) above the percent presented for each region.

Table 5. Comparison of the number of seabird nesting areas found in northern (NCA), central (CCA), and southern (SCA) California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1989-1991 (This study).[1]

	1975-1980				1989-1991			
	No. of nesting areas				No. of nesting areas			
Species	NCA	CCA	SCA	Total	NCC	CCA	SCA	Total
FTSP	6	0	0	6	5	1	0	6
LHSP	8	1	2	10	9	1	4	14
ASSP	1	1	9	11	2	1	11	14
BLSP	0	0	2	2	0	0	4	4
WHPE	-	-	-	-	-	-	-	-
BRPE	0	0	2	2	0	0	2	2
DCCO	11	2	4	17	16	16	5	37
BRCO	33	31	17	81	32	39	31	102
PECO	99	68	11	178	102	67	46	215
UNCO	1	3	0	4	0	0	1	1
BLOY	61	56	17	134	94	60	58	212
AMOY	0	0	2	2	0	0	0	0
BAOY	0	0	1	1	0	0	3	3
HEEG	0	2	0	2	0	0	0	0
RBGU	-	-	-	-	-	-	-	-
CAGU	0	0	0	0	0	3	0	3
WEGU	86	69	22	177	107	156	87	350
GWGU	0	0	0	0	-	-	0	-
BLTE	-	-	-	-	-	-	-	
GBTE	0	0	-	0	0	0	-	0
CATE	0	2	-	2	0	6	-	6
FOTE	0	5	-	5	0	21	-	21
LETE	0	6	-	6	0	10	-	10
ROTE	0	0	-	0	0	0	-	0
ELTE	0	0	-	0	0	0	-	0
BLSK	0	0	-	0	0	0	-	0
COMU	12	7	0	19	15	8	0	23
PIGU	92	69	12	173	107	94	34	235
MAMU	-	-	-	-	-	-	-	-
XAMU	0	0	11	11	0	0	14	14
CAAU	2	1	9	12	3	1	12	16
RHAU	5	3	0	8	19	10	3	32
TUPU	10	3	0	13	10	2	1	13
ZERO	0	2	1	3				33
TOTAL	113	112	44	269[2]	130	255	98[2]	483[2]

[1] A dash (-) indicates data are not available. Information on terns and skimmers in southern California will be included in the final draft of this report.

[2] Counts are incomplete. Complete counts (i.e. with southern California tern and skimmer data) will be available in the final draft of this report.

Table 6. Summary of breeding populations of seabird species in coastal California in 1989-1991.

Species Name	Species Code	Number of Nesting Areas[1]	Number of Breeding Birds	Percentage of Total Breeding Birds	State Population Trend
Fork-tailed Storm-petrel	FTSP	6	410	0.06	Unknown
Leach's Storm-petrel	LHSP	14	12,551	1.95	Declining
Ashy Storm-petrel	ASSP	14	7,209	1.12	Unknown
Black Storm-petrel	BLSP	4	274	0.04	Unknown
American White Pelican	WHPE	-	-	-	Interior
Brown Pelican	BRPE	2	11,916	1.85	Stable
Double-crested Cormorant	DCCO	37	10,037	1.56	Increasing
Brandt's Cormorant	BRCO	102	83,394	12.96	Stable
Pelagic Cormorant	PECO	215	14,345	2.23	Stable
Unidentified Cormorant	UNCO	1	2	<0.01	-
Black Oystercatcher	BLOY	212	888	0.14	Stable
Black x American Oystercatcher	BAOY	3	3	<0.01	Unknown
Heermann's Gull	HEEG	0	0	0.0	Irregular
Ring-billed Gull	RBGU	-	-	-	Interior
California Gull	CAGU	3	4,764	0.74	Increasing
Western Gull	WEGU	350	61,760	9.60	Increasing
Glaucous-winged Gull	GWGU	-	-	-	Hybrid
Black Tern	BLTE	-	-	-	Interior
Gull-billed Tern [incomplete]	GBTE	-	-	-	-
Caspian Tern [incomplete]	CATE	6	2,838	0.44	Declining
Forster's Tern [incomplete]	FOTE	21	3,550	0.55	Increasing
Least Tern [incomplete]	LETE	10	272	0.04	Declining
Royal Tern [incomplete]	ROTE	-	-	-	-
Elegant Tern [incomplete]	ELTE	-	-	-	-
Black Skimmer [incomplete]	BLSK	-	-	-	-
Common Murre	COMU	23	351,336	54.61	Declining
Pigeon Guillemot	PIGU	235	15,470	2.40	Stable
Xantus' Murrelet	XAMU	14	1,760	0.27	Unknown
Marbled Murrelet	MAMU	-	1,821	0.28	Unknown
Cassin's Auklet	CAAU	16	56,562	8.79	Unknown
Rhinoceros Auklet	RHAU	32	1,769	0.27	Increasing
Tufted Puffin	TUPU	13	276	0.04	Stable
Unidentified alcid	UNAL	9	104	0.02	-
Total		483[2]	643,307[2]		

1 Includes nesting areas active in 1989-1991 only. Incomplete count. Awaiting southern California tern and skimmer data.

2 Includes 33 inactive nesting areas.

SPECIES ACCOUNTS

FORK-TAILED STORM-PETREL

Fork-tailed Storm-petrels breed in the Pacific Ocean from the Sea of Okhotsk, Russia, across the Aleutian Islands, and south to northern California. They are difficult to census because they nest in burrows or crevices and are only active at the colony at night. Sowls et al. (1980) estimated the number of breeding birds at 1 colony in northern California and provided historical estimates for 5 other colonies surveyed in the late 1960's or early 1970's (Table 7). In 1989, minimal effort was extended on censusing this species during the breeding season. Thus, we have provided only historical estimates for 5 known northern California colonies. However, one possible new colony may now exist in central California (Table 7).

Northern California

Castle Rock National Wildlife Refuge - Birds were detected on two nights in 1989. On the night of 21-22 August, we heard a few birds calling as they flew around the rock. Most activity centered around the cliffs on the south side and near our campsite on the east side of the rock. One bird circled a tape player broadcasting vocalizations of Fork-tailed Storm-petrels. On the night of 12-13 September, 6 birds were captured in a mist net placed on the edge of a burrow area on the north central part of the rock (Table 9; area 04 in Figure 48). One bird had a refeathering incubation patch while the other 5 lacked incubation patches and had little or no body, primary or rectrix molt. Thus, these latter birds may have been nonbreeders. Due to insufficient data, we used the historical estimate of 100 breeding birds at Castle Rock (Sowls et al. 1980).

Fork-tailed Storm-petrels have been recorded breeding at Castle Rock since 1917 (Osborne 1972; Fraser 1934). Early observers reported these birds nesting in rock crevices, although they also may have nested in burrows. On 16 May 1970, Osborne (1972) captured 2 birds in a mist net at midnight. He estimated the total population probably was less than 100 pairs. Past and recent vegetation and soil changes may have reduced nesting habitat, as for Leach's Storm-petrels (see species account).

Little River Rock - Birds were detected on 2 nights in 1989. On 1-2 August, 1-2 birds were heard calling amidst the many calling Leach's Storm-petrels. On 28-29 August, 3 birds were captured in a mist net (Table 9). Also, birds were heard calling on 4 other occasions during the night. All captured birds had no visible incubation patches and exhibited little or no molt. Thus, they may have been nonbreeding. Due to insufficient data in 1989, we

used the historical estimate of 200 breeding birds (Sowls et al. 1980).

Harris (1974) captured and banded 122 Fork-tailed Storm-petrels between 1964 and 1969. Based on a ratio of 2 Fork-tailed per 100 Leach's Storm-petrels captured and an estimated breeding population of 10,000 Leach's Storm-petrels, he estimated that no more than 200 Fork-tailed Storm-petrels bred on Little River Rock. However, the number of breeding birds probably has declined due to habitat changes (see Leach's Storm-petrel account).

Other Northern California colonies - We did not expend sufficient effort to determine presence or absence of Fork-tailed Storm-petrels at 3 other known and 3 historical colonies (Table 7). Sowls et al. (1980; 1979-1980 survey archives) found 2 birds incubating eggs and heard two others calling from burrows on "Tolowa Rock" on 19 June 1980 and estimated 50-60 burrows. At Green Rock, Osborne (1972) found 3 nests in old puffin burrows on 18 June 1970 and estimated less than 50 breeding birds. At Trinidad Bay Rocks, Osborne (1972) found 1 nest on Tepona Rock on 29 April 1965. Five crevice/burrows found under boulders at "Double Rock", Trinidad Bay Rocks, on 6 May 1989 may have belonged to this species. Fork-tailed Storm-petrels have also been recorded historically at Whaler Island, Blank Rock, and Prisoner Rock (Clay 1916, 1925; Dawson 1923; Osborne 1972). The Whaler Island colony was destroyed when a breakwater was constructed and connected this island to the mainland in the 1930's. Blank Rock no longer has suitable nesting habitat due to soil erosion (Osborne 1972). At Prisoner Rock, Osborne (1972) found 6 dead birds along with 60 dead Leach's Storm-petrels on 10 August 1972 and suspected that they bred there. In 1989, we did not capture or hear any Fork-tailed Storm-petrels at Prisoner Rock (Table 9; Appendix 3). No dead birds were found, although many dead Leach's Storm-petrels were found. Thus, we did not believe that Fork-tailed Storm-petrels nested at Prisoner Rock in 1989.

Central California

One possible new colony may exist at the South Farallon Islands. On the night of 27-28 May 1990, a Fork-tailed Storm-petrel with a bare incubation patch was captured in a mist net (McChesney et. al., unpubl. data). Extensive mist netting studies in the early 1970's and in 1987 did not detect these birds (Ainley and Lewis 1974; Ainley et al. 1974; McChesney et al., unpubl. data). Recent at-sea sightings in central California waters during summer may further indicate a southward range expansion (Erickson et al. 1986, Bailey et al. 1989).

Summary

Due to the very small California population and census difficulties, we have not provided any new estimates for Fork-tailed Storm-petrels in 1989-1991. We did not land on the major colonies (e.g. Castle Rock, Green Rock, and Little River Rock) during the main part of the breeding season due to the disturbance that would have been caused to other nesting seabirds. However, breeding populations may have experienced recent declines due to changes in nesting habitat at Castle Rock and Little River Rock. Loss of nesting habitat already has led to the loss of Whaler Island and Blank Rock colonies. Further loss of nesting habitat could lead to extinction of this species in the state. More research is required to better assess current population levels. The recent occurrence of small numbers of Fork-tailed Storm-petrels off Point Reyes in central California waters may reflect displaced breeding birds prospecting for potential new nesting sites (e.g. North and South Farallon Islands).

Since these birds breed earlier than most other species (egg laying in March and April; Clay 1925, Harris 1974), future visits to colonies could be planned before cormorants and murres begin egg laying in early April. This approach would require careful assessment of potential disturbance but would allow for better assessment of this species current status. Additional mist netting and nest searching efforts at other potential nesting rocks in northern and central California could turn up other small colonies.

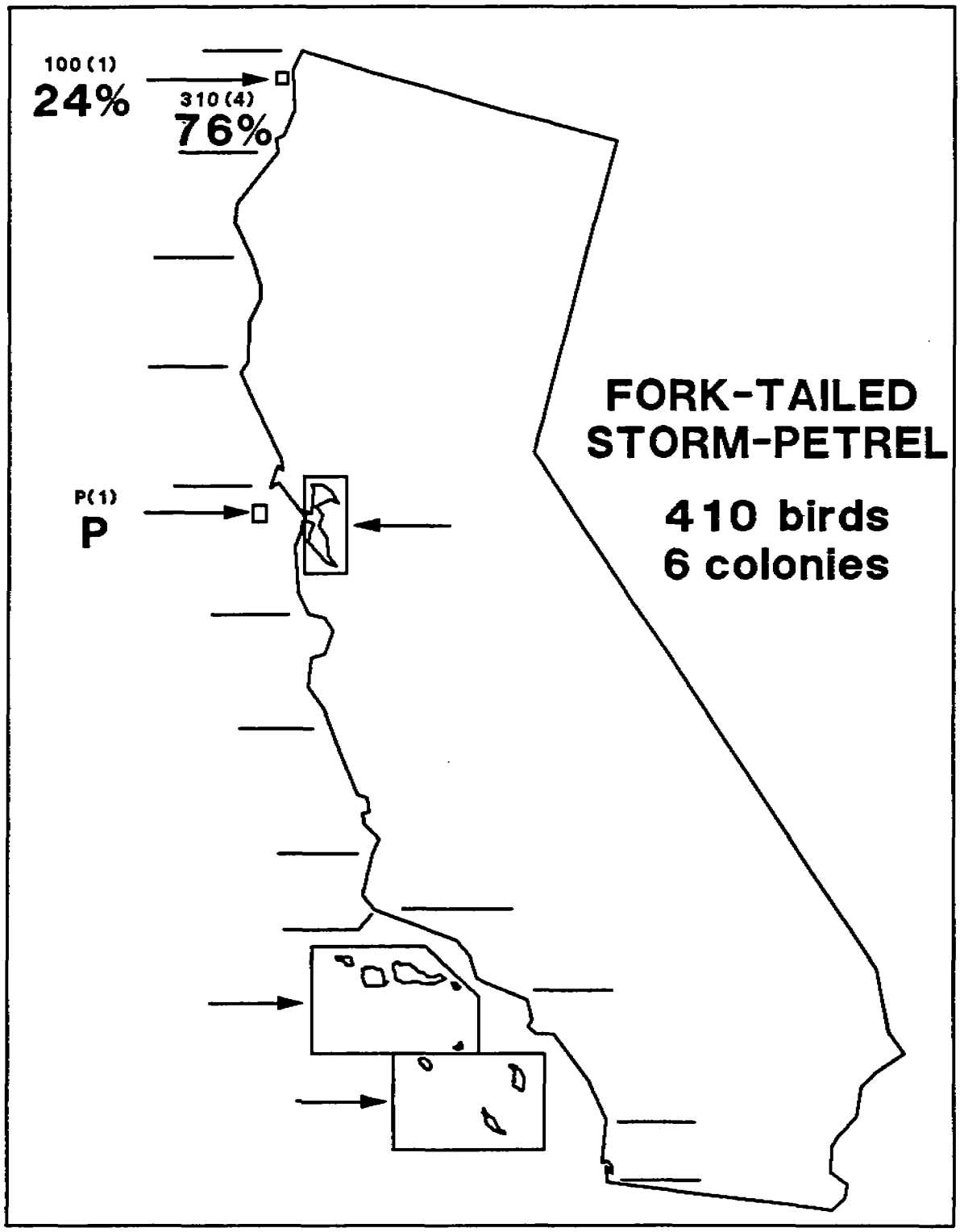


Figure 20. Percentage of state breeding population of Fork-tailed Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 7. Numbers of breeding Fork-tailed Storm-petrels at each colony in California in 1979-1980 (Sowls et al. 1980) and in 1989-1991 (This study).

Colony Name	Colony number CA	Colony number USFWS	Number of breeding birds[1] (percent) 1979-1980		1989-1991	
Northern California						
Castle Rock	DN-414-06	325-006	[100][2]	(24.4)	[100][2]	(24.4)
Tolowa Rocks	DN-414-07	325-007	60	(14.6)	[60]	(14.6)
Crescent City Harbor Area ("Whaler Island")	DN-414-09	325-045	H	(0.0)	H	(0.0)
Green Rock	MU-410-09	325-020	[50]	(12.2)	[50]	(12.2)
Blank Rock	MU-410-14	325-024	H	(0.0)	H	(0.0)
Prisoner Rock	MU-410-17	325-027	[X]	(0.0)	[H]	(0.0)
Trinidad Bay Rocks	MU-410-18	325-054	[X]	(0.0)	[X]	(0.0)
Little River Rock	MU-410-19	325-035	[200]	(48.8)	[200]	(48.8)
Central California						
South Farallon Islands	SF-FAI-02	429-052	0	(0.0)	P	(0.0)
Total			410[3]		410	

[1] X, present; P, probably/possibly present; H, historical nesting only. Estimates in brackets [ ] were based on previous information.
[2] Osborne (1972) reported less than 100 pairs. Interpreted or misinterpreted by Sowls et al. (1980) as 100 birds. Based on other historical information, we also use this estimate.
[3] Sowls et al. (1980) reported 310 breeding birds.

LEACH'S STORM-PETREL

Leach's Storm-petrels are one of the most widespread nesting seabirds in the northern hemisphere. In the Pacific Ocean, they breed from Japan, across the Aleutian Islands, and south to southern Baja California, Mexico. Leach's Storm-petrels are difficult to census because they nest in burrows or sometimes crevices, often in large colonies, and are active at the colony only at night. Hunt et al. (1979, 1980) identified 1 Leach's Storm-petrel colony in southern California and speculated that they were present at 2 other colonies (Table 8). Sowls et al. (1980) estimated the number of breeding birds at 3 colonies in northern California and noted 2 other possible sites. In addition, rough historical estimates were included for 2 colonies in northern California and 1 colony in central California which were surveyed in the 1960's or early 1970's (Harris 1974; Osborne 1971,1972; Ainley and Lewis 1974). In 1989 and 1991, we focused on updating and improving population estimates for Leach's Storm-petrels by conducting detailed burrow counts (northern California) and mist netting birds at night (northern and southern California). For many California colonies, we have provided the first standardized and well-documented population estimates for this species.

Northern California

Castle Rock National Wildlife Refuge - During overnight visits on 21-22 August and 12-13 September 1989, we did not detect any Leach's Storm-petrels. None were captured in mist nets on 12-13 September (Table 9, Appendix 3). However, we counted 687 potential small sites (mostly burrows and some crevices) over the entire rock on 12-13 September 1989 (Table 10, Figure 48). In area 2(A), small burrow densities in 3 plots were determined (0.0, 0.22, and 0.43/m^2). Using an average of 0.22 burrows/m^2, 331 small burrows were estimated over a 1,506 m^2 area with similar density. No small burrows were found in 3 other plots in area 2(B). We considered all small sites as potential storm-petrel nest sites. To account for storm-petrel use of medium and large burrows not used by alcids, 25% of all medium (792) and large (163) sites were considered as potential sites since they were not considered to have been used by alcids. By adding these 955 sites, 1,642 potential storm-petrel sites were determined. We then subtracted 67 potential sites considered as used by Fork-tailed Storm-petrels to derive an adjusted total of 1,575 potential Leach's Storm-petrel sites. Applying the L correction factor, we derived an estimate of 2,362 breeding birds.

Leach's Storm-petrels have long been reported nesting in large numbers at Castle Rock (Clay 1916; Fraser 1934; Martin 1938; Zerlang and Fraser 1940; Osborne 1971, 1972). In July 1917, Clay (Osborne 1972) dug up several in burrows and reported large numbers active at night, stating that "tens of thousands"

of birds were nesting. On 16 May 1970, Osborne (1971,1972) mist netted 66 birds in two hours and saw several thousand birds flying at midnight. Based on estimates in a similar sized area on Little River Rock (see Harris 1974), he roughly estimated 5,000 birds nesting in an Elymus mollis area on the eastern section of the rock.

If 5,000 breeding birds were present in 1970, a substantial decline in numbers of Leach's Storm-petrels has occurred. Substantial changes in vegetation and possibly soil in past and recent years (Osborne 1972; R. Lowe and E. Nelson, pers. comm.) may have contributed to a decline in the number of burrow sites. However, numbers of breeding Rhinoceros and Cassin's auklets have increased since earlier researchers visited the rock (Osborne 1972; see Cassin's and Rhinoceros Auklet accounts). Thus, alcids may have been displacing storm-petrels on Castle Rock. The apparent lack of Leach's Storm-petrels present on two 1989 visits possibly indicated an even greater decline. Both of our visits occurred during peak fledging at other northern California colonies (Figure 14; Harris 1974). During this period, adults are less active at colonies and are much less vocal than in other periods of the nesting cycle (Harris 1974; Ainley et al. 1974; G. J. McChesney, pers. obs.). However, it was surprising that no birds were detected and it was possible that numbers were very low. Further research is required to investigate this apparent decline.

Prisoner Rock - On 6 May 1989, we counted 71 burrows on Prisoner Rock. Applying the L correction factor to these 71 potential nest sites, 106 breeding birds were estimated. Storm-petrels were also mist netted on 3 nights in 1989 (Table 9, Appendix 3). Of 179 birds captured, 90.5% were estimated to be breeders based on incubation patch condition. Only 3 birds banded on Prisoner Rock were recaptured there. One other recaptured bird was banded on "Button Rock" (Appendix 3). To compare with the burrow count estimate, we calculated breeding population estimates using both programs CAPTURE (Otis et al. 1979) and JOLLY (Pollock et al. 1990) (Tables 11, 12). Program CAPTURE estimates ranged from 180-2,949 breeding birds; only one estimate of 915 breeding birds was obtained using program JOLLY. Most capture-recapture estimates were much higher than burrow counts and are unrealistic. This result likely was due to the large number of birds captured which probably were visiting from adjacent colonies. However, the M(b) and M(bh) models from CAPTURE provided estimates closer to burrow counts (Table 11).

Leach's Storm-petrels have been reported nesting on Prisoner Rock since 1910 (Osborne 1972). Osborne (1972) reported about 75 burrows with recent digging on 1 May 1970 and estimated 150-200 breeding birds. On 20 July 1979, Sowls et al. (1980; see 1979-1980 survey archives) counted 56 active and 46 inactive burrows on Prisoner Rock and estimated 160 breeding birds. Thus, our

1989 estimate was similar to but somewhat lower than past estimates. However, our burrow count was almost identical to the 1970 estimate which was not corrected for burrow occupancy. We counted fewer burrows than the 1979 count but their estimate of active burrows took into account "inaccessible" areas and may have been high. We found very little inaccessible habitat on Prisoner Rock in 1989. The 56 active burrows would have yielded an estimate of 112 breeding birds, very similar to the 1989 estimate.

Osborne (1972) and Sowls et al. (1980) reported finding the remains of large numbers of Leach's Storm-petrels on Prisoner Rock, the apparent victims of River Otters (Lutra canadensis). On 6 May 1989, we found the remains (mostly wings) of at least 12 dead Leach's Storm-petrels and more fresh remains were present on 30 July. At least 6 River Otters regularly frequented the Trinidad pier area in 1989, and an otter slide was present on Prisoner Rock. Caches of storm-petrel remains were not found at any other colonies in 1989-1991.

Trinidad Bay Rocks - In 1989, we found Leach's Storm-petrels breeding on at least 3 rocks within this colony area, including: "Split", "Button", and Tepona Rocks. In addition, Leach's Storm-petrels may have bred on "Double Rock".

At "Button Rock" (subcolony 17 on Map 14; see Appendix 2), we estimated the number of storm-petrel sites using four 2 m x 2 m plots on 12 May 1989 with an approximate density estimate for the coastal brushfield on top of the rock. Two plots in grassy areas averaged 7.37 burrows/m^2 (range 7.25-7.5/m^2) whereas two plots in fern-dominated vegetation averaged 5.0 burrows/m^2 (range 4.0-6.0/m^2). We estimated 2.5 burrows/m^2 for the coastal brushfield area. Ground tape measurements were used to determine the area of each habitat type. Grassy, fern and brush areas were determined to cover 201.9, 35.3, and 30.0 m^2, respectively. A total of 1,739 potential storm-petrel sites were estimated by multiplying average burrow densities and the area of each habitat type. By applying the L correction factor, 2,608 breeding birds were estimated for this subcolony.

At "Split Rock" (subcolony 16 on Map 14; see Appendix 2), we counted 181 burrows (including both west and east islets) and estimated another 16 burrows for part of the steep southeast side of the west islet on 16 August 1989. In addition, 1 adult and 2 chicks were found. At Tepona Rock (subcolony 19), we counted 849 storm-petrel burrows. Applying the L correction factor to the total of 2,785 sites for the 3 rocks, we determined an estimate of 4,178 breeding Leach's Storm-petrels for Trinidad Bay Rocks. This estimate did not account for use of some sites by Fork-tailed Storm-petrels which may have nested there in small numbers (Osborne 1972). In addition, 5 small burrow/crevices were found among boulders on the lower shelf of "Double Rock" (subcolony 06)

on 6 May 1989 and petrel odor was very strong. However, based on habitat type, these sites may have been used by Fork-tailed Storm-petrels. More burrows may have been present on the inaccessible top of "Double Rock".

In addition to burrow counts, we spent 3 nights mist netting on "Button Rock" (Table 9, Appendix 3). Of 362 birds captured, an estimated 94.2% were determined to be breeders based on incubation patch condition. To compare with burrow counts, programs CAPTURE (Otis et al. 1979) and JOLLY (Pollock et al. 1990) were used to estimate breeding population size (Tables 11, 12). Population estimates from the different models ranged between 552-2,606 breeding birds using CAPTURE and between 659-2,060 using JOLLY. Although capture-recapture estimates varied, the M(o) model from CAPTURE provided an estimate nearly identical to the burrow count estimate.

Osborne (1972) found about 100 burrows on "Button Rock" on 29 April 1965. It is uncertain whether this subcolony was active when next visited in 1970. At Tepona Rock, 200 burrows with fresh diggings were found and 600 breeding birds estimated in 1970. At "Split Rock", no storm-petrel burrows were found in 1965 and 1970 although petrel odor was noted. No storm-petrels were detected on "Double Rock".

Sowls et al. (1980) surveyed this colony in 1980 and estimated 1,640 breeding Leach's Storm-petrels. Burrow counts were conducted on "Split Rock" (N=20), "Button Rock" (N=500), and Tepona Rock (300 active sites estimated out of 500 burrow entrances) (Sowls et al., 1979-1980 survey archives). In addition, they captured 84 birds in a mist net on "Button Rock" between 2120-0450 h on 28-29 June 1980.

A marked increase in numbers of breeding Leach's Storm-petrels appeared to have occurred at Trinidad Bay Rocks. These birds may have been displaced from Little River Rock (see below). However, these rocks appeared near saturation and it will be unlikely that substantial increases will occur in the future.

<u>Little River Rock</u> - We counted 2,385 small burrows over the entire rock on 1 and 28 August 1989. We also added 15% to account for burrows possibly missed due to obscuring vegetation and small areas of steep inaccessible slopes. Using an adjusted total of 2,806 potential sites, subtracting 133 sites for use by Fork-tailed Storm-petrels, and applying the L correction factor, we determined an estimate of 4,009 breeding Leach's Storm-petrels on Little River Rock in 1989.

We also mist-netted birds on two nights (Table 9, Appendix 3). Of the 260 Leach's Storm-petrels mist netted, all but one appeared to be breeders based on incubation patch condition.

Capture-recapture estimates could not be calculated due to a lack of recaptures.

Harris (1974) estimated about 2,500-3,000 burrows on the west half of the rock in 1965. Using rough extrapolations for the remainder, he estimated a total of 6,590 burrows for the entire rock and further estimated 10,000 breeding birds. Although the 1965 estimate was rough, a large decline in the number of Leach's Storm-petrels clearly has occurred at Little River Rock. This decline has resulted from the establishment of a colony of Double-crested Cormorants in the early 1970's which occured mainly on the west peak in 1989. The flat top of this peak has been completely denuded of soil, presumably due to trampling, use of vegetation for nesting material, and guano. Double-crested Cormorants have increased from 4 birds in 1974, to 100 birds in 1980, to 542 birds in 1989 (Harris 1974, Sowls et al. 1980, This report). By 1989, these birds also had begun nesting on the east peak of the rock. Displaced storm-petrels from Little River Rock appeared to move to the Trinidad Bay Rocks colony.

Other northern California colonies - We discovered two new Leach's Storm-petrel colonies in 1989 (Table 8). At Westport, 45 probable Leach's Storm-petrel burrows were counted on 31 August, along with a hatched eggshell. At Gull Rock, Sonoma County, a Leach's Storm-petrel was found incubating an egg in a burrow on 5 June. The burrow was in a small patch of soil near the top of the otherwise bare rock. In addition, a few other potential burrow/crevices were found. We conducted several nights of mist netting at Prince Island (Table 9, Appendix 3). Like Sowls et al. (1980), we did not recapture any birds nor did we find any storm-petrel burrows. Although many captured birds had bare or refeathering incubation patches, a greater portion of birds with downy or defeathering incubation patches were captured than at other colonies on similar dates (Figures 9, 10). Thus, our data supported the speculation made by Sowls et al. (1980) that birds visiting Prince Island were probably from other nearby colonies such as Castle Rock or Goat Island, Oregon. See the Ashy Storm-petrel account for further discussion on storm-petrel visitation to other colonies.

We reported historical estimates for 3 other colonies which were not surveyed effectively for storm-petrels in 1989, including: "Tolowa Rocks", Green Rock and Fish Rocks (Table 8). At Green Rock, Leach's Storm-petrels reportedly nested in a large grassy area in the 1930's (Osborne 1972). Osborne found one dead bird there on 18 June 1970 but did not believe they were nesting (although he did find Fork-tailed Storm-petrels), citing soil erosion as a cause for their disappearance. We did not identify any storm-petrel burrows on Green Rock during a late-season search on 16 August 1989. However, burrow nesting species (Cassin's and Rhinoceros Auklets, Tufted Puffins) were found

there and Leach's Storm-petrels may still nest there as well. At Fish Rocks, Sowls et al. (1979-1980 survey archives) captured 29 Leach's Storm-petrels (3 recaptures) on 3 nights in 1980. We erected 2 mist nets on 7-8 August 1989 but no storm-petrels were detected (Table 9, Appendix 3). Like Sowls et al. (1980), we did not find any soil burrows although crevice nesting habitat was abundant.

Leach's Storm-petrels were recorded historically at 3 other colonies in northern California, including: Whaler Island, Flatiron Rock (also known as Off-Trinidad Rock), and Blank Rock (Table 8). The Whaler Island colony formerly was the largest colony in California, with an estimated 20,000 birds (Howell 1920). In the late 1930's, the Crescent City breakwater was built and connected the island to the mainland. In the 1950's, the island was quarried and the breakwater strengthened, eliminating habitat and allowing access by rats and other predators. Soil erosion has apparently caused the abandonement of Flatiron and Blank rocks (Osborne 1972).

Central California

No new colonies were found in central California. As did Sowls et al. (1980), we have provided a historical estimate for the only known colony at the South Farallon Islands (Table 8) (Ainley and Lewis 1974). Intensive mist netting at Southeast Farallon Island from July-September 1987 resulted in only 31 Leach's Storm-petrels captured (McChesney et al., unpubl. data). However, further mist netting in May 1990 resulted in similar numbers of captures to the early 1970's (McChesney et al., unpubl. data). More work will be required at the South Farallon Islands to provide an updated population estimate.

Southern California

Prince Island - In 1991, we captured 7 birds at Prince Island (Table 9, Appendix 4). All were assumed to be breeders based on incubation patch condition. No birds were recaptured. Five birds had mostly white rumps (codes 3-4); one bird had an intermediate rump (code 6); and one bird had a mostly dark rump (code 8-9) (see methods). To estimate population size, we compared capture rates by calculating the number of breeding Ashy Storm-petrels captured per Ashy tape-lure hour (6.98) versus the number of breeding Leach's Storm-petrels captured per Leach's tape-lure hour (0.69). Almost all birds were captured while broadcasting that species' vocalizations. Thus, tape-lure hours only included times when that species' vocalizations were broadcast. Using the capture rate ratio of 10.12:1 and applying this ratio to the Ashy Storm-petrel estimate of 1,154 birds, we estimated 114 breeding Leach's Storm-petrels at Prince Island.

Leach's Storm-petrels were first recorded at Prince Island by Hunt et al. (1979, 1980). They captured 3 birds (1 collected and 1 recaputred) in 1976 and 3 birds in 1977 (1 collected). All birds had white rumps. Based on this information, Sowls et al. (1980) reported 6+ breeding birds at Prince Island.

Ratios of Leach's:Ashy storm-petrels captured at Prince Island were higher in 1976-1977 than in 1991. However, past tape-luring efforts used only Leach's Storm-petrel vocalizations (R. L. Pitman, pers. comm). Differences in tape use probably resulted in different capture rates of each species. The population at Prince Island probably has changed little since 1976-1977.

Santa Barbara Island area - In 1991, we captured 9 Leach's Storm-petrels on Santa Barbara Island and 3 on Sutil Island (Table 9, Appendix 4). None were recaptured. Small numbers also were heard on nights when no birds were captured. All but 1 bird were determined to be breeders based on incubation patch condition. On Santa Barbara Island, 3 birds had mostly white rumps (codes 2-4), 3 birds had intermediate rumps (codes 5-6), and 3 birds had mostly dark rumps (code 10). On Sutil Island, 1 bird had a mostly white rump (code 4), 1 bird had a mostly dark rump (code 9-10), and 1 bird had an all dark rump (code 11). Since both Leach's and Black storm-petrels had similar capture rates, we compared their capture rate ratios with the population estimate for Black Storm-petrels to derive population estimates for Leach's Storm-petrels at Santa Barbara and Sutil Islands. Capture rates of 0.59 and 0.71 breeders per tape-lure hour were found for Leach's and Black Storm-petrels, respectively, at Santa Barbara Island whereas rates of 0.88 and 1.78 breeders/hr were recorded, respectively, at Sutil Island. Population estimates were then derived as at Prince Island (Santa Barbara County) (Table 8).

Prior to 1991, Leach's Storm-petrels had never been positively documented in the Santa Barbara Island area. Hunt et al. (1979) captured at least one possible Leach's Storm-petrel on Santa Barbara Island in 1976-1977. One bird also was reported captured there in 1978 (Hunt et al. 1980). Leach's Storm-petrels have probably been present in small numbers for many years without detection by researchers. Like other storm-petrels, they likely nest in crevices in the mostly-inaccessible cliffs of these islands.

Other southern California colonies - We found no other new colonies in southern California in 1991. The only other location where Leach's Storm-petrels have been recorded nesting was at Castle Rock, Santa Barbara County. One bird found in a crevice and collected in 1968 was originally identified as an Ashy Storm-petrel (Crossin and Brownell 1968). However, this bird was subsequently identified as a dark-rumped Leach's Storm-petrel

(Hunt et al. 1979). To prevent disturbance to nesting Brandt's Cormorants and marine mammals, we did not survey Castle Rock for storm-petrels during the breeding season in 1991. However, based on our captures at nearby Prince Island, a small population probably still resided at Castle Rock.

Summary

The 1989-1991 estimate of 12,551 breeding birds in California was much lower than the 18,306 breeding birds listed in 1975-1980 by Sowls et al. (1980). This resulted from much lower estimates at Little River Rock and Castle Rock (Del Norte County). Although differences in census methods existed, a substantial decline has occurred at Little River Rock and probably has occurred at Castle Rock. Further research will be needed to investigate these declines. We also discovered 2 small new colonies in northern California. In southern California, we discovered one new colony and obtained the first substantial documentation (including photographs) at another colony.

We suggest that future researchers implement a system of well-marked plots at colonies in northern California which can be monitored over the long term to assess changes in burrow numbers, burrow occupancy, soil and vegetation. Such monitoring plans would be relatively easy at the Prisoner Rock and Trinidad Bay Rocks colonies where disturbance to other nesting seabirds and marine mammals would be limited. Little River Rock could also be surveyed after nesting Double-crested Cormorants have departed. Complete burrow counts also were fairly easy to conduct at these relatively small colonies. More information is required on storm-petrels at Castle Rock National Wildlife Refuge. However, potential disturbance to other nesting seabirds has made visits to this rock difficult during the breeding season. In central California, an updated population estimate is required for the Farallon Islands National Wildlife Refuge.

In addition to burrow counts, future mist netting efforts at these and other colonies could be used to monitor relative changes in population sizes and to determine survival rates if conducted over the long term (i.e. several years). Mist netting can also be valuable for determining species presence at small colonies or where storm-petrels are nesting in rock crevices or cliffs (e.g. the Channel Islands and Farallon Islands). By using such efforts at other locations in California, other small colonies would likely be discovered.

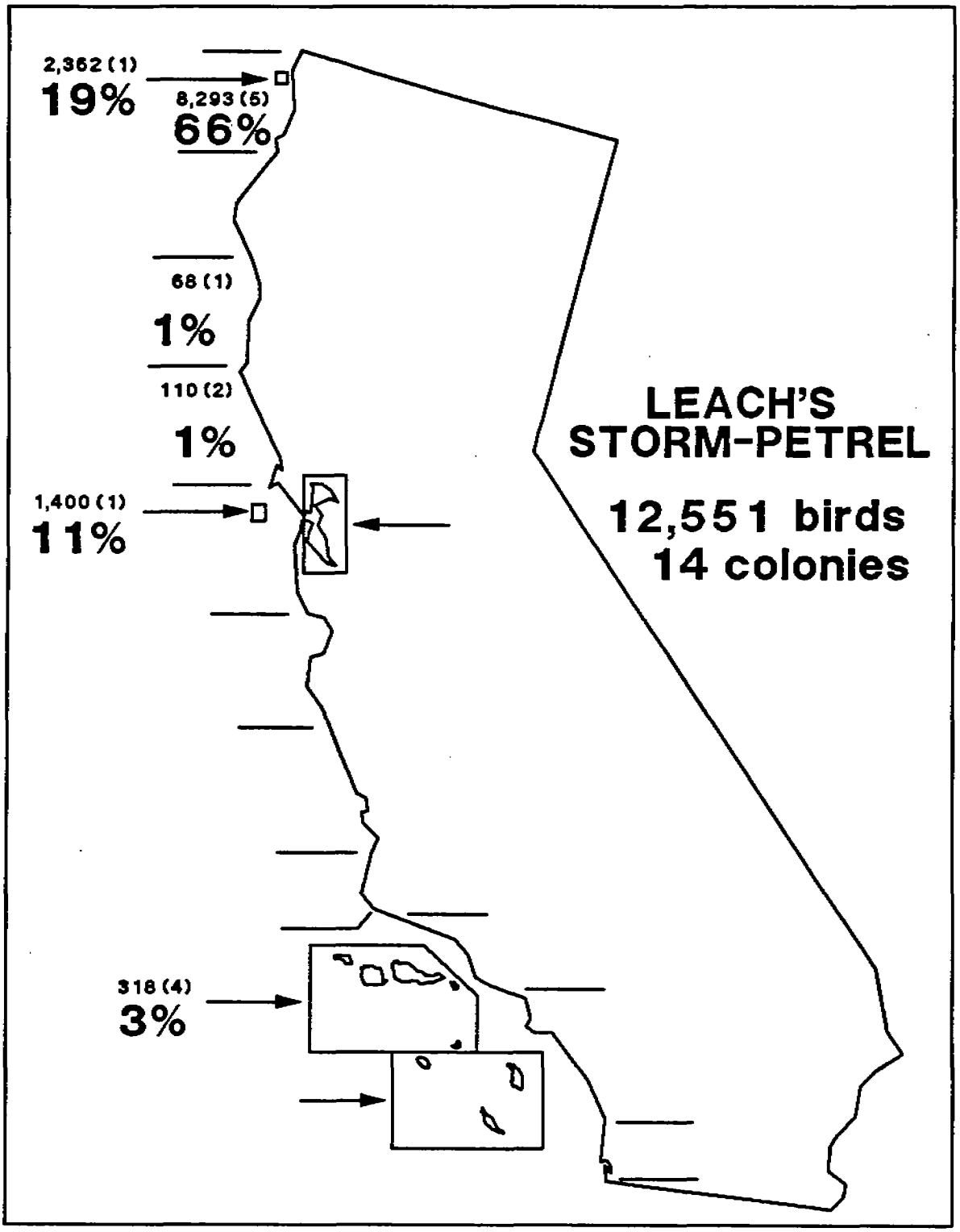


Figure 21. Percentage of state breeding population of Leach's Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 8. Numbers of breeding Leach's Storm-petrels at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1989-1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (percent) 1975-1980		1989-1991	
Northern California						
Prince Island	DN-414-03	325-003	P	(0.0)	P	(0.0)
Castle Rock	DN-414-06	325-006	[5,000]	(27.3)	2,362	(18.8)
Tolowa Rocks	DN-414-07	325-007	P	(0.0)	[P]	(0.0)
Crescent City Harbor Area ("Whaler Island")	DN-414-09	325-045	H	(0.0)	H	(0.0)
Green Rock	MU-410-09	325-019	[X]	(0.0)	[X]	(0.0)
Flatiron Rock	MU-410-13	325-023	H	(0.0)	H	(0.0)
Blank Rock	MU-410-14	325-024	H	(0.0)	H	(0.0)
Prisoner Rock	MU-410-17	325-027	160	(0.9)	106	(0.8)
Trinidad Bay Rocks	MU-410-18	325-054	1,640	(8.9)	4,178	(33.3)
Little River Rock	MU-410-19	325-035	[10,000]	(54.6)	4,009	(31.9)
Westport	ME-392-01	379-018	0	(0.0)	68	(0.5)
Fish Rocks	ME-384-10	404-003	100	(0.5)	[100]	(0.8)
Gull Rock	SO-382-13	404-035	0	(0.0)	10	(0.1)
Central California						
South Farallon Islands	SF-FAI-02	429-052	[1,400]	(7.6)	[1,400]	(11.2)
Southern California						
Castle Rock	SB-SMI-02	501-005	[X][2]	(0.0)	[X]	(0.0)
Prince Island	SB-SMI-07	501-004	6±	(<0.1)	114	(0.9)
Santa Barbara Island	SB-SBI-02	524-008	P[2]	(0.0)	167	(1.3)
Sutil Island	SB-SBI-03	524-009	0	(0.0)	37	(0.3)
Total			18,306[3]		12,551	

[1] X, present; P, probably/possibly present; H, historical nesting only; estimates in brackets are based on historical information (see text).
[2] Listed by Hunt et al. (1979, 1980) but omitted by Sowls et al. (1980).
[3] Sowls et al. (1980) reported a total of 18,304 breeding birds.

Table 9. Numbers of 4 storm-petrels and 2 alcid species captured in mist nets at 13 colonies in California, 1989-1991.

Colony Name	CA Colony Number	Spec.	Year	Month Jan	Apr	May	Jun	Jul	Aug	Sep	Oct	Total Birds	No. of[1] Birds Recapt.
Prince Island	DN-414-03	LHSP	1989	-	31	34	-	88	-	-	-	153	0
Castle Rock	DN-414-06	FTSP	1989	-	-	-	-	-	-	6	-	6	-
Prisoner Rock	MU-410-17	LHSP	1989	-	-	109	39	34	-	-	-	179	3[2]
"Button Rock"	MU-410-18	LHSP	1989	-	-	151	-	140	86	-	-	361	15[3]
Little River Rk.	MU-410-19	FTSP	1989	-	-	-	-	-	3	-	-	3	-
"	"	LHSP	1989	-	-	-	-	-	260	-	-	260	0[4]
"Van Damme Cove"	ME-390-05	ASSP	1989	-	-	-	-	-	1	-	-	1	-
Bird Rock	MA-380-04	ASSP	1989	-	-	-	-	-	48	-	-	48	12
Castle Rock	SB-SMI-02	ASSP	1991	-	-	-	-	-	-	-	1	1	-
Prince Island	SB-SMI-07	LHSP	1991	0	0	-	2	5	-	-	-	7	0
"	"	ASSP	1991	11	19	-	123	168	-	-	-	309	16
"	"	CAAU	1991	31+[5]	68	-	21	6	-	-	-	86[6]	14
Scorpion Rocks	SB-SZI-14	ASSP	1991	-	-	63	-	-	-	-	-	63	1
"	"	CAAU	1991	-	-	44	-	-	-	-	-	23	6
Willows Anch. Rks.	SB-SZI-20	ASSP	1991	-	-	51	-	-	-	-	-	51	-
Santa Barbara I.	SB-SBI-02	LHSP	1991	-	0	5	-	4	-	-	-	9	0
"	"	ASSP	1991	-	65	108	-	157	-	-	-	315	12[7]
"	"	BLSP	1991	-	0	7	-	44	-	-	-	51	1
"	"	XAMU	1991	-	41[8]	3[8]	-	0	-	-	-	43[8]	5[9]
"	"	CAAU	1991	-	13	15	-	0	-	-	-	23	6
Sutil Island	SB-SBI-03	LHSP	1991	-	1	-	0	2	-	-	-	3	0
"	"	ASSP	1991	-	18	-	29	38	-	-	-	84	0
"	"	BLSP	1991	-	0	-	13	26	-	-	-	36	3
"	"	CAAU	1991	-	8	-	1	0	-	-	-	9	0

[1] Does not include birds originally captured at another colony or birds subsequently captured at another colony.
[2] Does not include 1 bird originally captured at "Button Rock".
[3] One bird recaptured twice.
[4] Does not include one bird originally captured at Prisoner Rock.
[5] No birds banded.
[6] Only includes banded birds.
[7] Does not include 2 birds originally captured on Sutil Island.
[8] Includes birds captured on the ground by hand.
[9] Does not include 3 birds originally banded in 1976.

Table 10. Minimum numbers of small potential nest sites for storm-petrels counted at 4 colonies in California in 1989 and 1991.

Map Area[1]	Del Norte County		Santa Barbara County					
	Castle Rock		Prince Island		Castle Rock		Santa Barbara Island	
1	16	(2.3)	11	(1.1)	0	(0.0)	28	(15.9)
2	337	(49.1)	0	(0.0)	0	(0.0)	13	(7.4)
3	17	(2.5)	67	(6.9)	8	(1.8)	53	(30.1)
4	62	(9.0)	142(125)[2]	(14.7)	71	(15.6)	10	(5.7)
5	35	(5.1)	208(25)	(21.5)	30	(6.6)	3	(1.7)
6	1	(0.1)	52(52)	(5.4)	125	(27.5)	0	(0.0)
7	43	(6.3)	0	(0.0)	49	(10.8)	19	(10.8)
8	27	(3.9)	0	(0.0)	0	(0.0)	30	(17.0)
9	9	(1.3)	12	(1.2)	0	(0.0)	0	(0.0)
10	11	(1.6)	5	(0.5)	0	(0.0)	20	(11.4)
11	11	(1.6)	53(50)	(5.5)	0	(0.0)	0	(0.0)
12	86	(12.5)	335	(34.6)	0	(0.0)	-	
13	32	(4.7)	28	(2.9)	71	(15.6)	-	
14	-		54	(5.6)	101	(22.2)	-	
Total[3]	687		967(252)		455		176	

[1] See Figures 45, 48, and 50 for area locations.
[2] Numbers of sites in parentheses were estimated.
[3] Totals are minimal and exclude some nesting areas at each island (see text).

Table 11. Program CAPTURE breeding population estimates for Leach's Storm-petrels at 2 colonies in northern California in 1989.[1]

Colony Name	Model							
	M(o)	M(h)	M(b)	M(bh)	M(t)	M(th)	M(tb)	M(tbh)
Prisoner Rock	2949 ± 1644.5 (-274-6173) 0.13	320 ± 17.8 (285-356) 0.00	180 ± 8.0 (164-196) 0.41	180 ± 8.0 (164-196) 0.21	1611 ± 620.4 (395-2827) 0.36	NE - 0.56	NE - 1.00	NE - 0.36
"Button Rock"	2606 ± 611.4 (1407-3805) 0.22	665 ± 25.5 (614-715) 0.15	552 ± 72.5 (410-694) 1.00	552 ± 72.5 (409-695) 0.48	2509 ± 575.2 (1381-3637) 0.00	NE - 0.38	NE - 0.64	NE - 0.44

[1] Population estimate ± S.E., (95% confidence interval). The lower number is the score in the model selection criteria. A score of 1.00 indicates the model selected by the program (see methods). NE = no estimate (see Methods).

Table 12. Program JOLLY breeding population estimates for Leach's Storm-petrel at 2 colonies in northern California in 1989.[1]

Colony Name	Model						
	A	B			D		
	Period 2	Period 2	Period 3	Mean	Period 2	Period 3	Mean
Prisoner Rock	915 ±NE -	NE[2] - -	NE[2] - -	NE[2] - -	NE[2] - -	NE[2] - -	NE[2] - -
"Button Rock"	1404 ±1001.3 (-558-3366)	1861 ±1297.5 (-682-4404)	1457 ±830.1 (381-3739)	659 ±1407.7 (-1100-4418)	2060 ±856.4 (381-3739)	1421 ±586.2 (272-2570)	1741 ±1007.3 (-233-3715)

[1] Population estimate ± S.E., (95% confidence intervals). NE = no estimate.
[2] No estimate due to failure criteria.

ASHY STORM-PETREL

Ashy Storm-petrels breed almoet entirely in California. Only a few pairs are known to nest at Islas Los Coronados in Baja California, Mexico (Jehl and Everett 1985). They are extremely difficult to census because they nest in crevices among rockpiles, under boulders, or in steep cliffs and are only active at the colony at night. Hunt et al. (1979, 1980) estimated numbers breeding at 8 colonies in southern California plus one other possible colony. Sowls et al. (1980) estimated numbers of breeding birds at one colony in northern California and provided a historical estimate for the South Farallon Islands in central California that was surveyed only in 1971-1972 (Ainley and Lewis 1974). In 1989-1991, we focused on updating and improving population estimates at the smaller known colonies in the state, primarily by mist netting birds at night. For some colonies where insufficient survey effort was expended in 1989-1991, we reported historical estimates. At several colonies, we have provided the most standardized and well-documented population estimates available.

Northern California

"Van Damme Cove" - On the night of 5-6 August 1989 at 0033 hrs, we captured one Ashy Storm-petrel in a mist net on "Van Damme Rock" (subcolony 03 on Map 35; see Appendix 2) while broadcasting a tape of Leach's Storm-petrel vocalizations (Table 9; Appendices 2, 3). This bird had a bare, vascularized incubation patch. No other storm-petrels were seen or heard. No storm-petrel nests were found during a thorough search of the rock, although rock crevice habitat was available. If Ashy Storm-petrels did nest here, it would extend their breeding range about 85 miles north. The Van Damme Cove area was used extensively by sport divers. There was much evidence of human activity on this rock was prevalant which may prevent nesting or impact nesting birds.

Sowls et al. (1980; see 1979-1980 survey archives) camped on this rock (referring to it as "Anchor Rock") on the night of 5-6 June 1980. They mist netted from 2000-2400 hrs but no storm-petrels were detected.

Bird Rock - We captured and banded a total of 48 Ashy Storm-petrels on two nights in 1989 (Table 9, Appendix 3). Mist nets were placed in front of many large burrow/crevices in a small bank on the north side of the rock (site 1). Many birds were captured entering and departing the same large, deep crevices which may have contained several nests each. Another net was placed near the top of the rock (site 2) on 6-7 August but no activity occurred at this site (Appendix 3). We located 5 nests within the north bank and one nest in a crevice on the south side. Several other crevices were available in both areas. Population size was estimated at about 65 birds (95% confidence

interval of 47-83) with Chapman's (1951) modified Lincoln-Petersen method, using all birds captured. Since tapes did not appear to attract birds to the nets, we added about 10 birds to account for those nesting on the south side of the rock (Table 13).

Ashy Storm-petrels were first proven nesting at Bird Rock in 1972 when 2 nests were found and 20-24 breeding birds estimated (Ainley and Osborne 1972). On 1 July 1979, Sowls et al. (1980; see 1979-1980 survey archives) found one adult on an egg in a crevice in the north bank and noted petrel smell in 6 others (Table 13). Our higher estimate probably reflected increased effort rather than a population increase.

South Farallon Islands National Wildlife Refuge - The South Farallon Islands hosts the world's largest Ashy Storm-petrel colony (Sowls et al. 1980; Ainley and Boekelheide 1990; This study). We did not survey this colony in 1989 due to the large effort required to compare to or improve on previous efforts. About 4,000 breeding birds were estimated for Southeast Farallon Island subcolony only by Ainley and Lewis (1974) from an extensive mist net study conducted in 1971-1972. However, West End Island (subcolony 02 on Map 64) and the North Farallon Islands were not examined. Ainley and Boekelheide (1990) speculated that the total Farallon Islands population could be as large as 7,000 breeding birds, based on numbers observed each fall in nearby Monterey Bay. Extensive mist netting was also conducted at Southeast Farallon Island between July-September 1987 when 611 Ashy Storm-petrels were captured and banded at several sites (McChesney et al. 1992). Breeding population estimates (using 496 breeders) using program CAPTURE (Otis et al. 1978) ranged from 508 birds (model M(bh)) to 1529 birds (model M(h)). At this time, these estimates are not directly comparable to the 1971-1972 estimate. Further work conducted in 1990 (McChesney et al., unpubl. data) and 1992 (Sydeman et al., unpubl. data) will help further assess the status of this important population.

Southern California

Castle Rock - Due to potential disturbance to breeding seabirds and marine mammals, we did not land on Castle Rock during the main part of the nesting season. Since we could not assess the storm-petrel population, we reported Hunt et al. (1979, 1980) rough estimate of 200 breeding birds. However, during burrow/crevice counts on 21-22 October 1991, we found 1 nearly-fledged Ashy Storm-petrel chick and one adult was captured in a mist net at night (Table 9, Appendix 4). This bird had a refeathering incubation patch and was undergoing body, primary and rectrix molt. We counted 455 sites (mainly small crevices) on the rock (Table 10). Using a L correction factor of 75% to account for burrow occupancy, 341 breeding birds were estimated.

However, this L correction factor may be too high for crevices only.

Prince Island - In 1991, we captured and banded 309 Ashy Storm-petrels over 9 nights at 2 mist nets on the southeast side of the island (Table 9; Appendix 4; see Figure 50). Of these, 67.6% were determined to be breeders based on incubation patch condition (see Figure 12). Of 14 breeders recaptured, 2 were recaptured in the same period as the original capture. These recaptures were not included in analyses to determine breeding population size. Of the 2 nonbreeders recaptured, both were in the original capture period. The small number of captures in April were due to extremely windy conditions and did not represent the number of birds present. On both nights, birds were almost continuously circling but avoiding the net. Several nests also were located with limited effort. Five nests with eggs plus a pair with no egg were found in a narrow cave at the base of the steep northwest cliff on 8 June. Five other nest sites were located in June and July in crevices on the east and south sides.

Breeding population size was estimated using programs CAPTURE (Otis et al. 1978) and JOLLY (Pollock et al. 1990) (Tables 14, 15). Three capture periods were used for analyses: pre-egglaying (January-April), early incubation (June), and late incubation (July) for the population (Figures 12, 15). Since no single model appeared to fit the capture data appropriately (see methods), we took a mean of all model estimates (1,154 breeding birds) as the breeding population estimate. We considered this to be a standardized and repeatable approach given our inability to assess the inherent biases in each model. By adjusting the 967 small crevices counted with the rough L correction factor, we derived a second estimate of 1,451 breeding birds. As noted for Castle Rock, the L correction factor may be too high. However, this second estimate served to indicate that the capture-recapture estimate was reasonable.

Ashy Storm-petrels have been reported breeding at Prince Island by several observers, dating back at least to 1950 (reviewed in Hunt et al. 1979). Rough population estimates have ranged from 50-100 birds in 1968 (Huber 1968) to 800 birds in 1965 (Craig and Sheppard, unpubl. data in Hunt et al. 1979). Hunt et al. (1979, 1980) banded 161 birds over 12 nights in 1976-1977 and estimated 600 breeding birds. Our higher estimate probably reflected greater survey effort on this species.

Scorpion Rocks - In 1991, we banded 63 Ashy Storm-petrels (76.2% breeders) on 2 nights in May (Table 9, Appendix 4). Only one bird was recaptured on the second night. Mist nets were placed on the south edge of the largest rock (subcolony 01 on Map 190). Using Chapman's (1951) modified Lincoln-Petersen method, the breeding population was estimated to be 303 breeding birds (95 %

confidence interval, 0-627). For comparison, we estimated population size based on 51 potential small crevice sites counted on the 2 larger rocks. In addition, we included the proportion (25%) of medium (N=37) and large (N=5) crevices not considered to be used by Cassin's Auklets. By applying the rough L correction factor (75%) to 93 potential sites, we derived an estimate of 140 breeding birds. Given the small size of these rocks, we considered the lower estimate (based on crevice counts) to be most appropriate. However, if crevice use by auklets was lower than estimated, more storm-petrels may breed here.

Ashy Storm-petrels have been recorded breeding at Scorpion Rocks since 1928 (Hunt et al. 1979). Hunt et al. (1979) mist netted 9 birds on the night of 25 June 1976 and found one nest. They found 4 nests in 1977 and estimated 40 breeding birds. Our higher population estimate reflects greater mist netting effort.

Willows Anchorage Rocks - We captured and banded 51 Ashy Storm-petrels at this newly-discovered colony on 7-8 May 1991 (Table 9, Appendix 4). The mist net was placed near the top of the south rock. On a brief late night search for nests in accessible areas, adults without eggs were found occupying at least 6 crevices of various sizes. One pair occupied a crevice containing two Xantus' Murrelet eggs. During burrow/crevice counts on 23 October, 2 crevices contained downy chicks, one contained a hatched eggshell, and 10 crevices smelled of petrel. We treated all 62 sites on the south rock which did not contain evidence of alcid use as potential storm-petrel sites, and 12 sites were estimated for the very steep and inaccessible north rock. By applying the rough L correction factor, we estimated 111 breeding birds.

Santa Barbara Island Area - In 1991, we captured and banded 393 (74.5% breeders) Ashy Storm-petrels at Santa Barbara (n=315) and Sutil (n=84) islands (Table 9, Appendix 4). At least 5 birds were captured on both islands. One bird captured at Sutil Island may have been banded on Prince Island, Santa Barbara County (Appendix 4). However, it can be difficult to read the small numbers on these bands at night and, if one number was misread, this bird could have been banded on Santa Barbara Island. Of 15 breeders recaptured, one bird was recaptured in the same period as its original capture. This recapture was not used in capture-recapture analyses. Of the 11 nonbreeders recaptured, 7 were recaptured in the period of original capture, including 1 bird captured twice in the same night at different sites and 1 bird captured 3 times in the same capture period. Only 5 recaptured birds (including 3 breeders) were captured at the same site twice. No birds were captured more than once on Sutil Island. Net sites were placed at various sites on Santa Barbara Island (Figure 11). At Sutil Island, site 15 was located in the saddle at the top of the east side and site 16 was located at the base

of the cliff on the south side. We located one nest on Santa Barbara Island by tape playback on 12 April 1991. The calling bird responded to a tape broadcasting Ashy Storm-petrel vocalizations. It was located in a crevice under an overhanging boulder in the bluffs across from Shag Rock (between Arch Point and "Spire Pt.").

Breeding populations were estimated using programs CAPTURE (Otis et al. 1978) and JOLLY (Pollock et al. 1990) (Tables 14, 15). Numbers at Santa Barbara Island were estimated using the number of breeders captured there (as for other colonies). Because birds were not recaptured on Sutil Island, numbers there were estimated using breeders captured both at Sutil and Santa Barbara islands, then subtracting the number estimated for Santa Barbara Island only from the total. Since no single model appeared to fit the capture data appropriately (see methods), we took a mean of all available model estimates (874 and 1,460 breeding birds for Santa Barbara Island and Santa Barbara and Sutil islands combined. By subtraction, we estimated 586 breeding birds for Sutil Island (Table 13).

Ashy Storm-petrels were first confirmed nesting at Santa Barbara and Sutil islands in 1976-1977 by Hunt et al. (1979). In 1976, they mist netted 9 birds (2 recaptured) on 2 nights at Sutil Island and located at least 1 nest. In 1977, they banded 62 birds (9 recaptured) at Santa Barbara Island and located 1 nest. They estimated 40-50 and 300 breeding birds at Sutil Island and both islands combined , respectively (Table 13).

Our 1991 estimates were much higher than previous estimates, probably due to increased mist netting effort. We were not able to compare capture-recapture estimates to site counts since birds appear to nest primarily in inaccessible cliff habitat. Since no birds were recaptured on Sutil Island, we may have derived an inflated estimate of the population at both islands combined. Thus, less birds may nest at Sutil Island than we have surmised.

<u>Other southern California colonies</u> - We discovered two new nest sites within the Profile Point Area in 1991 (Table 13; see Appendix 2). On 6 May, 3 eggs (possibly old and abandoned) presumably of this species were found in "Cave of the Bird's Eggs" (named after Bunnell 1988; see subcolony 07 on Map 184). The eggs were found (along with several Pigeon Guillemot eggs) on the open floor of the cave. On 13 May, one bird was found incubating an egg in a crevice on a nearby unnamed rock (subcolony 01 on Map 184). Historically, Ashy Storm-petrels also nested in nearby Painted Cave as late as 1938 or 1940 (see Hunt et al. 1979). Storm-petrels there laid eggs on the exposed surface and in crevices among the cave walls (Wright and Snyder 1913). We did not find any there during an incomplete search of the cave walls near the cave entrance on 6 May.

We reported historical estimates for 4 other colonies in the Channel Islands that were not surveyed effectively in 1991. Hunt et al. (1979) mist netted 3 birds at Cuyler Harbor (at the south end of the Harris Point to Cuyler Harbor colony) on 24 June 1976. At Diablo Rocks, the larger southeast rock was searched extensively for nests on 5 May 1991. About 12 potential small crevices were counted but no evidence of petrel breeding was found. However, this survey date may have been too early to detect a small breeding population there (see Figure 15). Sppit Rock also was searched on 5 May 1991 but no sign of storm-petrels was found. Like at Diablo Rocks, storm-petrels may not have yet laid eggs by the survey date. Gull Island was not searched extensively for nests during the breeding season to prevent disturbance to nesting Brandt's Cormorants and marine mammals. One nest was discovered there in 1977 (Hunt et al. 1979).

Summary

The 1989-1991 estimate of 7,207 breeding birds was higher than the total of 5,216 breeding birds estimated in 1976-1980 (Table 13; Hunt et al. 1979, 1980; Sowls et al. 1980). Higher numbers probably resulted from increased effort towards sampling this species, particularly in Channel Islands National Park. At all locations where mist netting was conducted, as many or more birds were captured than were previously estimated breeding there. Ashy Storm-petrels exhibited an asynchronous nesting period in southern California in 1991, based on incubation patch data (Figures 12, 13 and 15). However, breeding phenology at Southeast Farallon Island and Bird Rock in central/northern California was similar but started slightly later than in Southern california (Figures 2, 3 and 10; Ainley et al. 1974; Ainley and Boekelheide 1990). Colony attendance probably occurred almost year-round, indicated by captures of birds at Prince Island in January 1991.

By tape luring, we greatly increased the number of birds captured. Whenever a tape was not in use, activity around the net decreased rapidly and very few birds were captured. Few Ashy Storm-petrels were captured when vocalizations of another species (i.e. Leach's or Black storm-petrels) were being broadcast. Our low numbers of recaptures of breeders were likely due to: 1) heterogeneity of capture probabilities; 2) behavioral responses (i.e. "trap-shy") of birds after the first capture; 3) visits by breeding adults from other colonies; and 4) some nonbreeders (which do not regularly attend colonies) may have been misclassified as breeders.

Heterogeneity of capture probabilities (i.e. each bird does not have an equal chance of being captured) was an obvious problem. Birds recaptured at Prince Island and the Santa Barbara Island area rarely were captured at the same site twice. Birds were mobile around the colony area, particularly during the

"flighting" period (prelaying and incubation periods), and were captured when attracted to broadcast vocalizations. Birds captured at different sites possibly were captured once near the nest site and once in another area of the colony. For example, at Prince Island, most recaptures were at net site 2, even though the majority of those birds were banded at net site 1 (Appendix 4). These net sites were only 50-75 meters apart. Net site 1 was located on a dirt slope some distance from most nesting areas whereas net site 2 was placed among rock outcrops where 3 nests were found. In the absence of broadcast vocalizations, most vocal activity occurred among the cliffs and rock outcrops (i.e. in nest areas). Thus, our tape luring attracted birds away from nesting areas, probably including birds from other areas of the island. On the other hand, birds nesting closer to net sites probably have higher capture probabilities than birds nesting further away. It was even more difficult to sample birds at Santa Barbara Island, where nets were placed at the tops of the high, precipitous nesting cliffs. Birds nesting in lower cliff areas or further from net sites probably would have lower capture probabilities than those nesting higher on the cliffs and closer to nets and tape-lures.

Storm-petrels appearred to exhibit a "trap-shy" behavioral response after the first capture. Stress resulting from capture and handling likely led them to avoid further capture. Behavioral response to a tape-lure may explain why recapture rates were much lower than that reported in Hunt et al. (1979) who did not use Ashy Storm-petrel tape lures (R. L. Pitman, pers. comm.). Previously-captured birds also may better avoid nets. On several nights, many more birds appeared to fly around net sites than were captured. This type of behavioral response would act to decrease the recapture rate and could have inflated population estimates.

Some storm-petrels captured in mist nets may breed at other colonies. Birds appeared to move freely between Santa Barbara and Sutil islands which might function as one loose colony. A similar situation was found with Leach's Storm-petrels in the Trinidad Bay area, Humboldt County, in 1989 (Table 9, Appendix 3). Two birds were captured at 2 different colonies there. At Prisoner Rock, more birds were captured than could be accounted for from breeding population estimates based on burrow counts. At Prince Island, Del Norte County, Leach's Storm-petrels were captured in mist nets even though they apparently did not breed there. This situation also has been found with British Storm-petrels (Hydrobates pelagicus) in the eastern North Atlantic where tens of thousands of birds have been captured at locations away from known colonies (Mainwood 1976, Fowler et al. 1982, Fowler and Okill 1988). Birds also have been recaptured at sites many kilometers from original capture locations. Most of these movements have been attributed to wandering nonbreeders, although breeders may also be involved. If Ashy Storm-petrels wandered

between colonies in the Channel Islands, the high capture rates at the relatively small Scorpion and Willows Anchorage rocks colonies could be explained. However, birds also may nest on the adjacent mainland cliffs of Santa Cruz Island which appearred to have abundant potential crevice habitat.

We may have underestimated the number of nonbreeders in our captured samples. Data on other storm-petrel species has indicated that even immature birds may develop incubation patches (Furness and Baillie 1981, Harris 1969, Scott 1970, Wilbur 1969). Up to a third of nonbreeding British Storm-petrels have been reported to undergo complete defeathering of the incubation patch (Scott 1970). If significant numbers of nonbreeding Ashy Storm-petrels develop incubation patches, capture-recapture estimates may be high.

Mist-netting conditions also affected capture probabilities (i.e. time effects). Nights with little or no moonlight had much higher bird activity than those with bright moonlight. Storm-petrels also were difficult to capture on windy nights (i.e. over about 10 knots). Birds detected and avoided mist nets billowing in the wind.

Although some of these factors may have contributed to overestimating breeding population sizes, most capture-recapture estimates for Leach's Storm-petrels at "Button Rock" (Trinidad Bay Rocks) were lower than estimates based on burrow counts. In part, this situation may reflect the small and discrete nature of burrow-nesting colonies of Leach's Storm-petrels, compared to the more spread out crevice-nesting colonies of Ashy Storm-petrels (such as found at Prince and Santa Barbara islands, Santa Barbara County). In any case, we expended minimal effort necessary to derive reasonable and repeatable estimates. Much more effort would be required to improve the reliability of estimates. Such efforts have been underway at the South Farallon Islands (McChesney et al., unpubl. data; Sydeman et al., unpubl. data). Revised estimates for this colony, the world's largest, should be available in the near future.

Although the 1989-1991 estimate was considerably higher than the past estimate, the world population of Ashy Storm-petrels was still very small. A catastrophe (e.g. a large oil spill) near a major aggregation could extirpate a large proportion of this species' population. For example, 4,000-7,000 Ashy Storm-petrels congregate each fall in Monterey Bay off central California (Ainley 1976, Roberson 1985). We recommend the instigation of a monitoring program at all medium and large colonies. Through extensive mist netting and nest searching, yearly fluctuations in breeding population size could be monitored as well as improving population estimates. Occupancy rates of nest crevices also could be determined, permitting comparisons with mist-net derived estimates. Nocturnal visitation and mist netting at other

potential nesting rocks on the California coast could turn up other small colonies. In particular, such efforts are required at West End Island (South Farallon Islands) and the North Farallon Islands, Farallon Islands National Wildlife Refuge. These islands were adjacent to the large Southeast Farallon Island colony and could contain significant numbers of breeding birds.

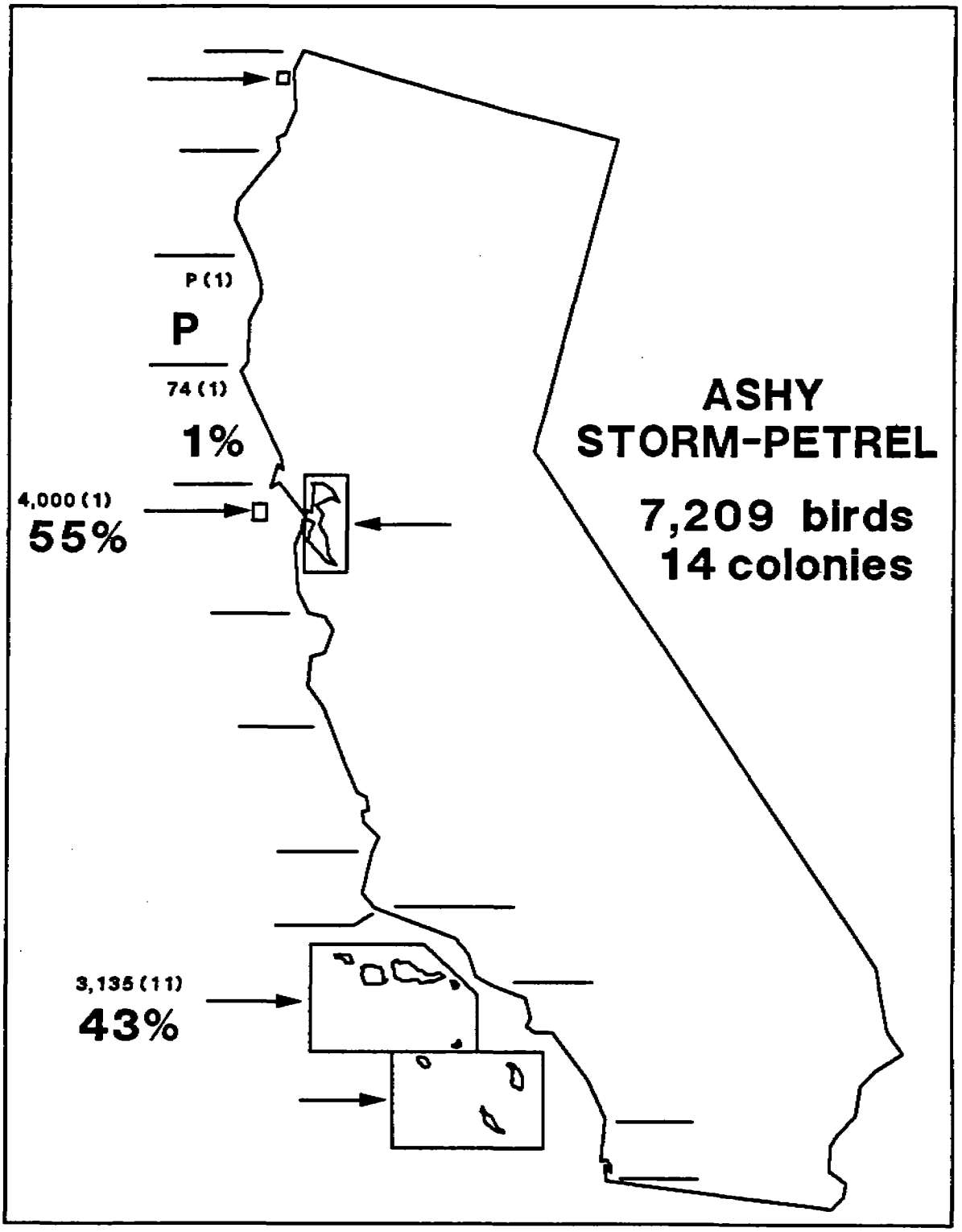


Figure 22. Percentage of state breeding population of Ashy Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 13. Numbers of breeding Ashy Storm-petrels in California in 1975-1980 (Hunt et al. 1979, 1980; Sowls et al. 1980) and in 1989-1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of breeding birds[1] (percent) 1975-1980		1989-1991	
Northern California						
Van Damme Cove	ME-390-05	379-027	0	(0.0)	X	(0.0)
Bird Rock	MA-380-04	404-010	14	(0.3)	74	(1.0)
Central California						
South Farallon Islands	SF-FAI-02	429-052	[4,000]	(76.7)	[4,000]	(55.5)
Southern California						
Castle Rock	SB-SMI-02	501-005	[200]	(3.8)	[200]	(2.8)
Harris Point to Cuyler Harbor	SB-SMI-06	501-015	[X]	(0.0)	[X]	(0.0)
Prince Island	SB-SMI-07	501-004	600	(11.5)	1,154	(16.0)
Profile Point Area	SB-SZI-03	502-017	N	(0.0)	8	(0.1)
Diablo Rocks	SB-SZI-06	502-020	20[2]	(0.4)	[20]	(0.3)
Spit Rock	SB-SZI-08	502-013	40[3]	(0.8)	[40]	(0.5)
Scorpion Rock	SB-SZI-14	502-010	40	(0.8)	140	(1.9)
Willows Anchorage Rocks	SB-SZI-20	524-019	0	(0.0)	111	(1.5)
Gull Island	SB-SZI-22	524-001	2	(<0.1)	[2]	(<0.1)
Santa Barbara Island	SB-SBI-02	524-008	250	(4.8)	874	(12.1)
Sutil Island	SB-SBI-03	524-009	50[4]	(0.9)	586	(8.1)
Total			5,216[5]		7,209	

[1] X, present; N, historical nesting only; estimates in brackets [ ] are based on previous information.
[2] Formerly included in "Kinton Point to Diablo Point" (502-014) in Sowls et al. (1980).
[3] Sowls et al. (1980) reported 16+ birds. Estimate is from Hunt et al. (1979).
[4] Estimate is from Hunt et al. (1980). Hunt et al. (1979) and Sowls et al. (1980) reported 40-50 birds.
[5] Sowls et al. (1980) reported 5,187 breeding birds.

Table 14. Program CAPTURE breeding population estimates for Ashy Storm-petrels at 3 colonies in southern California in 1991.[1]

	Model							
Colony Name	M(o)	M(h)	M(b)	M(bh)	M(t)	M(th)	M(tb)	M(tbh)
Prince Island	1330 ± 355.5 (633-2027) 0.76	404 ± 19.8 (444-551) 0.86	NE[2] - 0.05	NE[2] - 0.00	1226 ± 323.1 (592-1860) 0.01	NE - 0.27	NE - 0.39	NE - 1.00
Santa Barbara I.	1754 ± 495.1 (783-2725) 1.00	451 ± 21.0 (409-493) 0.89	NE[2] - 0.19	NE[2] - 0.51	1728 ± 482.9 (781-2675) 0.00	NE - 0.35	NE - 0.33	NE - 0.84
SBI & Sutil I.[3]	2204 ± 552.2 (1121-3287) 1.00	570 ± 23.6 (523-616) 0.94	NE[2] - 0.19	NE[2] - 0.47	2191 ± 550.0 (1112-3270) 0.00	NE - 0.36	NE - 0.37	NE - 0.92

[1] See Table 11 and methods for explanation of table presentation.
[2] No estimate due to failure criteria.
[3] SBI = Santa Barbara Island.

Table 15. Program JOLLY breeding population estimates for Ashy Storm-petrels at 3 colonies in southern California in 1991.[1]

	Model						
	A	B			D		
Colony Name	Period 2	Period 2	Period 3	Mean[2]	Period 2	Period 3	Mean[2]
Prince Island	1119 ±1038.6 (-916-3155)	1865 ±1722.6 (-1511-5242)	1519 ±881.9 (-209-3248)	1693 ±1670.9 (-1582-4968)	NE[3] - -	NE[3] - -	- - -
Santa Barbara I.	297 ±270.4 (-232-827)	411 ±378.6 (-331-1153)	109 ±203.0 (-289-507)	260 ±397.2 (-518-1038)	743 ±323.8 (108-1377)	763 ±340.8 (95-1431)	753 ±464.0 (-157-1662)
SBI & Sutil I.[4]	1013 ±790.6 (-537-2562)	1406 ±1082.9 (-716-3529)	786 ±1011.9 (-1197-2770)	1096 ±1395.4 (-1638-3831)	1651 ±858.4 (-31-3334)	1711 ±906.1 (-65-3487)	1681 ±1238.4 (-746-4108)

[1] See Table 12 and methods for explanation of table presention.
[2] Mean was used in calculation of final population estimates.
[3] No estimate due to failure criteria.
[4] SBI = Santa Barbara Island.

BLACK STORM-PETREL

Black Storm-petrels breed primarily on islands in the Gulf of California and off the west coast of Baja California, Mexico (Everett and Anderson 1991), extending north to the Channel Islands off southern California (Pitman and Speich 1976, Sowls et al. 1980). Like the Ashy Storm-petrel, Black Storm-petrels are extremely difficult to census. They nest in crevices under rocks or in steep cliffs and are only active at the colony at night. Hunt et al. (1979, 1980) discovered and provided estimates for California's 2 known colonies. In 1991, we focused on updating and improving past estimates by conducting extensive mist net surveys at known colonies.

Southern California

Santa Barbara Island area - In 1991, we captured and banded 51 (74.5% breeders) Black Storm-petrels on Santa Barbara Island and 36 (86.1% breeders) on Sutil Island (Table 9, Appendix 4). Three birds (all breeders) were recaptured on Sutil Island; the only recapture (a breeder) on Santa Barbara Island occurred in the same period as the original capture. Since birds only were captured during two capture periods (May-June and July), Chapman's (1951) modified Lincoln-Petersen method was used to estimate 74 breeding birds (95% confidence interval of 24-123) at Sutil Island. Since no birds were recaptured between the May and July capture periods at Santa Barbara Island, an estimate could not be derived for Santa Barbara Island alone. Although we did not document birds moving between Santa Barbara and Sutil Islands, data on Ashy Storm-petrels indicated that such movements probably occurred in Black Storm-petrels as well. Using Chapman's (1951) modified Lincoln-Petersen method for Santa Barbara and Sutil islands combined, we estimated 274 breeding birds (95% confidence interval, 75-473) for this complex. Subtracting 74 birds for Sutil Island, we estimated 200 breeding birds at Santa Barbara Island.

Based on incubation patch data on mist-netted birds in 1991 and known incubation and chick periods (Everett 1991), we estimated the approximate breeding phenology for Black Storm-petrels in the Channel Islands (Figure 16). Phenology appeared to be similar to birds nesting at Islas Los Coranados, Mexico, with late arrival to the colony and a synchronous nesting cycle.

Black Storm-petrels were first recorded nesting in the United States in 1976 at Sutil Island (Pitman and Speich 1976, Hunt et al. 1979). In addition, Hunt et al. (1979, 1980) banded 27 Black Storm-petrels (2 recaptures) on 18 nights from 28 May-8 July 1977. They estimated 20-30 and 150 breeding birds for Sutil Island and for the combined Santa Barbara Island area, respectively (Table 16). One nest was found at the same location on Santa Barbara Island in both 1986 and 1987 by C. A. Drost

(pers. comm.). The nest was located in a crevice in the cliffs at Arch Point.

Other southern California colonies - At Prince Island, a Black Storm-petrel was briefly caught in a mist net (site no. 1) on the night of 8-9 July 1991. The bird gave a characteristic flight call before escaping. A Black Storm-petrel again was heard at Prince Island on the night of 10-11 July 1991. This bird called twice near the mist net (site no. 1) in response to broadcasted Black Storm-petrel vocalizations. Although these birds may have been wandering nonbreeders, a few pairs of Black Storm-petrels may breed at Prince Island.

On 29 May 1991, a freshly-dead Black Storm-petrel was found near the entrance to a rock crevice on a rock at the south end of Seal Cove (subcolony 02 on Map 218), San Clemente Island. The bird did not have an incubation patch and did not show signs of injury. At this early date, this bird could have been either a wandering nonbreeder or a breeder which had not yet defeathered its incubation patch. Since a few crevices were available on this rock, a few Black Storm-petrels may nest there.

Holder (1910) reported finding a "young Black Petrel" crawling outside his tent at Mosquito Bay, San Clemente Island. This bird may have originated from a local colony. Wright and Snyder (1913) reported finding a freshly-dead Black or dark-rumped Leach's (Socorro) Storm-petrel at East Anacapa Island on 5 July 1912. This bird apparently had been killed by a predator. Since they commonly occur in the nearby waters during summer, this bird was probably a Black Storm-petrel. Thus, it was possible that these birds have bred at Anacapa Island.

Summary

Our total of 274 breeding birds in California was somewhat higher than the past estimate of 150 breeding birds in 1975-1977 (Hunt et al. 1979, 1980; Sowls et al. 1980), reflecting our increased mist netting efforts at Santa Barbara and Sutil Islands. We also identified two other possible breeding locations in the Channel Islands.

Although using mist-net captures to estimate storm-petrel population size has many difficulties (see Ashy Storm-petrel account), 1991 estimates seemed to reasonably reflect the approximate population sizes in the Santa Barbara Island area. Much greater effort focused solely on censusing this species could provide more reliable results. A monitoring program should be instigated in the Santa Barbara Island area that would examine fluctuations and help provide accurate estimates of the population size over time. By conducting further mist-net studies and locating nest sites, yearly fluctuations could be monitored and more accurate population estimates determined.

Other potential colonies, such as Prince Island, the (West, Middle and East) Anacapa Islands and Seal Cove Area should be investigated further for the existence of very small populations.

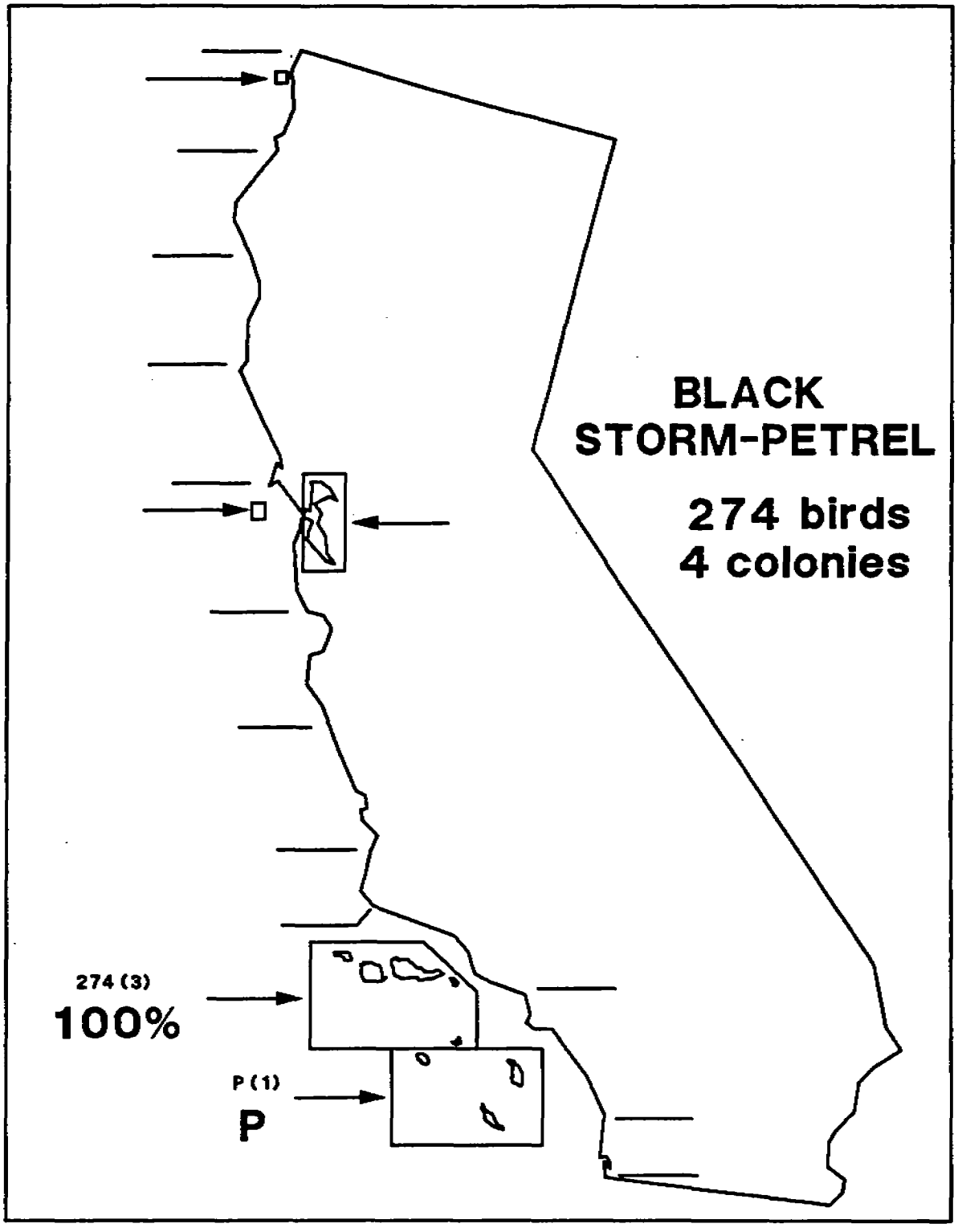


Figure 23. Percentage of state breeding population of Black Storm-petrel in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 16. Numbers of breeding Black Storm-petrels at each colony in California in 1975-1977 (Hunt et al. 1979, 1980; Sowls et al. 1980) and 1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of breeding birds[1] (percent) 1975-1977		Number of breeding birds[1] (percent) 1991	
Southern California						
Prince Island	SB-SMI-07	501-004	0	(0.0)	P	(0.0)
Santa Barbara Island	SB-SBI-02	524-008	120[2]	(80.0)	200	(73.0)
Sutil Island	SB-SBI-03	524-009	30[3]	(20.0)	74	(27.0)
Seal Cove Area	LA-CLI-08	524-036	0	(0.0)	P	(0.0)
Total			150		274	

[1] P, probably/possibly present.
[2] Estimate from Hunt et al. (1980). Hunt et al. (1979) reported 150 pairs (300 birds) total for Santa Barbara and Sutil Islands. Sowls et al. (1980) reported 120-130 birds for Santa Barbara Island.
[3] Estimate from Hunt et al. (1980). Hunt et al. (1979) and Sowls et al. (1980) reported 10-15 pairs (20-30 birds).

AMERICAN WHITE PELICAN

The American White Pelican breeds on islands in lakes in the interior of western North America from central Canada, south to Colorado and Utah, and west to Oregon and northeastern California (Sidle 1985). One outlying colony has been reported in southern Texas. California colonies were not surveyed by USFWS in 1989-1991.

Interior California

White Pelicans nested historically at several locations in California, including: Tule, Clear and Goose lakes, Modoc County; Eagle Lake, Lassen County; lower Sacramento Valley; Tulare Lake, Kings County; Buena Vista Lake, Kern County; and the Salton Sea, Imperial County (see summary in Grinnell and Miller 1944). White Pelicans also may have nested at Honey Lake, Lassen County, in the 1950's (Tait et al. 1978). Most colonies disappeared in the early to mid 1900's (Grinnell and Miller 1944).

Colonies have been monitored recently by U. S. Fish and Wildlife Service refuge staff and researchers from the University of California Davis at Clear Lake Reservoir, Clear Lake National Wildlife Refuge (Modoc County) and at Sheepy Lake, Lower Klamath National Wildlife Refuge (Siskiyou County) (Sidle et al. 1985; P. Moreno, pers. comm.). A colony of about 1,400 breeding birds was discovered at Hartson Reservoir (near Honey Lake), Lassen County, in 1976 (Tait et al. 1978). This reservoir was dry in 1977 and nesting has not been reported since. Numbers of breeding birds at Clear Lake Reservoir have fluctuated since 1986, with a general downward trend in 1990 and 1991 when about 1,800 and 1,310-1,350 birds, respectively, attempted to nest (P. Moreno, unpubl. data). Extremely poor breeding success in those years resulted from declining water levels and reduced prey resources related to drought since 1986 in concert with water diversions. In addition, heavy predation resulted when a land bridge connected the nesting island (Bird Island) with the mainland. In 1991, pelicans began nesting on a rocky island uncovered by the receding lake levels. At the Sheepy Lake colony, birds nested on top of tule reeds and breeding success has been less variable. About 400 and 520 birds bred there in 1990 and 1991, respectively (P. Moreno, unpubl. data).

Coastal observations

In the non-breeding season, White Pelicans occur in both freshwater and estuarine habitats. On the coast of California, birds have wintered regularly in: Tomales Bay; San Francisco, San Pablo and Suisun bays and their associated salt ponds; and Morro Bay. Non-breeding or failed breeding birds have occurred occasionally at these locations during the breeding season. On 13 June, we observed 27 birds in Morro Bay, including a feeding

flock of 13 birds. On 7 August 1989, 38 birds were counted near the mouth of Tomales Bay. We were quite surprised to find a large mostly-intact but broken egg on a rock at Westport, Mendocino County, on 31 August 1989. D. W. Anderson (pers. comm.) late identified it as a White Pelican egg. It probably was dumped either during migration or by a bird that could not find a nesting site. In 1990, large numbers were observed in the San Francisco Bay area: 24 birds flew south past the east side of Angel Island on 12 June; 4 birds were observed on the water in Carquinez Strait on 16 June; 244+ birds were feeding, roosting and flying in Suisun Bay on 16-17 June; 11 birds were observed on the water and flying in the lower Napa River on 19 June; and 7 birds were observed on the water and roosting on dikes at the Knight Island salt ponds on 20 June (see Harvey et al. 1992). Limited data has indicated that California breeders can winter in Mexico although they may also winter on the California coast (P. Moreno, unpubl. data).

Summary

The range and numbers of nesting White Pelicans in California have been reduced drastically during this century. This species has been listed as a species of special concern by the California Department of Fish and Game (Remsen 1978, Steinhart 1990) although this designation does not provide any direct protection. Human alteration of nesting habitat (i.e. agricultural and water development) has continued to be the major reason for decline and has prevented the reoccupation of former nesting sites. For example, the nesting island at Eagle Lake was abandoned in the late 1960's but has been more recently connected to the mainland by low lake levels caused by water diversions. In addition, a recreational vehicle park was located adjacent to the former nesting island (P. Moreno, pers. comm.). White Pelicans will probably continue to decline and possible become extinct in the state if measures are not taken to preserve and/or restore nesting habitat. Annual monitoring of breeding population size and breeding success at all colonies must be continued. Further information is also needed on White Pelican movements and habitat requirements outside the breeding season.

BROWN PELICAN

The Brown Pelican nests along the coasts of southern North America and northern South America. The subspecies P. o. californicus breeds from California to the Pacific coast of southern Mexico, including the Gulf of California. Pelicans build large stick nests on offshore islands. Nests can be difficult to count when located at the tops of high bluffs, on steep slopes in ravines and on high cliffs. Numbers of breeding birds vary substantially between years. Breeding phenology also is variable and nesting is protracted, often occurring over a 6-9 month period. In recent years in southern California, variability in nesting effort has been related to availability of Northern Anchovy (Engraulis mordax), their major food source there (Anderson et al. 1980, 1982; Anderson and Gress 1983). Pelicans forage in inshore waters near their colonies and along the mainland coast.

Based on periodic observations through the early 1900's, Brown Pelicans had been recorded nesting at 6-8 colonies between Bird Island, Monterey County, and Islas Los Coronados, Baja California, Mexico. Numbers of pelicans were thought to have declined substantially during the first complete survey of colonies in 1967-1968 when they were found nesting at only 2 colonies: West Anacapa Island in the Channel Islands and Islas Los Coronados (Schreiber and Delong 1969). Marine pollutants (principally DDE) were later found to have caused a gradual decline in pelicans from the mid 1950's to the mid 1970's, through poor breeding success due to thin-shelled eggs (Keith et al. 1971, Risebrough 1972, Jehl 1973, Anderson et al. 1975, Anderson and Gress 1983, Gress and Anderson 1983). A similar decline and thin-shelled eggs occurred at the same time in Double-crested Cormorants at West Anacapa Island (Gress et al. 1973, Anderson and Gress 1983) and thin-shelled eggs were also reported in Brandt's Cormorants at San Nicolas Island (Hunt et al. 1979). This problem resulted in a massive research effort to study Brown Pelicans, including a standardized annual monitoring of population size and breeding success at all colonies since 1969 (see summaries in Anderson and Gress 1983, Gress and Anderson 1983, Lewis and Gress 1988, Ingram 1992). This subspecies was classified as endangered under federal law in 1970 and under state law in 1971. Since 1985, the monitoring of pelican populations in the Channel Islands has become part of the Seabird Monitoring Program of Channel Islands National Park (Ingram et al. 1983, Lewis and Gress 1988, Lewis et al. 1988, Ingram 1992). However, monitoring at West Anacapa Island has been continued by earlier researchers, especially F. Gress. This highly-focused monitoring program plus associated studies have provided the best current understanding of normal fluctuations in population size, in addition to population responses to perturbations, for any seabird in California.

In 1991, F. Gress (University of California Davis) conducted detailed monitoring of population size on West Anacapa Island, using standard techniques (Gress 1992). T. Ingram (unpubl. data) of Channel Islands National Park monitored the colony at Santa Barbara Island, using similar techniques.

Southern California

Anacapa Island West (Channel Islands National Park) - This colony always has hosted the majority of breeding birds in California. Pelicans originally nested at both West and East Anacapa islands from 1884-1930 (Hunt et al. 1979, Gress and Anderson 1983). By 1935, the entire colony existed only on West Anacapa Island, probably due to disturbance from lighthouse construction and continuous human occupation of East Anacapa Island since then.

A total of 10,680 breeding birds were estimated in 1991 (Figure 24, Table 17), based on counts of 5,340 nests over the breeding season from vantage points on West Anacapa Island, boat counts and post-season searches of nesting areas (Gress 1992). Ground counts were conducted between 0900-1600 hours (PDT) using a 22X telescope from 10 standardized observation points located above nests and allowing complete views of most subcolonies. In some areas, dense vegetation and topographic features obscured some nests that were added after inspection of these areas during post-season searches. A few small nesting areas were visible only from an inflatable Avon boat. Nests were counted while anchored or drifting just offshore from the island under good weather conditions (usually early in the morning).

Five complete surveys were conducted monthly from late March to August 1991 plus a post-season nest search on 25 September 1991. Fifteen subcolonies were located between 100-600 feet (30-183 m) elevation over a 2-km stretch of the north side of the island (Figure 25), including a large, steep-sloped bowl ("The Amphitheater") and several high slopes, bluff tops, ravines and cliffs. The location of subcolonies were known from previous years and were broken down into about 150 smaller units for accurate counting of nests. On each survey, 3 types of data were collected for each count unit: 1) numbers and stages of all active nests (i.e. with incubating or brooding adults or chicks at various stages of development); 2) numbers of adults and subadults (separable by plumage) in nesting areas and roosting outside of nesting areas; and 3) numbers of abandoned nests. When a nest was abandoned during nest building or in early incubation, it was not covered in guano and grasses used to line the nest appeared golden. Nests abandoned later in the season were more difficult to separate from persistent nests from previous years and often required inspection during post-season searches. At least 2 counts were conducted at each count unit and the results were averaged. Data for each count unit from each survey were compared with preceding and succeeding surveys

to determine numbers of fledged nests, still-active nests, newly-built nests and abandoned nests (see examples of data handling in Gress 1992). Boat counts gathered the same data but were less accurate because of counting with binoculars from a less stable platform, longer observation distances, examining nests located in ravines and other difficult to observe habitats and poorer observing conditions than on shore (i.e. shadows, glare, wind).

Pelicans began egglaying in the Amphitheater and at Interior Bluffs in mid February (see Figure 18), followed by nesting at all bluffs east of Oak Canyon by early March. From late February through March, a series of tropical rainstorms passed through southern California. Prolonged storm conditions apparently prevented pelicans from finding sufficient food. By late March, 2000 (56%) of 3,600 nests were abandoned. During April, a second nesting effort occurred in both already-used locations and new subcolonies at North Bluff and Three Sisters Bluff. New nests continued to be built until late May. Thus, the 1991 season eventually consisted of two pulses of nesting effort. After March, about 1,015 (75%) nests were abandoned through May. By the end of the breeding season (which spanned 9 months), overall abandonment was 78% (4,170 of 5,340 nests).

The total of 5,340 nests in 1991 was the third largest nesting effort by pelicans at West Anacapa Island since 1969, surpassed only by numbers in 1986 (N=5,958 nests) and 1987 (N=6,326 nests)(see most recent summary in Ingram 1992). Unlike other years of high nesting effort, low breeding success occurred in 1991 (0.28 chicks/nest versus 0.58-1.24 in 1985-1987 and 1989). Low breeding success has occurred for the last 3 years due to chronic low food availability in the early part of the breeding season.

Given the prolonged, asynchronous breeding season, it was clear that 1-2 surveys would not be sufficient to determine population size in this species. Also, the colony covered a large area and many nests were difficult to observe unless traditional areas were specifically examined and checked after the breeding season. Further, the high rate of nest abandonment necessitated several surveys and very standardized treatment of abandoned nests. Detailed and standardized monitoring methods have been required to obtain accurate estimates of the numbers of pelicans breeding and to measure breeding success in a comparable fashion each year.

Santa Barbara Island (Channel Islands National Park) - In 1991, 1,236 breeding birds were estimated (T. Ingram, unpubl. data), based on 618 nests counted using a method similar to West Anacapa Island (see Ingram et al. 1983, Lewis et al. 1988, Ingram 1992). Nests were counted mainly from intensive ground counts from island vantage points; 3 nests were discovered in a new nesting area (not visible from island vantage points or boats) at the

"West Cliffs" area (subcolonies 18 and 19 on Map 200) from aerial photographs. Ground counts were easier to conduct at this colony because pelicans nested mainly on the sides and bases of low slopes along the southeast coast and on the north slope of Signal Peak (subcolonies 13-16 and 28 on Map 200, respectively). These colonies were closer to observation points and views were not obscured by vegetation or topography. Surveys were conducted at 2-4 week intervals from late February to August 1991. Breeding phenology, a high abandonment rate and low breeding success indicated that conditions were similar to West Anacapa Island in 1991 (T. Ingram, pers. comm.).

The total of 618 nests in 1991 was the fifth largest nesting effort since 1980 (Ingram 1992). Pelicans recolonized Santa Barbara Island after a 16-66 year absence in 1980 when 194 breeding birds were reported (Anderson and Gress 1983; not 174 breeding birds reported in Sowls et al. 1980). Pelicans may have bred there as recently as 1964 but the last definite nesting was reported in 1914 (Hunt et al. 1979). Schreiber and Delong (1969) reported nesting at Sutil Island in 1967 but this was an error (see Gress and Anderson 1983). From 1985-1991, nesting has occurred every year. Highest numbers (1,046-1,441 nests) were found in 1985-1986 which also were the two years of highest nesting effort on West Anacapa Island (Lewis and Gress 1988, Ingram 1992).

Scorpion Rocks - Sporadic breeding has been reported on this rock since 1909 (Willett 1912). In recent years, nesting occurred in 1972, 1974 and 1975 (160-210 breeding birds) but nesting has not been recorded since (Hunt et al. 1979, Anderson and Gress 1983). This rock may be used for nesting only when food is abundant and available in this area early in the breeding season (Anderson et al. 1982). However, this rock also was located in the middle of an anchorage and probably has been disturbed frequently by recreational boaters.

Other colonies - Pelicans bred regularly at Prince Island (San Miguel Island) from 1886-1939 (Hunt et al. 1979). None have been reported nesting there since 1939. Pelicans may have nested at San Nicolas Island in 1945 (Rett 1945) and possible old nests were reported in 1968 (Hunt et al. 1979). Human disturbance may have contributed to the loss of a colony on San Nicolas Island, if one ever occurred there (see Hunt et al. 1979). However, pollutants and/or the loss of prey resources (e.g. Pacific Sardine *Sardinops caerula* or Pacific Mackerel *Scomber japonicus*) may also have been involved in the loss of colonies at both Prince Island and San Nicolas Island. These colonies occurred within marine waters influenced by coastal upwelling where Northern Anchovy were less abundant and other fish (currently rockfish *Sebastes* sp.) predominated in other breeding seabird diets (Hunt et al. 1979; see Ainley and Boekelheide 1990).

Central California

Williams (1931) and Baldridge (1973) provided a detailed summary of pelicans nesting at Bird Island, Monterey County, from 1927-1966. This was the most northerly location where this subspecies has ever nested. Peak numbers of 55, 52 and 44 nests were reported in 1929, 1958 and 1933. Reported numbers were low because nests were obscured by large numbers of roosting pelicans and only single counts were made. This colony may have become established during an extended period of warm waters. However, a lack of breeding success since 1949 coincided with the occurrence of pollutants and the loss of the Pacific Sardine which probably was an important food resource (Baldridge 1973, Gress and Anderson 1983; see Ainley and Lewis 1974). No nesting birds were found here in 1989.

Summary

In 1991, 11,916 breeding birds were reported at 2 active colonies at West Anacapa Island and Santa Barbara Island (Figure 24, Table 17). No nesting birds were found at 3-4 other historical sites in southern California. No pelicans nested at Bird Island, Monterey County, in 1989. The 1991 total corresponded to 343% higher numbers than in 1979-1980 (N=2,690 breeding birds as listed by Sowls et al. 1980). Numbers of breeding pelicans have increased substantially since the population reached a low of 76 nests in 1977. Recovery from decline occurred due to reduced pollutants in the environment, recruitment from Mexican colonies in the Gulf of California, and increased breeding success at local colonies (Anderson and Gress 1983). Pelicans have now reached the highest historical population levels reported in the literature (about 10,000 breeding birds; Hunt et al. 1979, Gress and Anderson 1983). However, this historical level probably was underestimated to a large extent. The figure of 10,000 breeding birds was taken from an estimate of 5,000 pairs at East Anacapa island only in 1920. There was insufficient documentation to determine if this total was derived from a rough count on a single day and whether all nesting areas were viewed (see Gress and Anderson 1983). The continued recovery of the pelican population will depend on the achievement of reasonable breeding success over the long term. This goal has been threatened by food shortages that may result from long-term changes in prey resources (especially Northern Anchovy) due to over exploitation by fisheries (Anderson et al. 1980, Anderson and Gress 1984) and/or persistent ENSO conditions (Gress 1992). Low levels of pollutants also have persisted in the marine environment and still may influence breeding success. Human disturbance of colonies must also be prevented. Colonies at West Anacapa and Santa Barbara islands in Channel Islands National Park have been further protected with a buffer zone in surrounding waters enacted by the California Department of Fish and Game. This buffer zone prevents disturbance to nesting birds

from commercial and recreational boats. In addition, historical colony sites must be protected if they are to be recolonized. Most of these colonies are still disturbed by humans. Recolonization would be unlikely at East Anacapa Island and San Nicolas Island where human occupation has continued, unless large areas of suitable nesting habitat were to be set off limits. Other human and military activities also probably disturb roosting birds at San Nicolas Island. Scorpion Rocks and Prince Island are protected within Channel Islands National Park and low overflights are prohibited (as at West Anacapa and Santa Barbara islands) by the Channel Islands National Marine Sanctuary. Bird Island, Monterey County, is protected within the Point Lobos State Reserve where human activity and low overflights are prohibited.

The pelican monitoring program has demonstrated the great value of accurate and standardized annual population estimates for examining and interpreting short-term and long-term population changes. Annual monitoring was critical to studies aimed at understanding the decline caused by pollutants and the associated recovery process, given a background of variable breeding effort under natural conditions. Although these studies have continued, the large numbers of nesting pelicans has made annual monitoring an increasingly difficult and time consuming task. The labor intensive approach was designed when there were less than 800 nests from 1969-1978 at West Anacapa Island only. In 1991, we worked with Channel Islands National Park to experiment with aerial photographs (using low level photographs as taken at other seabird colonies in 1989-1991 as well as high resolution photographs) as an alternate method of determining breeding population size and possible breeding success. If several aerial surveys were flown per year and reasonable correction factors can be determined, this method may provide for better counts in many areas, more standardized estimates may be obtained between observers and biologists may require less expertise to derive estimates. However, comparisons between ground and aerial counts must be conducted over several years to ensure that new methodology can replace the standard method that has been used successfully since 1969. Even if it can, the original method also should be conducted periodically to maintain a record for examining long-term trends.

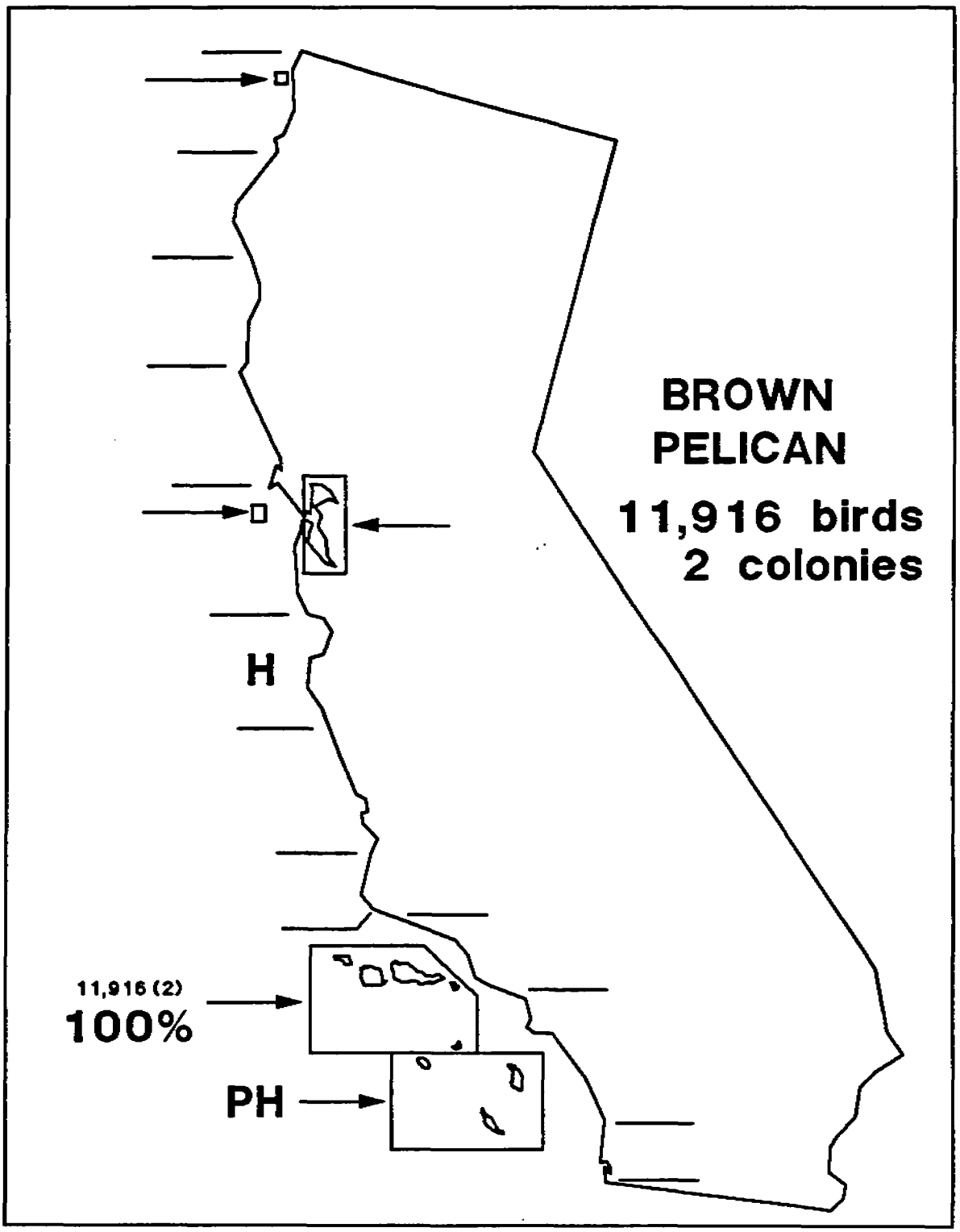


Figure 24. Percentage of state breeding population of Brown Pelican in coastal regions of California, 1989-1991. Symbols as in Figure 19.

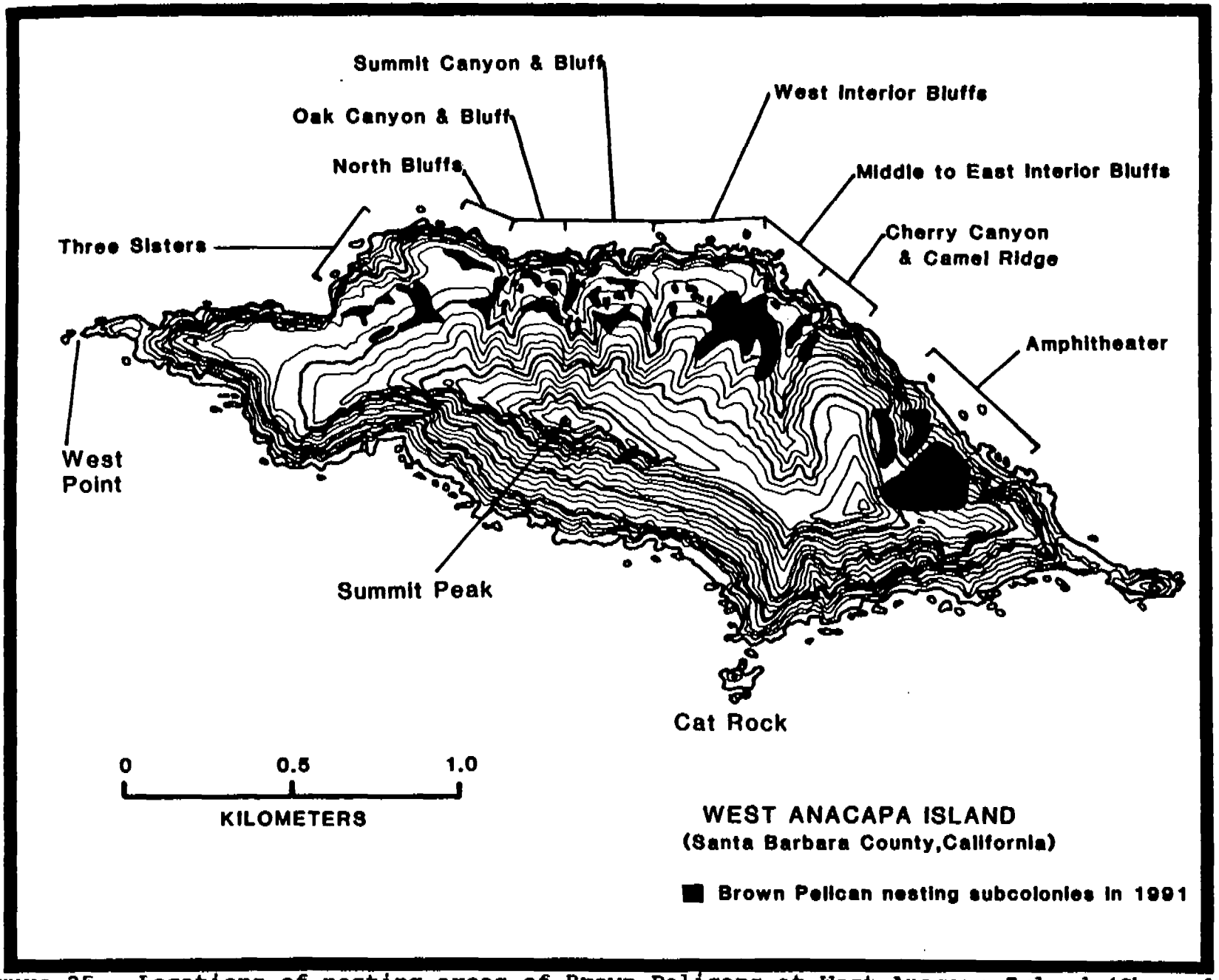


Figure 25. Locations of nesting areas of Brown Pelicans at West Anacapa Island (Channel Islands National Park), Ventura County (see Gress 1992). Darkened inland slopes show nesting areas used in 1991 (see Table 18).

Table 17. Numbers of breeding Brown Pelicans at each colony in California in 1975-1980 (Sowls et al. 1980) and in 1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		1989-1991	
Central California						
Bird Island	MO-362-09	454-009	H	(0.0)	H	(0.0)
Southern California						
Prince Island	SB-SMI-07	501-004	H	(0.0)	H	(0.0)
Scorpion Rocks	SB-SZI-14	502-010	160[2]	(0.0)	H	(0.0)
Anacapa Island-West	VE-AMI-01	502-007	2,516	(93.5)	10,680	(89.6)
Anacapa Island-East	VE-AMI-03	502-009	H	(0.0)	H	(0.0)
Santa Barbara Island	SB-SBI-02	524-008	174	(6.5)	1,236	(10.4)
Cormorant Rock Area	VE-SMI-07	524-028	PH[3]	(0.0)	PH	(0.0)
Total			2,690		11,916	

[1] H, historical nesting only; PH, possibly historical nesting only.
[2] Recorded during the study period but not included in total.
[3] Not included in Sowls et al. (1980).

Table 18. Numbers of Brown Pelican nests in different subareas of West Anacapa Island (Channel Islands National Park), Ventura County, in 1991 (from Gress 1992).

Subarea Name[1]	No. of Nesting Attempts	No. of Abandoned Nests
Three Sisters Bluff	1,010	864
Nrth Bluff	219	163
Oak Canyon	475	354
Oak Canyon Bluff	116	63
Summit Canyon	143	107
Summit Canyon Bluff	419	344
Box Canyon	135	91
West Interior Bluff	403	347
Willow Canyon	97	52
Middle Interior Bluff	370	291
Canyon Por Nada	163	125
East Interior Bluff	241	182
Cherry Canyon	180	142
Camel Ridge Bluff	32	20
Amphitheater	1,337	1,027
Total	5,340	4,170

[1] See Figure 25 for locations of subcolonies.

DOUBLE-CRESTED CORMORANT

The Double-crested Cormorant breeds in marine, estuarine and freshwater habitats over most of North America. From southern British Columbia to the Gulf of California, the subspecies P. a. albociliatus breeds mainly in marine and estuarine habitats although some nesting occurs up to a few hundred miles inland at freshwater and saltwater lakes (Harrison 1983). In California, birds use diverse habitats for nesting including: flat tops, slopes and cliffs on offshore islands and coastal rocks; mainland cliffs; artifical habitats, especially in estuaries (i.e. wharfs, bridges, towers, dikes, Eucalyptus trees, etc.); and islands in lakes or trees around lake margins. In coastal California, birds feed mainly on fish in estuaries (Ainley et al. 1981, Ainley and Boekelheide 1990). Thus, colonies tend to be located near foraging areas in river mouths, bays and lagoons. However, at a few colonies far from such foraging habitats, they feed on marine fish (Hunt et al. 1979). Numbers of breeding birds vary less between years than in Brandt's and Pelagic cormorants, presumably because their estuarine prey resources are more stable and colony shifting within and between years is not known to occur in this species.

Double-crested Cormorant nests can be difficult to count accurately where they nest on the flat tops of offshore islands, high on island or mainland cliffs or in association with Brandt's Cormorants. If viewed well, they can be distinquished fairly easily from Brandt's Cormorants by plumage differences. However, when observed from long distances, these species are difficult to separate. Due to nesting asynchrony within and between subcolonies, it can be difficult to obtain a peak count of nests on a single survey.

In 1989-1991 surveys, we focused on improving the accuracy of nest counts using aerial photographs at several of the larger known colonies (Prince Island [Del Norte County], Sea Gull Rock, Little River Rock, Old Arcata Wharf, Sugarloaf Island, Russian River Rocks, South Farallon Islands, Prince Island [Santa Barbara County], Santa Barbara Island and Sutil Island). All previous estimates of numbers of breeding birds at colonies were derived from nest and/or bird counts from boats and/or ground vantage points (Hunt et al. 1979, Sowls et al. 1980, Ainley and Boekelheide 1990). Briggs et al. (1983) took aerial photographs at 4 colonies in northern and central California in 1980-1982 but did not separate Double-crested from Brandt's cormorants. We also could not identify species in most aerial photographs. We confirmed species identification at different subcolonies with boat and ground observations. In addition, we separated some subcolonies based on nest type and dispersion. Double-crested Cormorants have larger, stick nests while Brandt's Cormorants have smaller, seaweed nests. Also, Double-crested Cormorant nests were more widely-spaced with less guano buildup than

Brandt's Cormorant nests at many colonies. We also searched all possible coastlines (using boat and ground surveys) to detect all small or large colonies that were present. In particular, we surveyed the coastlines of San Franciso, San Pablo and Suisun bays in 1990 which had not been surveyed earlier by Sowls et al. (1980). However, we did not survey all possible nesting habitats for this species since they can nest some distance inland or in saltponds, areas that were not completely surveyed. In 1989-1991, all nest counts were corrected with a J correction factor when necessary to account for nest failures and nesting asynchrony (see methods).

Northern California

In 1989, 3,252 breeding birds were estimated at 16 active colonies (including 245 breeding birds at 6 newly-discovered colonies)(Figure 26, Table 19). This total corresponded to 154% higher numbers than in 1979-1980 (N=1,280 breeding birds) and 135% higher numbers at 11 colonies known previously. Many colonies occurred in close proximity to the mouths of the Smith, Klamath, Mad, Eel and Russian rivers as well as near or in Arcata, Humboldt and Bodega bays. Double-crested Cormorants fed extensively in these estuaries. At Lake Earl (Del Norte County), 84 birds were observed in a feeding flock on 19 May 1989. Smaller numbers also were seen at adjacent Lake Talawa. Birds were observed flying north from these lakes towards the Prince Island colony. These lakes have an estuarine or lagoon nature because they become connected to the ocean at times.

At the 4 largest colonies (100-450 breeding birds) in 1979-1980, 2 colonies had much higher numbers (Prince Island and Little River Rock) and 2 colonies had slightly lower numbers (Sea Gull Rock and Old Arcata Wharf)(Table 19). There was substantial space for increased numbers of nests at the former two colonies. Nesting areas were viewed much better from aerial photographs than from boats or mainland vantage points, probably contributing to higher numbers at most colonies. At Little River Rock, nesting birds have denuded the west peak of soil and vegetation, removing a significant portion of an active colony of Leach's Storm-petrels and their burrowing habitat. Such habitats were found infrequently on offshore rocks and this loss of habitat has had a significant impact on the Leach's Storm-petrel population in northern California (Sowls et al. 1980; see species account). In 1989, cormorants had begun to nest on the east peak and will undoubtedly denude that peak over the next decade. At Sea Gull Rock and Old Arcata Wharf, limited nesting space was available. Lower numbers at Old Arcata Wharf (Arcata Bay) may be related to loss of nesting habitat due to deterioration of this long abandoned and delapitated structure. However, we counted 119 nests from aerial photographs taken on 30 May 1989 whereas counts of nests and/or birds in previous years were conducted from boats. Aerial photographs provided much better viewing

conditions for counting nests on this flat, elevated structure, without causing disturbance to nesting birds which occurs when visiting this colony by boat. This colony probably was not disturbed frequently by boats in Arcata Bay because it is protected by expansive mud flats. A new colony formed on artifical habitat (i.e. duck blinds) at the nearby Humboldt Bay Platforms which may have been colonized by nesting birds that left the Old Arcata Wharf colony.

Very large increases (Range=620-1219%) were found at 3 small colonies (ranging from 20-32 breeding birds in 1979-1980) located near river mouths (Radar Station Rocks, Sugarloaf Island and Russian River Rocks)(Table 19). Lower numbers at Unnamed Rocks and False Klamath Rock as well as the loss of the small colony at Last Chance Rock may reflect movement of nesting birds to the Radar Station Rocks and White Rock colonies, nearer to the mouth of the Klamath River. Large numbers of birds were observed foraging in the river in 1989. Sugarloaf Island and Russian River Rocks were viewed much better in aerial photographs which probably contributed to higher numbers. At 4 new colony sites (Tolowa Rocks, Flint Rock Head, Sea Lion Rock and Dillon Beach Rocks), limited nesting space permitted only small numbers of nests although these sites were not yet saturated.

Central California

South Farallon Islands (National Wildlife Refuge) - In 1989, we estimated 1,140 breeding birds at this colony located on the "Maintop" peak of West End Island (subcolony 02 on Map 64), making it the largest colony in coastal California (Table 19). This estimate was based on a count of 475 nests (and 527 birds) from aerial photographs taken on 23 May 1989. The nest count was adjusted with a J correction factor of 1.2 (Table 2). Two separate estimates of the numbers of breeding birds were derived by the Point Reyes Bird Observatory in 1989. One estimate of 620 breeding birds was based on a peak count of 267 nests in areas visible on the top and east side of Maintop from the lighthouse on Southeast Farallon Island on 25 May 1989 plus a boat count of 43 nests on the west side on 9 May 1989 (Emslie and Sydeman 1989). A second estimate of 638 breeding birds was based on 319 nests recorded over the entire breeding season in the same areas visible from the lighthouse (Stenzel et al. 1991). Aerial photographs provided more complete and much better viewing of this colony, permitting nests on a portion of the top and on a shelf on the southwest side to be counted that were not otherwise visible. A few Brandt's Cormorant nests (<10 nests) may have been included in aerial photographs but these were excluded in ground counts. The 1.2 J correction factor used to adjust counts from aerial photographs in 1989 (Table 2) was identical to the total number of nests observed from the lighthouse over the entire season divided by the peak number observed on 25 May (i.e. 319/267).

Numbers of Double-crested Cormorants have been monitored annually at the South Farallon Islands since 1972 (Ainley and Boekelheide 1990). Census methods have varied over the years: in 1972-1975, sporadic nest counts were made from various locations on Southeast Farallon Island; in 1976-1983, standardized nest counts were conducted daily using a low-power (20X) telescope from the biologists' house; in 1984-1987, nest counts were conducted every 5-10 days using a low-power telescope from the biologists' house; and in 1988-1990, nest counts were conducted every 5 days from a much better vantage point at the lighthouse using a high-power (60X) telescope. In some years, boat counts were made of portions of the colony not visible from Southeast Farallon Island. Numbers rose steadily from less than 100 to 458 breeding birds from 1972 to 1982 but then fell to less than 150 breeding birds in 1983, during the 1982-1983 ENSO event. Since then, numbers have continued to increase and surpassed 1982 numbers by 1988 (Ainley et al. 1988, Ainley and Boekelheide 1990). Numbers of nests based on standardized ground counts in 1988, 1989 and 1990 were 290, 319 and 275 nests, respectively (Stenzel et al. 1991). Numbers of nests observed in 1989 stood out as higher than in other recent years.

For comparison with other areas of the coast and other species, we calculated the degree of increase observed from 1979-1989. Sowls et al. (1980) listed a 1979 PRBO estimate of 180 breeding birds. However, Ainley and Boekelheide (1990) revised this estimate to about 240 breeding birds for 1979. Thus, numbers of breeding birds were 375% or 158-166% higher in 1989, depending on whether aerial photograph counts versus ground and boat counts were used to derive estimates in 1989. However, due to annual monitoring, it was very clear that numbers have increased since the early 1970's.

Ainley and Lewis (1974) indicated that numbers of breeding birds were much greater in the mid 1800's and had declined dramatically by the late 1800's, due to disturbance associated with commercial (murre) egging operations and human occupation of these small islands. They hypothesized that the loss of the Pacific Sardine (Sardinops caerulea) had prevented recovery by the early 1970's although it was unlikely that Double-crested Cormorants fed on sardines which did not occur in large numbers in estuaries. On the other hand, Ainley and Boekelheide (1990) pointed out that human disturbance has continued to the present day. Numbers increased after 1974 when permanent U. S. Coast Guard personnel left, only PRBO biologists remained and much of the islands were put off limits. But nesting space on Maintop became almost saturated by the late 1980's. Other historical nesting areas on Southeast Farallon Island (especially Lighthouse Hill) are still disturbed by biologists who live year round on the island. Constraints to further expansion may have caused birds to colonize and/or move to new colonies in San Francisco Bay since the early 1980's (see below). Double-crested

Cormorants have not been observed feeding in the vicinity of the islands and are thought to travel to San Francisco Bay and coastal lagoons to forage.

San Francisco Bay - In 1989-1991, 2,789 breeding birds were estimated at 9 colonies (including 2,422 breeding birds at 8 newly-discovered colonies)(Figure 26, Table 19). San Francisco Bay was not surveyed in 1979-1980 by Sowls et al. (1980). A small colony of 50 breeding birds was noted at Russ Island, Napa County, in 1978 (Varoujean 1979; excluded by Sowls et al. 1980). Birds nested at 3 different subcolonies at Russ Island in 1990. Nests were located in dead Eucalyptus trees at subcolonies 01 and 03 as well as on a series of duck blinds at subcolony 02 (see Map 82). This colony had been visited on 6 July 1988 by Point Reyes Bird Observatory (unpubl. data); 35 nests were counted at subcolony 01 where 49 nests were found in 1990 (in association with 2 Great Blue Heron [Ardea herodias] nests), despite further deterioration of the dead trees. In 1990, other nearby colonies were also found on artifical habitats (salt pond dikes at Knight Island and small towers at North San Pablo Bay Radar Target and Northeast San Pablo Bay Beacon) and may represent additional expansion from the original colony at Russ Island. Birds in this area appeared to forage in the Napa River, North San Pablo Bay and in saltponds.

The two largest colonies in the San Francisco Bay estuary system were found at the San Francisco-Oakland Bay Bridge (SFOBB; 1,116 breeding birds in 1990) and at the Richmond-San Rafael Bridge (RSRB; 778 breeding birds in 1989)(Table 19). Both colonies were first reported in 1984 (Campbell and LeValley 1984). Numbers at the RSRB colony increased from 296 nests in 1988 to 424 nests in 1990 (Stenzel et al. 1991). This colony has been surveyed closely throughout the breeding season by Point Reyes Bird Observatory. All nests were counted in 1988-1990, using roadside counts conducted from the lower deck of nests located on the cord girders and boat counts of nests on various beams underneath the roadway. This colony may have been established during a period of low bridge maintenance in the early 1980's or earlier. During 1988-1990, several bridge maintenance projects were rescheduled to prevent disturbance to nesting cormorants. The RSRB colony was composed of some birds from the South Farallon Islands, based on banded birds observed there in 1988-1990 (PRBO, unpubl. data). These birds may have emigrated to nest in this area during the 1982-1983 ENSO event when numbers fell at the South Farallon Islands. Birds from this colony foraged in the vicinity of The Brothers and The Sisters islands in southern San Pablo Bay, San Rafael Bay and in the Richmond Harbor area (PRBO, unpubl. data). The SFOBB colony has not been surveyed in detail. In 1988, 848 breeding birds were estimated, based on a boat count of 353 nests adjusted with a J correction factor of 1.2 (Table 2). This colony was difficult to survey from a boat because nests were located on girders and

beams under the lower roadway which were 200-300 feet (61-91 m) from the water. Thus, all nests probably were not counted there in 1988 or 1990, given comparisons of boat and roadside counts at parts of the RSRB colony (PRBO, unpubl. data). Aerial surveys are impratical at both the RSRB and SFOBB colonies because nests cannot be seen well from above and low flying would not be permitted in this area. It was unclear where birds from this colony foraged in south-central San Francisco Bay.

The Donlon Island colony may have existed in 1986 (P. Hoffman, pers. comm.) although it was not well documented until 1990. On 17 June, we counted 28 unattended nests on 100-200 foot (30-61 m) high beams on a Pacific Gas and Electric power tower surrounded by water. This survey occurred before chicks could have fledged and the colony may have been impacted by tower maintenance, recreational boaters or pollutants from a nearby pulp mill, causing colony abandonment. The small colony at Wheeler Island in Grizzly Bay, first reported in 1991, was located in dead Eucalyptus trees, in association with 12 Great Blue Heron nests (J. Kelly, pers. comm.). This specific area was not surveyed in 1990. These birds foraged in brackish waters in Suisun Bay and at the junction of the Sacramento and San Joaquin rivers. We did not survey east of the Antioch Bridge into the extensive delta area where other colonies may occur.

Small numbers (38 breeding birds) were first reported nesting at the Pacific Gas and Electric power towers that were surrounded by water beside the San Mateo Bridge in 1988 (PRBO, unpubl. data). On 25 July, 16 nests were counted on beams and platforms about 100-200 feet (30-61 m) from the water on 5 towers. On 22 June 1990, 76 nests (or 375% higher numbers) were found on 4 towers. In 1991, all nests were removed by maintenance workers (P. Metropolis, pers. comm.). These birds foraged in south San Francisco Bay and probably in nearby salt pond areas.

Numbers of breeding birds have increased dramatically in San Francisco Bay in recent years. Their use of artifical habitats has brought them into conflict with humans by fouling bridges and towers with guano and nesting material and nesting in areas that will be disturbed during maintenance activities. Fledglings also have posed to be traffic hazards (PRBO, unpubl. data). Policies should be instigated by the California Department of Transportation, the Pacific Gas and Electric Company and others to prevent disturbances to nesting birds by rescheduling maintenance and other activities. Sport fishing groups also have complained about depredation of stocked fish in reservoirs around the Bay (especially Marin County) and have considered some drastic actions (M. J. Rauzon, pers. comm.). Cormorants also may be impacted by pollutants in the estuary although increasing numbers and high breeding success has occurred at the Richmond-San Rafael Bridge colony (Stenzel et al. 1991).

There were no historical accounts of nesting within San Francisco Bay proper (e.g. Grinnell and Wythe 1925). However, large numbers of Double-crested Cormorants always have been reported to forage there. Birds have nested historically at 3 colonies near the mouth of San Francisco Bay (Point Resistance, Seal Rocks and Pillar Point), in addition to the South Farallon Islands (Table 19). In the late 1800's, many more birds (perhaps thousands) nested on the South Farallon Islands before they declined substantially (Ainley and Lewis 1974). Thus, before artifical nesting structures were available for nesting in the Bay, Double-crested Cormorants apparently bred at several colonies outside the estuary and travelled long distances to forage there. These 3 historical colonies may not have been reoccupied during recent population increases because there were no birds still alive with a history of nesting at these sites and coastal sites were farther from feeding and roosting areas than new colony sites on artifical habitats in the Bay.

Other Colonies - In 1989, 393 breeding birds were estimated at 6 colonies, excluding the South Farallon Islands and San Francisco Bay (including 388 breeding birds at 5 newly-discovered colonies). Four colonies (totalling 38 breeding birds) were located between Partington Point and Cape San Martin, Monterey County. Only the small colony at Partington Point North was known previously in this area in 1979-1980 (Table 19). These other colonies were difficult to survey and may have been missed in previous surveys because small numbers of nests were located on 100-200 foot (30-61 m) high cliffs which were also used for nesting by Brandt's Cormorants. This small subpopulation was not associated with a major river or estuary.

Larger numbers of breeding birds were found at 2 newly-discovered colonies near Morro Bay, San Luis Obispo County. At Fairbank Point (Morro Bay State Park), 138 nests (and 150 birds) were counted on a boat survey on 13 June 1989. Nests were located in dead Eucalyptus trees in association with nesting Great Egrets and Great Blue and Black-crowned Night Herons. At Morro Rock and Pillar Rock, 10 nests were estimated in a mixed colony of Double-crested and Brandt's cormorants about 200-400 feet (61-122 m) high on the west side of Morro Rock. This estimate may be low because nests were observed only from the ground level or a boat. We were not permitted by the California Department of Fish and Game to conduct an aerial survey of this colony (classified as an Ecological Reserve) due to concern about possible disturbance to nesting Peregrine Falcons. Birds from both of these colonies probably foraged mainly in Morro Bay. About 210 birds were observed roosting on a sandbar near Fairbank Point on 13 June 1989.

Southern California

In 1991, 2,463 breeding birds were estimated at 5 active colonies, corresponding to 492% higher numbers overall than in 1976-1979 (N=416 breeding birds as listed in Sowls et al. 1980) (Figure 26, Table 19). Much higher numbers were found at all 4 known colonies (Range=244-5386%). One small new colony was found at Shag Rock. Double-crested Cormorants nesting on the Channel Islands were not as tied to feeding areas in estuaries as found in northern and central California. At Prince Island, their diet in 1975-1977 included midwater fish (Sebastes sp.) and perch associated with kelp beds and diet was similar to Brandt's Cormorants there (Hunt et al. 1979). However, we observed many birds feeding and roosting at various lagoon mouths along the mainland coast (e.g. Ventura Harbor, Mugu Lagoon). These birds may have travelled long distances from colonies at West Anacapa Island and in the Santa Barbara Island area to forage in estuaries (although some non-breeding birds may stay along the mainland coasts during the breeding season). Birds travelled similar distances from the colony on the South Farallon Islands to feed in San Francisco Bay (Ainley and Boekelheide 1990). At least some of the 23 alternate-plumaged birds observed mainly at the mouth of San Diego Bay on 12 July 1991 probably were nesting at Islas Los Coronados, just south of the Mexican border.

Breeding population size has been examined by several researchers for many years in southern California, using counts from vantage points and boats (Gress et al. 1973; Hunt et al. 1979; Anderson and Gress 1983; Lewis and Gress 1985, 1988; Ingram 1992). Numbers at Anacapa Island West have been followed annually by F. Gress since 1969; colonies at Prince, Santa Barbara and Sutil islands were surveyed in 1975-1978 by Hunt et al. (1979); and annual monitoring of the latter 3 colonies have been conducted by Channel Islands National Park personnel since 1985. From these studies and 1991 surveys, it is clear that higher numbers have resulted from a combination of increased numbers of nesting birds since 1976-1979 in concert with census differences. Census difficulties have stemmed from long-distance counts and poor viewing of nesting areas located on high cliffs.

Prince Island - Birds nest along the rocky tops of 200-foot (61 m) high bluffs on the south, west and east sides of this island. Many nests are associated with Opuntia cactus patches, as noted by Hunt et al. (1979). We conducted an aerial survey of the entire colony on 15 June 1991 and counted 230 nests in photographs. For comparison, only 117 nests and sites were counted on a boat survey on 11 May 1991. Although more nests probably were built between boat and aerial surveys in 1991, aerial photographs permitted much better viewing of all colonies, especially the flat top part of the main cactus patch at the south end which was not visible from the boat. Closer and better views in photographs also allowed nests in visible areas to be

counted individually and small numbers of nests in isolated groups (mainly on the east side) could be better detected and counted. Further, it was easier to discern boundaries in photographs between adjacent subcolonies of Double-crested and Brandt's cormorants, mainly on the west side. We could not determine species identity at each nest and separated Double-crested Cormorant subcolonies based on their greater association with cactus, lower nesting density and lower guano buildup than at Brandt's Cormorant subcolonies in concert with boat maps made during the breeding season.

In 1976-1977, Hunt et al. (1979) estimated about 150 breeding birds in most of the same nesting areas, based on a boat count of 62 nests over these breeding seasons. From 1986-1989, peak counts of about 30-50 nests were obtained in late May (1987-1989) or late June (1986) during monthly boat surveys (Lewis and Gress 1988; D. B. Lewis, unpubl. notes). However, difficulty seeing and counting all nests present on the high bluffs plus species identification problems were noted in some areas. In 1990, a peak count of 204 nests was obtained (Ingram 1992). Although a new subcolony of 74 nests was reported on the northeast side, many more nests (N=130 nests) were also found in nesting areas used traditionally. Some Double-crested Cormorant nesting areas in 1986-1989 may have been considered to be Brandt's Cormorant subcolonies (D. B. Lewis and T. Ingram, pers. comm.), based on observations in 1976-1977 when Double-crested Cormorants nested higher on the bluffs than did Brandt's Cormorants (Hunt et al. 1979). If the 1976-1977 nest count was compared to 1989, 1990 and 1991 boat counts of nests, 42% lower, 229% higher and 89% higher numbers were indicated in these respective years. However, when compared to the 1991 nest count from aerial photographs, numbers were 271% higher in 1991 than in 1976-1977.

<u>Anacapa Island West</u> - Birds nested in vegetation and on rocky outcroppings on the tops of 200-300 foot (61-91 m) high bluffs as well as on the sides of cliffs on the north side of this island. In 1991, F. Gress (unpubl. data) counted 360 nests over the breeding season at 6 subcolonies (03, 06, 07, 08, 12 and 13 on Map 198; see Appendix 2), using a combination of detailed counts in many different nesting subareas conducted monthly from island vantage points and a boat (see Brown Pelican account). We did not take aerial photographs of cormorant colonies at Anacapa Island West in 1991.

The same detailed technique has been used to census and track numbers of nesting Double-crested Cormorants at this colony since 1969. Double-crested Cormorants then were experiencing reproductive failure that was tied to pollutant problems also affecting nesting Brown Pelicans there (Gress et al. 1973, Anderson and Gress 1983; see Brown Pelican account). From 1969-1975, numbers of nests fell from 76 to 3 nests. Since 1975,

numbers have climbed steadily (Lewis and Gress 1988, Ingram 1992), despite the 1982-1983 ENSO event which affected numbers at the South Farallon Islands in central California (see above). In addition, from 1988 to 1990, numbers jumped by 85% from 160 to 296 nests (Ingram 1992). This jump continued from 1990 to 1991 when 22% higher numbers of nests occurred. The standardized annual monitoring of cormorants at Anacapa Island West has provided clear evidence that this colony has been increasing for some time. Aerial surveys could detect even higher numbers than ground and boat counts in the future.

Santa Barbara Island Area - Birds nested at 3 nearby colonies in this area which probably acted as one assemblage of nesting birds (Table 19). At Santa Barbara Island, nests were located on 200-400 foot (61-122 m) high cliffs on the north side (subcolonies 03 and 04 on Map 200) and on 200-600 foot (61-183 m) high cliffs on the west side (subcolonies 18 and 19 on Map 200). At Sutil Island, nests were built on ledges at the tops of 200-300 foot (61-91 m) high cliffs on the northwest side. At Shag Rock, nests were found on 100-150 foot (30-46 m) high cliffs on the southwest side; nesting was first reported here in 1991.

In 1991, 87, 233 and 172 nests were counted on the "North Cliffs"and "West Cliffs" of Santa Barbara Island and Sutil Island, respectively, in aerial photographs taken on 15 June. Four nests were found on Shag Rock during a boat survey on 21 May 1991. The total of 496 nests was adjusted with a J correction factor of 1.2 (see Tables 2 and 4) to derive a combined estimate of 1,191 breeding birds. Aerial photographs provided much closer and better views of nesting areas which indicated that these areas have not been counted completely from island vantage points or boats in the past. For example, in 1990, 155, 30 and 50 nests were counted over the season at North Cliffs, West Cliffs and Sutil Island, respectively (Ingram 1992). Most nests (86%) in 1991 at West Cliffs were found in subcolony 18 which was not even known as a nesting area in 1990; a similar number (30 nests) was found in subcolony 19 in 1991 as in 1990.

In 1976-1977, only 7-10 nests were found on Santa Barbara Island and most birds nested on Sutil Island (N=30-60 nests)(Hunt et al. 1979). In 1986-1988, totals of 64, 171 and 162 nests were obtained for all 3 colonies combined with most nests occurring on Santa Barbara Island. Only 3 and 25 nests were found on Sutil Island in 1986 and 1988, respectively (Lewis and Gress 1988; D. B. Lewis, unpubl. notes). A 249% increase in numbers occurred between 1977 (N=62 nests) and 1990 (N=235 nests) using similar census techniques. Even higher numbers (640%) were found when comparing 1977 and 1991 estimates, including 110% higher numbers from 1990 to 1991. Due to differrring census methods, 1991 estimates were not as comparable with previous years but were more comparable with other colonies surveyed in southern California and elsewhere.

Interior California

Colonies in this area were not surveyed in 1989-1991. Double-crested Cormorants have bred historically at several localities, including: Tule Lake and Clear Lake, Modoc County; Eagle Lake, Lassen County; Clear Lake, Lake County; Butte Creek, Sutter County; Tulare Lake, Kings County; Buena Vista Lake, Kern County; Salton Sea, Imperial County; and Lake Henshaw, San Diego County (summarized in Grinnell and Miller 1944).

Recent nesting has been recorded at: Sheepy Lake, (Lower Klamath National Wildlife Refuge), Siskiyou County (P. Moreno, pers. comm.); Tule Lake lower sump (Tule Lake National Wildlife Refuge) and Clear Lake Reservoir (Clear Lake National Wildlife Refuge), Modoc County (P. Moreno, pers. comm.); Eagle Lake (Lederer 1976) and Hartson Reservoir (near Honey Lake) (Remsen 1978, Tait et al. 1978), Lassen County ; Butt Lake, Plumas County (Remsen 1978); Bridgeport Reservoir, Mono County (Stallcup and Greenberg 1974); Stone Lake, Sacramento County (Harvey et al. 1992); Topock Marsh (along the Colorado River), San Bernadino County (Garrett and Dunn 1981); and at both the north (Riverside County) and south (Imperial County) ends of the Salton Sea (Garrett and Dunn 1981). Colonies in Modoc and Siskiyou Counties suffered reduced breeding success in 1990-1991 due to receding water levels (P. Moreno, unpubl. data; see White Pelican account). Other colonies probably have suffered similar fates or may have disappeared altogether (e.g. Eagle Lake, Hartson Reservoir; see Remsen 1978; see White Pelican account).

A thorough survey of interior colonies is needed to better assess the current breeding status of Double-crested Cormorants in California.

Summary

In 1989-1991, 10,037 breeding birds were estimated at 37 active colonies in marine and estuarine habitats in California (including 3,065 breeding birds at 20 newly-discovered colonies)(Figure 26, Table 19). This total corresponded to 421% higher numbers than in 1975-1980 (N=1,926 breeding birds) and 262% higher numbers at 18 colonies known previously. Seven historical colonies were not present in 1975-1980 or 1989-1991. Higher numbers were related to increases in breeding birds which were evident at all colonies monitored annually since the mid 1970's (Sowls et al. 1980, Hunt et al. 1979, Ainley and Boekelheide 1990, Ingram 1992). Double-crested Cormorants also have been undergoing continent-wide increases for at least the past two decades due to high breeding success, reduced human disturbance and persecution and reduced impacts of pollutants in many areas (e.g. Drury 1973, Sowls et al. 1980, Anderson and Gress 1983, Hatch 1984, Vermeer and Rankin 1984, Hobson et al. 1989, Speich and Wahl 1989). However, pollutant and disturbance

problems still occur in some areas (e.g. Weseloh et al. 1983, Hobson et al. 1989). In California, increased numbers also have resulted from better censusing efforts in recent years at many colonies and the recent use of artifical nesting habitats, especially in the San Francisco Bay area. Additional work is required to develop better and more standardized population estimates (involving aerial photographs) at the South Farallon Islands (National Wildlife Refuge) and in Channel Islands National Park, in addition to continuing boat and ground counts for comparison with past estimates.

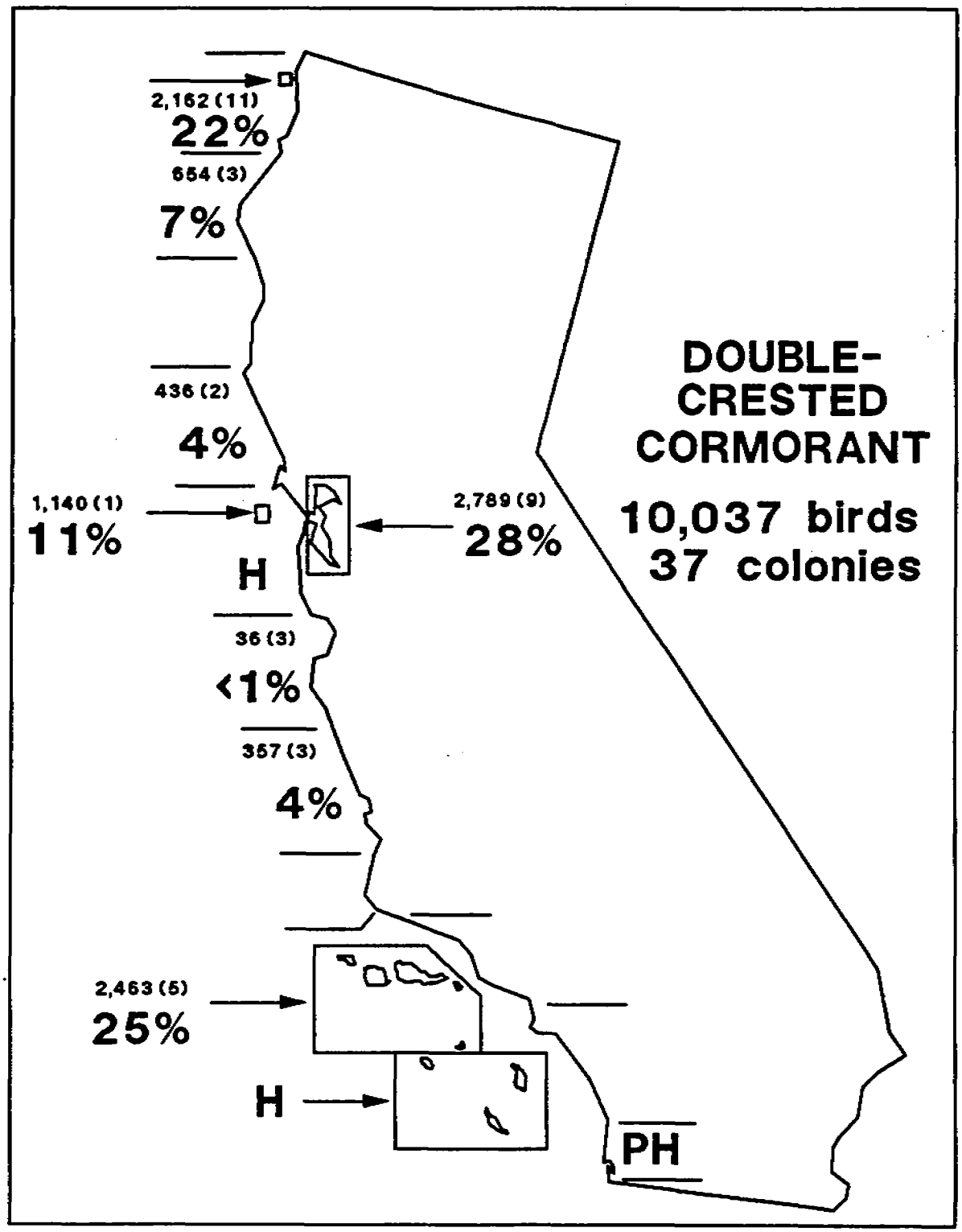


Figure 26. Percentage of marine and estuarine breeding population of Double-crested Cormorant in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 19. Numbers of breeding Double-crested Cormorants at each colony in marine and estuarine habitats in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980	1989-1991	
Northern California					
Prince Island	DN-414-03	325-003	450	1,102	(11.0)
Tolowa Rocks	DN-414-07	325-007	0	12	(0.1)
Unnamed Small Rocks	DN-414-10	325-046	22	2	(<0.1)
Last Chance Rock	DN-414-04	325-049	4	H	(0.0)
False Klamath Rock	DN-412-07	325-010	84	31	(0.3)
Radar Station Rocks	DN-412-09	325-051	20	144	(1.4)
Flint Rock Head	DN-412-10	325-011	0	26	(0.3)
White Rock	DN-412-11	325-012	60	74	(0.7)
Sea Gull Rock	HU-410-05	325-017	136	130	(1.3)
Sea Lion Rock	HU-410-07	325-018	0	89	(0.9)
White Rock	HU-410-08	325-019	H	H	(0.0)
Pilot Rock	HU-410-16	325-026	0	10	(0.1)
Little River Rock	HU-410-09	325-035	100	542	(5.4)
Old Arcata Wharf	HU-404-02	325-067	340	286	(2.8)
Humboldt Bay Platforms	HU-404-04	325-065	0	94	(0.9)
Sugarloaf Island	HU-402-02	325-041	32	274	(2.7)
Russian River Rocks	SO-382-09	404-005	32	422	(4.2)
Dillon Beach Rocks	MA-380-02	404-009	0	14	(0.1)
(Subtotal)			1,280	3,252	
Central California					
Point Resistance	MA-374-03	429-024	H[2]	H	(0.0)
South Farallon Islands	SF-FAI-02	429-052	180	1,140	(11.4)
Seal Rocks	SF-374-03	429-009	H[2]	H	(0.0)
Pillar Point	SM-372-04	429-030	H[2]	H	(0.0)
Russ Island	SFB-NA-02	404-051	50[2]	367	(3.7)
Knight Island	SFB-SN-01	404-053	0	156	(1.6)
North San Pablo Bay Radar Target	SFB-SN-03	404-055	0	48	(0.5)
Northeast San Pablo Bay Beacon	SFB-SN-04	404-056	0	10	(0.1)
Wheeler Island	SFB-SN-09	405-001	0	65	(0.6)
Donlon Island	SFB-SA-01	405-002	0	67	(0.7)
Richmond-San Rafael Bridge	SFB-CC-12	429-061	0	778	(7.7)
San Francisco-Oakland Bay Bridge	SFB-AL-05	429-071	0	1,116	(11.1)
San Mateo Bridge and P.G.&E. Towers	SFB-SM-06	429-107	0	182	(1.8)
Partington Ridge North	MO-360-10	454-014	6	5	(<0.1)
Anderson Canyon Rocks	MO-360-13	454-016	0	5	(<0.1)
Rockland Landing North	MO-360-23	454-037	0	26	(0.3)
Cape San Martin	MO-354-08	477-003	0	2	(<0.1)
Morro Rock and Pillar Rock	SL-352-07	477-026	0	24	(0.2)
Fairbank Point	SL-352-08	477-044	0	331	(3.3)
(Subtotal)			230	4,322	
Southern California					
Prince Island	SB-SMI-07	501-004	150	552	(5.5)
Scorpion Rocks	SB-SZI-14	502-010	H	H	(0.0)
Anacapa Island-West	VE-AMI-01	502-007	132	720	(7.2)
Shag Rock	SB-SBI-01	524-007	0	10	(0.1)
Santa Barbara Island	SB-SBI-02	524-008	14	768	(7.6)
Sutil Island	SB-SBI-03	524-009	120	413	(4.1)
Cormorant Rock Area	VE-SNI-07	524-028	PH[2]	PH	(0.0)
Ship Rock	LA-CAI-03	524-039	H[2]	H	(0.0)
(Subtotal)			416	2,463	
Total			1,926[3]	10,037	

[1] P, probably/possibly present; H, historical nesting only.
[2] Not listed in Sowls et al. (1980).
[3] Sowls et al. (1980) reported a total of 1,884 birds.

BRANDT'S CORMORANT

The Brandt's Cormorant breeds along the Pacific coast from southern Vancouver Island, British Columbia to southern Baja California, Mexico, including the Gulf of California. The center of their world range occurs in California. It often nests in dense colonies of a few hundred to a few thousand birds on flat or sloping surfaces of offshore islands but also will nest in small colonies or as isolated pairs and on mainland cliffs. Large numbers of nests can be difficult to count unless viewed well from higher vantage points or counted individually from high-quality aerial photographs. Numbers of breeding birds at a colony are variable within the breeding season because of nesting asynchrony between different subcolonies. In addition, numbers can vary substantially between years, depending on oceanographic factors that affect prey availability (Ainley and Boekelheide 1990) and occasional switching between nearby colony sites (Sowls et al. 1980).

In 1989-1991, we surveyed all large (>100 breeding birds) Brandt's Cormorant colonies which were present in 1975-1980 by counting nests from aerial photographs. Smaller colonies were counted only from boats and mainland vantage points. In northern and central California, only 1 aerial survey was conducted in late May (or in a few cases mid-June) 1989 during the incubation period when most or all birds had laid eggs but few large chicks were present (Figures 2, 3). At this time, nests with incubating or brooding adults were easily counted. With boat and mainland counts conducted during the same period, we covered all coastlines where Brandt's Cormorants could nest to ensure that all small, active colonies were detected. The same general approach was used by Sowls et al. (1980) in northern and central California in 1979-1980 but their surveys were conducted later in the breeding season. Briggs et al. (1983) also took aerial photographs of most large colonies in northern and central California in May and July 1980-1982 but only counted the numbers of birds present. In southern California in 1975-1978, Hunt et al. (1979) counted nests and/or birds mainly from boats and island vantage points in the Channel Islands and later in the breeding season (June-August) than 1991 surveys. A few colonies were surveyed in 1977 using aerial counts. In 1991, we conducted 2 aerial surveys (May and June) to account for greater nesting asynchrony in this area (Hunt et al. 1979) and to provide more comparable estimates to northern and central California.

Northern California

In 1989, 15,500 breeding birds were estimated at 32 active colonies (including 297 breeding birds at 3 newly-discovered colonies [Split Rock, Newport Rocks and Bird Rock] and 1,157 breeding birds at 2 colonies [Prince Island and Rockport Rocks] that were inactive in 1979-1980)(Figure 27, Table 20). This

total corresponded to 11% lower numbers overall than in 1979-1980 (N=17,328 breeding birds) and 19% lower numbers at 35 known colonies that were active in 1979-1980. At 6 large colonies (1,240-3,080 breeding birds) in 1979-1980, 5 colonies had lower numbers (Range=9-58%) and Castle Rock National Wildlife Refuge had 13% higher numbers in 1989. With lower numbers at Cape Vizcaino, Castle Rock became the largest colony in northern California in 1989. At 28 smaller colonies (<700 breeding birds), 17 colonies had lower numbers (including 7 colonies not detected in 1989) and 11 colonies had higher numbers.

In some cases, changes in numbers at specific colonies were associated with the use of nearby colony sites which may function as single aggregations of nesting birds. For example, 3,662 and 3,080 birds bred at Cape Vizcaino, Mendocino County, in 1979 and 1980 (Sowls et al. 1980). Similar numbers (2,545 breeding birds) bred at Cape Vizcaino and nearby Rockport Rocks, respectively, in 1989 (Table 20). Both colonies were active in 1969 as well (Osborne and Reynolds 1971). Similarly, 700 birds bred at Arched and Gull rocks (Sonoma County) in 1979 (Sowls et al. 1980). However, 650 birds bred only on Gull Rock in 1980 and 717 birds bred only at Arched Rock in 1989. Other examples of this behavior were noted (e.g. White Rock and 333 Point, Mendocino County). However, overall, colonies were relatively stable in location and had similar numbers between 1979-1980 and 1989. Slightly lower numbers could be partly accounted for by later survey dates in 1979-1980. In both years, aerial photographs were taken mainly in July when nests are more difficult to count when adults stop attending nest sites, large chicks are present and nests become obscured. Two colonies were recorded only in 1980 and 3 colonies only in 1979. Most (75%) of the 8 colonies not detected in 1989 each held less than 40 breeding birds in 1979-1980 and may have been ephemeral colonies present only in certain years.

Most-recent estimates listed by Sowls et al. (1980) and presented in Table 20 were determined mainly in 1980. Numbers were higher in 1979 at 17 of 26 colonies surveyed in both 1979 and 1980. Thus, comparisons of 1979 to 1989 numbers showed even lower relative numbers in 1989. Briggs et al. (1983) surveyed 19 colonies in northern California in May and July 1980-1982, including: Hunter Rocks, Prince Island, Castle Rock, False Klamath Rock, White Rock, Green Rock, Flatiron Rock, False Cape Rocks, Steamboat Rock, Cape Vizcaino, Kibesillah Rock, Goat Island, Casket Rock, Fish Rocks, Gualala Point Island, Arched Rock, Gull Rock, Bodega Rock and Bird Rock. Numbers of cormorants counted (including all 3 species and roosting birds) varied greatly although there was a general increase from May to July, presumably due mainly to the added presence of chicks and non-breeding subadults along with breeding adults in July. Using their lower May counts (and substituting July counts when May counts were not available), counts of 9,559, 8,119 and 6,690

birds were obtained in 1980, 1981 and 1982. By applying the 1989 K correction factor of 2.3 (Table 2), we derived estimates of 21,986, 18,674 and 15,387 breeding birds for 1980-1982, respectively. These rough estimates are high (due to the inclusion of other than breeding adult Brandt's Cormorants) and thus were reconcilable with estimates determined for these colonies in 1979, 1980 and 1989 (N=16,356, 14,384 and 12,389 breeding birds, respectively).

Central California

South Farallon Islands (National Wildlife Refuge) - In 1989, we estimated 16,742 breeding birds at this colony which is the largest in California and the world. This estimate was based on 7,610 nests (4,666 nests on Southeast Farallon Island, 2,934 nests on West End Island and 10 nests on the North Islets) counted from aerial photographs taken on 23 May 1989, adjusted with a J correction factor of 1.1 (Table 2). A separate estimate was derived by Point Reyes Bird Observatory, based on a ground count of 4,319 birds in nesting areas from vantage points on Southeast Farallon Island on 24 June 1989 supplemented with a count of 776 birds from a small boat on 25 June 1989. These counts were adjusted with slightly different daily K correction factors of 2.1 and 2.28 (respectively) to derive a total estimate of 10,839 breeding birds (Emslie and Sydeman 1989), or 35% lower numbers than derived from aerial photographs. Differences were even greater (48% lower) when we compared the PRBO estimate to an alternate estimate of 20,737 breeding birds (derived from 9,016 birds counted in aerial photographs adjusted with a K correction factor of 2.3 [Table 2]).

At Southeast Farallon Island, the PRBO estimate was 29% lower than derived from nests counted in aerial photographs. This subcolony was counted almost entirely from vantage points and lower numbers probably reflected counting difficulties. Large numbers of adults in expansive, dense colonies are difficult to count accurately (either individually or by block counting), especially in some areas where nests are not viewed well. At West End Island, numbers were 46% lower than derived from nests counted in aerial photographs. This subcolony was surveyed using a mixture of long-distance and poor-angle ground counts plus boat counts which all probably contributed to even greater underestimation due to counting difficulties. PRBO surveys occurred before the late chick period (when chicks were not constantly attended by adults) and there was little egglaying or nest failure between aerial and ground/boat surveys (Figures 2, 3). Thus, differences between estimates were related mainly to census techniques. Differences may be greater than shown because aerial photographs in 1989 were taken from farther away than at other colonies (see methods), due to concern about possible disturbance to nesting Common Murres, and numbers of nests counted individually may have been undercounted. However,

higher estimates were obtained in 1989-1991 using aerial photographs at almost all colonies in California which were surveyed using aerial photographs, boat counts and counts from mainland vantage points (Appendix 2).

Sowls et al. (1980) reported a 1979 PRBO estimate of 28,000 breeding birds at the South Farallon Islands. However, this estimate was revised to about 19,000 breeding birds for 1979 by Ainley and Boekelheide (1990) who also reported a peak population size of 23,800 breeding birds in 1974. This adjustment resulted in 9,000 fewer breeding birds than reported in 1979-1980, corresponding to 21% and 14% lower numbers in central California and California overall, respectively. Population estimates from 1973-1979 were very rough and were derived from counts in a study area, corrected for how counts at this area reflected trends in the total colony using ground and boat counts in 1980-1982. These latter estimates (Range=15,000-17,000 breeding birds) based on total counts (but without further documentation of how counts were adjusted) were much lower than estimates derived from aerial photographs by Briggs et al. (1983) in 1980-1982. We took their total July counts of 28,218, 13,182 and 12,840 birds and applied a 1989 K correction factor of 2.3 (Table 2) to derive estimates of about 64,900, 30,300 and 29,500 breeding birds in these respective years. These estimates were high (as discussed earlier) and photographic counts may have been less accurate since surveys were flown at very high altitudes (975-1,300 feet; Briggs et al. 1983). Overcounting may have resulted from block counting areas in July counts where individual birds could not be discerned and large chicks could have been included. May counts were much lower and incomplete.

Since 1982, PRBO surveys showed a dramatic decline in numbers after the 1982-1983 ENSO event (Ainley et al. 1988, Ainley and Boekelheide 1990). Numbers of breeding birds (determined from ground and boat counts) still had not recovered to pre-1983 levels by 1989. Brandt's Cormorants have not been surveyed using aerial photographs between 1982 and 1989.

<u>Other Colonies</u> - In 1989, 21,787 breeding birds were estimated at 38 active colonies in central California, excluding the South Farallon Islands (but including 2,717 breeding birds at 8 newly-discovered colonies and 1,559 breeding birds at 4 colonies that were inactive in 1979-1980)(Table 20). This total corresponded to 53% higher numbers overall than in 1979-1980 (N=14,251 breeding birds) and 22% higher numbers at 32 known colonies with 1979-1980 estimates. At 4 large colonies (1,200-4,200 breeding birds) in 1979-1980, 3 colonies (Bird Island, Bird Rock and Piedras Blancas Island) had higher numbers (Range=46-119%) although numbers were 37% lower at Point Reyes. At 28 smaller colonies (<1,000 breeding birds), 9 colonies had higher numbers and 18 colonies had lower numbers. Large increases were evident at Double Point and Castle Rocks and Mainland colonies and

medium-sized colonies (100-900 breeding birds) were established at 3 historical colony sites (Anderson Canyon Rocks, Plaskett Rock and Unnamed Rock) that were inactive in 1979-1980. Three known sites were inactive in 1979-1980 and 1989. Overall, higher numbers were evident in most of central California in 1989, contrasting with the much lower numbers at the South Farallon Islands since the 1982-1983 ENSO event (see above).

We also examined bird counts at 12 colonies by Briggs et al. (1983) in May 1980-1982, including Point Reyes, Double Point, North Farallon Islands, El Jarro to Davenport, Bird Rock, "Carmel Bay" [Guillemot Island and Pinnacle Point Area], Bird Island, Lopez Rock, Cape San Martin, Piedras Blancas Island, Lion Rock and Pecho Rock. By applying a 1989 K correction factor of 2.3 (Table 2) to 7,615, 7,485 and 2,940 birds counted, we derived total estimates of 17,515, 17,216 and 6,762 breeding birds at these colonies in 1980-1982, respectively. In 1989, similar numbers (N=17,238 breeding birds) to 1980 and 1981 were found. Lower numbers in 1982 were also found in northern California but not at the South Farallon Islands (see above).

Southern California

In 1991, 29,365 breeding birds were estimated at 31 active colonies (including 5,849 breeding birds at 13 newly-discovered colonies and 6 birds at the historical Shag Rock colony that was not active in 1975-1978)(Table 20). This total corresponded to 387% higher numbers overall than in 1975-1978 (N=6,032 breeding birds) and 290% higher numbers at 24 colonies active previously. At 3 large colonies (1,400-1,832 breeding birds) in 1975-1978 (Castle Rock, Prince Island and Sandy Point to Carrington Point), numbers were much higher (Range=94-232%). Huge increases (10-40 fold) occurred at 5 small colonies (<200 breeding birds) in 1975-1978, making them large colonies in 1991: 1087% at Gull Island, 1606% at northwestern Santa Cruz Island (formerly "Kinton Point to Diablo Point"), 1655% at Vizcaino Point East (San Nicolas Island) and 3957% at Point Bennett (San Miguel Island).

Some of the increase in numbers found was due to standardized counting of nests earlier in the breeding season in aerial photographs in 1991 compared to mainly unstandardized boat counts later in the season in 1975-1978. In addition, we were better able to detect peak numbers in southern California in 1991 because we conducted 2 aerial surveys. The level of increase noted between aerial surveys (about 30%) also was used to adjust counts at other smaller colonies which were surveyed only by boat early in the breeding season (see methods). This approach served to provide breeding population estimates that were more comparable with those determined on single surveys in northern and central California. However, in 1991, prey resources probably were abundant, allowing maximal numbers of birds to breed over the extended breeding season in southern California.

In 1991, the largest colony of 5,606 breeding birds in southern California at Bay Point (San Miguel Island) was found where Brandt's Cormorants had not been recorded previously to nest (Hunt et al. 1979). This colony was located near the long-established colonies at Prince Island and Castle Rock. If these two colonies were saturated with breeding birds in 1991, the Bay Point colony may have formed from overflow of increased numbers of younger and first-time breeders produced in previous years (mainly 1987-1989) from these colonies during a year of abundant prey. The second largest colony in 1991 at Vizcaino Point East (N=5,089 breeding birds) held only 290 breeding birds in 1977 (Hunt et al. 1979, Sowls et al. 1980). In 1991, this colony probably included birds from the Cormorant Rock colony (100 breeding birds in 1976; not present in 1977). This colony may have increased recently due to reduced human disturbance over the past decade. Human disturbances at the U. S. Navy base on San Nicolas Island were linked to the loss of colonies and poor breeding success there in the past. However, thin-shelled eggs (presumably due to pollutants) were also reported in the early 1970's (Hunt et al. 1979). Pollutants also affected Brown Pelicans and Double-crested Cormorants in southern California at this time and probably still affect them currently (see species accounts).

Human disturbance and/or pollutants may be responsible for the apparent recent loss of 4 small colonies at San Clemente Island (U. S. Navy base), loss of the only small mainland colony at La Jolla, as well as the loss of at least 2 small colonies (Ship and Bird rocks) located in an area of heavy recreational use near the isthmus at Santa Catalina Island in the early 1900's (Willett 1912, Howell 1917). Variable use of other colony sites at San Clemente Island (Lost Point South, Mail Point South and Seal Cove Area) may reflect human disturbance causing colony switching between years (see Carter et al. 1984 for Pelagic Cormorants).

No colonies were abandoned in the northern Channel Islands (within Channel Islands National Park) since 1975-1978 and colony switching was not evident there. In fact, suitable nesting habitat on offshore rocks and islands was limited such that colony switching was unlikely to occur to a significant extent, although subcolonies may occur in slightly different locations in different years (Hunt et al. 1979). The many small new colonies found in this area probably reflected greater survey effort and limited, ephemeral nesting on cliffs in a year of abundant prey (see Bay Point above). Increased human disturbance probably has occurred recently due to increased recreational and commercial use (fishing, diving and kayaking) along coastlines in Channel Islands National Park and Santa Cruz Island (Nature Conservancy).

Summary

In 1989-1991, 83,394 breeding birds were estimated at 102 active colonies (including 9,723 breeding birds at 24 newly-discovered colonies and 2,722 breeding birds at 7 known colony sites that were inactive in 1975-1980). This corresponded to 47% higher numbers overall than in 1975-1980 (N=65,611 breeding birds minus 9,000 breeding birds overestimated at the South Farallon Islands) and 25% higher numbers at 92 active colonies with previous estimates in 1975-1980. Population trends differed in different parts of the state. Numbers were similar or slightly lower in northern California, much lower at the South Farallon Islands yet higher in other parts of central California and much higher in southern California.

It is unclear why numbers at the South Farallon Islands have not recovered to levels found before the 1982-1983 ENSO event. Brandt's Cormorants feed extensively on juvenile rockfish (Sebastes sp.) there although many other types of prey are also used in ENSO years (Ainley et al. 1981, Ainley and Boekelheide 1990). At the Channel Islands, they also feed on rockfish as well as other prey (Hunt et al. 1979, Ainley et al. 1981). Yet much higher numbers were found in the Channel Islands than before the 1982-1983 ENSO event (although see earlier discussion of census differences). The impacts of ENSOs may be greater at the South Farallon Islands than at other colonies where prey resources may be more stable. Breeding success may be higher at other colonies during years of lower rockfish availability and colonists may occur in closer proximity to these colonies than the South Farallon Islands during the breeding and non-breeding seasons. Recovery at the South Farallon Islands also may have been slowed by significant mortality in gill nets between 1979 and 1987 (CDFG 1987; see Takekawa et al. 1990) and some mortality in oil spills (Page et al. 1990), although these factors would have impacted other colonies in this area as well. In fact, many of the colonies in this area did have lower numbers in 1989 than in 1979-1980 (Table 20).

Due to the variability of numbers of breeding Brandt's Cormorants between years and census methods, population size should be examined over several years using refined and highly-standardized aerial surveys to reduce error in annual estimates, to better describe interannual variability and, thus, to better assess trends in population size. At the South Farallon Islands ground and boat counts plus aerial surveys should be conducted annually. Brandt's Cormorants should be included in the annual monitoring program of Channel Islands National Park. Much more work is required to examine past estimates for comparability.

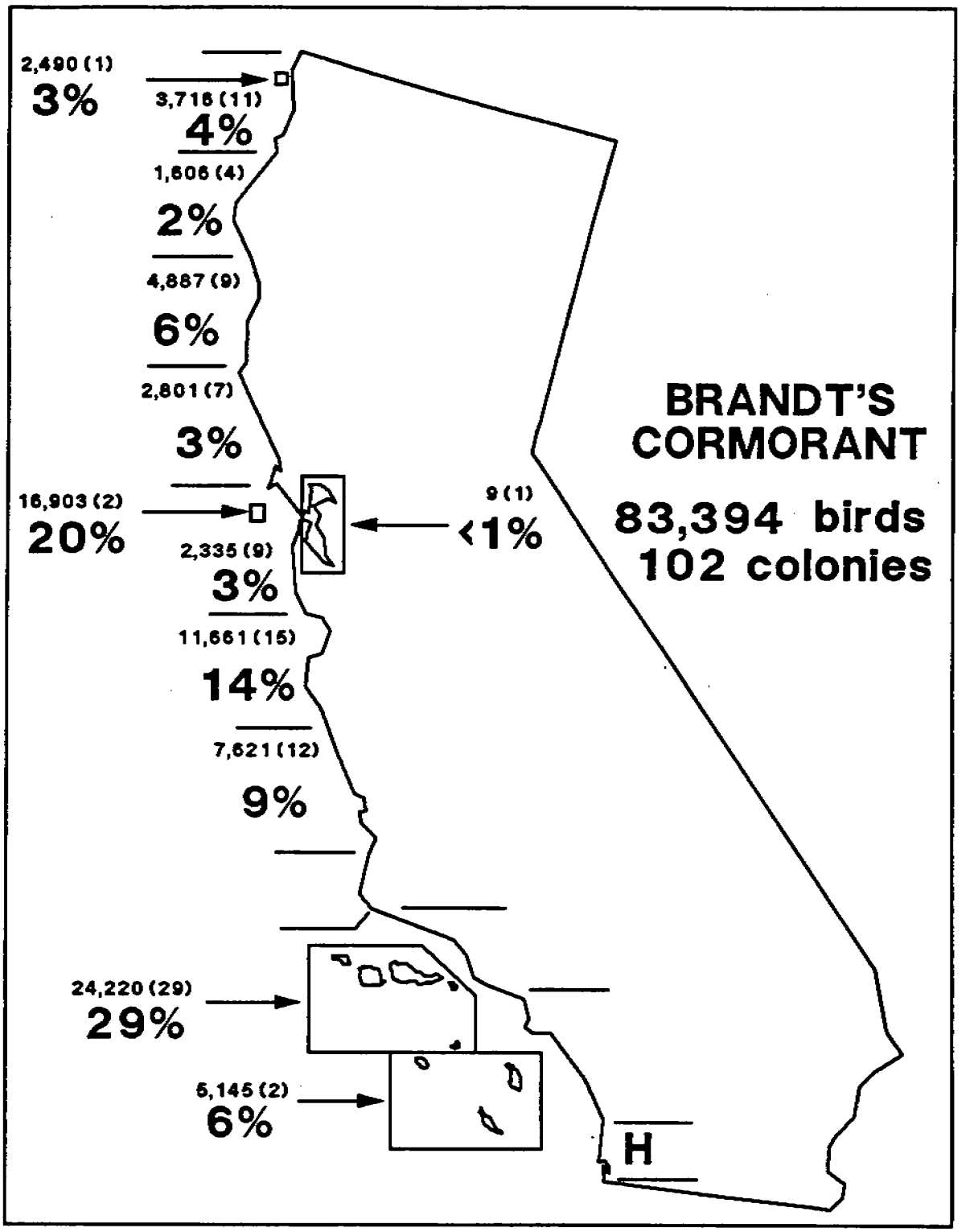


Figure 27. Percentage of state breeding population of Brandt's Cormorant in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 20. Numbers of breeding Brandt's Cormorants at each colony in California in 1975-1980 (Hunt et al. 1979; Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980	1989-1991	
Northern California					
Hunter Rocks	DN-414-02	325-002	680	464	(0.6)
Prince Island	DN-414-03	325-003	H	310	(0.4)
Castle Rock	DN-414-06	325-006	2,200	2,490	(3.0)
"Crescent City Harbor Area"	DN-414-09	325-045	40	H	(0.0)
Rock R	DN-412-01	325-048	140	216	(0.3)
Sister Rocks	DN-412-02	325-009	42	112	(0.1)
False Klamath Rock	DN-412-07	325-010	356	713	(0.8)
White Rock	DN-412-11	325-012	240	409	(0.5)
Split Rock	DN-412-13	325-062	0	51	(0.1)
Redding Rock	HU-412-01	325-013	158	246	(0.3)
Scotty Point to Megwill Point	HU-410-06	325-053	2	H	(0.0)
Green Rock	HU-410-09	325-020	216	62	(0.1)
Flatiron Rock	HU-410-13	325-023	1,540	1,032	(1.2)
Blank Rock	HU-410-14	325-024	52	101	(0.1)
Pilot Rock	HU-410-16	325-026	40	H	(0.0)
False Cape Rocks	HU-402-01	325-040	400	792	(0.9)
Sugarloaf Island	HU-402-02	325-041	[200]	293	(0.3)
Steamboat Rock	HU-402-03	325-042	494	464	(0.6)
3 Brothers and Hair Seal Rocks	HU-400-01	325-055	110	57	(0.1)
Anderson Cliffs	ME-394-03	379-013	304	169	(0.2)
Rockport Rocks	ME-394-07	379-001	H	847	(1.0)
Cape Vizcaino	ME-394-08	379-002	3,080	1,698	(2.0)
Kibesillah Rock	ME-392-04	379-004	350	66	(0.1)
Newport Rocks	ME-392-05	379-021	0	191	(0.2)
Goat Island Area	ME-390-01	379-006	1,240	1,087	(1.3)
Devil's Basin	ME-390-08	379-007	300	262	(0.3)
Cavanaugh Cove to Gunderson Rock	ME-390-09	379-030	4	H	(0.0)
Casket Rock	ME-390-11	379-009	330	70	(0.1)
White Rock	ME-390-13	379-010	448[2]	497	(0.6)
333 Point	ME-390-14	379-032	360	H	(0.0)
Fish Rocks	ME-384-10	404-003	18	211	(0.3)
Fish Rock Cove	ME-384-09	404-022	18	H	(0.0)
Gualala Point Island	SO-384-01	404-004	1,240	521	(0.6)
Russian River Rocks	SO-382-09	404-005	124	51	(0.1)
Arched Rock	SO-382-11	404-006	400[2]	717	(0.9)
Gull Rock	SO-382-13	404-035	650	H	(0.0)
Bodega Rock	SO-380-02	404-008	1,350	1,228	(1.5)
Sonoma-Marin County Line	MA-380-01	404-040	12	H	(0.0)
Dillon Beach Rocks	MA-380-02	404-009	190	18	(<0.1)
Bird Rock	MA-380-04	404-010	0	55	(0.1)
(Subtotal)			17,328	15,500	
Central California					
Point Reyes	MA-374-01	429-001	2,400	1,522	(1.8)
Point Resistance	MA-374-03	429-024	150	46	(0.1)
Millers Point Rocks	MA-374-04	429-002	194	114	(0.1)
Double Point	MA-374-05	429-003	258	1,802	(0.2)
Bird Island	MA-374-09	429-007	H	H	(0.0)
North Farallon Islands	SF-FAI-01	429-051	-	161	(0.2)
South Farallon Islands	SF-FAI-02	429-052	28,000[3]	16,742	(19.9)
Lobos Rock and Land's End	SF-374-02	429-029	80	117	(0.1)
Seal Rocks	SF-374-03	429-009	76[2]	H	(0.0)
San Pedro Rock	SM-372-04	429-013	H[4]	H	(0.0)
Devil's Slide Rock	SM-372-03	429-014	22	7	(<0.1)
Seal Rock Cliffs	SM-372-06	429-032	50	37	(<0.1)
Martins Beach	SM-372-07	429-033	40	H	(0.0)

Ano Nuevo Island	SM-370-04	429-023	0[5]	4	(<0.1)
El Jarro Point to Davenport	SC-370-02	429-050	236[5]	308	(0.4)
Yerba Buena Island	SFB-SF-07	429-038	0	9	(<0.1)
Bird Rock	MO-362-03	454-006	1,340	2,651	(3.2)
Guillemot Island Area	MO-362-06	454-023	0	554	(0.7)
Pinnacle Point Area	MO-362-07	454-007	200	H	(0.0)
Bird Island	MO-362-09	454-009	4,200	6,151	(7.3)
Castle Rocks and Mainland	MO-362-19	454-010	18	750	(0.9)
Hurricane Point Rocks	MO-362-20	454-011	444	29	(<0.1)
Cooper Point and Islands	MO-360-03	454-031	72	37	(<0.1)
Pfeiffer Point	MO-360-04	454-032	6	H	(0.0)
Grimes Point	MO-360-06	454-033	16	196	(0.2)
Lafler Rock and Mainland	MO-360-07	454-034	12	235	(0.3)
Torre Canyon Rocks	MO-360-08	454-013	125	H	(0.0)
Partington Ridge North	MO-360-10	454-014	910	172	(0.2)
McWay Rocks	MO-360-11	454-015	20	106	(0.1)
Partington Ridge South	MO-360-12	454-035	0	15	(<0.1)
Anderson Canyon Rock	MO-360-13	454-016	H	321	(0.4)
Burns Creek Rocks	MO-360-14	454-017	348	323	(0.4)
Dolan Rock	MO-360-16	454-018	100	H	(0.0)
Square Black Rock	MO-360-18	454-019	H	H	(0.0)
Lopez Rock	MO-360-21	454-020	H	114	(0.1)
Rockland Landing North	MO-360-23	454-037	16	7	(<0.1)
Plaskett Rock	MO-354-07	477-002	H	849	(1.0)
Cape San Martin	MO-354-08	477-003	680	750	(0.9)
Unnamed Rock	MO-354-09	477-004	H	275	(0.3)
Redwood Gulch Rock	MO-354-12	477-005	478	372	(0.4)
Unmapped Island	MO-354-14	477-019	0	31	(<0.1)
La Cruz Rock	SL-354-04	477-006	0	678	(0.8)
Piedras Blancas Island	SL-352-01	477-007	1,200	2,627	(3.1)
Morro Rock and Pillar Rock	SL-352-07	477-026	0	117	(0.1)
Pup Rock and Adjacent Mainland	SL-350-04	477-028	0	1,309	(1.6)
Lion Rock	SL-350-05	477-011	100[2]	277	(0.3)
Diablo Rock and Adjacent Mainland	SL-350-06	477-029	212	15	(<0.1)
Diablo Canyon Nuclear Power Plant South	SL-350-07	477-030	100	H	(0.0)
Pecho Rock	SL-350-09	477-032	148	321	(0.4)
(Subtotal)			42,251	38,529	
<u>Southern California</u>					
Point Bennett	SB-SNI-01	501-014	54	2,191	(2.6)
Castle Rock	SB-SNI-02	501-005	1,832	4,316	(5.1)
Richardson Rock	SB-SNI-03	501-026	0	17	(<0.1)
Northwest San Miguel Island	SB-SNI-04	501-027	0	31	(<0.1)
Harris Point to Cuyler Harbor	SB-SNI-06	501-015	10	3	(<0.1)
Prince Island	SB-SNI-07	501-004	1,814	3,522	(4.2)
Hoffman Point Area	SB-SNI-08	501-029	0	14	(<0.1)
Bay Point Area	SB-SNI-09	501-016	0	5,606	(6.7)
Sandy Point	SB-SRI-10	501-033	X	241	(0.3)
Northwest Santa Rosa Island	SB-SRI-02	501-034	X	823	(1.0)
Brockway Point Area	SB-SRI-03	501-035	X — 1,400[6]	H	(0.0)
Canada Verde to Santa Rosa Island W Base	SB-SRI-04	501-036	X	2,030	(2.4)
Carrington Point	SB-SRI-05	501-037	X	1,547	(1.8)
Sierra Pablo Area	SB-SRI-09	501-040	0	3	(<0.1)
South Point Area	SB-SRI-11	501-042	0	3	(<0.1)
Bee Rock Mainland Area	SB-SRI-13	501-044	0	3	(<0.1)
Fraser Point	SB-SZI-01	502-015	X	67	(0.1)
West Point Area	SB-SZI-02	502-016	X — 84[7]	1,299	(1.5)
Profile Point Area	SB-SZI-03	502-017	X	67	(0.1)
Cueva Valdaze Area	SB-SZI-04	502-018	0	45	(0.1)
Coche Point Northeast	SB-SZI-11	502-024	0	20	(<0.1)
Cavern Point Area	SB-SZI-12	502-025	0	34	(<0.1)
Scorpion Anchorage	SB-SZI-13	502-026	0	3	(<0.1)
San Pedro Point Area	SB-SZI-15	502-027	0	14	(<0.1)
Gull Island	SB-SZI-22	524-001	134	1,591	(1.9)
Anacapa Island-West	VE-ANI-01	502-007	2[2]	60	(0.1)
Anacapa Island-Middle	VE-ANI-02	502-008	4	3	(<0.1)
Shag Rock	SB-SBI-01	524-007	H[4]	6	(<0.1)
Santa Barbara Island	SB-SBI-02	524-008	102	577	(0.7)

Sutil Island	SB-SBI-03	524-009	152	84	(0.1)
Vizcaino Point East	VE-SNI-02	524-023	290[8]	5,089	(6.1)
Cormorant Rock Area	VE-SNI-07	524-028	100[2,8]	H	(0.0)
Ship Rock[4]	LA-CAI-03	524-039	H	H	(0.0)
Bird Rock	LA-CAI-04	524-010	H	H	(0.0)
Castle Rock	LA-CLI-01	524-029	H	H	(0.0)
Bird Rock	LA-CLI-02	524-030	H	H	(0.0)
Northwest Harbor to Wilson Cove	LA-CLI-03	524-031	10	H	(0.0)
Pyramid Cove	LA-CLI-04	524-032	4[4]	H	(0.0)
Lost Point South	LA-CLI-06	524-034	0	56	(0.1)
Mail Point South	LA-CLI-07	524-035	8[9]	H	(0.0)
Seal Cove Area	LA-CLI-08	524-036	26[9]	H	(0.0)
La Jolla		545-009	6	H	(0.0)
(Subtotal)			6,032	29,365	
Total			64,485[10]	83,394	

[1] X, present; P, probably/possibly present; H, historical nesting only; numbers in brackets [ ] were estimates based on historical information.
[2] Recorded during study period; not included in overall total but included in subtotals.
[3] Ainley and Boekelheide (1990) reported a revised estimate of about 19,000 breeding birds. See text.
[4] Not included in Sowls et al. (1980).
[5] Formerly included in "Greyhound Rock to Davenport" (429-035) in Sowls et al. (1980)
[6] Formerly included in "Sandy Point to Carrington Point" (501-007) in Sowls et al. (1980).
[7] Formerly included in "Kinton Point to Diablo Point" (502-014) in Sowls et al. (1980).
[8] Formerly included in "San Nicolas Island" (524-011) in Sowls et al. (1980).
[9] Formerly included in "Seal Cove to Lost Point" (524-013) in Sowls et al. (1980), who reported 30 birds for this colony. Data from Hunt et al. (1979).
[10] This total excluded 1,126 breeding birds (see footnote 2). Sowls et al. (1980) reported a total of 64,210 breeding birds.

PELAGIC CORMORANT

Pelagic Cormorants occur all along the coasts of the North Pacific. They are ubiquitous along the California coast, reaching the southern end of their breeding range at Santa Barbara Island, Santa Barbara County. Occasional nesting also has been reported just south of the Mexico border at Islas Los Coronados (Jehl 1977). These cormorants nest exclusively on cliffs (Seigel-Causey and Hunt 1976) and usually in small colonies of less than 100 breeding birds. These small colonies are scattered along the coast often in inconspicuous locations and can be difficult to detect. Numbers can vary substantially within the breeding season due to nest failures and different breeding phenologies at different subcolonies or between colonies. This may result in part from the use of different colony or subcolony sites in different years or sites may be switched within the breeding season after colony abandonment earlier in the same season (Sowls et al. 1980, Carter et al. 1984). In addition, numbers can vary considerably between years depending on oceanographic conditions that affect prey resources, especially ENSO (El Nino-Southern Oscillation) events (Ainley and Boekelheide 1990).

In 1989-1991, we focused mainly on detecting all colonies present by: 1) carefully surveying every section of coastline with potential habitat using a Zodiac inflatable boat which allowed access to all areas, including coves and sea caves; and 2) conducting surveys early in the breeding season such that colonies would be detected before possible colony abandonments occurred. However, we usually were unable to repeat nest counts to obtain peak counts at most colonies, except in Del Norte and Humboldt counties in northern California. Since different colonies and/or subcolonies can have different phenologies, single censuses can also result in minimal estimates of numbers of breeding birds. This approach was similar to techniques used to survey Pelagic Cormorants in northern and central California in 1979-1980 (Sowls et al. 1980) except that these previous surveys were conducted later in the year and some colonies were examined in 2 years. Previous surveys in southern California in 1975-1978 were conducted from a larger boat (which did not allow the same careful coverage of coastal areas), were conducted later in the season and some colonies were examined over several years (Hunt et al. 1979). In addition, it was not clear how previous nest counts were adjusted to derive population estimates.

In 1989-1991, we used correction factors to adjust nest counts and derive breeding population estimates. However, Pelagic Cormorants underwent nest failures at the South Farallon Islands in 1989 (Emslie and Sydeman 1989) whereas there was little evidence of nest failures at other colonies in northern and central California, at least at the time colonies were surveyed. Thus, correction factors derived from data collected

at the South Farallon Islands were not considered to be appropriate for application to other colonies. Instead, we applied correction factor values determined for Brandt's Cormorants (which did not undergo extensive nest failures in 1989 [Emslie and Sydeman 1989]) to minimally adjust nest counts of Pelagic Cormorants south of Humboldt County in northern California and throughout central and southern California. Data from southern California in 1991 (Table 4) indicated that correction factors for Brandt's and Pelagic cormorants were similar in a year of high nesting success for both species. In Del Norte and Humboldt counties in northern California, we surveyed many colonies several times in 1989 and were better able to adjust nest counts in this area using higher correction factors derived from these data (see methods). However, we did not consider the application of these correction factors south of this area to be appropriate.

Due to these difficulties, breeding population estimates in 1989-1991 and 1975-1980 were not directly comparable and any comparisons must be treated with caution. For this reason, we have examined changes in numbers only by combining many colonies over large sections of coast.

Northern California

In 1989, 8,400 breeding birds were estimated at 102 active colonies (including 486 breeding birds at 14 newly-discovered colonies) (Figure 28, Table 21). This total corresponded to 18% lower numbers overall than in 1979-1980 (N=10,224 breeding birds) and 23% lower numbers at 104 colonies known previously (including 3 colonies inactive in 1979-1980). In Del Norte and Humboldt counties (USFWS Map Block 325), a different pattern emerged than elsewhere in Northern California. Here, 3,192 breeding birds were estimated at 33 active colonies (including 99 breeding birds at 6 new colonies). This total corresponded to 16% higher numbers overall than in 1979-1980 (N=2,742 breeding birds) and 13% higher numbers at 39 colonies known previously (including 2 colonies inactive in 1979-1980). At 11 large colonies (100-400 breeding birds) in 1979-1980, 4 colonies had lower numbers (Range=54-98%) and 7 colonies had higher numbers (Range=5-137%). Three of the 4 colonies with lower numbers were censused in late June-July 1989 and nest counts were not adjusted whereas the 7 colonies with higher numbers were censused mainly in late May and were adjusted with the higher correction factor used for this area. Some adjustment probably was required for the late June-July counts but an appropriate correction factor was not available. Thus, these estimates were somewhat low. At 26 small colonies (<100 breeding birds) in 1979-1980, 8 colonies had lower numbers, 8 colonies had higher numbers and 10 colonies were not detected in 1989. All 6 new colonies were small. No nests were observed at the large Cormorant Hotel colony which contained 280

breeding birds in 1979. This colony was located near the twon of Shelter Cove. In 1989, newly-built homes occurred along the cliff tops there, including one house with a large spot light shining on the colony area at night. Thus, this colony may have been abandoned due to human disturbance.

In Mendocino, Sonoma and northern Marin counties (USFWS Map Blocks 379 and 404), 5,208 breeding birds were estimated at 69 active colonies (including 387 breeding birds at 8 newly-discovered colonies). This total corresponded to 30% lower numbers overall than in 1979-1980 (N=7,482 breeding birds) and 36% lower numbers at 65 colonies known previously (including 1 colony inactive in 1979-1980). At 27 large colonies (100-436 breeding birds) in 1979-1980, 24 colonies had lower numbers (Range=4-95%), 1 colony was the same size, and 2 colonies had slightly higher numbers (Range=5-8%). At 37 small colonies (<100 breeding birds) in 1979-1980, 18 had lower numbers, 15 had higher numbers and 4 colonies were not detected in 1989. Seven of 8 new colonies were small but 183 breeding birds were estimated at the Sea Lion Rocks to Arena Cove colony. This large new colony probably was missed in previous surveys. Colonies in this part of northern California were surveyed during the laying and early incubation period at the South Farallon Islands (Figures 2, 3). Numbers of nests probably had not peaked yet as indicated by greater numbers of birds attending the colony (and attending potential nest sites not included in nest counts) than could be accounted for by nest numbers. This factor and the use of the minimal correction factors from the South Farallon Islands probably led to some underestimation of the breeding population in this area. However, smaller numbers also may have bred in 1989 due to mild ENSO conditions which affected this area and farther south but possibly not areas farther north.

Central California

In 1989, 3,258 breeding birds were estimated at 67 active colonies (including 302 breeding birds at 13 newly-discovered colonies)(Figure 28, Table 21). This total corresponded to 38% lower numbers overall than in 1979-1980 (N=5,264 breeding birds) and 45% lower numbers at 73 colonies known previously (including 1 colony inactive in 1979-1980). At 7 large colonies (100-2,000 breeding birds) in 1979-1980, 5 colonies had lower numbers (Range=46-100%) and 2 colonies had slightly higher numbers (Range=8-14%). At the South Farallon Islands, the largest colony in California, numbers fell from 2,000 in 1972 (Ainley and Lewis 1974) to 800 breeding birds in 1987 (60% lower). Ainley and Boekelheide (1990) mistakenly reported only 1000 breeding birds for 1972 but indicated up to 1,600-1,800 breeding birds in 1979 and 1981. The 1987 estimate was the most current estimate available because birds abandoned nests before the annual census could be conducted in 1988 and 1989 (Emslie and Sydeman 1989) and similar numbers were noted from 1987-1989. Numbers also fell

from 808 to 266 breeding birds (67% lower) at the nearby colony at Point Reyes. Annual monitoring of population size at the South Farallon Islands showed that numbers declined dramatically during the 1982-1983 ENSO event but have increased since then (despite smaller ENSO events in 1986 and 1989) although not back to pre-1983 levels (Ainley et al. 1988, Ainley and Boekelheide 1990). Since this colony constituted 38% of breeding Pelagic Cormorants in central California in 1979-1980, lower numbers here are responsible for much of the lower numbers in central California. At 64 small colonies (<100 breeding birds) in 1979-1980, 25 colonies had lower numbers, 22 colonies had higher numbers and 17 colonies were not detected in 1989. Of 13 new colonies, 12 colonies were small and 198 breeding birds were found nesting on old and new buildings at Cannery Row, near Monterey. Nesting on old buildings was probably missed in earlier surveys although ledges under the newly-constructed Monterey Bay Aquarium were designed to attract nesting seabirds (A. Baldridge, pers. comm.). One colony was discovered in 1990, well within San Francisco Bay at Yerba Buena Island. Pelagic Cormorants were not found nesting here in June 1988 (H. R. Carter, pers. obs.).

Colonies in central California were surveyed during the early incubation period when nest abandonments were occuring on the South Farallon Islands. However, nesting failures were not evident in other areas at this time. In fact, breeding phenology appeared to be earlier at colonies along the mainland coast and large chicks were present at several colonies south of Santa Cruz by mid June 1989. Thus, we apparently surveyed this part of the coast at about the correct time to obtain peak nest counts, barring nest failures. However, as noted above for part of northern California, smaller numbers may have bred in 1989 due to mild ENSO conditions.

Southern California

In 1991, 2,687 breeding birds were estimated at 46 active colonies (including 842 breeding birds at 28 newly-discovered colonies)(Figure 28, Table 21). This total corresponded to 534% higher numbers overall than in 1975-1978 (N=424 breeding birds) and 315% higher numbers at 19 colonies known previously (including 2 colonies inactive in 1975-1978). At 19 colonies known in 1975-1978, 15 colonies had higher numbers, 2 colonies had slightly lower numbers and 1 small colony at Sutil Island was not detected. Of 28 new colonies, 26 colonies were small (<100 breeding birds) but 130 and 112 breeding birds were estimated at South Becher's Bay and San Pedro Point colonies, respectively. Large increases in numbers occurred at many known colonies (e.g., Point Bennett, Castle Rock, Northwest Santa Rosa Island, Brockway Point Area, Canada Verde to Santa Rosa Island W Base, Carrington Point, Anacapa Island [West, Middle and East] and Santa Barbara Island). New colonies were found throughout the Channel Islands

National Park area, especially along the north side of Santa Cruz Island and the south sides of Santa Rosa and San Miguel islands. At Santa Cruz, Santa Barbara and Anacapa islands, most nesting areas were located on cliffs associated with sea cave entrances and occasionally nests extended to the interior walls of caves. These cliffs were nearly vertical and occurred near to the water. Similar colony locations of Pelagic Cormorants were noted in Barkley Sound, British Columbia (Carter et al. 1984).

Because our surveying efforts for this species were much greater than in 1975-1977, it was difficult to determine how much the Pelagic Cormorant population has truly increased in southern California. Increases have been noted since the early 1980's by National Park biologists and other researchers at West and East Anacapa islands (Lewis and Gress 1988; Ingram 1992; F. Gress, unpubl. data). However, 1991 was a year of high nesting success and nesting effort for Pelagic Cormorants in southern California (F. Gress, unpubl. data). Numbers of nests at known colonies were probably much higher than usual and new colonies may have been just established in 1991. Annual monitoring by Channel Islands National Park has begun recently at certain colonies (Ingram 1992).

Summary

The 1989-1991 total of 14,345 breeding birds at 215 active colonies (including 1,630 breeding birds at 55 newly-discovered colonies and 146 breeding birds at 2 known colonies without previous estimates) was similar to the 1975-1980 total of 15,912 breeding birds (Hunt et al. 1979; Sowls et al. 1980; see Table 21). Our total corresponded to 10% lower numbers overall and 21% lower numbers at 196 known colonies with previous estimates. Lower numbers were most evident south of Humboldt County in northern California and in central California, particularly at the South Farallon Islands. In the former areas, peak nest counts were not obtained and nest counts were not fully adjusted to derive actual breeding population size in 1989. Better data were available in Del Norte and Humboldt counties in northern California, permitting better adjustment of nest counts, such that this area indicated slightly higher numbers overall. In southern California, higher numbers were obtained largely through greater survey effort than in 1975-1978 combined with increased numbers of breeding birds. Large numbers of new colonies in northern and central California (n=27) were matched by large numbers of inactive colonies in this area (n=31). This pattern probably resulted from the use of several colony sites over a series of years as well as more thorough censuses in certain areas in 1989.

While ENSO clearly affected the South Farallon Islands' colony in 1982-1983, 1986 and 1989 (as well as during the 1970's), impacts probably were less severe at mainland colonies

throughout northern and central California. Pelagic Cormorants at the South Farallon Islands feed extensively on juvenile rockfish (Sebastes sp.), a pelagic prey resource which occurs farther offshore and in the vicinity of this colony during the breeding season (Ainley and Boekelheide 1990). The effects of ENSO on juvenile rockfish are probably much greater than on other bottom-dwelling nearshore prey resources that Pelagic Cormorants probably used at mainland colonies. Thus, we do not consider lower numbers in northern and central California to have resulted mainly from ENSO-related declines. Instead, we believe that lower numbers mainly reflected our difficulty in properly adjusting single counts of nests to derive population estimates. Further work is also required to examine previous data to determine comparability with 1989-1991 estimates. Most previous estimates in northern and central California were derived using data collected in 1979. At the South Farallon Islands, Pelagic Cormorants had high breeding success and nesting effort in 1979 (Ainley and Boekelheide 1990). Thus, larger numbers of birds may have nested at other colonies as well. However, without multiple censuses in a given year and/or annual monitoring, it will be difficult to interpret population changes in this species in any case. An annual monitoring program should be instigated and methods developed to measure changes in population size at selected colonies along the coast and to develop adequate correction factors to adjust nest counts from colonies surveyed less frequently.

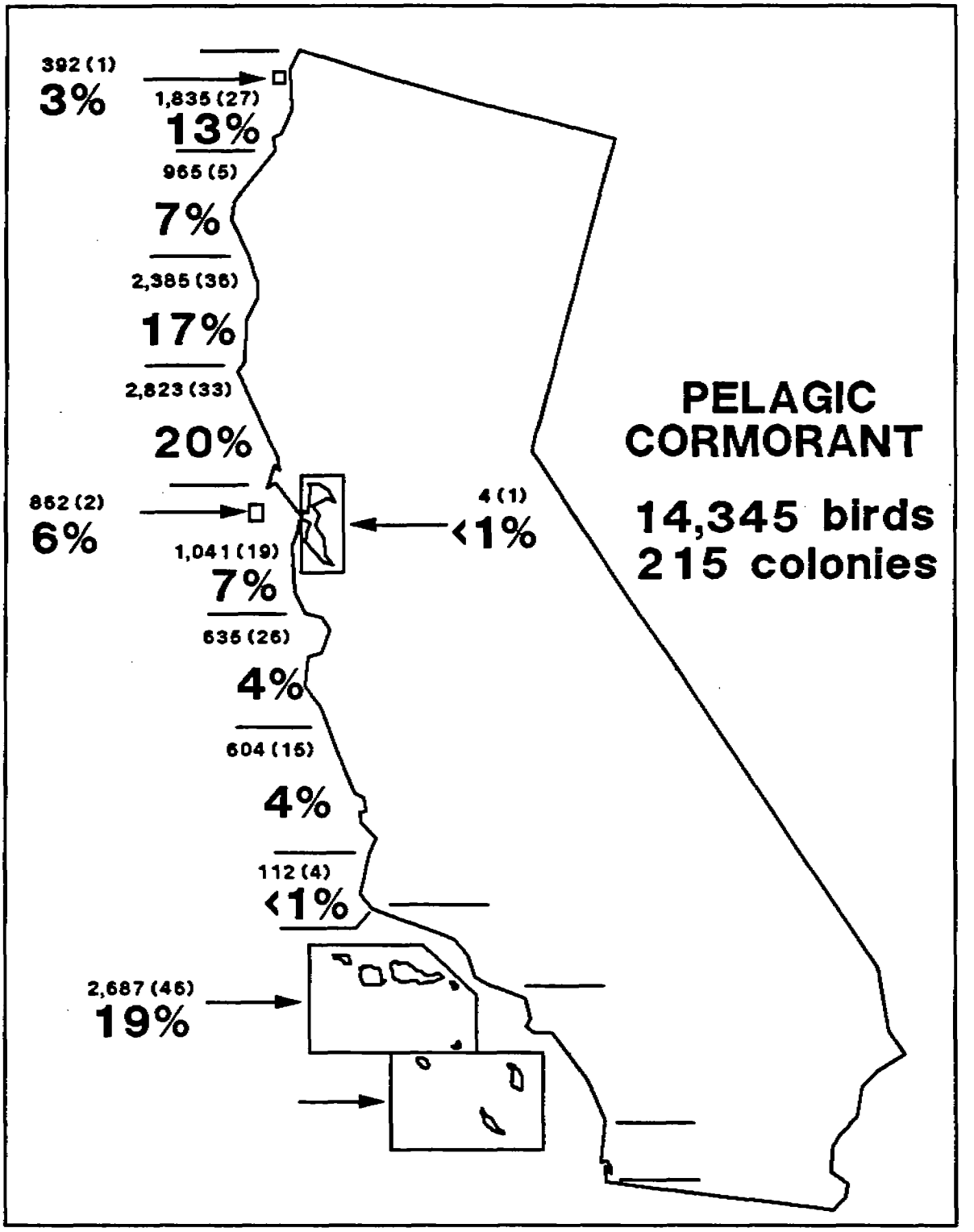


Figure 28. Percentage of state breeding population of Pelagic Cormorant in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 21. Numbers of breeding Pelagic Cormorants at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds (Percent) 1975-1980			1989-1991[1]	
Northern California							
Cone Rock	DN-414-01	325-001	0	(	)	31	(0.2)
Hunter Rocks	DN-414-02	325-002	122	(	)	56	(0.4)
Prince Island	DN-414-03	325-003	146	(	)	346	(2.4)
Point Saint George Lighthouse	DN-414-04	325-044	12	(	)	134	(0.9)
Point Saint George	DN-414-05	325-057	14	(	)	20	(0.1)
Castle Rock	DN-414-06	325-006	340	(	)	392	(2.7)
Tolowa Rocks	DN-414-07	325-007	92	(	)	70	(0.5)
"Crescent City Harbor Area"	DN-414-09	325-045	2	(	)	10	(0.1)
Unnamed Small Rocks	DN-414-10	325-046	66	(	)	96	(0.7)
Easy Triangle Rocks	DN-414-11	325-047	54	(	)	38	(0.3)
Rock R [Humpback Rock]	DN-412-01	325-048	10	(	)	H	(0.0)
Sister Rocks	DN-412-02	325-009	22	(	)	H	(0.0)
Midway Point to Damnation Creek	DN-412-03	325-059	0	(	)	10	(0.1)
Last Chance Rock	DN-412-04	325-049	40	(	)	34	(0.2)
Footsteps Rock	DN-412-05	325-050	36	(	)	154	(1.1)
Wilson Rock	DN-412-06	325-050	2	(	)	H	(0.0)
False Klamath Rock	DN-412-07	325-010	110	(	)	115	(0.8)
Radar Station Rocks	DN-412-09	325-051	34	(	)	29	(0.2)
Flint Rock Head	DN-412-10	325-011	[4]	(	)	34	(0.2)
White Rock	DN-412-11	325-012	12	(	)	10	(0.1)
Redding Rock	HU-412-01	325-013	0	(	)	6	(<0.1)
Dry Lagoon Cliffs	HU-410-01	325-063	0	(	)	10	(0.1)
Cormorant Rock	HU-410-02	325-015	14	(	)	H	(0.0)
Wedding Rock	HU-410-03	325-016	0	(	)	25	(0.2)
Palmer's Point to Scotty Point	HU-410-04	325-052	100	(	)	209	(1.5)
Sea Gull Rock	HU-410-05	325-017	106	(	)	2	(<0.1)
Scotty Point to Megwil Point	HU-410-06	325-053	134	(	)	206	(1.4)
Sea Lion Rock	HU-410-07	325-018	36	(	)	24	(0.2)
White Rock	HU-410-08	325-019	70	(	)	22	(0.2)
Green Rock	HU-410-09	325-020	48	(	)	4	(<0.1)
Puffin Rock	HU-410-10	325-021	8	(	)	H	(0.0)
Little Pewetole Rock	HU-410-11	325-022	[4]	(	)	H	(0.0)
Flatiron Rock	HU-410-13	325-023	4	(	)	H	(0.0)
Trinidad Head	HU-410-15	325-025	202	(	)	68	(0.5)
Blank Rock	HU-410-14	325-024	6[2]	(	)	H	(0.0)
Pilot Rock	HU-410-16	325-026	8	(	)	H	(0.0)
Prisoner Rock	HU-410-17	325-027	H	(	)	H	(0.0)
Trinidad Bay Rocks	HU-410-18	325-054	22	(	)	72	(0.2)
Little River Rock	HU-410-19	325-035	12	(	)	H	(0.0)
False Cape Rocks	HU-402-01	325-040	170	(	)	240	(1.7)
Sugarloaf Island	HU-402-02	325-041	[400]	(	)	627	(4.4)
Steamboat Rock	HU-402-03	325-042	H	(	)	H	(0.0)
Three Brothers and Hair Seal Rocks	HU-400-01	325-055	6	(	)	19	(0.1)
Sea Lion [Gulch] Rock	HU-400-02	325-043	0	(	)	17	(0.1)
Cormorant Hotel	HU-400-03	325-056	280	(	)	62	(0.4)
Point No Pass	ME-394-01	379-011	68	(	)	26	(0.2)
High Tip	ME-394-02	379-012	80	(	)	81	(0.6)
Anderson Cliffs	ME-394-03	379-013	132	(	)	7	(<0.1)
Mistake Point to Big White Rock	ME-394-04	379-014	132	(	)	53	(0.4)
Usal Bay	ME-394-05	379-015	62	(	)	11	(0.1)
Soldier Frank Point	ME-394-06	379-016	18	(	)	9	(0.1)
Rockport Rocks	ME-394-07	379-001	250	(	)	91	(0.6)
Cape Vizcaino	ME-394-08	379-002	120	(	)	70	(0.5)
Chris Rocks	ME-394-09	379-003	54	(	)	18	(0.1)
Hardy Rock and Union Landing	ME-394-10	379-017	46	(	)	31	(0.2)
Westport	ME-392-01	379-018	178	(	)	128	(0.9)
Chadbourne Rocks	ME-392-02	379-019	74	(	)	2	(<0.1)
Strawberry Cove	ME-392-03	379-020	84	(	)	55	(0.4)
Kibesillah Rock	ME-392-04	379-004	92	(	)	57	(0.4)

Newport Rocks	NE-392-05	379-021	192	(	)	57	(0.4)
Georgia Pacific	NE-392-06	379-022	32	(	)	37	(0.3)
Noyo Bay	NE-392-07	379-035	0	(	)	66	(0.5)
Mitchell Creek to Casper Point	NE-392-08	379-036	0	(	)	57	(0.4)
Casper Anchorage	NE-392-09	379-023	58	(	)	29	(0.2)
Casper Anchorage to Point Cabrillo	NE-392-10	379-037	0	(	)	13	(0.1)
Point Cabrillo Lighthouse-Jack Peters Gulch	NE-392-11	379-024	192	(	)	185	(1.3)
Goat Island Area	NE-390-01	379-006	134	(	)	119	(0.8)
Mendocino	NE-390-02	379-025	52	(	)	29	(0.2)
Mendocino Bay	NE-390-03	379-026	86	(	)	35	(0.2)
Mendocino Bay South	NE-390-04	379-038	0	(	)	15	(0.1)
Van Damme Cove	NE-390-05	379-027	26	(	)	68	(0.5)
Schoolhouse Creek to Albion River	NE-390-06	379-028	436	(	)	279	(1.9)
Albion Cove to Navarro River	NE-390-07	379-029	266	(	)	121	(0.8)
Devil's Basin	NE-390-08	379-007	132	(	)	70	(0.5)
Cavanaugh Cove to Gunderson Rock	NE-390-09	379-030	410	(	)	156	(1.1)
Wharf Rocks	NE-390-10	379-008	90	(	)	11	(0.1)
Casket Rock	NE-390-11	379-009	2[2]	(	)	H	(0.0)
Bonee Cliffs	NE-390-12	379-031	176	(	)	176	(1.2)
White Rock	NE-390-13	379-010	H	(	)	18	(0.1)
333 Point	NE-390-14	379-032	100	(	)	108	(0.8)
Bridgeport Landing	NE-390-15	379-033	16	(	)	73	(0.5)
Mallo Pass Creek	NE-390-16	379-034	20	(	)	24	(0.2)
Point Arena	NE-384-01	404-017	28	(	)	154	(1.1)
Sea Lion Rock	NE-384-02	404-001	6	(	)	106	(0.7)
Sea Lion Rocks to Arena Cove	NE-384-03	404-042	0	(	)	183	(1.3)
Moat Cove	NE-384-04	404-018	40	(	)	H	(0.0)
Section 30 Cove	NE-384-05	404-019	30	(	)	42	(0.3)
Saunders Landing	NE-384-06	404-020	174	(	)	20	(0.1)
Iverson Point	NE-384-07	404-002	96	(	)	42	(0.3)
Triplett Gulch	NE-384-08	404-021	390	(	)	119	(0.8)
Fish Rock Cove	NE-384-09	404-022	54	(	)	33	(0.2)
Fish Rocks	NE-384-10	404-003	400	(	)	123	(0.9)
Collins Landing to Gualala River	NE-384-11	404-023	368	(	)	187	(1.3)
Gualala Point Island	SO-384-01	404-004	0	(	)	4	(<0.1)
Delmar Point	SO-384-02	404-024	12	(	)	9	(0.1)
Sea Ranch	SO-384-03	404-025	164	(	)	84	(0.6)
Black Point to Stewart's Point	SO-384-04	404-026	54	(	)	40	(0.3)
Stewart's Point to Rocky Point	SO-382-01	404-027	76	(	)	66	(0.5)
Horseshoe Cove	SO-382-02	404-028	50	(	)	121	(0.8)
Cannon Gulch to Stump Beach	SO-382-03	404-029	124	(	)	79	(0.6)
Gerstle Cove to Stillwater Cove	SO-382-04	404-030	86	(	)	110	(0.8)
Bench Mark 125 to Timber Cove	SO-382-05	404-031	74	(	)	62	(0.4)
Windermere Point to Jewell Gulch	SO-382-06	404-043	0	(	)	40	(0.3)
Northwest Cape Rocks	SO-382-07	404-032	20	(	)	H	(0.0)
Russian Gulch	SO-382-08	404-033	336	(	)	227	(1.6)
Russian River Rocks	SO-382-09	404-005	88	(	)	125	(0.9)
Arched Rock	SO-382-11	404-006	0	(	)	9	(0.1)
Peaked Hill	SO-382-12	404-034	156	(	)	44	(0.3)
Gull Rock	SO-382-13	404-035	16	(	)	44	(0.3)
Shell-Wrights Beach Rocks	SO-382-14	404-036	112	(	)	55	(0.4)
Duncans's Point to Arched Rock	SO-382-15	404-037	70	(	)	136	(0.9)
Bodega Head	SO-380-01	404-038	168	(	)	103	(0.7)
Pinnacle Rock	SO-380-04	404-039	4	(	)	51	(0.4)
Sonoma-Marin County Line	MA-380-01	404-040	134	(	)	84	(0.6)
Dillon Beach Rocks	MA-380-02	404-009	186	(	)	143	(1.0)
Tomales Point	MA-380-03	404-011	134	(	)	141	(1.0)
Bird Rock	MA-380-04	404-010	8	(	)	37	(0.3)
Elephant Rock Complex	MA-380-05	404-041	16	(	)	H	(0.0)
(Subtotal)			10,224			8,400	
<u>Central California</u>							
Point Reyes	MA-374-01	429-001	808	(	)	266	(1.9)
Point Resistance	MA-374-03	429-024	104	(	)	H	(0.0)
Millers Point Rocks	MA-374-04	429-002	60	(	)	59	(0.4)
Double Point	MA-374-05	429-003	16	(	)	9	(0.1)
Gull Rock Area	MA-374-07	429-025	28	(	)	9	(0.1)
Muir Beach Headlands to Tennessee Cove	MA-374-08	429-026	34	(	)	42	(0.3)

Point Bonita	MA-374-10	429-008	60	( )		95	(0.7)
Bonita Cove	MA-374-11	429-027	20	( )		2	(<0.1)
Point Diablo Bluffs and Needles	MA-374-12	429-028	64	( )		15	(0.1)
North Farallon Islands	SF-FAI-01	429-051	ND	( )		62	(0.4)
South Farallon Islands	SF-FAI-02	429-052	[2,000]	( )		800[3]	(5.6)
Mori Point	SM-372-01	429-046	0	( )		31	(0.2)
San Pedro Rock	SM-372-02	429-013	8	( )		7	(<0.1)
Devil's Slide Rock	SM-372-03	429-014	180	( )		46	(0.3)
Pillar Point	SM-372-04	429-030	16	( )		5	(<0.1)
Eel Rock Cliffs	SM-372-05	429-031	12	( )		9	(0.1)
Seal Rock Cliffs	SM-372-06	429-032	108	( )		123	(0.9)
Martin's Beach	SM-372-07	429-033	100	( )		108	(0.8)
Ano Nuevo Island	SM-370-04	429-023	10	( )		13	(0.1)
Punta del Ano Nuevo	SM-370-05	429-022	210	( )		114	(0.8)
Greyhound Rock to El Jarro Point	SC-370-01	429-049	ND	50[4]	( )	66	(0.5)
El Jarro Point to Davenport	SC-370-02	429-050	ND			22	(0.2)
Yerba Buena Island	SFB-SF-07	429-038	0	( )		4	(<0.1)
Davenport to Sand Hill Bluff	SC-364-01	454-038	ND			13	(0.1)
Sand Hill Bluff to Needle Rock Point	SC-364-02	454-039	ND	28[5]	( )	2	(<0.1)
Needle Rock Point to Terrace Point	SC-364-03	454-040	ND			31	(0.2)
Cannery Row	MO-362-02	454-044	0	( )		198	(1.4)
North Carmel Bay	MO-362-04	454-045	0	( )		9	(0.1)
Guillemot Island Area	MO-362-06	454-023	14	( )		20	(0.1)
Pinnacle Point Area	MO-362-07	454-007	22	( )		33	(0.2)
Sand Hill Cove Area	MO-362-08	454-008	36	( )		18	(0.1)
Bird Island	MO-362-09	454-009	16	( )		4	(<0.1)
Carmel Highlands	MO-362-10	454-046	0	( )		2	(<0.1)
Yankee Point South	MO-362-12	454-047	0	( )		7	(<0.1)
Soberanes Creek Rocks	MO-362-13	454-026	30	( )		46	(0.3)
Soberanes Point South	MO-362-15	454-027	2	( )		7	(<0.1)
Rocky Point	MO-362-17	454-028	6	( )		N	(0.0)
Bench Mark-227X	MO-362-18	454-029	68	( )		35	(0.2)
Castle Rocks and Mainland	MO-362-19	454-010	96	( )		46	(0.3)
Hurricane Point Rocks	MO-362-20	454-011	50	( )		N	(0.0)
Point Sur	MO-360-01	454-012	54	( )		33	(0.2)
Molera Rock	MO-360-02	454-030	26	( )		N	(0.2)
Cooper Point and Islands	MO-360-03	454-031	20	( )		18	(0.1)
Pfieffer Point	MO-360-04	454-032	4	( )		9	(0.1)
Wreck Beach South	MO-360-05	454-049	0	( )		11	(0.1)
Grimes Point	MO-360-06	454-033	20	( )		N	(0.0)
Lafler Rock and Mainland	MO-360-07	454-034	6	( )		4	(<0.1)
Torre Canyon Rocks	MO-360-08	454-013	22	( )		15	(0.1)
Partington Ridge North	MO-360-10	454-014	26	( )		2	(<0.1)
Partington Ridge South	MO-360-12	454-035	20	( )		N	(0.0)
Anderson Canyon Rocks	MO-360-13	454-016	82	( )		26	(0.2)
Bench Mark 223	MO-360-17	454-052	0	( )		11	(0.1)
Bench Mark 247	MO-360-20	454-036	6	( )		N	(0.0)
Rockland Landing North	MO-360-23	454-037	64	( )		33	(0.2)
Rockland Landing	MO-360-24	454-055	0	( )		2	(<0.1)
36 North	MO-354-02	477-013	6	( )		N	(0.0)
Larus Rock	MO-354-03	477-014	2	( )		N	(0.0)
Unnamed Point	MO-354-04	477-015	6	( )		N	(0.0)
Small Rocks & Mainland N.E. of Plaskett Rk.	MO-354-06	477-001	42	( )		2	(<0.1)
Plaskett Rock	MO-354-07	477-002	10	( )		N	(0.0)
Cape San Martin	MO-354-08	477-003	26	( )		18	(0.1)
Unnamed Rock	MO-354-09	477-004	2	( )		N	(0.0)
Mainland Point across from Bird Rock	MO-354-10	477-016	38	( )		26	(0.2)
Point North of Redwood Gulch	MO-354-11	477-017	26	( )		2	(<0.1)
Seastack South of Redwood Gulch	MO-354-13	477-018	16	( )		9	(0.1)
Unmapped Island	MO-354-14	477-019	56	( )		N	(0.0)
Salmon Creek	MO-354-15	477-020	12	( )		N	(0.0)
Arched Peninsula South of Salmon Creek	MO-354-16	477-021	8	( )		24	(0.2)
Ragged Point Lodge Colony	MO-354-01	477-022	46	( )		N	(0.0)
3 Rocks	SL-354-03	477-023	38	( )		48	(0.3)
Two Rocks South of Point Piedras Blancas	SL-352-03	477-024	0	( )		7	(<0.1)
Morro Rock and Pillar Rock	SL-352-07	477-026	40	( )		53	(0.4)
Point Buchon	SL-350-02	477-009	4	( )		48	(0.3)
Unnamed Rocks	SL-350-03	477-010	64	( )		174	(1.2)
Lion Rock	SL-350-05	477-011	N	( )		N	(0.0)

Diablo Rock and Adjacent Mainland	SL-350-05	477-029	16	( )	H	(0.0)
Diablo Canyon Nuclear Power Plant South	SL-350-07	477-030	82	( )	114	(0.8)
Double Rock Region	SL-350-08	477-031	16	( )	18	(0.1)
Shell Beach Rocks	SL-350-13	477-035	4	( )	H	(0.0)
Fossil Point	SL-350-12	477-034	44	( )	46	(0.3)
North Pismo Beach Rocks	SL-350-14	477-036	18	( )	15	(0.1)
Mussel Point	SB-344-02	501-017	0	( )	9	(0.1)
Lion Rock	SB-344-04	501-008	0	( )	4	(<0.1)
Purisima Point South	SB-344-09	501-021	0	( )	7	(<0.1)
Point Arguello	SB-342-04	501-011	30	( )	92	(0.6)
Point Conception	SB-342-06	501-013	6	( )	H	(0.0)
(Subtotal)			5,264		3,258	
<u>Southern California</u>						
Point Bennett	SB-SMI-01	501-014	24	( )	174	(1.2)
Castle Rock	SB-SMI-02	501-005	50	( )	106	(0.7)
Northwest San Miguel Island	SB-SMI-04	501-027	0	( )	51	(0.4)
Simonton Cove	SB-SMI-05	501-028	0	( )	2	(<0.1)
Harris Point to Cuyler Harbor	SB-SMI-06	501-015	124	( )	196	(1.4)
Prince Island	SB-SMI-07	501-004	40	( )	44	(0.3)
Hoffman Point Area	SB-SMI-08	501-029	X		15	(0.1)
Bay Point Area	SB-SMI-09	501-016	X	52[6] ( )	24	(0.2)
Cardwell Point West	SB-SMI-10	501-030	0	( )	46	(0.3)
Crook Point to Tyler Bight	SB-SMI-11	501-031	0	( )	15	(0.1)
Tyler Bight to Adam's Cove	SB-SMI-12	501-032	0	( )	18	(0.1)
Sandy Point	SB-SRI-01	501-033	30[6]	( )	24	(0.2)
Northwest Santa Rosa Island	SB-SRI-02	501-034	P[6]	( )	84	(0.6)
Brockway Point Area	SB-SRI-03	501-035	X		108	(0.8)
Caneda Verde to Santa Rosa Island W Base	SB-SRI-04	501-036	X	42[7] ( )	444	(3.1)
Carrington Point	SB-SRI-05	501-037	X		198	(1.4)
North Becher's Bay	SB-SRI-06	501-038	0	( )	24	(0.2)
South Becher's Bay	SB-SRI-07	501-039	0	( )	130	(0.9)
East Point Area	SB-SRI-08	501-014	0	( )	4	(<0.1)
Sierra Pablo Area	SB-SRI-09	501-040	0	( )	62	(0.4)
Ford Point to Wreck Canyon	SB-SRI-10	501-041	0	( )	24	(0.2)
South Point Area	SB-SRI-11	501-042	0	( )	9	(0.1)
Cluster Point South	SB-SRI-12	501-043	0	( )	4	(<0.1)
Bee Rock Mainland Area	SB-SRI-13	501-044	0	( )	29	(0.2)
Southwest Santa Rosa Island	SB-SRI-14	501-045	0	( )	18	(0.1)
Fraser Point	SB-SZI-01	502-015	50[8]	( )	57	(0.4)
West Point Area	SB-SZI-02	502-016	0	( )	64	(0.4)
Profile Point Area	SB-SZI-03	502-017	N	( )	57	(0.4)
Cueva Valdaze Area	SB-SZI-04	502-018	0	( )	22	(0.2)
Arch Rock to Diablo Point	SB-SZI-05	502-019	0	( )	31	(0.2)
Fry's Harbor to Twin Harbors	SB-SZI-07	502-021	0	( )	9	(0.1)
Prisoner's Harbor Area	SB-SZI-10	502-023	0	( )	2	(<0.1)
Coche Point Northeast	SB-SZI-11	502-024	0	( )	13	(0.1)
Cavern Point Area	SB-SZI-12	502-025	0	( )	15	(0.1)
Scorpion Anchorage	SB-SZI-13	502-026	0	( )	15	(0.1)
Scorpion Rocks	SB-SZI-14	502-010	N	( )	20	(0.1)
San Pedro Point Area	SB-SZI-15	502-027	0	( )	112	(0.8)
Santa Cruz Island Isthmus South	SB-SZI-17	524-016	0	( )	2	(<0.1)
Bowen Point Area	SB-SZI-19	524-018	0	( )	4	(<0.1)
Gull Island	SB-SZI-22	524-001	8[2]	( )	22	(0.2)
Black Point Northwest	SB-SZI-24	502-028	0	( )	15	(0.1)
Anacapa Island-West	VE-ANI-01	502-007	2[2]	( )	146	(1.0)
Anacapa Island-Middle	VE-ANI-02	502-008	4	( )	84	(0.6)
Anacapa Island-East	VE-ANI-03	502-009	0	( )	98	(0.7)
Shag Rock	SB-SBI-01	524-007	0	( )	4	(<0.1)
Santa Barbara Island	SB-SBI-02	524-008	4	( )	42	(0.3)
Sutil Island	SB-SBI-03	524-009	4	( )	N	(0.0)
(Subtotal)			424		2,687	
<u>Total</u>			15,912[9]		14,345	

[1] X, present; P, possibly/probably present; N, historical nesting only; numbers in brackets [ ] were estimates based on historical information.

[2] Found nesting during the study period but not in the latest year surveyed; not included in subtotal or total.
[3] Estimate derived from 1977 data (Emslie and Sydeman 1989).
[4] Formerly included in "Greyhound Rock to Davenport" (429-035) in Sowls et al. (1980).
[5] Formerly included in "Davenport to Point Santa Cruz" (454-021) in Sowls et al. (1980)
[6] Hunt et al. (1979) reported 52 birds between east Cuyler Harbor and Cardwell Point. Sowls et al. (1980) included all birds in Bay Point Area.
[7] Formerly included in "Sandy Point to Carrington Point" (501-007) in Sowls et al. (1980). Data from Hunt et al. (1979).
[8] Formerly included in "Kinton Point to Diablo Point" (502-014) in Sowls et al. (1980). Data from Hunt et al. (1979).
[9] Sowls et al. (1980) reported a total of 15,870 birds.

AMERICAN OYSTERCATCHER

Southern California

In 1991, we observed 3 Black x American Oystercatcher hybrids in the Channel Islands National Park (Figure 30). Hybrids were identified by their white lower belly and vent areas and black mid and upper breast and wings. In all 3 birds, the white underparts were small and difficult to see except on close inspection. At Santa Cruz Island, single hybrids were seen at the Profile Point Area colony (subcolony 04 on Map 184; see Appendix 2) on 6 May and Valley Anchorage to Coches Prietos Anchorage colony (about midway between the anchorages) on 2 May. A single hybrid was seen on 19-20 May at the same location at Anacapa Island-Middle (East Fish Camp; subcolony 17 on Map 199). The latter two birds appeared to be paired with a Black Oystercatcher.

American Oystercatchers have been reported in a number of years on the southern California coast and particularly in the Channel Islands. Evermann (1886) reported that American Oystercatchers were occasionally observed "along the seacoast" of Ventura County in 1879-1881 and he listed them as a breeding species. However, breeding was never fully documented. A female American Oystercatcher with a well-developed egg in its oviduct was collected at Santa Barbara Island on 2 June 1863 (Baird et al. 1884, Grinnell 1915). A single American Oystercatcher was present at Anacapa Island-West from May 1964 until October 1980 (Abbott 1965, Hunt et al. 1979, Garrett and Dunn 1981). From 1-3 birds were recorded as resident at Fraser Point, Santa Cruz Island from November 1966 until 1980 (Garrett and Dunn 1981) and hybrids were first reported there in 1975-1978 (Hunt et al. 1979). Garrett and Dunn (1981) also reported historical records at: Point Loma, San Diego County (1862, 1964-65, 1978); Point Fermin, Los Angeles County (Dec. 1978-Jan. 1979); and at Avila Beach, San Luis Obispo County (1978). Hybridization has indicated that American oystercatchers have bred in the recent past in southern California, at least by pairing with Balck Oystercatchers. Such hybridization has occured regularly in Baja California, Mexico, where American Oystercatchers have occured regularly as far north as Islas Los Coronados (Kenyon 1949, Garrett and Dunn 1981).

BLACK OYSTERCATCHER

Black Oystercatchers breed along the Pacific coast from the Aleutian Islands to central Baja California, Mexico. These shorebirds nested solitarily along rocky shorelines but tend to aggregate in nesting areas used by other seabirds. Thus, they can be censused at the same time although with less effort and emphasis than expended on seabirds, the prime focus of 1989-1991 and previous seabird colony surveys. While this added task has required little additional effort, breeding population estimates of this species usually were not determined well and were the least standardized of all species surveyed. It was often difficult to observe birds and to find their cryptic nests without substantial search effort. Most seabird researchers have recorded numbers of birds seen at potential nesting areas and subjectively derived a breeding population estimate, based on habitat and general coverage. Unfortunately, the number of birds counted was highly dependent on specific search effort expended at each nesting area, how well all coastal areas were searched (especially areas where seabirds did not nest and in habitats where birds were difficult to observe) and the time of day and time in the breeding season when counts were conducted. Most areas were searched very briefly from an inflatable Zodiac boat under variable weather and observing conditions whereas some areas were searched from mainland vantage points or by specific ground searches for nests. Boat counts, in particular, usually resulted in undercounting birds present. In addition, counted birds could have included non-breeding birds and foraging birds away from nesting areas which could lead to misadjusted numbers used to derive estimates and some breeding birds could be misassigned to certain areas where they did not actually breed. Given these census difficulties, breeding population estimates of Black Oystercatchers at most colonies were rough and must be viewed with caution.

Hunt et al. (1979) estimated a total of 242 breeding birds at 17 nesting areas in southern California in 1975-1977 and Sowls et al. (1980) estimated 462 breeding birds at 117 colonies in northern and central California in 1979-1980 (Table 22). In 1989-1991, we focused on carefully searching all coastlines for Black Oystercatchers by inflatable boat (and where possible also by ground counts from vantage points) and carefully recording all birds observed at each subcolony noted (see Appendix 2). This approach allowed for the discovery of several new potential nesting areas but surveys were still brief, numbers recorded were probably low and some nesting areas were probably missed. We used raw counts as breeding population estimates because an adequate correction factor to adjust counts was not available. Although 1989-1991 estimates are minimal, it should be possible to better compare these estimates with future surveys to determine trends.

Northern California

In 1989, 369 breeding birds were estimated at 94 colonies (including 105 breeding birds at 37 newly-discovered colonies)(Figure 29, Table 22). This total corresponded to 63% higher numbers overall than in 1979-1980 (N=226 breeding birds) and 17% higher numbers at 62 colonies known previously. At 61 known colonies with previous estimates, 27 colonies had higher numbers, 26 colonies had lower numbers (including 5 colonies not detected in 1989) and 8 colonies had identical numbers (Table 22). Higher numbers in northern California probably reflected the discovery of many new nesting areas. However, in some areas that may have been well searched (e.g. Crescent City Harbor Area, Sea Ranch, Cannon Gulch to Stump Beach, Shell-Wrights Beach Rocks), large numbers (ranging from 11-20 birds) were found in 1989 where few or no birds were reported in 1979-1980. Thus, Black Oystercatchers may have increased in some areas as well. More work would be required to examine previous estimates and discuss data collection methods in these areas with previous data collectors to determine comparability.

Central California

In 1989-1990, 212 breeding birds were estimated at 60 colonies (including 32 breeding birds at 19 newly-discovered colonies and 5 breeding birds at 3 colonies in San Francisco Bay which was not surveyed in 1979-1980). This total corresponded to 10% lower numbers overall than in 1979-1980 (N=236 breeding birds) and 26% lower numbers at 60 colonies known previously. At 54 known colonies with previous estimates, 38 colonies had lower numbers (including 23 colonies not detected in 1989), 9 colonies had higher numbers and 7 colonies had identical numbers (Table 22).

At the South Farallon Islands, the largest breeding aggregation in California, numbers fell slightly from 40 to 30 breeding birds. In 1989, numbers of breeding birds were determined by regularly searching for nests on visible portions of Southeast Farallon and West End islands from vantage points near the lighthouse on the peak of Southeast Farallon Island. A total of 11 nests were found and 4 nests were added for areas not viewed (Emslie and Sydeman 1989). Ainley and Lewis (1974) counted 52 birds and 20 breeding pairs in 1972 but it was not clear how counts were conducted or how data were handled. Annual censuses have shown that numbers can vary from 30-60 breeding birds (PRBO, unpubl. data) although these estimates have not been completely standardized. Black Oystercatchers disappeared from the South Farallon Islands from the 1860's until the 1950's, presumably as a result of disturbance from humans and domestic animals (Ainley and Lewis 1974). Elevated numbers of marine mammals in recent years may have reduced the amount of nesting

habitat available since they occupy (haul out or raise pups on) the same habitats (Warheit et al. 1984).

At Ano Nuevo Island, the second largest breeding aggregation in California, we counted 27 birds but found only 5 nests during a ground search of all accessible areas (without disturbing marine mammals) on 14 June 1989. Numbers did not appear to have changed here (assuming almost all birds counted were breeding in 1989), despite increased marine mammal numbers there (Warheit et al. 1984). Numbers of breeding birds at several other colonies in California may be as large or larger than found at Ano Nuevo or the South Farallon islands but detailed ground surveys were not conducted at most colonies. In 1989, birds were conspicuously absent from large sections of rocky coast from Rocky Point to Grimes Point, Monterey County (where 26 breeding birds were found previously at 6 colonies), and from Cape San Martin (Monterey County) to Ragged Point Lodge Colony (San Luis Obispo County)(where at least 10 breeding birds were estimated previously at 5 colonies). These parts of the coast are disturbed little by humans and few marine mammals occur there. Lower numbers seemed evident in most of central California. However, Black Oystercatchers recently expanded their distribution into San Francisco Bay where they were first reported breeding at Brooks Island in 1985 and at the Marin Islands in 1988 (Harvey et al. 1992).

Southern California

In 1991, 307 breeding birds were estimated at 58 colonies (including 13 breeding birds at 5 new colonies in the Channel Islands and 13 breeding birds at 2 colonies on the mainland coast which had not been surveyed previously)(Table 22). This total corresponded to 26% higher numbers overall than in 1975-1978 (N=226 breeding birds). It was not possible to determine exactly where birds had been recorded previously because totals were presented mostly for major islands (i.e. not on a colony by colony basis). By combining data for 1991, numbers were 23%, 37%, 70% and 1050% higher at Santa Cruz, Santa Barbara, Anacapa and San Nicolas islands, respectively (Table 22). However, numbers were 2% and 28% lower at San Miguel and Santa Rosa islands, respectively. Only 1-2 pairs still bred at Santa Catalina and San Clemente islands as found in 1975-1978 (Hunt et al. 1979). Higher numbers probably reflected greater survey effort for this species for the most part. However, a rapid increase was reported at San Nicolas Island in the early 1980's (Lindberg et al. 1990). Numbers appered to have declined there by 1991 possibly due to effective loss of nesting habitat due to the expanded numbers of and coastal areas used by marine mammals (Warheit et al. 1984). Lower numbers at Santa Rosa Island require further investigation but may reflect previous overestimation. In 1991, Black Oystercatchers were found nesting along the mainland coast where they nested on artifical habitats

(e.g. breakwaters) at Marina Del Rey and San Pedro Bay. Birds have been reported in these areas in the recent past (Garrett and Dunn 1981).

Hybrid Black-American oystercatchers also were recorded in the Channel Islands in 1991 (see American Oystercatcher account).

Summary

In 1989-1991, 888 breeding birds were estimated at 212 colonies (including at least 150 breeding birds at at least 61 newly-discovered colonies and 18 breeding birds at 5 colonies found in areas not surveyed previously)(Table 22). This total corresponded to 29% higher numbers overall than in 1975-1980 (N=688 breeding birds). However, birds were not detected at 28 known colonies that hosted 76 breeding birds in 1975-1980.

Certainly, higher survey effort resulted in finding new colonies and higher numbers at some known colonies. However, previous estimates are not directly comparable to 1989-1991 estimates (as discussed earlier). For example, all previous bird counts were at least rounded off to represent breeding pairs (Table 22). Even this slight adjustment could add a minimum of 113 breeding birds to our total for California. Bird counts were obtained at several subcolonies and such rounding may have occurred several times at many colonies. More work would be required to examine previous estimates to attempt to account for such differences in data handling. However, 1989-1991 estimates for some colonies may be high where birds moved between different subcolonies which were surveyed well on different days. We included the highest number of birds observed at each subcolony in colony estimates which could have caused double-counting in a few cases. Research is badly needed to develop adequate correction factors for application to such broad-scale surveys of this species to derive more accurate breeding population estimates.

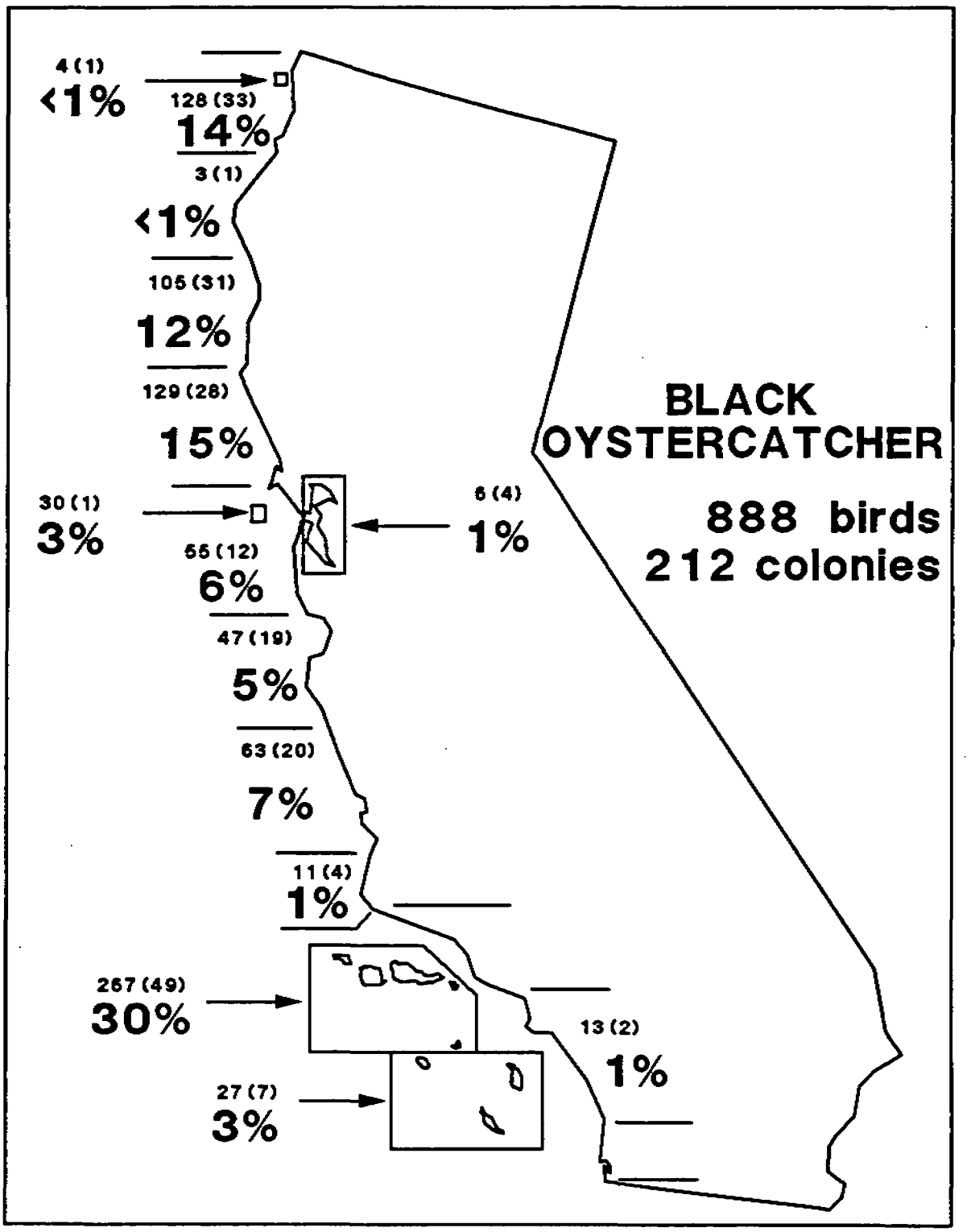


Figure 29. Percentage of state breeding population of Black Oystercatcher in coastal regions of California, 1989-1991. Symbols as in Figure 19.

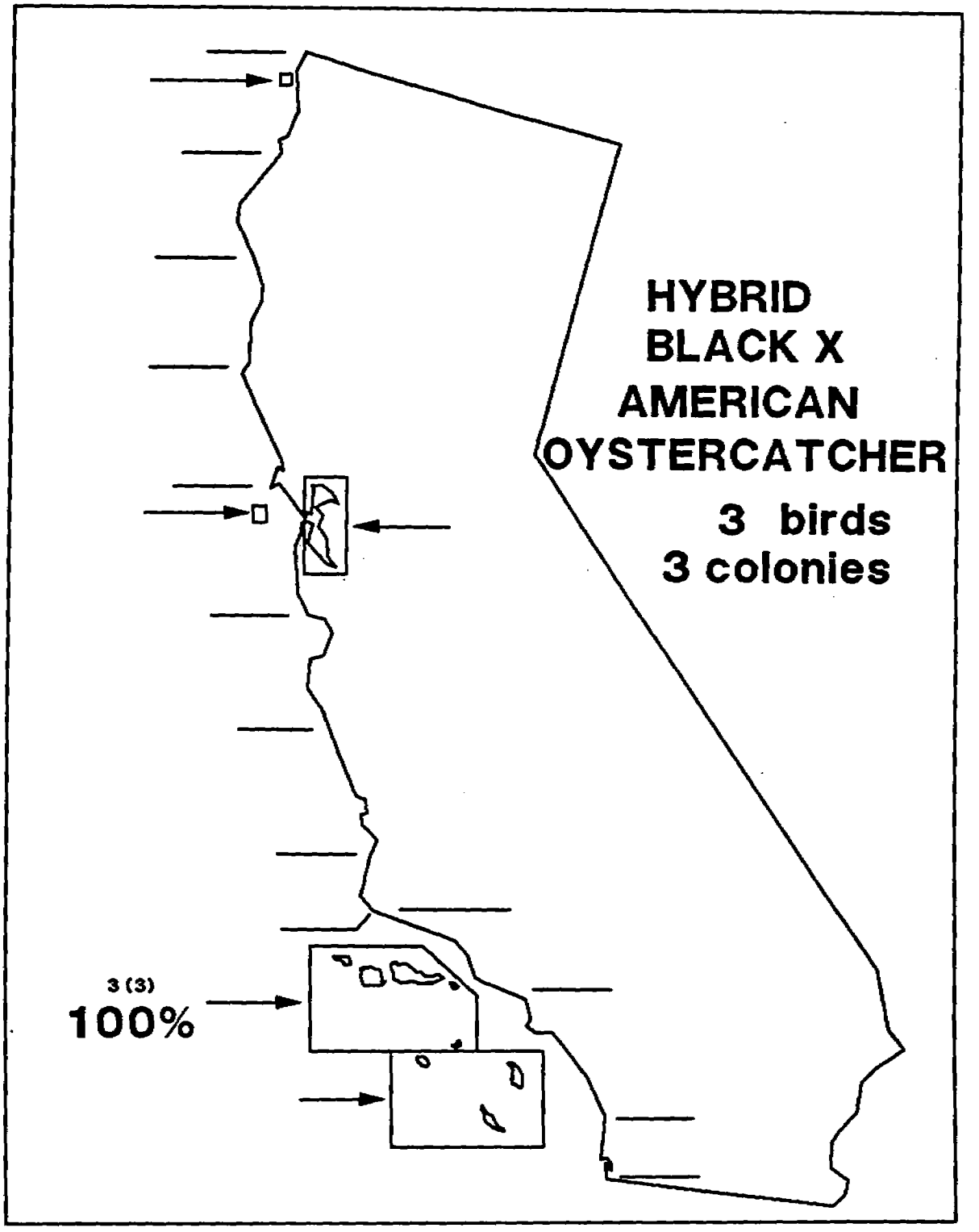


Figure 30. Percentage of state breeding population of hybrid Black X American Oystercatchers in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 22. Numbers of breeding Black Oystercatchers at each colony in California in 1975-1980 (Hunt et al. 1979; Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980	1989-1991	
Northern California					
Cone Rock	DN-414-01	325-001	0	3	(0.3)
Hunter Rocks	DN-414-02	325-002	2	4	(0.5)
Prince Island	DN-414-03	325-003	6	8	(0.9)
Point Saint George Lighthouse	DN-414-04	325-044	0	5	(0.6)
Point Saint George	DN-414-05	325-057	8	4	(0.5)
Castle Rock	DN-414-06	325-006	6	4	(0.5)
Tolowa Rocks	DN-414-07	325-007	8	12	(1.4)
White Rock	DN-414-08	325-008	2	3	(0.3)
"Crescent City Harbor Area"	DN-414-09	325-045	4	17	(1.9)
Unnamed Small Rocks	DN-414-10	325-046	6	5	(0.6)
Easy Triangle Rocks	DN-414-11	325-047	2	4	(0.5)
Rock R	DN-412-01	325-048	0	1	(0.1)
Sister Rocks	DN-412-02	325-009	2	1	(0.1)
Midway Point to Damnation Creek	DN-412-03	325-059	0	1	(0.1)
Footsteps Rock	DN-412-05	325-050	2	3	(0.3)
Wilson Rock	DN-412-06	325-058	2	5	(0.6)
False Klamath Rock	DN-412-07	325-010	0	2	(0.2)
Radar Station Rocks	DN-412-09	325-051	P	2	(0.2)
White Rock	DN-412-11	325-012	2	H	(0.0)
Split Rock	DN-412-13	325-062	0	2	(0.2)
Cormorant Rock	HU-410-02	325-015	2	2	(0.2)
Wedding Rock	HU-410-03	325-016	0	3	(0.3)
Palmer's Point to Scotty Point	HU-410-04	325-052	10	9	(1.0)
Sea Gull Rock	HU-410-05	325-017	2	1	(0.1)
Scotty Point to Megwil Point	HU-410-06	325-053	6	5	(0.6)
Sea Lion Rock	HU-410-07	325-018	2	2	(0.2)
Green Rock	HU-410-09	325-020	2	2	(0.2)
Puffin Rock	HU-410-10	325-021	2	3	(0.3)
Pewetole Island	HU-410-12	325-064	0	2	(0.2)
Flatiron Rock	HU-410-13	325-023	2	6	(0.7)
Blank Rock	HU-410-14	325-024	2	1	(0.1)
Trinidad Head	HU-410-15	325-025	0	3	(0.3)
Pilot Rock	HU-410-16	325-026	2	1	(0.1)
Trinidad Bay Rocks	HU-410-18	325-054	10	4	(0.5)
Little River Rock	HU-410-19	325-035	2	2	(0.2)
False Cape Rocks	HU-402-01	325-040	2	H	(0.0)
Sugarloaf Island	HU-402-02	325-041	6	3	(0.3)
High Tip	ME-394-02	379-012	2	3	(0.3)
Anderson Cliffs	ME-394-03	379-013	0	4	(0.5)
Mistake Point to Big White Rock	ME-394-04	379-014	0	1	(0.1)
Soldier Frank Point	ME-394-06	379-016	0	3	(0.3)
Rockport Rocks	ME-394-07	379-001	2	1	(0.1)
Cape Vizcaino	ME-394-08	379-002	0	2	(0.2)
Hardy Rock and Union Landing	ME-394-10	379-017	0	7	(0.8)
Westport	ME-392-01	379-018	2	7	(0.8)
Chadbourne Rocks	ME-392-02	379-019	0	4	(0.5)
Strawberry Cove	ME-392-03	379-020	2	1	(0.1)
Kibesillah Rock	ME-392-04	379-004	0	1	(0.1)
Newport Rocks	ME-392-05	379-005	4	1	(0.1)
Georgia Pacific	ME-392-06	379-022	2	2	(0.2)
Noyo Bay	ME-392-07	379-035	0	2	(0.2)
Mitchell Creek to Casper Point	ME-392-08	379-036	0	2	(0.2)
Casper Anchorage	ME-392-09	379-023	2	6	(0.7)
Casper Anchorage to Point Cabrillo	ME-392-10	379-037	0	4	(0.4)
Point Cabrillo Lighthouse-Jack Peters Gulch	ME-392-11	379-024	4	7	(0.8)
Goat Island Area	ME-390-01	379-006	6	6	(0.7)
Mendocino	ME-390-02	379-025	2	3	(0.3)
Mendocino Bay	ME-390-03	379-026	2	H	(0.0)
Mendocino Bay South	ME-390-04	379-038	0	1	(0.1)
Van Damme Cove	ME-390-05	379-027	2	3	(0.3)
Schoolhouse Creek to Albion River	ME-390-06	379-028	14	3	(0.3)
Albion Cove to Navarro River	ME-390-07	379-029	8	1	(0.1)

Devil's Basin	ME-390-08	379-007	2	8	(0.9)
Cavanaugh Cove to Gunderson Rock	ME-390-09	379-030	8	11	(1.2)
Wharf Rocks	ME-390-10	379-008	2	1	(0.1)
Bonee Cliffs	ME-390-12	379-031	0	5	(0.6)
White Rock	ME-390-13	379-010	0	2	(0.2)
333 Point	ME-390-14	379-032	2	1	(0.1)
Mallo Pass Creek	ME-390-16	379-034	0	2	(0.2)
Point Arena	ME-384-01	404-017	2	7	(0.8)
Sea Lion Rocks	ME-384-02	404-001	2	4	(0.5)
Iverson Landing	ME-384-07	404-002	4	N	(0.0)
Sea Lion Rocks to Arena Cove	ME-384-03	404-042	0	4	(0.5)
Fish Rock Cove	ME-384-09	404-022	0	1	(0.0)
Fish Rocks	ME-384-10	404-003	4	6	(0.7)
Collins Landing to Gualala River	ME-384-11	404-023	6	4	(0.5)
Gualala Point Island	SO-384-01	404-004	0	1	(0.1)
Sea Ranch	SO-384-03	404-025	2	11	(1.2)
Black Point to Stewart's Point	SO-384-04	404-026	0	4	(0.5)
Stewart's Point to Rocky Point	SO-382-01	404-027	0	1	(0.1)
Cannon Gulch to Stump Beach	SO-382-03	404-029	0	14	(1.6)
Gerstle Cove to Stillwater Cove	SO-382-04	404-030	0	6	(0.7)
Bench Mark 125 to Timber Cove	SO-382-05	404-031	0	2	(0.2)
Windermere Point to Jewell Gulch	SO-382-06	404-043	0	1	(0.1)
Northwest Cape Rocks	SO-382-07	404-032	0	1	(0.1)
Russian Gulch	SO-382-08	404-033	2	7	(0.8)
Russian River Rocks	SO-382-09	404-005	0	2	(0.2)
Goat Rock to Peaked Hill	SO-382-10	404-044	0	1	(0.1)
Peaked Hill	SO-382-12	404-034	2	1	(0.1)
Gull Rock	SO-382-13	404-035	0	2	(0.2)
Shell-Wrights Beach Rocks	SO-382-14	404-036	6	20	(2.3)
Duncan's Point to Arched Rock	SO-382-15	404-037	2	4	(0.5)
Bodega Head	SO-380-01	404-038	6	6	(0.7)
Bodega Rock	SO-380-02	404-008	[2]	N	(0.0)
Pinnacle Rock	SO-380-04	404-039	2	2	(0.2)
Sonoma-Marin County Line	MA-380-01	404-040	4	5	(0.6)
Dillon Beach Rocks	MA-380-02	404-009	6	3	(0.3)
Tomales Point	MA-380-03	404-011	0	3	(0.3)
Bird Rock	MA-380-04	404-010	2	6	(0.7)
(Subtotal)			226	369	
<u>Central California</u>					
Point Reyes	MA-374-01	429-001	10	6	(0.7)
Point Resistance	MA-374-03	429-024	2	N	(0.0)
Millers Point Rocks	MA-374-04	429-002	0	1	(0.1)
Double Point Rocks	MA-374-05	429-003	[2]	N	(0.0)
Gull Rock Area	MA-374-07	429-025	2	1	(0.1)
Muir Beach Headlands to Tennessee Cove	MA-374-08	429-026	2	1	(0.1)
Bird Island	MA-374-09	429-007	0	1	(0.1)
South Farallon Islands	SF-FAI-02	429-052	[40]	30	(3.4)
Seal Rocks	SF-374-03	429-009	2	3	(0.3)
Mussel Rock Area	SM-374-01	429-045	0	1	(0.1)
San Pedro Rock	SM-372-02	429-013	2	2	(0.2)
San Pedro Rock	SM-372-03	429-014	4	N	(0.0)
Seal Rock Cliffs	SM-372-06	429-032	4	N	(0.0)
Martin's Beach	SM-372-07	429-033	2	1	(0.1)
Pomponio Beach to Pescadero Beach	SM-370-01	429-047	0	2	(0.2)
Pigeon Point	SM-370-02	429-034	0	N	(0.0)
Ano Nuevo Island	SM-370-04	429-023	24	27	(3.0)
Greyhound Rock to El Jarro Point	SC-370-01	429-049	ND 6^2	9	(1.0)
El Jarro Point to Davenport	SC-370-02	429-050	ND	0	(0.0)
Marin Islands	SFB-MA-07	429-059	-	2	(0.2)
The Brothers	SFB-CC-10	429-040	-	1	(0.1)
Yerba Buena Island	SFB-SF-07	429-038	-	2	(0.2)
Davenport to Sand Hill Bluff	SC-364-01	454-038	ND	1	(0.1)
Sand Hill Bluff to Needle Rock Point	SC-364-02	454-039	ND P^3	3	(0.3)
Needle Rock Point to Terrace Point	SC-364-03	454-040	ND	6	(0.7)
Terrace Point to Point Santa Cruz	SC-364-04	454-041	ND	1	(0.1)
Bird Rock	MO-362-03	454-006	2	2	(0.2)
Pescadero Rocks	MO-362-05	454-022	2	2	(0.2)
Guillemot Island Area	MO-362-06	454-023	4	10	(1.1)

Pinnacle Point Area	MO-362-07	454-007	P	3	(0.3)
Sand Hill Cove Area	MO-362-08	454-008	2	1	(0.1)
Bird Island	MO-362-09	454-009	4	2	(0.2)
Carmel Highlands	MO-362-10	454-046	0	1	(0.1)
Yankee Point South	MO-362-12	454-047	0	5	(0.6)
Soberanes Creek Rocks	MO-362-13	454-026	0	1	(0.1)
Lobos Rocks	MO-362-14	454-025	0	4	(0.5)
Soberanes Point South	MO-362-15	454-027	4	H	(0.0)
Kasler Point North	MO-362-16	454-048	0	1	(0.1)
Rocky Point	MO-362-17	454-028	4	H	(0.0)
Bench Mark 227-x	MO-362-18	454-029	2	H	(0.0)
Castle Rocks and Mainland	MO-362-19	454-010	6	H	(0.0)
Hurricane Point Rocks	MO-362-20	454-011	10	H	(0.0)
Point Sur	MO-360-01	454-012	2	H	(0.0)
Grimes Point	MO-360-06	454-033	2	H	(0.0)
Torre Canyon Rocks	MO-360-08	454-013	2	1	(0.1)
McWay Rocks	MO-360-11	454-015	2	H	(0.0)
Partington Ridge North	MO-360-10	454-014	4	1	(0.1)
Burns Creek Rocks	MO-360-14	454-017	0	1	(0.1)
Gamboa Point	MO-360-19	454-033	2	1	(0.1)
Larus Rock	MO-354-03	477-014	2	H	(0.0)
Unnamed Point	MO-354-04	477-015	2	H	(0.0)
Gorda Area	MO-354-05	477-040	0	1	(0.1)
Small Rocks & mainland N.E of Plaskett Rock	MO-354-06	477-001	6	6	(0.7)
Plaskett Rock	MO-354-07	477-002	2	1	(0.1)
Cape San Martin	MO-354-08	477-003	4	H	(0.0)
Unnamed Rock	MO-354-09	477-004	2	H	(0.0)
Mainland Point across from Bird Rock	MO-354-10	477-016	2	H	(0.0)
Seastack south of Redwood Gulch	MO-354-13	477-018	X	H	(0.0)
Ragged Point Lodge Colony	SL-354-01	477-022	2	H	(0.0)
3 Rocks	SL-354-03	477-023	0	2	(0.2)
La Cruz Rock	SL-354-04	477-006	2	H	(0.0)
Piedras Blancas Island	SL-352-01	477-007	2	1	(0.1)
Point Piedras Blancas	SL-352-02	477-042	0	2	(0.2)
Two Rocks South of Point Piedras Blancas	SL-352-03	477-024	0	1	(0.1)
Point San Simeon	SL-352-04	477-038	0	1	(0.1)
Island South of Cayucos Point	SL-352-06	477-025	2	6	(0.7)
Morro Rock and Pillar Rock	SL-352-07	477-026	2	H	(0.0)
Point Buchon	SL-350-02	477-009	6	6	(0.7)
Unnamed Rocks	SL-350-03	477-010	10	6	(0.7)
Pup Rock and Adjacent Mainland	SL-350-04	477-028	2	2	(0.2)
Lion Rock	SL-350-05	477-011	2	1	(0.1)
Diablo Rock and adjacent mainland	SL-350-06	477-029	2	H	(0.0)
Diablo Canyon Nuclear Power Plant South	SL-350-07	477-030	4	1	(0.1)
Double Rock Region	SL-350-08	477-031	0	3	(0.3)
Smith and Whaler Islands	SL-350-10	477-033	4	1	(0.1)
Port San Luis	SL-350-11	477-045	0	1	(0.1)
Fossil Point	SL-350-12	477-034	6	7	(0.8)
Shell Beach Rocks	SL-350-13	477-035	6	11	(1.2)
North Pismo Beach Rocks	SL-350-14	477-036	4	3	(0.3)
Mainland and Rocks East of Destroyer Rock	SB-342-02	501-010	0	1	(0.1)
Point Arguello	SB-342-04	501-011	2	6	(0.7)
Rocky Point	SB-342-05	501-012	2	2	(0.2)
Point Conception	SB-342-06	501-013	0	2	(0.2)
(Subtotal)			236	212	
<u>Southern California</u>					
Point Bennett	SB-SNI-01	501-014	P[3]	6	(0.7)
Castle Rock	SB-SNI-02	501-005	6	2	(0.2)
Simonton Cove	SB-SNI-05	501-028	P[3]	7	(0.8)
Harris Point to Cuyler Harbor	SB-SNI-06	501-015	X[3]	27	(3.0)
Prince Island	SB-SNI-07	501-004	6	8	(0.9)
Hoffman Point Area	SB-SNI-08	501-029	P[3]	4	(0.5)
Bay Point Area	SB-SNI-09	501-016	P[3]	1	(0.1)
Cardwell Point West	SB-SNI-10	501-030	P[3]	2	(0.2)
Crook Point to Tyler Bight	SB-SNI-11	501-031	P[3]	2	(0.2)
Sandy Point	SB-SRI-01	501-033	P	3	(0.3)
Northwest Santa Rosa Island	SB-SRI-02	501-034	P	2	(0.2)
Brockway Point Area	SB-SRI-03	501-035	P	4	(0.5)

Canada Verde to Santa Rosa Island W Base	SB-SRI-04	501-036	P	3	(0.3)
Carrington Point	SB-SRI-05	501-037	P	4	(0.5)
North Becher's Bay	SB-SRI-06	501-038	P — 40[5]	2	(0.2)
South Becher's Bay	SB-SRI-07	501-039	P	2	(0.2)
Sierra Pablo Area	SB-SRI-09	501-040	P	2	(0.2)
South Point Area	SB-SRI-11	501-042	P	5	(0.6)
Bee Rock Mainland	SB-SRI-13	501-044	P	1	(0.1)
Southwest Santa Rosa Island	SB-SRI-14	501-045	P	1	(0.1)
Fraser Point	SB-SZI-01	502-015	P[6]	8	(0.9)
West Point Area	SB-SZI-02	502-016	P[6]	1	(0.1)
Profile Point Area	SB-SZI-03	502-017	P[6]	20	(2.3)
Cueva Valdaze Area	SB-SZI-04	502-018	P[6]	8	(0.9)
Arch Rock to Diablo Point	SB-SZI-05	502-019	P[6]	7	(0.8)
Diablo Rocks	SB-SZI-06	502-020	2[7]	4	(0.5)
Fry's Harbor to Twin Harbors	SB-SZI-07	502-021	P[6]	6	(0.7)
Sppit Rock	SB-SZI-08	502-013	6	4	(0.5)
Pelican Bay Area	SB-SZI-09	502-022	P[6]	5	(0.6)
Prisoner's Harbor Area	SB-SZI-10	502-023	P[6]	9	(1.0)
Coche Point Northeast	SB-SZI-11	502-024	P[6]	11	(1.2)
Cavern Point Area	SB-SZI-12	502-025	P[6]	2	(0.2)
Scorpion Anchorage	SB-SZI-13	502-026	P[6]	4	(0.5)
Scorpion Rocks	SB-SZI-14	502-010	2	1	(0.1)
San Pedro Point Area	SB-SZI-15	502-027	P[6]	5	(0.6)
Isthmus South	SB-SZI-17	524-016	P[6]	5	(0.6)
Valley Anchorage to Coches Prietas Anchorage	SB-SZI-18	524-017	P[6]	5	(0.6)
Bowen Point Area	SB-SZI-19	524-018	P[6]	1	(0.1)
Willows Anchorage Rocks	SB-SZI-20	524-019	P[6]	4	(0.5)
Punta Arena	SB-SZI-21	524-020	P[6]	1	(0.1)
Gull Island	SB-SZI-22	524-001	8	6	(0.7)
Kinton Point to Posa Anchorage	SB-SZI-23	524-021	P[6]	2	(0.2)
Black Point Northwest	SB-SZI-24	502-028	P[6]	4	(0.5)
Anacapa Island-West	VE-AMI-01	502-007	X	15	(1.7)
Anacapa Island-Middle	VE-AMI-02	502-008	X — 20	14	(1.6)
Anacapa Island-East	VE-AMI-03	502-009	X	5	(0.6)
Shag Rock	SB-SBI-01	524-007	0	2	(0.2)
Santa Barbara Island	SB-SBI-02	524-008	12	16	(1.8)
Sutil Island	SB-SBI-03	524-009	4	4	(0.5)
Vizcaino Point South	VE-SNI-01	524-022	0	3	(0.3)
Thousand Springs Area	VE-SNI-03	524-024	0	3	(0.3)
Dutch Harbor Area	VE-SNI-05	524-026	0	2	(0.2)
Elephant Seal Beach Area	VE-SNI-06	524-027	0	3	(0.3)
Cormorant Rock Area	VE-SNI-07	524-028	2[8]	12	(1.4)
Bird Rock	LA-CAI-04	524-010	2[9]	2	(0.2)
Seal Cove Area	LA-CLI-08	524-036	2[10]	2	(0.2)
Marina Del Rey Breakwater		524-055	-	2	(0.2)
San Pedro Bay		524-056	-	11	(1.2)
(Subtotal)			244	307	
Total			706[11]	888	

1 X, present; P, probably/possibly present; H, historical nesting only; ND, no data; a dash (-) indicated the area was not surveyed during the study period; numbers in brackets [ ] indicated estimates based on historical information.
2 Formerly included in "Greyhound Rock to Davenport" (429-035) in Sowls et al. (1980)
3 Formerly included in "Davenport to Point Santa Cruz" (454-021) in Sowls et al. (1980)
4 Estimate for entire San Miguel Island, not including Castle Rock and Prince Island, was 48 birds.
5 Estimate for entire Santa Rosa Island was 40 birds.
6 Estimate for entire Santa Cruz Island, not including Sppit, Scorpion, Diablo and Gull rocks, was 82 birds (Hunt et al. 1979).
7 Formerly included in "Kinton Point to Diablo Point" (502-014) in Sowls et al. (1980).
8 Formerly included in "San Nicolas Island" (524-011) in Sowls et al. (1980).
9 Reported in Hunt et al. (1979) but not included in Sowls et al. (1980).
10 Formerly included in "Seal Cove to Lost Point" (524-013) in Sowls et al. (1980). Hunt et al. (1979) estimated one additional pair for San Clemente Island but did not specify a location. Sowls et al. (1980) included this colony in "Bird Rock and Northwest San Clemente Island" (524-012).
11 Sowls et al. (1980) reported a total of 704 birds.

HEERMANN'S GULL

Central California

Heermann's Gulls breed primarily on islands in the Gulf of California, Mexico. Two small colonies also have been reported on the Pacific coast of Baja California (Everett and Anderson 1991). This species occurs regularly in large numbers in California after the Mexican breeding season. However, they have been twice recorded to nest in central California at Alcatraz Island (Golden Gate National Recreation Area) and Seal Beach Rocks (Sowls et al. 1980, Howell et al. 1983). At Alcatraz Island, 2 birds nested at the same nest site in 1979-1981. At Shell Beach Rocks, 2 nests (4 breeding birds) were found on one rock in 1980. All nesting attempts in California have failed and none have been reported nesting since 1981. None were found breeding in 1989-1991 surveys.

RING-BILLED GULL

Interior California

Interior nesting colonies of Ring-billed Gulls in California were not surveyed in 1989-1991. Ring-billed Gulls were first reported nesting on islets in Hartson Reservoir (near Honey Lake), Lassen County, in 1940-1941 (Moffitt 1942). This colony apparently had been present for several years. Moffitt (1942) indicated possible nesting at Tule Lake National Wildlife Refuge, Siskiyou County, and at Clear Lake, Modoc County. Birds apparently have nested at Hartson Reservoir as recently as 1976 (Tait et al. 1978). In 1991, P. Moreno (pers. comm.) noted nesting Ring-billed Gulls at Clear Lake Reservoir (Clear Lake National Wildlife Refuge), Modoc County. Both colonies are threatened by low lake levels (see White Pelican species account).

A thorough survey of interior colonies is needed to assess the current breeding status of Ring-billed Gulls in California.

CALIFORNIA GULL

California Gulls breed primarily in interior western North American from central Canada, south to Wyoming and Utah, and west to coastal Central California. They nest primarily on islands in lakes. In California, the subspecies L. c. californicus has nested mainly at interior locations. Only 4 breeding colonies have been reported recently in coastal California. In winter, they occur in large numbers in nearshore and offshore waters in California (Roberson 1985, Briggs et al. 1987, Harris 1991).

Central California

San Francisco Bay - In 1989-1990, 4,768 birds nested at three active colonies located on dikes and dredge spoil islands in salt ponds in south San Francisco Bay (Figure 32). This species was the most numerous nesting seabird species in San Francisco Bay in 1989-1990. Most birds nested at Alviso Plant, Pond No. A6 (4,328 breeding birds in 1989) with smaller numbers at nearby satellite colonies at the Alviso Plant (Pond Nos. A9 and A10; Pond A1) where 434 and 2 breeding birds were reported in 1989 and 1990, respectively. One other colony was established only in 1988 when 30 birds bred near Fremont at Plant No. 2 (Pond Nos. 11 and 26).

California Gulls first nested at the main Alviso Plant (Pond No. A6) colony in 1981 when 30 nests were found on dredge spoil islands (Rigney and Rigney 1981). This habitat was abandoned in 1989 but other colonies have formed in the vicinity. Numbers have increased rapidly there due to immigration and high breeding success (Jones 1986; SFBBO, unpubl. data). This population may have formed from displaced birds from the large colony at Mono Lake (see below).

Interior California

Interior colonies of California Gulls were not surveyed in 1989-1991. Colonies have been reported historically at: Clear Lake, Modoc County; Eagle Lake, Lassen County; Mono Lake, Mono County; and possibly in the Sutter Basin (Sacramento Valley), Sutter County (see summary in Grinnell and Miller 1944). One pair reportedly bred at Lake Tahoe, El Dorado County, in 1925 (Orr and Moffitt 1971).

Colonies have been reported recently at: Lower Klamath National Wildlife Refuge, Siskiyou County, and Goose Lake, Modoc County (Campbell et al. 1985, Erickson et al. 1986); Clear Lake Reservoir (Clear Lake National Wildlife Refuge), Modoc County (P. Moreno, pers. comm.); and at Mono Lake.

Mono Lake used to be the largest colony in the world but currently hosts the world's second largest breeding population. Numbers of breeding birds have ranged from 44,000-49,500 breeding

birds between 1983-1989 (Dierks 1990). In 1990, 61,474 birds reportedly bred there (PRBO, unpubl. data). Low water levels have connected nesting islands with the mainland, allowing access by predators and resultant poor breeding success, elevated adult mortality and/or colony abandonment (Jehl 1989, Dierks 1990). In addition, low water levels may affect brine shrimp, the main prey resource. Similar problems have been reported at Klamath Basin colonies (Erickson et al. 1986).

More information is needed on current breeding colony locations and populations of California Gulls in interior California.

Summary

California Gulls began nesting in coastal California in 1981 and have increased rapidly to 4,768 breeding birds by 1989-1990. California Gulls have experienced recent increases in other parts of their range as well (Jehl 1987). The Mono Lake colony has been one of the most important colonies in the world and was the most important for the subspecies *L. c. californicus*. Due to human-related habitat changes there and elsewhere in California, California Gulls probably breed at far fewer interior locations than historically and numbers have been much reduced on the state level.

A thorough survey of interior colonies is needed to better assess the current population of California Gulls in California. Also, annual monitoring should be continued at Mono Lake and other colonies to determine trends in population size, breeding success, and habitat changes (i.e. water levels). PRBO, the Mono Lake Committee and Hubbs Marine Research Center have been monitoring colonies at Mono Lake since 1983 and SFBBO has monitored the San Francisco Bay colonies since 1981.

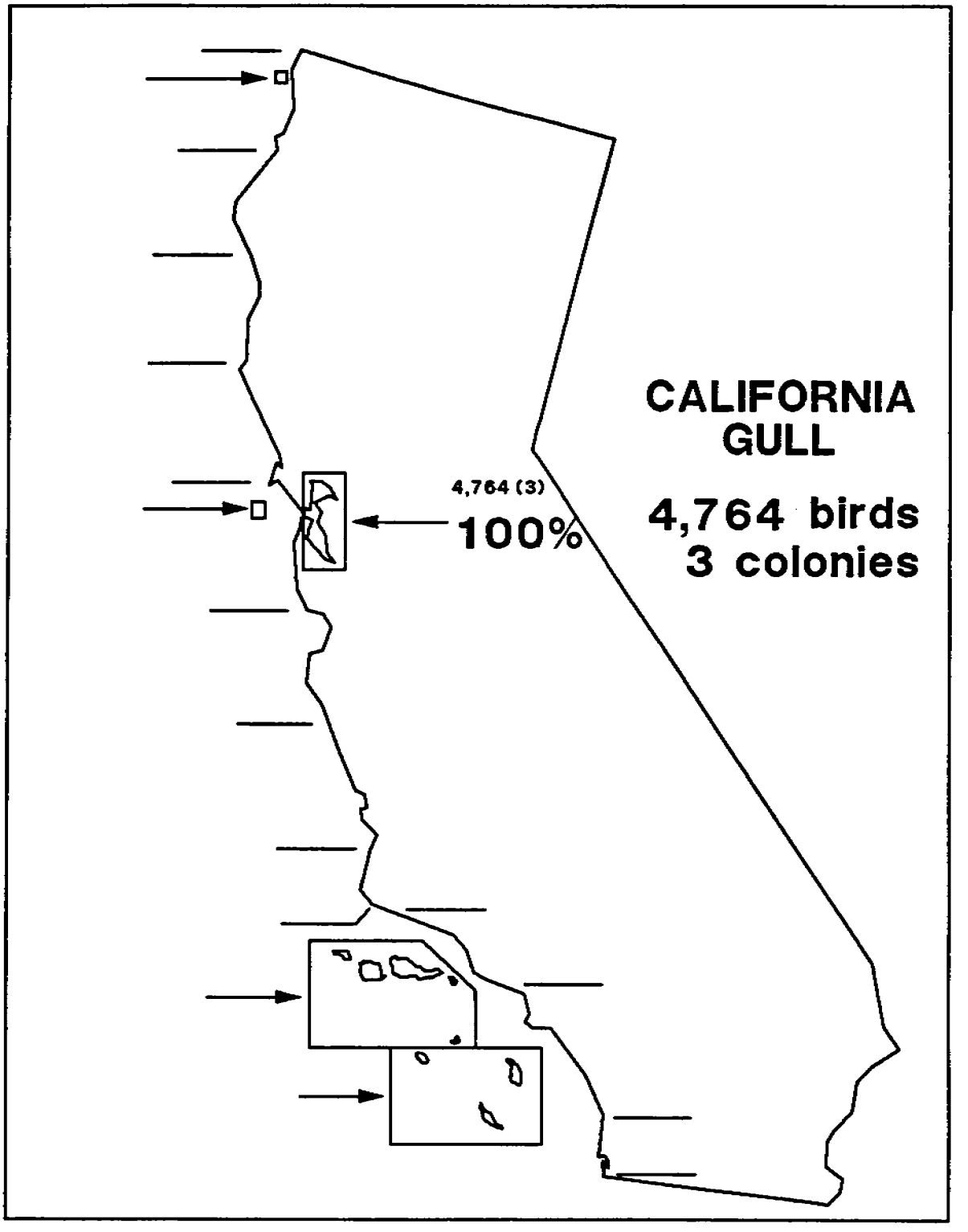


Figure 32. Percentage of marine and estuarine breeding population of California Gull in coastal regions of California, 1989-1991. Symbols as in Figure 19.

WESTERN GULL

The Western Gull breeds along the Pacific coast from southern British Columbia to the Pacific coast of central Baja California, Mexico. Largest numbers breed in California. It nests on the ground in solitary pairs, small colonies and in very large colonies involving thousands of birds. Nesting colonies are quite visible when numbers of these whitish-grey birds congregate on the tops of offshore rocks and fly to and from nests during the day. However, solitary pairs or small colonies on mainland cliffs or tall rocks can be difficult to observe and ,at times, can be mistakenely considered as roosting birds which occur regularly in the same habitats. At large colonies, the sheer number of birds and their distracting behavior can make counting nests and birds difficult. Counts of adults and potential nest sites conducted from vantage points require less effort and cause less disturbance to nesting gulls but require adequate correction factors to derive breeding population estimates. Direct counts of all nests present during an effort-intensive ground search of all nesting areas provides for more accurate estimates (often without correction factors) when such counts are feasible.

In 1989-1991, our surveys focused on searching for small, inconspicuous colonies, conducting more standardized counts (including detailed ground counts) at large colonies and searching large sections of coast that had not been surveyed in detail in the past (e.g. Channel Islands) or had not been surveyed previously even though adequate habitat existed (San Francisco Bay and the southern California mainland).

Northern California

In 1989-1990, 4,967 breeding birds were estimated at 107 active colonies (including 208 breeding birds at 29 small, newly-discovered colonies)(Figure 31, Table 23). This total corresponded to 3% higher numbers overall than in 1979-1980 (N=4,812 breeding birds) and 1% lower numbers at 86 previously-known colonies. At 8 large colonies (116-1,350 breeding birds) in 1979-1980, 5 colonies had lower numbers (Range=16-71%) and 3 colonies had higher numbers (Range=1-47%). At Castle Rock (National Wildlife Refuge), the largest colony in northern California, numbers were almost identical (Table 23). However, portions of the top of this rock were difficult to survey from a boat and counts of the numbers of birds may have been underestimated in 1989. At 77 small colonies (<100 breeding birds), 41 colonies had lower numbers (including 8 known colonies not detected in 1989), 31 colonies had higher numbers and 5 colonies had identical numbers (Table 23). Little change was evident overall in northern California.

Central California

South Farallon Islands (National Wildlife Refuge) - In 1989, 22,246 breeding birds were estimated at this colony which is the largest in California and the world. This total was derived in two parts. For Southeast Farallon Island, the North Islets and Saddle Rock, a total of 14,851 birds were counted on 13 June 1988 (PRBO, unpubl. data). By applying a K correction factor of 1.348, 20,019 breeding birds were estimated for these areas in 1988. This total was adjusted to 21,040 breeding birds, based on a 5.1% increase in nest density in 12 plots from 1988 to 1989 (Emslie and Sydeman 1989). We excluded 595 birds counted at West End Island (subcolony 02 in Map 64) from this process since this area cannot be counted well from vantage points on Southeast Farallon Island. Instead, we added our 1989 count of 603 nests (1206 breeding birds) from aerial photographs for this subcolony.

Sowls et al. (1980) reported a 1979 PRBO estimate of 32,000 breeding birds for the South Farallon Islands. However, this estimate included 6,500 non-breeding adults (L. B. Spear, pers. comm.). Ainley and Boekelheide (1990) reported a revised estimate of 25,500 breeding birds for 1979. Western Gull numbers have been stable there between 22,000 and 25,000 breeding birds since 1959 (Ainley and Lewis 1974, Spear et al. 1987, Ainley and Boekelheide 1990). However, by omitting 6,500 breeding birds from the 1979 estimate, previous numbers of Western Gulls were actually 20%, 19% and 13% lower than reported at the South Farallon Islands, central California and California, respectively.

San Francisco Bay - This area was not surveyed in 1979-1980 (Sowls et al. 1980). At 4 historical colonies reported by other researchers (i.e. The Sisters and Point San Quentin, The Brothers, Red Rock and Yerba Buena Island), numbers were 147% higher in 1990 (Table 23). Colonies were also known at Alcatraz Island and Pier 45 but previous estimates were not available to compare with the 966 breeding birds found there in 1990. A total of 1,584 breeding birds were estimated at 53 newly-discovered colonies. New colonies were discovered throughout the estuary from Suisun Bay in the northeast (Mothball Fleet; located east of the Benicia-Martinez Bridge) to Alviso in the south (Alviso Plant, Pond No. A6), although highest numbers were found in the central part of the estuary. Large new colonies (96-502 breeding birds) were discovered at Brooks Island, Alameda Naval Air Station, San Francisco Piers South and Treasure Island (Table 23). Most new colonies were located on artifical habitats (e.g. breakwaters, wharfs, piers, light piles and bridges), often with limited nesting space and many appeared to have been colonized recently. For instance, the Alameda Naval Air Station colony was probably colonized in about 1982 (Bailey 1985).

Other Colonies - In 1989, 3,317 breeding birds were estimated at 96 active colonies (including 337 breeding birds at 37 newly-discovered colonies) in central California, excluding the South Farallon Islands and San Francisco Bay (Table 23). This total corresponded to 39% higher numbers overall than in 1979-1980 (N=2,390 breeding birds) and 25% higher numbers at 62 colonies known previously. At 5 large colonies (120-474 breeding birds) in 1979-1980, numbers were lower at 4 colonies (Range=5-93%). At Ano Nuevo Island (State Reserve), numbers were 476% higher (Table 23). The dramatic increase at Ano Nuevo Island to 1,382 breeding birds in 1989 has made it as large as Castle Rock National Wildlife Refuge (1,370 breeding birds), the largest colony in northern California. Ano Nuevo Island was located near San Francisco Bay where other dramatic increases have occurred. Increases may reflect saturation at the South Farallon Islands (and resultant overflow to nearby areas). Increases also may be related to high chick production and survival of subadults due to enhanced food resources (especially human refuse).

At the Elkhorn Slough Salt Ponds, numbers were 93% lower in 1989 than in 1979-1980. Nesting habitat (i.e. salt pond dikes) has been altered and most birds no longer nest there. New colonies were found in nearby areas on other artifical habitats at the Elkhorn Slough Estuarine Reserve, Moss Landing Harbor, Monterey Harbor and Cannery Row. These colonies (totalling 152 breeding birds) may be comprised partly of birds that moved from the salt ponds. At Elkhorn Slough Estuarine Reserve, birds nested at newly-created salt marsh islands. At 57 small colonies (<100 breeding birds), 27 colonies had lower numbers, 27 colonies had higher numbers and 3 colonies had identical numbers. Five small colonies were not detected in 1989. All new colonies were small and found all along the coast in this area (Table 23).

Southern California

In 1991, 27,956 breeding birds were estimated at 87 active colonies (including 600 breeding birds at 49 newly-discovered colonies in the Channel Islands and 32 breeding birds at 5 colonies on the mainland coast which was not surveyed in 1975-1978)(Table 23). This total corresponded to 144% higher numbers overall than in 1975-1978 (N=11,458 breeding birds) and 138% higher numbers at 33 colonies known previously. Very large increases were found at 3 of the 5 largest colonies (227% at Santa Barbara Island, 235% at San Nicolas Island and 1,158% [or an 11-fold increase] at East Anacapa Island) and 55% higher numbers were found at Middle and West Anacapa islands combined. Estimates at large colonies derived from detailed nest counts in 1991 may have been elevated slightly compared to previous estimates because we included significant numbers of empty nests (11%, 14%, 15%, 24% and 46% of nests counted at Middle Anacapa Island, Santa Barbara Island, East Anacapa Island, Cormorant Rock and Vizcaino Point South colonies, respectively). As a general

rule throughout California, we included small numbers of empty nests because they can represent incomplete, prelaying, failed, hatched or fledged nesting attempts. For instance, at Ano Nuevo Island and Alameda Naval Air Station colonies in central California, 7% and 18% of nests counted were empty. However, these colonies were surveyed during the early chick period when some chicks were hiding outside of nests. In 1991, large colonies in the Channel Islands were surveyed during the early incubation period. We assumed that empty nests mainly represented prelaying attempts, especially at San Nicolas Island colonies which were surveyed earliest relative to the local timing of breeding that varies between islands (Hunt et al. 1979). However, some empty nests may not have received eggs or persisted from the previous year.

At 5 medium-sized colonies (100-960 breeding birds), 4 colonies had lower numbers (Range=5-51%) and numbers were 26% higher at Castle Rock. At Prince Island, numbers were similar, falling slightly from 960 to 916 breeding birds. Large numbers of birds nested on the flat top of this island which was very difficult to survey from a boat. Numbers were probably underestimated in 1991. At 6 small colonies (<100 breeding birds) in 1975-1978, large increases occurred: 1,495% [or a 14-fold increase] at Point Bennett; 260% at Sandy Point to Carrington Point, Santa Rosa Island (5 newly-defined colonies combined); 485% at Fraser Point to Diablo Point, Santa Cruz Island (6 newly-defined colonies combined); 167% at Coche Point to Cavern Point, Santa Cruz Island (2 newly-defined colonies); 278% at Seal Cove Area; and 1,170% [or a 12-fold increase] at North Island Naval Air Station. Increases at Castle Rock and Point Bennett (San Miguel Island) and Vizcaino Point South, Cormorant Rock and Elephant Seal Beach Area (San Nicolas Island) may reflect increased local prey resources. Gulls at these colonies eat seal and sealion placentae and scavenge dead animals at these large marine mammal rookeries which have increased dramatically in the last few decades. Higher numbers at some other areas in the Channel Islands probably reflected more extensive surveys in 1991. At Santa Rosa, Santa Cruz and Santa Catalina islands, in particular, many coastal areas probably were not surveyed with sufficient detail in 1975-1978 to detect some small subcolonies and/or colonies; in fact, 36 small new colonies were discovered at these islands. However, small new colonies were found throughout the Channel Islands. In southern California, we also included birds attending potential nest sites on cliffs (where either nests were not visible or were not present) as breeding birds because many areas were surveyed in the early incubation period when small colonies might not have laid eggs yet. A large (1,170% [or a 12-fold] increase at the North Island Naval Air Station was associated with discoveries of 5 other small colonies on the mainland south of Los Angeles, especially near San Diego. Mainland cliffs and bluffs from Point Conception to Mexico had not been surveyed previously although

little habitat was available and only 2 colonies were known previously in this area (Table 23). However, human disturbance may prevent nesting at other potential areas (e.g., Point Dume, Palos Verdes Point and Dana Point).

Summary

In 1989-1991, 61,760 breeding birds were estimated at 350 active colonies in California (including 2,729 breeding birds at 168 newly-discovered colonies and 966 breeding birds at 2 previously known colonies without estimates). This total corresponded to 39% higher numbers overall than 1975-1980 (N=44,452 breeding birds, excluding 6,500 breeding birds from the South Farallon Islands) and 31% higher numbers at previously known colonies with estimates. Most increases were evident in the Channel Islands and the San Francisco Bay region. Numbers at the South Farallon Islands, elsewhere in central California and northern California showed little change.

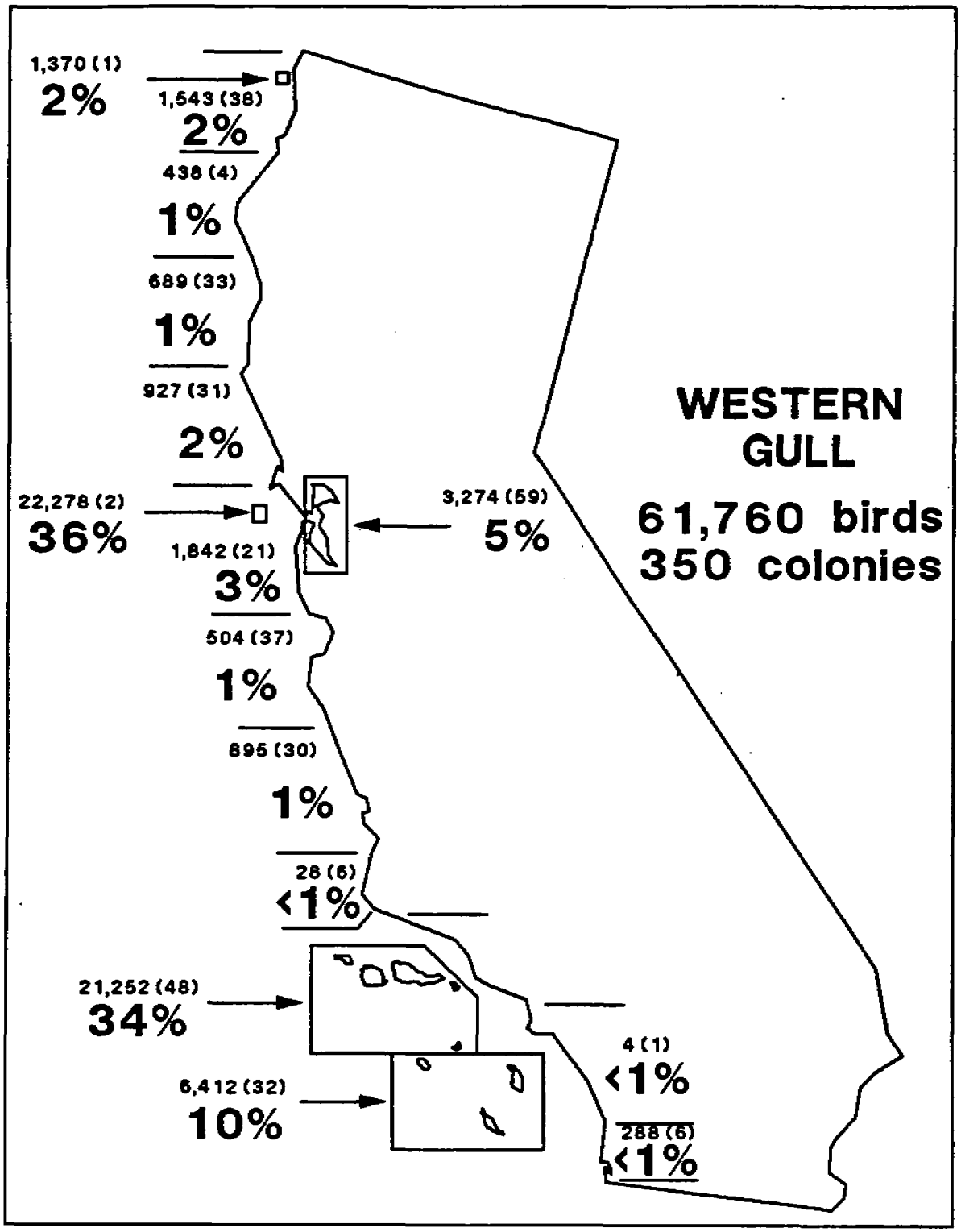


Figure 31. Percentage of state breeding population of Western Gull in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 23. Numbers of breeding Western Gulls at each colony in California in 1975-1980 (Hunt et al. 1979; Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980	1989-1991	
Northern California					
Cone Rock	DN-414-01	325-001	10	6	(<0.1)
Hunter Rocks	DN-414-02	325-002	38	28	(<0.1)
Prince Island	DN-414-03	325-003	420	616	(1.0)
Point Saint George Lighthouse	DN-414-04	325-044	0	6	(<0.1)
Point Saint George	DN-414-05	325-057	20	8	(<0.1)
Castle Rock	DN-414-06	325-006	1,350	1,370	(2.2)
Tolowa Rocks	DN-414-07	325-007	116	34	(0.1)
White Rock	DN-414-08	325-008	74	66	(0.1)
Crescent City Harbor Area	DN-414-09	325-045	24	10	(<0.1)
Unnamed Small Rocks	DN-414-10	325-046	28	30	(<0.1)
Easy Triangle Rocks	DN-414-11	325-047	8	8	(<0.1)
Rock R	DN-412-01	325-048	4	N	(0.0)
Sister Rocks	DN-412-02	325-009	40	22	(<0.1)
Midway Point to Damnation Creek	DN-412-03	325-059	0	4	(<0.1)
Last Chance Rock	DN-412-04	325-049	4	2	(<0.1)
Footsteps Rock	DN-412-05	325-050	4	2	(<0.1)
Wilson Rock	DN-412-06	325-058	8	10	(<0.1)
False Klamath Rock	DN-412-07	325-010	80	92	(0.1)
False Klamath Cove to Pine Point	DN-412-08	325-060	0	2	(<0.1)
Radar Station Rocks	DN-412-09	325-051	X	2	(<0.1)
White Rock	DN-412-11	325-012	24	2	(<0.1)
High Bluff South	DN-412-12	325-061	0	26	(<0.1)
Split Rock	DN-412-13	325-062	0	2	(<0.1)
Redding Rock	HU-412-01	325-013	20	15	(<0.1)
Cormorant Rock	HU-410-02	325-015	2	N	(0.0)
Wedding Rock	HU-410-03	325-016	0	2	(<0.1)
Palmer's Point to Scotty Point	HU-410-04	325-052	20	22	(<0.1)
Sea Gull Rock	HU-410-05	325-017	40	44	(0.1)
Scotty Point to Megwil Point	HU-410-06	325-053	16	22	(<0.1)
Sea Lion Rock	HU-410-07	325-018	28	20	(<0.1)
White Rock	HU-410-08	325-019	20	12	(<0.1)
Green Rock	HU-410-09	325-020	40	28	(<0.1)
Puffin Rock	HU-410-10	325-021	44	20	(<0.1)
Little Pewetole Rock	HU-410-11	325-022	0	2	(<0.1)
Flatiron Rock	HU-410-13	325-023	40	114	(0.2)
Blank Rock	HU-410-14	325-024	80	96	(0.2)
Trinidad Head	HU-410-15	325-025	0	4	(<0.1)
Pilot Rock	HU-410-16	325-026	40	60	(0.1)
Prisoner Rock	HU-410-17	325-027	2	2	(<0.1)
Trinidad Bay Rocks	HU-410-18	325-054	22	48	(0.1)
Little River Rock	HU-410-19	325-035	60	54	(0.1)
Central Humboldt Bay	HU-404-03	325-068	0	12	(<0.1)
False Cape Rocks	HU-402-01	325-040	220	96	(0.2)
Sugarloaf Island	HU-402-02	325-041	320	268	(0.4)
Steamboat Rock	HU-402-03	325-042	60	62	(0.1)
Three Brothers and Hair Seal Rocks	HU-400-01	325-055	4	N	(0.0)
Sea Lion [Gulch] Rock	HU-400-02	325-043	2	N	(0.0)
Cormorant Hotel	HU-400-03	325-056	2	N	(0.0)
Point No Pass	ME-394-01	379-011	2	4	(<0.1)
High Tip	ME-394-02	379-012	4	2	(<0.1)
Anderson Cliffs	ME-394-03	379-013	4	4	(<0.1)
Mistake Point to Big White Rock	ME-394-04	379-014	2	8	(<0.1)
Usal Bay	ME-394-05	379-015	2	N	(0.0)
Soldier Frank Point	ME-394-06	379-016	20	14	(<0.1)
Rockport Rocks	ME-394-07	379-001	10	16	(<0.1)
Cape Vizcaino	ME-394-08	379-002	60	56	(0.1)

Chris Rocks	ME-394-09	379-003	6	2	(<0.1)
Hardy Rock and Union Landing	ME-394-10	379-017	8	4	(<0.1)
Westport	ME-392-01	379-018	4	20	(<0.1)
Chadbourne Rocks	ME-392-02	379-019	0	4	(<0.1)
Kibesillah Rock	ME-392-04	379-004	20	12	(<0.1)
Newport Rocks	ME-392-05	379-021	2	26	(<0.1)
Georgia Pacific	ME-392-06	379-022	4	78	(0.1)
Noyo Bay	ME-392-07	379-035	0	10	(<0.1)
Mitchell Creek to Casper Point	ME-392-08	379-036	0	8	(<0.1)
Casper Anchorage	ME-392-09	379-023	0	4	(<0.1)
Casper Anchorage to Point Cabrillo	ME-392-10	379-037	0	18	(<0.1)
Point Cabrillo Lighthouse-Jack Peters Gulch	ME-392-11	379-024	0	12	(<0.1)
Goat Island Area	ME-390-01	379-006	2	48	(0.1)
Mendocino Bay	ME-390-03	379-026	0	2	(<0.1)
Mendocino Bay South	ME-390-04	379-038	0	2	(<0.1)
Van Damme Cove	ME-390-05	379-027	140	158	(<0.1)
Schoolhouse Creek to Albion River	ME-390-06	379-028	34	74	(0.1)
Albion Cove to Navarro River	ME-390-07	379-029	16	14	(<0.1)
Devil's Basin	ME-390-08	379-007	14	8	(<0.1)
Cavanaugh Cove to Gunderson Rock	ME-390-09	379-030	20	7	(<0.1)
Wharf Rock	ME-390-10	379-008	10	24	(<0.1)
Casket Rock	ME-390-11	379-009	2	6	(<0.1)
Bonee Cliffs	ME-390-12	379-031	0	10	(<0.1)
White Rock	ME-390-13	379-010	40	26	(<0.1)
333 Point	ME-390-14	379-032	0	4	(<0.1)
Bridgeport Landing	ME-390-15	379-033	2	N	(0.0)
Mallo Pass Creek	ME-390-16	379-034	4	4	(<0.1)
Point Arena	ME-384-01	404-017	0	4	(<0.1)
Sea Lion Rocks	ME-384-02	404-001	2	9	(<0.1)
Sea Lion Rocks to Arena Cove	ME-384-03	404-042	0	16	(<0.1)
Triplett Gulch	ME-384-08	404-021	0	4	(<0.1)
Fish Rocks	ME-384-10	404-003	350	170	(0.3)
Collins Landing to Gualala River	ME-384-11	404-023	2	N	(0.0)
Gualala Point Island	SO-384-01	404-004	40	26	(<0.1)
Sea Ranch	SO-384-03	404-025	20	16	(<0.1)
Black Point to Stewart's Point	SO-384-04	404-026	0	6	(<0.1)
Stewart's Point to Rocky Point	SO-382-01	404-027	8	4	(<0.1)
Horseshoe Cove	SO-382-02	404-028	0	2	(<0.1)
Gerstle Cove to Stillwater Cove	SO-382-04	404-030	6	16	(<0.1)
Bench Mark 125 to Timber Cove	SO-382-05	404-031	2	32	(0.1)
Windermere Point to Jewell Gulch	SO-382-06	404-043	0	6	(<0.1)
Northwest Cape Rocks	SO-382-07	404-032	28	52	(0.1)
Russian Gulch	SO-382-08	404-033	10	42	(0.1)
Russian River Rocks	SO-382-09	404-005	64	44	(0.1)
Goat Rock to Peaked Hill	SO-382-10	404-044	0	6	(<0.1)
Arched Rock	SO-382-11	404-006	60	34	(0.1)
Peaked Hill	SO-382-12	404-034	20	6	(<0.1)
Gull Rock	SO-382-13	404-035	28	34	(0.1)
Shell-Wrights Beach Rocks	SO-382-14	404-036	80	88	(0.1)
Duncan's Point to Arched Rock	SO-382-15	404-037	16	34	(0.1)
Bodega Head	SO-380-01	404-038	0	10	(<0.1)
Bodega Rock	SO-380-02	404-008	50	24	(<0.1)
Bodega Harbor	SO-380-03	404-045	0	12	(<0.1)
Pinnacle Rock	SO-380-04	404-039	2	2	(<0.1)
Sonoma-Marin County Line	MA-380-01	404-040	16	14	(<0.1)
Dillon Beach Rocks	MA-380-02	404-009	12	32	(0.1)
Tomales Point	MA-380-03	404-011	2	6	(<0.1)
Bird Rock	MA-380-04	404-010	228	168	(0.3)
Elephant Rock Complex	MA-380-05	404-041	0	8	(<0.1)
(Subtotal)			4,812	4,967	
<u>Central California</u>					
Point Reyes	MA-374-01	429-001	62	178	(0.3)
Point Resistance	MA-374-03	429-024	20	8	(<0.1)
Millers Point Rocks	MA-374-04	429-002	34	30	(<0.1)
Double Point Rocks	MA-374-05	429-003	24	8	(<0.1)
Stinson Beach to Rocky Point	MA-374-06	429-043	0	6	(<0.1)
Gull Rock Area	MA-374-07	429-025	4	6	(<0.1)

Muir Beach Headlands to Tennessee Cove	MA-374-08	429-026	0	20	(<0.1)
Bird Island	MA-374-09	429-007	2	56	(0.1)
Point Bonita	MA-374-10	429-008	4	10	(<).1)
Bonita Cove	MA-374-11	429-027	2	6	(<0.1)
Point Diablo Bluffs and Needles	MA-374-12	429-028	16	34	(0.1)
North Farallon Islands	SF-FAI-01	429-051	-	32	(0.1)
South Farallon Islands	SF-FAI-02	429-052	32,000[2]	22,246	(35.8)
Fort Point to Helmut Rock	SF-374-01	429-044	0	6	(<0.1)
Lobos Rock and Land's End	SF-374-02	429-029	12	14	(<0.1)
Seal Rocks	SF-374-03	429-009	44	46	(0.1)
San Pedro Rock	SM-372-02	429-013	8	6	(<0.1)
Devil's Slide Rock	SM-372-03	429-014	2	16	(<0.1)
Seal Rock Cliffs	SM-372-06	429-032	0	2	(<0.1)
Pigeon Point	SM-370-02	429-034	0	2	(<0.1)
Gazos Creek North	SM-370-03	429-048	0	4	(<0.1)
Ano Nuevo Island	SM-370-04	429-023	240	1,382	(2.2)
Greyhound Rock to El Jarro Point	SC-370-01	429-049	0[3]	2	(<0.1)
Yellow Bluff	SFB-MA-01	429-053	-	2	(<0.1)
Sausalito Point Area	SFB-MA-02	429-054	-	4	(<0.1)
Peninsula Point and Cone Rock	SFB-MA-03	429-055	-	6	(<0.1)
Angel Island	SFB-MA-04	429-056	-	6	(<0.1)
Bluff Point to Paradise Cay	SFB-MA-05	429-057	-	4	(<0.1)
Point San Quentin	SFB-MA-06	429-058	-	6	(<0.1)
Marin Islands	SFB-MA-07	429-059	-	64	(0.1)
The Sisters and Point San Quentin	SFB-MA-08	429-041	[40+]	96	(0.2)
Rat Rock	SFB-MA-09	404-046	-	2	(<0.1)
Southwest San Pablo Bay Duck Blinds	SFB-MA-10	404-047	-	16	(<0.1)
Marin County-West San Pablo Bay Ship Channel	SFB-MA-11	404-048	-	14	(<0.1)
Sonoma Co.-West San Pablo Bay Ship Channel	SFB-SO-01	404-049	-	2	(<0.1)
Knight Island	SFB-SN-01	404-053	-	8	(<0.1)
Northeast San Pablo Bay Beacon	SFB-SN-04	404-056	-	2	(<0.1)
Mair Island Strait	SFB-SN-05	404-057	-	20	(<0.1)
Commodore Jones Point to Benicia Point	SFB-SN-06	404-058	-	10	(<).1)
Benicia Point to Army Point	SFB-SN-07	404-059	-	6	(<0.1)
Mothball Fleet	SFB-SN-08	404-060	-	10	(<0.1)
Suisun Point Area	SFB-CC-03	404-061	-	6	(<0.1)
Nevada Dock	SFB-CC-04	404-062	-	2	(<0.1)
Eckley to Selby	SFB-CC-05	404-063	-	4	(<).1)
Davis Point Unocal Wharf	SFB-CC-06	404-064	-	22	(<0.1)
Hercules Wharf	SFB-CC-07	404-065	-	2	(<0.1)
Pinole Point	SFB-CC-08	404-066	-	2	(<0.1)
East San Pablo Bay Ship Channel	SFB-CC-09	404-067	-	6	(<0.1)
The Brothers	SFB-CC-10	429-040	[80]	178	(0.3)
Castro Point Area	SFB-CC-11	429-060	-	8	(<0.1)
Richmond-San Rafael Bridge	SFB-CC-12	429-061	-	18	(<0.1)
Castro Rocks	SFB-CC-13	429-062	-	N	(0.0)
Red Rock	SFB-CC-14	429-039	[92+]	384	(0.5)
Standard Oil Long Wharf	SFB-CC-15	429-063	-	6	(<0.1)
Richmond Harbor Entrance Channel	SFB-CC-16	429-064	-	12	(<0.1)
Brooks Island Area	SFB-CC-17	429-065	-	98	(0.2)
Richmond Inner Harbor	SFB-CC-18	429-066	-	12	(<0.1)
Albany Hill Cove	SFB-AL-01	429-067	-	2	(<0.1)
Berkeley Yaght Harbor Breakwaters	SFB-AL-02	429-068	-	38	(0.1)
Berkeley Pier	SFB-AL-03	429-069	-	40	(0.1)
Bay Bridge "Toll Plaza Point"	SFB-AL-04	429-070	-	2	(<0.1)
San Francisco-Oakland Bay Bridge East	SFB-AL-05	429-071	-	40	(0.1)
Oakland Outer Harbor	SFB-AL-06	429-072	-	8	(<0.1)
Oakland Middle Harbor	SFB-AL-07	429-073	-	10	(<0.1)
Oakland Inner Harbor	SFB-AL-08	429-074	-	6	(<0.1)
Government Island Area	SFB-AL-09	429-075	-	2	(<0.1)
Alameda Naval Air Station	SFB-AL-10	429-010	-	502	(0.8)
Mulford Landing Channel	SFB-AL-11	429-078	-	2	(<0.1)
San Mateo Bridge and P.G.&E. Towers	SFB-SM-07	429-107	-	6	(<0.1)
San Francisco Ship Channel	SFB-SM-08	429-108	-	8	(<0.1)
Oyster Point Area	SFB-SM-09	429-109	-	2	(<0.1)
Double Rock	SFB-SF-01	429-110	-	2	(<0.1)
Hunter's Point	SFB-SF-02	429-111	-	50	(0.1)
Lash Lighter Basin	SFB-SF-03	429-112	-	40	(0.1)
Potrero Point	SFB-SF-04	429-113	-	6	(<0.1)

San Francisco Piers South	SFB-SF-05	429-114	-	232	(0.4)
San Francisco-Oakland Bay Bridge West	SFB-SF-06	429-115	-	48	(0.1)
Yerba Buena Island	SFB-SF-07	429-038	[80]	62	(0.1)
Treasure Island	SFB-SF-08	429-116	-	96	(0.2)
San Francisco Piers North	SFB-SF-09	429-117	-	62	(0.1)
Pier 45	SFB-SF-10	429-037	[X]	66	(0.1)
Alcatraz Island	SFB-SF-11	429-036	X	900	(1.4)
Needle Rock Point to Terrace Point	SC-364-03	454-040	ND [4]	6	(<0.1)
Terrace Point to Point Santa Cruz	SC-364-04	454-041	ND	2	(<0.1)
Elkhorn Slough Salt Ponds	MO-364-02	454-003	122	10	(<0.1)
Elkhorn Slough Estuarine Reserve	MO-364-03	454-058	0	16	(<0.1)
Moss Landing Harbor	MO-364-04	454-042	0	16	(<0.1)
Monterey Harbor	MO-362-01	454-043	0	24	(<0.1)
Cannery Row	MO-362-02	454-044	0	86	(0.1)
Bird Rock	MO-362-03	454-006	10	16	(<0.1)
North Carmel Bay	MO-362-04	454-045	0	6	(<0.1)
Pescadero Rocks	MO-362-05	454-022	20	20	(<0.1)
Guillemot Island Area	MO-362-06	454-023	60	30	(<0.1)
Pinnacle Point Area	MO-362-07	454-007	14	10	(<0.1)
Sand Hill Cove Area	MO-362-08	454-008	2	4	(<0.1)
Bird Island	MO-362-09	454-009	46	90	(0.1)
Yankee Point	MO-362-10	454-024	8	N	(0.0)
Yankee Point South	MO-362-12	454-047	0	18	(<0.1)
Soberanes Creek Rocks	MO-362-13	454-026	4	6	(<0.1)
Lobos Rocks	MO-362-14	454-025	12	4	(<0.1)
Soberanes Point South	MO-362-15	454-027	6	1	(<0.1)
Kasler Point North	MO-362-16	454-048	0	2	(<0.1)
Rocky Point	MO-362-17	454-028	20	6	(<0.1)
Bench Mark-227X	MO-362-18	454-029	300	38	(0.1)
Castle Rocks and Mainland	MO-362-19	454-010	78	12	(<0.1)
Hurricane Point Rocks	MO-362-20	454-011	72	14	(<0.1)
Point Sur	MO-360-01	454-012	6	N	(0.0)
Molera Rock	MO-360-02	454-030	8	8	(<0.1)
Cooper Point and Islands	MO-360-03	454-031	0	1	(<0.1)
Wreck Beach South	MO-360-05	454-049	0	2	(<0.1)
Grimes Point	MO-360-06	454-033	0	4	(<0.1)
Partington Point	MO-360-09	454-050	0	14	(<0.1)
Partington Ridge North	MO-360-10	454-014	30	7	(<0.1)
McWay Rocks	MO-360-11	454-015	8	14	(<0.1)
Partington Ridge South	MO-360-12	454-035	30	8	(<0.1)
Anderson Canyon Rock	MO-360-13	454-016	0	2	(<0.1)
Burns Creek Rocks	MO-360-14	454-017	4	2	(<0.1)
Buck Creek	MO-360-15	454-051	0	2	(<0.1)
Gamboa Point	MO-360-19	454-053	0	4	(<0.1)
Lopez Point South	MO-360-22	454-054	0	2	(<0.1)
Rockland Landing North	MO-360-23	454-037	0	7	(<0.1)
Rockland Landing	MO-360-24	454-055	0	6	(<0.1)
Kirk Creek to Mill Creek	MO-354-01	477-039	0	2	(<0.1)
Larus Rock	MO-354-03	477-014	20	2	(<0.1)
Unnamed Point	MO-354-04	477-015	4	8	(<0.1)
Gorda Area	MO-354-05	477-040	0	8	(<0.1)
Small Rocks Northeast of Plaskett Rock	MO-354-06	477-001	64	26	(<0.1)
Plaskett Rock	MO-354-07	477-002	60	5	(<0.1)
Cape San Martin	MO-354-08	477-003	474	349	(0.6)
Unnamed Rock	MO-354-09	477-004	12	4	(<0.1)
Point North of Redwood Gulch	MO-354-11	477-017	0	2	(<0.1)
Redwood Gulch Rock	MO-354-12	477-005	0	2	(<0.1)
Seastack South of Redwood Gulch	MO-354-13	477-018	6	6	(<0.1)
Unmapped Island	MO-354-14	477-019	0	3	(<0.1)
Ragged Point Lodge Colony	SL-354-01	477-022	14	N	(0.0)
Ragged Point South	SL-354-02	477-041	0	2	(<0.1)
3 Rocks	SL-354-03	477-023	2	12	(<0.1)
La Cruz Rock	SL-354-04	477-006	10	18	(<0.1)
Piedras Blancas Island	SL-352-01	477-007	56	34	(0.1)
Point Piedras Blancas	SL-352-02	477-042	0	2	(<0.1)
Two Rocks South of Point Piedras Blancas	SL-352-03	477-024	48	14	(<0.1)
Point San Simeon	SL-352-04	477-038	0	10	(<0.1)
Morro Rock and Pillar Rock	SL-352-07	477-026	120	114	(0.2)
Spooner's Cove	SL-350-01	477-027	2	N	(0.0)

Point Buchon	SL-350-02	477-009	0		40	(0.1)
Unnamed Rocks	SL-350-03	477-010	22		49	(0.1)
Pup Rock and Adjacent Mainland	SL-350-04	477-028	54		44	(0.1)
Lion Rock	SL-350-05	477-011	34		24	(<0.1)
Diablo Rock and Adjacent Mainland	SL-350-06	477-029	4		26	(<0.1)
Diablo Canyon Nuclear Power Plant South	SL-350-07	477-030	10		28	(<0.1)
Double Rock Region	SL-350-08	477-031	0		6	(<0.1)
Pecho Rock	SL-350-09	477-032	4		14	(<0.1)
Smith and Whaler Islands	SL-350-10	477-033	2		H	(0.0)
Fossil Point	SL-350-12	477-034	6		21	(<0.1)
Shell Beach Rocks	SL-350-13	477-035	14		18	(<0.1)
North Pismo Beach Rocks	SL-350-14	477-036	8		10	(<0.1)
Mussel Point	SB-344-02	501-017	0		7	(<0.1)
Point Sal	SB-344-03	501-018	0		4	(<0.1)
Lion Rock	SB-344-04	501-008	0		2	(<0.1)
Purisima Point South	SB-344-09	501-021	0		7	(<0.1)
Point Arguello	SB-342-04	501-011	4		6	(<0.1)
Point Conception	SB-342-06	501-013	0		2	(<0.1)
(Subtotal)			34,682		28,837	
<u>Southern California</u>						
Point Bennett	SB-SMI-01	501-014	40		638	(1.0)
Castle Rock	SB-SMI-02	501-005	100		126	(0.2)
Simonton Cove	SB-SMI-05	501-028	0		38	(0.1)
Harris Point to Cuyler Harbor	SB-SMI-06	501-015	28		98	(0.2)
Prince Island	SB-SMI-07	501-004	960		916	(1.5)
Hoffman Point Area	SB-SMI-08	501-029	0		4	(<0.1)
Bay Point Area	SB-SMI-09	501-016	0		6	(<0.1)
Crook Point to Tyler Bight	SB-SMI-11	501-031	0		16	(<0.1)
Tyler Bight to Adam's Cove	SB-SMI-12	501-032	0		50	(0.1)
Sandy Point	SB-SRI-01	501-033	ND		6	(<0.1)
Northwest Santa Rosa Island	SB-SRI-02	501-034	ND		30	(<0.1)
Brockway Point Area	SB-SRI-03	501-035	ND	30[5]	10	(<0.1)
Canada Verde to Santa Rosa Island W Base	SB-SRI-04	501-036	ND		26	(<0.1)
Carrington Point	SB-SRI-05	501-037	ND		36	(0.1)
North Becher's Bay	SB-SRI-06	501-038	0		34	(0.1)
South Becher's Bay	SB-SRI-07	501-039	0		6	(<0.1)
Sierra Pablo Area	SB-SRI-09	501-040	0		4	(<0.1)
South Point Area	SB-SRI-11	501-042	0		6	(<0.1)
Bee Rock Mainland Area	SB-SRI-13	501-044	0		10	(<0.1)
Southwest Santa Rosa Island	SB-SRI-14	501-045	0		2	(<0.1)
Fraser Point	SB-SZI-01	502-015	ND		14	(<0.1)
West Point Area	SB-SZI-02	502-016	ND		170	(0.1)
Profile Point Area	SB-SZI-03	502-017	ND	80[6]	36	(0.1)
Cueva Valdaze Area	SB-SZI-04	502-018	ND		64	(0.1)
Arch Rock to Diablo Point	SB-SZI-05	502-019	ND		122	(0.2)
Diablo Rocks	SB-SZI-06	502-020	ND		62	(0.1)
Fry's Harbor to Twin Harbors	SB-SZI-07	502-021	0		32	(0.1)
Sppit Rock	SB-SZI-08	502-013	0		16	(<0.1)
Pelican Bay Area	SB-SZI-09	502-022	0		14	(<0.1)
Prisoner's Harbor Area	SB-SZI-10	502-023	0		18	(<0.1)
Coche Point Northeast	SB-SZI-11	502-024	ND	92[7]	144	(0.2)
Cavern Point Area	SB-SZI-12	502-025	ND		102	(0.2)
Scorpion Anchorage	SB-SZI-13	502-026	0		10	(<0.1)
Scorpion Rocks	SB-SZI-14	502-010	300		154	(0.2)
San Pedro Point Area	SB-SZI-15	502-027	0		18	(<0.1)
Sandstone Point West	SB-SZI-16	524-015	0		4	(<0.1)
Valley Anchorage to Coches Prietas Anchorage	SB-SZI-18	524-017	0		22	(<0.1)
Bowen Point Area	SB-SZI-19	524-018	0		10	(<0.1)
Willows Anchorage Rocks	SB-SZI-20	524-019	0		18	(<0.1)
Gull Island	SB-SZI-22	524-001	170		162	(0.3)
Kinton Point to Posa Anchorage	SB-SZI-23	524-021	0		10	(<0.1)
Black Point Northwest	SB-SZI-24	502-028	0		34	(0.1)
Anacapa Island-West	VE-ANI-01	502-007	X	5,000	1,448	(2.3)
Anacapa Island-Middle	VE-ANI-02	502-008	X		6,310	(10.2)
Anacapa Island-East	VE-ANI-03	502-009	200		2,516	(4.1)
Shag Rock	SB-SBI-01	524-007	20		84	(0.1)
Santa Barbara Island	SB-SBI-02	524-008	2,300		7,520	(12.1)

Sutil Island	SB-SBI-03	524-009	150	74	(0.1)
Vizcaino Point South	VE-SNI-01	524-022	1,800[7]	5,638	(9.1)
Thousands Springs Area	VE-SNI-03	524-024	0	4	(<0.1)
Light Point West	VE-SNI-04	524-025	0	2	(<0.1)
Dutch Harbor Area	VE-SNI-05	525-026	0	6	(<0.1)
Elephant Seal Beach Area	VE-SNI-06	525-027	0	86	(0.1)
Cormorant Rock Area	VE-SNI-07	525-028	2[7,8]	302	(0.5)
Lorenzo Beach to Stony Point	LA-CAI-01	524-037	0	2	(<0.1)
Indian Rock and Emerald Bay	LA-CAI-02	524-038	0	12	(<0.1)
Ship Rock	LA-CAI-03	524-039	0	2	(<0.1)
Bird Rock	LA-CAI-04	524-010	52	50	(0.1)
Isthmus Cove Area	LA-CAI-05	524-040	0	18	(<0.1)
Blue Cavern Point to Spouting Caves	LA-CAI-06	524-041	0	6	(<0.1)
Empire Landing Area	LA-CAI-07	524-042	0	4	(<0.1)
Italian Gardens	LA-CAI-08	524-043	0	2	(<0.1)
Whites Landing	LA-CAI-09	524-044	0	4	(<0.1)
Toyon Bay	LA-CAI-10	524-045	0	4	(<0.1)
Descanso Bay	LA-CAI-11	524-046	0	2	(<0.1)
Pebbly Beach South	LA-CAI-12	524-047	0	2	(<0.1)
Catalina Island East End Light	LA-CAI-13	524-048	0	2	(<).1)
Silver Canyon Landing Area	LA-CAI-14	524-049	0	8	(<0.1)
China Point North	LA-CAI-15	524-050	0	4	(<0.1)
Little Harbor Area	LA-CAI-16	524-051	0	10	(<0.1)
Catalina Harbor East	LA-CAI-17	524-052	0	6	(<0.1)
Catalina Head	LA-CAI-18	524-053	0	8	(<0.1)
Cape Cortes to Whale Rock	LA-CAI-19	524-054	0	10	(<0.1)
Castle Rock	LA-CLI-01	524-029	0	2	(<0.1)
Bird Rock	LA-CLI-02	524-030	56[9]	54	(0.1)
Northwest Harbor to Wilson Cove	LA-CLI-03	524-031	0	6	(<0.1)
China Point Island	LA-CLI-05	524-033	0	2	(<0.1)
Lost Point South	LA-CLI-06	524-034	0	4	(<0.1)
Mail Point South	LA-CLI-07	524-035	20[10]	14	(<0.1)
Seal Cove Area	LA-CLI-08	524-036	36[10]	136	(0.2)
San Pedro Bay		524-056	-	4	(<0.1)
La Jolla		545-009	4	6	(<0.1)
Sea World		545-010	-	4	(<0.1)
Point Loma		545-011	-	10	(<0.1)
Shelter Island Area		545-012	-	10	(<0.1)
Harbor Island		545-013	-	4	(<0.1)
North Island Naval Air Station		545-014	20[11]	254	(0.4)
(Subtotal)			11,460	27,956	
Total			50,952[12]	61,760	

1 X, present; H, historical nesting only; ND, no data; a dash (-) indicates the area was not surveyed during the study period; numbers in brackets indicate estimates based on historical information.
2 Ainley and Boekelheide (1990) reported a revised estimate of 25,500 breeding birds. See text.
3 Formerly included in "Greyhound Rock to Davenport" (429-035) in Sowls et al. (1980).
4 Formerly included in "Davenport to Pt. Santa Cruz" (454-021) in Sowls et al. (1980).
5 Formerly included in "Sandy Point to Carrington Point" (501-007) in Sowls et al. (1980).
6 Formerly included in "Kinton Point to Diablo Point" (502-014) in Sowls et al. (1980).
7 Formerly included in "San Nicolas Island" (524-011) in Sowls et al. (1980).
8 Not included in total.
9 Formerly included in "Bird Rock and N.W. San Clemente Island" (524-012) in Sowls et al. (1980).
10 Formerly included in "Seal Cove to Lost Point" (524-013) in Sowls et al. (1980).
11 Formerly included in "North San Diego Bay" (545-003) in Sowls et al. (1980).
12 Sowls et al. (1980) reported a total of 50,930 birds.

GLAUCOUS-WINGED GULL

Glaucous-winged Gulls breed along the Pacific coast from the Commander Islands, Russia, across the Aleutian Islands and south to northwestern Oregon (Spendelow and Patton 1988). In coastal California, they occur in large numbers in winter although smaller numbers of non-breeding birds also are present during the summer (Roberson 1985, Briggs et al. 1987, Harris 1991, Harvey et al. 1992). Considerable hybridization has been recorded with the Western Gull (Scott 1971, Hoffman et al. 1978). Hybrids have been difficult to distinguish from type-plumaged Western or Glaucous-winged gulls because of much normal plumage variation and extensive hybridization in these species well beyond the region of overlap of breeding ranges (Bell 1992). No birds in the type-plumage of Glaucous-winged Gulls were found nesting in 1989-1991 in California. However, we did observe nesting birds in nearly type-plumage in northern and central California which we have referred to as hybrids although they may have been pure Glaucous-winged Gulls as well.

Northern California

In 1989-1990, Glaucous-winged x Western Gull hybrids at 4 possible nesting colonies in northern California. On 1 August 1989, 2 hybrids circled observers (along with several Western Gulls) when they were disturbed by our landing on Little River Rock. These birds were later seen roosting there and we did not establish if they were nesting, given the late survey date. At Gull Rock and Shell-Wrights Beach Rocks (subcolony 14 on Map 52), Sonoma County, single hybrids were observed in incubating posture on nests on 5 June 1989. Neither mates were present. At the Central Humboldt Bay colony, 2 hybrids were observed together at the same site on 2 and 7 July 1990 on an old wharf (subcolony 05 on Map 16). These birds did not harass observers when approached closely in a boat, as did two pairs of nesting Western Gulls there. No nest was found. Another hybrid was observed at subcolony 02 at Central Humboldt Bay on 2 July 1990. This hybrid was paired with a type-plumaged Western Gull and was attending a nest containing at least 2 chicks.

Central California

A hybrid was seen flying past a breakwater at Alameda Naval Air Station in San Francisco Bay on 28 June 1990 (subcolony 13 on Map 100). Only 1 nest with a type-plumaged Western Gull in attendance was noted. L. Collins (pers. comm.) noted a probable hybrid paired with a Western Gull at this location earlier in the 1990 breeding season.

BLACK TERN

Interior colonies of the Black Tern in California were not surveyed in 1989-1991. Colonies have been reported historically at: Tule Lake and Alturas Meadow, Modoc County; Eagle Lake, Lassen County; Lake Tahoe, El Dorado County; Sacramento River; San Joaquin River (near Merced) and Los Banos, Merced County; Buena Vista Lake, Kern County; and Lake Merritt (near Castroville), Monterey County (see summary in Grinnell and Miller 1944). Breeding populations have been much reduced due to changes in nesting habitats from agricultural and water developments.

An thorough survey of interior colonies is needed to assess the current breeding status of Black Terns in California.

GULL-BILLED TERN

Gull-billed Terns were first recorded nesting in California in 1927 when about 1,000 birds bred on small islets at the south end of the Salton Sea, Imperial County (Pemberton 1927). This colony apparently has declined due to rising water levels which have covered nesting islets (Garrett and Dunn 1981). At least 120 birds successfully bred there in 1991 (McCaskie 1991). Sixty breeding birds were reported at the South San Diego Bay, San Diego County, colony in 1991 (McCaskie 1991).

Further information on the California breeding population of Gull-billed Terns will be included in the final draft of this report.

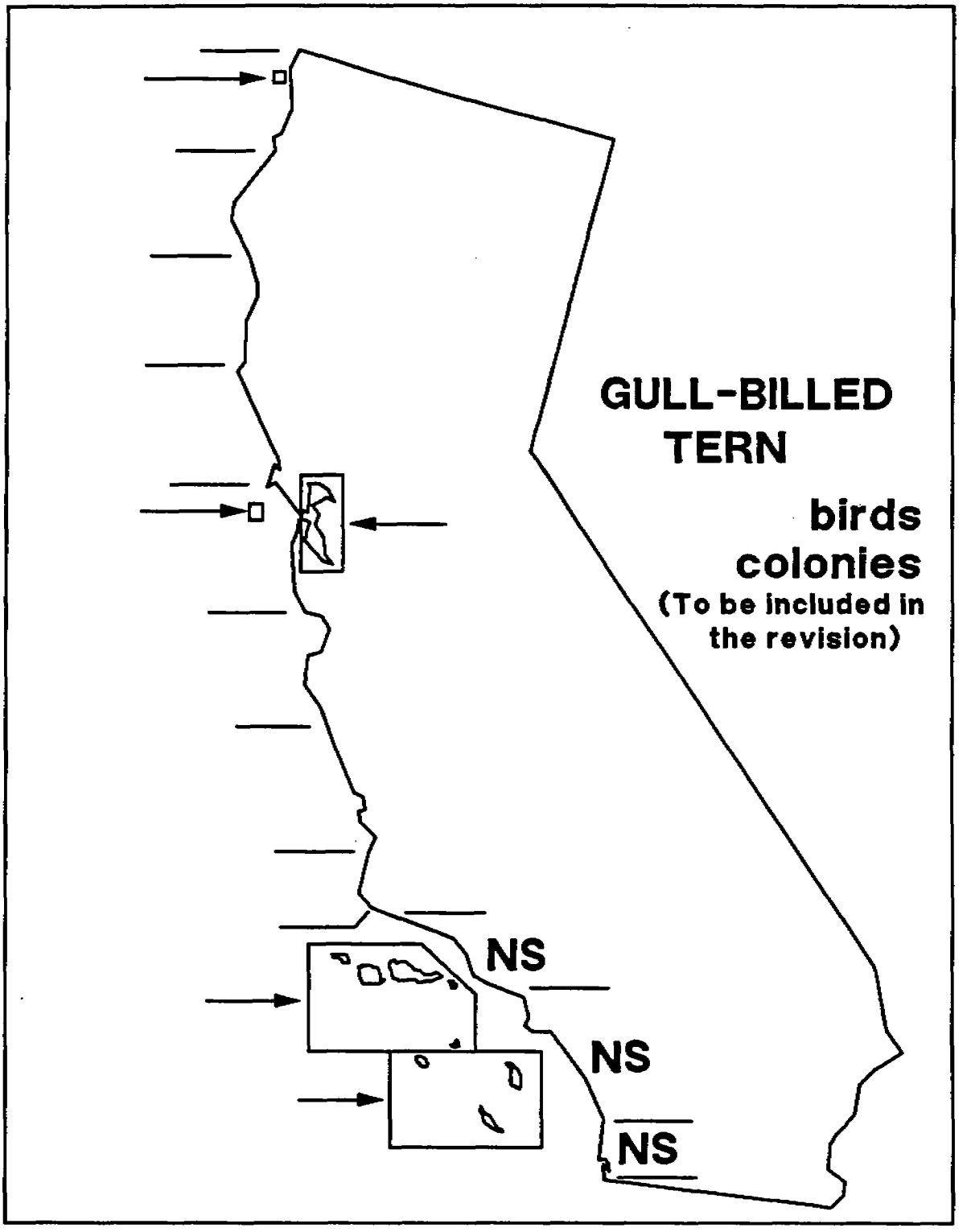


Figure 33. Percentage of marine and estuarine breeding population of Gull-billed Tern in coastal regions of California, 1989-1991. Symbols as in Figure 19.

CASPIAN TERN

Caspian Terns breed in many parts of the world. Breeding populations are scattered throughout many areas of North America. In California, Caspian Terns historically bred only at interior lakes and marshes. However, birds emmigrated to coastal sites in Arcata, San Francisco, Monterey and San Diego bays starting in the 1910's as part of a major expansion throughout the Pacific coast population (reviewed in Gill and Mewaldt 1983).

Sowls et al. (1980) reported on 3 coastal California colonies in 1979-1980 (Table 26). In 1989-1991, we did not survey Caspian Tern colonies. Instead, we have provided estimates provided by other researchers (e.g. San Francisco Bay Bird Observatory [SFBBO]).

Northern California

Only 1 colony has ever been reported on the coast of northern California at the Arcata Bay Sand Islands (Humboldt Bay National Wildlife Refuge). Over one hundred nests (200+ breeding birds) were reported on the largest of these islands ("Sand Island") in 1966 (Harris 1991, Yocom and Harris 1975). By 1969, the colony had moved to a smaller nearby islet and only contained 27 nests. This colony has not been recorded since 1969 (Harris 1991). An increase in the local gull population resulting from a nearby waste refuse site may have increased predation and caused colony abandonment there (E. Nelson, pers. comm.). This colony was not active when investigated on 2 July 1990. Sowls et al. (1980) mistakenly considered this colony as "present" in 1979-1980. Large numbers present in Humboldt Bay in summer might indicate that local nesting still occurs somewhere (Harris 1991) or at least a source of future recolonists still exists.

Central California

San Francisco Bay - In 1989-1990, 2,818 birds nested at five active colonies in this area (Table 26). Colonies were located mostly on salt pond levees, although colonies at Brooks Island and Alameda Naval Air Station were on a sand spit and sand fill, respectively. These terns were reported only recently to nest in San Pablo Bay at Little and Knight islands. Caspian Terns also were known to have nested at three other areas in San Francisco Bay. These areas were abandoned due to maintenance of salt pond levees.

Caspian Terns were first reported nesting on salt pond levees in San Francisco Bay in 1916 (Grinnell and Miller 1944). Between 1926 and 1943, numbers increased from 300 to 800 breeding birds and other nearby colonies arose (DeGroot 1931, Miller 1943). This increase continued up to about 3,000 birds through the 1970's. In 1981, south San Francisco Bay populations

numbered between 1,175 and 2,225 birds (Rigney and Rigney 1981). Through the 1980's, numbers and colony locations have oscillated and the population has declined due to disturbance from maintenance of salt pond levees (SFBBO, unpubl. data). Newly-formed colonies probably have consisted of displaced birds from abandoned colonies. A recent summary of nesting in San Francisco Bay has been prepared by Harvey et al. (1992).

Monterey Bay Area - The only other known colonies of caspian terns in central California colonies have occurred in the vicinity of Elkhorn Slough in the central Monterey Bay Area. In 1991, 20 birds bred at a newly-formed colony at the Elkhorn Slough Estuarine Reserve (D. Serdehely, pers. comm.) (Table 26). Nests were on salt marsh islands created in the early 1980's as part of a wetland restoration project by the California Department of Fish and Game. No other colonies were found in this area during USFWS surveys in 1989.

Caspian Terns have bred historically at 2 other nearby locations. The well-studied Elkhorn Slough Salt Ponds colony was last active in 1980 (Harvey 1982). Changes in salt pond levees caused terns to abandon this site. A wetland restoration project at the old salt ponds may create new nesting habitat for terns. A small colony of Caspian Terns bred unsuccessfully at the Salinas River New Mouth (now in the Salinas River National Wildlife Refuge) in 1983 (J. Warriner, pers. comm.).

Southern California

Birds were first reported to nest in the coastal region of southern California in 1940 when a colony was discovered on salt pond levees at South San Diego Bay, San Diego County (Emblen 1954). About 900 birds and 818 birds bred at this colony in 1980 and 1981, respectively (Sowls et al. 1980, Gill and Mewaldt 1983). In 1986, birds began nesting on sand-fill islands at the Bolsa Chica Ecological Reserve, Orange County (Collins et al. 1991).

Further information on Caspian Terns nesting along the coast of southern California will be included in the final draft of this report.

Interior California

Caspian Terns historically nested only at inland lakes and marshes in interior California. Former colonies were reported at: Tule Lake, Modoc County; Sutter Basin (Sacramento Valley), Sutter County; Buena Vista Lake, Kern County; and at the southeastern end of the Salton Sea, Imperial County (see summary in Grinnell and Miller 1944). Some or all of these colonies have been abandoned since the early 1900's due to man-related alterations of those areas. The Sacramento-San Joaquin vallies

were abandoned by the 1950's and the Salton Sea area by about 1960 (Gill and Mewaldt 1983). Gill and Mewaldt (1983) reported small colonies active in the 1970's at several other locations: Lower Klamath Lake (Lower Klamath National Wildlife Refuge), Big Sage Lake, and Meiss Lake, Siskiyou County; Clear Lake (Clear Lake National Wildlife Refuge) and Goose Lake, Modoc County; Hartson Reservoir, Lassen County; and Mono Lake, Mono County. Other recent nesting has been reported at the South Evaporation Basins, Kings County (Campbell et al. 1985), the Tulare Lake Drainage District ponds, Tulare County (Erickson et al. 1986); and the Tule Lake lower sump (Tule Lake National Wildlife Refuge), Siskiyou County (P. Moreno, pers. comm.).

Summary

The 1989-1990 estimate of 2,838 breeding Caspian Terns on the coasts of northern and central California was 389% higher than estimated in 1979-1980 (N=580 breeding birds) (Table 26). This increase was partly due to true increases in the San Francisco Bay region since historical times although increases were larger than reported in Sowls et al. (1980). Decreases in this area also have occurred since the early 1980's, mostly due to maintenance activities at salt pond levees causing poor breeding success and colony abandonment. Caspian Terns no longer nest at three areas in Arcata and Monterey bays.

Many interior colonies have been long abandoned and current breeding populations there probably have been much reduced. Changes in nesting habitats due to agricultural and water developments have resulted in population decline. Many interior colonies have emmigrated to coastal estuaries. Unfortunately, little current information is available on interior colonies.

A thorough survey of interior colonies is needed to better assess the current breeding status of Caspian Terns in California. Annual monitoring of population size, breeding success, and changes in nesting habitat should be conducted at major coastal and interior colonies to detect and explain population trends. Measures should be taken to restore and/or protect nesting habitat.

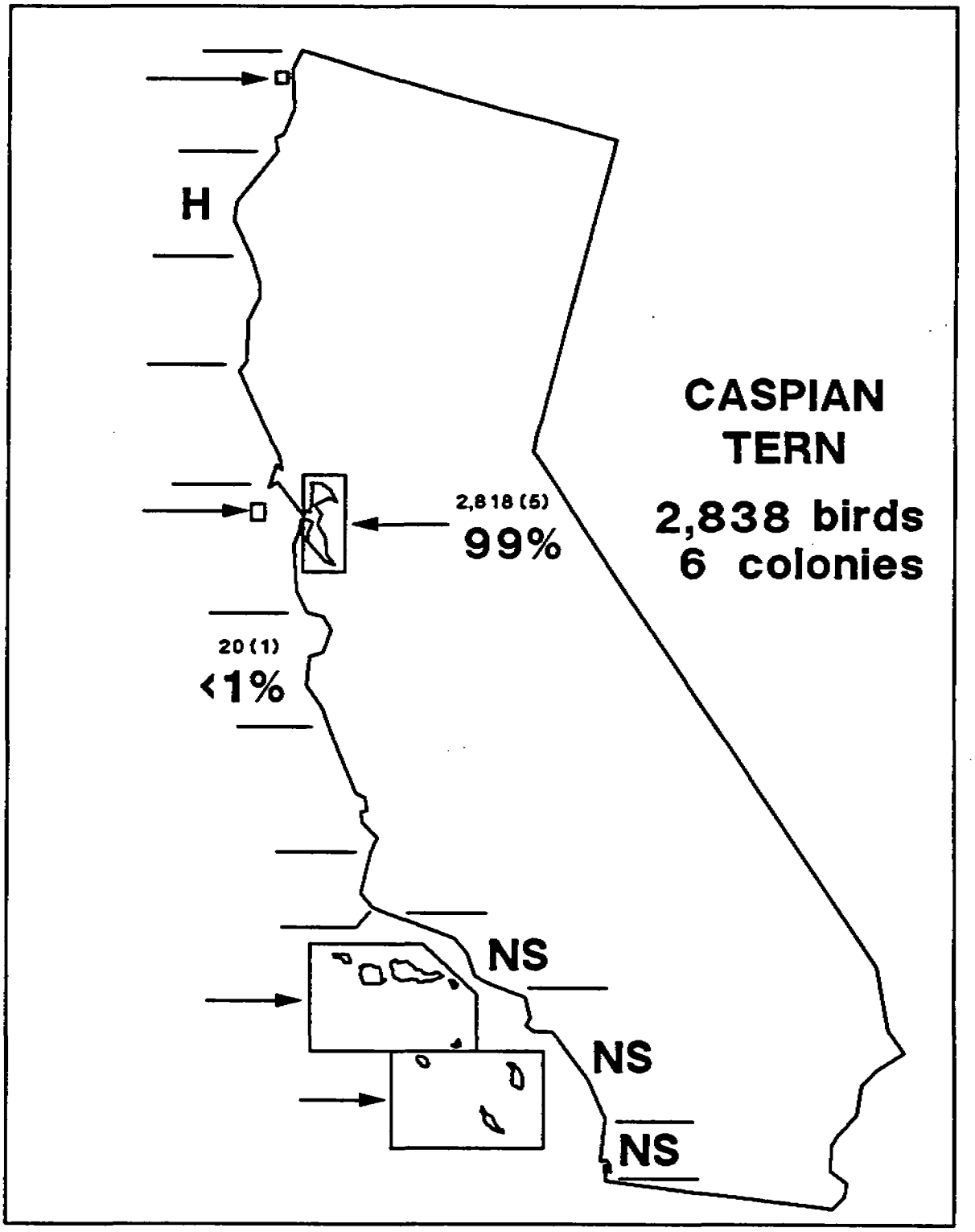


Figure 38. Percentage of marine and estuarine breeding population of Caspian Tern in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 26. Numbers of breeding Caspian Terns at each colony in marine and estuarine habitats in California in 1979-1980 (Sowls et al. 1980) and in 1989-1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		Number of Breeding Birds[1] (Percent) 1989-1991	
Northern California						
Arcata Bay Sand Islands[2]	HU-404-01	325-066	[X]		H	( )
Central California						
Little Island	SFB-MA-01	404-050	-	( )	H	( )
Knight Island	SFB-SM-01	404-053	-	( )	76	( )
Brooks Island Area	SFB-CC-17	429-065	-	( )	120	( )
Alameda Naval Air Station	SFB-AL-10	429-010	-	( )	1188	( )
Baumberg Plant No. 1, Pond Nos. 2, 4 and 7	SFB-AL-21	429-084	-	( )	H	( )
KGO Radio Towers	SFB-AL-28	429-091	H[3]	( )	H	( )
Plant No. 2, Pond Nos. 4 and 5	SFB-AL-32	430-001	[400][4]	( )	634	( )
Plant No. 2, Pond B1 (East)	SFB-SM-06	429-106	-	( )	800	( )
Elkhorn Slough Salt Ponds	MO-364-02	454-003	180	( )	H	( )
Elkhorn Slough Estuarine Reserve	MO-364-03	454-058	0	( )	20	( )
Salinas River New Mouth	MO-364-06	454-060	0	( )	H	( )
Southern California						
(Data needs to be summarized)						
Total			580[5]		2,838[5]	

[1] X, present; H, historical nesting only; a dash (-) indicates the colony was not surveyed during the study period; estimates in brackets [ ] are based on historical information.
[2] Formerly included in "Old Arcata Wharf" (325-038) in Sowls et al. (1980) (see text).
[3] Not included in Sowls et al. (1980).
[4] Formerly included in "Coyote Creek" (429-019) in Sowls et al. (1980).
[5] Totals include northern and central California only.

FORSTER'S TERN

Forster's Terns breed primarily in interior North America, with other scattered colonies on the coasts of the Atlantic and Pacific oceans as well as in the Gulf of Mexico. These terns usually nest on islands in lakes or in marshes. In California, they historically bred almost entirely at interior sites (Grinnell and Miller 1944).

Sowls et al. (1980) included estimates for 5 colonies in central California, based on available information in the literature. In 1989-1991, we did not survey Forster's Tern colonies. Instead, we have reported population estimates provided by other researchers (e.g. San Francisco Bay Bird Observatory [SFBBO]).

Central California

San Francisco Bay - In 1989-1990, 3,550 birds nested at 21 active colonies in this area, correspnding to 67% higher numbers than reported in Sowls et al. (1980) (Table 24). Nesting has been reported only recently in San Pablo Bay at colonies at Island No. 2, Knight Island and White Slough. Other nesting areas in south San Francisco Bay have been used historically but have been abandoned due to disturbance from maintenance of salt pond levees.

Forster's Terns were first reported nesting on salt pond levees in San Francisco Bay in 1948 when about 200 birds bred at the colony found at the Baumberg Plant No. 1 (Pond No. 16)(Sibley 1952). Since then, numbers of birds and colonies have increased steadily in this area with about 2,400-4,000 birds estimated in 1971-1972 (Gill 1977). Numbers peaked in 1981 at about 5,000 birds (Rigney and Rigney 1981). In the 1970's and 1980's, numbers and colony locations have oscillated and the population has declined due to disturbance from maintenance of salt pond levees and predation from introduced Red Fox (*Vulpes vulpes*) (SFBBO, unpubl. data). A recent summary of nesting in the San Francisco Bay area has been prepared by Harvey et al. (1992).

Other central California colonies - Outside of San Francisco Bay, the only Forster's Tern colonies known in this region have been located in the central Monterey Bay area. Since the early 1900's, birds nested on salt pond levees at the Elkhorn Slough Salt Ponds (Sibley 1952). This colony was last active in 1980. Changes in salt pond levees caused terns to abandon this site. Another colony reportedly occurred at the Salinas River New Mouth (now in the Salinas River National Wildlife Refuge) in 1949 (H. Cogswell, pers. comm.).

Southern California

Forster's Terns have bred in South San Diego Bay, San Diego County, since about 1962 (Garrett and Dunn 1981). This colony contained about 2,000 breeding birds in 1980 (Sowls et al. 1980). Another colony formed recently at the Bolsa Chica Ecological Reserve, Orange County (Collins et al. 1991). Further information on the southern California Forster's Tern breeding population will be included in the final draft of this report.

Interior California

Forster's Terns nested historically at several localities in interior California, including: Willow [Creek] Ranch, Modoc County; Eagle Lake, Lassen County; Lake Tahoe, El Dorado County; "Sacramento Valley"; Los Banos, Merced County; and Buena Vista Lake, Kern County (see summary in Grinnell and Miller 1944).

Since 1970, birds have nested sporadically at the south end of the Salton Sea, Imperial County. In 1978, 400 birds bred at the north end of the Salton Sea, Riverside County (Garrett and Dunn 1981). Only 6 Forster's Terns were reported nesting at the south end of the Salton Sea in 1991 (McCaskie 1991). Birds also have nested recently at Sheepy Lake (Lower Klamath National Wildlife Refuge), Siskiyou County; Tule Lake lower sump (Tule Lake National Wildlife Refuge), and possibly at Clear Lake Reservoir (Clear Lake National Wildlife Refuge), Modoc County (P. Moreno, pers. comm.).

Summary

In 1989-1990, 3,550 breeding Forster's Terns were estimated at 21 colonies in northern and central California, corresponding to 60% higher numbers than reported by Sowls et al. (1980) (Table 24). All active colonies were found in the San Francisco Bay area. Higher numbers in this area resulted from increases over historical numbers. However, most of Sowls et al. (1980) estimates were based on numbers provided in the literature. Thus, their estimates did not reflect increases up to 1979-1980. Since 1980, declines have occurred at these colonies due to human disturbance and predation. Forster's Terns have abandoned 2 areas in Monterey Bay. Declines at interior colonies have been related to man-caused habitat alterations, mainly agricultural and water developments. However, there is little information on current populations and colony locations in this broad area.

A thorough survey of interior colonies is needed to better assess the current breeding status of Forster's Terns in California. Population sizes, breeding success, and changes in nesting habitat should be monitored annually at major coastal and interior colonies. Measures should be taken to restore and/or protect nesting habitat.

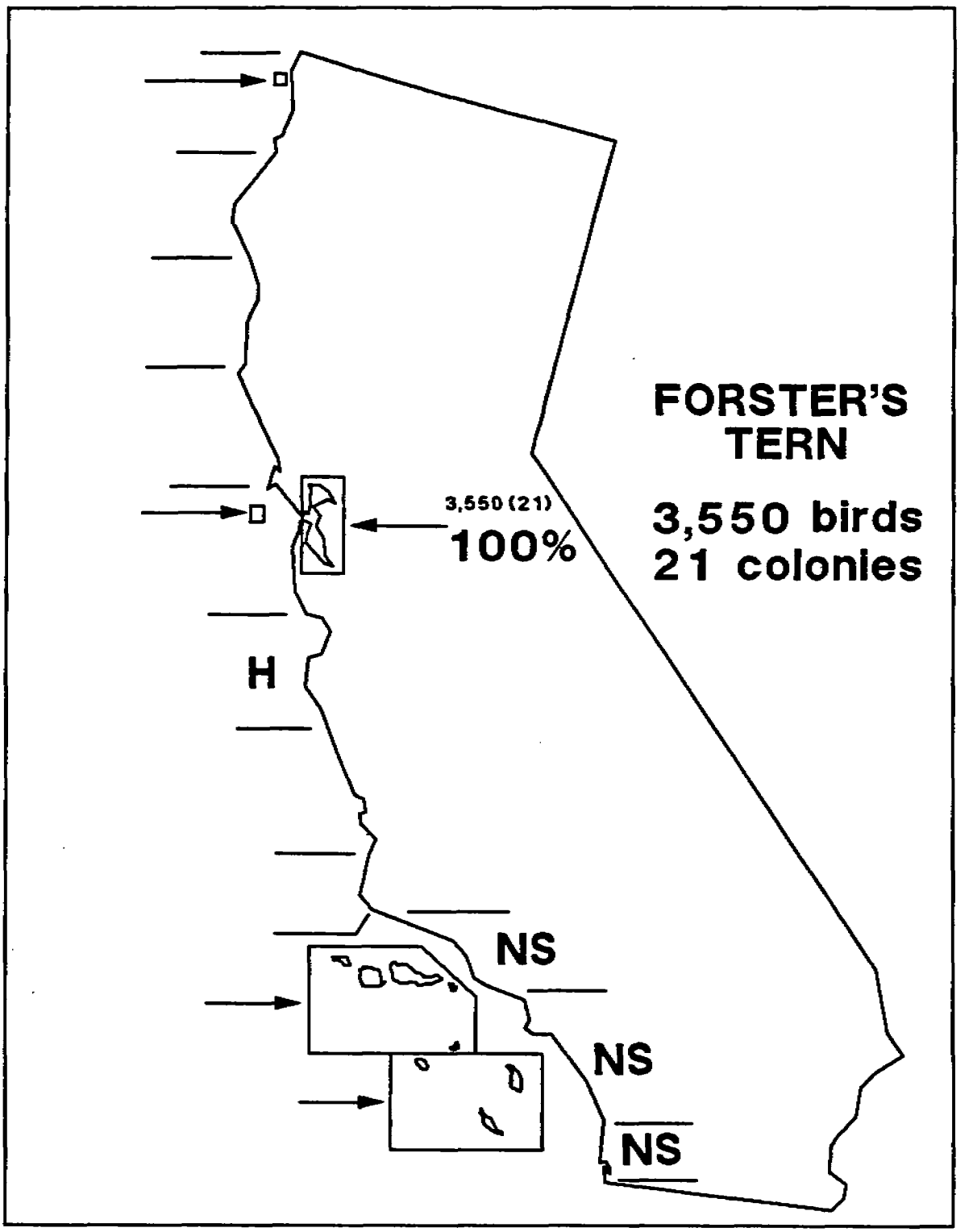


Figure 34. Percentage of marine and estuarine breeding population of Forster's Tern in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 24. Numbers of breeding Forster's Terns at each colony in marine and estuarine habitats in California in 1975-1980 (Sowls et al. 1980) and in 1989-1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		Number of Breeding Birds[1] (Percent) 1989-1991	
Central California						
Island No. 2	SFB-NA-03	404-052	-	( )	50	( )
Knight Island	SFB-SM-01	404-053	-	( )	270	( )
White Slough	SFB-SM-02	404-054	-	( )	40	( )
Baumberg Plant No. 1, Pond 10	SFB-AL-16	429-015	[200][2]	( )	814	( )
Baumberg Plant No. 1, Pond No. 8A	SFB-AL-18	429-081	-	( )	313	( )
Baumberg Plant No. 1, Pond No. 6B	SFB-AL-19	429-082	-	( )	85	( )
Baumberg Plant No. 1, Pond Nos. 2, 4 and 7	SFB-AL-21	429-084	[614][3]	( )	H	( )
Baumberg Plant No. 1, Pond Nos. 4, 5 and 7	SFB-AL-22	429-085	-	( )	94	( )
Plant No. 1, Pond No. 1A	SFB-AL-24	429-087	-	( )	H	( )
Plant No. 1, Pond No. 2A	SFB-AL-25	429-088	-	( )	125	( )
Plant No. 1, Pond No. 3A	SFB-AL-26	429-089	-	( )	H	( )
KGO Radio Towers	SFB-AL-28	429-091	H[4]	( )	H	( )
Plant No. 1, Pond No. 3	SFB-AL-29	429-092	-	( )	99	( )
Plant No. 1, Pond No. 1	SFB-AL-30	429-093	-	( )	204	( )
Plant No. 2, Pond Nos. 11 and 26	SFB-AL-31	429-094	H[4]	( )	H	( )
Alviso Plant, Pond No. A17	SFB-SR-01	430-002	-	( )	25	( )
Alviso Plant, Pond No. A18	SFB-SR-02	430-003	-	( )	H	( )
Alviso Plant, Pond No. A16	SFB-SR-03	430-004	-	( )	43	( )
Alviso Plant, Pond No. A8	SFB-SR-05	430-006	-	( )	158	( )
Alviso Plant, Pond No. A7	SFB-SR-06	429-095	-	( )	95	( )
Alviso Plant, Pond No. A6	SFB-SR-07	429-096	-	( )	194	( )
Alviso Plant, Pond No. A5	SFB-SR-08	429-097	[1,256][5]	( )	H	( )
Alviso Plant, Pond No. B2	SFB-SR-09	429-098	-	( )	480	( )
Alviso Plant, Pond No. A1	SFB-SR-10	429-099	-	( )	38	( )
Charleston Slough	SFB-SR-11	429-100	-	( )	250	( )
Redwood City Plant, Pond No. 1	SFB-SM-01	429-101	-	( )	100	( )
Redwood City Plant, Pond No. 3	SFB-SM-02	429-102	60[4]	( )	H	( )
Bair Island, Pond No. A10	SFB-SM-03	429-103	-	( )	H	( )
Bair Island, Pond No. A9	SFB-SM-04	429-104	-	( )	H	( )
Bair Island, Pond No. B3	SFB-SM-05	429-105	-	( )	H	( )
Bair Island, Pond No. B1 (East)	SFB-SM-06	429-106	-	( )	63	( )
Oyster Point Area	SFB-SM-09	429-109	-	( )	10	( )
Elkhorn Slough Salt Ponds	MO-364-02	454-003	95	( )	H	( )
Salinas River New Mouth	MO-364-06	454-060	H[4]	( )	H	( )
Southern California						
(Data will be included in revision)						
Total			2,225[6]		3,550[6]	

[1] H, historical nesting only; a dash (-) indicated that the area was not surveyed during the study period; estimates in brackets [ ] were based on previous information.
[2] Formerly called "Alameda Creek" in Sowls et al. (1980).
[3] Formerly included in "Coyote Hills" (429-017) in Sowls et al. (1980). We estimated 768 birds at this colony.
[4] Not included in Sowls et al. (1980).
[5] Formerly included in "Guadalupe Slough" (429-020) in Sowls et al. (1980).
[6] Totals were for central California only.

LEAST TERN

Least Terns nest in many scattered parts of North America, where 5 subspecies occur: on the coasts of the Atlantic Ocean and the Carribean Sea (S. a. antillarum); in interior areas of the Mississippi basin (S. a. athalassos); on the eastern coasts of Mexico and the West Indies (S. a. mexicana and staebleri); and on the coasts of California and Baja California, Mexico (S. a. browni). They nest primarily in loose colonies on beaches and sand dunes. The California subspecies nests as far north as the San Francisco Bay area. It is the most isolated subspecies and was listed as an endangered species in 1971.

Sowls et al. (1980) provided breeding population estimates for 7 colonies in northern and central California (Table 25), based on data from surveys carried out by several researchers for the California Department of Fish and Game. Since 1979-1980, tern colonies have been monitored annually. Least Tern colonies were not examined during USFWS surveys in 1989-1991. Instead, we have provided breeding population estimates provided by the California Department of Fish and Game and other researchers.

Central California

San Francisco Bay area - In 1989-1990, 178 birds nested at 4 areas in San Francisco and Suisun bays, corresponding to 2% lower numbers than reported in 1979-1980 (N=182 breeding birds)(Figure 35, Table 25). Least Terns have nested historically at 10 other locations in San Francisco Bay which were not active in 1989-1990. All colonies in the San Francisco Bay Area have been located on man-made habitat (i.e. salt pond levees, air fields). Many sites have been abandoned due to habitat alteration and/or human disturbance (i.e. development, maintenance of salt pond levees).

Least Terns were first reported nesting in San Francisco Bay at Ballena Bay, Alameda County, in 1967 (Chandik and Baldridge 1967), after being suspected of nesting in the general vicinity for several years. Shortly thereafter, other nesting sites were discovered nearby at the Alameda Naval Air Station, Bay Farm Island, Bair Island and the Oakland International Airport. The Ballena Bay and Bay Farm Island nesting areas became residential areas and unsuitable for nesting by the early 1970's. Since the mid 1970's, Least Terns have nested peripherally at many new nesting areas but the only substantial colonies that have persisted over time still occur at the Alameda Naval Air Station and the Oakland International Airport. Overall, numbers of Least Terns in San Francisco Bay appeared to be stable, although predators and changes in habitat continue to threaten colonies. Atwood et al. (1979), Erickson (1985) and Harvey et al. (1992) have provided summaries of the history of nesting by Least Terns in this area.

San Luis Obispo and Santa Barbara counties - In 1989, 94 birds nested at 6 colonies along the southern coast of San Luis Obispo county and the northwestern coast of Santa Barbara county (Table 25). This total corresponded to 24% lower numbers than reported in 1979-1980 (N = 124 breeding birds). Birds nested on natural sand dunes and beaches. Least Terns also have nested at 2 locations in this area which were not active in 1989.

Other colonies - No other active colonies were known in central California in 1989-1990. The central Monterey Bay area historically supported nesting Least Terns with colonies located on natural sand dunes and beaches near estuaries (i.e. Elkhorn Slough)(Table 25). They have not been reported nesting in this area since 1956 when terns still bred at Palm Beach and Salinas River Old Mouth. Birds apparently emmigrated to the San Francisco Bay area (see above). Nesting Least Terns may have left Monterey Bay due to changes in local estuaries and pollution (Davis and Baldridge 1980).

Southern California

Several Least Tern colonies occur on beaches and man-made habitats in this area. Data on the southern California Least Tern breeding population will be included in the final draft of this report.

Summary

In 1989-1990, 264 breeding Least Terns were estimated at 10 colonies northern and central California, corresponding to 10% lower numbers than reported in 1979-1980 (Table 25). Although numbers of Least Terns have fluctuated between years, the central California population appearred to be fairly stable. Birds were not found nesting at 16 historical nesting sites. None were found at the historical Monterey Bay area locations. Numbers for southern California colonies will be included in the final draft report.

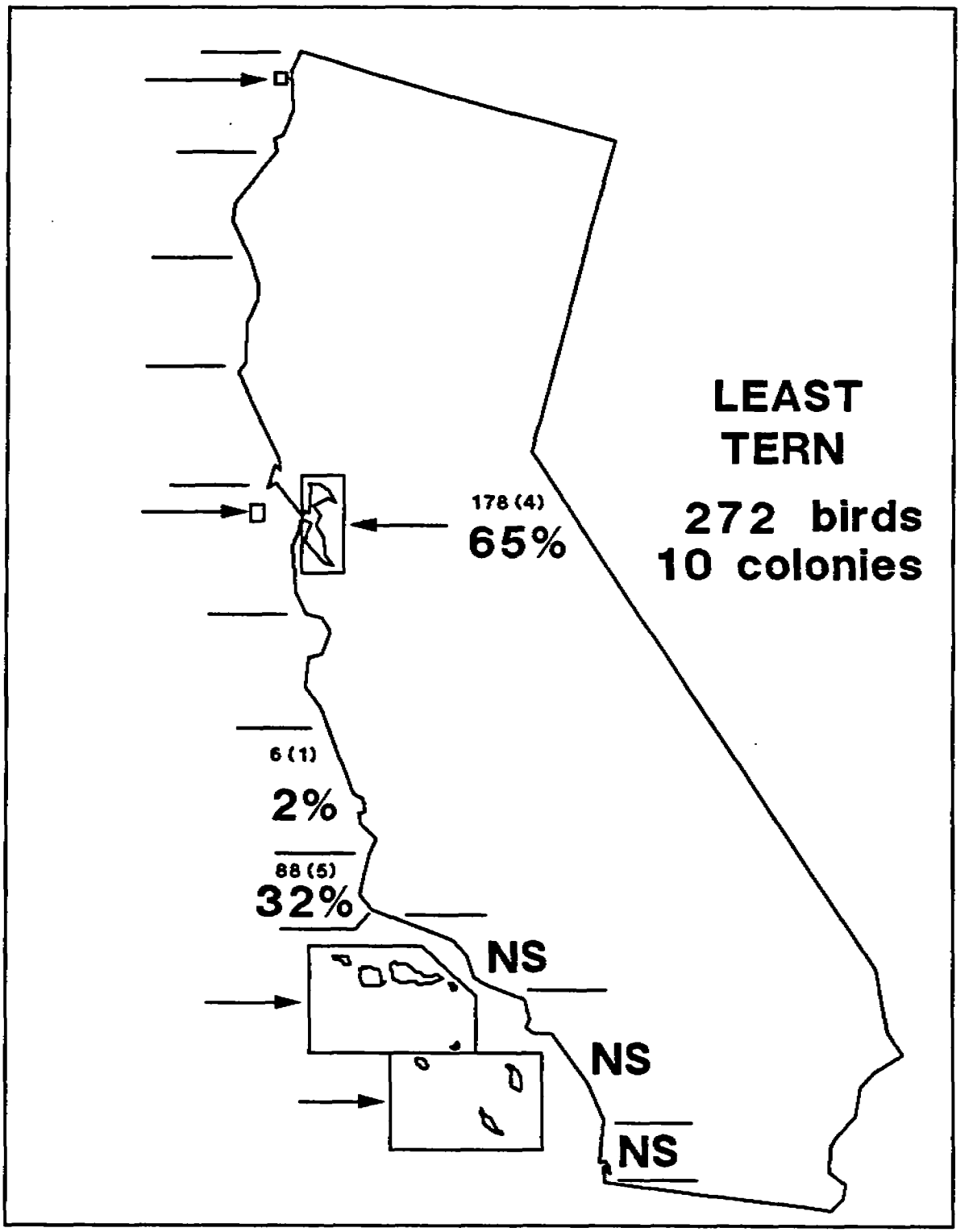


Figure 35. Percentage of state breeding population of Least Tern in coastal regions California, 1989-1991. Symbols as in Figure 19.

Table 25. Numbers of breeding Least Terns at each colony in California in 1975-1980 (Sowls et al. 1980) and in 1989-1991 (This study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980	1989-1991	
Central California					
Pacific Gas and Electric Plant, Pittsburg	SFB-CC-01	405-002	0	8	( )
Port Chicago Allied Chemical Plant	SFB-CC-02	405-003	0	H	( )
Bay Bridge Toll Plaza Point	SFB-AL-04	429-070	0	H	( )
Alameda Naval Air Station	SFB-AL-10	429-010	80	144-150	( )
Ballena Bay	SFB-AL-11	429-076	H[2]	H	( )
Bay Farm Island	SFB-AL-12	429-077	H[2]	H	( )
Oakland International Airport	SFB-AL-13	429-011	14[3]	18	( )
Hayward Marsh, Basin 3A	SFB-AL-15	429-079	0	2	( )
Baumberg Plant No. 1, Pond Nos. 10 and 11	SFB-AL-17	429-080	0	H	( )
Baumberg Plant No. 1, Pond Nos. 1, 2 and 7	SFB-AL-20	429-083	ND [80][4]	H	( )
Plant No. 1, Pond No. 1A Northwest	SFB-AL-23	429-086	ND	H	( )
Plant No. 1, Pond Nos. 4, 5, 6 and 7	SFB-AL-27	429-090	0	H	( )
Redwood City Plant, Pond No. 3	SFB-SM-02	429-102	H[2]	H	( )
Bair Island, Pond No. B1 (East)	SFB-SM-06	429-106	H[5]	H	( )
Palm Beach	SC-364-05	454-056	H[2]	H	( )
Salinas River Old Mouth	MO-364-01	454-057	H[2]	H	( )
Moro Cojo Slough	MO-364-05	454-059	H[2]	H	( )
Salinas River New Mouth	MO-364-06	454-060	H[2]	H	( )
Morro Bay Spit	SL-352-09	477-046	0	H	( )
Oso Flaco Lake North	SL-350-15	477-047	0	6	( )
Oso Flaco Lake South	SL-350-15	477-037	12-20	H	( )
Guadalupe Dunes North[3]	SL-344-01	501-023	0	X	( )
Guadalupe Dunes South[3]	SB-344-01	501-001	40	40	( )
San Antonio Creek	SB-344-07	501-024	ND 54-64[6]	6	( )
Purisima Point	SB-344-08	501-025	ND	36	( )
Santa Ynez Estuary	SB-344-10	501-026	0	6	( )
Southern California					
(Data needs to be summarized)					
Total			274-292[7]	258-264[7]	

1 H, historical nesting only; X, breeding; ND, no data; numbers in brackets [ ] indicated estimates based on historical information.
2 Not included in Sowls et al. (1980).
3 Recorded during study period but not included in total.
4 Formerly included in "Coyote Hills" (429-017) in Sowls et al. (1980). We estimated 100 birds.
5 Formerly included in "Bair Island" (429-016) in Sowls et al. (1980).
6 Formerly included in "San Antonio Creek and Purisima Point" (501-003) in Sowls et al. (1980).
7 Totals included central California only.

ROYAL TERN

Royal Terns were first reported nesting in California in 1959 when one pair bred at the south end of San Diego Bay, San Diego County (Gallup and Bailey 1960). Nesting also was reported in 1960 but was not recorded there again until 1980 (Small 1960, Schaffner 1985). Small numbers also began nesting at Bolsa Chica Ecological Reserve, Orange County in 1988, where 4-20 birds bred in 1988-1990 (Collins et al. 1991).

Further information on the California breeding population of Royal Terns will be included in the final draft of this report.

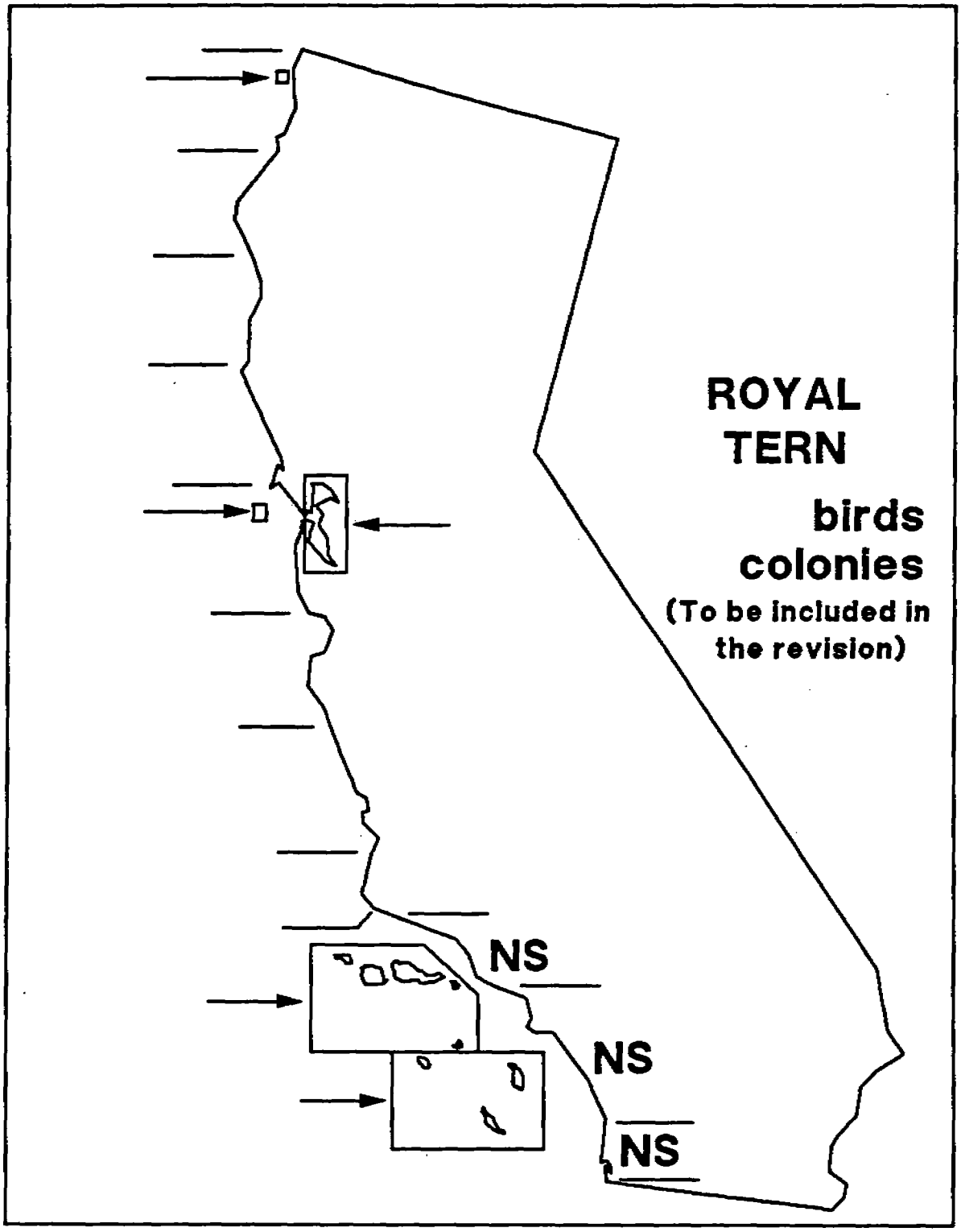


Figure 36. Percentage of state breeding population of Royal Tern in coastal regions California, 1989-1991. Symbols as in Figure 19.

ELEGANT TERN

Most of the world population of Elegant Terns breeds at Isla Raza in the Gulf of California, Mexico (Walker 1965, Wilbur 1987). In 1959, the first recorded nesting in the United States occurred on salt pond dikes at South San Diego Bay, San Diego County, California (Gallup and Bailey 1960). Numbers at this colony ranged between 1,412-1,722 breeding birds in 1980-1982 (Schaffner 1985). In 1987, 62 Elegant Terns first bred at the Bolsa Chica Ecological Reserve, Orange County, where numbers ranged from 900-2,400 birds in 1988-1990 (Collins et al. 1991). Birds at Bolsa Chica nested on sand-fill islands created for nesting Least Terns.

Further information on the California breeding population of Elegant Terns will be included in the final draft of this report.

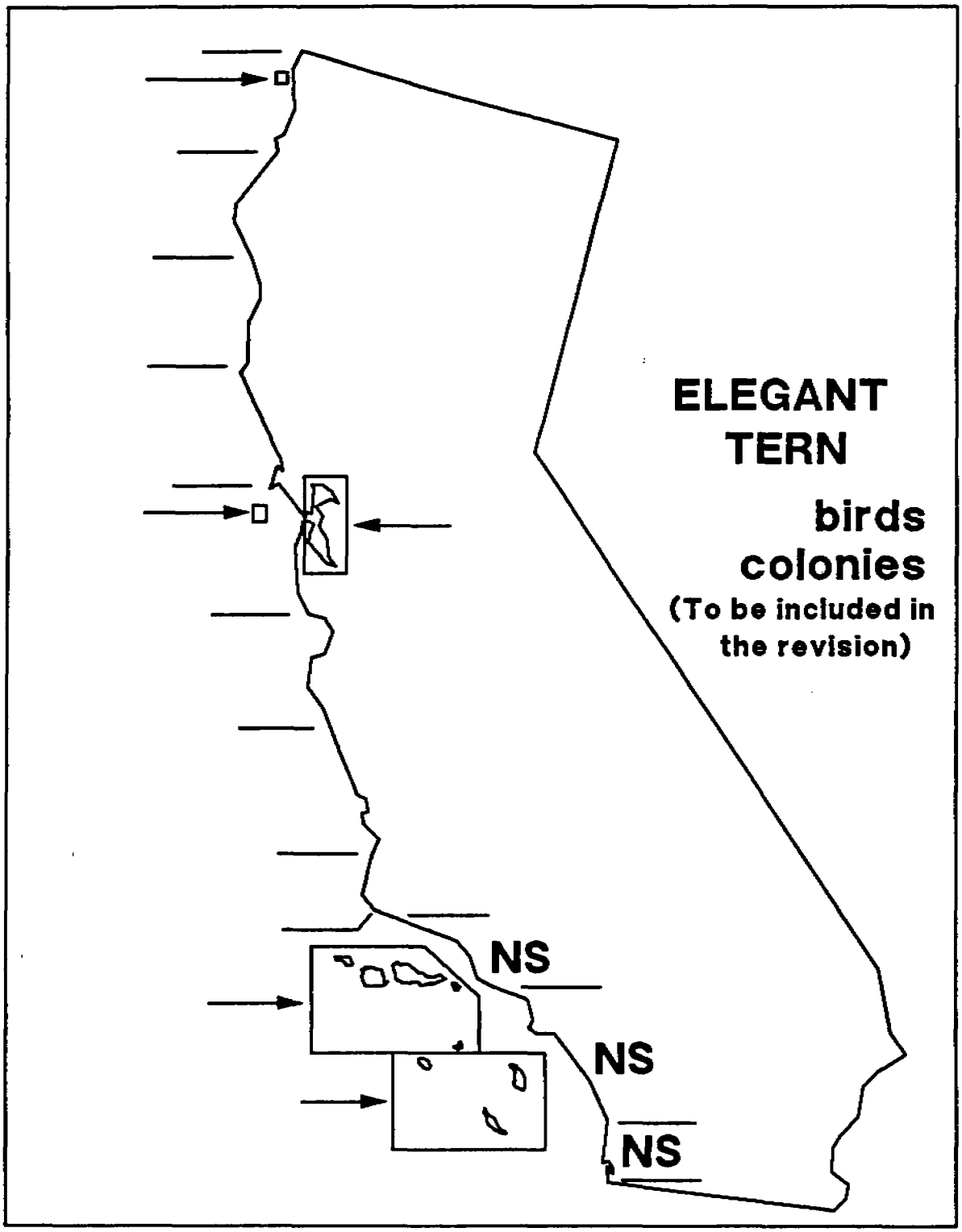


Figure 37. Percentage of state breeding population of Elegant Tern in coastal regions California, 1989-1991. Symbols as in Figure 19.

BLACK SKIMMER

Black Skimmers were first reported nesting in California in 1972 when 5 nests were discovered at the south end of the Salton Sea, Imperial County (McCaskie et al. 1974). Birds have continued nesting there with 160 birds attempting breeding in 1991 (McCaskie 1991). One pair bred within a colony of Caspian Terns at the Tulare Lake Drainage District ponds, Kings County, in 1986 (Erickson et al. 1986). In coastal California, Black Skimmers have nested at Bolsa Chica Ecological Reserve and at upper Newport Bay, Orange County, and at South San Diego Bay, San Diego County (McCaskie 1986, 1991; Sowls et al. 1980).

Further information on the California breeding population of Black Skimmers will be included in the final draft of this report.

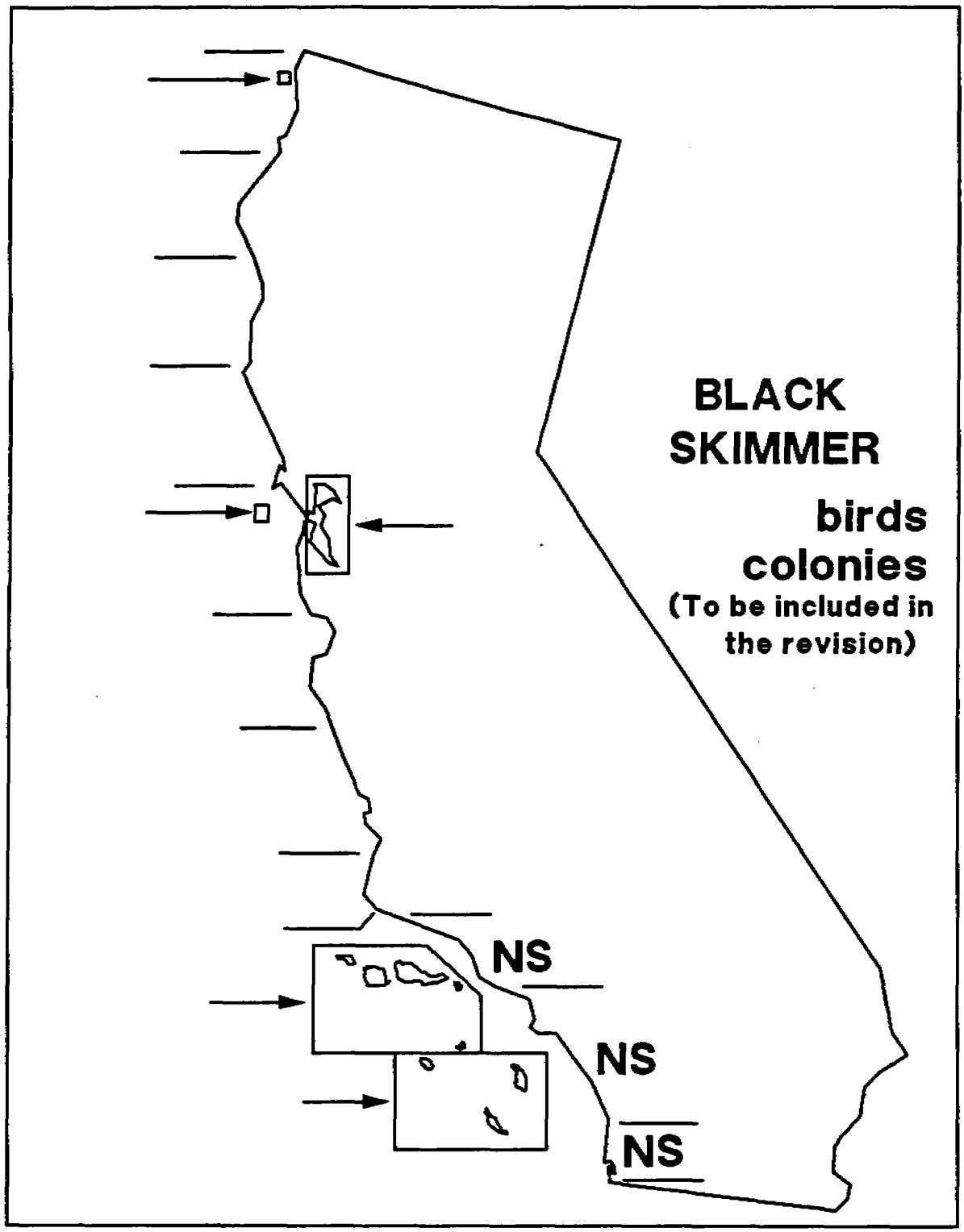


Figure 39. Percentage of marine and estuarine breeding population of Black Skimmer in coastal regions of California, 1989-1991. Symbols as in Figure 19.

COMMON MURRE

Common Murres breed along much of the coasts of the north Pacific and north Atlantic oceans. The subspecies U. a. californica nests from southern British Columbia to central California. Within this region, several geographically-separated populations occur. Two of these populations occur in northern and central California, respectively. Murres are an extremely important and visible part of the seabird resource in California, being the most abundant nesting species and having the greatest biomass of all breeding species in the state (Sowls et al. 1980, Ainley and Boekelheide 1990). Murres lay their eggs on the bare surface of the ground or on cliff ledges and nest in very large and dense colonies on islands and mainland cliffs. Murres are difficult to count accurately because they nest shoulder to shoulder in dense aggregations and portions of colonies often occur in locations which are difficult to observe from ground or boat vantages (e.g. high cliffs and slopes and flat tops of tall rocks and islands).

Using oblique-overhead aerial photographs that provide views of all colony areas, birds can be counted carefully on enlarged projections of photographs to provide standardized and repeatable estimates of population size (Takekawa et al. 1990). Since 1979, murre censuses have been conducted almost annually at many colonies in California. By 1986, techniques had been fully refined. In 1989, we focused on conducting similar detailed surveys at all colonies using aerial photography (see methods) for comparison with past and future surveys using the same refined techniques discussed in Takekawa et al. (1990; see methods).

Northern California

In 1989, 258,010 breeding birds were estimated at 15 active colonies (including 1,927 breeding birds at 3 newly-discovered colonies at Rock R, Rockport Rocks, and Goat Island Area)(Figure 40, Table 27). This total corresponded to almost identical numbers overall as in 1979-1980 (as reported in Sowls et al. 1980; N=258,050) and 1% lower numbers at 12 colonies known previously. In addition, Briggs et al. (1983) reported 85 murres at Bruhel Point Rocks, Mendocino County, in July 1982 but not in May 1980-1982. Thus, although these may have been prospecting birds, nesting habitat did not appear to be very suitable and we did not consider this to have been a breeding colony. At 12 previously-known colonies, 8 colonies had higher numbers (Range=19-626%) and 4 colonies had lower numbers (Range=9-44%) in 1989 than in 1979-1980 (Table 27).

Trends at 5 colonies were examined more closely because they have been surveyed frequently in recent years, including 1979 and/or 1980, 1982, and 1986 (Sowls et al. 1980, Briggs et al.

1983, Takekawa et al. 1990). False Klamath and Green rocks had 10% lower numbers in 1986 than their 1982 peaks; these slight declines continued with 9% and 8% lower numbers, respectively, from 1986 to 1989. However, at Flatiron Rock, 13% higher numbers were found in 1986 compared to the 1979 peak; this increase continued with 23% higher numbers from 1986 to 1989. At the small colony on Redding Rock, the trend changed from 24% lower numbers (1980-1986) to 109% higher numbers (1986-1989). This increase occurred despite known disturbances to breeding murres at Redding Rock. For example, in mid May 1989 (before our aerial survey), U. S. Coast Guard personnel landed on the rock by helicopter to maintain the light, causing birds to flush from and abandon their eggs. At Castle Rock National Wildlife Refuge, the largest colony in California, pre-1986 estimates were considered to be overestimates by Takekawa et al. (1990). Numbers were 8% higher in 1989 than in 1986, suggesting a slightly increasing trend there. If murre numbers at Castle Rock were the same in 1979-1980 as in 1986, then 1989 numbers for northern California overall would have been reported to be about 11% higher. In any case, this population appeared to be either stable or slightly increasing. Murre numbers also increased in northern California through the 1970's (Osborne 1972, Sowls et al. 1980).

The discovery of the Goat Island Area colony extended the range of the northern California population south by about 25 miles (40 km). Together with the establishment of the Rockport Rocks colony and higher numbers at the Cape Vizcaino colony, a slight expansion appeared to be occurring in this area.

Central California

In 1989, 93,326 breeding birds were estimated at 8 active colonies (including 358 breeding birds at 1 newly-discovered colony at Millers Point Rocks)(Figure 40, Table 27). This total corresponded to 40% lower numbers overall than in 1979-1980 (compared to the total of 105,100 breeding birds reported in Sowls et al. [1980] plus 51,540 breeding birds at the North Farallon Islands in 1980 as reported by Takekawa et al. [1990]). At 8 known colonies in 1979-1980, 7 had lower numbers (Range= 8-73%) and 1 colony (Devil's Slide Rock) no longer existed in 1989 (Table 27). Briggs et al. (1983) first discovered 105 breeding murres at Millers Point Rocks in 1980 which increased to 830 breeding birds in 1982. In addition, 30 birds were seen at Martin's Beach, San Mateo County, in July 1981 but not in May 1980-1982. As for Bruhel Point Rocks in northern California, we did not consider this location to have been a breeding colony. The San Pedro Rock colony was heavily impacted by egging in the late 1800's and has been inactive since 1908 (Ray 1909).

The decline of the murre population in central California during the 1980's has been well documented, based on aerial surveys in 1979, 1980, 1982, 1985, and 1986 (Sowls et al. 1980,

Briggs et al. 1983, Takekawa et al. 1990) and annual ground and boat surveys at the South Farallon Islands (Carter 1986, Ainley and Boekelheide 1990). This population was increasing steadily through the 1970's and early 1980's until a series of events sent it into a steep decline. From recent peak colony sizes in 1980-1982 to 1986, the population declined by 53% due to high mortality in gill nets (CDFG 1987), compounded by mortality from the 1984 Puerto Rican, 1986 Apex Houston and smaller oil spills (PRBO 1985, Ford et al. 1987, Page et al. 1990) as well as the severe 1982-1983 ENSO event (Stenzel et al. 1988, Ainley and Boekelheide 1990). Individual colonies declined 46-100%, including the loss of the Devil's Slide Rock colony. In 1987, fishing regulation changes vastly reduced gill-net mortality and no large mortalities from oil spills have been documented in this area between 1986 and 1989.

From 1986-1989, this population declined by 15% (using a total of 108,530 breeding birds reported in Takekawa et al. 1990 plus 830 breeding birds at Miller's Point Rocks in 1982 reported by Briggs et al. 1983). This decline corresponded to an additional 7% decline from the 1980-1982 peak. However, lower numbers (Range=26-47%) occurred only at 4 colonies (South Farallon Islands, Point Reyes, Castle Rocks and Mainland and Hurricane Point Rocks) whereas higher numbers (Range=16-36%) occurred at 3 colonies (North Farallon Islands, Point Resistance and Double Point Rocks). The Devil's Slide Rock colony was not recolonized. Additional decline has resulted presumably from much lower recruitment of first-time breeders due to: 1) earlier mortality of subadult murres; 2) low production of young during the 1982-1983 ENSO (Ainley and Boekelheide 1990); and 3) low production of young because of lower breeding population sizes since 1982.

Recent population sizes of Common Murres in central California have been much reduced from numbers reported in the mid 1800's. At the South Farallon Islands, the colony declined from an estimated 400,000 breeding birds to only a few hundred to a few thousand birds in the early 1900's due to commercial egging, human occupation of the islands and oil pollution (Ainley and Lewis 1974, Takekawa et al. 1990). Numbers did not recover until the 1960's when an increase began and continued until the early 1980's. Other colonies along the coast also were impacted during this period. The colony at San Pedro Rock was extirpated around 1908 (Ray 1909). Other undocumented colonies may have been extirpated as well.

Southern California

Only the one historical colony at Prince Island, Santa Barbara County, has ever been known in southern California and this colony has not been active since 1912 (reviewed in Hunt et al. 1979). Several egg collectors in the late 1800's and early

1900's may have depleted this small colony of only a few hundred breeding birds which was widely separated from the nearest colonies at Hurricane Point Rocks and Castle Rocks and Mainland north of Point Sur in central California. Sumner (1939) observed 1 bird at Prince Island in 1939 and 1 bird was observed flying near the original nesting area on the northwest cliffs on 22 May 1976 (Hunt et al. 1979). On 14 July 1976, a pair of birds were reported "on the cliffs" at Prince Island but further documentation was lacking (Garrett and Dunn 1981).

In 1991, murres were not found nesting at Prince Island. However, 1 alternate-plumaged bird was observed flying by the northwest cliffs at 1700 hours on 8 June. On 9 July, 2 alternate-plumaged birds were seen on the water below these cliffs at 1420 hours and 1 bird flew by the east end of the island at 1445 hours. On 14 July, another single bird was observed flying around the south end of the island. These observations may indicate prospecting activity by subadult birds. Tufted Puffins recently recolonized Prince Island and Rhinoceros Auklets also now nest there (see species accounts for these species).

Summary

In 1989, 351,336 breeding birds were estimated at 23 active colonies (including 2,285 breeding birds at 4 newly-discovered colonies and 27,308 breeding birds at 1 colony [North Farallon Islands] which lacked a previous estimate). This total corresponded to 3% lower numbers overall than reported by Sowls et al. (1980) in 1979-1980 and 11% lower numbers at known colonies with previous estimates. Numbers of breeding murres in the northern California population were stable or increasing. Extensive decline occurred from 1980-1986 (reviewed in Takekawa et al. 1990) and has continued (although at a slower rate) through 1989 in the central California population. One colony has already been lost and other colonies, especially at Castle Rocks and Mainland and Hurricane Point Rocks, are nearing extinction.

Annual surveys should be continued for Common Murre colonies throughout California to better examine the nature of decline and to document further declines or recoveries. Such surveys are planned by USFWS (San Francisco Bay National Wildlife Refuge) and PRBO. Although aerial photographs can be taken with a few days of data collection effort, the careful counting of birds in photographs is very time consuming. For instance, 1987, 1988 and 1990 photographs were taken but have not been counted. Photographs were not taken at all in 1991 and 1992 due to budget and time constraints.

In addition, careful monitoring and extensive documentation of murre mortality (from oil spills, gillnetting and other

sources) is required. Detailed and coordinated beached bird surveys, tallies of birds from rehabilitation centers and aerial surveys of birds at sea have been used to better estimate the extent of mortality from marine oil spills (PRBO 1985, Carter et al. 1987, Ford et al. 1987, Stenzel et al. 1988, Carter and Page 1989, Page et al. 1990). A specialized bycatch monitoring program was conducted by the California Department of Fish and Game to examine mortality of murres and other seabirds and marine mammals in gill nets in central California from 1983-1987 (CDFG 1987, Takekawa et al. 1990). Through extensive discussions between state and federal agencies plus research, environmental and fishing groups from 1982-1987, gill-net fishing was first restricted to certain areas and then effectively eliminated in 1988 by prohibiting gill-net fishing from nearshore waters north of Monterey Bay (Takekawa et al. 1990). Some mortality has continued in Monterey Bay (D. Brewer, pers. comm.). Much better documentation of human disturbance at murre colonies is further required. Human disturbances probably have occurred regularly at many colonies due to boats, occasional landings on nesting islands by the U. S. Coast Guard and other people, recreational activities along coastlines and overflights. Protection from human disturbances has been provided only at the Farallon Islands and Castle Rock National Wildlife Refuges where PRBO and Refuge biologists must prevent island landings and overflights under 1,000 feet have been prohibited. At the South Farallon Islands, a buffer zone was placed around certain parts of the colony to prevent disturbance by commercial abalone and urchin divers and other commercial and recreational boat traffic. This buffer zone was requested by USFWS (San Francisco Bay National Wildlife Refuge) after several years of disturbances documented by resident PRBO biologists on the islands. The buffer zone was enacted by the California Department of Fish and Game. Island wardens and buffer zones may be required at many other colonies.

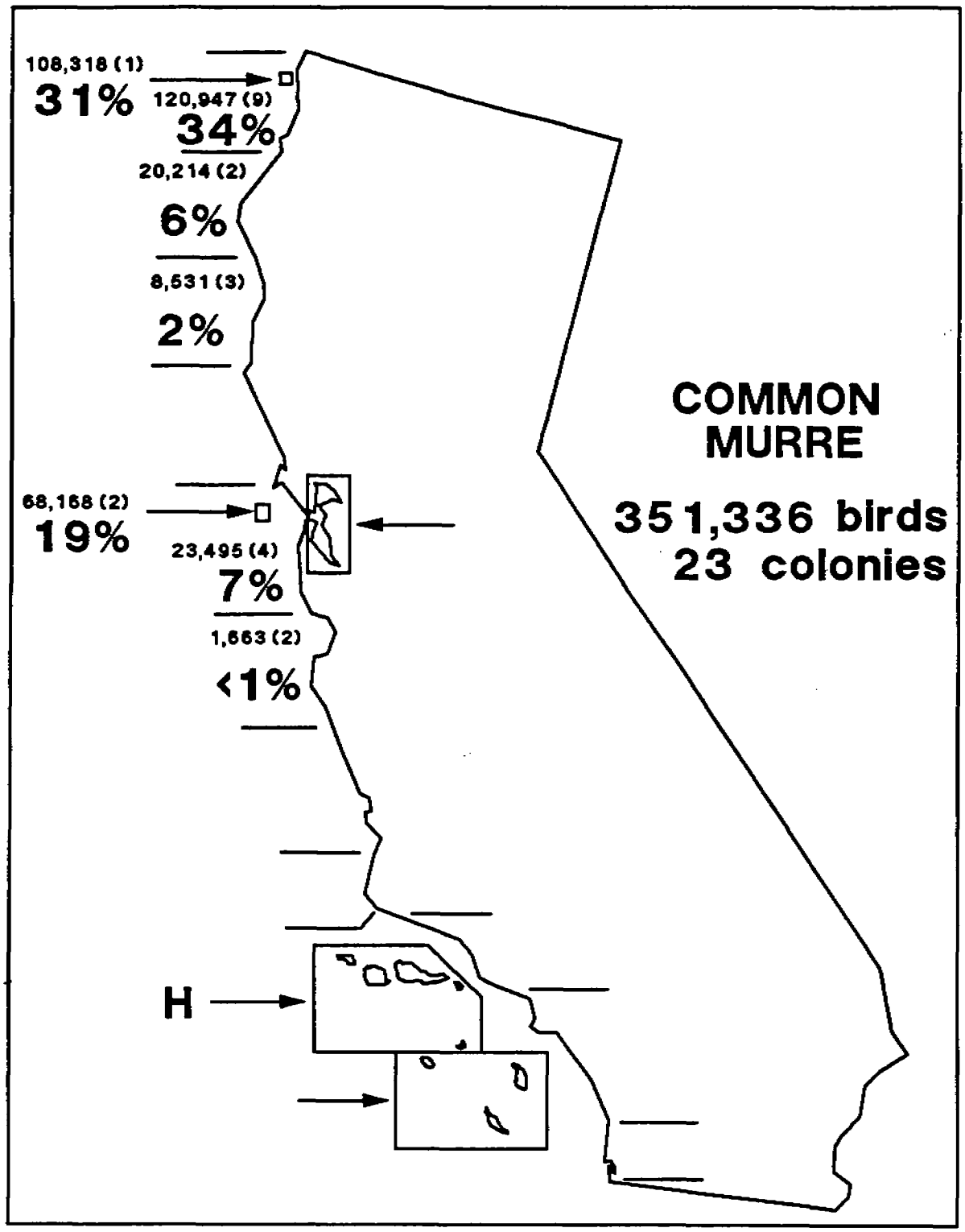


Figure 40. Percentage of state breeding population of Common Murre in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 27. Numbers of breeding Common Murres at each colony in California in 1975-1980 (Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		1989-1991	
Northern California						
Castle Rock	DN-414-06	325-006	126,000	(34.7)	108,318	(30.8)
Rock R	DN-412-01	325-048	0	(0.0)	326	(0.1)
Sister Rocks	DN-412-02	325-009	50	(<0.1)	363	(0.1)
False Klamath Rock	DN-412-07	325-010	26,500	(7.3)	43,898	(12.5)
Redding Rock	HU-412-01	325-013	2,100	(0.6)	2,742	(0.8)
White Rock	HU-410-08	325-019	2,600	(0.7)	5,304	(1.5)
Green Rock	HU-410-09	325-020	55,000	(15.1)	32,021	(9.1)
Flatiron Rock	HU-410-13	325-023	24,000	(6.6)	33,456	(9.5)
Blank Rock	HU-410-14	325-024	1,000	(0.3)	556	(0.2)
Pilot Rock	HU-410-16	325-026	2,500	(0.7)	2,281	(0.6)
False Cape Rocks	HU-402-01	325-040	8,000	(2.2)	11,051	(3.1)
Steamboat Rock	HU-402-03	325-042	4,500	(1.2)	9,163	(2.6)
Rockport Rocks	ME-394-07	379-001	0	(0.0)	1,544	(0.4)
Cape Vizcaino	ME-394-08	379-002	5,800	(1.6)	6,930	(2.0)
Goat Island Area	ME-390-01	379-006	0	(0.0)	57	(<0.1)
(Subtotal)			258,050		258,010	
Central California						
Point Reyes	MA-374-01	429-001	16,500	(4.5)	15,155	(4.3)
Point Resistance	MA-374-03	429-024	7,500	(2.1)	3,518	(1.0)
Millers Point Rocks	MA-374-04	429-002	0	(0.0)	358	(0.1)
Double Point Rocks	MA-374-05	429-003	13,000	(3.6)	4,464	(1.3)
North Farallon Islands	SF-FAI-01	429-051	51,540[2]	(0.0)	27,308	(7.8)
South Farallon Islands	SF-FAI-02	429-052	60,000	(16.5)	40,860	(11.6)
San Pedro Rock	SM-372-02	429-013	H	(0.0)	H	(0.0)
Devil's Slide Rock	SM-372-03	429-014	2,300	(0.6)	H	(0.0)
Castle Rocks and Mainland	MO-362-19	454-010	3,500	(1.0)	1,050	(0.3)
Hurricane Point Rocks	MO-362-20	454-011	2,300	(0.6)	613	(0.2)
(Subtotal)			105,100[2]		93,326	
Southern California						
Prince Island	SB-SMI-07	501-004	H	(0.0)	H	(0.0)
Total			363,150[2]		351,336	

[1] H, historical nesting only; a dash (-) indicated the colony was not surveyed during the study period.
[2] The estimate for the North Farallon Islands was derived from data provided in Briggs et al. (1983) as calculated in Takekawa et al. (1990). Sowls et al. (1980) did not include an estimate for North Farallon Islands and reported a total of 363,154 breeding birds. Totals and subtotals in this table did not include the North Farallon Islands in 1979-1980.

PIGEON GUILLEMOT

Pigeon Guillemots occur along most of the coasts of the North Pacific Ocean. They are ubiquitous along the California coast, reaching the southern end of their range at Santa Barbara Island, Santa Barbara County. Guillemots are diurnal and can be easily observed at larger colonies during the day. However, they nest in rock crevices and burrows often located in inaccessible island and mainland cliffs in small, scattered colonies that can be difficult to detect. In addition, numbers of birds visible at colonies are highly variable, especially depending on time of day and period of the breeding season (Figures 6, 7). Numbers can also vary considerably between years depending on oceanographic conditions that affect prey resources, especially ENSO (El Nino-Southern Oscillation) events (Ainley and Boekelheide 1990).

In 1989-1991, we focused mainly on detecting all colonies present by: 1) carefully surveying every possible section of coastline using a Zodiac inflatable boat which allowed access to all coastal areas, including coves and sea caves; 2) conducting counts of birds as early in the day as feasible (given coverage of large sections of coast per day) when numbers of guillemots are typically highest (Figures 6, 7); and 3) conducting surveys in the early part of the breeding season (and in some areas, the prebreeding period) when numbers of birds visibly attending colonies are highest, especially in years when nest failures or colony abandonments occur. However, we usually were unable to repeat surveys to obtain peak counts at most colonies. This approach was most similar to techniques used to survey guillemots in northern and central California in 1979-1980 (Sowls et al. 1980) except that these previous surveys were conducted later in the year. Previous surveys in southern California in 1975-1978 were conducted from a larger boat (which did not allow the same careful coverage of coastal areas), were less standardized by time of day and were conducted later in the year (Hunt et al. 1979). In addition, it is not clear how previous estimates were adjusted to derive population estimates. Due to these census differences and high variability of bird counts at colonies, breeding population estimates in 1989-1991 and 1975-1980 are not directly comparable and any comparisons must be treated with caution. For this reason, we have examined changes in numbers only at many colonies combined over large sections of coast.

Northern California

In 1989, 3,894 breeding birds were estimated at 107 active colonies (including 396 breeding birds at 19 newly-dicovered colonies)(Figure 41, Table 28). This total corresponded to 22% lower numbers overall than in 1979-1980 (N=5,002 breeding birds) and 30% lower numbers at the 92 colonies known previously (including 4 colonies inactive in 1989). In Del Norte and Humboldt counties (USFWS Map Block 325), counts were conducted in

late April (pre-breeding) and mid-late May (prior to median laying) and were adjusted differently than farther south (see methods). Here, 1,735 breeding birds were estimated at 41 colonies (including 73 breeding birds at 6 new colonies), corresponding to 39% lower numbers overall than in 1979-1980 (N= 2,828 breeding birds) and 41% lower numbers at the 35 colonies known previously. At 7 large colonies (100-800 breeding birds) in 1979-1980, 6 colonies had lower numbers (Range=28-63%) and 1 colony had 15% higher numbers. For example, numbers at Castle Rock, Prince Island and False Cape Rocks fell 45%, 49% and 37%, respectively (Table 28). Surveys in mid-late May had the highest numbers of guillemots at large colonies and were used to derive breeding population estimates. At 28 small colonies (<100 breeding birds), 20 colonies had lower numbers and 8 colonies had higher numbers.

In Mendocino, Sonoma and northern Marin counties (USFWS Map Blocks 379 and 404), 2,161 breeding birds were estimated at 70 colonies (including 323 breeding birds at 13 new colonies), corresponding to 1% lower numbers overall than in 1979-1980 (N=2,174 breeding birds) and 16% lower numbers at the 57 colonies known previously. At 6 large colonies (100-250 breeding birds) in 1979-1980, 5 colonies had lower numbers (Range=52-76%) and 1 colony had 70% higher numbers. For example, numbers at Triplett Gulch, Goat Island Area and Van Damme Cove fell 28%, 45% and 24%, respectively (Table 28). At 51 small colonies (<100 breeding birds), 19 colonies had lower numbers and 32 had equal to or higher numbers. Small colonies at Point No Pass, Soldier Frank Point, Duncan Point to Arched Rock and Tomales Point were not detected in 1989.

Central California

In 1989, 8,358 breeding birds were estimated at 94 active colonies (including 690 breeding birds at 30 newly-discovered colonies and 144 breeding birds at 4 known colonies without previous estimates)(Figure 41, Table 28). This total corresponded to 5% lower numbers overall than in 1979-1980 (N=8,774 breeding birds) and 14% lower numbers at 66 colonies with previous estimates. At 18 large colonies (100-3000 breeding birds) in 1979-1980, 12 colonies had lower numbers (Range=2-100%) and 6 colonies had higher numbers (Range=19-413%). At 44 small colonies (<100 breeding birds), 13 colonies had lower numbers and 31 colonies had higher numbers.

At the South Farallon Islands (the largest colony in California), numbers fell from 3000 in 1979 (PRBO estimate reported in Sowls et al. 1980) to 1867 breeding birds in 1989 (38% lower). However, Ainley and Boekelheide (1990) reported a revised estimate of 2,000 breeding birds in 1979, similar to the 1989 estimate. Changing this estimate accounted for much of the lower numbers found in central California. In comparison, large

colonies on the adjacent mainland at Point Reyes and Greyhound Rock to Point Santa Cruz increased by 413% and 13%, respectively. Annual monitoring of population size at the South Farallon Islands colony showed that numbers declined drastically after the 1982-1983 ENSO event but have increased since (despite smaller ENSO events in 1986 and 1989) back to pre-1983 levels by 1989 (Ainley et al. 1988, Ainley and Boekelheide 1990). In addition, substantial numbers were killed in gill nets between Point Reyes and Monterey in 1979-1987 (CDFG 1987; see Takekawa et al. 1990).

Much lower numbers also were found at several other known colonies in central California (e.g., Devil's Slide Rock, Martin's Beach, Bench Mark-227X, Castle Rocks and Mainland, Hurricane Point Rocks, McWay Rocks, Partington Ridge South and Diablo Nuclear Power Plant South)(Table 28). However, much higher numbers were found at several known colonies (e.g., San Pedro Rock, Ano Nuevo Island, Point Buchon, Shell Beach Rocks, North Pismo Beach Rocks, Mainland and rocks east of Destroyer Rock and Point Arguello) in addition to large newly-discovered colonies (e.g., Coast Campground South, Monterey Harbor, Cannery Row, Anderson Canyon Rocks, Point Sal and North Honda)(Table 28). One large colony (Pinnacle Point Area) and 9 small colonies (Point Diablo Bluffs and Needles, Seal Rocks, Eel Rock Cliffs, Sand Hill Cove, Yankee Point, Lafler Rock and Mainland, Plaskett Rock, Cape San Martin and Redwood Gulch Rock) reported in 1979-1980 were not detected in 1989.

Southern California

In 1991, 3,218 breeding birds were estimated at 34 active colonies (including 178 breeding birds at 12 newly-discovered colonies), corresponding to 112% higher numbers overall than in 1975-1978 (N=1,540 breeding birds) and 97% higher numbers at 22 colonies known previously. At 6 large colonies (120-400 breeding birds), 5 colonies had higher numbers (Range=28-240%) and 1 colony had 82% lower numbers. For example, at Harris Point to Cuyler Harbor (San Miguel Island) and northern Santa Cruz Island (9 newly-defined colonies combined), numbers increased from 140 to 365 and 400 to 1,361 breeding birds, respectively (Table 28). At 4 small colonies (<100 breeding birds), all had higher numbers in 1991. Guillemots were detected at all previously-known colonies. Increases in numbers were quite evident at small colonies at the end of the range of Pigeon Guillemots in the Anacapa Islands area (640% higher at 3 colonies combined) and in the Santa Barbara Island area (137% higher at 3 colonies combined) but no new colonies were discovered in the southern Channel Islands. Higher numbers may have reflected a true increase since 1975-1977 and some increase over certain years due to abundant prey resources in 1991 in addition to known differences in census techiques which would result in higher numbers in 1991.

Summary

The 1989-1991 total of 15,470 breeding birds at 235 active colonies (including 1,264 breeding birds at 61 newly-discovered colonies and 1,507 breeding birds at known colonies without previous estimates) was almost identical to the 1975-1980 total of 15,316 breeding birds (Hunt et al. 1979, Sowls et al. 1980). This total corresponded to 1% higher numbers overall and 8% lower numbers at 188 previously-known colonies. On the other hand, this slight overall difference masked large changes in numbers in different parts of the coast. Lower numbers were most evident in the Del Norte and Humboldt counties' area of northern California and at the South Farallon Islands in central California. Although numbers were adjusted differently in the former area, we believe that this factor had only a small effect on estimates there relative to other areas surveyed in 1989-1991. Lower numbers also were found at many other colonies in northern and central California although higher numbers were also found at other colonies. A newly-revised 1979 estimate at the South Farallon Islands accounted for lower numbers there, despite ENSO-related decline and recovery between 1979 and 1989. In southern California, higher numbers are evident although our censusing effort was greater than in 1975-1978.

While ENSO events and gillnetting clearly affected the colony at the South Farallon Islands, impacts there appear to have been greater than at other nearby colonies. Guillemots at this colony feed extensively on juvenile rockfish (Sebastes sp.), a pelagic prey resource which occurs farther offshore and in the vicinity of this colony during the breeding season (Ainley and Boekelheide 1990). The effects of ENSO events on juvenile rockfich are probably much greater than on other bottom-dwelling nearshore prey resources that guillemots probably use at other mainland colonies. Thus, we do not consider lower numbers in northern and central California to have resulted mainly from ENSO-related declines. Instead, we believe that lower numbers in this area and higher numbers in southern California may have resulted primarily from differences in how censuses were conducted and how numbers were adjusted to derive estimates. This interpretation is supported by the increase in numbers found in southern California where ENSO effects and related declines should have been greatest. However, a mild ENSO event occurred in 1989, affecting numbers of breeding birds and breeding success at the South Farallon Islands (Emslie and Sydeman 1989). Numbers of breeding birds at other colonies in northern and central California may have been affected but to a lesser extent. If colonies in the Channel Islands (especially in the San Miguel and Santa Rosa islands area) also rely on rockfish or other offshore prey which are affected by ENSO, numbers of breeding birds may have been higher in 1991. Thus, numbers in southern California may have been slightly elevated in comparison to numbers in northern and central California.

Further work is required to examine previous data to determine comparability with 1989-1991 estimates. However, without detailed multiple censuses in a given year and/or annual monitoring, it will be difficult to interpret population changes in this species in any case. An annual monitoring program should be instigated to examine changes in population size at selected colonies along the coast. A substantial and standardized effort will be required to develop techniques to derive repeatable and comparable estimates at studied colonies and to develop adequate correction factors to adjust counts at other colonies which are surveyed less frequently.

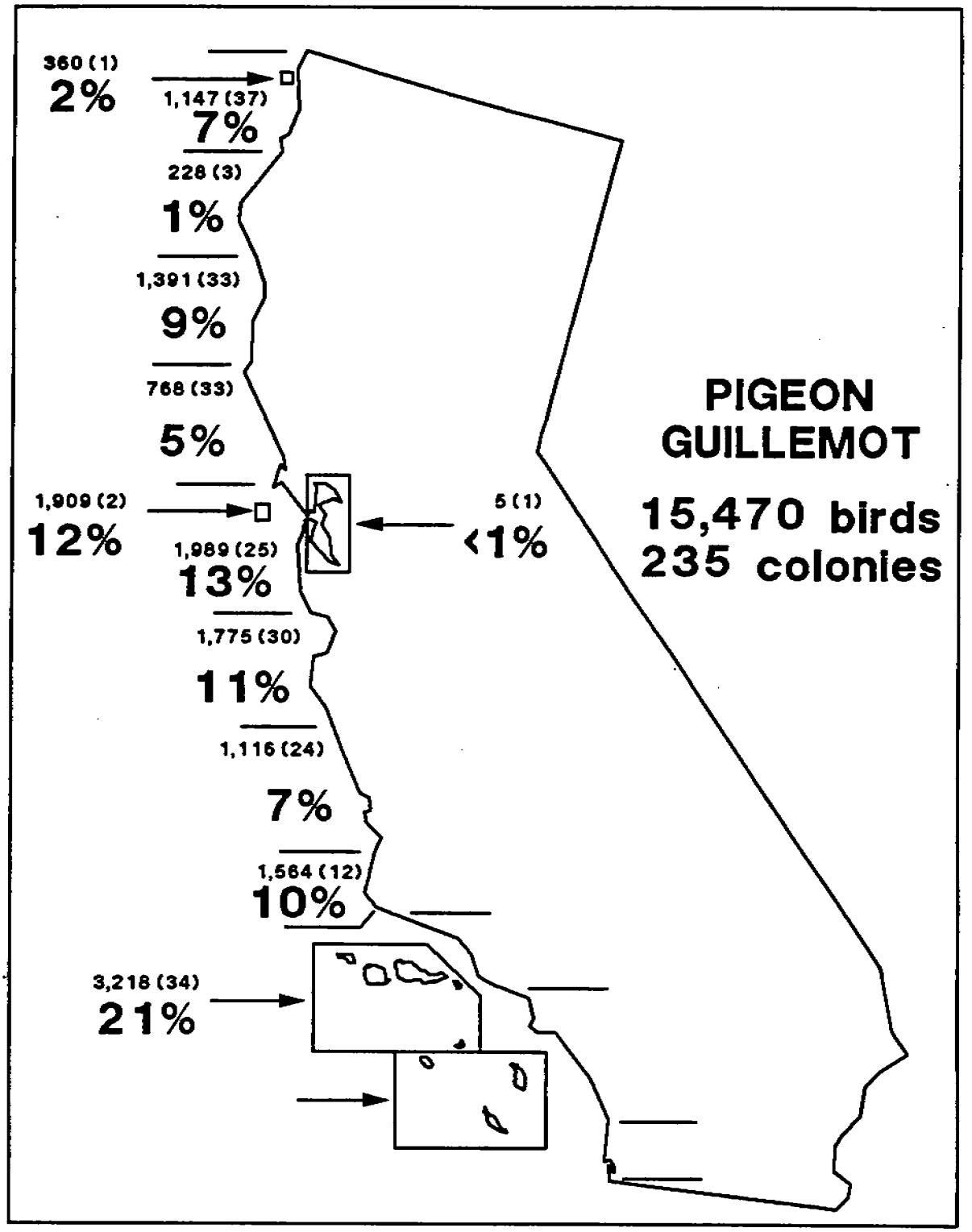


Figure 41. Percentage of state breeding population of Pigeon Guillemot in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 28. Numbers of breeding Pigeon Guillemots at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		1989-1991	
Northern California						
Cone Rock	DN-414-01	325-001	8	( )	12	(0.1)
Hunter Rocks	DN-414-02	325-002	120	( )	138	(0.9)
Prince Island	DN-414-03	325-003	450	( )	221	(1.4)
Point Saint George Lighthouse	DN-414-04	325-044	0	( )	6	(<0.1)
Point Saint George	DN-414-05	325-057	40	( )	64	(0.4)
Castle Rock	DN-414-06	325-006	800	( )	360	(2.3)
Tolowa Rocks	DN-414-07	325-007	40	( )	39	(0.3)
White Rock	DN-414-08	325-008	10	( )	1	(<0.1)
Crescent City Harbor Area	DN-414-09	325-045	72	( )	33	(0.2)
Unnamed Small Rocks	DN-414-10	325-046	100	( )	59	(0.4)
Easy Triangle Rocks	DN-414-11	325-047	20	( )	16	(0.1)
Rock R	DN-412-01	325-048	2	( )	3	(<0.1)
Sister Rocks	DN-412-02	325-049	40	( )	48	(0.3)
Footsteps Rock	DN-412-05	325-050	60	( )	61	(0.4)
False Klamath Rock	DN-412-07	325-010	160	( )	72	(0.5)
False Klamath Cove to Pine Point	DN-412-08	325-060	0	( )	16	(0.1)
Radar Station Rocks	DN-412-09	325-051	20	( )	13	(0.1)
Flint Rock Head	DN-412-10	325-011	0	( )	5	(<0.1)
White Rock	DN-412-11	325-012	6	( )	18	(0.1)
High Bluff South	DN-412-12	325-061	0	( )	29	(0.2)
Split Rock	DN-412-13	325-062	0	( )	13	(0.1)
Redding Rock	HU-412-01	325-013	8	( )	3	(<0.1)
Dry Lagoon Cliffs	HU-410-01	325-063	0	( )	4	(<0.1)
Wedding Rock	HU-410-03	325-016	60	( )	83	(0.5)
Palmer's Point to Scotty Point	HU-410-04	325-052	40	( )	27	(0.2)
"Sea Gull Rock"	HU-410-05	325-017	12	( )	1	(<0.1)
Scotty Point to Megwill Point	HU-410-06	325-053	60	( )	9	(0.1)
"Sea Lion Rock"	HU-410-07	325-018	20	( )	5	(<0.1)
White Rock	HU-410-08	325-019	24	( )	10	(0.1)
Green Rock	HU-410-09	325-020	28	( )	25	(0.2)
"Puffin Rock"	HU-410-10	325-021	10	( )	8	(0.1)
Flatiron Rock	HU-410-13	325-023	2	( )	3	(<0.1)
Blank Rock	HU-410-14	325-024	20	( )	5	(<0.1)
Trinidad Head	HU-410-15	325-025	60	( )	30	(0.2)
Pilot Rock	HU-410-16	325-026	20	( )	5	(<0.1)
Prisoner Rock	HU-410-17	325-027	4	( )	3	(<0.1)
Trinidad Bay Rocks	HU-410-18	325-054	60	( )	36	(0.2)
Little River Rock	HU-410-19	325-035	60	( )	23	(0.1)
False Cape Rocks	HU-402-01	325-040	150	( )	55	(0.4)
Sugarloaf Island	HU-402-02	325-041	240	( )	172	(1.1)
Steamboat Rock	HU-402-03	325-042	2	( )	1	(<0.1)
Point No Pass	ME-394-01	379-011	2	( )	N	(0.0)
High Tip	ME-394-02	379-012	4	( )	18	(0.1)
Anderson Cliffs	ME-394-03	379-013	40	( )	40	(0.3)
Mistake Point to Big White Rock	ME-394-04	379-014	100	( )	40	(0.3)
Usal Bay	ME-394-05	379-015	40	( )	18	(0.1)
Soldier Frank Point	ME-394-06	379-016	20	( )	N	(0.0)
Rockport Rocks	ME-394-07	379-001	20	( )	8	(0.1)
Cape Vizcaino	ME-394-08	379-002	8	( )	42	(0.3)
Chris Rocks	ME-394-09	379-003	0	( )	25	(0.2)
Hardy Rock and Union Landing	ME-394-10	379-017	6	( )	22	(0.1)
Westport	ME-392-01	379-018	4	( )	94	(0.6)
Chadbourne Rocks	ME-392-02	379-019	0	( )	8	(0.1)
Strawberry Cove	ME-392-03	379-020	10	( )	8	(0.1)
Kibesillah Rock	ME-392-04	379-004	0	( )	8	(0.1)
Newport Rocks	ME-392-05	379-021	28	( )	42	(0.3)
Georgia Pacific	ME-392-06	379-022	0	( )	36	(0.2)
Noyo Bay	ME-392-07	379-035	0	( )	88	(0.6)
Mitchell Creek to Caspar Point	ME-392-08	379-036	0	( )	48	(0.3)

Casper Anchorage	ME-392-09	379-023	2	(	)	37	(0.2)
Casper Anchorage to Point Cabrillo	ME-392-10	379-037	0	(	)	15	(0.1)
Point Cabrillo Lighthouse-Jack Peters Glh	ME-392-11	379-024	38	(	)	63	(0.4)
Goat Island Area	ME-390-01	379-006	120	(	)	54	(0.3)
Mendocino	ME-390-02	379-025	32	(	)	58	(0.4)
Mendocino Bay	ME-390-03	379-026	20	(	)	36	(0.2)
Mendocino Bay South	ME-390-04	379-038	0	(	)	41	(0.3)
"Van Damme Cove"	ME-390-05	379-027	120	(	)	29	(0.2)
Schoolhouse Creek to Albion River	ME-390-06	379-028	68	(	)	152	(1.0)
Albion Cove to Navarro River	ME-390-07	379-029	30	(	)	28	(0.2)
Devil's Basin	ME-390-08	379-007	20	(	)	49	(0.3)
Cavanaugh Cove to Gunderson Rock	ME-390-09	379-030	100	(	)	170	(1.1)
Wharf Rocks	ME-390-10	379-008	34	(	)	55	(0.4)
Casket Rock	ME-390-11	379-009	10	(	)	10	(0.1)
Bonee Cliffs	ME-390-12	379-031	40	(	)	25	(0.2)
White Rock	ME-390-13	379-010	10	(	)	22	(0.1)
Mallo Pass Creek	ME-390-16	379-034	20	(	)	2	(<0.1)
Point Arena	ME-384-01	404-017	60	(	)	52	(0.3)
Sea Lion Rocks	ME-384-02	404-001	60	(	)	12	(0.1)
Sea Lion Rocks to Arena Cove	ME-384-03	404-042	0	(	)	2	(<0.1)
"Moat Cove"	ME-384-04	404-018	0	(	)	10	(0.1)
"Section 30 Cove	ME-384-05	404-019	30	(	)	8	(0.1)
Saunders Landing	ME-384-06	404-020	2	(	)	8	(0.1)
Iverson Landing	ME-384-07	404-002	30	(	)	5	(<0.1)
Triplett Gulch	ME-384-08	404-021	200	(	)	55	(0.4)
Fish Rocks	ME-384-10	404-003	250	(	)	119	(0.8)
Collins Landing to Gualala River	ME-384-11	404-023	30	(	)	90	(0.6)
Gualala Point Island	SO-384-01	404-004	40	(	)	29	(0.2)
Sea Ranch	SO-384-03	404-025	8	(	)	42	(0.3)
Black Point to Stewart's Point	SO-384-04	404-026	2	(	)	12	(0.1)
Stewart's Point to Rocky Point	SO-382-01	404-027	6	(	)	15	(0.1)
Horseshoe Cove	SO-382-02	404-028	14	(	)	2	(<0.1)
Cannon Gulch to Stump Beach	SO-382-03	404-029	4	(	)	2	(<0.1)
Gerstle Cove to Stillwater Cove	SO-382-04	404-030	18	(	)	10	(0.1)
Bench Mark 125 to Timber Cove	SO-382-05	404-031	0	(	)	10	(0.1)
Windermere Point to Jewell Gulch	SO-382-06	404-043	2	(	)	2	(<0.1)
Russian Gulch	SO-382-08	404-033	60	(	)	20	(0.1)
Russian River Rocks	SO-382-09	404-005	40	(	)	5	(<0.1)
Arched Rock	SO-382-11	404-006	20	(	)	2	(<0.1)
Peaked Hill	SO-382-12	404-034	80	(	)	2	(<0.1)
Gull Rock	SO-382-13	404-035	40	(	)	2	(<0.1)
Shell-Wright Beach Rocks	SO-382-14	404-036	8	(	)	5	(<0.1)
Duncan Point to Arched Rock	SO-382-15	404-037	4	(	)	H	(0.0)
Bodega Head	SO-380-01	404-038	60	(	)	2	(<0.1)
Bodega Rock	SO-380-02	404-008	0	(	)	30	(0.2)
Bodega Harbor	SO-380-03	404-045	0	(	)	2	(<0.1)
Pinnacle Rock	SO-380-04	404-039	30	(	)	27	(0.2)
Sonoma-Marin County Line	MA-380-01	404-040	40	(	)	25	(0.2)
Dillon Beach Rocks	MA-380-02	404-009	40	(	)	20	(0.1)
Tomales Point	MA-380-03	404-011	8	(	)	H	(0.0)
Bird Rock	MA-380-04	404-010	30	(	)	115	(0.7)
Elephant Rock Complex	MA-380-05	404-041	12	(	)	28	(0.2)
(Subtotal)			5,002			3,894	
<u>Central California</u>							
Point Reyes	MA-374-01	429-001	120	(	)	616	(4.0)
Coast Campground South	MA-374-02	429-042	0	(	)	63	(0.4)
Point Resistance	MA-374-03	429-024	60	(	)	50	(0.3)
Millers Point Rocks	MA-374-04	429-002	10	(	)	55	(0.4)
Double Point Rocks	MA-374-05	429-003	40	(	)	22	(0.1)
Gull Rock Area	MA-374-07	429-025	2	(	)	7	(<0.1)
Muir Beach Headlands to Tennessee Cove	MA-374-08	429-026	X	(	)	34	(0.2)
Bird Island	MA-374-09	429-007	4	(	)	5	(<0.1)
Point Bonita	MA-374-10	429-008	X	(	)	66	(0.4)
Bonita Cove	MA-374-11	429-027	X	(	)	2	(<0.1)
Point Diablo Bluffs and Needles	MA-374-12	429-028	X	(	)	H	(0.0)
North Farallon Islands	SF-FAI-01	429-051	ND	(	)	42	(0.3)
South Farallon Islands	SF-FAI-02	429-052	3,000	(	)	1,867	(12.1)

Lobos Rock and Land's End	SF-374-02	429-029	68	( )		18	(0.1)
Seal Rocks	SF-374-03	429-009	6	( )		N	(0.0)
Mussel Rock Area	SM-374-01	429-045	0	( )		10	(0.1)
Mori Point	SM-372-01	429-046	0	( )		18	(0.1)
San Pedro Rock	SM-372-02	429-013	40	( )		70	(0.5)
Devil's Slide Rock	SM-372-03	429-014	120	( )		30	(0.2)
Pillar Point	SM-372-04	429-030	6	( )		2	(<0.1)
Eel Rock Cliffs	SM-372-05	429-031	P	( )		N	(0.0)
Seal Rock Cliffs	SM-372-06	429-032	10	( )		12	(0.1)
Martin's Beach	SM-372-07	429-033	120	( )		20	(0.1)
Pomponio Beach to Pescadero Beach	SM-370-01	429-047	0	( )		20	(0.1)
Pigeon Point	SM-370-02	429-034	6	( )		8	(0.1)
Gazos Creek North	SM-370-03	429-048	0	( )		8	(0.1)
Ano Nuevo Island	SM-370-04	429-023	64	( )		117	(0.8)
Punta del Ano Nuevo	SM-370-05	429-022	70	( )		102	(0.7)
Greyhound Rock to El Jarro Point	SC-370-01	429-049	ND	400[2]	( )	321	(2.1)
El Jarro Point to Davenport	SC-370-02	429-050	ND			313	(2.0)
Alcatraz Island	SFB-SF-11	429-036	0	( )		5	(<0.1)
Davenport to Sand Hill Bluff	SC-364-01	454-038	ND			495	(3.2)
Sand Hill Bluff to Needle Rock Point	SC-364-02	454-039	ND	1,200[3]	( )	245	(1.6)
Needle Rock Point to Terrace Point	SC-364-03	454-040	ND			232	(1.5)
Terrace Point to Point Santa Cruz	SC-364-04	454-041	ND			205	(1.3)
Monterey Harbor	MO-362-01	454-043	0	( )		35	(0.2)
Cannery Row	MO-362-02	454-044	0	( )		88	(0.6)
Pescadero Rocks	MO-362-05	454-022	0	( )		22	(0.1)
Guillemot Island Area	MO-362-06	454-023	40	( )		18	(0.1)
Pinnacle Point Area	MO-362-07	454-007	100	( )		N	(0.0)
Sand Hill Cove	MO-362-08	454-008	20	( )		N	(0.0)
Bird Island	MO-362-09	454-009	4	( )		5	(<0.1)
Yankee Point	MO-362-11	454-024	X	( )		N	(0.0)
Yankee Point South	MO-362-12	454-047	0	( )		2	(<0.1)
Soberanes Creek Rocks	MO-362-13	454-026	40	( )		15	(0.1)
Lobos Rocks	MO-362-14	454-025	0	( )		8	(0.1)
Soberanes Point South	MO-362-15	454-027	0	( )		7	(<0.1)
Kasler Point North	MO-362-16	454-048	0	( )		3	(<0.1)
Rocky Point	MO-362-17	454-028	40	( )		17	(0.1)
Bench Mark-227x	MO-362-18	454-029	160	( )		36	(0.2)
Castle Rocks and Mainland	MO-362-19	454-010	88	( )		19	(0.1)
Hurricane Point Rocks	MO-362-20	454-011	80	( )		20	(0.1)
Point Sur	MO-360-01	454-012	4	( )		3	(<0.1)
Molera Rock	MO-360-02	454-030	P	( )		5	(<0.1)
Cooper Point and Islands	MO-360-03	454-031	40	( )		18	(0.1)
Pfieffer Point	MO-360-04	454-032	8	( )		5	(<0.1)
Wreck Beach South	MO-360-05	454-049	0	( )		8	(<0.1)
Lafler Rock and Mainland	MO-360-07	454-034	20	( )		N	(0.0)
Partington Point	MO-360-09	454-050	0	( )		5	(<0.1)
Partington Ridge North	MO-360-10	454-014	80	( )		18	(0.1)
McWay Rocks	MO-360-11	454-015	100	( )		15	(0.1)
Partington Ridge South	MO-360-12	454-035	416	( )		165	(1.1)
Anderson Canyon Rocks	MO-360-13	454-016	0	( )		32	(0.2)
Burns Creek Rocks	MO-360-14	454-017	24	( )		12	(0.1)
Rockland Landing	MO-360-24	454-055	0	( )		17	(0.1)
Larus Rock	MO-354-03	477-014	0	( )		2	(<0.1)
Gorda Area	MO-354-05	477-040	0	( )		5	(<0.1)
Small Rocks Northeast of Plaskett Rock	MO-354-06	477-001	30	( )		40	(0.3)
Plaskett Rock	MO-354-07	477-002	20	( )		N	(0.0)
Cape San Martin	MO-354-08	477-003	8	( )		N	(0.0)
Mainland Point across from Bird Rock	MO-354-10	477-016	0	( )		5	(<0.1)
Redwood Gulch Rock	MO-354-12	477-005	2	( )		N	(0.0)
Unmapped Island	MO-354-14	477-019	12	( )		5	(<0.1)
Arched Peninsula South of Salmon Creek	MO-354-16	477-021	80	( )		28	(0.2)
Ragged Point Lodge Colony	SL-354-01	477-022	20	( )		8	(0.1)
Piedras Blancas Island	SL-352-01	477-007	50	( )		29	(0.2)
Two Rocks South of Point Piedras Blancas	SL-352-03	477-024	20	( )		5	(<0.1)
Point San Simeon	SL-352-04	477-038	40	( )		42	(0.3)
South San Simeon	SL-352-05	477-043	0	( )		22	(0.1)
Morro Rock and Pillar Rock	SL-352-07	477-026	40	( )		24	(0.2)
Spooner's Cove	SL-350-01	477-027	100	( )		56	(0.4)
Point Buchon	SL-350-02	477-009	20	( )		102	(0.7)

Unnamed Rocks	SL-350-03	477-010	200	( )	242	(1.6)
Lion Rock	SL-350-05	477-011	30	( )	18	(0.1)
Diablo Rock and Adjacent Mainland	SL-350-06	477-029	60	( )	5	(<0.1)
Diablo Canyon Nuclear Power Plant South	SL-350-07	477-030	132	( )	48	(0.3)
Double Rock Region	SL-350-08	477-031	0	( )	5	(<0.1)
Smith and Whaler Islands	SL-350-10	477-033	20	( )	18	(0.1)
Port San Luis	SL-350-11	477-045	0	( )	19	(0.1)
Fossil Point	SL-350-12	477-034	110	( )	131	(0.8)
Shell Beach Rocks	SL-350-13	477-035	100	( )	153	(1.0)
North Pismo Beach Rocks	SL-350-14	477-036	60	( )	104	(0.7)
Mussel Point	SB-344-02	501-017	0	( )	5	(<0.1)
Point Sal	SB-344-03	501-018	0	( )	45	(0.3)
Lion Rock	SB-344-04	501-008	0	( )	5	(<0.1)
Point Sal Beach South	SB-344-05	501-019	0	( )	8	(0.1)
Lions Head South	SB-344-06	501-020	0	( )	5	(<0.1)
Purisima Point South	SB-344-09	501-021	0	( )	25	(0.2)
North Honda	SB-342-01	501-022	0	( )	198	(1.3)
Mainland and Rocks East of Destroyer Rock	SB-342-02	501-010	80	( )	148	(1.0)
Destroyer Rock	SB-342-03	501-009	100	( )	65	(0.4)
Point Arguello	SB-342-04	501-011	700	( )	953	(6.2)
Rocky Point	SB-342-05	501-012	100	( )	78	(0.5)
Point Conception	SB-342-06	501-013	30	( )	29	(0.2)
(Subtotal)			8,774		8,358	
<u>Southern California</u>						
Castle Rock	SB-SNI-02	501-005	200	( )	255	(1.6)
Richardson Rock	SB-SNI-03	501-026	0	( )	22	(0.1)
Harris Point to Cuyler Harbor	SB-SNI-06	501-015	140	( )	365	(2.4)
Prince Island	SB-SNI-07	501-004	300	( )	405	(2.6)
Hoffman Point Area	SB-SNI-08	501-029	0	( )	35	(0.2)
Bay Point Area	SB-SNI-09	501-016	120	( )	22	(0.1)
Tyler Bight to Adam's Cove	SB-SNI-12	501-032	0	( )	10	(0.1)
Brockway Point Area	SB-SRI-03	501-035	ND		8	(0.1)
Canada Verde to Santa Rosa Island W Base	SB-SRI-04	501-036	ND	250[4] ( )	65	(0.4)
Carrington Point	SB-SRI-05	501-037	ND		130	(0.8)
South Becher's Bay	SB-SRI-07	501-039	ND		76	(0.5)
Sierra Pablo Area	SB-SRI-09	501-040	0	( )	8	(0.1)
Fraser Point	SB-SZI-01	502-015	X		62	(0.4)
West Point Area	SB-SZI-02	502-016	X		452	(2.9)
Profile Point Area	SB-SZI-03	502-017	X	400[5,6] ( )	365	(2.4)
Cueva Valdaze Area	SB-SZI-04	502-018	X		129	(0.8)
Arch Rock to Diablo Point	SB-SZI-05	502-019	X		82	(0.5)
Diablo Rocks	SB-SZI-06	502-020	X		10	(0.1)
Fry's Harbor to Twin Harbors	SB-SZI-07	502-021	0	( )	10	(0.1)
Pelican Bay Area	SB-SZI-09	502-022	0	( )	2	(<0.1)
Prisoner's Harbor Area	SB-SZI-10	502-023	0	( )	20	(0.1)
Coche Point Northeast	SB-SZI-11	502-024	X	X[5,7] ( )	88	(0.6)
Cavern Point Area	SB-SZI-12	502-025	X		82	(0.5)
Scorpion Anchorage	SB-SZI-13	502-026	X[5,8]	( )	91	(0.6)
Scorpion Rocks	SB-SZI-14	502-010	8[5,9]	( )	28	(0.2)
San Pedro Point Area	SB-SZI-15	502-027	0	( )	34	(0.2)
Gull Island	SB-SZI-22	524-001	0	( )	2	(<0.1)
Black Point Northwest	SB-SZI-24	502-028	X[5,6]	( )	2	(<0.1)
Anacapa Island-West	VE-ANI-01	502-007	10	( )	47	(0.3)
Anacapa Island-Middle	VE-ANI-02	502-008	0	( )	4	(<0.1)
Anacapa Island-East	VE-ANI-03	502-009	0	( )	23	(0.1)
Shag Rock	SB-SBI-01	524-007	0	( )	8	(0.1)
Santa Barbara Island	SB-SBI-02	524-008	90	( )	238	(1.5)
Sutil Island	SB-SBI-03	524-009	30	( )	38	(0.2)
(Subtotal)			1,540		3,218	
<u>Total</u>			15,316[10]		15,470	

1 X, present; P, probably/possibly present; H, historical nesting only; ND, no data.
2 Formerly included in "Greyhound Rock to Davenport" (429-035) in Sowls et al. (1980).
3 Formerly included in "Davenport to Pt. Santa Cruz" (454-021) in Sowls et al. (1980).

4 Formerly included in "Sandy Point to Carrington Point" (501-007) in Sowls et al. (1980). They did not include South Becher's Bay.
5 Hunt et al. (1979, 1980) reported 400+ birds for all of Santa Cruz Island.
6 Formerly included in "Kinton Point to Diablo Point" (502-014) in Sowls et al. (1980).
7 Formerly included in "Coche Point to Cavern Point" (502-012) in Sowls et al. (1980).
8 Listed in Hunt et al. (1979) but not listed in Sowls et al. (1980).
9 Not included in total.
10 Sowls et al. (1980) reported a total of 14,724 breeding birds.

MARBLED MURRELET

The Marbled Murrelet breeds along the coasts of the North Pacific Ocean from northern Japan, across the Aleutian Islands, and south to central California. Unlike other seabirds, it does not nest in colonies on islands or in estuaries. Instead, from southern Alaska to California and in much of its Asian range, it nests solitarily on the branches of old-growth coniferous trees from the coast (including forested islands) up to 100 km inland. In south-central Alaska and presumably on the Aleutian Islands, it will also nest on the surface of the ground or in rock cavities in alpine areas and on treeless offshore islands. This species has received much attention in recent years because of the massive loss of coastal old-growth forests due to extensive logging since the late 1800's throughout its North American range (Sealy and Carter 1984; Marshall 1988; see several papers in Carter and Morrison 1992). In addition, these murrelets have been killed at sea by oil spills and in gill nets (Carter and Sealy 1984, Page et al. 1990, Piatt et al. 1990). In 1991, the Marbled Murrelet was classified under state law as an endangered species in California. It has been proposed under federal law as a threatened species in California, Oregon and Washington. In 1990, it was classified as a threatened species in Canada (British Columbia).

It is very difficult to determine breeding population size in this species. Marbled Murrelets fly to and from their nests mainly at crepuscular and nocturnal times although they will on occasion visit nests during the day (Carter and Sealy 1990). Tree nests are located on the large upper branches of conifers, often over 30 m high (Singer et al. 1991). Tree nests are hard to find, given the cryptic plumage and behavior of adults and chicks at nests high up in trees. To date, less than 40 tree and ground nests have ever been found and knowledge of where nesting areas are located is incomplete (Carter and Morrison 1992; Ewins et al., in press). In California, only 5 nests have been found through 1991 (Binford et al. 1975; Carter and Erickson 1992; Singer et al. 1991, unpubl. data). Four nests were found in old-growth Douglas fir (Pseudotsuga menziesii) and 1 nest was found in a coast redwood (Sequoia sempervirens) in central California. Thus, the only known method of determining population size is to count birds at sea. This task is daunting but is reasonable because these coastal birds tend to occur within a few kilometers of shore throughout the year and tend to aggregate in certain feeding areas (Sealy and Carter 1984, Carter and Sealy 1990). However, as yet, specific repeatable methods of conducting at-sea censuses for determining population size in many different geographic areas and habitats have not been fully developed.

Sowls et al. (1980) estimated 2,000 breeding birds in California in 1979-1980, based on incidental observations of birds at sea during the breeding season in northern and central

California (between the Oregon Border and Point Sal, Santa Barbara County). Murrelets occurred in two main geographically-separated populations adjacent to areas of remaining old-growth forests: 1) the northern population between the Oregon border and Eureka (Del Norte and Humboldt counties); and 2) the central population between Half Moon Bay and Santa Cruz (San Mateo and Santa Cruz counties). Because Sowls et al. (1980) did not provide details on data collection, numbers observed or how population size was determined, Carter and Erickson (1988, 1992) extracted and listed the raw data on murrelets for the 1979-1980 survey from archived data. Their examination of the data resulted in an approximate estimate of 1,650 breeding birds. In 1989, we focused our efforts on attempting to repeat a similar type of survey as conducted in 1979-1980, although we standardized our observations in the form of at-sea transects rather than reporting observations incidentally. This approach required minimal effort, allowed a general comparison to the 1979-1980 estimate and can be more easily repeated in the future. A separate research effort by the U. S. Forest Service began in 1989 and still continues which has been focused entirely on examining aspects of at-sea distribution and variability in numbers counted at sea. With much greater effort and focus, this work should allow for more refined estimates of breeding population size in the future. When available, these estimates will not be comparable with 1979-1980 or 1989 estimates.

Northern California

From 24-28 April 1989, we conducted 151.2 km of at-sea transects to examine murrelet distribution and abundance throughout the entire area of the northern population (Figures 42, 43). We counted 175 birds on these transects with most (81%) birds being observed between the Oregon border and Redwood Creek (Table 29). This coastal area was adjacent to the largest remaining stands of old-growth forest (Figure 43) where murrelets are known to nest (Sander 1987; Carter and Erickson 1988, 1992; Paton and Ralph 1988, 1990; Ralph et al. 1990a,b; Paton et al. 1991, 1992). Of interest, 58 birds were observed between Prince Island and Cone Rock (just south of the Oregon border) and 26 birds between Trinidad and the mouth of Humboldt Bay, areas where murrelets were previously thought to be uncommon (Carter and Erickson 1988). To derive a rough population estimate of 893 breeding birds, we reduced observed numbers by 15% (to account for non-breeding birds), multiplied numbers by a factor of two (because transects occurred during the pre-breeding and early incubation period [Figure 4] when one member of many breeding pairs would be at nests), and multiplied these numbers by a factor of three to account for uncounted birds at sea (as 1979-1980 data was treated by Carter and Erickson 1988). Since not all pairs would have laid eggs at this time, we may have over adjusted numbers by using a factor of two. However, we repeated a 47.0-km section of the coast between the Klamath River and

Rocky Point on 25 June 1989 during the nestling period (Figure 4) when both members of most breeding pairs should be at sea and found 2.5 times as many birds as on 25 April 1989 (i.e. 98 versus 40 birds). Certainly, this method of obtaining a population estimate is rough and more intensive surveys are required to determine a more accurate estimate (see Sealy and Carter 1984, Ralph et al. 1990a). Thus, we could not tell if numbers have truly declined from the 1,380 breeding birds estimated in 1979-1980 to the 893 breeding birds estimated in 1989.

In 1989, murrelets were largely confined within the same area of northern California as found in the 1979-1980 survey. Birds were observed only four times well south of this area within northern California (Table 29). Observations of 8 birds just south of the mouth of the Eel River (Humboldt County) probably indicated that the the northern population actually extended slightly farther south than found by Sowls et al. (1980). Thus, we probably missed some birds between the mouth of Humboldt Bay and the Eel River mouth where we did not conduct surveys in 1989. Two birds were also observed in this area at False Cape Rocks on 26 July 1979 (see Carter and Erickson 1988). The 7 birds seen at the mouths of the Garcia and Gualala rivers (southern Mendocino County) were the only observations between Cape Mendocino and Half Moon Bay. These records supported the contention that a small breeding population (estimated roughly at 36 breeding birds in 1989; Figure 42) still exists in southern Mendocino and/or northern Sonoma counties (Carter and Erickson 1988). Ten murrelets were observed during June and July 1979-1980 in the same general vicinity (i.e. Gualala River mouth, Black Point, Stewart's Point, Gutchell Gulch, and Bourns Landing) and 3 birds were observed near the Gualala River mouth in 1985. Small numbers of murrelets also occur regularly in July and August in southern Sonoma County (i.e. mouth of the Russian River and Bodega Head areas) and may represent post-breeding dispersal of this population into areas frequented by bird watchers.

Although we searched under good weather conditions, Marbled Murrelets were not observed between Cape Mendocino and the mouth of the Garcia River in 1989. However, birds were observed at several localities in this area in 1979 (i.e., Big Flat, Point No Pass, Usal Bay, Shelter Cove) and between 1979 and 1982 (i.e., Bear Harbor, Gualala River, McKerricker Beach, Mendocino, Jackass Gulch) (see Carter and Erickson 1988). Our efforts to observe murrelets at sea in this area were minimal because we covered long stretches of coast usually once only, we did not conduct transects in this area and we were focused on surveying other seabird colonies. Thus, small numbers of birds could have been missed quite easily.

Central California

From 7-8 June 1989, we conducted 91.5 km of at-sea transects to examine murrelet distribution and abundance throughout the entire area of the central population (Figures 42, 43). We counted 168 birds on these transects with most (62%) birds being observed between Franklin Point and Cove Beach (south end of Año Nuevo State Reserve) (Table 29). This area was adjacent to the largest remaining stands of old-growth forest (Figure 43) where murrelets are known to nest (Binford et al. 1975; Singer and Verardo 1975; Carter and Erickson 1988, 1992; Paton and Ralph 1988, 1990; Suddujian et al. 1990a,b, 1992; Becking 1991; Singer et al. 1991; Keitt 1991; Naslund, unpubl. data). Of interest, most (71%) birds were observed farther north between Miramontes Point and Pescadero Beach in 1980 (Carter and Erickson 1988), where only 16% were observed in 1989. We derived a rough population estimate of 857 breeding birds for the central population using the same technique as for the northern population. Since these counts occurred mainly during the incubation period (Figure 4), one member of most breeding pairs should have been at the nest. While this estimate also is rough, we observed twice as many birds in 1989 compared to 1980. In fact, numbers observed in 1989 approached the 225 total estimated for 1980. Thus, we consider that this population was larger than estimated in 1979-1980, although we cannot tell if numbers were underestimated previously or have increased since then.

No observations of Marbled Murrelets were made north of Half Moon Bay in central California in 1989. Small numbers of birds have been reported in the past from Marin County during the breeding season where some potential nesting habitat exists (Figure 43). Murrelets may have nested historically here as well as in parts of San Francisco Bay (Carter and Erickson 1988). South of Santa Cruz, only 1 bird (in basic plumage) was observed off Pfeiffer Point, Monterey County. This bird was assumed to be a non-breeder. Murrelets also may have nested historically on the Monterey peninsula or farther south but few observations have been made in this area during the breeding season in recent years. Only 3 birds were observed south of Santa Cruz in 1979-1980; 1 molting bird was observed between Piedras Blancas Point and La Cruz Rock (San Luis Obispo County) and 2 birds were observed at Point Sal, Santa Barbara County (Carter and Erickson 1988).

Summary

In 1989, a total of 1,821 breeding birds were estimated in California (Figure 42). Although this total was similar to previous estimates of 1,650-2,000 birds, it is likely that numbers of Marbled Murrelets in northern California are declining due to the continued removal of the dwindling old-growth forest nesting habitat where all birds in this area are thought to nest.

Although remaining old-growth forests are being removed at a slower rate in central California, nesting areas there already are small and fragmented. Gill-net fishing and oil spills have caused some mortality in central California (Carter and Erickson 1988, Page et al. 1990). While it was difficult to determine how many birds were affected and at-sea populations have not been monitored to detect any changes, it is likely that such mortality was significant. The current small size of both populations in California probably reflects a large decline over the past century due to the extensive loss of old-growth forests. Continued decline, possibly leading to extinction, has been projected (see Carter and Erickson 1988, 1992 for a summary of population status and conservation problems).

Research efforts by the U. S. Forest Service, Santa Cruz City Museum, Point Reyes Bird Observatory, University of California (Santa Cruz), Humboldt State University, and others have provided new information on inland and at-sea distribution, population sizes, and breeding biology. Most efforts to date have focused on identifying nesting areas within coastal forests. A sustained effort over several years will be required to develop adequate methods for determining reasonable and repeatable estimates of population size based on at-sea surveys or by monitoring bird activity at forested nesting areas. Without these methods, we will not be able to properly monitor the status of these small, endangered populations. Monitoring is critical to the effective management of this species which will undergo intensive consideration over the next few decades as final decisions are made with regard to remaining old-growth forests on private and public lands.

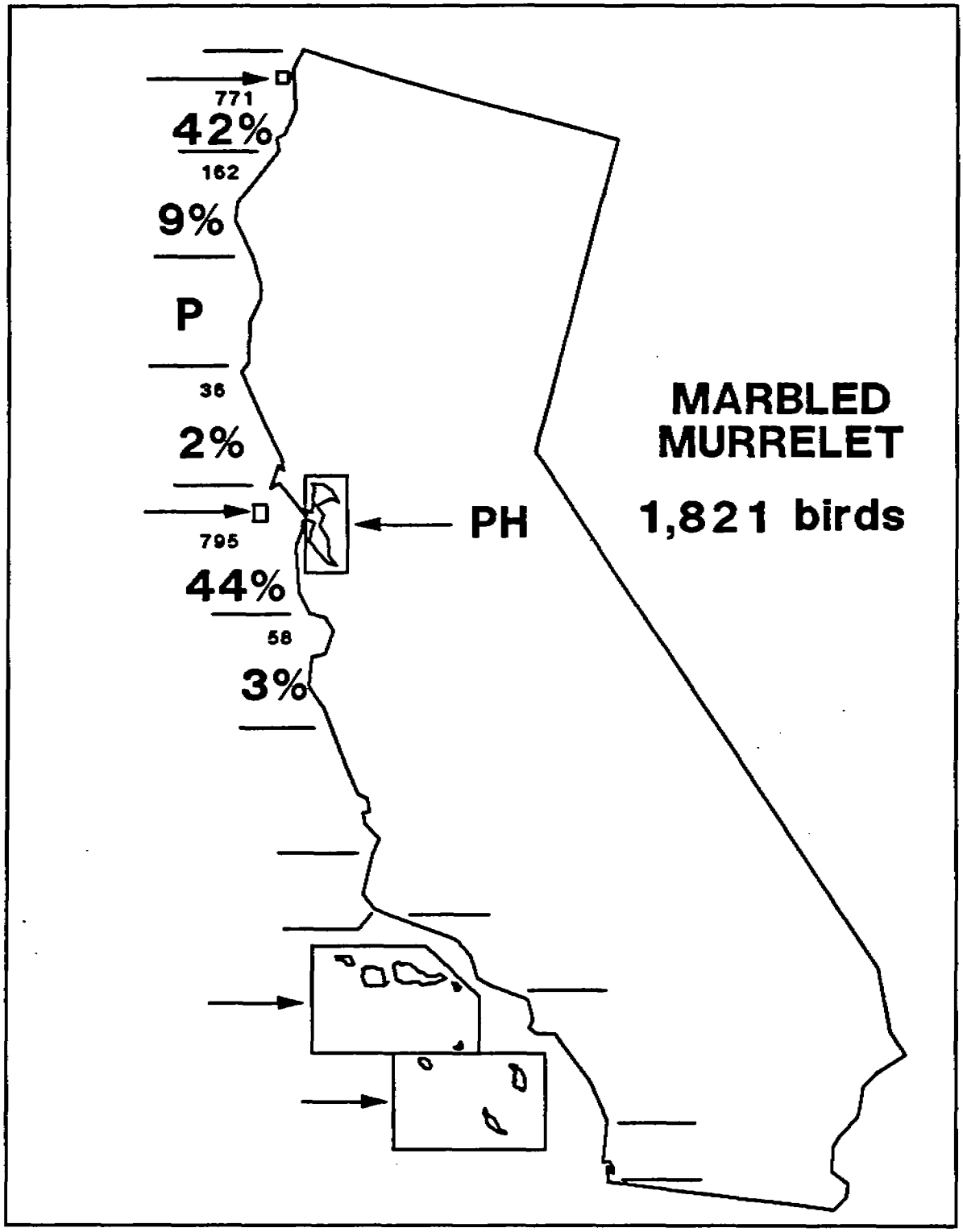


Figure 42. Percentage of state breeding population of Marbled Murrelet in coastal regions of California, 1989-1991. Symbols as in Figure 19.

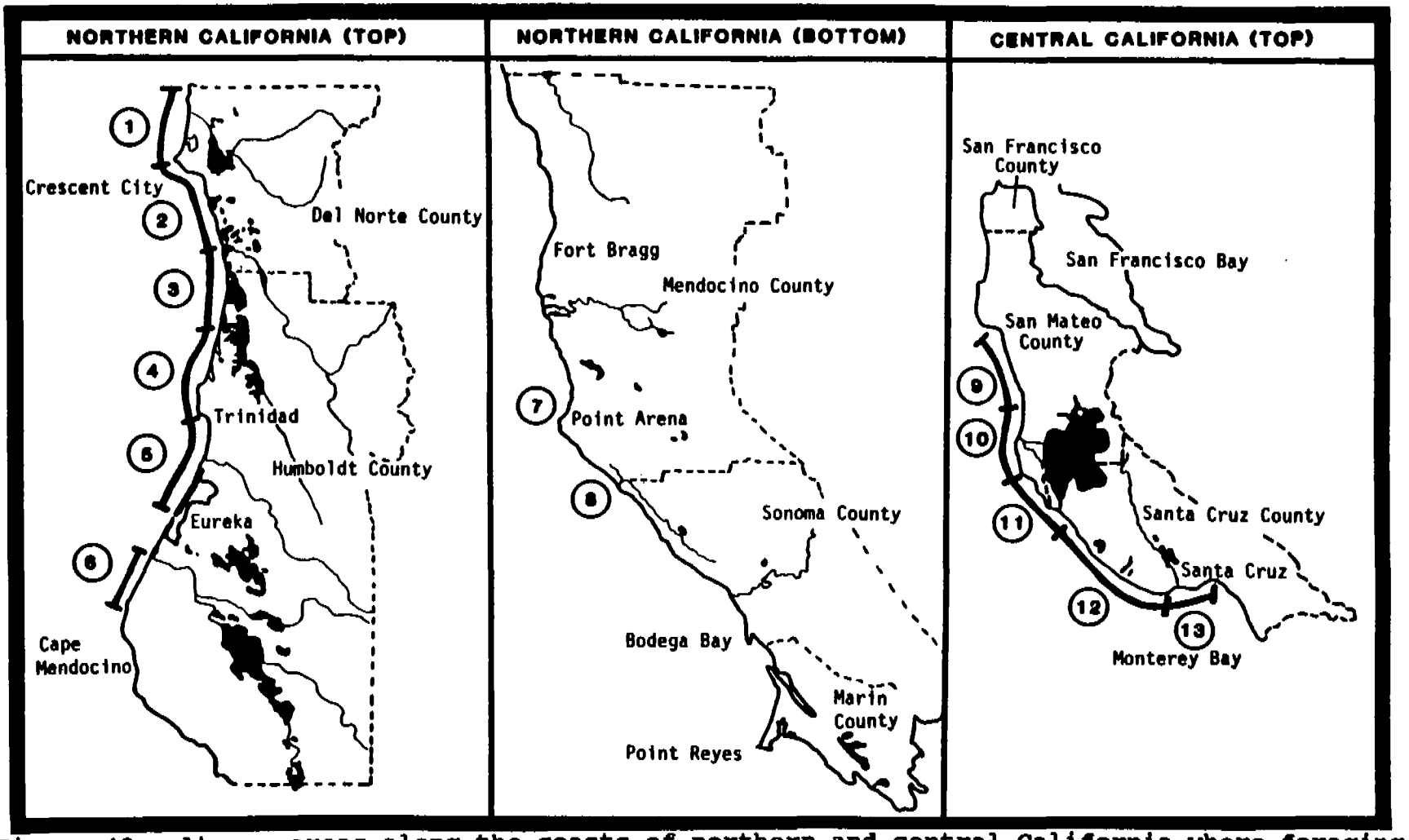


Figure 43. At-sea areas along the coasts of northern and central California where foraging Marbled Murrelets were observed in 1989 (see Table 29). Darkened inland areas refer to old-growth redwood-dominated forests where murrelets nest.

Table 29. Summary of observations of Marbled Murrelets used for determining breeding population estimates. See Appendix 5 for a complete listing of all observations made in 1989.

Coastal Areas	Dates	Number of birds counted		
		Water	Flying	Total
Northern California				
Oregon border to Point Saint George	28 April 1989	64	0	64
Point Saint George to Klamath River	26 & 28 April 1989	42	0	42
Klamath River to Redwood Creek	25 April 1989	35	0	35
Redwood Creek to Trinidad	25 April 1989	7	1	8
Trinidad to Humboldt Bay Mouth	24 April 1989	24	2	26
Eel River mouth to Naval Oceanographic Center	26 May 1989	5	3	8
Garcia River Mouth	2 June 1989	4	0	4
Gualala River Mouth	3 June 1989	3	0	3
(Subtotal)		184	6	190
Central California				
Princeton Harbor to North Tunitas Beach	7 June 1989	2	1	3
North Tunitas Beach to Pigeon Point	7 June 1989	25	1	26
Pigeon Point to Waddell Creek Mouth	7 & 8 June 1989	114	6	120
Waddell Creek Mouth to Point Santa Cruz	8 June 1989	12	0	12
Point Santa Cruz to New Brighton Beach	8 June 1989	7	0	7
(Subtotal)		160	8	168
Total		345	14	359

XANTUS MURRELET

The world population of this rare species nests only in southern California and Baja California, Mexico. Two subspecies have been described: S. h. hypoleuca nests primarily in Baja California and S. h. scrippsi nests mainly in California (Jehl and Bond 1975, Hunt et al. 1979; see Winnett et al. 1979). Xantus' Murrelets are difficult to census because they nest in crevices and under bushes in small scattered colonies and visit nest sites at night. In 1991, we focused our census efforts on updating the population estimate for Xantus' Murrelets at Santa Barbara Island, the largest colony in southern California.

Southern California

Sowls et al. (1980) identified 11 nesting areas of Xantus' Murrelets in southern California (Table 30), reportedly totalling about 3,500 breeding birds (see below). These population estimates were determined through extensive surveys by Hunt et al. (1979) in 1975-1978 in the Santa Barbara Island area (including colonies on Santa Barbara Island, Sutil Island, and Shag Rock) and minimal surveys elsewhere in the Channel Islands. These researchers also provided a detailed account of historical estimates at known colonies. These accounts included historical breeding at 2 other colonies: West Anacapa Island (main island and Cat Rock) and possible recent breeding at Wilson Cove, San Clemente Island (Table 30). This information was not transcribed by Sowls et al. (1980).

Hunt et al. (1979) found that the Santa Barbara Island area colonies constituted the vast bulk (over 95%) of the California murrelet population in 1975-1978 (Table 30). As did Hunt et al. (1979), we also focused our 1991 census efforts in the Santa Barbara Island area. Shag Rock and small portions of Sutil and Santa Barbara islands were searched for active and potential nest sites in April, May, or June during the 1991 breeding season. Most of Sutil and Santa Barbara islands were surveyed on 25-29 October 1991 when all "accessible" areas were covered on foot and each potential nest site was counted (see methods). Some "inaccessible" areas, including the bases of bluffs and sea caves, were checked by dropping off personnel from a boat. Other "inaccessible" areas, especially high cliffs, were estimated from a boat. Even within "accessible" areas, it was necessary to estimate a small proportion of potential sites to avoid injury and for complete coverage.

Santa Barbara Island - We determined a total of 1,421 potential nest sites in coastal areas all around the island (Tables 30, 31; Figure 45). Most potential sites (78.5%) were counted directly while 21.5% were estimated (Table 31). Most potential sites were in rock crevices (85.4%), although murrelets also nested under bushes (13.9%) and artifical sites (0.8%)(Tables 31, 32). By

applying separate L correction factors for rock crevices (52.3% active) and bush (30.8% active) sites (see Table 33), we derived an estimate of 1,402 breeding birds at Santa Barbara Island.

The only previous estimates for this colony were made in 1975-1977 and have been varyingly reported as: 1) 2,000-4,000 breeding birds (Hunt et al. 1979: 169; Sowls et al. 1980); 2) 2,000-10,000 breeding birds (Hunt et al. 1979: 252); 3) 3,000 breeding birds (Hunt et al. 1980); and 4) 6,000-10,000 breeding birds (Murray et al. 1983). The lower end estimate of 2,000 breeding birds was derived from an extensive ground search of "accessible areas" in 1977 for active nests (31.4%) plus estimates for areas that were not completely searched (68.6%), totalling 1390 breeding birds (Table 34). In addition, we presumed that 610 breeding birds were added to approximate numbers of birds nesting in "inaccessible areas". Nests were also found mainly in rock crevices and under bushes (Table 32), although rocky cliff habitat was probably underestimated (Hunt et al. 1979). Areas with high numbers of potential and active nest sites were located in the same locations in 1977 and 1991 (Tables 31, 34). This direct count of active sites was considered more reliable than an extrapolation method used in 1975 when 9 transects (100m x 4m) and 2 quadrats in prime murrelet habitat were used to obtain site densities (Hunt et al. 1978). Average density on transects was 0.36 nests/100m^2 and in quadrats was 2.2 nests/100m^2. Total murrelet habitat was estimated at roughly 500,000 m^2 but researchers cautioned that transects were not representative and that the estimated area of murrelet habitat was very rough. In 1975, they roughly estimated about 2,000 breeding birds.

We presumed that other higher estimates reported from 1975-1977 have resulted from extrapolations based on at-sea radial transects conducted around Santa Barbara Island (see Hunt et al. 1979: 312-352). Extrapolated population estimates were not presented in detail, except for 20-21 March 1976 transects where 103 birds were seen and 2,741 birds were extrapolated (Hunt et al. 1979: 318-319). This extrapolation was not the highest since even higher numbers were observed on other surveys (up to 237 birds on 24 May 1976). Given the high variability evident in these at-sea counts, the complex and possibly unreliable extrapolation method (based on small numbers of observations including identified and non-identified birds), inclusion of subadults and birds from other nearby colonies, and exclusion of birds foraging over 18.5 km from the island or birds at nest sites, we believe that these extrapolated numbers should be considered unreliable and disregarded from further consideration in estimating breeding population size of Xantus' Murrelets in the Santa Barbara Island area.

To assess the status of the murrelet population at Santa Barbara Island, we compared the 1991 estimate of 918 breeding

birds in "accessible areas" only with the 1977 ground-search estimate of 1390 breeding birds in "accessible areas" only (Table 34). What could appear to be a 30% decline in Xantus' Murrelet numbers in accessible areas from 1977 to 1991 may have resulted from:

1) differences in ground-search techniques: a) In 1991, we may have defined some areas as "inaccessible" which were considered accessible in 1977. However, we believe that this is unlikely because we intensively searched areas that were very difficult to access on foot. Also, we determined 410 potential sites in inaccessible areas which were either counted (38.8%) or estimated (61.2%) using a boat (Table 34). In 1991, this corresponded to 242 active sites or 484 breeding birds, slightly less than the 610 breeding birds estimated for inaccessible areas in 1977. In 1991, 21.4% of 159 sites inspected in "inaccessible" areas (accessed by boat) contained eggshell fragments in October, similar to 29.4% in all areas (Table 31); b) In 1977, researchers conducted one or more searches for active nests. We do not know if all active nests were found in 1977 because birds could have laid and failed before counts; or, birds laying eggs after counts may not have been accounted for. In 1991, the L correction factors adjusted counts of potential nests to estimate the total number of sites with eggs laid over the entire breeding season; and c) In 1977, most active sites (68.6%) in accessible areas were estimated; only 31.4% of active sites in accessible areas were actually found. In contrast, most potential sites (91.5%) in accessible areas were counted in 1991 (Table 34). The 1977 estimation technique has not been described and may reflect an educated guess. For example, they counted 74 active sites in the Cat Canyon area and estimated another 126 sites for the area not searched between Cat Canyon and Signal Peak (Table 6), stating that this area appeared to be "prime habitat". In 1991, we counted 293 potential sites and estimated another 70 potential sites in the same area. Using L correction factors, this corresponded to 147 and 37 active sites, respectively. Thus, 1991 data were reconcilable with 1977 data, depending on how additional active sites were estimated in 1977. Overall, our impression was that differences in techniques probably accounted for some but not most of the difference between 1977 and 1991 estimates;

2) loss of artifical habitat. The quonset hut which served as ranger quarters in 1977 was demolished in 1990. It was replaced during the 1991 breeding season by a new building without potential nest sites for murrelets. Between 2-4% of active sites occurred under artifical sites in 1977 (Table 32). In 1991, 11 sites (6 active) were still extant under the construction materials and remaining outlying shacks but only 2 active nests were expected to remain by 1992 (T. Ingram, pers. comm.). Between 11 and 15 April 1991, we captured 34 murrelets (including 1 birds banded in 1977 and 3 birds banded in 1978) in

the vicinity of the construction area (see Appendix 4). The 1977 birds was banded as an adult (D. Bystrak, pers. comm.) and was at least 16 years old in 1991. Murrelets were landing and sitting on the ground in pairs; only 6 birds had developing brood patches and one female had an egg in its oviduct. We suspect that the removal of the quonset hut has eliminated about 20 (2.8%) active nests;

3) loss of bush sites due to drought. In the Tent Slopes study area, occupancy of potential nest sites under Eriophyllum bushes has dropped somewhat over the last few years (T. Ingram, pers. comm.). Some birds have been observed incubating and/or abandoning eggs under defoliated, dead bushes which normally offer protection from predators and heat. The prolonged drought from 1987-1991 apparently led to a dieback of these bushes which contributed to a loss of actual nest sites. This could account partly for the lower numbers of sites in the Tent Slopes and Arch Point to Landing Cove areas compared to 1977 (Tables 31, 34). Birds unable to use bush sites may have to move large distances to find suitable alternate sites (bush or crevice) which are in short supply or displaced birds may not breed at all in a given year. Birds may nest under bushes because prime crevice sites are limited. Thus, the number of breeding birds may be slightly depressed during extended drought conditions due to loss of bush sites;

4) reduced breeding success due to Deer Mouse (Peromyscus maniculatus) predation on eggs. Mouse predation on eggs has been reported to be severe (Hunt et al. 1979; Murray 1980; Murray et al. 1979, 1983); 44% of 470 eggs laid between 1976-1978 were lost to mouse predation. However, the mouse population on Santa Barbara Island undergoes great fluctuations. It reaches exceptionally high numbers, usually in fall, every 3-4 years with matching periods of low numbers in between (Drost and Fellers 1991). Predation is probably highest when mouse numbers are still high in the following spring as murrelets start egglaying. At this time, the first egg is laid and left unattended for a week while the second egg is formed; 28% of eggs were lost at this time (Murray et al. 1983). Effects of mouse predation require further study;

5) annual variability in the size of the breeding population. Little is known about annual changes in the total population. Little change has occurred from 1983-1991 in the use of monitored crevice sites in the Cat Canyon and Tent Slopes study areas (T. Ingram, pers. comm.). However, in 1978 (a late-nesting year), researchers had the impression that fewer birds bred than in 1977 but quantitative data were lacking (Hunt and Butler 1980). It appeared that the years 1977 and 1991 were comparable in terms of breeding phenology and there is no reason to suspect that annual variability was a significant factor in the apparent decline from 1977-1991; and

6) other factors which contributed to poor breeding success, including: predation on adults at the colony by Western Gulls (also see Oades 1974), Barn Owls (Tyto alba), and Peregrine Falcons (Falco peregrinus) (C. Drost, pers. comm.); mortality away from the colony (e.g. oil spills, fishing nets); pollutants causing reproductive abnormalities; and reduction in the availablity of prey (especially Northern Anchovy Engraulis mordax). These factors require further investigation to assess their impact on the murrelet population.

Our assessment is that the Xantus' Murrelet population on Santa Barbara Island is either stable or has declined slightly since 1977. In either case, the population is much smaller than previously reported. Hunt et al. (1979, 1981) interpreted their larger population estimates as reflective of a dramatic increase since the early 1900's when naturalists thought that feral cats and Peregrine Falcons had all but eliminated murrelets from the island. We consider the current population size to be very low. It probably has increased since the early 1900's due to the removal of feral cats and loss of breeding falcons. However, murrelets could have been overlooked by some early workers since murrelets nest on steep bluffs around the periphery of the island and most birds are present only for 2 months per year (which can vary in timing from year to year). Thus, the degree of increase could be much smaller than previously thought.

Sutil Island - We determined a total of 208 potential Xantus' Murrelet and Cassin's Auklet sites. Murrelet eggshell fragments were found in 13 sites; most (84.6%) were located on the steep slopes on the lower south side. On 13 April 1991, we searched the top part of the island at night and found only one active nest under an old Double-crested Cormorant nest and eggshell fragments in two Eriophyllum bush sites. Only auklets were caught in mist nets and found in crevices in this area although murrelets were heard calling continuously just offshore. Thus, we treated all cliff (59), lower slope (49), bush (18), and cormorant nest (1) sites as potential murrelet sites whereas all upper slope and top crevice sites (including all burrows and burrow/crevices) were treated as potential auklet sites (see Cassin's Auklet account). The total of 127 potential sites was adjusted with L correction factors (Table 33) to derive an estimate of 126 breeding birds. This estimate was slightly lower than the 150 breeding birds estimated by Hunt et al. (1979, 1981). These researchers found 17 active and 7 probably active nests on the island during the breeding season.

Shag Rock - On 22 May 1991, we completely searched Shag Rock and found 15 potential murrelet sites in rock crevices, including 4 active nests, 11 other potential sites, and excluding 1 probable Cassin's Auklet site. By applying the L correction factor for crevices (Table 33), we estimated 16 breeding birds. While this estimate is slightly lower than the 30 breeding birds estimated

in 1977 (Hunt et al. 1979, 1981), previous researchers actually found only 4 active and 4 probably active nests.

Other colonies - In 1991, we heard small numbers of murrelets calling on several nights while we were mistnetting storm-petrels at known colonies at Prince Island and Scorpion Rocks, as well as on one night at a newly-discovered colony at Willows Anchorage Rocks (Table 30). In Figure 46, we have presented data for all nights spent at these colonies when we recorded murrelet vocalizations each period when they occurred throughout the night (see Appendix 4 for summary of all mistnetting nights, including nights when no murrelets were heard). We also presented some comparable data from Santa Barbara and Sutil islands for comparison in Figure 46. Murrelets vocalized (using a repeated three-note whistle) at night on the water below the nesting slopes and occasionally when flying into nesting areas. At main colonies on Santa Barbara and Sutil islands, vocalizations occurred at least every half hour throughout the night during the main breeding season from April-May 1991 (i.e. similar to Elephant Seal Point in Figure 46). At certain times (especially after dusk and before dawn), calling would intensify into a continuous din. Most often, we did not attempt to record murrelet vocalizations at Santa Barbara Island because to record continous calling required too much effort. However, by July 1991, calling at Santa Barbara Island was much more sporadic (never continuous) and easier to record when only a few birds were still present (Figure 46).

Murrelet vocalizations at Prince Island, Scorpion Rocks and Willows Anchorage Rocks, even during the main breeding season in April-May 1991, were sporadic through the night (Figure 46). Never more than a few birds were calling at a time. However, vocalization activity did seem to be higher just after dusk and before dawn as at Santa Barbara Island. At Prince island, a few calls were also heard in July (Figure 46). Based on vocalization patterns, we suspected that only small numbers of birds bred at these other colonies. At Prince Island in October, 2 crevice sites were found that contained eggshell fragments. At Willows Anchorage Rocks on the night of 7-8 May 1991, we found 1 active nest, heard at least 5-10 birds calling at one time, and saw 2 birds on the surface of the south rock. A total of 3 active medium crevice sites (with eggshells) were counted there in October, resulting in an estimate of 6 breeding birds. No nests or eggshell fragments were found at Scorpion Rocks in May or October 1991.

We saw a few birds several miles offshore but in the general vicinity of East Anacapa Island in May 1991. F. Gress (pers. comm.) heard a few birds calling at Landing Cove at East Anacapa Island in April 1991 and found one nest in Landing Cove in 1988. C. Drost (pers. comm.) also had found one nest at Garbage Cove (near Landing Cove) at East Anacapa Island in 1987. Further,

Gress (pers. comm.) found a broken eggshell of a Xantus' Murrelet at the west end of West Anacapa Island in July 1991. Such nesting evidence has not been obtained since the 1930's on the west island or nearby Cat Rock (Hunt et al. 1979). We searched Cat Rock on 20 May 1991 but did not find any evidence of nesting. Rats are and have been abundant on East, Middle, and West Anacapa islands (Erickson, unpubl. data). Introduced rats probably restrict murrelet nesting to a few cliff locations on these islands.

We did not obtain any nesting evidence at other known, possible or historical colonies in 1991. On 31 May 1991, we searched Bird Rock (Catalina Island) and rock crevices and floors of dry sea caves on parts of Santa Cruz Island but found no signs of nesting. Minimal efforts were made to detect presence at Harris Point to Cuyler Harbor (Cuyler Harbor only), Middle Anacapa Island (East Fish Camp only), and Wilson Cove where we anchored near shore overnight in May but did not note birds calling on the water. We did not make any effort to determine presence during the breeding season at Castle Rock, Gull Island, Seal Cove to Lost Point, or West Anacapa Island (main island). No eggshell fragments were found during extensive crevice counts at Castle Rock and Gull Island in October 1991.

For all of these small colonies, we were not able to determine specific population estimates for 1991. We have instead used previous estimates since we could not improve upon them (Table 30). We suspect only small numbers (<10-50 breeding birds) at each colony, totalling less than 150 breeding birds. This total is about half of the 320 birds included by Sowls et al. (1980) for other colonies.

Central California

We observed Xantus' Murrlets only twice north of Point Conception during 1989 surveys. A single bird was observed on the water north of La Cruz Rock, Monterey County, on 18 June 1989 and a single bird (with two other small unidentified alcids) was seen on the water off Pfeiffer Point, Monterey County, on 20 June 1989. No evidence of nesting was found and these may have been non-breeding birds well north of known nesting areas in southern California. However, due to their nocturnal visitation of nests, it is difficult to determine nesting activity unless nests are found. These observations may reflect the existence of small numbers nesting somewhere along the coast south of Monterey to Point Conception. However, Xantus' Murrelets also may undergo rapid post-nesting dispersal into this area where they are common from August through October (Briggs et al. 1987). Xantus' Murrelets have been observed frequently in the vicinity of the Farallon Islands in June during PRBO at-sea cruises in the 1980's but have not been found nesting on the South Farallon Islands.

Summary

We derived a total estimate of 1,719-1,727 breeding birds at southern California colonies in 1991 (Table 30). This number was much lower than some 1977 estimates (ranging up to 4,374-10,000 breeding birds) but much of this difference was probably accounted for by survey and estimation techniques (see earlier discussion). Nonetheless, a temporary or long-term decline could be occurring at Santa Barbara Island, the only colony of significant size in southern California. This colony is the largest in the world for the suspecies S. h. scrippsi and may be the larger than any colony in the world. The size and status of colonies on the west coast of Baja California has never been determined. Detailed censuses have not been conducted there. Crossin's 1968 estimate for Isla Guadalupe of 3,500 breeders and 1,300 non-breeders (Jehl and Everett 1985) has not been further substantiated and may be an overestimate, given our experience with previous estimates at Santa Barbara Island. Anderson and Everett (1991) interpreted this estimate as 2,400 breeding pairs. The very small size of the southern California and world population dictates that greater attention must be focused on this species. Additional research is required to further assess its status and to investigate the impacts of the various factors noted above at Santa Barbara Island and other colonies (e.g. removal of rats from Anacapa Island).

Since it is so difficult to determine population sizes at other small colonies, we suggest that future workers develop a nocturnal vocalization census technique to provide a relative measure of murrelet vocalization rates at small colonies. Similar techniques have been developed for Marbled Murrelets (see Paton et al. 1990). Since vocalization patterns vary between nights, it will require some research effort to develop an adequate technique and an adequate number of sampling nights. In 1991, we did not standardize our recording of detections sufficiently to measure vocalization rate because we were focused on mistnetting storm-petrels at the same time. However, we have provided our data in sufficient detail in Figure 46 for a general comparison to future data.

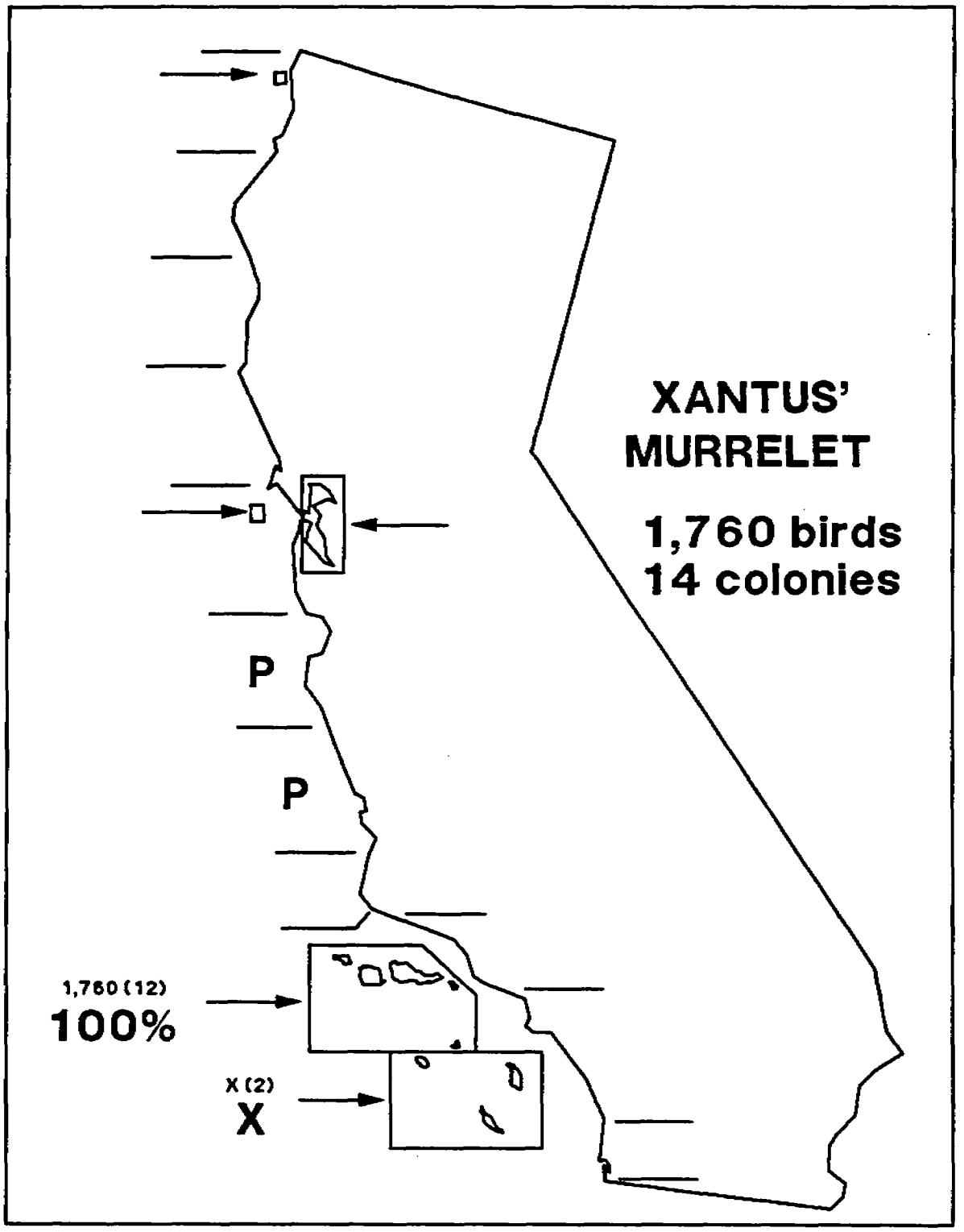


Figure 44. Percentage of state breeding population of Xantus' Murrelet in coastal regions of California, 1989-1991. Symbols as in Figure 19.

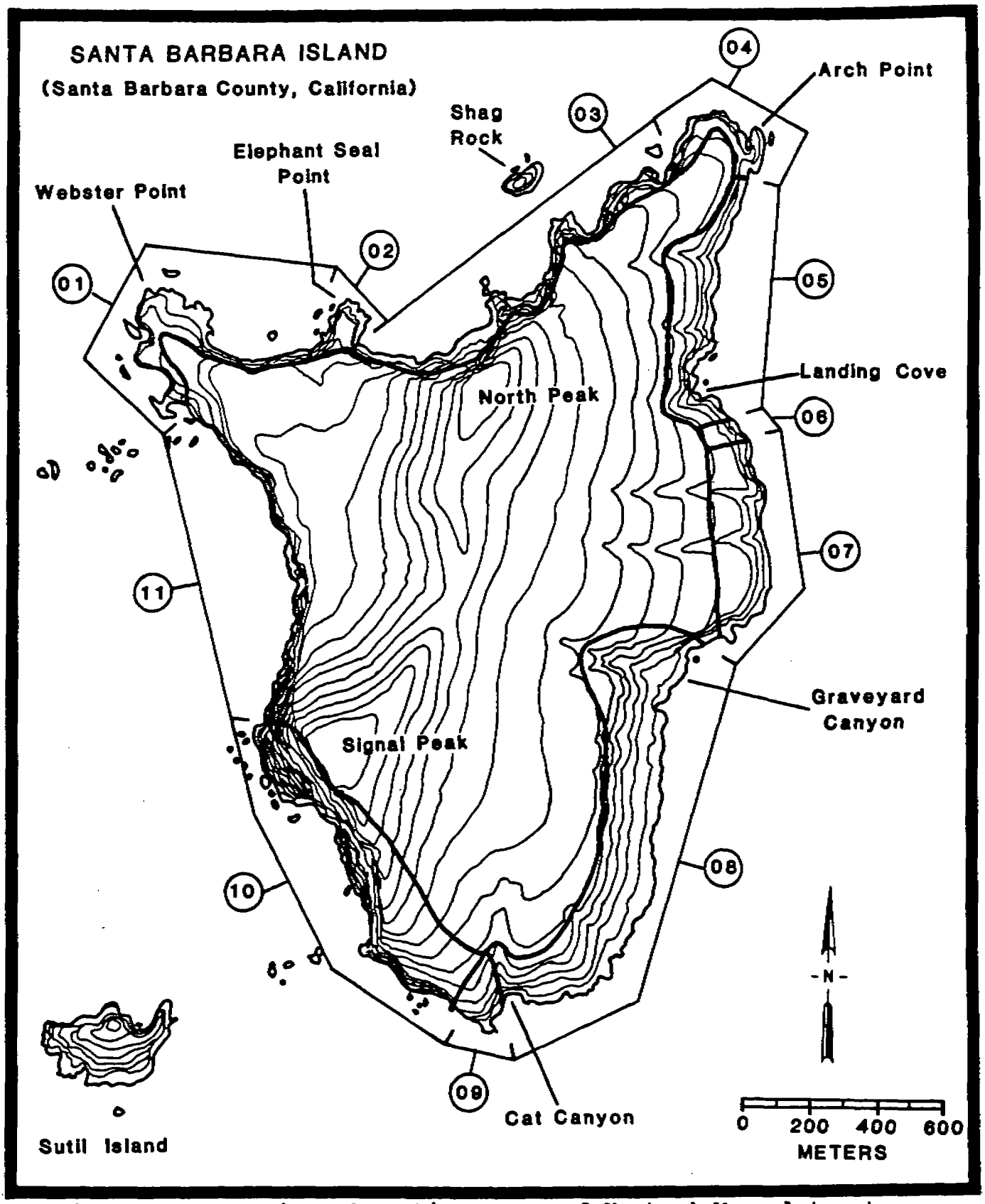


Figure 45. Location of nesting areas of Xantus' Murrelets at Santa Barbara Island (Channel Islands National Park), Santa Barbara County, California. See Tables 31 and 34 for breakdowns by numbered subareas.

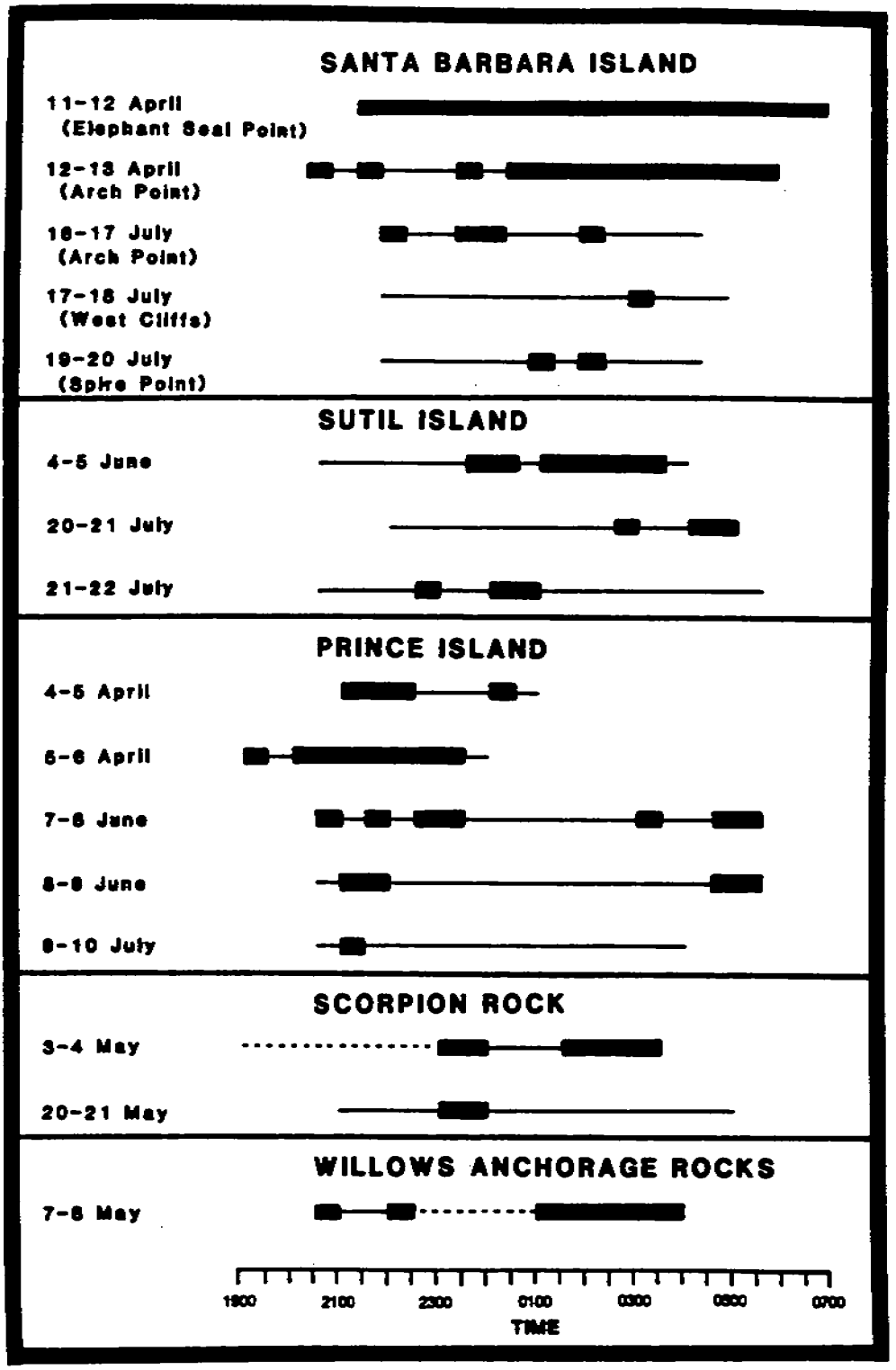


Figure 46. Timing of nocturnal vocalizations of Xantus' Murrelets heard while mist netting at several colonies in southern California, 1991. Thick bars indicate that one or more vocalizations were heard. Thin lines indicate that no vocalizations were heard. Dashed lines indicate that no vocalizations were heard but strong winds may have prevented effective hearing.

Table 30. Numbers of breeding Xantus Murrelets at each colony in southern California in 1975-1978 (Hunt et al. 1979, Sowls et al. 1980) and in 1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		Number of Breeding Birds[1] (Percent) 1989-1991	
Southern California						
Castle Rock	SB-SMI-02	501-005	P	(0.0)	[P][2,3]	(0.0)
Harris Point to Cuyler Harbor	SB-SMI-06	501-015	P	(0.0)	[P]	(0.0)
Prince Island	SB-SMI-07	501-004	150[4]	(4.4)	[150][4]	(8.7)
Scorpion Rocks	SB-SZI-14	502-010	P	(0.0)	18[3,5]	(0.1)
Valley Anchorage to Coches Prietas Anchorage	SB-SZI-18	524-017	-[7]	(0.0)	[P][6]	(0.0)
Willows Anchorage Rocks	SB-SZI-20	524-019	-[7]	(0.0)	6[8]	(0.1)
Gull Island	SB-SZI-22	524-001	2	(<0.1)	[2][2,3]	(<0.1)
Anacapa Island-West	VE-ANI-01	502-007	H	(0.0)	X[2,9]	(0.0)
Anacapa Island-East	VE-ANI-03	502-009	<40[10]	(0.1)	[<40][2]	(2.3)
Shag Rock	SB-SBI-01	524-007	30	(0.1)	16	(0.1)
Santa Barbara Island	SB-SBI-02	524-008	2,000-4,000	(88.9)	1,402	(81.2)
Sutil Island	SB-SBI-03	524-009	150	(4.4)	126	(7.3)
Northwest Harbor to Wilson Cove[11]	LA-CLI-03	524-031	P	(0.0)	[P][2]	(0.0)
Seal Cove Area[12]	LA-CLI-08	524-036	X	(<0.1)	[P][2]	(0.0)
Bird Rock	LA-CAI-04	524-010	H	(0.0)	H[2,8]	(0.0)
Total			2,374-4,374[13]		1,712-1,727[13]	

1 X, present; P, probably present; H, historical nesting only. Estimates in brackets [ ] are based on estimates.
2 Colony not visited at night to determine presence or absence.
3 No eggshell fragments were found during October site counts.
4 Hunt et al. (1979) reported 150 breeding birds for all of San Miguel Island, including Prince Island, Castle Rock, and Harris Point to Cuyler Harbor; Sowls et al. (1980) assigned all 150 to Prince Island.
5 Murrelets heard calling at night but no active nests found.
6 Murrelets heard calling at night in 1982 only (Hunt and Ingram 1982).
7 Colony not known to exist before 1991.
8 Estimate based on active sites only.
9 Rocks were searched but no nests or eggshell fragments were found.
10 This estimate was reported only by Sowls et al. (1980: 46).
11 Reported by Hunt et al. (1979) but omitted by Sowls et al. (1980).
12 Colony was formerly included in "Seal Cove to Lost Point" (524-013) in Sowls et al. (1980).
13 Midpoints of ranges used to calculate percentages.

Table 31. Numbers of potential Xantus' Murrelet nest sites in various areas and habitats on Santa Barbara Island (Channel Islands National Park), Santa Barbara County, California, in 1991.

		Rock Crevices[1]			Bush Vegetation			Total Sites	
Map Area[2]	Area Name	Medium	Large	Unknown[3]	Eriophyllum	Eriogonium	Unknown[3]	Number	Percent
1	Webster Point	11	25(10)[4]	32(32)	0	0	0	68(42)	4.8
2	Elephant Seal Point	23	28(3)	15	0	0	0	66(3)	4.6
3	Elephant Seal Point to Arch Point	77(26)	44(10)	49(27)	8	0	0	178(63)	12.5
4	Arch Point	1	31(20)	84	0	0	0	116(20)	8.2
5	Arch Point to Tent Slopes Study Area	25	62(3)	20(4)[5]	24	49	0	180(7)	12.7
6	Tent Slopes Study Area	0	0	13	38	0	1	52(0)	3.7
7	Tent Slopes Study Area to Graveyard Canyon	75(15)	51(12)	0	39	13	0	178(27)	12.5
8	Graveyard Canyon to Cat Canyon Study Area	63	51	26(26)	0	0	0	140(26)	9.9
9	Cat Canyon Study Area	0	0	133	0	1	0	134(0)	9.4
10	Cat Canyon Study Area to Signal Peak	103(5)	62(25)	40(40)	0	4	20	229(70)	16.1
11	Signal Peak to Webster Point	29	51(48)	0	0	0	0	80(48)	5.6
Total (Combined areas)		407(46)[6]	405(131)[7]	412(126)	109(0)	67(0)	21(0)	1421(306)	100.0
Percent Total Sites		28.6	28.5	29.0	7.7	4.7	1.5	100.0	-
Percent Sites with Eggshells		21.6	16.1	45.6	44.0	35.8	28.6	29.4	-

[1] See text for definitions of medium and large crevices. Small crevices were excluded.
[2] See Figure 45. Map areas are broken down into smaller subareas in archived materials.
[3] Includes not recorded, unidentified, and other.
[4] Numbers of sites in parentheses were estimated for inaccessible portions.
[5] Includes 11 sites in artifical habitat (4 estimated) at the Ranger Station and construction site (see text).
[6] Excludes 10 Cassin's Auklet sites (1 crevice at area 8; 9 burrow/crevices at area 2); includes 24 burrow/crevices.
[7] Excludes 13 Cassin's Auklet sites at area 2; includes 5 burrow/crevices.
[8] Excludes estimated sites and artifical habitat sites in area 5.

Table 32. Nesting habitat types used by Xantus Murrelets on Santa Barbara Island, California, in 1976-1978 (Hunt et al. 1979, Murray et al. 1983) and 1991.

	Percent of Active Sites	
Nesting Habitat Type	1976-1978[1]	1991
Rock Crevices	70.0-76.5	90.4
Eriophyllum bushes	16.1-21.0	4.9
Other Plants[2]	0.0-6.0	3.9
Artifical Structures	2.0-4.1	0.9
Other[3]	3.0-3.6	0.0
Total sites examined	212-244	701

[1] Range of values reported in Hunt et al. (1979) and Murray et al. (1983).
[2] Includes *Eriogonium*, *Hemizonia*, *Suaeda*, morning glory, tall grass.
[3] Includes burrows of other species and under old pelican nests.

Table 33. Occupancy of potential crevice and bush nest sites by Xantus Murrelets at Santa Barbara Island, (Channel Islands National Park), Santa Barbara County, California, in 1991.

	Percent of potential sites occupied[1]		
Census Date	Monitored Sites[2]	Other Sites[3]	Total
Crevice Sites (Cat Canyon Study Area)			
28 March	24.3	-	-
1 April	33.8	-	-
10 April	52.7	-	-
15 April	56.8	8.3	35.3
24 April	56.8	-	-
1 May	58.1	-	-
8 May	58.1	-	-
18 May	66.2	28.3	49.6
22 May	68.9	-	-
29 May	68.9	-	-
Season Total	68.9	31.0[4]	52.3[4]
Bush Sites (Tent Slopes Study Area)			
27 March	0.0	-	0.0
31 March	0.0	-	0.0
9 April	17.9	-	17.9
15 April	25.6	-	25.6
24 April	28.2	-	28.2
1 May	30.8	-	30.8
8 May	30.8	-	30.8
Season Total	30.8	-	30.8

1 Percent of potential sites with evidence of egglaying in 1991 (including the presence of whole or broken eggs, chicks, and/or adults) at the time indicated or before.

2 These sites were monitored by the Seabird Monitoring Program of Channel Islands National Park (T. Ingram, unpubl. data). Almost all sites were known to have been used in a previous year by Xantus Murrelets. For the Cat Canyon Study Area, 3 new sites were added in 1991 and 1 *Eriogonium* bush site was excluded from calculations. For the Tent Slopes Study Area, 38 *Eriophyllum* and 1 *Hemizonia* bush sites were included.

3 These sites were located in 1991 only. They included other potential nest sites in the same area as monitored sites.

4 Values included an additional 2.7% other sites after 18 May, as found for the monitored sites.

Table 34. Numbers of active Xantus' Murrelet nest sites in accessible and inaccessible areas of Santa Barbara Island (Channel Islands National Park), Santa Barbara County, California, in 1977 and 1991.

Map Area[3]	Area Name	Active Sites (1991)[1] Total Number	Number Inaccessible[4]	Number Accessible[5]	Percent Accessible	Active Sites (1977)[2] Number Accessible	Percent Accessible
1	Webster Point	36(22)[6]	17(17)	19(5)	4.1	30(29)	4.3
2	Elephant Seal Point	35(2)	22(0)	13(2)	2.8	50(47)	7.2
3	Elephant Seal Point to Arch Point	91(33)	38(22)	53(11)	11.5	50(41)	7.2
4	Arch Point	61(10)	44(0)	17(10)	3.7		
5	Arch Point to Tent Slopes Study Area	78(4)	35(2)	43(2)	9.4	60(38)[7]	8.6
6	Tent Slopes Study Area	19(0)	0	19(0)	4.1	175(85)	25.2
7	Tent Slopes Study Area to Graveyard Canyon	82(14)	18(12)	64(2)	13.9		
8	Graveyard Canyon to Cat Canyon	73(13)	6(6)	67(7)	14.6	30(29)	4.3
9	Cat Canyon Study Area	70(0)	0	70(0)	15.3	200(126)	28.8
10	Cat Canyon to Signal Peak	114(37)	37(37)	77(0)	16.8		
11	Signal Peak to Webster Point	42(25)	25(25)	17(0)	3.7	100(82)	14.4
Total (Combined Areas)		701(160)	242(121)	459(39)	100.0	695(477)	100.0
Percent Sites		100.0	34.5	65.5	-	-	-

[1] Using sites in Table 31 and applying L correction factors from Table 33 for crevices and bushes seperately.
[2] Data from Hunt et al. (1979(3): 173).
[3] See Figure 45.
[4] Included sites accessible only by boat.
[5] Included sites accessible by foot although portions were inaccessible.
[6] Numbers of sites in parentheses were estimated for inaccessible areas.
[7] Included artifical sites (Hunt et al. 1979).

CASSIN'S AUKLET

Cassin's Auklets breed along the Pacific coast from the Aleutian Islands, Alaska, to central Baja California, Mexico. They are difficult to census because they nest in burrows and crevices, often in large colonies, and visit nest sites only at night. Hunt et al. (1979) identified and provided rough estimates for 9 Cassin's Auklet colonies in southern California in 1975-1978 (Figure 47, Table 35). Four colonies in northern and central California were not surveyed by Sowls et al. (1980) who instead substituted rough historical estimates from before 1972 (Osborne 1972, Manuwal 1974). In 1989 and 1991, we focused on updating and improving population estimates of Cassin's Auklets in California by conducting detailed burrow and crevice counts after the breeding season at known colonies. For many California colonies, we have provided the first standardized and well-documented population estimates for Cassin's Auklets.

Northern California

Castle Rock National Wildlife Refuge - We counted 4,466 potential medium and large burrow and crevice sites over the entire island on 12-13 September 1989 (Figure 48, Table 36). Sites were counted individually over most of the island but were estimated using plots in part of area 2 (see methods). In area 2(A), medium burrow densities in 3 plots were 0.43, 0.54, and 0.86/m^2 and (in the same respective plots) large burrow densities were 0.97, 0.11, and 0.0/m^2. Using averages of 0.61 medium and 0.36 large burrows/m^2, 918 medium and 542 large burrows were estimated over a 1,506-m^2 area with similar densities. In area 2(B), medium burrow densities in three other plots were 0.75, 0.86, and 1.61/m^2. Using the average density of 1.07/m^2, 749 burrows were estimated over a 700-m^2 area with similar densities. We considered all medium sites as potential Cassin's Auklet nest sites as well as 593 estimated large sites that were not considered to be used by larger alcids (Pigeon Guillemot, Rhinoceros Auklet, and Tufted Puffins). By applying the L correction factor to the adjusted total of 3,759 sites, we derived an estimate of 5,638 breeding birds. However, since almost all (97.8%) auklet sites were burrows, the 75% L value may have been low (see methods) and led to an underestimate.

Osborne (1972) estimated 3,600 breeding birds at Castle Rock in 1970. He also reported another estimate of 5,000 breeding birds (Osborne 1971). In a 10,000 square foot area with *Baeria maritima* vegetation, 154 burrows were counted. Densities in *Elymus mollis* vegetation appeared to be greater but were not measured. The measured density (0.17 burrows/m^2) was extrapolated over an estimated three-acre flat area with *Baeria-Poa* and *Elymus* vegetation (presumably areas 2-4 and 10-12 in Figure 48) plus "The Pit" (area 13 in Figure 48) to obtain an estimate of 3,600 breeding birds. By our calculations, this

extrapolation should have resulted in 2,012 burrows; however, if 90% were considered to be active, about 3,600 breeding birds could be derived. Numbers of sites on other parts of the island and use of larger sites apparently were not accounted for.

Burrow densities in 1989 were determined from small plots in high-density areas and were not directly comparable to the 1970 burrow-density value. We believe that numbers of Cassin's Auklets breeding at Castle Rock have increased slightly or remained the same since 1970. However, large increases may have occurred before 1970 since only 100 breeding birds were estimated in 1959 (Thoreson 1964; also see Osborne 1972).

Green Rock - We counted 56 medium burrows amongst low bushes on the east side on 16 August 1989. Some sites contained dead chicks and feathers. We derived an estimate of 84 breeding birds, calculated as above. A few additional birds may have nested in Tufted Puffin burrows (see Osborne 1972). Osborne (1972) estimated 50 breeding birds in the same area. Potential burrow nesting habitat appeared to be saturated with burrows. We believe that Cassin's Auklet numbers in 1989 were similar to 1970.

Fish Rocks - We discovered a probable small, new colony at Fish Rocks, Mendocino County. On 7 August 1989, we found three dried-out carcasses of Cassin's Auklets on the western rock, including two after-hatching year birds and one large chick or fledgling. No other evidence of nesting was found and no birds were heard at night. However, all birds should have finished nesting by this date (Figures 2, 3). Potential crevice sites abound at this colony although deep soil areas contained no burrows. An active Peregrine Falcon eyrie was present on the western rock with adults noted on 3 June and 7-8 August 1989. Several seabird carcasses and remains were found at the nest (M. Kirvin, pers. comm.). Thus, carcasses could have been brought to the island by falcons. However, the nearest known Cassin's Auklet colony is about 75-80 miles away at the South Farallon Islands. We believe that the few carcasses were more likely to have resulted from gull predation on a small number of breeding auklets at Fish Rocks.

Central California

South Farallon Islands National Wildlife Refuge - We counted 26,343 medium and large burrows and crevices over the entire group of islands on 3-8 September 1989 (Figure 49; Tables 37, 38). Sites were counted individually in all areas, including artifical habitats (i.e. rock walls, cement pads, etc.). Small numbers of crevice sites were estimated roughly for a few small areas where the terrain was almost vertical. We counted 20,481 sites on Southeast Farallon Island and 5,360, 466, and 36 sites on West End Island, the North Islets, and Saddle Rock,

respectively. All medium sites were considered as potential Cassin's Auklet sites; 432 and 406 large sites were added for Southeast Farallon Island and other subcolonies, respectively, that were not considered to be used by larger alcids (Pigeon Guillemots, Rhinoceros Auklets and Tufted Puffins). Using an adjusted total of 25,516 potential sites, we derived an overall estimate of 38,274 breeding birds for the South Farallon Islands, calculated as for other colonies. Since many potential sites were crevices, the 75% L correction factor seemed reasonable to correct for burrow occupancy.

In 1971, Manuwal (1972, 1974) derived estimates of 52,746 sites and 105,492 breeding birds for the Southeast Farallon Island subcolony alone, compared to the 1989 estimate of 29,880 breeding birds (Table 37). All sites were treated as active sites (i.e. burrow occupancy was 100%). Site density was determined in seven 100-m^2 plots (each representing different habitats). Most of the rest of the island was extrapolated using areas of habitats determined by direct measurement or estimated from a topographic map. It is not clearly stated how the areas of most habitats were determined. In two other artifical nesting habitats (i.e. the railroad bed, rock walls and piles), sites were directly counted or otherwise sampled and extrapolated.

Overall, we believe that the 1971 method probably yielded an overestimate of the number of nest sites present, possibly due to using a small number of unrepresentative sample plots and/or inaccurate estimates of the amount of different habitat types available. The rugged topography of the South Farallon Islands (see Figure 49) would make it very difficult to derive accurate estimates of area for any part or especially habitat type of the islands (except for the relatively-flat marine terrace) by casual interpretation of topographic maps or aerial photographs. In 1989, Cassin's Auklet sites were found over almost all of the island (Figure 49, Table 37) as found in 1971 (Manuwal 1972, 1974) and in 1959-1960 (Thoreson 1964). In 1989, Cassin's Auklet sites were located in deep soil at the base of Lighthouse Hill (areas 10 and 14) and on talus slopes (areas 4, 5, 8, and 14) (Table 37). In 1971, highest site densities occurred in similar locations and habitats as in 1989 in vegetated depressions (1.09/m^2) and deep soil grassy plains (0.60/m^2). Talus slopes had moderate densities (0.32/m^2) and bare rock had low densities (0.05/m^2). Excluding nest boxes and large sites, similar percentages of sites were classified by nest type in 1971 and 1989, respectively: burrows and burrow/crevices (63.8% versus 58.6%); crevices (30.6% versus 27.1%); and artifical habitats (5.7% versus 14.3%). It appeared that the estimation of the area of habitats in 1971 was responsible for most of the extrapolation error in 1971. For instance, numbers of sites counted directly in artifical habitats in 1971 (N= 2,996 sites) were similar to numbers counted in 1989 (N= 2,739 sites). The small difference

was probably accounted for by some collapsing of rock walls which has occurred in several areas since 1971.

Further support for probable overestimation in the 1971 estimate at Southeast Farallon Island can be found in the at-sea population size of Cassin's Auklets. In 1981-1982, intensive systematic at-sea surveys of seabirds were conducted out to the edge of the continental shelf throughout northern and central California (Briggs et al. 1987). Between Point Arena and the Monterey Peninsula (i.e. the entire foraging area for Cassin's Auklets from the South Farallon Islands), 1,542 km were surveyed during the breeding season in May when almost the entire adult and subadult populations are at-sea during daylight hours and before most chicks have fledged. Using the overall mean of 4.83 ± 9.81 (SD) Cassin's Auklets/km^2, 47,300 birds were extrapolated at sea (R. G. Ford, unpubl. data). This 1981-1982 estimate is close to the 1989 estimate of 38,274 breeding birds plus 19.1% non-breeders.

Although survey techniques clearly cause some of the differences between 1971 and 1989 estimates of Cassin's Auklets at Southeast Farallon Island, other factors must also be considered that may have contributed to a decline in numbers or to lower numbers in 1989:

1) a decline in the number of burrow sites. On the southeastern marine terrace, the Point Reyes Bird Observatory (PRBO) has suspected a decline in the number of burrows since the late 1970's due to changes in the soil substrate. Soil compaction has occurred from the expanding population of Northern Elephant Seals (Mirounga angustirostris) since 1972 when the breeding population reestablished itself (Huber 1987). Males roam the marine terrace during the winter and station themselves in auklet nesting areas. Soil erosion has occurred from heavy rain and storm waves during El Nino-Southern Oscillation events, especially in 1982-1983 (Kaza and Boekelheide 1984). Soil stability has been reduced due to drought from 1987-1989, causing some burrows to collapse and cause breeding failure during the spring and summer;

2) increased predation. Decline may have resulted from increased predation by the vastly-increased population of Western Gulls since 1959. By the early 1980's, gulls gradually expanded to nest over the entire island and numbers have remained high ever since (Ainley and Lewis 1974, Manuwal 1979, Ainley and Boekelheide 1990). In the shallow soil areas on the marine terrace, gulls will dig out and kill adults and chicks, especially if their burrows collapse while auklets are still nesting. Also, numbers of wintering Peregrine Falcons have increased dramatically. Falcons prey on various alcids and gulls and can kill large numbers (PRBO, unpubl. data);

3) At minimum, a few hundred Cassin's Auklets were reported killed in the Gulf of the Farallones area during the November 1984 Puerto Rican oil spill (PRBO 1985, Ford et al. 1987) and the February 1986 Apex Houston oil spill (Page et al. 1990). These mortalities may have been greater than reported and other non-reported oiling mortality also may have contributed to decline;

4) Multiple use of nest crevices by several species. PRBO (unpubl. data) reported that about 25% of Pigeon Guillemot crevices are used as nest sites by Cassin's Auklets before they are occupied by Pigeon Guillemots. We determined an approximate minimum of 243 active Pigeon Guillemot sites occurred in Cassin's Auklet nesting areas. Thus, at least 61 Cassin's Auklets could have been omitted in 1989 estimates;

5) Burrow collapse in late summer. In shallow-soil areas (especially on the marine terrace), some active burrows do not remain intact throughout the year. Usually, these burrows collapse in late summer after the breeding season and they may not be recognizable as burrows by fall. We included 631 collapsed or crushed burrows counted around the island in early September 1989 (Table 37); 67.0% were found on the south marine terrace. We believe that including these sites accounted for most or all sites that may become unrecognizable later in the fall;

6) Inclusion of large sites. It was not clear how large sites were treated in the 1971 estimate. If they were all excluded, then an additional 648 breeding birds were included in the 1989 estimate. If all large sites were included in 1971, then 842 breeding birds were excluded from the 1989 estimate. In 1971, very few if any Rhinoceros Auklets nested on Southeast Farallon Island (Ainley and Lewis 1974); thus, Rhinoceros Auklets may now occupy some large crevice sites used previously by Cassin's Auklets; and

7) Inclusion of nest boxes. Totals of 399 Cassin's Auklet nest boxes and 57 Rhinoceros Auklet or Pigeon Guillemot nest boxes were present in 1989 (Table 37). All nest boxes were installed after 1971. Presumably, the 643 breeding birds estimated to use these boxes would have nested in other sites if boxes were not present.

Further research is required to refine 1989 population estimates at the South Farallon Islands. Factors which may be causing actual decline must be studied and the 1971 estimation technique must be further evaluated.

Based on the 1971 estimate for Southeast Farallon Island, Ainley and Boekelheide (1990) estimated that about 30,000 Cassin's Auklets bred on West End Island, compared to the 1989 estimate of 7,451 breeding birds for West End Island. The 1989

estimate was based on an adjusted total of 4,967 sites, including 243 large sites. We doubt if a decline in Cassin's Auklet numbers has occurred on West End Island because Cassin's Auklets appeared to be nesting densely in all available habitats there. Small numbers of Cassin's Auklets were found nesting on the North Islets and Saddle Rock in 1989 (Table 38). These rocks were not known to be nesting areas in the past (Ainley and Boekelheide 1990). Cassin's Auklets also may nest at the North Farallon Islands. These four rocks have never been surveyed for nocturnal crevice-nesting species.

Southern California

Castle Rock - We determined a total of 1,807 medium and large nest sites on 21-22 October 1991 (Figure 50, Table 39). Most sites (80.2%) were counted directly and 19.8% were estimated for inaccessible areas. Most potential sites were burrow/crevices (73.1%) while 17.4% and 9.5% were crevices and burrows, respectively (Table 39). Pigeon Guillemots probably nested in some of the up to 119 large crevices counted, especially on the south side (areas 7-12); guillemots also nested in sites that were not enumerated during Cassin's Auklet site counts. To account for this, 64 (50%) of the 128 estimated active Pigeon Guillemot sites (based on bird counts during the breeding season) were subtracted. By applying the L correction factor to the adjusted total of 1,743 potential sites, an estimate of 2,614 breeding birds was derived. No systematic surveys of Cassin's Auklets have been conducted previously at Castle Rock, although rough estimates of 2,000-2,500 breeding birds have been reported (Hunt et al. 1979).

Prince Island - A total of 6,049 medium and large potential nest sites were determined from burrow and crevice counts on 22-23 October 1991 (Figure 50, Table 40). Most sites (43.6%) were located in burrow/crevices; 38.0% and 17.5% were located in burrows and crevices, respectively. As in 1975-1977, potential sites were found all over the island in 1991 but highest numbers were found at the southeast end. Dense burrowing occurred in association with the *Opuntia* cactus patch (area 7) and in the deep dirt areas below the cactus (area 6) (Figure 50, Table 40). Pigeon Guillemots probably nested in some of the 55-146 large sites counted in areas 1 and 2 along the north side (where they were only observed during the breeding season). Pigeon Guillemots also nested in other large crevice sites not enumerated during Cassin's Auklet site counts. Rhinoceros Auklets and Tufted Puffins nesting at Prince Island were all assumed to be nesting in large crevices on the north side which were not counted during Cassin's Auklet site counts. However, the few large burrows counted may have belonged to Rhinoceros Auklets. To account for use of large sites by Pigeon Guillemots, 101 (50%) of the 202 estimated active Pigeon Guillemot sites (based on bird counts during the breeding season) were subtracted to obtain an adjusted

total of 5,948 potential Cassin's Auklet sites. By applying the L correction factor, we derived an estimate of 8,922 breeding birds.

In 1975-1977, Hunt et al. (1978, 1979) estimated 19,200-25,600 breeding Cassin's Auklets at Prince Island. In 1975, nest site densities were determined in a 625 m^2 quadrat (containing a patch of iceplant Gasoul crystallinum) on top of the island (0.064 active sites/m^2) and in thirty 25 m^2 quadrats in rocky habitat (mean 1.2 active sites/quadrat or 0.048/m^2, range 0-9/quadrat). A minimum 1975 estimate of 19,200 breeding birds (9,600 active sites) was determined by multiplying active site densities by an estimate of the amount of Cassin's Auklet nesting habitat available (i.e. 625(0.064) + 199,375(0.048)). It is not stated how the estimate of 200,000 m^2 of auklet nesting habitat was derived. A maximum 1975 estimate of 25,600 breeding birds (12,800 active sites) was determined using the highest active-site density only (i.e. 200,000(0.064)). In 1976-1977, Hunt et al. (1979) reported that densities ranged from 0.1 sites/m^2 (rocky habitat) to 8.0 sites/m^2 (on the edge of the Opuntia cactus patch in area 7). Average density on the edge of the cactus patch was 5.4 sites/m^2. Somehow, an estimate of 20,400 breeding birds (10,200 active sites) was derived from this density data for 1976-1977 using a similar method as used for 1975 estimates (Hunt et al. 1979).

As concluded at Southeast Farallon Island, we believe that the 1975-1977 method of determining population size for Cassin's Auklets yielded an overestimate of the number of active sites at Prince Island. This possibly resulted from using the average of a small number of unrepresentative quadrats and/or inaccurate estimates of the amount of nesting habitat available. A decline in the auklet population has not been suspected at Prince Island although little attention has been paid to the numbers of auklets nesting here since 1978. Further work is required to refine the 1991 population estimate and to evaluate 1975-1977 estimates.

Other factors were considered that could have contributed to differences between 1991 and 1975-1977 estimates:

1) Loss of burrow sites before October counts. We noted much lower numbers of burrows in area 6 in October compared to April, June or July. Burrows had filled in on these steep dirt slopes. We added 100 estimated sites to October counts in area 6 to account for the loss of these sites;

2) Loss of sites due to soil erosion. In early April 1991, we noted that many nest boxes had been covered with soil due to soil erosion from heavy rains in the preceding March. Numbers of sites in steep slope areas also seemed lower than usual (T. Ingram and D. Lewis, pers. comm.). Heavy rains during the 1982-1983 and 1986 El Nino-Southern Oscillation events may also have

caused soil erosion and corresponding lower densities of sites in steep slope areas since 1977;

3) Loss of sites located in vegetation. In 1991, no sites were found in small iceplant patches on top of the island and few sites occurred well inside cactus patches, especially in areas 9 and 10 on the west side. In 1975-1977, sites were reported in some number in these habitats and the gull colony on top of the island was covered in iceplant (Hunt et al. 1978, 1979). Vegetation seemed to be much reduced and in poor health in 1991. It may have died back due to drought from 1987-1991 or other factors;

4) Inclusion of larger sites. It is not clear how large sites were treated in the 1975-1977 estimates. If they were excluded, then an additional 152 breeding birds were included in the 1991 estimate. If all large sites were included in 1975-1977 estimates, then 68 breeding birds were excluded from the 1991 estimate;

5) Nest boxes. We included 51 nest boxes (77 breeding birds) in the 1991 estimate. These boxes were installed in 1986. Presumably, these birds would have nested in natural sites if boxes were not present; and

6) Increased predation. In 1991, we noted Peregrine Falcons in January, April and October at Prince Island. A suspected eyrie was found on San Miguel Island, south of nearby Harris Point in May. Falcon predation in the winter and summer probably has been increasing. Western Gull numbers do not seem to have changed significantly at Prince Island since 1975-1977.

Harris Point to Cuyler Harbor - In 1991, we discovered a small new colony of Cassin's Auklets at the Hare Rock subcolony. On 11 May, 2 active nests were found and 17 burrow/crevices were counted on the rock. Two other probably-active sites were noted on 7 June. A total of 26 breeding birds was estimated. This small colony may have been been missed by previous researchers. Hunt et al. (1979) found only 1 probable Ashy Storm-petrel site there on 25 June 1976. However, Cassin's Auklets could have finished breeding by the time of this census (see Figure 17).

Diablo and Sppit Rocks - We discovered 19 burrow/crevices and estimated 29 breeding birds at east Diablo Rock on 5 May 1991. No sites were suspected on the west rock. Only one probable Cassin's Auklet site was found at Diablo Rocks in June 1976 (S. M. Speich, pers. comm.) although 30 breeding birds were listed for small islets in this area of Santa Cruz Island (excluding Sppit Rock) by Hunt et al. (1979). At Sppit Rock, we searched but did not find any Cassin's Auklet sites on 5 May 1991. It is possible that auklets laid eggs later in the season. Three

active nests were found and 10 breeding birds were estimated on 22 June 1977 (Hunt et al. 1979).

Scorpion Rocks - We determined a total of 364 medium and large sites on all four rocks in May and October burrow and crevice site counts. By applying the L correction factor, we derived an estimate of 546 breeding birds. On the nights of 3-4 and 20-21 May 1991, we captured and banded 29 and 19 (including 4 recaptured) auklets in mistnets on the main rock (Table 9, Appendix 4); 58.6% and 63.2% had developing or developed incubation patches, respectively. Auklets were netted during periods of auklet vocalizations. On 3-4 May, auklet vocalizations stopped at 0136 hours, shortly after the moon rose at 0035 hours. On 20-21 May, auklets did not call constantly until after 0200 when the moon became obscured. Presumably, auklets were quiet when nesting Western Gulls might catch and kill them in the moonlight (see Nelson 1989). This may be especially true at Scorpion Rocks where the ground color is whitish from guano deposits and auklet silhouettes were quite discernible.

In 1975-1977, only 100 breeding birds were estimated for Scorpion Rocks (Table 35) but it was not clear whether all four rocks were censused. Also, only 15 burrows were found during a search on 22 June 1976 of the main rock (Hunt et al. 1979). In comparison, 125 burrows and 17 crevice/burrows were counted on 2 May 1991 in the guano-soil on the accessible top of the main east rock. However, only 2 burrows were observed there on 24 October 1991 although depressions could be seen where old burrows had been filled in with Brown Pelican guano.

Willows Anchorage Rocks - In 1991, we discovered a small new colony on these small rocks off the south side of Santa Cruz Island. Only one auklet was heard calling during storm-petrel mistnetting on the south rock on the night of 7-8 May 1991. However, 4 sites with eggshell fragments and 1 other probable site were found during burrow and crevice counts on 23 October 1991. No sites were suspected on the inaccessible north rock. Thus, we estimated 10 breeding birds for this colony.

Santa Barbara Island Area - At Santa Barbara Island, we counted 31 probably-active Cassin's Auklet sites during April, June and October 1991 counts of Xantus' Murrelet sites: 4 medium sites were found in area 8 (1 crevice with an eggshell fragment near Cat Canyon and 3 burrows near Graveyard Canyon (see Figure 45)); 1 medium burrow was found in area 4 under the arch at Arch Point; 2 medium crevices and 1 burrow were found in area 3; and 23 sites were found in area 2 (13 large crevices were found in the upper accessible areas of Elephant Seal Point while 1 medium burrow and 9 medium burrow/crevices were found in areas accessible by boat). During nocturnal mistnetting for storm-petrels at locations around Santa Barbara Island, we heard vocalizations or captured

birds only in these three general areas (Table 9, Appendix 4). At Elephant Seal Point, we captured and banded auklets in a mistnet placed at the entrance to a small cave located on the top outer cliff of the point: 3 birds (with incubation patches) were caught on 11-12 April, 9 birds (with incubation patches, including 1 recapture) on 14-15 April, and 11 birds (with incubation patches, including 5 recaptures) on 19-20 May. Using Chapman's (1951) modified Lincoln-Petersen method, we estimated about 26 breeding birds were nesting in this cave. At this cave, auklets rarely vocalized during the night although a few birds could be heard calling sporadically from another cave closer to the water (where 9 sites were found in October 1991 counts). Single auklets were caught in mistnets on 4 nights at Arch Point in April and May and on the night of 21-22 May at Webster Point. This scattering of additional observations away from the known breeding sites suggested that small additional numbers nested at scattered inaccessible cliff locations around the island in 1991. To account for this, we added 50% to our otherwise estimate of 88 breeding birds to derive a final estimate of 132 breeding birds for Santa Barbara Island. This estimate was similar to the 150 breeding birds estimated in 1975-1977 (Hunt et al. 1979) when birds were reported in essentially the same areas of the island as in 1991.

At Sutil Island, 81 sites (including all burrows and burrow/crevices) were counted on the upper slope and top areas in October 1991; 127 other sites (including all plant and cliff sites) on the lower slopes and cliffs were treated as Xantus' Murrelet sites (see Xantus' Murrelet account). On 13-14 April, we observed 16 occupied sites on top of the island. We captured and banded 8 birds (71.4% with incubation patches) in a mistnet in the saddle between the two peaks (site 15 on Figure 11). A few birds were heard occassionally after 0200 hours. Only 1 bird was captured on 4-5 June (Table 9, Appendix 4). Using the L correction factor, 122 breeding birds were estimated.

At Shag Rock, we found 1 probably-active large burrow/crevice on 22 May 1991. Although they have not been recorded nesting here before, this small rock is located near the northern shore of Santa Barbara Island where auklets nest currently and have nested historically (Hunt et al. 1979).

<u>Other Colonies</u> - Similar numbers of breeding birds were found at other colonies in 1991 compared to 1975-1978 surveys (Table 1). At Point Bennett, San Miguel Island, R. DeLong (pers. comm.) reported 13 potential nest sites in 1991, 12 on Cormorant Rock and 1 on the main point. On 11 May 1991, we did not visit these nesting areas at Point Bennett due to concern over disturbance to marine mammals but we did find 6 large alcid burrows on the north side of the colony which may have been Cassin's or Rhinoceros auklet sites. Excluding the 6 other sites, we derived an estimate of 20 breeding birds. At Gull Island, we counted 88

medium and large sites resulting in an estimate of 132 breeding birds. On 24 October 1991, eggshell fragments were found in 2 medium crevice sites and a whole egg was found in the only artifical site under a cement pad under the navigation-light structure. Although Cassin's Auklets have been recorded to nest historically at Anacapa Island, we did not determine if they still nested there in 1991. None were found and breeding was considered doubtful in 1975-1977 (Hunt et al. 1979). Rat predation may be preventing the Anacapa Islands from being recolonized (Erickson 1992). At San Clemente Island, we found the remains of an old dried-out Cassin's Auklet on China Point Island. No evidence of nesting was found on the island which was covered with rubble fallout. This island was located in a naval bombing range which probably has prevented birds from nesting there.

Summary

The 1989-1991 estimate of 56,572 breeding birds in California is much lower than the 161,160 breeding birds listed in Sowls et al. (1980). Most of this difference is probably accounted for by differences between census techniques at the South Farallon Islands and Prince Island; however, a decline has also probably occurred at the South Farallon Islands. We also discovered 4 small new colonies in southern California and 1 probable colony in northern California. In general, numbers of Cassin's Auklets appear to have increased in the Santa Cruz Island area since 1975-1977.

We suggest that future researchers should implement a system of well-marked plots on colonies throughout California which can be monitored over the long term to assess changes in burrow numbers, burrow and crevice occupancy, soil and vegetation, and numbers of nesting gulls. Such a project would be complicated by the great variety of nesting habitats used in California, progressing from primarily burrows in northern California to primarily crevices in southern California (Table 41). Artifical sites are also used to a significant degree at the South Farallon Islands. Future censusing efforts would be greatly facilitated if sample plots could be used to estimate population size in a reliable manner. Obstacles to such techniques include determining areas of various habitats on islands with varied and rugged topography, developing an adequate sampling system, and preventing disturbance to auklets, other nesting species, and marine mammals. We believe that complete counts of auklet sites as conducted in 1989 and 1991 are not required for every census but will be required periodically to ensure that extrapolated estimates are reasonable for assessing long-term trends.

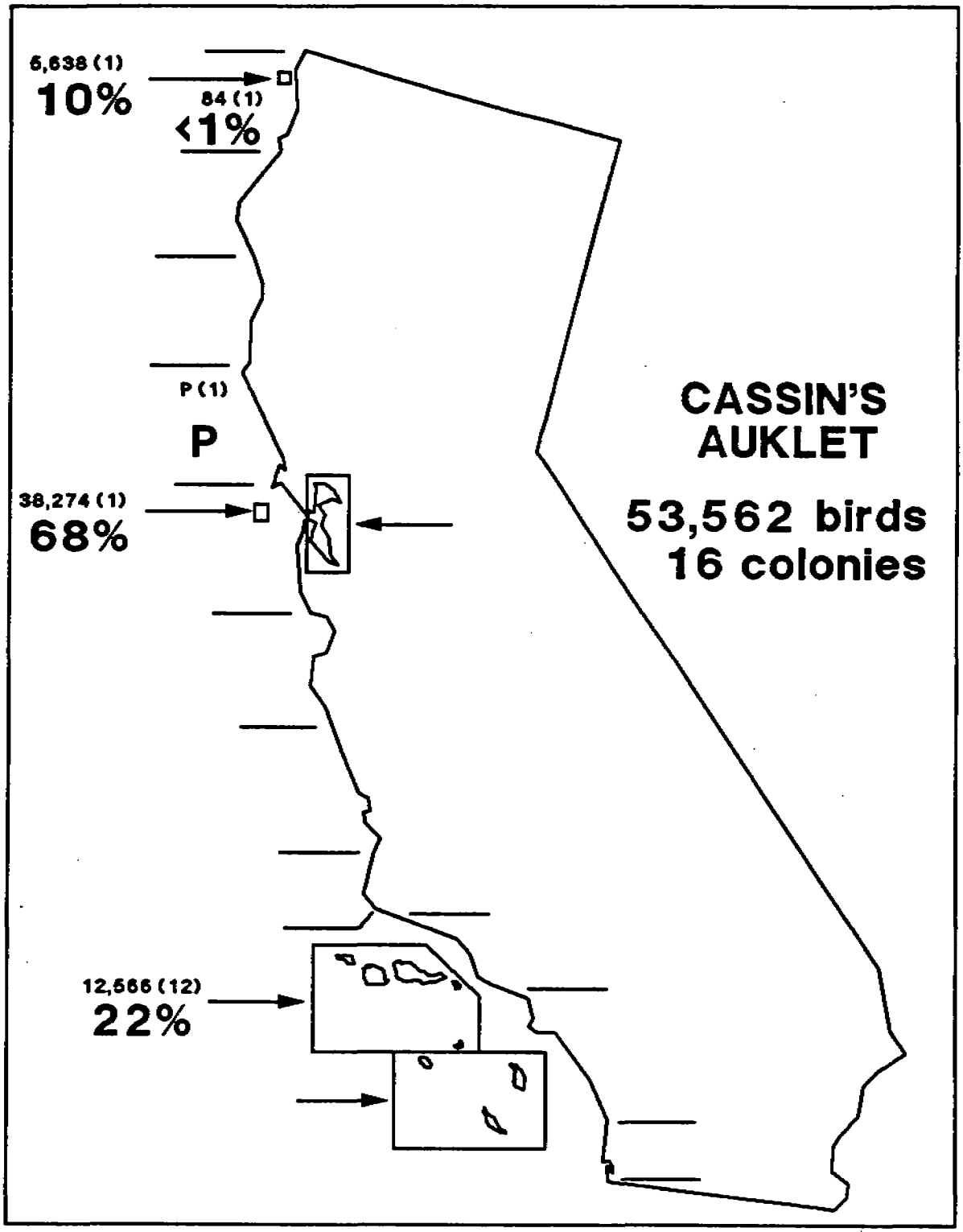


Figure 47. Percentage of state breeding population of Cassin's Auklet in coastal regions of California, 1989-1991. Symbols as in Figure 19.

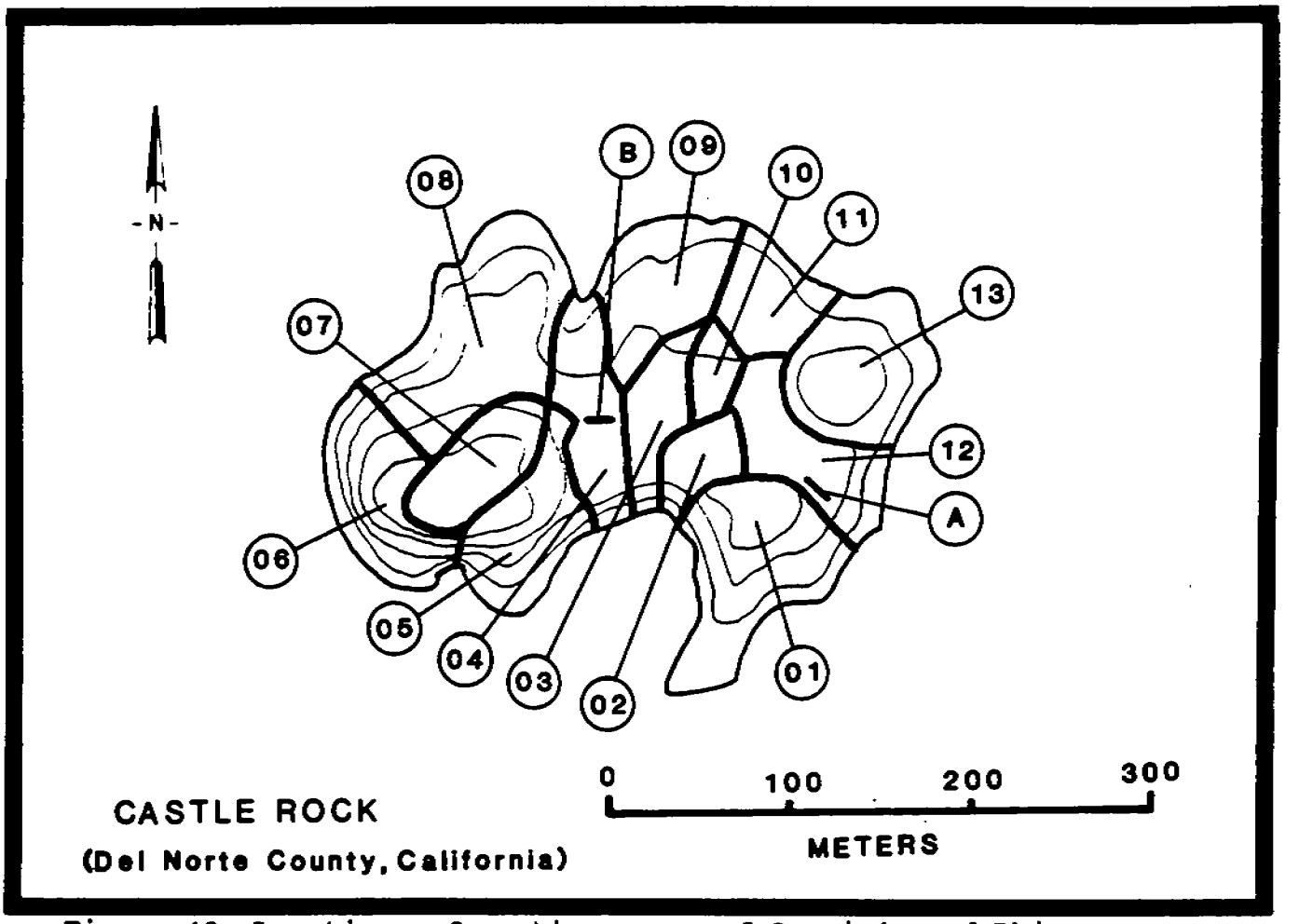


Figure 48. Locations of nesting areas of Cassin's and Rhinoceros auklets at Castle Rock (National Wildlife Refuge), Del Norte County, California. See Tables 36 and 43 for breakdowns by numbered subareas)

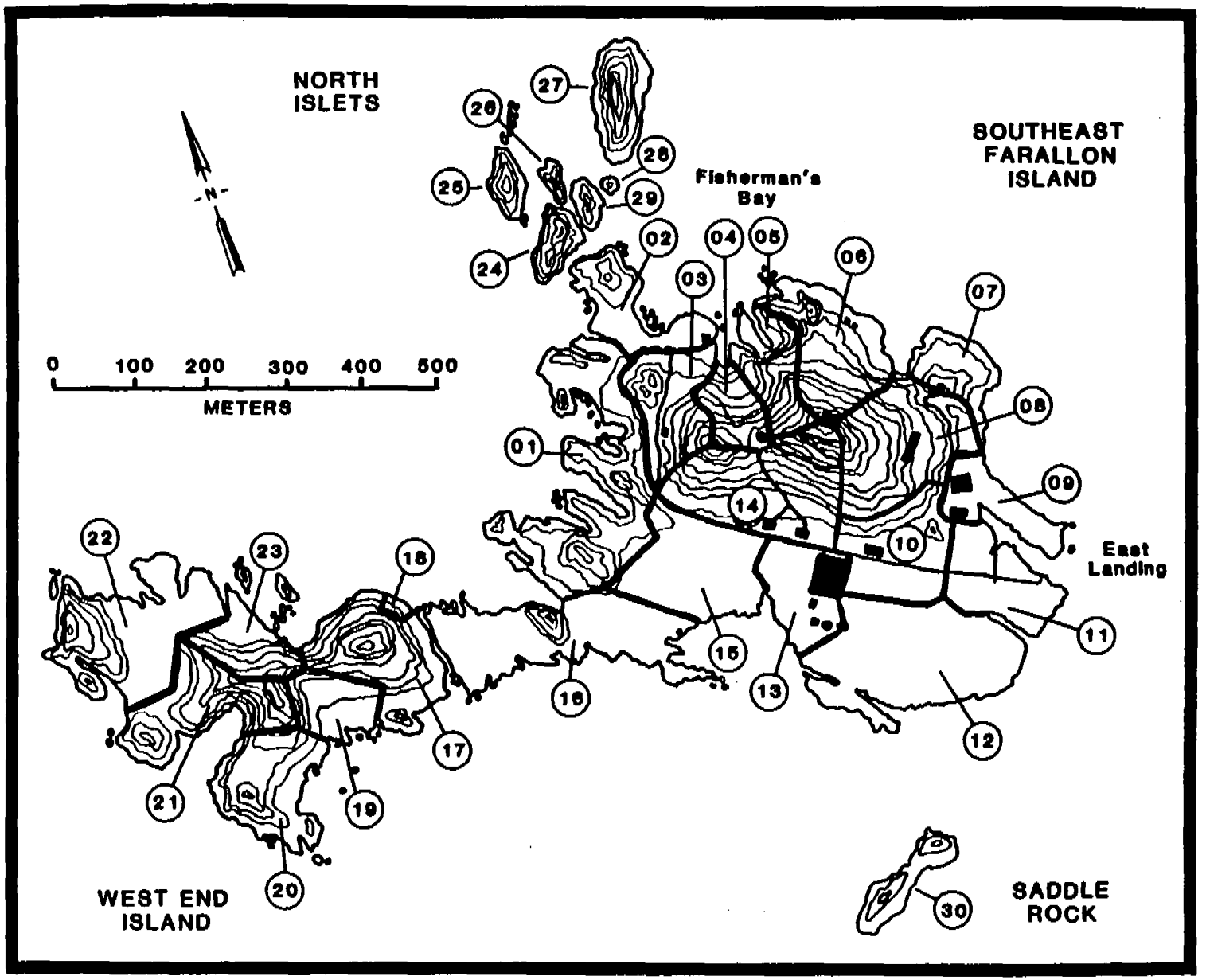


Figure 49. Locations of nesting areas of Cassin's and Rhinoceros auklets at the South Farallon Islands (National Wildlife Refuge), San Francisco County, California. See Tables 37, 38, 44 and 45 for breakdowns by numbered subareas.

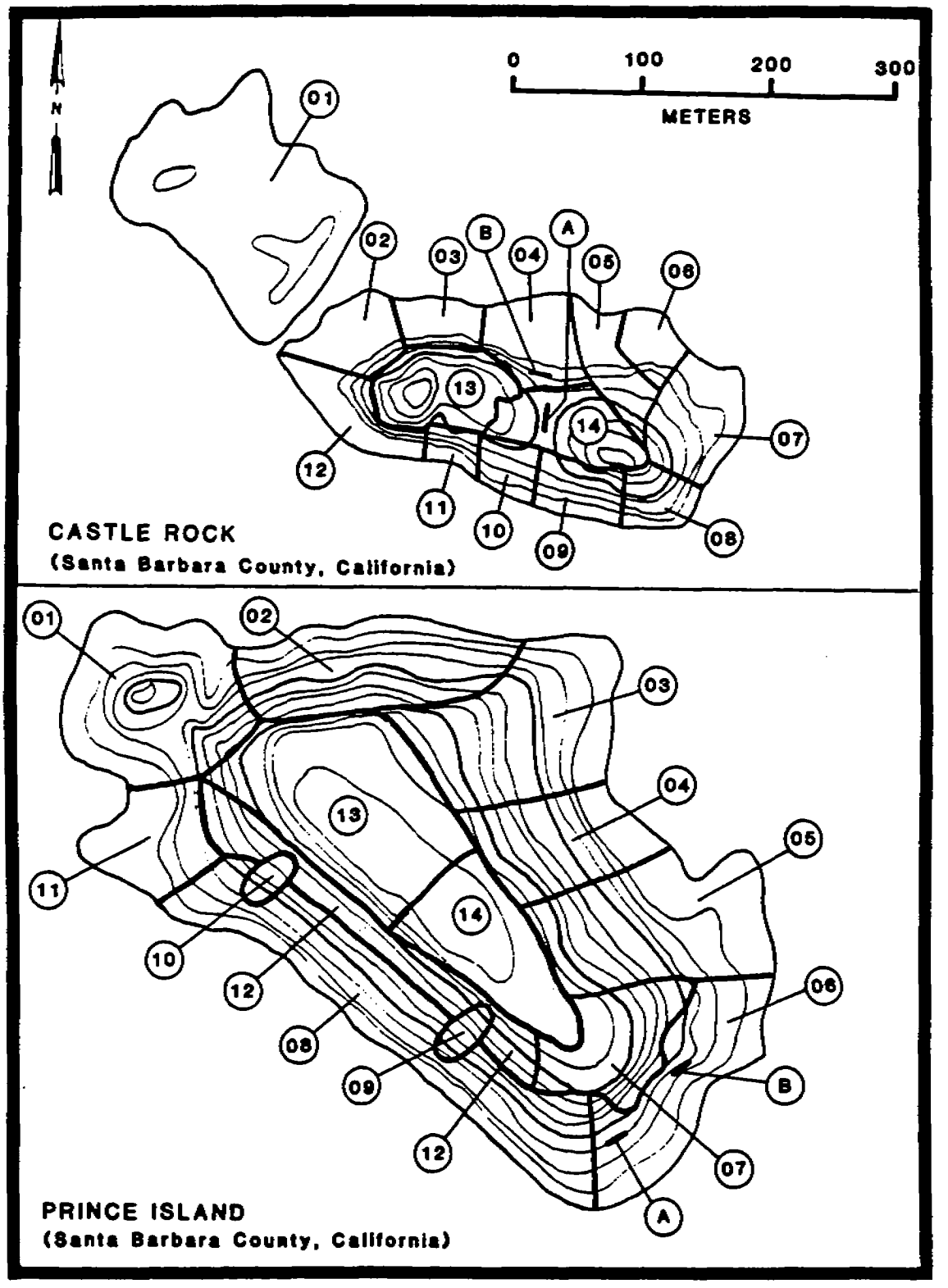


Figure 50. Locations of nesting areas of Cassin's Auklets at Castle Rock and Prince Island (Channel Islands National Park), Santa Barbara County, California. See Tables 39 and 40 for breakdowns by numbered subareas. A and B refer to mist-net sites 1 and 2, respectively.

Table 35. Numbers of breeding Cassin's Auklets at each colony in California in 1975-1980 (Hunt et al. 1979, Sowls et al. 1980) and in 1989-1991.

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		1989-1991	
Northern California						
Castle Rock	DN-414-06	325-006	[3,600]	(2.2)	5,638	(10.0)
Green Rock	HU-410-09	325-020	[50]	(<0.1)	84	(0.1)
Flatiron Rock	HU-410-13	325-023	H	(0.0)	H	(0.0)
Fish Rocks	ME-384-10	404-003	0	(0.0)	P	(0.0)
Central California						
South Farallon Islands	SF-FAI-02	429-052	[135,000][2]	(83.8)	38,274	(67.7)
Southern California						
Point Bennett	SB-SMI-01	501-014	20	(<0.1)	20	(<0.1)
Castle Rock	SB-SMI-02	501-005	2,000	(0.1)	2,614	(4.6)
Harris Point to Cuyler Harbor	SB-SMI-06	501-015	0	(0.0)	28	(<0.1)
Prince Island	SB-SMI-07	501-004	20,000	(12.4)	8,922	(15.8)
Diablo Rocks	SB-SZI-06	502-020	30[3]	(<0.1)	28	(<0.1)
Spit Rock	SB-SZI-08	502-013	20	(<0.1)	[20]	(<0.1)
Scorpion Rocks	SB-SZI-14	502-010	100	(<0.1)	546	(1.0)
Willows Anchorage Rocks	SB-SZI-20	524-019	0	(0.0)	10[4]	(<0.1)
Gull Island	SB-SZI-22	524-001	150	(<0.1)	132	(0.2)
Anacapa Island-East	VE-AMI-03	502-009	H[5]	(0.0)	H	(0.0)
Shag Rock	SB-SBI-01	524-007	0	(0.0)	2	(<0.1)
Santa Barbara Island	SB-SBI-02	524-008	150	(<0.1)	132[4]	(0.2)
Sutil Island	SB-SBI-03	524-009	70	(<0.1)	122	(0.2)
Total			161,160		56,562	

[1] X, present; P, probably breeding; H, historical nesting only. Estimates in brackets [ ] are based on historical estimates.
[2] Includes 30,000 birds added by Ainley and Boekelheide (1990).
[3] Listed as probably nesting by Sowls et al. (1980). Hunt et al. (1979) estimated 30 breeding birds for small islets in this area.
[4] Estimate based on probably-active Cassin's Auklet sites only.
[5] Historical nesting indicated at Anacapa Island by Hunt et al. (1979) but omitted by Sowls et al. (1980).

Table 36. Numbers of potential nest sites of Cassin's Auklets in various habitats at Castle Rock (National Wildlife Refuge), Del Norte County, California, in 1989.

Map Area	Area Name	Burrow Medium	Burrow Large	Burrow/Crevice Medium	Burrow/Crevice Large	Crevice Medium	Crevice Large	Total Sites Number	Total Sites Percent
1	East Peak	0	0	19	1	16	0	36	0.8
2	Dense Burrows	1695[3]	564[3]	0	0	0	0	2259[3]	50.6
3	East Center	167	1	0	0	0	0	168	3.8
4	West Center	250	53	4	0	0	0	307	6.9
5	Southwest Side	7	0	19	0	6	1	33	0.7
6	West End	5	0	0	0	2	0	7	0.2
7	West Peak	183	53	12	2	0	0	250	5.6
8	Northwest Side	117	40	15	2	0	0	174	3.9
9	North Side Center	26	21	0	0	0	1	48	1.1
10	Northeast Meadow[2]	100	21	0	0	0	0	121	2.7
11	Access Path Area[2]	26	56	0	0	0	0	82	1.8
12	East Meadow[2]	352	339	0	0	0	0	691	15.5
13	The Pit[2]	145	145	0	0	0	0	290	6.5
Total (Combined Areas)		3073	1293	69	5	24	2	4466	100.0
Percent Total Sites		68.8	29.0	1.5	0.1	0.5	<0.1	100.0	-

[1] See Figure 48 for locations of areas.
[2] Most sites were estimated from the periphery of the area.
[3] Most sites were estimated from plot extrapolations.

Table 37. Numbers of potential nest sites of Cassin's Auklets in various habitats at the Southeast Farallon Island subcolony of the South Farallon Islands (National Wildlife Refuge), San Francisco County, California, in 1989. Natural and artifical habitat sites are indicated by N and A, respectively.

Map Area[1]	Area Name	Burrow		Burrow/Crevice				Crevice				Nest Box		Total	
				Med		Lrg		Med		Lrg					
		Med	Lrg	N	A	N	A	N	A	N	A	Med	Lrg	No.	Pct.
1	Maintop Bay	320[42][2]	0	449	71	17	0	236	86	19	0	18	1	1217	5.9
2	Aulon Peninsula to Boathouse	0	0	12	10	0	0	53	22	2	0	0	0	99	0.5
3	Northwest Slopes	211[52]	0	636	64	30	0	529	77	70	0	12	8	1637	8.0
4	North Landing Bowl No. 1	205[15]	8	1032	59	31	0	378	126	57	0	1	0	1897	9.3
5	North Landing Bowl No. 2	12	0	820	0	37	0	710	0	73	0	0	0	1652	8.1
6	Fertilizer Flat	25	0	992	3	12	0	529	0	11	0	0	0	1572	7.7
7	Shubrick Point	67[1]	0	853	6	16	0	691	0	81	0	0	1	1715	8.4
8	Southeast Slopes	49[13]	0	889	20	64	0	948	310	68	0	8	0	2356	11.5
9	Blowhole Peninsula	8[4]	1	15	17	0	0	102	0	2	0	0	15	160	0.8
10	Heligoland Area	901[115]	3	262	166	15	0	56	77	20	0	62	5	1567	7.7
11	Garbage Gulch to Sea Pigeon Gulch	81[23]	0	15	77	0	0	9	21	1	0	35	0	239	1.2
12	Southeast Marine Terrace	745[174]	0	117	76	0	0	171	35	1	0	0	0	1145	5.6
13	Heloped to Sewer Gulch	142[49]	0	50	143	0	0	12	132	0	0	35	0	514	2.5
14	Southwest Slopes	736[81]	2	1055	422	71	3	716	673	196	25	215	22	4136	20.2
15	Southwest Marine Terrace	357[62]	0	85	22	0	0	15	3	0	0	13	5	500	2.4
16	Sand Flat to Weather Service Peninsula	34	0	9	21	0	0	11	0	0	0	0	0	75	0.4
Total (Areas Combined)		3893[631]	14	7291	1177	293	3	5166	1562	601	25	399	57	20481	-
Percent Total Sites		19.0	0.1	35.6	5.7	1.4	<0.1	25.2	7.6	2.9	0.1	1.9	0.3	-	-

[1] See Figure 49 for locations of areas.
[2] Numbers of crushed/collapsed burrows in square brackets.

Table 38. Numbers of potential nest sites of Cassin's Auklets in various habitats at West End Island, North Islets, and Saddle Rock subcolonies at the South Farallon Islands (National Wildlife Refuge), San Francisco County, California, in 1989.

Map Area[1]	Area Name	Burrow		Burrow/Crevice		Crevice		Total Sites	
		Medium	Large	Medium	Large	Medium	Large	Number	Percent
West End Island									
17	Maintop	0	0	31	0	371	60	462	7.9
18	Maintop Shoulder	0	0	169	0	0	0	169	2.9
19	Raven's Cliff	76	4	885	74	435	49	1523	26.0
20	Indian Head	37[1][2]	0	334	51	217	87	726	12.4
21	Shell Beach	106[2]	0	622[3]	34	211	63	1036	17.7
22	West Head	-	-	-	-	-	-	150[4]	2.6
23	Pelican Bowl	185[2]	0	894	22	151[5]	42	1294	22.1
North Islets									
24	Aulon Islet	14	0	69	2	24	3	112	1.9
25	Sealion Islet	-	-	-	-	-	-	0[6]	0.0
26	Finger Rock	0	0	0	0	0	2	2	<0.1
27	Sugar Loaf	0	0	191	0	129	21	341	5.8
28	Chocolate Chip	0	0	0	0	3	1	4	<0.1
29	Arch Rock	0	0	0	0	3	4	7	<0.1
Saddle Rock									
30	Saddle Rock	0	0	0	0	33	3	36	0.1
Total (Areas Combined)		418[5]	4	3195	183	1577	335	5862	100.0
Percent Total Sites[6]		7.3	<0.1	55.9	3.2	27.6	5.7	100.0	-

[1] See Figure 49 for locations of areas.
[1] Numbers in square brackets refer to crushed/collapsed burrows.
[2] Included 1 artifical site under wood.
[3] This area was not accessible in September due to concern over disturbance to sealions. P. Pyle (pers. comm.) estimated 150 sites there when visited in December 1989.
[4] Includes 9 artifical sites in a rock wall.
[5] This area was not accessible in September due to concern over disturbance to sealions. However, due to its exposed location, we assumed that no sites were present.
[6] Calculated using a total of 5712 sites (excluding 150 sites at area 22).

Table 39. Numbers of potential nest sites of Cassin's Auklets in various habitats at Castle Rock (Channel Islands National Park), Santa Barbara County, California, in 1991.

Map Area[1]	Area Name	Burrow			Burrow/Crevice			Crevice			Total Sites	
		Medium	Large	Unk.	Medium	Large	Unk.	Medium	Large	Unk.	Number	Percent
1	Northwest Rock[2]	0	0	0	0	0	0	0	0	0	0(0)[3]	0.0
2	Northwest End	0	0	0	0	0	28(28)	0	0	0	28(28)	1.5
3	North Side No. 1	5	0	0	37	1	13(13)	0	0	0	56(13)	3.1
4	North Side No. 2	83[3][4]	0	0	228	4	7(7)	1	1	0	324(7)	17.9
5	North Side No. 3	13[8]	0	0	138	0	70(70)	29	2	0	252(70)	13.9
6	North Side No. 4	20[13]	0	0	298	0	32(32)	87(32)	11	0	448(64)	24.8
7	East End	19	0	0	149	0	0	76	1	0	245(0)	13.6
8	South Side No. 1	0	0	0	0	0	18(18)	0	0	0	18(18)	0.1
9	South Side No. 2	0	0	0	0	0	18(18)	0	0	0	18(18)	0.1
10	South Side No. 3	0	0	0	0	0	35(35)	0	0	0	35(35)	0.2
11	South Side No. 4	0	0	0	0	0	20(20)	0	0	0	20(20)	0.1
12	Southwest End	0	0	0	0	0	28(28)	0	0	0	28(28)	0.2
13	West Peak	0	0	0	46	5	31(31)	10	4	0	96(31)	5.3
14	East Peak	31[10]	0	0	89	1	25(25)	85	8	0	239(25)	13.2
Total (Combined Areas)		171[34]	0	0	985	11	325(325)	288(32)	27	0	1807(357)	100.0
Percent Total Sites		9.5	0.0	0.0	54.5	0.1	18.0	15.9	1.5	0.0	100.0	-

[1] See Figure 50 for locations of areas.
[2] Rock not visited on foot due to concern over disturbance of sealions and fur seals. Aerial photographs indicated that no soil was present for burrowing. We assumed no sites were present.
[3] Numbers of estimated sites in round parentheses.
[4] Numbers of collapsed/crushed burrows in square brackets.

Table 40. Numbers of potential nest sites of Cassin's Auklets in various habitats at Prince Island (Channel Islands National Park), Santa Barbara County, California, in 1991.

Map Area[1]	Area Name	Burrow			Burrow/Crevice			Crevice			Total Sites	
		Medium	Large	Unk.	Medium	Large	Unk.	Medium	Large	Unk.	Number	Percent
1	Northwest Point	98	0	0	156	1	0	9	54	0	318(0)[2]	5.3
2	North Cliffs	0	0	0	0	0	56(56)	0	0	35(35)	91(91)	1.5
3	East Bowl No. 1	237[44][3]	3	0	503	40	0	133[4]	23	0	939(0)	15.5
4	East Bowl No. 2	4	0	0	68	0	0	68	4	0	144(0)	2.4
5	East Bowl No. 3	18[1]	0	0	742	6	20(20)	144	37	0	967(20)	16.0
6	Southeast End	325(100)	0	0	424(246)	0	0	57[4]	0	0	806(346)	13.3
7	Southeast Cactus	1464(516)	0	0	35	0	150(150)	48(48)	0	0	1697(714)	28.1
8	Lower West Side	41(41)	0	0	37(37)	0	102(102)	58(58)	12(12)	0	250(250)	4.1
9	Southwest Cactus	21	0	0	4	0	0	0	0	0	25(0)	<0.1
10	Northwest Cactus	16(15)	0	0	0	0	0	0	0	0	16(15)	<0.1
11	Northwest Cove	0	0	0	39	11	0	2	20	0	72(0)	0.1
12	Upper West Side	1[1]	0	0	91	0	55(55)	263	44	0	454(55)	7.5
13	North Flat Top	40[29]	1	0	25	0	0	45	5	0	116(0)	1.9
14	South Flat Top	13[5]	5	0	71	1	0	36	15	0	154(0)	2.5
Total (Combined Areas)		2291(672) [93]	9	0	2195(283)	59	383(383)	812(106)	214(12)	35(35)	6049(1491)	100.0
Percent Total Sites		37.9	<0.1	1.5	36.3	0.1	6.3	13.4	3.5	0.1	100.0	-

[1] See Figure 50 for locations of areas.
[2] Numbers of estimated sites in round parentheses.
[3] Numbers of crushed/collapsed burrows in square brackets.
[4] Includes nest boxes (24 boxes in area 3; 27 boxes in area 6).

Table 41. Availability of different types of potential nest sites for Cassin's Auklets in different regions of California. Predominant nest site types were underlined to demonstrate the progression from burrow to crevice nesting as colonies occur farther south.

Colony Name	Burrow	Burrow/Crevice	Crevice	Artifical	Total Sites
Northern California					
Castle Rock	97.1	2.2	0.8	0.0	3166[1]
Green Rock	100.0	0.0	0.0	0.0	56[1]
Central California					
South Farallon Islands					
Southeast Farallon Island	20.0	37.4	26.5	16.1	19,488[1]
Other Subcolonies	8.0	61.6	30.2	0.2	5,189[1]
Southern California					
Castle Rock	9.5	73.1	17.4	0.0	1,807[2]
Prince Island	38.0	43.6	17.5	0.1	6,049[2]
Diablo Rocks	0.0	89.5	10.5	0.0	19[2]
Scorpion Rocks	37.9	16.2	45.9	0.0	364[2]
Willows Anchorage Rocks	0.0	0.0	100.0	0.0	5[3]
Gull Island	5.7	6.8	86.4	1.1	88[2]
Shag Rock	0.0	100.0	0.0	0.0	1[3]
Santa Barbara Island	13.6	20.5	65.9	0.0	44[3]
Sutil Island	4.9	38.3	56.8	0.0	81[2]

[1] Using only medium sites.
[2] Including medium and large sites.
[3] Including only sites considered to be Cassin's Auklets'.

RHINOCEROS AUKLET

Rhinoceros Auklets breed along the coasts of the North Pacific Ocean from korea, across the Aleutian Islands, Alaska, and south to California. This alcid is difficult to census because they nest in burrows and crevices, often in small scattered colonies, and are mainly crepuscular or nocturnal in their nest visitations. In 1979-1980, Sowls et al. (1980) listed only 8 breeding colonies in northern and central California. In 1989, we focused on updating and improving population estimates at the relatively-large, known colonies. Detailed burrow and crevice counts were conducted at 4 of the 6 largest colonies: Castle Rock, Green Rock, South Farallon Islands, and Ano Nuevo Island. However, at other known colony sites and at most of the 25 newly-discovered sites, we detected small numbers of breeding Rhinoceros Auklets solely by the presence of alternate-plumaged adults on the water during the day in close proximity to potential nesting areas on islands and mainland cliffs. We considered these birds to be breeding because it is unusual for foraging birds to occur close to shore in the day unless they were "staging" near nesting areas. However, some birds may have been misassigned as nesting at a site when in fact they were not nesting there. On the other hand, many more small nesting areas probably were missed than were misassigned as nesting areas. Since we also did not know how to adjust numbers of Rhinoceros Auklets observed on the water beside colonies to derive breeding population estimates, we simply listed the maximum number of birds seen at the locality for the population estimate. Without doubt, estimates based on unadjusted numbers of birds seen in the vicinity of colonies were minimal.

Northern California

Castle Rock National Wildlife Refuge - We counted 1,300 large potential alcid burrow and crevice sites over the entire island on 12-13 September 1989 (Figure 48; Tables 42, 43). Sites were counted individually over most of the island but were estimated using plots and peripheral counts in areas 2 and 10-13 (see Cassin's Auklet account for details of this estimation process). Large sites were considered approximately large enough for use by Pigeon Guillemots, Rhinoceros Auklets, and Tufted Puffins. We assigned most large sites to one of these species based upon island locations where Pigeon Guillemots and Tufted Puffins had been observed during the day in the 1989 breeding season. We also noted that the entrances to many Rhinoceros Auklet burrows and burrow/crevices were smaller and less rounded than Pigeon Guillemot or Tufted Puffin burrows, presumably because they do not stand up as high on their hind limbs when walking on land (Storer 1945). Most Rhinoceros Auklet burrow sites were located on the large north-facing meadow on the east end (areas 2, 3, 10-12) where many Cassin's Auklet and storm-petrel burrows also were located (Figure 48, Table 43). Three dead chicks were found in

burrow entrances there in September 1989. A minimum of 878 potential Rhinoceros Auklet sites were determined for Castle Rock. By adding 310 potential sites that could not be assigned to a single species, a maximum of 1,188 potential sites was derived. By applying the rough L correction factor of 50% (to account for burrow occupancy) to the mean value of 1033 potential sites, we estimated a breeding population of 1,034 breeding birds.

Prior to 1969, only 1 nest had ever been found on Castle Rock in 1917 (Osborne 1972). In 1970, Osborne (1972) estimated 100-150 breeding birds. He apparently did not conduct a burrow count but indicated that Rhinoceros Auklets nested in much of the meadow area where they were mostly found in 1989. Osborne (cited in Sowls et al. [1980]) apparently returned to Castle Rock in 1977 and thought that numbers had increased to over 200 birds. We believe that Rhinoceros Auklet numbers have increased significantly at Castle Rock since the early 1970's.

Green Rock - On 16 August 1989, 31 large alcid burrows were counted on Green Rock. These burrows could have been used by Rhinoceros Auklets or Tufted Puffins since both species were observed at the colony in 1989. Rhinoceros Auklets were recorded on the water by the rock on 2 May (1 bird at 0745 hours), 25 May (4 birds at 0658-0734 hours), 10 July (3 birds at 0610-0750 hours), and 16 August (1 bird at 1050-1230 hours). We derived an estimate of 15 active Tufted Puffin sites, based on counts of birds present at the colony earlier in the breeding season. We considered the remaining 16 sites to be potential Rhinoceros Auklet sites, corresponding to an estimate of 16 breeding birds. Osborne (1972) did not mention Rhinoceros Auklets breeding at Green Rock in the early 1970s. On 24 June 1980, Sowls et al. (1980) observed 38 birds near Green Rock between 2000-2045 hours (see 1979-1980 survey archives) yet only 6 breeding birds were estimated there. These researchers also did not have firm evidence of nesting, other than the presence of birds near the colony.

Other colonies - In 1989, six small new sites (totalling 31 birds) were found between the Oregon border and Cape Mendocino (Table 1). Sowls et al. (1980) had reported only 5 colonies (including Castle and Green rocks above) in this area previously. However, 3 birds were seen off Wedding Rock on 15 May 1979 (see 1979-1980 survey archives) but apparently were not considered to be breeding there at that time. In 1989, we did not observe any birds at Flatiron Rock whereas 1 bird was seen off this rock on 10 May 1979. This bird was not considered to be breeding there. On 16 August 1989, 17 large alcid burrows were counted on the southeast end that was accessible without disturbing Brandt's Cormorants and California Sealions. These burrows may have been used by Rhinoceros Auklets, Pigeon Guillemots, or Tufted Puffins. However, only 3 Pigeon Guillemots and no Tufted Puffins were

observed in the vicinty of Flatiron Rock in 1989. We listed Flatiron Rock as a possible breeding colony in 1989, even though birds were not observed there, since it is more likely that Rhinoceros Auklets were missed than the other 2 species. Birds were seen in the general vicinity (e.g. Wedding Rock, Green Rock and Pilot Rock) and may have nested at Flatiron Rock.

Between Cape Mendocino and Point Reyes, 30 birds were found at 10 newly-reported sites in 1989. Sowls et al. (1980) reported only one small colony at Fish Rocks in this area. However, small numbers of birds were seen near Rockport Rocks on 12 June 1979 (see 1979-1980 survey archives). In addition, small numbers of Rhinoceros Auklets were observed near 5 other potential colonies in 1979-1980 where no birds were seen in 1989 (Table 42). Apparently, Sowls et al. (1980) did not consider these to be breeding birds.

Since it was hard to determine how many birds are nesting at small colonies, we could fully assess the status of Rhinoceros Auklets nesting in northern California at sites other than Castle Rock. We suspect that numbers are increasing based on the numbers of new sites discovered but insufficient effort was expended to verify numbers of breeding birds. In 1979-1980, Sowls et al. (1980) did not apparently consider birds to be breeding unless birds were seen near sites on nesting islands. Thus, we have included some 1979-1980 sites that were "known" previously (based on the presence of birds in the vicinity of a colony).

Central California

South Farallon Islands National Wildlife Refuge - We counted a total of 1,515 large potential alcid sites on the South Farallon Islands between 3-8 September 1989: 993, 486, 33, and 3 potential sites were found at the Southeast Farallon Island, West End Island, North Islets, and Saddle Rock subcolonies, respectively (Figure 49; Tables 44,45). Details of these extensive counts were presented in the methods. Large sites were considered large enough to be used by Pigeon Guillemots, Rhinoceros Auklets and Tufted Puffins. We assigned most large sites to one of these species, using the same criteria as mentioned above for Castle Rock.

On Southeast Farallon Island, we determined a minimum of 306 and a maximum of 441 potential Rhinoceros Auklet sites (Table 44), corresponding to an estimate of 374 breeding birds. For other subcolonies combined, a minimum of 134 and a maximum of 151 potential sites were determined (Tables 44, 45), corresponding to an estimate of 143 breeding birds. Overall, a minimum of 440 and a maximum of 592 potential Rhinoceros Auklet sites were determined for the South Farallon Islands. By applying the (50%) L correction factor to the mean value of 516 sites, an estimate

of 516 breeding birds was determined. Small numbers of Rhinoceros Auklets may also breed at the North Farallon Islands which were not surveyed for nocturnal crevice-nesting species in 1989 or previously.

Point Reyes Bird Observatory derived an alternate estimate of 500 breeding birds at the Southeast Farallon Island subcolony in 1989 (Emslie and Sydeman 1989). This estimate was based on an estimate of about 250 active sites in selected areas of the island. This estimate would be similar to our estimate if we had applied a L correction factor of 67% instead of 50% for burrow occupancy to the 1989 total of 374 potential sites. This value is within the range of annual values found in Washington (Wilson 1976, pers. comm.).

Rhinoceros Auklets recolonized the South Farallon Islands in 1971-1972, after not being recorded since the mid 1800's (Grinnell 1926, Ainley and Lewis 1974). Since 1983, they have increased dramatically (Ainley and Boekelheide 1990). Increase has occurred despite heavy mortality from the February 1986 Apex Houston oil spill when at least 1,566 birds were killed between Point Reyes, Marin County, and Point Lobos, Monterey County (Page et al. 1990). While many birds killed must have been wintering birds from farther north, some must have been killed from the local breeding population located mainly at the South Farallon Islands.

Ano Nuevo Island - We counted a total of 79 potential sites on the island on 14 June 1989. Seventy potential sites (57 intact burrows, 4 collapsed burrows, and 9 nest boxes) were found in the main nesting area in the east-center of the island. In addition, 9 intact burrows were found along the bluff top at the southeast end, east of the old lighthouse quarters. On the night of 13-14 June 1989, we observed 3-4 birds landing at or leaving from each of these areas between 2040-2200 hours. Rhinoceros Auklets were nesting in only one of the nest boxes. By applying the L correction factor to the total of 79 potential sites, we derived an estimate of 79 breeding birds.

Rhinoceros Auklets recently colonized this island. Twenty burrows were first discovered in 1986 (D. B. Lewis, pers. comm.). Some colonizing birds may have come from the South Farallon Islands where numbers were increasing rapidly in the mid 1980s. We believe that numbers of Rhinoceros Auklets are continuing to increase at Año Nuevo Island. However, suitable burrowing habitat on this small island may soon be saturated and suspected heavy kleptoparasitism of adults carrying prey to feed chicks by the dense population of breeding Western Gulls may reduce breeding success.

Other colonies - We found 84 birds at 6 other newly-discovered sites from Ano Nuevo Island to Point Arguello. Only the isolated

Point Arguello colony was known in this area previously (Sowls et al. 1980). No Rhinoceros Auklets were observed in this area in 1979-1980. D. L. Suddjian (pers. comm.) first reported nesting by small numbers of Rhinoceros Auklets at the El Jarro Point to Davenport colony in 1987. We believe that numbers of nesting Rhinoceros Auklets have increased south of Ano Nuevo Island since 1979-1980.

Southern California

In 1991, we discovered Rhinoceros Auklets nesting in southern California for the first time. There are no definite historical records of breeding in this area and none were observed in 1975-1977 (Hunt et al. 1979). Baird et al. (1884) reported that they nested at Santa Barbara Island although Howell (1917) doubted this record. In 1991, small numbers of birds were observed at 3 locations around San Miguel Island: Castle Rock (1 bird on 10 June), Harris Point to Cuyler Harbor (1 bird on 10 June; 3 birds on 12 July) and Prince Island (up to 15 birds on 7-10 June; up to 4 birds on 12-14 July)(Table 42). In addition, 6 large alcid burrows were found on the north side of Point Bennett on 11 May 1991 which may have been Rhinoceros or Cassin's auklet sites. At Prince Island, we observed birds landing on the island or standing at sites located in the North Cliffs area (see Figure 50) on 8 June (0712 and 1635 hours), 13 July (0805 hours), and 14 July (0729-1021 hours). In June, birds were seen entering a narrow cave at the base of the north cliffs. During longer observations on 14 July, birds were seen rubbing bills in probable courtship displays and entering and leaving at least 3 crevice sites. Even though small and recently-established, the Prince Island colony was the seventh largest in California in 1989-1991 (Table 42).

Small numbers of Rhinoceros Auklets were observed at sea (away from nesting colonies) on several occasions between late May and early July 1991 along the western margin of the Southern California Bight and north of Santa Barbara Island (Table 46). These observations may indicate foraging areas for San Miguel island breeders but sightings included birds in breeding and non-breeding plumage. Large numbers of Rhinoceros Auklets winter in the Southern California Bight (Briggs et al. 1987). The small breeding population at San Miguel Island may have become established by wintering birds that remained south through the summer or by colonists from the Point Arguello colony in central California.

Summary

We estimated an overall total of 1,769 breeding birds in California in 1989-1991 compared to only 368 breeding birds in 1979-1980 (Table 42). Based on large increases at the two main colonies (Castle Rock and the South Farallon Islands) and the

establishment of an almost continuous band of small numbers of breeding birds all along the coasts of northern and central California (extending into southern California), we believe that numbers of Rhinoceros Auklets have increased rapidly since 1979-1980. Population increase and expansion in California appears to be a continuation of increases noted in the early 1970's along much of the west coast south of British Columbia (Scott et al. 1974, Sowls et al. 1980; also see Speich and Wahl 1989). Further increase in the numbers of breeding Rhinoceros Auklets in California is likely to be limited by low availability of suitable nesting habitat. Nesting populations could be enhanced by installing artifical nesting habitat (e.g. nest boxes) which is used readily on the South Farallon Islands and at Ano Nuevo Island.

Future research should involve: 1) implementing a system of well-marked plots on large colonies to monitor changes in burrow numbers, burrow and crevice occupancy, soil and vegetation, and numbers of nesting gulls (also see Cassin's Auklet account for additional comments); 2) examining small colony sites more closely to determine actual numbers of breeding birds; and 3) searching for and closely examining other small colonies that may have been missed in 1989-1991 surveys. At small colonies, dusk and dawn watches could assist detection of birds using colonies and may act as a relative measure of population size. However, correction factors for determining the relative numbers of breeders and nonbreeders would be required. Birds have been mistnetted at the South Farallon Islands as they arrived at nesting areas at and after dusk (PRBO, unpubl. data). Analyses of such data could provide approximate correction factors.

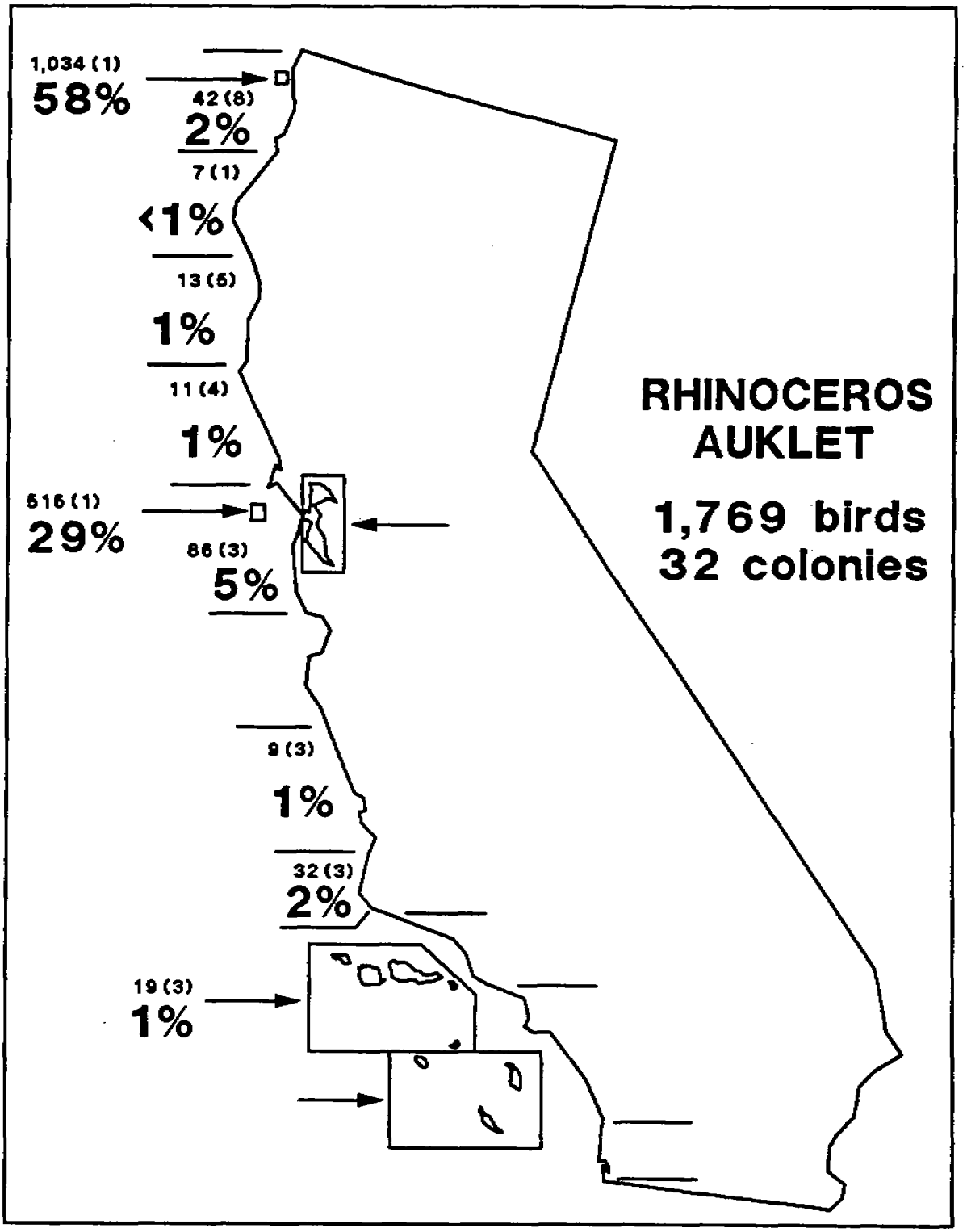


Figure 51. Percentage of breeding population of Rhinoceros Auklet in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 42. Numbers of breeding Rhinoceros Auklets at each colony in California in 1975-1980 (Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		Number of Breeding Birds[1] (Percent) 1989-1991	
Northern California						
Prince Island	DN-414-03	325-003	12	(3.3)	1	(0.1)
Castle Rock	DN-414-06	325-006	200	(54.3)	1,034[2,3]	(58.4)
Tolowa Rocks	DN-414-07	325-007	0	(0.0)	1	(0.1)
White Rock	DN-412-11	325-012	0	(0.0)	1	(0.1)
Redding Rock	HU-412-01	325-013	0	(0.0)	1	(0.1)
Wedding Rock	HU-410-03	325-016	0	[3][4] (0.0)	20	(1.1)
Green Rock	HU-410-09	325-020	6	(1.6)	16[3]	(0.9)
Flatiron Rock	HU-410-13	325-023	0	[1] (0.0)	P[5]	(0.0)
Pilot Rock	HU-410-16	325-026	0	(0.0)	1	(0.1)
Little River Rock	HU-410-19	325-035	P	(0.0)	1	(0.1)
Sugarloaf Island	HU-402-02	325-041	0	(0.0)	7	(0.4)
Rockport Rocks	ME-394-07	379-001	0	[1] (0.0)	2	(0.1)
Cape Vizcaino	ME-394-08	379-002	0	(0.0)	1	(0.1)
Georgia Pacific	ME-392-06	379-022	0	[1] (0.0)	0	(0.0)
Goat Island Area	ME-390-01	379-006	0	(0.0)	4	(0.2)
Van Damme Cove	ME-390-05	379-027	0	(0.0)	3	(0.2)
Casket Rock	ME-390-11	379-009	0	(0.0)	3	(0.2)
Point Arena	ME-384-01	404-017	0	[1] (0.0)	0	(0.0)
Fish Rocks	ME-384-10	404-003	14	(3.8)	4[2]	(0.2)
Gualala Point Island	SO-384-01	404-004	0	[2] (0.0)	0	(0.0)
Sea Ranch	SO-384-03	404-025	0	[2] (0.0)	0	(0.0)
Arched Rock	SO-382-11	404-006	0	[1] (0.0)	0	(0.0)
Bodega Rock	SO-380-02	404-008	0	(0.0)	2	(0.1)
Pinnacle Rock	SO-380-04	404-039	0	(0.0)	2	(0.1)
Bird Rock	MA-380-04	404-010	0	(0.0)	3	(0.2)
Central California						
Point Reyes	MA-374-01	429-001	6	(1.6)	6	(0.3)
South Farallon Islands	SF-FAI-02	429-052	100[6]	(27.2)	516[2,3]	(29.2)
Ano Nuevo Island	SM-370-04	429-023	0	(0.0)	79[2,3]	(4.5)
El Jarro Point to Davenport	SC-370-02	429-050	0	(0.0)	1	(0.1)
Piedras Blancas Island	SL-352-01	477-007	0	(0.0)	3	(0.2)
Shell Beach Rocks	SL-350-13	477-035	0	(0.0)	5	(0.3)
North Pismo Beach Rocks	SL-350-14	477-036	0	(0.0)	1	(0.1)
Point Sal	SB-344-03	501-018	0	(0.0)	3	(0.2)
Mainland and rocks east of Destroyer Rock	SB-342-02	501-010	0	(0.0)	5	(0.3)
Point Arguello	SB-342-04	501-011	30	(8.2)	24[2]	(1.4)
Southern California						
Castle Rock	SB-SNI-02	501-005	0	(0.0)	1	(0.1)
Harris Point to Cuyler Harbor	SB-SNI-06	501-015	0	(0.0)	3	(0.2)
Prince Island	SB-SNI-07	501-004	0	(0.0)	15[2]	(0.8)
Santa Barbara Island	SB-SBI-02	524-008	PN[7]	(0.0)	(PN)	(0.0)
Total			368[8]		1,769	

[1] Number of birds observed on the water off the colony, except where noted.
[2] Birds observed landing on or leaving from shore.
[3] Detailed nest site counts were conducted.
[4] Numbers in square brackets refer to maximum numbers of birds observed near or at colonies but which were not considered to be breeding birds by Sowls et al. (1980).
[5] Possible nesting (see text).
[6] Sowls et al. (1980) reported a 1979 PRBO estimate of 100 breeding birds whereas Ainley and Boekelheide (1990) reported a 1979 PRBO estimate of 176 breeding birds.
[7] Possible historical breeding was noted by Baird et al. (1884) but not mentioned by Hunt et al. (1979) or Sowls et al. (1980).
[8] Sowls et al. (1980) reported 362 birds.

Table 43. Numbers of potential nest sites of Rhinoceros Auklets, Tufted Puffins, and Pigeon Guillemots at Castle Rock (National Wildlife Refuge), Del Norte County, California, in 1989. Burrow, burrow/crevice, and crevice sites were indicated by B, B/C, and C, respectively.

Map Area[1]	Area Name	Rhinoceros Auklet			Tufted Puffin			Pigeon Guillemot			Other[2]	Total Sites	
		B	B/C	C	B	B/C	C	B	B/C	C	B	Number	Percent
1	East Peak	0	0	0	0	0	0	0	1	0	0	1	0.1
2	Dense Burrows[3]	564[4]	0	0	0	0	0	0	0	0	0	564	43.4
3	East Center	1	0	0	0	0	0	0	0	0	0	1	0.1
4	West Center	0	0	0	3	0	0	0	0	0	50	53	4.1
5	Southwest Side	0	0	0	0	0	0	0	0	1	0	1	0.1
6	West End	0	0	0	0	0	0	0	0	0	0	0	0.0
7	West Peak	4	0	0	7	2	0	0	0	0	42	55	4.2
8	Northwest Side	19	2	0	13	0	0	8	0	0	0	42	3.2
9	North Side Center	0	0	0	4	0	0	0	0	1	17	22	1.7
10	Northeast Meadow[3]	21	0	0	0	0	0	0	0	0	0	21	1.6
11	Access Path Area[3]	0	0	0	0	0	0	0	0	0	56	56	4.3
12	East Meadow[3]	267	0	0	72	0	0	0	0	0	0	339	26.1
13	The Pit[3]	0	0	0	0	0	0	0	0	0	145	145	11.2
Total (Combined Areas)		876	2	0	99	2	0	8	1	2	310[5]	1300	100.0
Percent Total Sites		67.4	0.2	0.0	7.6	0.2	0.0	0.6	0.1	0.2	23.8	100.0	-

[1] See Figure 48 for locations of areas.
[2] Burrows that were not assigned to one species.
[3] Most sites estimated from the periphery of areas.
[4] Most sites extrapolated from plots (see text).
[5] Rhinoceros Auklet or Pigeon Guillemot (88 sites).

Table 44. Numbers of potential nest sites of Rhinoceros Auklets and Pigeon Guillemots at the Southeast Farallon Island subcolony of the South Farallon Islands (National Wildlife Refuge), San Francisco County, California, in 1989. Burrow, burrow/crevice, crevice, and nest box sites were indicated by B, B/C, C, and NB, respectively.

Map Area[2]	Area Name	Rhinoceros Auklet				Pigeon Guillemot				Other Sites				Total Sites[1]	
		B	B/C	C	NB	B	B/C	C	NB	B	B/C	C	NB	Number	Percent
1	Maintop Bay	0	0	0	0	0	0	0	0	0	17	19	1	37	3.7
2	Aulon Peninsula to Boathouse	0	0	0	0	0	0	0	0	0	0	2	0	2	0.2
3	Northwest Slopes	0	30	1	8	0	0	64	0	0	0	5	0	108	10.9
4	North Landing Bowl No. 1	8	31	26	0	0	0	30	0	0	0	1	0	96	9.7
5	North Landing Bowl No. 2	0	27	0	0	0	10	67	0	0	0	6[3]	0	110	11.1
6	Fertilizer Flat	0	2	0	0	0	10	9	0	0	0	2	0	23	2.3
7	Shubrick Point	0	0	10	0	0	0	31	1	0	16	40[3]	0	98	9.9
8	Southeast Slopes	0	26	0	0	0	0	58	0	0	38[4]	10[3]	0	132	13.3
9	Blowhole Peninsula	0	0	2	0	1	0	0	15	0	0	0	0	18	1.8
10	Heligoland Area	3	15	16	5	0	0	4	0	0	0	0	0	43	4.3
11	Garbage Gulch to Sea Pigeon Gulch	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
12	Southeast Marine Terrace	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
13	Heloped to Sewer Gulch	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
14	Southwest Slopes	2	58	12	19	0	16[5]	209[6]	3	0	0	0	0	319	32.1
15	Southwest Marine Terrace	0	0	0	5	0	0	0	0	0	0	0	0	5	0.5
16	Sand Flat to Weather Service Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total (Combined Areas)		13	189	67	37	1	36	474	19	0	71[4]	85[3]	1	993	100.0
Percent Total Sites		1.3	19.0	6.7	3.7	0.1	3.6	47.4	1.9	0.0	71.5	85.6	0.1	100.0	-

[1] Using large sites only.
[2] See Figure 49 for locations of areas.
[3] Includes 1 Tufted Puffin site in area 7, 6 Tufted Puffin or Pigeon Guillemot sites in area 5, and 1 Tufted Puffin or Rhinoceros Auklet site in area 8.
[4] Includes 15 Tufted Puffin or Pigeon Guillemot sites.
[5] Includes 3 artifical burrow/crevices.
[6] Includes 25 artifical crevices.

Table 45. Numbers of potential nest sites of Rhinoceros Auklets and Pigeon Guillemots in various habitats at the West End Island, North Islets, and Saddle Rock subcolonies of the South Farallon Islands (National Wildlife Refuge), San Francisco County, California, in 1989. Burrow, burrow/crevice, and crevice sites were indicated by B, B/C, and C, respectively.

Map Area[2]	Area Name	Rhinoceros Auklet			Pigeon Guillemot			Other Sites			Total Sites[1]	
		B	B/C	C	B	B/C	C	B	B/C	C	Number	Percent
West End Island												
17	Maintop	0	0	0	0	0	25	0	0	35[3]	60	11.5
18	Maintop Shoulder	0	0	0	0	0	0	0	0	0	0	0.0
19	Raven's Cliff	4	18	8	0	56	41	0	0	0	127	24.3
20	Indian Head	0	27	6	0	24	76	0	0	5	138	26.4
21	Shell Beach	0	17	30	0	17	25	0	0	8	97	18.6
22	West Head	-	-	-	-	-	-	-	-	-	0[4]	0.0
23	Pelican Bowl	0	21	0	0	1	42	0	0	0	64	12.3
North Islets												
24	Aulon Islet	0	2	0	0	0	3	0	0	0	5	1.0
25	Sealion Islet	-	-	-	-	-	-	-	-	-	0[5]	0.0
26	Finger Rock	0	0	1	0	0	1	0	0	0	2	0.4
27	Sugar Loaf	0	0	0	0	0	21	0	0	0	21	4.0
28	Chocolate Chip	0	0	0	0	0	1	0	0	0	1	0.2
29	Arch Rock	0	0	0	0	0	4	0	0	0	4	0.8
Saddle Rock												
30	Saddle Rock	0	0	0	0	0	2	0	0	1[3]	3	0.6
Total (Combined Areas)		4	85	45	0	98	241	0	0	49	522	100.0
Percent Total Sites		0.8	16.3	8.6	0.0	18.8	46.2	0.0	0.0	9.4	100.0	-

[1] Using large sites only.
[2] See Figure 49 for locations of areas.
[3] Includes 31 and 1 Tufted Puffin or Pigeon Guillemot sites in areas 17 and 30, respectively.
[4] This area was not accessible in October 1989 because of concern about disturbance to sealions. P. Pyle (pers. comm.) did not report any large sites there in December 1989.
[5] This area was not accessible because of concern about disturbance to sealions. Due to its high exposure to rough seas, we assumed that no sites were present.

Table 46. At-sea sightings of Rhinoceros Auklets in the Southern California Bight, 1991. Observations were made mostly from the M/V Instinct.

Date	Time	Latitude	Longitude	Location	No. Birds	Plumage[1]	Activity
05/22/91	1040	33°42′ N	119°25′ W	Between West Santa Cruz Island and Santa Barbara Island, near Santa Cruz Basin	2	2 NB	on water
	1103	33°40′ N	119°24′ W	" "	3	Unknown	" "
05/23/91	0905	33°41.7′ N	119°04.9′ W	North of Santa Barbara Island	2	2 NB	" "
	1151	34°02.7′ N	119°12.8′ W	" "	1	Unknown	flying
05/25/91	1921	33°35.7′ N	119°17.8′ W	Northwest of Santa Barbara Island	1	1 NB	on water
05/28/91	1035	33°11.3′ N	119°10.7′ W	Between San Nicolas and San Clemente islands	1	Unknown	" "
	1125	33°09.9′ N	119°03.4′ W	" "	3	3 NB	" "
	1157	33°08.8′ N	118°58.6′ W	" "	2	2 BP	" "
	1227	33°07.9′ N	118°53.4′ W	" "	2	1 BP, 1 NB	" "
	1311	33°07.7′ N	118°46.0′ W	" "	3	2 BP, 1 NB	" "
06/07/91	1240	34°03.5′ N	120°16.8′ W	North end of San Miguel Passage	1	1 BP	" "
06/10/91	1326	34°03.6′ N	120°08.0′ W	North of Santa Rosa Island	1	1 NB	" "
07/08/91[2]	1140	-	-	North end of San Miguel Passage	2	Unknown	" "

[1] Breeding plumage, BP; Non-breeding plumage, NB.
[2] Observation was made from the M/V Island Ranger.

TUFTED PUFFIN

Tufted Puffins breed throughout the coasts of the North Pacific Ocean. In North America, they breed from northwestern Alaska to southern California. Tufted Puffins are difficult to census because they nest in burrows and crevices, often in small scattered colonies, and are only sporadically observed standing at the entrances to their nest sites during the day. Sowls et al. (1980) listed a total of 20 colony sites in California but only 9 sites were active in 1979-1980. In addition, at least 5 other historical colony sites had been omitted including: Bird Rock (Marin County), San Pedro Rock, Pecho Rock, East Anacapa Island, and Shag Rock (Table 47). Another historical colony was reported in Carmel Bay, Monterey County (Loomis 1895). This colony may correspond with either Pescadero Rocks or Guillemot Island colonies.

In 1989, we surveyed Tufted Puffins by counting the number of birds visible at colonies. Counts were preferably conducted in the early morning period when puffin numbers are highest and birds are more consistently present (see methods). However, birds counted may have included prebreeding, breeding and non-breeding birds. We surveyed several of the larger known colonies in northern California several times to obtain a peak count. Many other small colonies were only visited once or twice and sometimes later in the day. If puffins were not observed at a small colony, we were not sure if birds were still breeding there or not due to variability in colony attendance. All 1989-1991 estimates of colony size were derived from counts of birds adjusted with a rough K correction factor (see methods). At some colonies, we used burrow and crevice counts to cross check estimates for reliability.

Northern California

Prince Island - On 30 July 1989, the high count of 6-8 birds at 4 potential sites was obtained on the north side (near the arch entrance) where a large grayish-downy chick (either Tufted Puffin or Rhinoceros Auklet) was observed under a large boulder. Earlier in 1989, lower numbers were observed only in the same area : 7 birds on 3 May, 6 birds at 3 sites on 20 May, and 3-4 birds on 11-12 July. By adjusting the 30 July count of 7 birds (mean of 6-8 birds) with the rough (3.8) K correction factor, we derived an estimate of 27 breeding birds.

Osborne (1972) did not record the presence of Tufted Puffins at Prince Island in 1970. Sowls et al. (1980) also had a peak count of 8 birds at 0830 hours on 3 July 1980 and 4 sites were identified on the west and north sides of Prince Island on 20-21 May 1980 (see 1979-1980 survey archives). Since an estimate of 8 breeding birds was derived in 1980 (Sowls et al. 1980), these researchers apparently assumed that either all breeding birds

were seen or that some non-breeding birds also were present on 3 July. We suspect that numbers of Tufted Puffins have not changed much between 1980 and 1989.

Castle Rock National Wildlife Refuge - A peak count of 34 birds attending 23 potential sites was obtained on 20 May 1989 between 0658-0855 hours. Only 10, 26, and 16 birds were counted on 29 April (0815-0930 hrs), 17 May (0625-0815 hrs), and 21 May (0650-1020 hrs), respectively. By adjusting the 20 May count with the rough (2.4) K correction factor, 82 breeding birds were estimated.

Although this estimation method was consistent with how numbers of puffins were estimated at most colonies, this estimate may be low for Castle Rock. During counts of burrow and crevice sites on 12-13 September 1989, we determined a minimum of 101 Tufted Puffin potential sites (Table 43). By adding 222 other sites which could not be assigned to species, a maximum of 323 sites was derived. By applying the rough (50%) L correction factor to account for burrow occupancy to the mean value of 212 potential sites, we obtained a second estimate of 212 breeding birds. Since only 47.6% of potential sites were identified as potential Tufted Puffin sites, we consider this estimate to be very rough but indicative that numbers may be higher than the first estimate.

Detailed boat counts of puffins were required to record all birds attending sites around Castle Rock. However, it is possible that certain portions of the colony were not viewed well enough and that this led to underestimation of the number of birds that were actually present. For instance, many (72) puffin burrows were located in the east meadow area (area 12) which is covered in Elymus-soil tussocks (Table 2). Although a maximum of 7 birds were counted at the entrances to many burrows around the seaward periphery, the rest of this 80-foot high area is flat and some birds probably were not visible from the boat.

Osborne (1972) estimated 50 breeding birds at Castle Rock in 1970; he reported the highest known count of 56 birds on 13 August 1970. Sowls et al. (1980) estimated 100 breeding birds at Castle Rock in 1980. On 21 May 1979 (1110 hrs), only 22 birds and 62 burrows were counted from a boat. A high count of 40 birds was conducted on 19 June 1980 (0700-0800 hrs). We suspect that numbers of Tufted Puffins at Castle Rock have changed little between 1970 and 1989.

Green Rock - A peak count of 12 birds at 7 sites was obtained on a complete boat census of the rock at 0658-0734 hours on 25 May 1989. At other times in 1989, lower numbers were counted: 2 birds at 2 sites on 2 May (0745 hours) and 9 birds at 6 sites on 10 July (0720-0730 hours). Up to 9 birds were seen at 5 sites on 10 July 1989 at 0610-0750 hours on the visible portion of the

rock from a mainland observation point at Elk Head. Extensive observations made from this point on several dates at Green and Puffin rocks in April-June 1989 indicated that numbers of puffins were usually higher in the early morning and often none were visible later in the day (see Figure 7). We derived an estimate of 29 breeding birds for Green Rock, using the 25 May count and the rough (2.4) K correction factor.

On 16 August 1989, we counted 31 large alcid burrows on Green Rock. These burrows could have used by Tufted Puffins or Rhinoceros Auklets. Since at least 7 sites were attended by puffins, we felt that 14-15 active sites (derived from the 29 breeding bird estimate above) was reasonable. If 50-75% of all burrows contained Tufted Puffins, then as many as 31-47 breeding birds (or 15-24 active sites) could have been present.

Osborne (1972) estimated that about 50 burrows were present in 1970. However, he estimated only 10 breeding birds, based on observing 5 birds on the rock on 21 May 1970. Sowl et al. (1980) observed a maximum of 3 birds on 1 August 1979 and estimated 10 breeding birds as well. We suspect that the numbers of Tufted Puffins have increased slightly at Green Rock since 1980.

Other Colonies - In 1989, similar numbers of Tufted Puffins were found at 5 other small colonies in northern California as found in 1979-1980 (Table 47). A total of 20 birds were observed at three new sites: False Klamath Rock, Redding Rock, and False Cape Rocks. However, a single Tufted Puffin had been noted on False Klamath Rock on 6 May 1980 (see 1979-1980 survey archives) but it was not listed as a colony site by Sowls et al. (1980).

Central California

South Farallon Islands National Wildlife Refuge - In 1989, Point Reyes Bird Observatory (PRBO) determined the number of breeding Tufted Puffins by detailed observations throughout the breeding season of adults attending potential nest sites and/or carrying fish to these sites to feed chicks (Emslie and Sydeman 1989). Observations of a limited portion of the islands were conducted every five days from April to August 1989. A total of 79 potential locations were counted but regular attendance by adults or fish-carrying birds were observed at only 23 sites. To account for birds that laid eggs but did not raise chicks, 12 sites were added. Thus, the 35 active sites contained an estimated 70 breeding birds. Since all of the islands (especially most of West End Island) were not observed effectively from accessible observation points, this estimate was low.

During detailed burrow and crevice counts on 3-8 September 1989, we counted a total of 65 possible Tufted Puffin sites; 33, 31, and 1 potential sites were found on Southeast Farallon

Island, West End, and Saddle Rock subcolonies, respectively (Figure 49; Tables 44, 45). Puffins nested mainly in crevices located on rock outcroppings and talus slopes, especially on Lighthouse Hill and Maintop. We had great difficulty assigning many crevices to one species in certain areas where it was not well known whether Pigeon Guillemots or Tufted puffins would have used specific sites. We also did not count some puffin sites in a few inaccessible areas. Thus, we were not able to derive an estimate of the number of breeding Tufted Puffins based on potential site counts. However, the limited crevice counts were reconcilable with PRBO puffin observations.

In the 1800's, Tufted Puffins were much more abundant at the South Farallon Islands. Numbers declined rapidly from several thousands in 1911, to 300 birds in 1933, to 26 birds in 1959 (see summary in Ainley and Lewis 1974). Oil pollution and loss of the sardine (a potential prey resource) may have caused this decline. In the 1970's, numbers of breeding Tufted Puffins at the South Farallon Islands increased gradually from 54 to 100 breeding birds but then fell dramatically after the 1982-1983 El Nino-Southern Oscillation event (Ainley et al. 1988; Ainley and Boekelheide 1990). By 1985, numbers had recovered to earlier levels and have continued to increase slowly since then. Tufted Puffins have not been observed visiting sites at the North Farallon Islands, despite numerous birdwatching trips in this area, and are not suspected to breed there.

Other Colonies - In 1989, Tufted Puffins were observed at Point Reyes (just north of the North Farallon Islands) but none were observed at two sites that were active in 1979-1980 and at least 3 other historical sites south of the South Farallon Islands (Table 27; see Willett 1909).

Southern California

Prince Island - In 1991, we discovered that Tufted Puffins had recolonized an historical colony site at Prince Island. On 11 May at 0729-0850 hours, we first noted a single puffin at a potential nest site on the "North Cliffs". Four birds were observed at 3 sites on 8 June (0640-0737 hours) and 10 June (0717-1050 hours). On 13 July (0805-0840 hours) and 14 July (0640-1042 hours), 2 birds were observed at 1 site, bill rubbing, allopreening, and entering a crevice with nesting material. On 23 October 1991, C. Striplen repelled down the North Cliffs to one of the crevice sites that puffins had attended earlier in the breeding season. He discovered (but could not reach) some large whitish eggshell fragments located in a large deep crevice. These fragments could have been either Tufted Puffin or Rhinoceros Auklet fragments since Rhinoceros Auklets also nested in the North Cliffs in 1991. By applying the rough (2.4) K correction factor to the 8 June count, we derived an estimate of 10 breeding birds.

Hunt et al. (1979) provided a detailed summary of historical nesting of Tufted Puffins at 4 sites in southern California (Table 47). Moderate numbers bred at Prince Island from 1886-1912 but since then researchers have failed to find any there. However, puffins may have nested as late as the 1950s at Prince Island, based on unsubstantiated reports (Small 1960). No puffins were noted in 1965, 1968, and 1975-1977 during several seabird surveys in the area.

Summary

In 1989-1991, a total of 276 breeding Tufted Puffins were estimated in California with only 53.1% at the two largest colonies (Castle Rock and the South Farallon Islands) (Table 47). This estimate was similar to the 250 breeding birds estimated in 1979-1980 when 79.4% were estimated at the two largest colonies (Sowls et al. 1980). Thus, smaller colonies (<30 breeding birds) now constitute a significant proportion (46.9%) of the breeding Tufted Puffins in the state. Numbers of puffins appear to be stable or increasing slightly but trends are difficult to substantiate due to variability in colony attendance. In any case, numbers in 1989-1991 were well below historical numbers at some colonies and many colonies were no longer active. However, other historical colonies in southern California may soon be recolonized if the Prince Island colony continues to persist and produce colonists.

To improve upon 1989-1991 population estimates, future surveys will require a more standardized system for determining numbers of Tufted Puffins at specific colonies. To account for variation in colony attendance between days and years, many counts must be conducted at certain times (especially early in the morning and early in the year). Further research is also required to examine the relationship between numbers seen at a colony (or a portion of a colony) at a specific time and the actual numbers of breeding birds. This relationship should be examined at several sites along the coast and over several years to examine variability in numbers present and breeding in relation to prey resources and timing of breeding. This research would lead to the development of a better K correction factor for adjusting observed Tufted Puffin numbers to obtain population estimates.

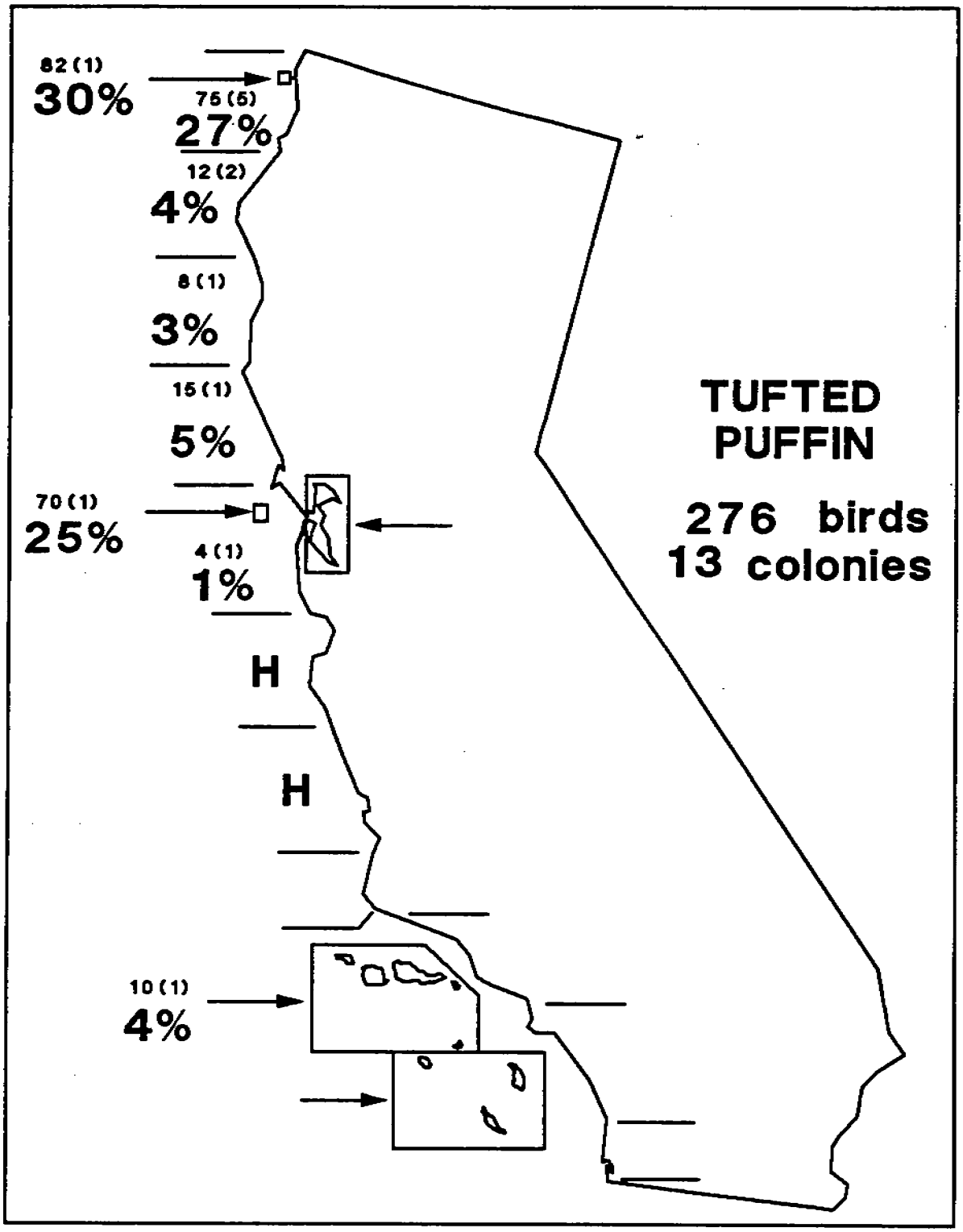


Figure 52. Percentage of breeding population of Tufted Puffin in coastal regions of California, 1989-1991. Symbols as in Figure 19.

Table 47. Numbers of breeding Tufted Puffins at each colony in California in 1975-1980 (Sowls et al. 1980) and 1989-1991 (This Study).

Colony Name	Colony Number CA	Colony Number USFWS	Number of Breeding Birds[1] (Percent) 1975-1980		1989-1991	
Northern California						
Prince Island	DN-414-03	325-003	8	(3.2)	27	(9.8)
Castle Rock	DN-414-06	325-006	100	(39.7)	82	(29.7)
False Klamath Rock	DN-412-07	325-010	-[1][1]	(0.0)	4	(1.4)
Redding Rock	HU-412-01	325-013	0	(0.0)	8	(2.9)
White Rock	HU-410-08	325-019	N	(0.0)	N[1]	(0.0)
Green Rock	HU-410-09	325-020	10	(4.0)	29	(10.5)
Puffin Rock	HU-410-10	325-021	6	(2.4)	7	(2.5)
Flatiron Rock	HU-410-13	325-023	2	(0.8)	0	(0.0)
Blank Rock	HU-410-14	325-024	N	(0.0)	N	(0.0)
Little River Rock	HU-410-19	325-035	N	(0.0)	N	(0.0)
False Cape Rocks	HU-402-01	325-040	0	(0.0)	8	(2.9)
Sugarloaf Island	HU-402-02	325-041	4	(1.6)	4	(1.4)
Goat Island Area	ME-390-01	379-006	4	(1.6)	8	(2.9)
Van Damme Cove	ME-390-05	379-027	2	(0.8)	0	(0.0)
Fish Rocks	ME-384-10	404-003	4	(1.6)	15	(5.4)
Arched Rock	SO-382-11	404-006	2	(0.8)	0	(0.0)
Bird Rock	MA-380-04	404-010	N[2]	(0.0)	N	(0.0)
Central California						
Point Reyes	MA-374-01	429-001	6	(2.4)	4	(1.4)
South Farallon Islands	SF-FAI-02	429-052	100[3]	(39.7)	70	(25.4)
San Pedro Rock	SM-372-02	429-013	N[2]	(0.0)	N	(0.0)
Pescadero Rocks	MO-362-05	454-022	PN[2]	(0.0)	PN	(0.0)
Guillemot Island	MO-362-06	454-023	PN[2]	(0.0)	PN	(0.0)
Hurricane Point Rocks	MO-362-20	454-011	2	(0.8)	0	(0.0)
Piedras Blancas Island	SL-352-01	477-007	2[4]	(0.0)	0	(0.0)
Pecho Rock	SL-350-09	477-032	N[2]	(0.0)	N	(0.0)
Southern California						
Prince Island	SB-SMI-07	501-004	N	(0.0)	10	(3.6)
West Point Area	SB-SZI-02	502-016	N	(0.0)	N	(0.0)
Anacapa Island-East	VE-AMI-03	502-009	N[2]	(0.0)	N	(0.0)
Shag Rock	SB-SBI-01	524-007	N[2]	(0.0)	N	(0.0)
Santa Barbara Island	SB-SBI-02	524-008	N	(0.0)	N	(0.0)
Total			250		276	

[1] Numbers in square brackets refer to numbers of birds observed at a colony but which were not considered to be breeding by Sowls et al. (1980); numbers in round parentheses were derived directly from the most recent historical estimate.
[2] Not included in Sowls et al. (1980). See text and population estimate tables.
[3] Sowls et al. (1980) reported a 1979 PRBO estimate of 100 breeding birds whereas Ainley and Boekelheide (1990) reported a 1979 PRBO estimate of 90 breeding birds.
[4] Recorded during the study period but not included in total.

HOW TO USE MAPS AND TABLES

A few minutes taken to carefully read this section will facilitate the use of these maps and tables in this report.

Colony Numbering Systems

Varoujean (1979) and Sowls et al. (1980) identified the location of each breeding colony known in California on 1 of 11 U. S. Geological Survey (USGS) maps which cover the entire California coast. An index to these maps has been presented in Figure 53. Colonies were numbered under a **U.S. Fish and Wildlife Service (USFWS) colony numbering system** covering the entire United States. The first three digits of the six-digit USFWS catalog number for each colony was the map number, whereas the last three digits were colony identifiers (each specific for a nesting colony area within that map). However, because seabird colonies were discovered over a period of time, USFWS colony numbers within each of the maps were not sequential along the coast. Many new colonies were identified by Sowls et al. (1980) and 1989-1991 (This study), after colony numbers were assigned initially by Varoujean (1979). As did Sowls et al. (1980), we retained these original USFWS colony numbers and added new colony numbers as necessary. In this way, survey data for specific colonies over time always was attributed to the same colony site.

While it was critical to have this standardized USFWS colony numbering system and for it not to change over time, it has become more difficult and confusing to access data from the Catalog as new colonies were discovered. Colony numbers increasingly have become out of numerical and north-to-south order along the coast. These data have been recently computerized, alleviating this problem to some extent for those who have access to this, previous, and future data sets. However, many users of this report will not have this flexibility. Thus, we developed the **California (CA) colony numbering system** that: 1) ordered all known and historical colonies in 1989-1991 from north to south; 2) allowed for additions of new colonies in the future without jumbling the numerical or north-to-south order of colony numbers over a large section of coast; and 3) separated colonies into political units (i.e. county) as well as more natural geographic units (e.g. Channel Islands). We recognized that the CA system must be not only more useful than the USFWS system but also must be compatible with the USFWS system. Thus, we built the CA system as a subdivision of the USFWS system. We also recognized that the CA system will only apply to California and will not be adopted at the national level. For this reason, we cross referenced USFWS and CA colony numbers in the tables and appendices such that the user can choose to use either system.

In Figure 54, we presented the 29 CA system map blocks (plus separated blocks for the Farallon Islands (FAI); San Francisco Bay

(SFB); Channel Islands National Park Area; and the Southern Channel Islands. When juxtaposed with the 11 larger map blocks of the USFWS system (Figure 53), one will notice the relationship to the CA blocks and latitude. The 29 blocks were 20′ latitude subdivisions of the coast. Each block's number referred to it's latitude and thus has inherent value in describing a colony's location (e.g. 384 = 38°40′ to 39°00′N). However, since several counties may occur within this latitude block, we have prefaced it with a two-letter coastal county code (Table 48).

Thus, all colonies were first assigned a county code. This designation was especially important for the four separated blocks where the latitude block number was omitted. In the Channel Islands, we replaced the latitude identifier with abbreviations for each island: San Miguel Island (SMI), Santa Rosa Island (SRI), Santa Cruz Island (SZI), Anacapa Island (ANI), Santa Barbara Island (SBI), San Nicolas Island (SNI), Santa Catalina Island (CAI) and San Clemente Island (CLI). For the Channel Islands, colonies were presented in the above island order and colonies were numbered in a clockwise direction starting at the northwest corner of each island. In San Francisco Bay, we prefaced colony numbers with SFB to prevent confusion with colonies in some of the same counties (Sonoma, Marin, San Francisco, and San Mateo) on the outer coast. Similar to the Channel Islands, colonies in San Francisco Bay were not presented in north to south order. Instead, colonies were ordered in a clockwise direction starting at the north end of the Golden Gate Bridge. The two-digit suffix was the colony identifier (each specific for a colony area within the county <u>and</u> 20′ latitude block or other block). Since these blocks were much smaller than the USFWS system maps, we felt that it was necessary to assign only two digits since fewer than one hundred colonies could occur within a county or island in a CA system map block.

To demonstrate differences between the USFWS and CA colony numbering systems, we considered the following example:

USFWS system	325-006 Castle Rock
CA system	DN-414-06 Castle Rock

If unfamiliar with the USFWS system, one would know nothing about where Castle Rock was located and would be confused between Castle Rocks in Del Norte, Monterey, Santa Barbara and Los Angeles counties. Even once familiar with the USFWS system, we still would only know that this colony occurred somewhere between 40° and 42° N latitude. Using the CA system, we know that this colony was located in Del Norte (DN) county, between 41° 40′ and 42° 00′ N latitude, was the sixth colony from the north end of the county coast and undoubtedly was Castle Rock National Wildlife Refuge.

Tables: Estimates of numbers of breeding birds by species and colony

For each colony, we have presented non-rounded estimates of the number of breeding birds (not breeding pairs) for each species under the "TOTAL BIRDS" column. In a few cases, "X" or "P" indicated that birds were breeding or probably/possibly breeding but an estimate of the number of breeding birds was not available. Actual raw numbers obtained during censuses were presented under the "NEST", "BIRD", and "SITE" columns (see methods for how raw numbers were treated to obtain breeding bird estimates). Raw numbers will be more valuable for some users' purposes. The letters "ND" indicated that no data were collected or a complete count was not available. **Numbers of nests included:** nests that were empty, attended by an adult in incubating posture, attended by adult(s) standing in or beside a nest, or eggs/chicks were present. Sometimes, the numbers of nests could not be or were only partially determined, usually due to poor observing conditions, large chicks creching or leaving nests or nests were not visible (e.g. Common Murres). **Numbers of birds included:** birds in nesting areas only (i.e. Double-crested and Brandt's Cormorants, Western Gull, and Common Murre); all birds combined from nesting areas, on the ocean near land, and flying over water/land (i.e. Black Oystercatcher, Pigeon Guillemot, Rhinoceros Auklet, and Tufted Puffin); birds in the nesting area plus roosting birds at active subcolony sites only (i.e. Pelagic Cormorant); or birds mist-netted, heard, or otherwise found at colonies (i.e. storm-petrels). Sometimes, numbers of birds could not be or were only partially determined, usually due to poor observing conditions, large chicks mixing with adults, flushing of adults, etc. **Numbers of sites included:** possible nest sites where birds were recorded in a probable/possible nest location but nests were not observed (i.e. Black Oystercatcher, Western Gull); potential nest sites attended by birds but nests were not present or when these were not distinguished from active nests (i.e. Pelagic Cormorant); burrow/crevice entrances counted on nesting islands (i.e. Pigeon Guillemot, Xantus' Murrelet, Cassin's Auklet, Rhinoceros Auklet, and Tufted Puffin); or (usually) burrow/crevice entrances attended by birds that were counted from boats (i.e. Pigeon Guillemot, Tufted Puffin). All CENSUS DATES were in 1989-1991, except where historical or other data were substituted due to incomplete coverage. CENSUS METHODS were coded as in Table 49.

When colonies and/or subcolonies were censused more than once, we selected the census with the highest number of nests, birds, and/or sites for estimating numbers of breeding birds. When more than one census date and/or method was indicated for a species in tables, numbers of nests, birds, and sites have been summed from different subcolonies or different parts of the same subcolony.

To assist comparisons between 1975-1980 and 1989-1991 surveys, we asterisked newly-discovered colony numbers, newly-discovered

nesting species at previously-known colonies and newly-rediscovered historical information. In addition, when a species was not found nesting at a colony in 1989-1991 where it had nested previously, we appended information on the most recent nesting of historically-nesting species.

We have not included data on rocks, islands, or mainland points where either only roosting or no birds were observed in 1989-1991 or 1979-1980 surveys. In 1989-1991, we combed almost the entire coast so that any rock that has not been listed as a colony can be considered to have been checked at least once during the main part of the breeding season. Negative data for some locations were stored in the Colony Status Records (see Appendix 1).

Maps: Summary, colony, and subcolony

Summary maps - Tables and summary maps were divided into sections that covered approximately one degree of latitude blocks, in order from north to south. These sections approximated the USFWS map block sections presented by Sowls et al. (1980). At the start of each section, a summary map indicated the locations of all colonies within that USFWS map block. Colonies were indicated using circled numbers and were numbered using the CA system. Colony numbers can be derived from these maps using the county, 20'-latitude block, and the circled colony numbers, in that order.

Colony maps - Detailed colony maps were presented in Volume II of this report. In the population estimate tables, we indicated on which map the particular colony was indicated. We chose to redraw the colony maps presented in Sowls et al. (1980) such that: 1) previously-known and newly-discovered colonies were indicated on larger sections of improved reproductions of USGS topographic maps (providing more information about surrounding coastal topography, landmarks, and adjacent colonies); 2) colony boundaries were indicated more specifically than in Sowls et al. (1980); 3) some previously-known colonies were not mapped earlier and/or were redefined for consistency with how most colonies were designated by Sowls et al. (1980); and 4) some colonies' boundaries were extended slightly to include peripheral extensions of nesting areas. Each colony number was presented within a rectangular box on each map.

For colonies located in salt ponds in San Francisco and South San Diego bays, we indicated either the exact portion of dikes used as nesting areas or we merely indicated with a pointing arm the particular nesting pond (within which birds nested on "islands" of partly-submerged old dikes or dredge spoils). In the latter case, several subcolonies may be involved and varied in location between years within the pond.

Subcolony maps - We instigated a major change from the style of

colony maps provided by Sowls et al. (1980). Since many colonies consisted of stretches of coast or groups of island, we indicated specific, identifiable nesting units (or "subcolonies") within colony boundaries on the colony maps. Subcolonies often referred to different islands, rocks and sections of mainland cliffs. This more refined depiction of colonies acted as an index to divisions in the raw data, available in the archived Colony Status Records or the more accessible computer files (see Appendices 1, 2). Some users will wish to use this finer breakdown of data to examine "subcolony" size and species use of different types of nesting habitats under varying ownership. Such separations were required especially within many colonies that have been defined somewhat arbitrarily or with a different definition than elsewhere. On all colony maps, we identified subcolonies with circled two-digit numbers and attempted to order subcolonies from north to south or along the coast. All other areas within colonies were surveyed but no breeding birds were found. A chief advantage of identifying subcolonies will be to facilitate future censuses by assisting relocation of difficult-to-find nesting areas and indicating where seabirds were not found nesting during 1989-1991 surveys. Thus, we can document loss, newly-founded and/or local shifts of nesting areas both within and between designated colonies.

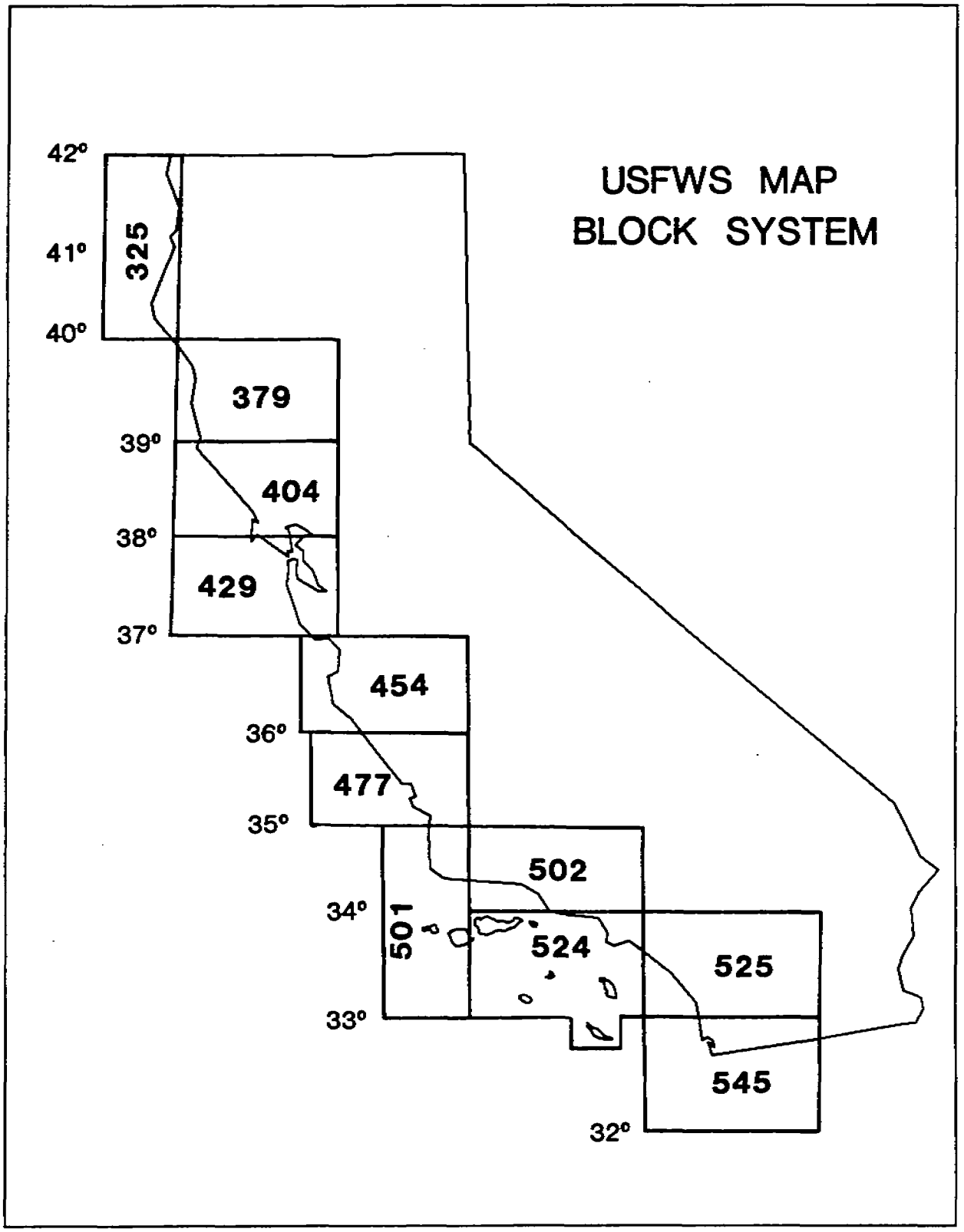


Figure 53. Index to map block areas for the USFWS colony numbering system (after Sowls et al. 1980).

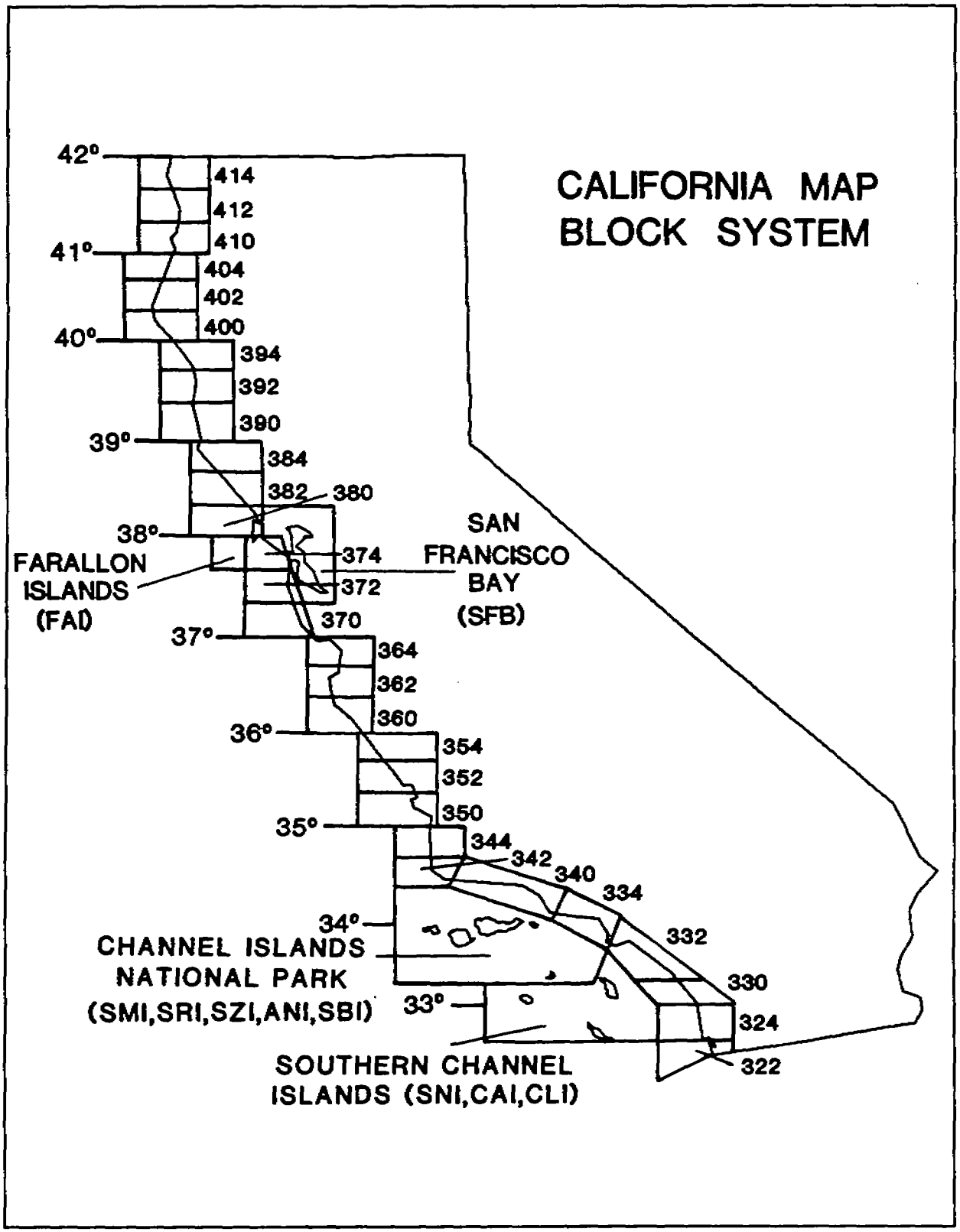


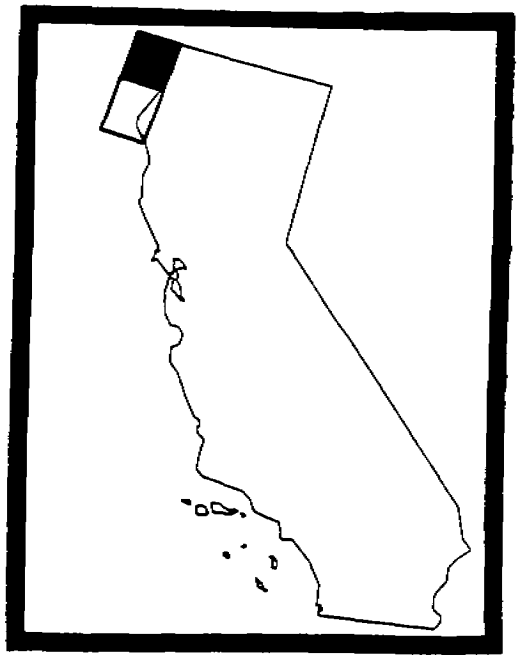
Figure 54. Index to map block areas for the California (CA) colony numbering system.

Table 48. County abbreviations used in the California Colony Number.

Code	County	Code	County
DN	Del Norte	CC	Contra Costa
HU	Humboldt	AL	Alameda
ME	Mendocino	SR	Santa Clara
SO	Sonoma	SC	Santa Cruz
MA	Marin	MO	Monterey
SF	San Francisco	SL	San Luis Obispo
SM	San Mateo	SB	Santa Barbara
SO	Sonoma	VE	Ventura
NA	Napa	LA	Los Angeles
SN	Solano	OR	Orange
SA	Sacramento	SD	San Diego

Table 49. Summary methods used to census seabird colonies in California, 1989-1991.

Code	Census Description
01	Boat census
02	Mainland census
03	Landed on island (included boat census)
04	Complete aerial photograph count
05	Burrow/crevice count
06	Boat, mainland, and/or landed on island
07	Mist netting
08	Plot increases over 1988
09	Partial boat census
10	Heard at night only
11	Partial mainland rooftop count
12	Complete mainland rooftop count
13	Mist-netting, landed on island and/or burrow/crevice count
14	Captured by hand on the ground
15	Partial aerial photograph count

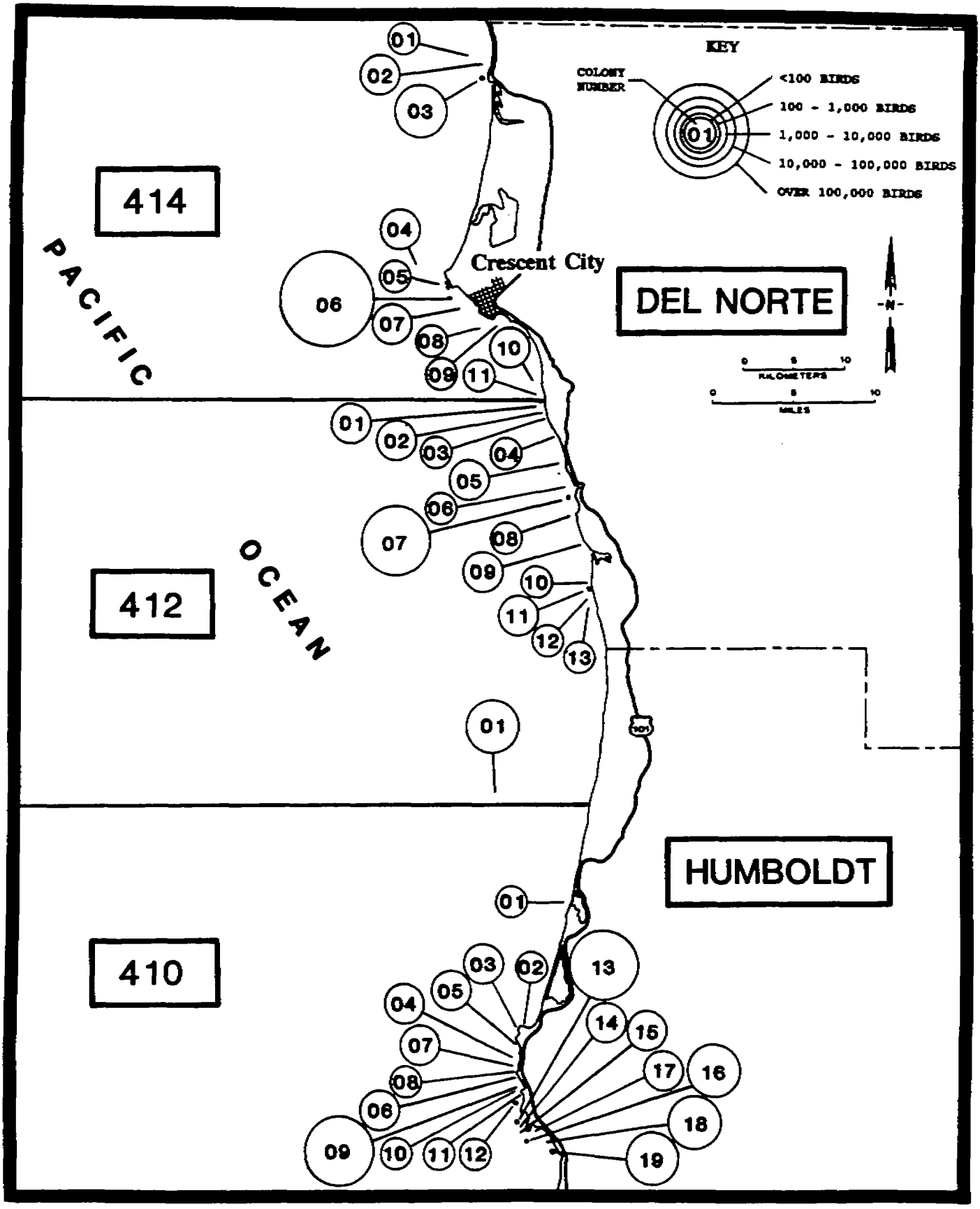


USFWS MAP BLOCK
325
(North) Eureka

The map on the facing page is an index to the locations of colonies within the northern half of USFWS Map Block 325, Eureka. All colonies on this map are numbered consecutively from north to south within counties in 20' latitude California Map Blocks (i.e. 414 = 41°40' to 42°00'N; 412 = 41°20' to 41°40'N; 410 = 41°00 to 41°20'N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Fork-tailed Storm-petrel	410	0.2%
Leach's Storm-petrel	10,655	4.0%
Double-crested Cormorant	2,162	0.8%
Brandt's Cormorant	6,206	2.4%
Pelagic Cormorant	2,227	0.8%
Black Oystercatcher	132	0.1%
Western Gull	2,913	1.1%
Common Murre	229,265	87.1%
Pigeon Guillemot	1,507	0.6%
Marbled Murrelet	771	0.3%
Cassin's Auklet	5,722	2.2%
Rhinoceros Auklet	1,076	0.4%
Tufted Puffin	157	0.1%
Unidentified storm-petrel	8	<0.1%
Unidentified alcid	27	<0.1%
Total	263,238	


KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
414
PACIFIC
OCEAN
412
410
Crescent City
DEL NORTE
HUMBOLDT
KILOMETERS
MILES
N

NORTHERN CALIFORNIA
USFWS MAP BLOCK 325: (NORTH) EUREKA
(Includes California Map Blocks 414, 412 and 410)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **DN-414-01** Colony Name: **Cone Rock**
USFWS Colony Number: **325-001**
Latitude: 41°58'21"N Map Number: 1
Longitude: 124°13'02"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	0	11	2	31	04/28/89,01
Blk. Oystercatcher*	0	3	1	3	05/20/89,01
Western Gull	3	10	0	6	05/20/89,01
Pigeon Guillemot	0	9	1	12	05/20/89,01
TOTAL				52	

CA Colony Number: **DN-414-02** Colony Name: **Hunter Rocks**
USFWS Colony Number: **325-002**
Latitude: 41°57'22"N Map Number: 1
Longitude: 124°12'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	211	277	0	464	05/30/89,04
Pelagic Cormorant	28	37	2	56	06/28/89,02
Blk. Oystercatcher	0	4	0	4	04/26/89,02
Western Gull	14	59	0	28	05/20/89,01
Pigeon Guillemot	0	106	36	138	05/20/89,01
TOTAL				690	

CA Colony Number: **DN-414-03** Colony Name: **Prince Island**
USFWS Colony Number: **325-003**
Latitude: 41°57'04"N Map Number: 1
Longitude: 124°12'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel	0	153	0	P	1989,07
Dbl.-cr. Cormorant	459	522	0	1102	05/30/89,04
Brandt's Cormorant	141	177	0	310	05/30/89,04
Pelagic Cormorant	36	51	0	346	05/20/89,03
Blk. Oystercatcher	0	8	0	8	05/20/89,03
Western Gull	308	374	0	616	05/20/89,03
Pigeon Guillemot	16	170	0	221	05/20/89,03
Rhinoceros Auklet	0	1	0	1	07/11/89,03
Tufted Puffin	1	7	4	27	07/29/89,03
TOTAL				2631	

CA Colony Number: **DN-414-04** Colony Name: **Point Saint George Lighthouse**
USFWS Colony Number: **325-044**
Latitude: 41°50'00"N Map Number: 2
Longitude: 124°22'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	14	178	0	134	05/21/89,01
Blk. Oystercatcher*	0	5	1	5	05/21/89,01;05/21/89,03
Western Gull*	3	20	0	6	05/21/89,01;05/21/89,03
Pigeon Guillemot*	0	5	0	6	05/21/89,03
TOTAL				151	

CA Colony Number: **DN-414-05** Colony Name: **Point Saint George**
USFWS Colony Number: **325-057**
Latitude: 41°47'00"N Map Number: 3
Longitude: 124°15'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	10	72	0	20	07/11/89,01
Blk. Oystercatcher	0	4	2	4	04/29/89,01
Western Gull	4	ND	0	8	05/21/89,01
Pigeon Guillemot	0	49	0	64	05/21/89,01
TOTAL				96	

CA Colony Number: **DN-414-06** Colony Name: **Castle Rock**
USFWS Colony Number: **325-006**
Latitude: 41°45'37"N Map Number: 3
Longitude: 124°15'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
F.-t. Storm-petrel	0	6	67	100	09/12/89,05;09/12/89,07; 1970(Osborne 1972)
Lch. Storm-petrel	0	0	1097	1646	09/12/89,05
Brandt's Cormorant	1132	1467	0	2490	05/30/89,04
Pelagic Cormorant	178	224	0	392	05/21/89,01
Blk. Oystercatcher	0	4	2	4	04/29/89,01
Western Gull	685	1447	0	1370	05/21/89,01
Common Murre	ND	64475	0	108318	05/30/89,04
Pigeon Guillemot	0	277	1	360	05/17/89,01;05/21/89,01
Cassin's Auklet	ND	ND	3759	5638	09/12/89,05
Rhinoceros Auklet	ND	ND	1033	1034	09/12/89,05
Tufted Puffin	0	34	23	82	05/20/89,01
TOTAL				121434	

CA Colony Number: **DN-414-07** Colony Name: **"Tolowa Rocks"**
USFWS Colony Number: **325-007**
Latitude: 41°45'15"N Map Number: 3
Longitude: 124°14'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
F.-t. Storm-petrel	ND	ND	ND	60	1980(Sowls et al. 1980)
Lch. Storm-petrel	ND	ND	ND	P	1980(Sowls et al. 1980)
Dbl.-cr. Cormorant*	5	11	0	12	05/20/89,01
Pelagic Cormorant	26	90	3	70	05/20/89,03;07/11/89,01
Blk. Oystercatcher	1	12	2	12	04/28/89,01;05/20/89,01; 05/20/89,03;05/21/89,01
Western Gull	17	67	0	34	05/17/89,01;05/20/89,01; 05/20/89,03
Pigeon Guillemot	0	34	0	39	04/28/89,01;05/20/89,01; 05/20/89,03
Rhinoceros Auklet*	0	1	0	1	05/20/89,01
TOTAL				228	

CA Colony Number: **DN-414-08** Colony Name: **White Rock**
USFWS Colony Number: **325-008**
Latitude: 41°44'46"N Map Number: 4
Longitude: 124°13'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	3	0	3	05/21/89,03
Western Gull	33	62	0	66	05/21/89,03
Pigeon Guillemot	0	1	0	1	04/28/89,01
TOTAL				70	

CA Colony Number: **DN-414-09** Colony Name: **"Whaler Island", Crescent City breakwater, Steamboat Rock and unnamed rocks**
USFWS Colony Number: **325-045**
Latitude: 41°45'00"N Map Number: 4
Longitude: 124°12'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	7	0	10	04/28/89,01
Blk. Oystercatcher	2	17	0	17	04/28/89,01;05/21/89,03
Western Gull	4	9	0	10	05/21/89,03
Pigeon Guillemot	0	29	0	33	04/28/89,01;05/20/89,01; 05/21/89,01;05/21/89,03
TOTAL				70	
Historically-nesting species (most recent known date)					
F.-t. Storm-petrel	ND	ND	ND	X	1939(Sowls et al. 1980)
Lch. Storm-petrel	ND	ND	ND	X	1939(Sowls et al. 1980)
Brandt's Cormorant	ND	ND	ND	40	1980(Sowls et al. 1980)
Cassin's Auklet	ND	ND	ND	P	1925(Sowls et al. 1980)

CA Colony Number: **DN-414-10** Colony Name: **Unnamed Small Rocks**
USFWS Colony Number: **325-046**
Latitude: 41°42'00"N Map Number: 5
Longitude: 124°08'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	1	1	0	2	04/26/89,01
Pelagic Cormorant	10	45	12	96	05/22/89,01
Blk. Oystercatcher	0	5	3	5	04/26/89,01;05/22/89,01
Western Gull	15	22	0	30	05/22/89,01
Pigeon Guillemot	0	47	0	59	04/26/89,01;05/22/89,01
TOTAL				192	

CA Colony Number: **DN-414-11** Colony Name: **"Easy Triangle Rocks"**
USFWS Colony Number: **325-047**
Latitude: 41°40'22"N Map Number: 5
Longitude: 124°08'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	31	0	38	05/22/89,01
Blk. Oystercatcher	0	4	0	4	05/22/89,01
Western Gull	4	7	0	8	05/22/89,01
Pigeon Guillemot	0	14	0	16	04/26/89,01;05/22/89,01
TOTAL				66	

CA Colony Number: **DN-412-01** Colony Name: **"Rock R" [Humpback Rock]**
USFWS Colony Number: **325-048**
Latitude: 41°40'00"N Map Number: 5
Longitude: 124°08'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	98	135	0	216	05/30/89,04
Blk. Oystercatcher	0	1	0	1	05/22/89,01
Common Murre*	ND	194	0	326	05/30/89,04
Pigeon Guillemot	0	2	0	3	05/22/89,01
TOTAL				546	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	10	1980(Sowls et al. 1980)
Western Gull	ND	ND	ND	4	1980(Sowls et al. 1980)

CA Colony Number: **DN-412-02** Colony Name: **Sister Rocks**
USFWS Colony Number: **325-009**
Latitude: 41°39'29"N Map Number: 5
Longitude: 124°08'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	51	96	0	112	05/30/89,04
Blk. Oystercatcher	0	1	0	1	05/22/89,01
Western Gull	11	35	0	22	05/22/89,01
Common Murre	ND	216	0	363	05/30/89,04
Pigeon Guillemot	0	48	0	48	04/26/89,01
TOTAL				546	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	22	1980(Sowls et al. 1980)

CA Colony Number: **DN-412-03** Colony Name: **Midway Point to Damnation Creek**
USFWS Colony Number: **325-059***
Latitude: 41°39'19"N Map Number: 5
Longitude: 124°07'57"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	12	0	10	05/22/89,01
Blk. Oystercatcher	0	1	0	1	05/22/89,01
Western Gull	2	36	0	4	05/22/89,01
TOTAL				15	

CA Colony Number: **DN-412-04** Colony Name: **"Last Chance Rock"**
USFWS Colony Number: **325-049**
Latitude: 41°38'05"N Map Number: 6
Longitude: 124°07'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	0	12	4	34	05/22/89,01
Western Gull	1	1	0	2	05/22/89,01
TOTAL				36	
Historically-nesting species (most recent known date)					
Dbl.-cr. Cormorant	ND	ND	ND	4	1980(Sowls et al. 1980)

CA Colony Number: **DN-412-05** Colony Name: **Footsteps Rock**
USFWS Colony Number: **325-050**
Latitude: 41°37'00"N Map Number: 6
Longitude: 124°07'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	16	57	14	154	05/22/89,01
Blk. Oystercatcher	0	3	0	3	04/26/89,01
Western Gull	1	5	0	2	05/22/89,01
Pigeon Guillemot	0	47	0	61	05/22/89,01
TOTAL				220	

CA Colony Number: **DN-412-06** Colony Name: **Wilson Rock**
USFWS Colony Number: **325-058**
Latitude: 41°35'45"N Map Number: 7
Longitude: 124°06'37"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	5	0	5	05/22/89,03
Western Gull	5	8	0	10	05/22/89,03
TOTAL				15	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **DN-412-07** Colony Name: **False Klamath Rock**
USFWS Colony Number: **325-010**
Latitude: 41°35'40"N Map Number: 7
Longitude: 124°06'36"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	13	14	0	31	05/12/89,02
Brandt's Cormorant	324	404	0	713	05/30/89,04
Pelagic Cormorant	12	57	27	115	05/22/89,01
Blk. Oystercatcher*	0	2	0	2	05/12/89,02
Western Gull	46	79	0	92	05/22/89,02
Common Murre	ND	26130	0	43898	05/30/89,04
Pigeon Guillemot	0	55	0	72	05/22/89,01
Tufted Puffin*	0	1	1	4	05/22/89,02
TOTAL				44927	

CA Colony Number: **DN-412-08** Colony Name: **False Klamath Cove to Pine Point**
USFWS Colony Number: **325-060***
Latitude: 41°35'00"N Map Number: 7
Longitude: 124°05'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	33	0	2	05/22/89,01
Pigeon Guillemot	0	12	0	16	05/22/89,01
TOTAL				18	

CA Colony Number: **DN-412-09** Colony Name: **"Radar Station Rocks"**
USFWS Colony Number: **325-051**
Latitude: 41°33'30"N Map Number: 7
Longitude: 124°06'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	60	77	0	144	05/22/89,01
Pelagic Cormorant	3	35	16	29	05/22/89,01
Blk. Oystercatcher	1	2	0	2	05/22/89,01
Western Gull	1	1	0	2	05/22/89,01
Pigeon Guillemot	0	10	1	13	05/22/89,01
TOTAL				190	

CA Colony Number: **DN-412-10** Colony Name: **Flint Rock Head**
USFWS Colony Number: **325-011**
Latitude: 41°31'31"N Map Number: 8
Longitude: 124°05'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	11	11	0	26	06/25/89,01
Pelagic Cormorant	17	21	0	34	06/25/89,01
Pigeon Guillemot	0	5	0	5	04/25/89,01
TOTAL				65	

CA Colony Number: **DN-412-11** Colony Name: **White Rock**
USFWS Colony Number: **325-012**
Latitude: 41°30′56"N Map Number: 8
Longitude: 124°05′06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	31	68	0	74	05/12/89,02
Brandt's Cormorant	186	250	0	409	05/30/89,04
Pelagic Cormorant	5	14	0	10	08/03/89,02
Western Gull	1	11	0	2	06/28/89,02
Pigeon Guillemot	0	18	0	18	04/25/89,01
Rhinoceros Auklet*	0	1	0	1	06/25/89,01
TOTAL				514	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **DN-412-12** Colony Name: **High Bluff South**
USFWS Colony Number: **325-061***
Latitude: 41°30′29"N Map Number: 8
Longitude: 124°04′40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	22	0	26	06/25/89,01
Pigeon Guillemot	0	22	5	29	06/25/89,01
TOTAL				55	

CA Colony Number: **DN-412-13** Colony Name: **Split Rock**
USFWS Colony Number: **325-062***
Latitude: 41°28′35"N Map Number: 9
Longitude: 124°03′58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	23	70	0	51	06/25/89,01
Blk. Oystercatcher	0	2	1	2	06/25/89,01
Western Gull	0	2	1	2	06/25/89,01
Pigeon Guillemot	0	10	0	13	06/25/89,01
TOTAL				68	

CA Colony Number: **HU-412-01** Colony Name: **Redding Rock**
USFWS Colony Number: **325-013**
Latitude: 41°20′29"N Map Number: 10
Longitude: 124°10′26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	112	172	0	246	05/30/89,04
Pelagic Cormorant	3	5	0	6	06/25/89,01
Western Gull	ND	11	0	15	06/25/89,01
Common Murre	ND	1632	0	2742	05/30/89,04
Pigeon Guillemot	0	2	0	3	06/25/89,01
Rhinoceros Auklet*	0	1	0	1	06/25/89,01
Tufted Puffin*	0	2	1	8	06/25/89,01
TOTAL				3021	

CA Colony Number: **HU-410-01** Colony Name: **Dry Lagoon Cliffs**
USFWS Colony Number: **325-063***
Latitude: 41°14′08"N Map Number: 11
Longitude: 124°06′23"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	5	5	0	10	06/25/89,01
Pigeon Guillemot	0	3	0	4	06/25/89,01
TOTAL				14	

CA Colony Number: **HU-410-02** Colony Name: **"Cormorant Rock"**
USFWS Colony Number: **325-015**
Latitude: 41°08′32"N Map Number: 12
Longitude: 124°09′39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	0	2	05/16/89,02
TOTAL				2	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	14	1980(Sowls et al. 1980)
Western Gull	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **HU-410-03** Colony Name: **Wedding Rock**
USFWS Colony Number: **325-016**
Latitude: 41°08′28"N Map Number: 12
Longitude: 124°09′32"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant*	0	9	7	25	05/16/89,02
Blk. Oystercatcher*	0	3	0	3	05/16/89,02;05/25/89,01
Western Gull*	1	2	0	2	05/16/89,02
Pigeon Guillemot	0	64	8	83	05/16/89,02
Rhinoceros Auklet*	0	20	0	20	05/16/89,02
TOTAL				133	

CA Colony Number: **HU-410-04** Colony Name: **Palmer's Point to Scotty Point**
USFWS Colony Number: **325-052**
Latitude: 41°07'00"N Map Number: 12
Longitude: 124°10'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	36	50	6	209	05/25/89,01;07/10/89,01
Blk. Oystercatcher	1	9	2	9	05/02/89,01;07/10/89,01
Western Gull	11	25	0	22	05/25/89,01
Pigeon Guillemot	0	23	0	27	05/02/89,01;05/25/89,01
TOTAL				267	

CA Colony Number: **HU-410-05** Colony Name: **"Sea Gull Rock"**
USFWS Colony Number: **325-017**
Latitude: 41°05'21"N Map Number: 12
Longitude: 124°09'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	54	63	0	130	05/30/89,04
Pelagic Cormorant	1	2	0	2	07/10/89,01
Blk. Oystercatcher	0	1	0	1	05/18/89,02
Western Gull	22	43	0	44	05/25/89,01
Pigeon Guillemot	0	1	0	1	05/25/89,01
TOTAL				178	

CA Colony Number: **HU-410-06** Colony Name: **Scotty Point to Megwil Point**
USFWS Colony Number: **325-053**
Latitude: 41°05'00"N Map Number: 13
Longitude: 124°10'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	88	137	1	206	05/25/89,01;07/10/89,01
Blk. Oystercatcher	0	5	0	5	05/25/89,01
Western Gull	11	20	0	22	05/25/89,01
Pigeon Guillemot	0	9	0	9	05/02/89,01;05/25/89,01
TOTAL				242	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **HU-410-07** Colony Name: **"Sea Lion Rock"**
USFWS Colony Number: **325-018**
Latitude: 41°05'40"N Map Number: 13
Longitude: 124°09'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	37	40	0	89	05/26/89,02
Pelagic Cormorant	1	9	2	24	04/25/89,01;05/25/89,01
Blk. Oystercatcher	0	2	1	2	05/02/89,01
Western Gull	10	29	0	20	05/25/89,01
Pigeon Guillemot	0	5	0	5	05/02/89,01
TOTAL				140	

CA Colony Number: **HU-410-08** Colony Name: **White Rock**
USFWS Colony Number: **325-019**
Latitude: 41°05'13"N Map Number: 13
Longitude: 124°09'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	11	12	1	22	06/25/89,01
Western Gull	6	14	0	12	05/25/89,01
Common Murre	ND	3157	0	5304	05/30/89,04
Pigeon Guillemot	0	8	5	10	05/26/89,02
TOTAL				5348	
Historically-nesting species (most recent known date)					
Dbl.-cr. Cormorant	ND	ND	ND	24	1970(Sowls et al. 1980)
Tufted Puffin	ND	ND	ND	X	1970(Sowls et al. 1980)

CA Colony Number: **HU-410-09** Colony Name: **Green Rock**
USFWS Colony Number: **325-020**
Latitude: 41°04'32"N Map Number: 13
Longitude: 124°09'48"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
F.-t. Storm-petrel	ND	ND	ND	50	1970(Osborne 1972)
Lch. Storm-petrel	ND	ND	ND	X	1970(Osborne 1972)
Brandt's Cormorant	28	53	0	62	05/30/89,04
Pelagic Cormorant	2	10	0	4	07/10/89,01
Blk. Oystercatcher	1	2	0	2	08/16/89,03
Western Gull	14	39	0	28	05/25/89,01
Common Murre	ND	19060	0	32021	05/30/89,04
Pigeon Guillemot	0	19	8	25	05/25/89,01
Cassin's Auklet	ND	ND	56	84	08/16/89,05
Rhinoceros Auklet	ND	ND	16	16	08/16/89,05
Tufted Puffin	0	12	7	29	05/25/89,01
TOTAL				32321	

CA Colony Number: **HU-410-10** Colony Name: **"Puffin Rock"**
USFWS Colony Number: **325-021**
Latitude: 41°04'18"N Map Number: 13
Longitude: 124°09'32"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	2	3	0	3	07/10/89,02
Western Gull	10	20	0	20	05/25/89,01
Pigeon Guillemot	1	6	0	8	05/25/89,01
Tufted Puffin	0	3	2	7	05/02/89,01
TOTAL				38	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	8	1980(Sowls et al. 1980)

CA Colony Number: **HU-410-11** Colony Name: **"Little Pewetole Rock"**
USFWS Colony Number: **325-022**
Latitude: 41°04'00"N Map Number: 13
Longitude: 124°09'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull*	1	1	0	2	05/25/89,01
TOTAL				2	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	4	1970(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **HU-410-12** Colony Name: **Pewetole Island**
USFWS Colony Number: **325-064***
Latitude: 41°03'49"N Map Number: 13
Longitude: 124°09'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	2	0	2	05/25/89,01
TOTAL				2	

CA Colony Number: **HU-410-13** Colony Name: **Flatiron Rock**
USFWS Colony Number: **325-023**
Latitude: 41°03'34"N Map Number: 13
Longitude: 124°09'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	469	610	0	1032	05/30/89,04
Blk. Oystercatcher	3	6	0	6	08/16/89,03
Western Gull	57	127	0	114	05/30/89,04
Common Murre	ND	19914	0	33456	05/30/89,04
Pigeon Guillemot	0	3	0	3	04/25/89,01
Unid. alcid	ND	ND	18	27	08/16/89,05
TOTAL				34638	
Historically-nesting species (most recent known date)					
Lch. Storm-petrel	ND	ND	ND	X	1934(Sowls et al. 1980)
Pelagic Cormorant	ND	ND	ND	4	1979(Sowls et al. 1980)
Cassin's Auklet	ND	ND	ND	X	1934(Sowls et al. 1980)
Tufted Puffin	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **HU-410-14** Colony Name: **Blank Rock**
USFWS Colony Number: **325-024**
Latitude: 41°03'15"N Map Number: 14
Longitude: 124°09'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	46	84	0	101	05/30/89,04
Blk. Oystercatcher	0	1	0	1	05/02/89,01
Western Gull	48	81	0	96	05/26/89,02
Common Murre	ND	331	0	556	05/30/89,04
Pigeon Guillemot	0	5	0	5	05/02/89,01
TOTAL				759	
Historically-nesting species (most recent known date)					
F.-t. Storm-petrel	ND	ND	ND	X	1916(Sowls et al. 1980)
Lch. Storm-petrel	ND	ND	ND	X	1916(Sowls et al. 1980)
Pelagic Cormorant	ND	ND	ND	6	1979(Sowls et al. 1980)
Tufted Puffin	ND	ND	ND	X	1916(Sowls et al. 1980)

CA Colony Number: **HU-410-15** Colony Name: **Trinidad Head**
USFWS Colony Number: **325-025**
Latitude: 41°03'09"N Map Number: 14
Longitude: 124°08'58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	34	68	0	68	07/10/89,01
Blk. Oystercatcher*	0	3	1	3	05/02/89,01
Western Gull*	2	4	0	4	05/02/89,01
Pigeon Guillemot	1	30	0	30	04/25/89,01
TOTAL				105	

CA Colony Number: **HU-410-16** Colony Name: **Pilot Rock**
USFWS Colony Number: **325-026**
Latitude: 41°03'06"N Map Number: 14
Longitude: 124°09'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant*	4	5	0	10	05/25/89,01
Blk. Oystercatcher	0	1	0	1	05/25/89,01
Western Gull	30	56	0	60	05/25/89,01
Common Murre	ND	1358	0	2281	05/30/89,04
Pigeon Guillemot	0	4	1	5	05/25/89,01
Rhinoceros Auklet*	0	1	0	1	08/16/89,03
TOTAL				2358	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	40	1979(Sowls et al. 1980)
Pelagic Cormorant	ND	ND	ND	8	1979(Sowls et al. 1980)

CA Colony Number: **HU-410-17** Colony Name: **Prisoner Rock**
USFWS Colony Number: **325-027**
Latitude: 41°03'07"N Map Number: 14
Longitude: 124°08'34"W

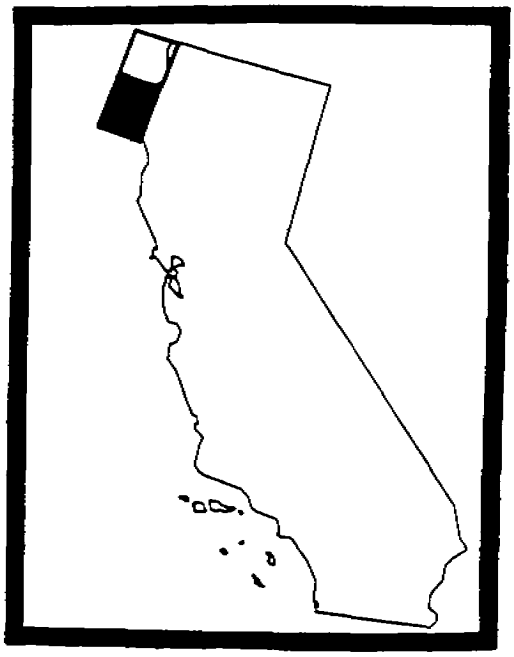
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel	0	179	71	106	05/06/89,05;1989,07
Western Gull	1	2	0	2	05/25/89,01
Pigeon Guillemot	0	3	1	3	05/02/89,01
TOTAL				111	
Historically-nesting species (most recent known date)					
F.-t. Storm-petrel	ND	ND	ND	X	1972(Sowls et al. 1980)
Pelagic Cormorant	ND	ND	ND	4	1972(Sowls et al. 1980)

CA Colony Number: **HU-410-18** Colony Name: **Trinidad Bay Rocks**
USFWS Colony Number: **325-054**
Latitude: 41°03'00"N Map Number: 14
Longitude: 124°08'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
F.-t. Storm-petrel	ND	ND	ND	X	1970(Osborne 1972)
Lch. Storm-petrel	3	362	2785	4178	05/12/89,05;08/16/89,05
Pelagic Cormorant	17	41	2	72	05/25/89,01
Blk. Oystercatcher	1	4	0	4	04/24/89,01;05/25/89,01; 07/10/89,01
Western Gull	24	35	0	48	05/25/89,01
Pigeon Guillemot	0	31	9	36	04/24/89,01;05/02/89,01; 05/25/89,01
Unid. petrel	ND	ND	5	8	05/06/89,05
TOTAL				4346	

CA Colony Number: **HU-410-19** Colony Name: **Little River Rock**
USFWS Colony Number: **325-035**
Latitude: 41°02'08"N Map Number: 14
Longitude: 124°07'16"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
F.-t. Storm-petrel	0	3	133	200	08/01/89,05;08/28/89,05; (Harris 1974)
Lch. Storm-petrel	ND	ND	2673	4010	08/01/89,05;08/28/89,05; (Harris 1974)
Dbl.-cr. Cormorant	226	230	0	542	05/30/89,04
Blk. Oystercatcher	0	2	1	2	08/01/89,03
Western Gull	27	57	0	54	05/25/89,01
Pigeon Guillemot	0	18	8	23	05/26/89,02
Rhinoceros Auklet	0	1	0	1	08/01/89,01
TOTAL				4832	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	12	1980(Sowls et al. 1980)
Tufted Puffin	ND	ND	ND	X	1972(Sowls et al. 1980)

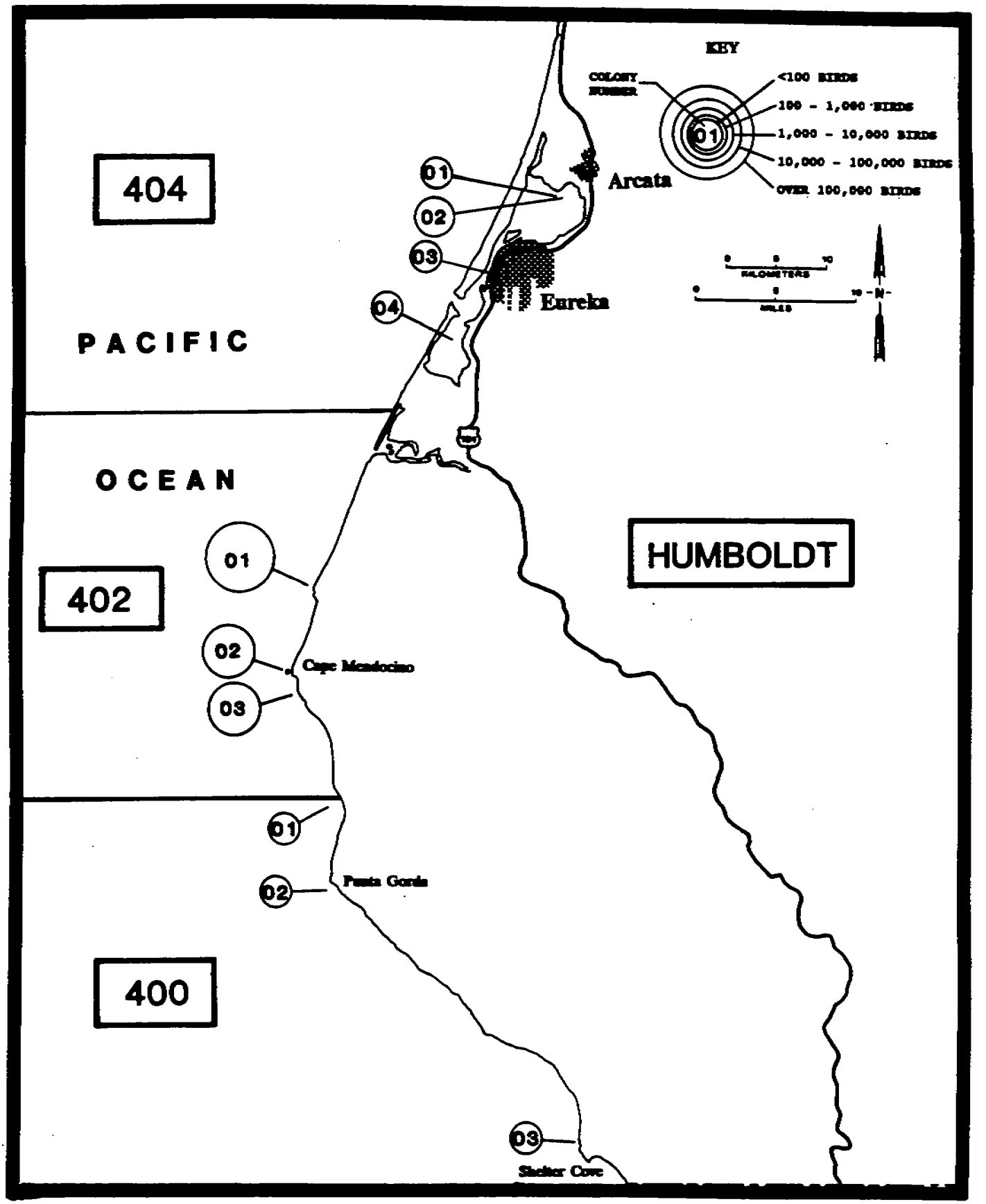


USFWS MAP BLOCK
325
(South) Eureka

The map on the facing page is an index to the locations of colonies within the southern half of USFWS Map Block 325, Eureka. All colonies on this map are numbered consecutively from north to south within counties in 20′ latitude California Map Blocks (i.e. 404 = 40°40′ to 41°00′N; 402 = 40°20′ to 40°40′N; 400 = 40°00 to 40°20′N). The Humboldt-Mendocino county line occurs at 40°N and forms the bottom border of the map. In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Double-crested Cormorant	654	2.7%
Brandt's Cormorant	1,606	6.6%
Pelagic Cormorant	965	4.0%
Black Oystercatcher	3	<0.1%
Western Gull	438	1.8%
Caspian Tern	H	0.0%
Common Murre	20,214	83.2%
Pigeon Guillemot	228	0.9%
Marbled Murrelet	162	0.7%
Rhinoceros Auklet	7	<0.1%
Tufted Puffin	12	<0.1%
Total	24,289	


KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
01
404
PACIFIC
OCEAN
Arcata
Eureka
02
03
04
HUMBOLDT
402
Cape Mendocino
400
Punta Gorda
Shelter Cove
KILOMETERS
MILES
N

NORTHERN CALIFORNIA
USFWS MAP BLOCK 325: (SOUTH) EUREKA
(Includes California Map Blocks 404, 402 and 400)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
* - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **HU-404-01** Colony Name: **Arcata Bay Sand Islands**
USFWS Colony Number: **325-038, 325-066** (Old Arcata Wharf [Part])
Latitude: 40°50'36"N Map Number: 15
Longitude: 124°07'13"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	07/02/90,03
TOTAL				0	
Historically-nesting species (most recent known date)					
Caspian Tern	27	ND	0	54	1969(Yocom and Harris 1975)

CA Colony Number: **HU-404-02** Colony Name: **Old Arcata Wharf**
USFWS Colony Number: **325-038, 325-067** (Old Arcata Wharf [Part])
Latitude: 40°50'43"N Map Number: 15
Longitude: 124°06'32"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	119	165	0	286	05/30/89,04
TOTAL				286	

CA Colony Number: **HU-404-03** Colony Name: **Central Humboldt Bay**
USFWS Colony Number: **325-068***
Latitude: 40°47'48"N Map Number: 16
Longitude: 124°11'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	6	11	0	12	07/02/90,01
TOTAL				12	

CA Colony Number: **HU-404-04** Colony Name: **Humboldt Bay Duck Blinds**
USFWS Colony Number: **325-065***
Latitude: 40°43'03"N Map Number: 17
Longitude: 124°14'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	39	119	0	94	05/17/89,01
TOTAL				94	

CA Colony Number: **HU-402-01** Colony Name: **False Cape Rocks**
USFWS Colony Number: **325-040**
Latitude: 40°30'38"N Map Number: 18
Longitude: 124°23'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	360	515	0	792	05/31/89,04
Pelagic Cormorant	25	130	52	240	05/26/89,01
Western Gull	48	137	0	96	05/26/89,01
Common Murre	ND	6578	0	11051	05/31/89,04
Pigeon Guillemot	0	42	9	55	05/26/89,01
Tufted Puffin*	0	2	0	8	05/26/89,01
TOTAL				12242	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **HU-402-02** Colony Name: **Sugarloaf Island**
USFWS Colony Number: **325-041**
Latitude: 40°26'18"N Map Number: 19
Longitude: 124°24'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	114	127	0	274	05/31/89,04
Brandt's Cormorant	133	188	0	293	05/31/89,04
Pelagic Cormorant	ND	224	135	627	05/26/89,01
Blk. Oystercatcher	1	3	0	3	05/26/89,01
Western Gull	134	247	5	268	05/26/89,09;05/27/89,02
Pigeon Guillemot	0	132	14	172	05/27/89,01
Rhinoceros Auklet*	0	7	0	7	05/26/89,01
Tufted Puffin	0	1	0	4	05/26/89,01
TOTAL				1648	

CA Colony Number: **HU-402-03** Colony Name: **Steamboat Rock**
USFWS Colony Number: **325-042**
Latitude: 40°24'54"N Map Number: 19
Longitude: 124°24'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	211	280	0	464	05/31/89,04
Western Gull	ND	44	0	62	05/31/89,04
Common Murre	ND	5454	0	9163	05/31/89,04
Pigeon Guillemot	0	1	0	1	05/27/89,01
TOTAL				9690	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	4	1970(Sowls et al. 1980)

CA Colony Number: **HU-400-01** Colony Name: **Three Brothers and Hair Seal Rocks**
USFWS Colony Number: **325-055**
Latitude: 40°19'40"N Map Number: 20
Longitude: 124°21'58"W

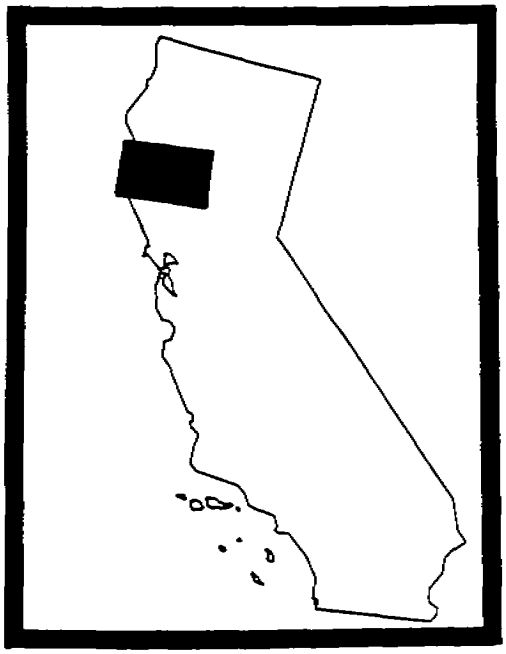
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	26	152	0	57	05/31/89,04
Pelagic Cormorant	2	7	2	19	05/27/89,01
TOTAL				76	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	4	1979(Sowls et al. 1980)

CA Colony Number: **HU-400-02** Colony Name: **Sea Lion [Gulch] Rock**
USFWS Colony Number: **325-043**
Latitude: 40°14'20"N Map Number: 21
Longitude: 124°19'54"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	0	6	0	17	05/27/89,01
TOTAL				17	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **HU-400-03** Colony Name: **"Cormorant Hotel"**
USFWS Colony Number: **325-056**
Latitude: 40°02'10"N Map Number: 22
Longitude: 124°04'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	0	22	0	62	05/27/89,01
TOTAL				62	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1979(Sowls et al. 1980)

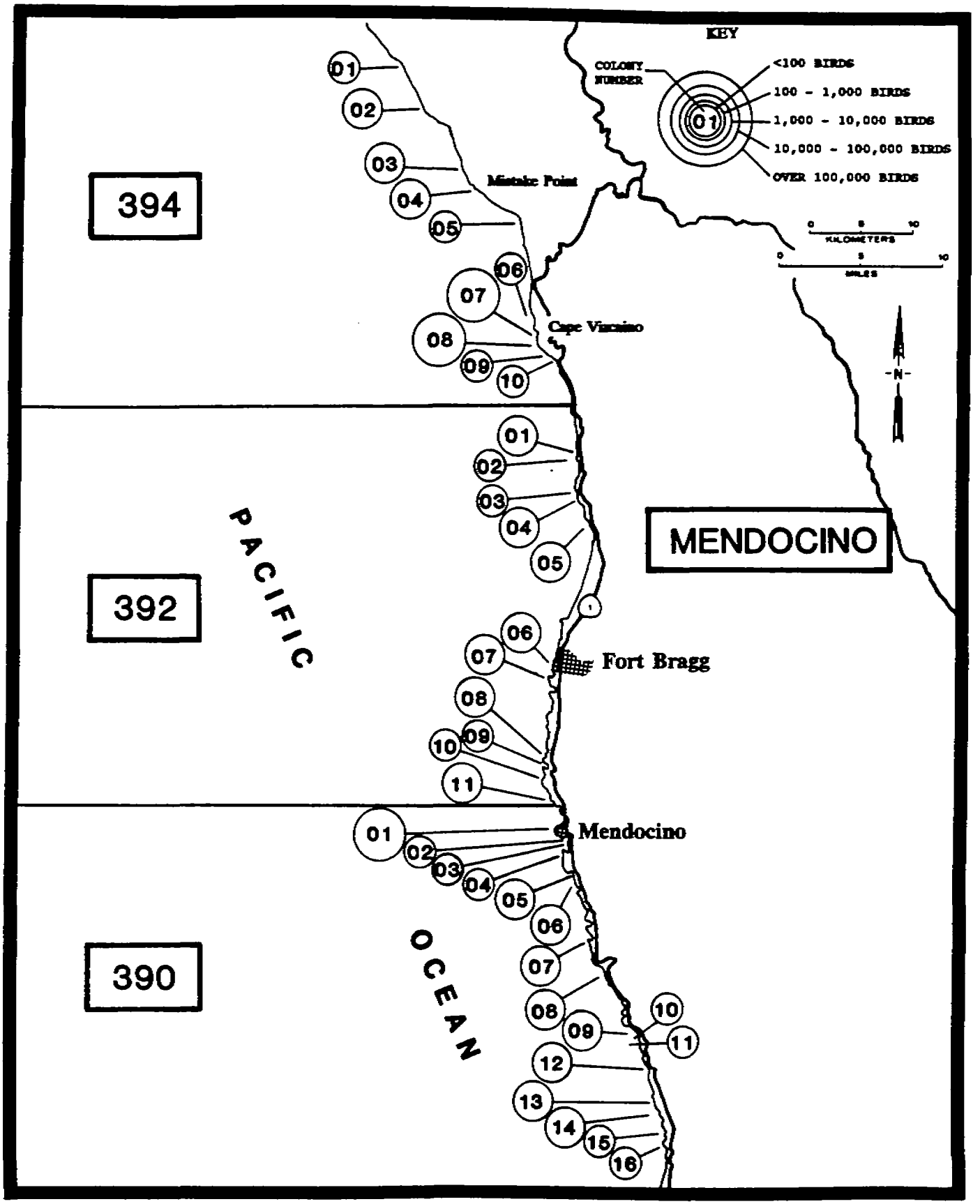


USFWS MAP BLOCK
379
Ukiah

The map on the facing page is an index to the locations of colonies within USFWS Map Block 379, Ukiah. All colonies on this map are numbered consecutively from north to south within counties in 20′ latitude California Map Blocks (i.e. 394 = 39°40′ to 40°00′N; 392 = 39°20′ to 39°40′N; 390 = 39°00 to 39°20′N). The Humboldt-Mendocino county line occurs at 40°N and forms the bottom border of the map. In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Leach's Storm-petrel	68	0.4%
Ashy Storm-petrel	P	0.0%
Brandt's Cormorant	4,887	27.0%
Pelagic Cormorant	2,385	13.2%
Black Oystercatcher	105	0.6%
Western Gull	689	3.8%
Common Murre	8,531	47.1%
Pigeon Guillemot	1,391	7.7%
Marbled Murrelet	P	0.0%
Rhinoceros Auklet	13	0.1%
Tufted Puffin	8	<0.1%
Unidentified alcid	22	0.1%
Total	18,099	


KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
KILOMETERS
MILES
N
394
392
390
MENDOCINO
PACIFIC
OCEAN
Mistake Point
Cape Vizcaino
Fort Bragg
Mendocino

NORTHERN CALIFORNIA
USFWS MAP BLOCK 379: UKIAH
(Includes California Map Blocks 394, 392 and 390)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **ME-394-01** Colony Name: **Point No Pass**
USFWS Colony Number: **379-011**
Latitude: 39°58'40"N Map Number: 23
Longitude: 123°59'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	12	71	1	26	05/28/89,01
Western Gull	2	2	0	4	05/28/89,01
TOTAL				30	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **ME-394-02** Colony Name: **High Tip**
USFWS Colony Number: **379-012**
Latitude: 39°55'30"N Map Number: 24
Longitude: 123°57'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	37	89	19	81	05/28/89,01
Blk. Oystercatcher	0	3	1	3	05/28/89,01
Western Gull	1	1	0	2	05/28/89,01
Pigeon Guillemot	0	7	0	18	05/28/89,01
TOTAL				104	

CA Colony Number: **ME-394-03** Colony Name: **Anderson Cliffs**
USFWS Colony Number: **379-013**
Latitude: 39°52'30"N Map Number: 25
Longitude: 123°54'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	77	100	0	169	05/31/89,04
Pelagic Cormorant	3	20	15	7	05/28/89,01
Blk. Oystercatcher*	1	4	0	4	05/28/89,01
Western Gull	2	4	0	4	05/28/89,01
Pigeon Guillemot	0	16	0	40	05/28/89,01
TOTAL				224	

CA Colony Number: **ME-394-04** Colony Name: **Mistake Point to Big White Rock**
USFWS Colony Number: **379-014**
Latitude: 39°51'30"N Map Number: 25
Longitude: 123°53'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	24	122	26	53	05/28/89,01
Blk. Oystercatcher*	0	1	0	1	05/28/89,01
Western Gull	0	5	0	8	05/28/89,01
Pigeon Guillemot	0	16	0	40	05/28/89,01
TOTAL				102	

CA Colony Number: **ME-394-05** Colony Name: **Usal Bay**
USFWS Colony Number: **379-015**
Latitude: 39°48'45"N Map Number: 26
Longitude: 123°50'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	5	41	4	11	05/28/89,01
Pigeon Guillemot	0	7	1	18	05/28/89,01
TOTAL				29	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **ME-394-06** Colony Name: **Soldier Frank Point**
USFWS Colony Number: **379-016**
Latitude: 39°45'18"N Map Number: 27
Longitude: 123°50'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	27	16	9	05/28/89,01
Blk. Oystercatcher*	0	3	0	3	05/28/89,01
Western Gull	7	28	0	14	05/28/89,01
TOTAL				26	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	20	1979(Sowls et al. 1980)

CA Colony Number: **ME-394-07** Colony Name: **"Rockport Rocks"**
USFWS Colony Number: **379-001**
Latitude: 39°44'10"N Map Number: 28
Longitude: 123°50'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	385	499	0	847	05/31/89,04
Pelagic Cormorant	39	88	2	91	05/28/89,01;05/28/89,02; 05/31/89,04
Blk. Oystercatcher	0	1	1	1	05/28/89,02
Western Gull	8	21	0	16	05/28/89,01;05/28/89,02
Common Murre*	ND	919	0	1544	05/28/89,01;05/31/89,04
Pigeon Guillemot	0	3	1	8	05/28/89,01
Rhinoceros Auklet*	0	2	0	2	05/28/89,01
TOTAL				2509	

CA Colony Number: **ME-394-08** Colony Name: **Cape Vizcaino**
USFWS Colony Number: **379-002**
Latitude: 39°43'34"N Map Number: 28
Longitude: 123°49'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	772	1011	0	1698	05/31/89,04
Pelagic Cormorant	32	77	25	70	05/28/89,01
Blk. Oystercatcher*	1	2	0	2	05/28/89,01
Western Gull	28	38	1	56	05/28/89,01
Common Murre	ND	4125	0	6930	05/31/89,04
Pigeon Guillemot	0	17	0	42	05/28/89,01
Rhinoceros Auklet*	0	1	0	1	05/28/89,01
TOTAL				8799	

CA Colony Number: **ME-394-09** Colony Name: **Chris Rocks**
USFWS Colony Number: **379-003**
Latitude: 39°42'51"N Map Number: 28
Longitude: 123°48'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	8	80	0	18	05/28/89,01
Western Gull	1	1	0	2	05/28/89,01
Pigeon Guillemot*	0	10	0	25	05/28/89,01
TOTAL				45	

CA Colony Number: **ME-394-10** Colony Name: **Hardy Rock and "Union Landing"**
USFWS Colony Number: **379-017**
Latitude: 39°42'20"N Map Number: 29
Longitude: 123°48'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	14	62	8	31	05/28/89,01
Blk. Oystercatcher*	0	7	0	7	05/28/89,01
Western Gull	2	2	0	4	05/28/89,01
Pigeon Guillemot	0	9	0	22	05/28/89,01
TOTAL				64	

CA Colony Number: **ME-392-01** Colony Name: **Westport**
USFWS Colony Number: **379-018**
Latitude: 39°38'00"N Map Number: 30
Longitude: 123°47'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel*	ND	ND	45	68	08/31/89,05
Pelagic Cormorant	58	119	4	128	05/28/89,02;05/30/89,01
Blk. Oystercatcher	1	7	1	7	05/30/89,01
Western Gull	10	20	0	20	05/28/89,02;05/30/89,01
Pigeon Guillemot	0	48	10	94	05/30/89,01
TOTAL				317	

CA Colony Number: **ME-392-02** Colony Name: **"Chadbourne Rocks"**
USFWS Colony Number: **379-019**
Latitude: 39°37'02"N Map Number: 30
Longitude: 123°47'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	1	0	2	05/30/89,01
Blk. Oystercatcher*	2	4	0	4	05/28/89,01
Western Gull*	2	3	0	4	05/30/89,01
Pigeon Guillemot*	0	3	0	8	05/30/89,01
TOTAL				18	

CA Colony Number: **ME-392-03** Colony Name: **"Strawberry Cove"**
USFWS Colony Number: **379-020**
Latitude: 39°35'37"N Map Number: 31
Longitude: 123°47'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	25	25	27	55	08/05/89,02
Blk. Oystercatcher	0	1	0	1	05/30/89,01
Pigeon Guillemot	0	3	0	8	05/30/89,01
TOTAL				64	

CA Colony Number: **ME-392-04** Colony Name: **Kibesillah Rock**
USFWS Colony Number: **379-004**
Latitude: 39°34'49"N Map Number: 31
Longitude: 123°46'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	30	51	0	66	05/28/89,02
Pelagic Cormorant	26	50	11	57	05/28/89,02
Blk. Oystercatcher*	0	1	1	1	05/28/89,02
Western Gull	6	7	0	12	05/28/89,02
Pigeon Guillemot*	0	3	2	8	05/30/89,01
Unid. alcid	ND	ND	5	8	05/28/89,05
TOTAL				152	

CA Colony Number: **ME-392-05** Colony Name: **"Newport Rocks"**
USFWS Colony Number: **379-005**
Latitude: 39°34'49"N Map Number: 31
Longitude: 123°46'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	87	129	0	191	06/16/89,04
Pelagic Cormorant	26	47	15	57	05/28/89,02;05/30/89,01
Blk. Oystercatcher	0	1	0	1	05/28/89,02
Western Gull	13	27	0	26	05/28/89,02;05/30/89,01
Pigeon Guillemot	0	17	10	42	05/30/89,01
Unid. alcid	ND	ND	8	12	05/30/89,05
TOTAL				329	

CA Colony Number: **ME-392-06** Colony Name: **"Georgia Pacific"**
USFWS Colony Number: **379-022**
Latitude: 39°27'00"N Map Number: 32
Longitude: 123°48'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	17	31	9	37	05/30/89,01;05/30/89,02
Blk. Oystercatcher	0	2	0	2	05/30/89,01
Western Gull	39	87	0	78	05/30/89,01;05/30/89,02
Pigeon Guillemot*	0	21	0	36	05/30/89,02
TOTAL				153	

CA Colony Number: **ME-392-07** Colony Name: **Noyo Bay**
USFWS Colony Number: **379-035***
Latitude: 39°25'35"N Map Number: 32
Longitude: 123°48'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	30	71	6	66	05/30/89,01;05/30/89,02; 05/31/89,01
Blk. Oystercatcher	0	2	0	2	05/31/89,01
Western Gull	5	8	0	10	05/30/89,01;05/30/89,02; 05/31/89,01
Pigeon Guillemot	0	52	25	88	05/31/89,01
TOTAL				166	

CA Colony Number: **ME-392-08** Colony Name: **Mitchell Creek to Caspar Point**
USFWS Colony Number: **379-036***
Latitude: 39°23'01"N Map Number: 33
Longitude: 123°49'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	26	50	5	57	05/30/89,02;05/31/89,01
Blk. Oystercatcher	0	2	2	2	05/30/89,02
Western Gull	4	8	0	8	05/30/89,02;05/31/89,01
Pigeon Guillemot	0	20	2	48	05/30/89,02;05/31/89,01
TOTAL				115	

CA Colony Number: **ME-392-09** Colony Name: **Caspar Anchorage**
USFWS Colony Number: **379-023**
Latitude: 39°22'00"N Map Number: 33
Longitude: 123°49'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	13	23	4	29	05/31/89,01
Blk. Oystercatcher	0	6	1	6	05/30/89,02;05/31/89,01
Western Gull*	2	5	0	4	05/31/89,01
Pigeon Guillemot	0	22	8	37	05/31/89,01
TOTAL				76	

CA Colony Number: **ME-392-10** Colony Name: **Caspar Anchorage to Point Cabrillo**
USFWS Colony Number: **379-037***
Latitude: 39°21'27"N Map Number: 33
Longitude: 123°49'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	6	14	4	13	05/30/89,02
Blk. Oystercatcher	1	4	1	4	05/30/89,02
Western Gull	9	13	0	18	05/30/89,02;05/31/89,01
Pigeon Guillemot	0	9	2	15	05/31/89,01
TOTAL				50	

CA Colony Number: **ME-392-11** Colony Name: **Point Cabrillo to Jack Peters Gulch**
USFWS Colony Number: **379-024**
Latitude: 39°20'00"N Map Number: 34
Longitude: 123°49'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	84	150	18	185	05/30/89,02;05/31/89,01
Blk. Oystercatcher	0	7	1	7	05/30/89,02
Western Gull*	6	9	0	12	05/30/89,02;05/31/89,01
Pigeon Guillemot	0	36	13	63	05/30/89,02;05/31/89,01
TOTAL				267	

CA Colony Number: **ME-390-01** Colony Name: **Goat Island Area**
USFWS Colony Number: **379-006**
Latitude: 39°18'28"N Map Number: 34
Longitude: 123°48'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	494	560	0	1087	05/31/89,01;06/16/89,04
Pelagic Cormorant	54	77	14	119	05/30/89,02
Blk. Oystercatcher	1	6	0	6	05/31/89,01
Western Gull	24	49	0	48	05/30/89,02;05/31/89,01; 06/01/89,02
Common Murre*	ND	34	0	57	06/16/89,04
Pigeon Guillemot	0	26	12	54	05/31/89,01;08/05/89,02
Rhinoceros Auklet*	0	4	0	4	05/31/89,01;08/05/89,02
Tufted Puffin	1	2	0	8	05/30/89,02
Unid. alcid	ND	ND	1	2	08/05/89,05
TOTAL				1385	

CA Colony Number: **ME-390-02** Colony Name: **Mendocino**
USFWS Colony Number: **379-025**
Latitude: 39°18'10"N Map Number: 34
Longitude: 123°47'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	13	28	2	29	05/31/89,01
Blk. Oystercatcher	0	3	0	3	05/31/89,01
Pigeon Guillemot	0	34	0	58	05/31/89,01
TOTAL				90	

CA Colony Number: **ME-390-03** Colony Name: **Mendocino Bay**
USFWS Colony Number: **379-026**
Latitude: 39°17'30"N Map Number: 35
Longitude: 123°47'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	16	29	12	35	05/31/89,01
Western Gull*	1	3	0	2	05/31/89,01
Pigeon Guillemot	0	21	0	36	05/31/89,01
TOTAL				73	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **ME-390-04** Colony Name: **Mendocino Bay South**
USFWS Colony Number: **379-038***
Latitude: 39°17'17"N Map Number: 35
Longitude: 123°48'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	7	10	1	15	05/31/89,01
Blk. Oystercatcher	0	1	0	1	05/31/89,01
Western Gull	1	1	0	2	05/31/89,01
Pigeon Guillemot	0	24	0	41	05/31/89,01
TOTAL				59	

CA Colony Number: **ME-390-05** Colony Name: **"Van Damme Cove"**
USFWS Colony Number: **379-027**
Latitude: 39°16'10"N Map Number: 35
Longitude: 123°47'28"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel*	ND	1	0	P	08/05/89,07
Pelagic Cormorant	31	68	16	68	05/31/89,01;05/31/89,03
Blk. Oystercatcher	2	3	0	3	05/31/89,01;05/31/89,03
Western Gull	79	114	0	158	05/31/89,01;05/31/89,03
Pigeon Guillemot	0	17	0	29	05/31/89,03
Rhinoceros Auklet*	0	3	0	3	05/31/89,03
TOTAL				261	
Historically-nesting species (most recent known date)					
Tufted Puffin	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **ME-390-06** Colony Name: **Schoolhouse Creek to Albion River**
USFWS Colony Number: **379-028**
Latitude: 39°15'00"N Map Number: 35
Longitude: 123°46'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	127	173	3	279	05/31/89,01
Blk. Oystercatcher	1	3	1	3	05/31/89,01;05/31/89,03
Western Gull	37	47	0	74	05/31/89,01;05/31/89,03
Pigeon Guillemot	0	61	0	152	05/31/89,01
TOTAL				508	

CA Colony Number: **ME-390-07** Colony Name: **Albion Cove to Navarro River**
USFWS Colony Number: **379-029**
Latitude: 39°12'30"N Map Number: 36
Longitude: 123°46'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	55	99	2	121	05/31/89,01
Blk. Oystercatcher	0	1	0	1	05/31/89,01
Western Gull	7	9	0	14	05/31/89,01;06/01/89,02
Pigeon Guillemot	0	11	0	28	05/31/89,01
TOTAL				164	

CA Colony Number: **ME-390-08** Colony Name: **"Devil's Basin"**
USFWS Colony Number: **379-007**
Latitude: 39°10'14"N Map Number: 36
Longitude: 123°44'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	119	132	0	262	06/16/89,04
Pelagic Cormorant	32	73	9	70	06/01/89,01;06/01/89,02
Blk. Oystercatcher	0	8	3	8	06/01/89,01
Western Gull	4	7	1	8	06/01/89,01
Pigeon Guillemot	0	29	6	49	06/01/89,01;06/01/89,02
TOTAL				397	

CA Colony Number: **ME-390-09** Colony Name: **Cavanaugh Cove to Gunderson Rock**
USFWS Colony Number: **379-030**
Latitude: 39°08'00"N Map Number: 37
Longitude: 123°44'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	71	119	19	156	06/01/89,01;06/01/89,02; 06/02/89,01
Blk. Oystercatcher	0	11	2	11	06/01/89,01;06/02/89,01
Western Gull	2	8	1	7	06/01/89,01;06/02/89,01
Pigeon Guillemot	0	68	0	170	06/01/89,01;06/02/01,01
TOTAL				344	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	4	1980(Sowls et al. 1980)

CA Colony Number: **ME-390-10** Colony Name: **Wharf Rocks**
USFWS Colony Number: **379-008**
Latitude: 39°07'49"N Map Number: 37
Longitude: 123°43'24"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	5	6	1	11	06/01/89,01
Blk. Oystercatcher	0	1	1	1	06/01/89,01
Western Gull	12	19	0	24	06/01/89,01
Pigeon Guillemot	0	22	2	55	06/01/89,01
TOTAL				91	

CA Colony Number: **ME-390-11** Colony Name: **Casket Rock**
USFWS Colony Number: **379-009**
Latitude: 39°07'49"N Map Number: 37
Longitude: 123°43'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	32	52	0	70	06/16/89,04
Western Gull	3	6	0	6	06/01/89,01
Pigeon Guillemot	0	4	4	10	06/01/89,01
Rhinoceros Auklet*	0	3	0	3	06/01/89,01
TOTAL				89	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **ME-390-12** Colony Name: **"Bonee Cliffs"**
USFWS Colony Number: **379-031**
Latitude: 39°07'00"N Map Number: 38
Longitude: 123°42'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	80	99	8	176	06/02/89,01
Blk. Oystercatcher*	0	5	0	5	06/02/89,01
Western Gull*	5	12	0	10	06/02/89,01
Pigeon Guillemot	0	10	0	25	06/02/89,01
TOTAL				216	

CA Colony Number: **ME-390-13** Colony Name: **White Rock**
USFWS Colony Number: **379-010**
Latitude: 39°05'42"N Map Number: 38
Longitude: 123°43'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	226	273	0	497	06/16/89,04
Pelagic Cormorant	8	13	0	18	06/02/89,01
Blk. Oystercatcher*	1	2	0	2	06/02/89,01
Western Gull	13	22	0	26	06/02/89,01
Pigeon Guillemot	0	9	2	22	06/02/89,01
TOTAL				565	

CA Colony Number: **ME-390-14** Colony Name: **"333 Point"**
USFWS Colony Number: **379-032**
Latitude: 39°05'00"N Map Number: 38
Longitude: 123°42'30"W

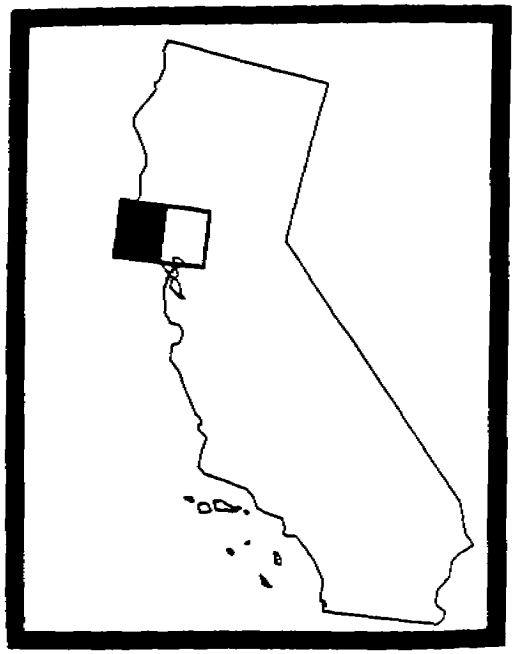
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	49	62	10	108	06/02/89,01
Blk. Oystercatcher	0	1	0	1	06/02/89,01
Western Gull*	2	2	0	4	06/02/89,01
TOTAL				113	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	360	1980(Sowls et al. 1980)

CA Colony Number: **ME-390-15** Colony Name: **Bridgeport Landing**
USFWS Colony Number: **379-033**
Latitude: 39°03'45"N Map Number: 39
Longitude: 123°41'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	33	53	0	73	06/02/89,01
TOTAL				73	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **ME-390-16** Colony Name: **Mallo Pass Creek**
USFWS Colony Number: **379-034**
Latitude: 39°02'20"N Map Number: 39
Longitude: 123°41'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	11	9	0	24	06/02/89,01
Blk. Oystercatcher*	0	2	0	2	06/02/89,01
Western Gull	2	3	0	4	06/02/89,01
Pigeon Guillemot	0	1	0	2	06/02/89,01
TOTAL				32	

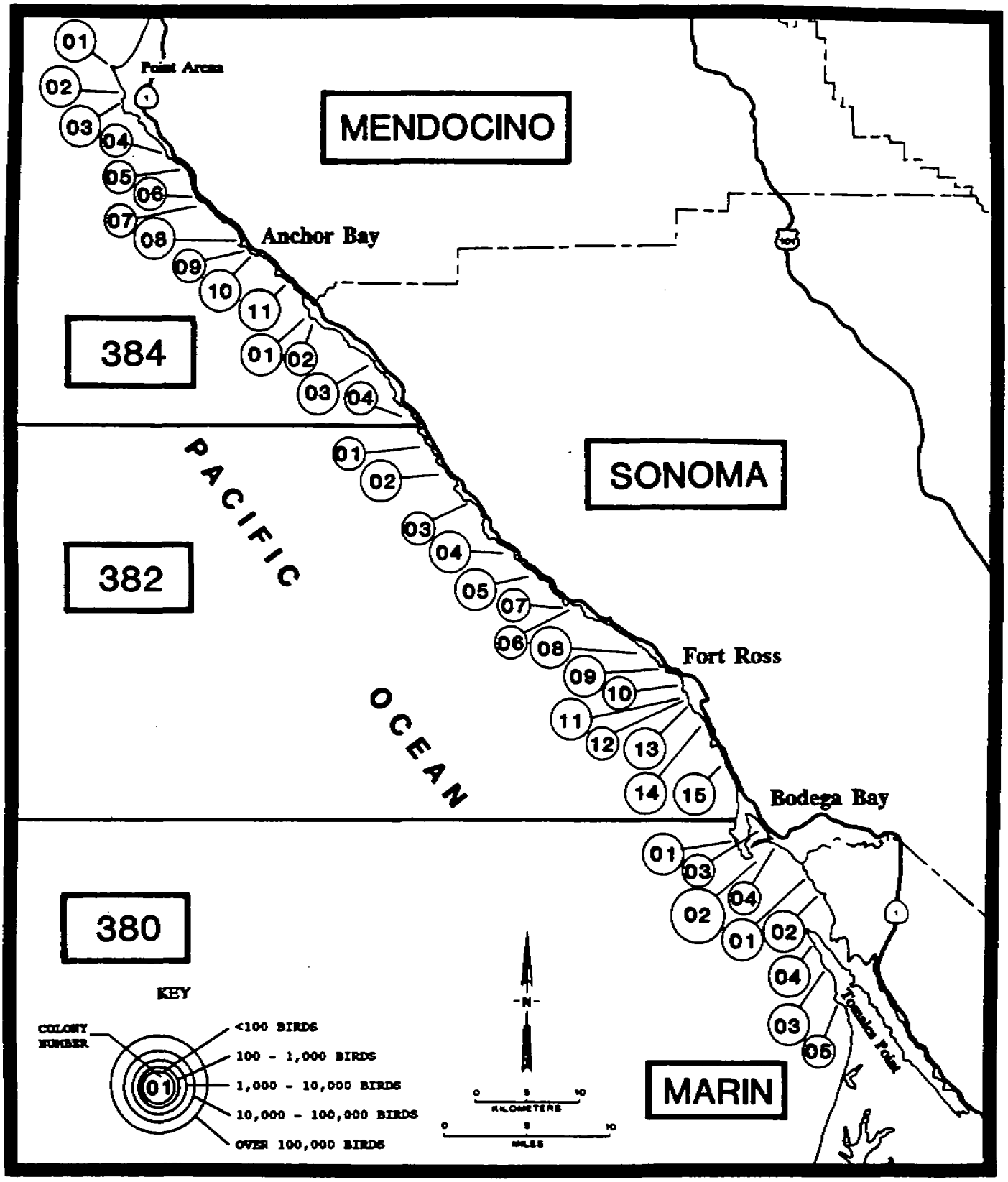


USFWS MAP BLOCK
404
(West) Santa Rosa

The map on the facing page is an index to the locations of colonies within the western half of USFWS Map Block 404, Santa Rosa. All colonies on this map are numbered consecutively from north to south within counties in 20' latitude California Map Blocks (i.e. 384 = 38°40' to 39°00'N; 382 = 38°20' to 38°40'N; 380 = 38°00 to 38°20'N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Leach's Storm-petrel	110	1.3%
Ashy Storm-petrel	74	0.9%
Doubled-crested Cormorant	436	5.3%
Brandt's Cormorant	2,801	34.3%
Pelagic Cormorant	2,823	34.6%
Black Oystercatcher	129	1.6%
Western Gull	927	11.4%
Pigeon Guillemot	768	9.4%
Marbled Murrelet	36	0.4%
Cassin's Auklet	P	0.0%
Rhinoceros Auklet	11	0.1%
Tufted Puffin	15	0.2%
Unidentified alcid	34	0.4%
Total	8,164	


MENDOCINO
SONOMA
MARIN
384
382
380
PACIFIC
OCEAN
Point Arena
Anchor Bay
Fort Ross
Bodega Bay
Tomales Point
KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
N
KILOMETERS
MILES

NORTHERN CALIFORNIA
USFWS MAP BLOCK 404: (WEST) SANTA ROSA
(Includes California Map Blocks 384, 382 and 380)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **ME-384-01** Colony Name: **Point Arena**
USFWS Colony Number: **404-017**
Latitude: 38°57'20"N Map Number: 40
Longitude: 123°44'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	70	132	15	154	06/02/89,01;06/03/89,02
Blk. Oystercatcher	1	7	0	7	06/03/89,02
Western Gull*	2	3	0	4	06/02/89,01
Pigeon Guillemot	0	21	1	52	06/02/89,01
Unid. alcid	ND	ND	13	20	06/03/89,05
TOTAL				237	

CA Colony Number: **ME-384-02** Colony Name: **Sea Lion Rocks**
USFWS Colony Number: **404-001**
Latitude: 38°56'07"N Map Number: 40
Longitude: 123°43'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	48	74	5	106	06/02/89,01
Blk. Oystercatcher	0	4	0	4	06/02/89,01
Western Gull	0	6	0	9	06/02/89,01
Pigeon Guillemot	0	5	3	12	06/02/89,01;06/03/89,02
TOTAL				131	

CA Colony Number: **ME-384-03** Colony Name: **Sea Lion Rocks to Arena Cove**
USFWS Colony Number: **404-042***
Latitude: 38°55'41"N Map Number: 40
Longitude: 123°43'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	83	188	4	183	06/02/89,01
Blk. Oystercatcher	0	4	0	4	06/02/89,01;06/03/89,02
Western Gull	8	16	0	16	06/02/89,01;06/03/89,02
TOTAL				203	

CA Colony Number: **ME-384-04** Colony Name: **"Moat Cove"**
USFWS Colony Number: **404-018**
Latitude: 38°53'10"N Map Number: 41
Longitude: 123°41'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot*	0	4	2	10	06/02/89,01
TOTAL				10	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	40	1979(Sowls et al. 1980)

CA Colony Number: **ME-384-05** Colony Name: **"Section 30 Cove"**
USFWS Colony Number: **404-019**
Latitude: 38°52'59"N Map Number: 41
Longitude: 123°40'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant*	19	39	9	42	06/02/89,01
Pigeon Guillemot	0	3	0	8	06/02/89,01
TOTAL				50	

CA Colony Number: **ME-384-06** Colony Name: **Saunders Landing**
USFWS Colony Number: **404-020**
Latitude: 38°51'13"N Map Number: 42
Longitude: 123°39'05"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	9	17	3	20	06/02/89,01
Pigeon Guillemot	0	3	0	8	06/02/89,01
TOTAL				28	

CA Colony Number: **ME-384-07** Colony Name: **"Iverson Landing"**
USFWS Colony Number: **404-002**
Latitude: 38°50'39"N Map Number: 42
Longitude: 123°38'37"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	19	41	11	42	06/02/89,01
Pigeon Guillemot	0	2	0	5	06/02/89,01
TOTAL				47	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	4	1980(Sowls et al. 1980)

CA Colony Number: **ME-384-08** Colony Name: **Triplett Gulch**
USFWS Colony Number: **404-021**
Latitude: 38°49'00"N Map Number: 43
Longitude: 123°36'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	54	74	9	119	06/02/89,01;06/03/89,01
Western Gull*	0	3	0	4	06/02/89,01
Pigeon Guillemot	2	22	0	55	06/02/89,01;06/03/89,01
TOTAL				178	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **ME-384-09** Colony Name: **"Fish Rock Cove"**
USFWS Colony Number: **404-022**
Latitude: 38°47'45"N Map Number: 43
Longitude: 123°35'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	15	20	0	33	06/03/89,01
Blk. Oystercatcher*	0	1	0	1	06/03/89,01
TOTAL				34	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	18	1980(Sowls et al. 1980)

CA Colony Number: **ME-384-10** Colony Name: **Fish Rocks**
USFWS Colony Number: **404-003**
Latitude: 38°48'00"N Map Number: 43
Longitude: 123°35'31"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel	ND	ND	ND	100	1980(Sowls et al. 1980)
Brandt's Cormorant	96	147	0	211	05/23/89,04
Pelagic Cormorant	56	84	0	123	06/03/89,03
Blk. Oystercatcher	0	6	1	6	06/03/89,03
Western Gull	85	210	0	170	06/03/89,03
Pigeon Guillemot	0	70	27	119	06/03/89,03
Cassin's Auklet*	1	2	0	P	08/07/89,03
Rhinoceros Auklet	0	4	1	4	06/03/89,03
Tufted Puffin	0	4	0	15	06/03/89,03
TOTAL				748	

CA Colony Number: **ME-384-11** Colony Name: **Collins Landing to Gualala River**
USFWS Colony Number: **404-023**
Latitude: 38°46'00"N Map Number: 44
Longitude: 123°32'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	85	113	6	187	06/03/89,01
Blk. Oystercatcher	0	4	0	4	06/03/89,01
Pigeon Guillemot	0	53	0	90	06/03/89,01
TOTAL				281	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **SO-384-01** Colony Name: **Gualala Point Island**
USFWS Colony Number: **404-004**
Latitude: 38°45'04"N Map Number: 45
Longitude: 123°31'42"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	237	298	0	521	05/23/89,04
Pelagic Cormorant*	2	45	0	4	06/03/89,01
Blk. Oystercatcher*	0	1	0	1	06/03/89,01
Western Gull	13	26	0	26	06/03/89,01
Pigeon Guillemot	0	17	0	29	06/03/89,01
TOTAL				581	

CA Colony Number: **SO-384-02** Colony Name: **Del Mar Point**
USFWS Colony Number: **404-024**
Latitude: 38°44'15"N Map Number: 45
Longitude: 123°31'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	0	0	9	06/03/89,01
TOTAL				9	

CA Colony Number: **SO-384-03** Colony Name: **Sea Ranch**
USFWS Colony Number: **404-025**
Latitude: 38°42'00"N Map Number: 46
Longitude: 123°27'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	38	81	5	84	06/03/89,01
Blk. Oystercatcher	1	11	0	11	06/03/89,01
Western Gull	8	15	0	16	06/03/89,01
Pigeon Guillemot	0	17	14	42	06/03/89,01
TOTAL				153	

CA Colony Number: **SO-384-04** Colony Name: **Black Point to Stewart's Point**
USFWS Colony Number: **404-026**
Latitude: 38°40'00"N Map Number: 47
Longitude: 123°25'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	18	52	7	40	06/03/89,01
Blk. Oystercatcher*	0	4	1	4	06/03/89,01
Western Gull*	3	4	0	6	06/03/89,01
Pigeon Guillemot	0	5	0	12	06/03/89,01
TOTAL				62	

CA Colony Number: **SO-382-01** Colony Name: **Stewart's Point to Rocky Point**
USFWS Colony Number: **404-027**
Latitude: 38°39'00"N Map Number: 47
Longitude: 123°38'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	30	70	6	66	06/03/89,01
Blk. Oystercatcher*	0	1	0	1	06/03/89,01
Western Gull	2	3	0	4	06/03/89,01
Pigeon Guillemot	0	6	0	15	06/03/89,01
TOTAL				86	

CA Colony Number: **SO-382-02** Colony Name: **Horseshoe Cove**
USFWS Colony Number: **404-028**
Latitude: 38°36'30"N Map Number: 48
Longitude: 123°22'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	55	84	0	121	06/03/89,01
Western Gull*	1	3	0	2	06/03/89,01
Pigeon Guillemot	0	1	0	2	06/03/89,01
TOTAL				125	

CA Colony Number: **SO-382-03** Colony Name: **Cannon Gulch to Stump Beach**
USFWS Colony Number: **404-029**
Latitude: 38°35'30"N Map Number: 48
Longitude: 123°20'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	36	79	0	79	06/03/89,03
Blk. Oystercatcher*	0	14	0	14	06/03/89,03
Pigeon Guillemot	0	1	0	2	06/03/89,03
TOTAL				95	

CA Colony Number: **SO-382-04** Colony Name: **Gerstle Cove to Stillwater Cove**
USFWS Colony Number: **404-030**
Latitude: 38°33'00"N Map Number: 49
Longitude: 123°18'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	50	64	2	110	06/05/89,01
Blk. Oystercatcher*	0	6	1	6	06/05/89,01
Western Gull	8	22	1	16	06/05/89,01
Pigeon Guillemot	0	4	1	10	06/05/89,01
TOTAL				142	

CA Colony Number: **SO-382-05** Colony Name: **Bench Mark 125 to Timber Cove**
USFWS Colony Number: **404-031**
Latitude: 38°32'20"N Map Number: 49
Longitude: 123°17'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	28	56	5	62	06/05/89,01
Blk. Oystercatcher*	0	2	1	2	06/05/89,01
Western Gull	16	43	0	32	06/05/89,01
Pigeon Guillemot*	0	4	1	10	06/05/89,01
TOTAL				106	

CA Colony Number: **SO-382-06** Colony Name: **Windermere Point to Jewell Gulch**
USFWS Colony Number: **404-043***
Latitude: 38°30'20"N Map Number: 50
Longitude: 123°13'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	18	27	3	40	06/05/89,01
Blk. Oystercatcher	0	1	0	1	06/05/89,01
Western Gull	3	5	0	6	06/05/89,01
Pigeon Guillemot	0	1	0	2	06/05/89,01
TOTAL				49	

CA Colony Number: **SO-382-07** Colony Name: **"Northwest Cape Rocks"**
USFWS Colony Number: **404-032**
Latitude: 38°30'40"N Map Number: 50
Longitude: 123°15'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	1	1	0	1	06/05/89,01
Western Gull	26	46	0	52	06/05/89,01
TOTAL				53	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	20	1979(Sowls et al. 1980)

CA Colony Number: **SO-382-08** Colony Name: **"Russian Gulch"**
USFWS Colony Number: **404-033**
Latitude: 38°28'00"N Map Number: 51
Longitude: 123°09'36"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	103	111	7	227	06/05/89,01;06/05/89,02
Blk. Oystercatcher	0	7	1	7	06/05/89,01
Western Gull	21	39	0	42	06/05/89,01;06/05/89,02
Pigeon Guillemot	0	8	4	20	06/05/89,01
TOTAL				296	

CA Colony Number: **SO-382-09** Colony Name: **"Russian River Rocks"**
USFWS Colony Number: **404-005**
Latitude: 38°27'14"N Map Number: 51
Longitude: 123°08'34"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	176	201	0	422	05/23/89,04;06/05/89,01; 06/05/89,02
Brandt's Cormorant	23	34	0	51	06/05/89,02
Pelagic Cormorant	57	59	1	125	05/23/89,04;06/05/89,01; 06/05/89,02
Blk. Oystercatcher*	0	2	0	2	06/05/89,01;06/05/89,02
Western Gull	22	42	0	44	06/05/89,01;06/05/89,02
Pigeon Guillemot	1	2	0	5	06/05/89,01;06/05/89,02
TOTAL				649	

CA Colony Number: **SO-382-10** Colony Name: **Goat Rock to Peaked Hill**
USFWS Colony Number: **404-044***
Latitude: 38°26'14"N Map Number: 52
Longitude: 123°07'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	06/05/89,01
Western Gull	3	10	0	6	06/05/89,01
TOTAL				7	

CA Colony Number: **SO-382-11** Colony Name: **Arched Rock**
USFWS Colony Number: **404-006**
Latitude: 38°25'53"N Map Number: 52
Longitude: 123°07'32"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	326	409	0	717	05/23/89,04
Pelagic Cormorant*	4	4	0	9	06/05/89,01
Western Gull	17	90	0	34	06/05/89,01
Pigeon Guillemot	0	1	0	2	06/05/89,01
TOTAL				762	
Historically-nesting species (most recent known date)					
Tufted Puffin	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **SO-382-12** Colony Name: **"Peaked Hill"**
USFWS Colony Number: **404-034**
Latitude: 38°25'45"N Map Number: 52
Longitude: 123°07'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	20	23	1	44	06/05/89,01
Blk. Oystercatcher	0	1	1	1	06/05/89,01
Western Gull	3	4	0	6	06/05/89,01
Pigeon Guillemot	0	1	1	2	06/05/89,01
TOTAL				53	

CA Colony Number: **SO-382-13** Colony Name: **Gull Rock**
USFWS Colony Number: **404-035**
Latitude: 38°25'30"N Map Number: 52
Longitude: 123°07'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel*	1	1	2	10	06/05/89,05
Pelagic Cormorant	20	23	1	44	06/05/89,01
Blk. Oystercatcher*	0	2	0	2	06/05/89,01
Western Gull	17	30	0	34	06/05/89,03
Pigeon Guillemot	0	1	0	2	06/05/89,01
Unid. alcid	ND	ND	9	14	06/05/89,05
TOTAL				106	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	650	1980(Sowls et al. 1980)

CA Colony Number: **SO-382-14** Colony Name: **Shell-Wright Beach Rocks**
USFWS Colony Number: **404-036**
Latitude: 38°25'00"N Map Number: 52
Longitude: 123°06'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	25	49	6	55	06/04/89,02;06/05/89,01
Blk. Oystercatcher	3	20	3	20	06/04/89,02;06/05/89,01
Western Gull	44	83	0	88	06/04/89,02;06/05/89,01
Pigeon Guillemot	1	2	1	5	06/05/89,01
TOTAL				168	

CA Colony Number: **SO-382-15** Colony Name: **Duncan Point to Arched Rock**
USFWS Colony Number: **404-037**
Latitude: 38°22'30"N Map Number: 53
Longitude: 123°05'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	62	66	0	136	06/04/89,02;06/05/89,01
Blk. Oystercatcher	2	4	0	4	06/04/89,02;06/05/89,01
Western Gull	17	27	0	34	06/04/89,02;06/05/89,01
TOTAL				174	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	4	1979(Sowls et al. 1980)

CA Colony Number: **SO-380-01** Colony Name: **Bodega Head**
USFWS Colony Number: **404-038**
Latitude: 38°18'00"N Map Number: 54
Longitude: 123°03'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	47	79	12	103	06/05/89,01
Blk. Oystercatcher	1	6	0	6	06/05/89,01
Western Gull*	5	11	0	10	06/05/89,01
Pigeon Guillemot	0	1	0	2	06/05/89,01
TOTAL				121	

CA Colony Number: **SO-380-02** Colony Name: **Bodega Rock**
USFWS Colony Number: **404-008**
Latitude: 38°17'48"N Map Number: 54
Longitude: 123°02'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	558	746	0	1228	05/23/89,04
Western Gull	12	22	0	24	06/05/89,01
Pigeon Guillemot*	0	12	0	30	06/05/89,01
Rhinoceros Auklet*	0	2	0	2	06/05/89,01
TOTAL				1284	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1969(Sowls et al. 1980)

CA Colony Number: **SO-380-03** Colony Name: **Bodega Harbor**
USFWS Colony Number: **404-045***
Latitude: 38°19'21"N Map Number: 54
Longitude: 123°02'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	6	9	0	12	06/05/89,01
Pigeon Guillemot	0	1	0	2	06/05/89,01
TOTAL				14	

CA Colony Number: **SO-380-04** Colony Name: **Pinnacle Rock**
USFWS Colony Number: **404-039**
Latitude: 38°18'20"N Map Number: 54
Longitude: 123°01'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	23	36	3	51	06/05/89,01
Blk. Oystercatcher	0	2	1	2	06/05/89,01
Western Gull	1	2	0	2	06/05/89,01
Pigeon Guillemot	0	16	3	27	06/05/89,01
Rhinoceros Auklet*	0	2	0	2	06/05/89,01
TOTAL				84	

CA Colony Number: **MA-380-01** Colony Name: **"Sonoma-Marin County Line"**
USFWS Colony Number: **404-040**
Latitude: 38°17'20"N Map Number: 55
Longitude: 123°00'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	38	48	3	84	06/05/89,01
Blk. Oystercatcher	0	5	3	5	06/05/89,01
Western Gull	7	20	0	14	06/05/89,01
Pigeon Guillemot	0	10	0	25	06/05/89,01
TOTAL				128	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	12	1980(Sowls et al. 1980)

CA Colony Number: **MA-380-02** Colony Name: **"Dillon Beach Rocks"**
USFWS Colony Number: **404-009**
Latitude: 38°16'26"N Map Number: 55
Longitude: 122°59'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant*	6	8	0	14	06/05/89,01
Brandt's Cormorant	8	8	0	18	06/05/89,01
Pelagic Cormorant	65	94	6	143	06/05/89,01
Blk. Oystercatcher*	0	3	3	3	06/05/89,01
Western Gull	16	25	0	32	06/05/89,01
Pigeon Guillemot	0	8	2	20	06/05/89,01
TOTAL				230	

CA Colony Number: **MA-380-03** Colony Name: **Tomales Point**
USFWS Colony Number: **404-011**
Latitude: 38°12'13"N Map Number: 56
Longitude: 122°57'39"W

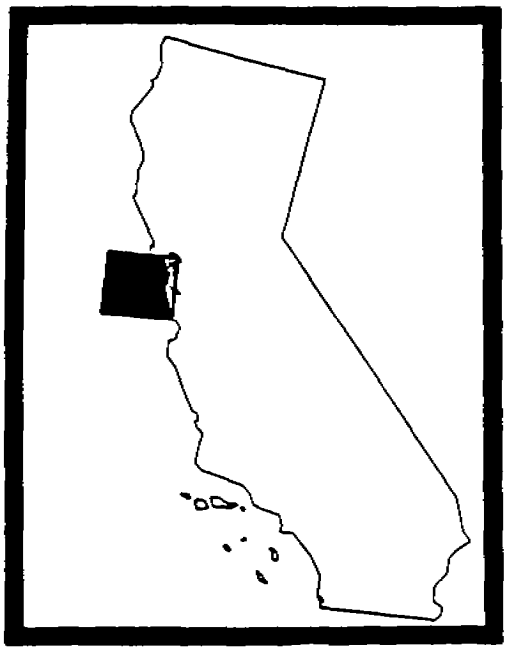
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	64	93	10	141	06/05/89,01
Blk. Oystercatcher*	0	3	2	3	06/05/89,01
Western Gull	3	6	0	6	06/05/89,01
TOTAL				150	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	8	1972(Sowls et al. 1980)

CA Colony Number: **MA-380-04** Colony Name: **Bird Rock**
USFWS Colony Number: **404-010**
Latitude: 38°13'49"N Map Number: 56
Longitude: 122°59'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	6	48	28	74	1989,05;1989,07
Brandt's Cormorant*	25	66	0	55	05/23/89,04
Pelagic Cormorant	17	118	1	37	06/05/89,01
Blk. Oystercatcher	1	6	0	6	08/06/89,03
Western Gull	84	ND	0	168	05/23/89,04
Pigeon Guillemot	0	46	0	115	06/05/89,01
Rhinoceros Auklet*	0	3	0	3	06/05/89,01
TOTAL				488	
Historically-nesting species (most recent known date)					
Tufted Puffin*	ND	ND	ND	4	1930(Stephens and Pringle 1933)

CA Colony Number: **MA-380-05** Colony Name: **"Elephant Rock Complex"**
USFWS Colony Number: **404-041**
Latitude: 38°11'00"N Map Number: 57
Longitude: 122°58'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull*	4	8	0	8	06/05/89,01
Pigeon Guillemot	0	11	0	28	06/05/89,01
TOTAL				36	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	16	1979(Sowls et al. 1980)

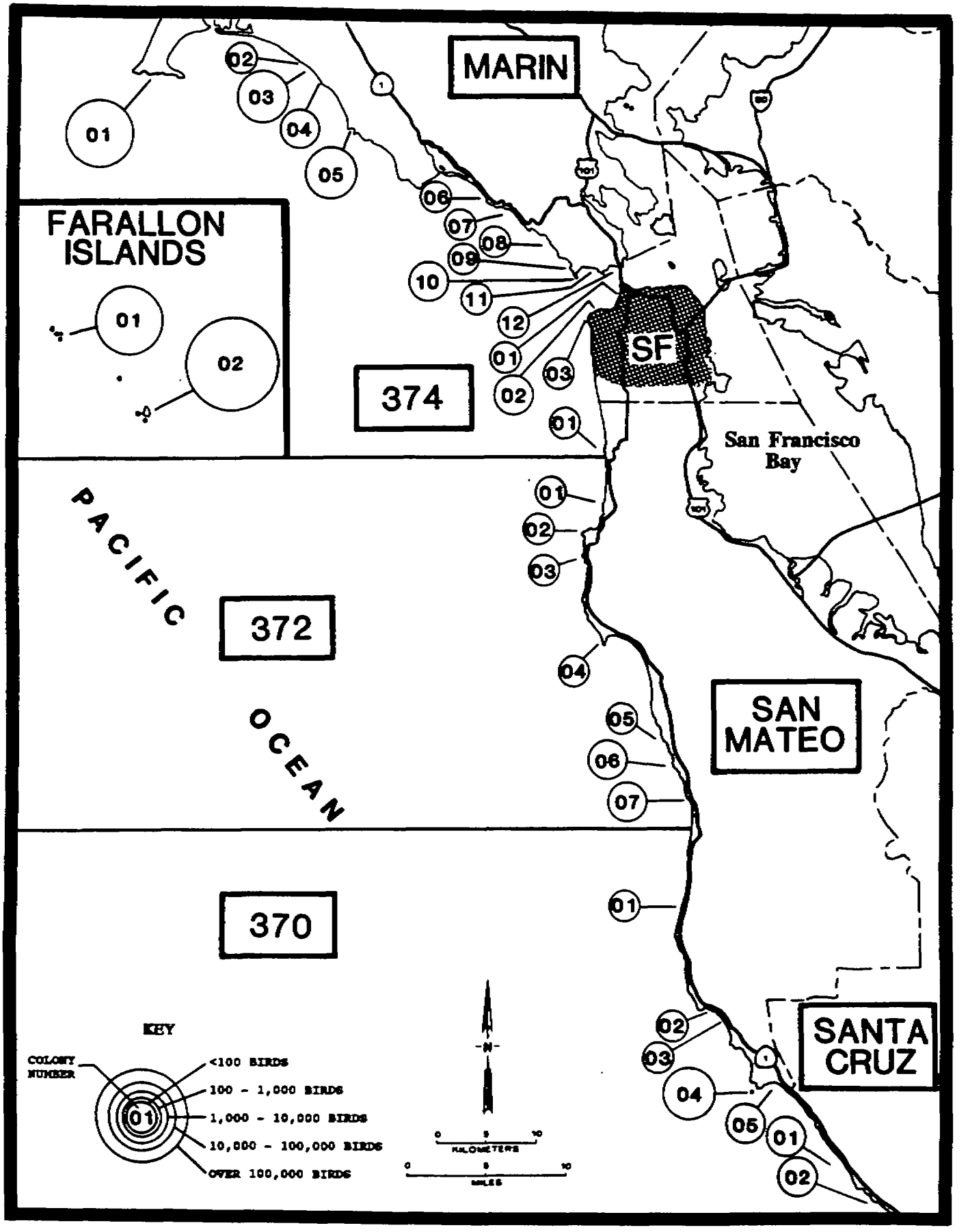


USFWS MAP BLOCK
429
(West) San Francisco

The map on the facing page is an index to the locations of colonies within the western half of USFWS Map Block 429, San Francisco. All colonies on this map are numbered consecutively from north to south within counties in 20′ latitude California Map Blocks (i.e. 374 = 37°40′ to 38°00′N; 372 = 37°20′ to 37°40′N; 370 = 37°00 to 37°20′N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number, with the Farallon Islands (FAI) placed between Marin (MA) and San Francisco (SF) county colonies in block 374. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Fork-tailed Storm-petrel	P	0.0%
Leach's Storm-petrel	1,400	0.7%
Ashy Storm-petrel	4,000	2.1%
Doubled-crested Cormorant	1,140	0.6%
Brandt's Cormorant	19,238	10.3%
Pelagic Cormorant	1,903	1.0%
Black Oystercatcher	85	<0.1%
Western Gull	24,120	12.9%
Common Murre	91,663	49.0%
Pigeon Guillemot	3,898	2.1%
Marbled Murrelet	795	0.4%
Cassin's Auklet	38,274	20.4%
Rhinoceros Auklet	602	0.3%
Tufted Puffin	74	<0.1%
Total	187,192	


MARIN
FARALLON ISLANDS
374
SF
San Francisco Bay
PACIFIC OCEAN
372
SAN MATEO
370
SANTA CRUZ
KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
N
KILOMETERS
MILES

CENTRAL CALIFORNIA
USFWS MAP BLOCK 429: (WEST) SAN FRANCISCO
(Includes California Map Blocks 374, 372, 370 and FAI)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **MA-374-01** Colony Name: **Point Reyes**
USFWS Colony Number: **429-001**
Latitude: 37°59'30"N Map Number: 58
Longitude: 123°59'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	692	884	0	1522	05/23/89,04;06/06/89,01
Pelagic Cormorant	121	301	25	266	06/06/89,01
Blk. Oystercatcher	0	6	3	6	06/06/89,01
Western Gull	89	197	0	178	06/06/89,01
Common Murre	ND	9021	0	15155	05/23/89,04;06/06/89,01
Pigeon Guillemot	2	282	27	616	06/06/89,01
Rhinoceros Auklet	0	6	0	6	06/06/89,01
Tufted Puffin	0	1	0	4	06/06/89,01
TOTAL				17753	

CA Colony Number: **MA-374-02** Colony Name: **Coast Campground South**
USFWS Colony Number: **429-042***
Latitude: 38°00'52"N Map Number: 59
Longitude: 122°51'14"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	37	2	63	06/07/89,01
TOTAL				63	

CA Colony Number: **MA-374-03** Colony Name: **Point Resistance**
USFWS Colony Number: **429-024**
Latitude: 37°59′55"N Map Number: 59
Longitude: 122°49′40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	21	29	0	46	05/23/89,04
Western Gull	4	17	0	8	06/07/89,01
Common Murre	ND	2094	0	3518	05/23/89,04
Pigeon Guillemot	0	20	0	50	06/07/89,01
TOTAL				3622	
Historically-nesting species (most recent known date)					
Dbl.-cr. Cormorant*	ND	ND	ND	X	1929(Bolander and Bryant 1930)
Pelagic Cormorant	ND	ND	ND	104	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MA-374-04** Colony Name: **Millers Point Rocks**
USFWS Colony Number: **429-002**
Latitude: 37°58′53"N Map Number: 59
Longitude: 122°48′35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	52	90	0	114	05/23/89,04
Pelagic Cormorant	27	54	0	59	06/07/89,01
Blk. Oystercatcher*	0	1	1	1	06/07/89,01
Western Gull	15	30	0	30	06/07/89,01
Common Murre*	ND	213	0	358	06/07/89,01
Pigeon Guillemot	0	22	8	55	06/07/89,01
TOTAL				617	

CA Colony Number: **MA-374-05** Colony Name: **Double Point Rocks**
USFWS Colony Number: **429-003**
Latitude: 37°56′51"N Map Number: 60
Longitude: 122°47′08"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	82	113	0	180	05/23/89,04
Pelagic Cormorant	4	25	0	9	06/07/89,01
Western Gull	4	13	0	8	06/07/89,01
Common Murre	ND	2657	0	4464	05/23/89,04
Pigeon Guillemot	0	9	4	22	06/07/89,01
TOTAL				4683	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1970(Sowls et al. 1980)

CA Colony Number: **MA-374-06** Colony Name: **Stinson Beach to Rocky Point**
USFWS Colony Number: **429-043***
Latitude: 37°53'08"N Map Number: 61
Longitude: 122°37'38"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	5	0	6	06/08/89,01
TOTAL				6	

CA Colony Number: **MA-374-07** Colony Name: **Gull Rock Area**
USFWS Colony Number: **429-025**
Latitude: 37°52'35"N Map Number: 61
Longitude: 122°37'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	11	3	9	06/08/89,01
Blk. Oystercatcher	0	1	1	1	06/08/89,01
Western Gull	3	7	0	6	06/08/89,01
Pigeon Guillemot	0	4	0	7	06/08/89,01
TOTAL				23	

CA Colony Number: **MA-374-08** Colony Name: **Muir Beach Headlands to Tennessee Cove**
USFWS Colony Number: **429-026**
Latitude: 37°51'00"N Map Number: 62
Longitude: 122°33'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	19	35	3	42	06/08/89,01
Blk. Oystercatcher	0	1	1	1	06/08/89,01
Western Gull*	10	21	0	20	06/08/89,01
Pigeon Guillemot	0	20	0	34	06/08/89,01
TOTAL				97	

CA Colony Number: **MA-374-09** Colony Name: **Bird Island**
USFWS Colony Number: **429-007**
Latitude: 37°49'27"N Map Number: 63
Longitude: 122°32'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	0	1	1	1	06/08/89,01
Western Gull	28	45	0	56	06/08/89,01
Pigeon Guillemot	0	3	0	5	06/08/89,01
TOTAL				62	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	75	1969(Sowls et al. 1980)

CA Colony Number: **MA-374-10** Colony Name: **Point Bonita**
USFWS Colony Number: **429-008**
Latitude: 37°48'55"N Map Number: 63
Longitude: 122°31'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	43	64	0	95	06/08/89,01
Western Gull	5	16	0	10	06/08/89,01
Pigeon Guillemot	0	39	0	66	06/08/89,01
TOTAL				171	

CA Colony Number: **MA-374-11** Colony Name: **Bonita Cove**
USFWS Colony Number: **429-027**
Latitude: 37°49'30"N Map Number: 63
Longitude: 122°31'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	23	0	2	06/08/89,01
Western Gull	3	8	0	6	06/08/89,01
Pigeon Guillemot	0	1	0	2	06/08/89,01
TOTAL				10	

CA Colony Number: **MA-374-12** Colony Name: **Point Diablo Bluffs and Needles**
USFWS Colony Number: **429-028**
Latitude: 37°49'30"N Map Number: 63
Longitude: 122°29'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	7	16	0	15	06/08/89,01
Western Gull	17	33	0	34	06/08/89,01
TOTAL				49	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	X	1979(Sowls et al. 1980)

CA Colony Number: **SF-FAI-01** Colony Name: **North Farallon Islands**
USFWS Colony Number: **429-012, 429-051** (Farallon Islands [Part])
Latitude: 37°46'04"N Map Number: 64
Longitude: 123°05'56"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	73	110	0	161	05/23/89,04
Pelagic Cormorant	9	31	10	62	04/30/89,01(PRBO,unpubl. data);05/23/89,04
Western Gull	ND	21	5	32	04/30/89,01(PRBO,unpubl. data);05/23/89,04
Common Murre	ND	15428	0	27308	05/23/89,04
Pigeon Guillemot	0	42	13	42	04/30/89,01(PRBO,unpubl. data
TOTAL				27605	

CA Colony Number: **SF-FAI-02** Colony Name: **South Farallon Islands**
USFWS Colony Number: **429-012, 429-052** (Farallon Islands [Part])
Latitude: 37°42′00"N Map Number: 64
Longitude: 123°00′00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
F.-t. Storm-petrel*	ND	1	ND	P	1990(PRBO, unpubl. data)
Lch. Storm-petrel	ND	ND	ND	1400	1972(Ainley and Lewis 1974)
Ashy Storm-petrel	ND	ND	ND	4000	1972(Ainley and Lewis 1974)
Dbl.-cr. Cormorant	475	527	0	1140	05/23/89,04
Brandt's Cormorant	7610	9016	0	16742	05/23/89,04
Pelagic Cormorant	ND	749	0	800	1987(Emslie and Sydeman 1989)
Blk. Oystercatcher	15	ND	0	30	1989(Emslie and Sydeman 1989)
Western Gull	ND	15890	0	22246	05/23/89,04;(Emslie and Sydeman 1989)
Common Murre	ND	23085	0	40860	05/23/89,04
Pigeon Guillemot	ND	1867	0	1867	04/09/89,02(Emslie and Sydeman 1989)
Cassin's Auklet	ND	ND	25516	38274	09/03/89,05
Rhinoceros Auklet	ND	ND	516	516	09/03/89,05
Tufted Puffin	ND	ND	119	70	1989(Emslie and Sydeman 1989)
TOTAL				127945	

CA Colony Number: **SF-374-01** Colony Name: **Fort Point Rock to Helmet Rock**
USFWS Colony Number: **429-044***
Latitude: 37°48′16"N Map Number: 65
Longitude: 122°28′38"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	6	0	6	06/06/89,01
TOTAL				6	

CA Colony Number: **SF-374-02** Colony Name: **Lobos Rock and Lands End**
USFWS Colony Number: **429-029**
Latitude: 37°47′15"N Map Number: 65
Longitude: 122°30′20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	53	189	0	117	05/23/89,04
Western Gull	7	16	0	14	06/06/89,01
Pigeon Guillemot	0	7	1	18	06/06/89,01
TOTAL				149	

CA Colony Number: **SF-374-03** Colony Name: **Seal Rocks**
USFWS Colony Number: **429-009**
Latitude: 37°46'42"N Map Number: 65
Longitude: 122°30'53"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	3	1	3	06/07/89,02
Western Gull	23	52	0	46	06/06/89,01;06/07/89,02
TOTAL				49	
Historically-nesting species (most recent known date)					
Dbl.-cr. Cormorant*	ND	ND	ND	ND	1917(Squires 1917)
Brandt's Cormorant	ND	ND	ND	76	1979(Sowls et al. 1980)
Pigeon Guillemot	ND	ND	ND	6	1979(Sowls et al. 1980)

CA Colony Number: **SM-374-01** Colony Name: **Mussel Rock Area**
USFWS Colony Number: **429-045***
Latitude: 37°40'00"N Map Number: 66
Longitude: 122°29'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	1	0	1	06/06/89,01
Pigeon Guillemot	0	4	0	10	06/06/89,01
TOTAL				11	

CA Colony Number: **SM-372-01** Colony Name: **Mori Point**
USFWS Colony Number: **429-046***
Latitude: 37°37'05"N Map Number: 67
Longitude: 122°29'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	14	26	6	31	06/06/89,01
Pigeon Guillemot	0	7	0	18	06/06/89,01
TOTAL				49	

CA Colony Number: **SM-372-02** Colony Name: **San Pedro Rock**
USFWS Colony Number: **429-013**
Latitude: 37°35'43"N Map Number: 67
Longitude: 122°31'20"W Map Page: 203

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	3	2	0	7	06/06/89,01
Blk. Oystercatcher	0	2	0	2	06/06/89,01
Western Gull	3	9	0	6	06/06/89,01
Pigeon Guillemot	0	28	0	70	
TOTAL				85	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	X	1908(Ray 1909)
Common Murre*	ND	20	0	X	1908(Ray 1909)
Tufted Puffin*	ND	6	0	X	1908(Ray 1909)

CA Colony Number: **SM-372-03** Colony Name: **Devil's Slide Rock**
USFWS Colony Number: **429-014**
Latitude: 37°34'28"N Map Number: 67
Longitude: 122°31'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	3	20	0	7	05/24/89,04
Pelagic Cormorant	21	26	1	46	06/06/89,01
Western Gull	8	13	0	16	06/06/89,01
Pigeon Guillemot	0	12	0	30	06/06/89,01
TOTAL				99	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	4	1979(Sowls et al. 1980)
Common Murre	ND	ND	ND	2570	1982(Briggs et al. 1983)

CA Colony Number: **SM-372-04** Colony Name: **Pillar Point**
USFWS Colony Number: **429-030**
Latitude: 37°29'30"N Map Number: 68
Longitude: 122°29'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	0	2	2	5	06/06/89,01
Pigeon Guillemot	0	1	0	2	06/06/89,01
TOTAL				7	
Dbl.-cr. Cormorant*	8	ND	ND	16	1940(Unknown 1940)

CA Colony Number: **SM-372-05** Colony Name: **Eel Rock Cliffs**
USFWS Colony Number: **429-031**
Latitude: 37°24'15"N Map Number: 69
Longitude: 122°25'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	18	6	9	06/07/89,01
TOTAL				9	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	X	1979(Sowls et al. 1980)

CA Colony Number: **SM-372-06** Colony Name: **Seal Rock Cliffs**
USFWS Colony Number: **429-032**
Latitude: 37°23'00"N Map Number: 69
Longitude: 122°25'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	17	29	0	37	06/07/89,01
Pelagic Cormorant	56	88	12	123	06/07/89,01
Western Gull*	1	1	0	2	06/07/89,01
Pigeon Guillemot	0	7	4	12	06/07/89,01
TOTAL				174	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	4	1980(Sowls et al. 1980)

CA Colony Number: **SM-372-07** Colony Name: **Martins Beach**
USFWS Colony Number: **429-033**
Latitude: 37°22'00"N Map Number: 69
Longitude: 122°24'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	49	66	12	108	06/07/89,01
Blk. Oystercatcher	0	1	0	1	06/07/89,01
Pigeon Guillemot	0	12	1	20	06/07/89,01
TOTAL				129	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	40	1980(Sowls et al. 1980)

CA Colony Number: **SM-370-01** Colony Name: **Pomponio Beach to Pescadero Beach**
USFWS Colony Number: **429-047***
Latitude: 37°16'42"N Map Number: 70
Longitude: 122°24'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	1	2	06/07/89,01
Pigeon Guillemot	0	8	0	20	06/07/89,01
TOTAL				22	

CA Colony Number: **SM-370-02** Colony Name: **Pigeon Point**
USFWS Colony Number: **429-034**
Latitude: 37°10'55"N Map Number: 71
Longitude: 122°23'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull*	1	2	0	2	06/07/89,01
Pigeon Guillemot	0	3	0	8	06/07/89,01
TOTAL				10	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **SM-370-03** Colony Name: **Gazos Creek North**
USFWS Colony Number: **429-048***
Latitude: 37°10'23"N Map Number: 71
Longitude: 122°22'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	3	0	4	06/07/89,01
Pigeon Guillemot	0	3	0	8	06/07/89,01
TOTAL				12	

CA Colony Number: **SM-370-04** Colony Name: **Ano Nuevo Island**
USFWS Colony Number: **429-023**
Latitude: 37°06'30"N Map Number: 72
Longitude: 122°20'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	2	ND	0	4	06/14/89,03
Pelagic Cormorant	6	61	3	13	06/14/89,03
Blk. Oystercatcher	5	27	0	27	06/14/89,03
Western Gull	691	ND	0	1382	06/13/89,03
Pigeon Guillemot	14	69	6	117	06/14/89,03
Rhinoceros Auklet*	ND	ND	79	79	06/14/89,03
TOTAL				1688	

CA Colony Number: **SM-370-05** Colony Name: **Punta del Ano Nuevo**
USFWS Colony Number: **429-022**
Latitude: 37°07'07"N Map Number: 72
Longitude: 122°20'09"W

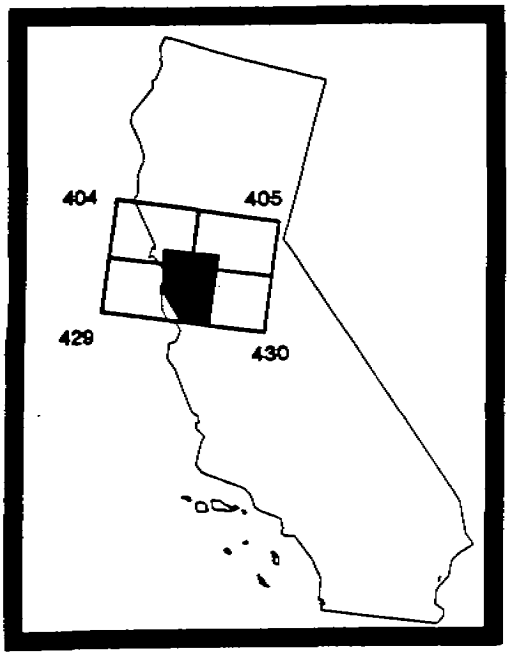
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	52	66	2	114	06/07/89,01
Pigeon Guillemot	0	44	1	102	06/07/89,01;06/08/89,01
TOTAL				216	

CA Colony Number: **SC-370-01** Colony Name: **Greyhound Rock to El Jarro Point** (Greyhound Rock to Davenport [Part])
USFWS Colony Number: **429-035, 429-049**
Latitude: 37°03'31"N Map Number: 73, 74
Longitude: 122°15'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	30	47	4	66	06/08/89,01
Blk. Oystercatcher	0	9	1	9	06/08/89,01
Western Gull*	1	1	0	2	06/08/89,01
Pigeon Guillemot	0	189	1	321	06/07/89,02;06/08/89,01
TOTAL				398	

CA Colony Number: **SC-370-02** Colony Name: **El Jarro Point to Davenport** (Greyhound Rock to Davenport [Part])
USFWS Colony Number: **429-035, 429-050**
Latitude: 37°01'05"N Map Number: 74
Longitude: 122°12'23"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	140	161	0	308	05/24/89,04
Pelagic Cormorant	10	38	5	22	06/08/89,01
Pigeon Guillemot	0	126	4	313	06/07/89,02;06/08/89,01; 06/08/89,02
Rhinoceros Auklet*	0	1	0	1	06/08/89,01
TOTAL				644	



SAN FRANCISCO BAY

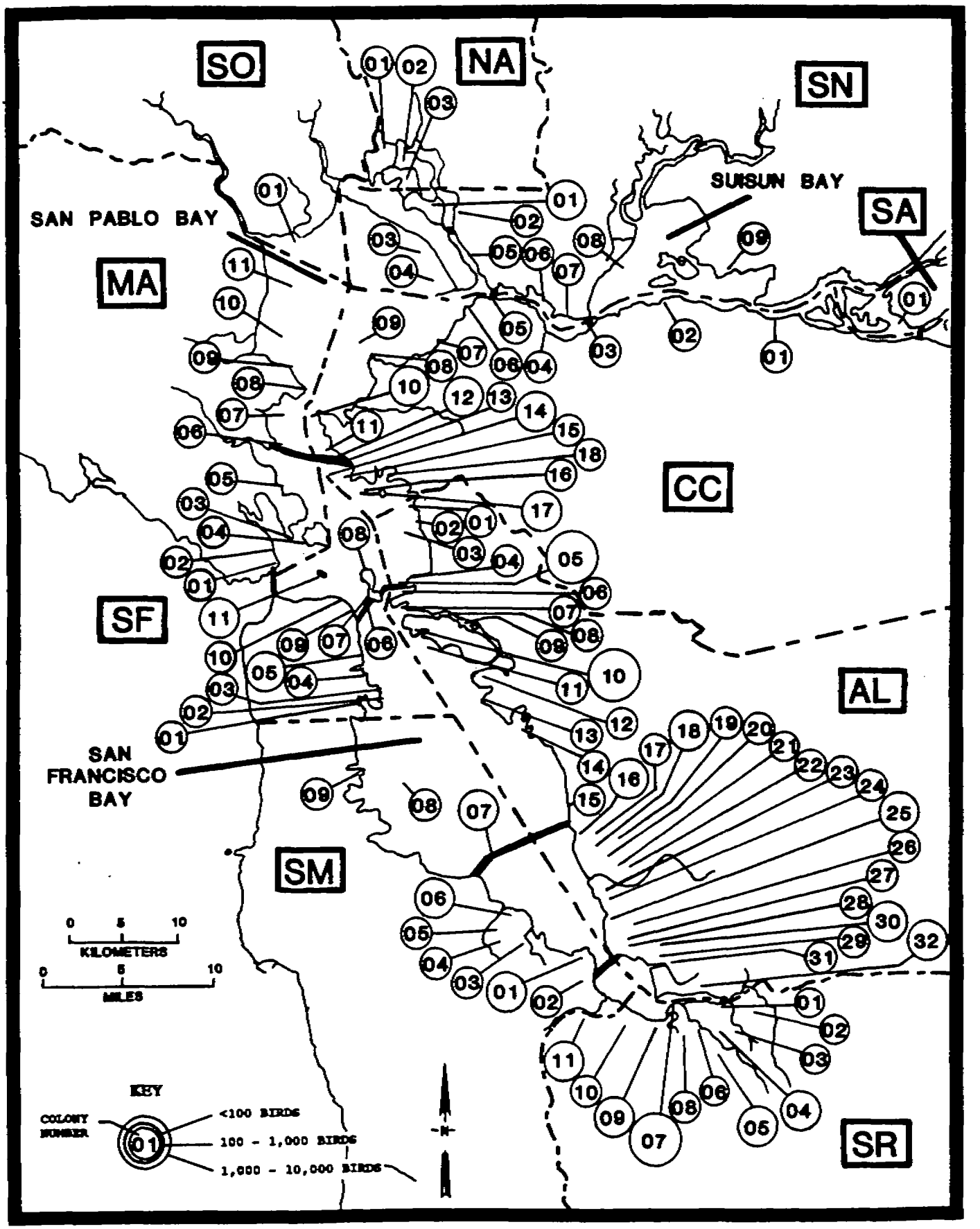
USFWS MAP BLOCKS:

404 (East) Santa Rosa,
405 (West) Sacramento,
429 (East) San Francisco, and
430 (West) San Jose

The map on the facing page is an index to the locations of colonies within the entire San Francisco Bay estuary east of the Golden Gate, plus adjacent salt pond areas and river/creek mouths. These colonies occur within the eastern parts of USFWS Map Blocks 404 and 429 as well as the western edges of USFWS Map Blocks 405 and 430. Colonies on this map are numbered consecutively in a clockwise direction along the coast within each county, starting at the north end of the Golden Gate Bridge in southern Marin County and ending at the south end of the Golden Gate Bridge in northern San Francisco County. In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989-1990:

Doubled-crested Cormorant	2,789	16.0%
Brandt's Cormorant	9	<0.1%
Pelagic Cormorant	4	<0.1%
Black Oystercatcher	6	<0.1%
Western Gull	3,274	18.8%
California Gull	4,764	27.4%
Heermann's Gull	H	0.0%
Forster's Tern	3,550	20.4%
Least Tern	178	1.0%
Caspian Tern	2,818	16.2%
Pigeon Guillemot	5	<0.1%
Marbled Murrelet	PH	0.0%
Total	17,397	


SO
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SAN FRANCISCO BAY
0 5 10
KILOMETERS
0 5 10
MILES
KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
N

CENTRAL CALIFORNIA
SAN FRANCISCO BAY AREA

USFWS MAP BLOCKS 404 ([EAST] SANTA ROSA), 405 ([WEST] SACRAMENTO), 429 ([EAST] SAN FRANCISCO), 430 ([WEST] SAN JOSE)
(Includes California Map Block SFB)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **SFB-MA-01** Colony Name: **Yellow Bluff**
USFWS Colony Number: **429-053***
Latitude: 37°50'13"N Map Number: 75
Longitude: 122°28'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	4	0	2	06/12/90,01
TOTAL				2	

CA Colony Number: **SFB-MA-02** Colony Name: **Sausalito Point Area**
USFWS Colony Number: **429-054***
Latitude: 37°51'22"N Map Number: 75
Longitude: 122°28'34"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	29	0	4	06/12/90,01
TOTAL				4	

CA Colony Number: **SFB-MA-03** Colony Name: **Peninsula Point and Cone Rock**
USFWS Colony Number: **429-055***
Latitude: 37°51'44"N Map Number: 75
Longitude: 122°27'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	3	0	6	06/12/90,01
TOTAL				6	

CA Colony Number: **SFB-MA-04** Colony Name: **Angel Island**
USFWS Colony Number: **429-056***
Latitude: 37°51'18"N Map Number: 76
Longitude: 122°26'24"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	11	0	6	06/12/90,01
TOTAL				6	

CA Colony Number: **SFB-MA-05** Colony Name: **Bluff Point to Paradise Cay**
USFWS Colony Number: **429-057***
Latitude: 37°53'47"N Map Number: 77
Longitude: 122°27'37"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	7	0	4	06/12/90,01
TOTAL				4	

CA Colony Number: **SFB-MA-06** Colony Name: **Point San Quentin**
USFWS Colony Number: **429-058***
Latitude: 37°56'48"N Map Number: 78
Longitude: 122°28'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	15	0	6	06/12/90,01
TOTAL				6	

CA Colony Number: **SFB-MA-07** Colony Name: **Marin Islands**
USFWS Colony Number: **429-059***
Latitude: 37°57'57"N Map Number: 78
Longitude: 122°28'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	2	0	2	06/11/90,06
Western Gull	18	56	14	64	06/12/90,01
TOTAL				66	

CA Colony Number: **SFB-MA-08** Colony Name: **The Sisters and Point San Pedro**
USFWS Colony Number: **429-041**
Latitude: 37°59'22"N Map Number: 79
Longitude: 122°26'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	48	ND	0	96	06/11/90,01
TOTAL				96	

CA Colony Number: **SFB-MA-09** Colony Name: **Rat Rock**
USFWS Colony Number: **404-046***
Latitude: 38°00'16"N Map Number: 79
Longitude: 122°27'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	4	0	2	06/19/90,03
TOTAL				2	

CA Colony Number: **SFB-MA-10** Colony Name: **Southwest San Pablo Bay Duck Blinds**
USFWS Colony Number: **404-047***
Latitude: 38°02'15"N Map Number: 80
Longitude: 122°28'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	4	11	2	16	06/19/90,01
TOTAL				16	

CA Colony Number: **SFB-MA-11** Colony Name: **Marin County-West San Pablo Bay Ship Channel**
USFWS Colony Number: **404-048***
Latitude: 38°04'17"N Map Number: 80
Longitude: 122°25'38"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	7	11	0	14	06/19/90,01
TOTAL				14	

CA Colony Number: **SFB-SO-01** Colony Name: **Sonoma County-West San Pablo Bay Ship Channel**
USFWS Colony Number: **404-049***
Latitude: 38°06'36"N Map Number: 81
Longitude: 122°27'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	2	0	2	06/19/90,01
TOTAL				2	

CA Colony Number: **SFB-NA-01** Colony Name: **Little Island**
USFWS Colony Number: **404-050***
Latitude: 38°10'52"N Map Number: 82
Longitude: 122°20'31"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1990(R. Leong, unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Caspian Tern	ND	600	0	750	1978(Page and Stenzel 1981)

CA Colony Number: **SFB-NA-02** Colony Name: **Russ Island**
USFWS Colony Number: **404-051***
Latitude: 38°10'57"N Map Number: 82
Longitude: 122°19'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	153	152	0	367	06/05/90,02(PRBO, unpubl. data)
TOTAL				367	

CA Colony Number: **SFB-NA-03** Colony Name: **Island No. 2**
USFWS Colony Number: **404-052***
Latitude: 38°09'56"N Map Number: 82
Longitude: 122°19'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	25	ND	0	50	06/17/89(R. Leong, unpubl. data)
TOTAL				50	

CA Colony Number: **SFB-SN-01** Colony Name: **Knight Island**
USFWS Colony Number: **404-053***
Latitude: 38°08'16"N Map Number: 83
Longitude: 122°17'58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	65	198	0	156	07/20/90,02
Western Gull	4	22	0	8	07/20/90,02
Forster's Tern	135	ND	0	270	07/20/90,02
Caspian Tern	38	133	0	76	06/10/90,02(R. Leong, unpubl. data)
TOTAL				510	

CA Colony Number: **SFB-SN-02** Colony Name: **White Slough**
USFWS Colony Number: **404-054***
Latitude: 38°07'39"N Map Number: 83
Longitude: 122°15'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	20	40	0	40	05/29/89,02(R. Leong, unpubl. data)
TOTAL				40	

CA Colony Number: **SFB-SN-03** Colony Name: **North San Pablo Bay Radar Target**
USFWS Colony Number: **404-055***
Latitude: 38°06'04"N Map Number: 84
Longitude: 122°19'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	20	12	0	48	06/19/90,01
TOTAL				48	

CA Colony Number: **SFB-SN-04** Colony Name: **Northeast San Pablo Bay Beacon**
USFWS Colony Number: **404-056***
Latitude: 38°04'17"N Map Number: 84
Longitude: 122°17'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	4	11	0	10	06/19/90,01
Western Gull	1	1	0	2	06/19/90,01
TOTAL				12	

CA Colony Number: **SFB-SN-05** Colony Name: **Mare Island Strait**
USFWS Colony Number: **404-057***
Latitude: 38°04'40"N Map Number: 85
Longitude: 122°14'43"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	10	34	0	20	06/18/90,01;1990(R. Leong, unpubl. data)
TOTAL				20	

CA Colony Number: **SFB-SN-06** Colony Name: **Commodore Jones Point to Benicia Point**
USFWS Colony Number: **404-058***
Latitude: 38°02'37"N Map Number: 86
Longitude: 122°09'54"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	5	8	0	10	06/16/90,03
TOTAL				10	

CA Colony Number: **SFB-SN-07** Colony Name: **Benicia Point to Army Point**
USFWS Colony Number: **404-059***
Latitude: 38°02'32"N Map Number: 86
Longitude: 122°09'08"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	5	0	6	06/16/90,01
TOTAL				6	

CA Colony Number: **SFB-SN-08** Colony Name: **Mothball Fleet**
USFWS Colony Number: **404-060***
Latitude: 38°05'00"N Map Number: 87
Longitude: 122°05'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	ND	7	2	10	06/16/90,01
TOTAL				10	

CA Colony Number: **SFB-SN-09** Colony Name: **Wheeler Island**
USFWS Colony Number: **405-001***
Latitude: 38°04'37"N Map Number: 88
Longitude: 121°57'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	27	ND	0	65	05/23/91,02 (J. Kelly, pers. comm.)
TOTAL				65	

CA Colony Number: **SFB-SA-01** Colony Name: **Donlon Island**
USFWS Colony Number: **405-002***
Latitude: 38°01'45"N Map Number: 89
Longitude: 121°46'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	28	0	0	67	06/17/90,01
TOTAL				67	

CA Colony Number: **SFB-CC-01** Colony Name: **Pittsburg Pacific Gas and Electric Plant**
USFWS Colony Number: **405-003***
Latitude: 38°02'17"N Map Number: 90
Longitude: 121°54'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	4	6	0	8	1989(Massey 1989)
TOTAL				8	

CA Colony Number: **SFB-CC-02** Colony Name: **Port Chicago Allied Chemical Company**
USFWS Colony Number: **405-004***
Latitude: 38°02'56"N Map Number: 91
Longitude: 121°59'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	1	2	0	2	1988(Massey 1988)

CA Colony Number: **SFB-CC-03** Colony Name: **Suisun Point Area**
USFWS Colony Number: **404-061***
Latitude: 38°02'15"N Map Number: 86
Longitude: 122°07'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	5	0	6	06/16/90,01
TOTAL				6	

CA Colony Number: **SFB-CC-04** Colony Name: **Nevada Dock**
USFWS Colony Number: **404-062***
Latitude: 38°02'11"N Map Number: 86
Longitude: 122°10'22"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	06/16/90,01
TOTAL				2	

CA Colony Number: **SFB-CC-05** Colony Name: **Eckley to Selby**
USFWS Colony Number: **404-063***
Latitude: 38°03'27"N Map Number: 92
Longitude: 122°13'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	3	0	4	06/16/90,01
TOTAL				4	

CA Colony Number: **SFB-CC-06** Colony Name: **Davis Point Unocal Wharves**
USFWS Colony Number: **404-064***
Latitude: 38°03'16"N Map Number: 93
Longitude: 122°15'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	11	25	0	22	06/18/90,01
TOTAL				22	

CA Colony Number: **SFB-CC-07** Colony Name: **Hercules Wharf**
USFWS Colony Number: **404-065***
Latitude: 38°01'23"N Map Number: 93
Longitude: 122°17'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	06/18/90,01
TOTAL				2	

CA Colony Number: **SFB-CC-08** Colony Name: **Pinole Point**
USFWS Colony Number: **404-066***
Latitude: 38°00'25"N Map Number: 94
Longitude: 122°21'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	2	0	2	06/18/90,01
TOTAL				2	

CA Colony Number: **SFB-CC-09** Colony Name: **East San Pablo Bay Ship Channel**
USFWS Colony Number: **404-067***
Latitude: 38°01'48"N Map Number: 80
Longitude: 122°22'18"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	4	0	6	06/18/90,01
TOTAL				6	

CA Colony Number: **SFB-CC-10** Colony Name: **The Brothers**
USFWS Colony Number: **429-040**
Latitude: 37°57'47"N Map Number: 95
Longitude: 122°26'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	0	1	0	1	06/11/90,01
Western Gull	89	185	0	178	06/11/90,03
TOTAL				179	

CA Colony Number: **SFB-CC-11** Colony Name: **Castro Point Area**
USFWS Colony Number: **429-060***
Latitude: 37°56'08"N Map Number: 95
Longitude: 122°24'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	4	18	0	8	06/11/90,01
TOTAL				8	

CA Colony Number: **SFB-CC-12** Colony Name: **Richmond-San Rafael Bridge**
USFWS Colony Number: **429-061***
Latitude: 37°56'01"N Map Number: 78, 95
Longitude: 122°25'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	389	ND	0	778	1989(Rauzon et al. 1990)
Western Gull	9	24	0	18	06/11/90,01;1990(PRBO, unpubl. data)
TOTAL				796	

CA Colony Number: **SFB-CC-13** Colony Name: **Castro Rocks**
USFWS Colony Number: **429-062***
Latitude: 37°55'57"N Map Number: 95
Longitude: 122°24'57"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1990(PRBO, unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Western Gull	2	4	0	4	1988(PRBO, unpubl. data)

CA Colony Number: **SFB-CC-14** Colony Name: **Red Rock**
USFWS Colony Number: **429-039**
Latitude: 37°55'45"N Map Number: 95
Longitude: 122°25'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	192	ND	0	384	06/11/90,03
TOTAL				384	

CA Colony Number: **SFB-CC-15** Colony Name: **Standard Oil Long Wharf**
USFWS Colony Number: **429-063***
Latitude: 37°55'31"N Map Number: 95
Longitude: 122°24'14"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	8	0	6	06/24/90,01
TOTAL				6	

CA Colony Number: **SFB-CC-16** Colony Name: **Richmond Harbor Entrance Channel**
USFWS Colony Number: **429-064***
Latitude: 37°54'18"N Map Number: 96
Longitude: 122°22'38"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	6	8	0	12	06/13/90,01;06/24/90,01
TOTAL				12	

CA Colony Number: **SFB-CC-17** Colony Name: **Brooks Island Area**
USFWS Colony Number: **429-065***
Latitude: 37°53'47"N Map Number: 96
Longitude: 122°21'16"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	2	0	2	06/10/90,03
Western Gull	49	ND	2	98	06/10/90,03
Caspian Tern	0	ND	60	120	08/11/90,03(F. McCollom, unpubl. data)
TOTAL				220	

CA Colony Number: **SFB-CC-18** Colony Name: **Richmond Inner Harbor**
USFWS Colony Number: **429-066***
Latitude: 37°54'36"N Map Number: 96, 97
Longitude: 122°21'42"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	ND	8	1	12	06/13/90,01;06/24/90,01
TOTAL				12	

CA Colony Number: **SFB-AL-01** Colony Name: **Albany Hill Cove**
USFWS Colony Number: **429-067***
Latitude: 37°53'33"N Map Number: 97
Longitude: 122°18'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	5	0	2	06/13/90,01
TOTAL				2	

CA Colony Number: **SFB-AL-02** Colony Name: **Berkeley Yacht Harbor Breakwaters**
USFWS Colony Number: **429-068***
Latitude: 37°51'59"N Map Number: 98
Longitude: 122°19'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	19	ND	0	38	06/13/90,01
TOTAL				38	

CA Colony Number: **SFB-AL-03** Colony Name: **Berkeley Pier**
USFWS Colony Number: **429-069***
Latitude: 37°51'15"N Map Number: 98
Longitude: 122°20'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	20	51	0	40	06/13/90,01
TOTAL				40	

CA Colony Number: **SFB-AL-04** Colony Name: **Bay Bridge "Toll Plaza Point"**
USFWS Colony Number: **429-070***
Latitude: 37°49'52"N Map Number: 99
Longitude: 122°18'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	28	0	2	06/13/90,01
TOTAL				2	
Historically-nesting species (most recent known date)					
Least Tern	1	2	0	2	1985(Collins 1985)

CA Colony Number: **SFB-AL-05** Colony Name: **San Francisco-Oakland Bay Bridge East**
USFWS Colony Number: **429-071***
Latitude: 37°49'10"N Map Number: 99
Longitude: 122°20'31"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	465	692	0	1116	06/04/90(PRBO, unpubl. data)
Western Gull	20	ND	0	40	06/13/90,01
TOTAL				1156	

CA Colony Number: **SFB-AL-06** Colony Name: **Oakland Outer Harbor**
USFWS Colony Number: **429-072***
Latitude: 37°48'59"N Map Number: 99
Longitude: 122°19'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	4	6	0	8	06/14/90,01
TOTAL				8	

CA Colony Number: **SFB-AL-07** Colony Name: **Oakland Middle Harbor**
USFWS Colony Number: **429-073***
Latitude: 37°48'01"N Map Number: 99
Longitude: 122°21'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	5	6	0	10	06/14/90,01
TOTAL				10	

CA Colony Number: **SFB-AL-08** Colony Name: **Oakland Inner Harbor**
USFWS Colony Number: **429-074***
Latitude: 37°47'27"N Map Number: 100
Longitude: 122°18'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	4	0	6	06/14/90,01
TOTAL				6	

CA Colony Number: **SFB-AL-09** Colony Name: **Government Island Area**
USFWS Colony Number: **429-075***
Latitude: 37°47'05"N Map Number: 101
Longitude: 122°15'18"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	06/14/90,01
TOTAL				2	

CA Colony Number: **SFB-AL-10** Colony Name: **Alameda Naval Air Station**
USFWS Colony Number: **429-010**
Latitude: 37°47'12"N Map Number: 100
Longitude: 122°19'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull*	251	ND	0	502	06/14/90,03;06/28/90,02
Least Tern	78	144-150	0	150	1989(Massey 1989)
Caspian Tern*	ND	950	0	1188	06/01/90(L. Collins, unpubl. data)
TOTAL				1840	

CA Colony Number: **SFB-AL-11** Colony Name: **Ballena Bay**
USFWS Colony Number: **429-076***
Latitude: 37°46'00"N Map Number: 100
Longitude: 122°17'13"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	3	8	1	6	1968(Chandik and Baldridge 1968)

CA Colony Number: **SFB-AL-12** Colony Name: **Bay Farm Island**
USFWS Colony Number: **429-077***
Latitude: 37°44'36"N Map Number: 102
Longitude: 122°15'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	11	18	0	22	1975(CDFG, unpubl. notes)

CA Colony Number: **SFB-AL-13** Colony Name: **Oakland International Airport**
USFWS Colony Number: **429-011**
Latitude: 37°43'22"N Map Number: 102
Longitude: 122°14'42"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	9	12	0	18	1989(Massey 1989)
TOTAL				18	

CA Colony Number: **SFB-AL-14** Colony Name: **Mulford Landing Channel**
USFWS Colony Number: **429-078***
Latitude: 37°41'26"N Map Number: 103
Longitude: 122°11'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	06/22/90,01
TOTAL				2	

CA Colony Number: **SFB-AL-15** Colony Name: **Hayward Marsh, Basin 3A**
USFWS Colony Number: **429-079***
Latitude: 37°37'47"N Map Number: 104
Longitude: 122°08'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	1	2	0	2	1990(M. Taylor, unpubl. data)
TOTAL				2	

CA Colony Number: **SFB-AL-16** Colony Name: **Baumberg Plant No. 1, Pond No. 10 (Alameda Creek)**
USFWS Colony Number: **429-015**
Latitude: 37°36'41"N Map Number: 104
Longitude: 122°08'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	651	0	814	1989(SFBBO,unpubl. data)
TOTAL				814	

CA Colony Number: **SFB-AL-17** Colony Name: **Baumberg Plant No. 1, Pond Nos. 10 and 11**
USFWS Colony Number: **429-080***
Latitude: 37°36'42"N Map Number: 104
Longitude: 122°08'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	1	2	0	2	1985(Collins 1985)

CA Colony Number: **SFB-AL-18** Colony Name: **Baumberg Plant No. 1,**
USFWS Colony Number: **429-081*** **Pond No. 8A**
Latitude: 37°35'49"N Map Number: 104
Longitude: 122°07'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	250	0	313	1989(SFBBO,unpubl. data)
TOTAL				313	

CA Colony Number: **SFB-AL-19** Colony Name: **Baumberg Plant No. 1,**
USFWS Colony Number: **429-082*** **Pond No. 6B**
Latitude: 37°35'53"N Map Number: 105
Longitude: 122°06'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	68	0	85	1989(SFBBO,unpubl. data)
TOTAL				85	

CA Colony Number: **SFB-AL-20** Colony Name: **Baumberg Plant No. 1,**
USFWS Colony Number: **429-017, 429-083** **Pond Nos. 1, 2, and 7**
(Coyote Hills [Part])
Latitude: 37°35'08"N Map Number: 106
Longitude: 122°07'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	ND	75-100	0	100	1971(Gill 1973)

CA Colony Number: **SFB-AL-21** Colony Name: **Baumberg Plant No. 1,**
USFWS Colony Number: **429-017, 429-084** **Pond Nos. 2, 4, and 7**
(Coyote Hills [Part])
Latitude: 37°34'49"N Map Number: 106
Longitude: 122°07'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	ND	614	0	768	1971(Gill 1973)
Caspian Tern	125	365	0	250	1986(SFBBO,unpubl. data)

CA Colony Number: **SFB-AL-22** Colony Name: **Baumberg Plant No. 1, Pond Nos. 4, 5, and 7**
USFWS Colony Number: **429-085***
Latitude: 37°34'51"N Map Number: 106
Longitude: 122°06'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	75	0	94	1989(SFBBO,unpubl. data)
TOTAL				94	

CA Colony Number: **SFB-AL-23** Colony Name: **Plant No. 1, Pond No. 1A-Northwest** (Coyote Hills [Part])
USFWS Colony Number: **429-017, 429-086**
Latitude: 37°34'07"N Map Number: 106
Longitude: 122°07'27"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	12	ND	0	24	1980(Rigney and Emery 1980)

CA Colony Number: **SFB-AL-24** Colony Name: **Plant No. 1, Pond No. 1A**
USFWS Colony Number: **429-087***
Latitude: 37°34'02"N Map Number: 106
Longitude: 122°07'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	22	ND	0	44	1981(SFBBO,unpubl. data)

CA Colony Number: **SFB-AL-25** Colony Name: **Plant No. 1, Pond No. 2A**
USFWS Colony Number: **429-088***
Latitude: 37°33'36"N Map Number: 106
Longitude: 122°07'24"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	100	0	125	1989(SFBBO,unpubl. data)
TOTAL				125	

CA Colony Number: **SFB-AL-26** Colony Name: **Plant No. 1, Pond No. 3A**
USFWS Colony Number: **429-089***
Latitude: 37°33'14"N Map Number: 106
Longitude: 122°06'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	25	ND	0	50	1981(SFBBO,unpubl. data)

CA Colony Number: **SFB-AL-27** Colony Name: **Plant No. 1, Pond Nos. 4, 5, 6, and 7**
USFWS Colony Number: **429-090***
Latitude: 37°32'03"N Map Number: 107
Longitude: 122°06'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	1	9	0	2	1981(SFBBO,unpubl. data)

CA Colony Number: **SFB-AL-28** Colony Name: **KGO Radio Towers**
USFWS Colony Number: **429-091***
Latitude: 37°31'31"N Map Number: 107
Longitude: 122°06'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	277	ND	0	554	1971(Gill 1973)
Caspian Tern	ND	ND	0	X	1966(Chaniot 1970)

CA Colony Number: **SFB-AL-29** Colony Name: **Plant No. 1, Pond No. 3**
USFWS Colony Number: **429-092***
Latitude: 37°30'45"N Map Number: 107
Longitude: 122°06'02"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	79	0	99	1989(SFBBO,unpubl. data)
TOTAL				99	

CA Colony Number: **SFB-AL-30** Colony Name: **Plant No. 1, Pond No. 1**
USFWS Colony Number: **429-093***
Latitude: 37°31'32"N Map Number: 107
Longitude: 122°04'37"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	163	0	204	1989(SFBBO,unpubl. data)
TOTAL				204	

CA Colony Number: **SFB-AL-31** Colony Name: **Plant No. 2, Pond Nos. 11 and 26**
USFWS Colony Number: **429-094***
Latitude: 37°29'50"N Map Number: 108
Longitude: 122°02'42"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
California Gull	15	ND	0	30	1988(SFBBO,unpubl. data)
Forster's Tern	11	ND	0	22	1953(Sibley 1953)

CA Colony Number: **SFB-AL-32** Colony Name: **Plant No. 2, Pond Nos. 4 and 5** (Coyote Creek)
USFWS Colony Number: **429-019, 430-001**
Latitude: 37°28'27"N Map Number: 109
Longitude: 121°59'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Caspian Tern	317	ND	0	634	05/14/89(SFBNWR, unpubl. data)
TOTAL				634	

CA Colony Number: **SFB-SR-01** Colony Name: **Alviso Plant, Pond No. A17**
USFWS Colony Number: **430-002***
Latitude: 37°27'33"N Map Number: 109
Longitude: 121°58'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	20	0	25	1989(SFBBO,unpubl. data)
TOTAL				25	

CA Colony Number: **SFB-SR-02** Colony Name: **Alviso Plant, Pond No. A18**
USFWS Colony Number: **430-003***
Latitude: 37°26′49"N Map Number: 109
Longitude: 121°56′33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	ND	22	0	28	1988(SFBBO,unpubl. data)

CA Colony Number: **SFB-SR-03** Colony Name: **Alviso Plant, Pond No. A16**
USFWS Colony Number: **430-004***
Latitude: 37°26′31"N Map Number: 109
Longitude: 121°57′43"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	34	0	43	1989(SFBBO,unpubl. data)
TOTAL				43	

CA Colony Number: **SFB-SR-04** Colony Name: **Alviso Plant, Pond Nos. A9 and A10**
USFWS Colony Number: **430-005***
Latitude: 37°26′57"N Map Number: 109
Longitude: 121°59′34"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
California Gull	217	350	0	434	1989(SFBBO,unpubl. data)
TOTAL				434	

CA Colony Number: **SFB-SR-05** Colony Name: **Alviso Plant, Pond No. A8** (Guadalupe Slough [Part])
USFWS Colony Number: **429-020, 430-006**
Latitude: 37°25′43"N Map Number: 110
Longitude: 121°59′42"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	126	0	158	1989(SFBBO,unpubl. data)
TOTAL				158	

CA Colony Number: **SFB-SR-06** Colony Name: **Alviso Plant, Pond No. A7** (Guadalupe Slough [Part])
USFWS Colony Number: **429-020, 429-095**
Latitude: 37°26′29"N Map Number: 111
Longitude: 122°00′27"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	76	0	95	1989(SFBBO,unpubl. data)
TOTAL				95	

CA Colony Number: **SFB-SR-07** Colony Name: **Alviso Plant, Pond No. A6** (Guadalupe Slough [Part])
USFWS Colony Number: **429-020, 429-096**
Latitude: 37°27'24"N Map Number: 111
Longitude: 122°01'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull*	2	ND	0	4	1989(SFBBO,unpubl. data)
California Gull*	2164	4500	0	4328	1989(SFBBO,unpubl. data)
Forster's Tern	ND	155	0	194	1989(SFBBO,unpubl. data)
TOTAL				4526	

CA Colony Number: **SFB-SR-08** Colony Name: **Alviso Plant, Pond No. A5** (Guadalupe Slough [Part])
USFWS Colony Number: **429-020, 429-097**
Latitude: 37°26'37"N Map Number: 111
Longitude: 122°01'23"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	ND	10	0	13	1987(SFBBO,unpubl. data)

CA Colony Number: **SFB-SR-09** Colony Name: **Alviso Plant, Pond No. B2**
USFWS Colony Number: **429-098***
Latitude: 37°26'22"N Map Number: 111
Longitude: 122°02'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	384	0	480	1989(SFBBO,unpubl. data)
TOTAL				480	

CA Colony Number: **SFB-SR-10** Colony Name: **Alviso Plant, Pond No. A1**
USFWS Colony Number: **429-099***
Latitude: 37°26'11"N Map Number: 112
Longitude: 122°05'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
California Gull	1	2	0	2	07/01/90(P. Metropulos, unpubl. data)
Forster's Tern	ND	30	0	38	1989(SFBBO,unpubl. data)
TOTAL				40	

CA Colony Number: **SFB-SR-11** Colony Name: **Charleston Slough**
USFWS Colony Number: **429-100***
Latitude: 37°26'33"N Map Number: 112
Longitude: 122°05'22"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	200	0	250	1989(SFBBO,unpubl. data)
TOTAL				250	

CA Colony Number: **SFB-SM-01** Colony Name: **Redwood City Plant, Pond No. 1**
USFWS Colony Number: **429-101***
Latitude: 37°29'51"N Map Number: 113
Longitude: 122°08'59"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern	ND	80	0	100	1989(SFBBO,unpubl. data)
TOTAL				100	

CA Colony Number: **SFB-SM-02** Colony Name: **Redwood City Plant, Pond No. 3**
USFWS Colony Number: **429-102***
Latitude: 37°29'15"N Map Number: 113
Longitude: 122°08'48"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	30	ND	0	60	1976(B. Sauppe, unpubl. data)
Least Tern	3	ND	0	6	1976(B. Sauppe, unpubl. data)

CA Colony Number: **SFB-SM-03** Colony Name: **Bair Island, Pond No. A10**
USFWS Colony Number: **429-016, 429-103** (Bair Island [Part])
Latitude: 37°31'01"N Map Number: 114
Longitude: 122°13'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern*	ND	100	0	125	1982(SFBNWR,unpubl. data)

CA Colony Number: **SFB-SM-04** Colony Name: **Bair Island, Pond No. A9**
USFWS Colony Number: **429-016, 429-104** (Bair Island [Part])
Latitude: 37°30'58"N Map Number: 114
Longitude: 122°14'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern*	ND	200	0	250	1982(SFBNWR,unpubl. data)

CA Colony Number: **SFB-SM-05** Colony Name: **Bair Island, Pond No. B3**
USFWS Colony Number: **429-016, 429-105** (Bair Island [Part])
Latitude: 37°31'42"N Map Number: 114
Longitude: 122°14'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(SFBBO,unpubl. data)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern*	ND	150	0	188	1987(SFBBO,unpubl. data)

CA Colony Number: **SFB-SM-06** Colony Name: **Bair Island, Pond No. B1**
USFWS Colony Number: **429-016, 429-106** **(East)** (Bair Island [Part])
Latitude: 37°32'12"N Map Number: 114
Longitude: 122°12'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Forster's Tern*	ND	50	0	63	1989(SFBBO,unpubl. data)
Caspian Tern*	400	600	0	800	1989(SFBBO,unpubl. data)
TOTAL				863	
Historically-nesting species (most recent known date)					
Least Tern	3	6	0	6	1984(SFBBO,unpubl. data)

CA Colony Number: **SFB-SM-07** Colony Name: **San Mateo Bridge and Pacific Gas and Electric Towers**
USFWS Colony Number: **429-107***
Latitude: 37°35'24"N Map Number: 115
Longitude: 122°14'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	76	122	0	182	06/22/90,01
Western Gull	3	9	2	6	06/22/90,01
TOTAL				188	

CA Colony Number: **SFB-SM-08** Colony Name: **San Francisco Bay Ship Channel**
USFWS Colony Number: **429-108***
Latitude: 37°40'05"N Map Number: 116
Longitude: 122°21'31"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	4	6	0	8	06/14/90,01
TOTAL				8	

CA Colony Number: **SFB-SM-09** Colony Name: **Oyster Point Area**
USFWS Colony Number: **429-109***
Latitude: 37°39'01"N Map Number: 117
Longitude: 122°22'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	06/07/90,01
Forster's Tern	5	8	0	10	06/07/90,03
TOTAL				12	

CA Colony Number: **SFB-SF-01** Colony Name: **Double Rock**
USFWS Colony Number: **429-110***
Latitude: 37°43'14"N Map Number: 118
Longitude: 122°22'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	4	0	2	06/07/90,03
TOTAL				2	

CA Colony Number: **SFB-SF-02** Colony Name: **Hunter's Point**
USFWS Colony Number: **429-111***
Latitude: 37°43'42"N Map Number: 118
Longitude: 122°21'22"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	ND	35	0	50	06/07/90,01;06/29/90,02
TOTAL				50	

CA Colony Number: **SFB-SF-03** Colony Name: **Lash Lighter Basin**
USFWS Colony Number: **429-112***
Latitude: 37°44'24"N Map Number: 118
Longitude: 122°22'05"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	20	60	0	40	06/29/90,02
TOTAL				40	

CA Colony Number: **SFB-SF-04** Colony Name: **Potrero Point**
USFWS Colony Number: **429-113***
Latitude: 37°45'19"N Map Number: 119
Longitude: 122°22'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	28	0	6	06/05/90,01
TOTAL				6	

CA Colony Number: **SFB-SF-05** Colony Name: **San Francisco Piers South**
USFWS Colony Number: **429-114***
Latitude: 37°46'51"N Map Number: 119
Longitude: 122°22'59"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	116	251	3	232	06/05/90,01;06/29/90,03
TOTAL				232	

CA Colony Number: **SFB-SF-06** Colony Name: **San Francisco-Oakland Bay Bridge West**
USFWS Colony Number: **429-115***
Latitude: 37°48'03"N Map Number: 99
Longitude: 122°22'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	24	49	0	48	06/13/90,01
TOTAL				48	

CA Colony Number: **SFB-SF-07** Colony Name: **Yerba Buena Island**
USFWS Colony Number: **429-038**
Latitude: 37°48'34"N Map Number: 99
Longitude: 122°22'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	4	15	0	9	06/14/90,01
Pelagic Cormorant*	2	15	2	4	06/14/90,01
Blk. Oystercatcher*	0	1	0	1	06/13/90,01
Western Gull	31	82	12	62	06/13/90,01
TOTAL				76	

CA Colony Number: **SFB-SF-08** Colony Name: **Treasure Island**
USFWS Colony Number: **429-116***
Latitude: 37°49'48"N Map Number: 99
Longitude: 122°21'53"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	48	74	0	96	06/13/90,01
TOTAL				96	

CA Colony Number: **SFB-SF-09** Colony Name: **San Francisco Piers North**
USFWS Colony Number: **429-117***
Latitude: 37°48'27"N Map Number: 120
Longitude: 122°24'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	31	160	0	62	06/06/90,11;06/06/90,12
TOTAL				62	

CA Colony Number: **SFB-SF-10** Colony Name: **Pier 45**
USFWS Colony Number: **429-037**
Latitude: 37°48'34"N Map Number: 120
Longitude: 122°25'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	33	457	0	66	06/29/90,12
TOTAL				66	

CA Colony Number: **SFB-SF-11** Colony Name: **Alcatraz Island**
USFWS Colony Number: **429-036**
Latitude: 37°49'34"N Map Number: 120
Longitude: 122°25'20"W

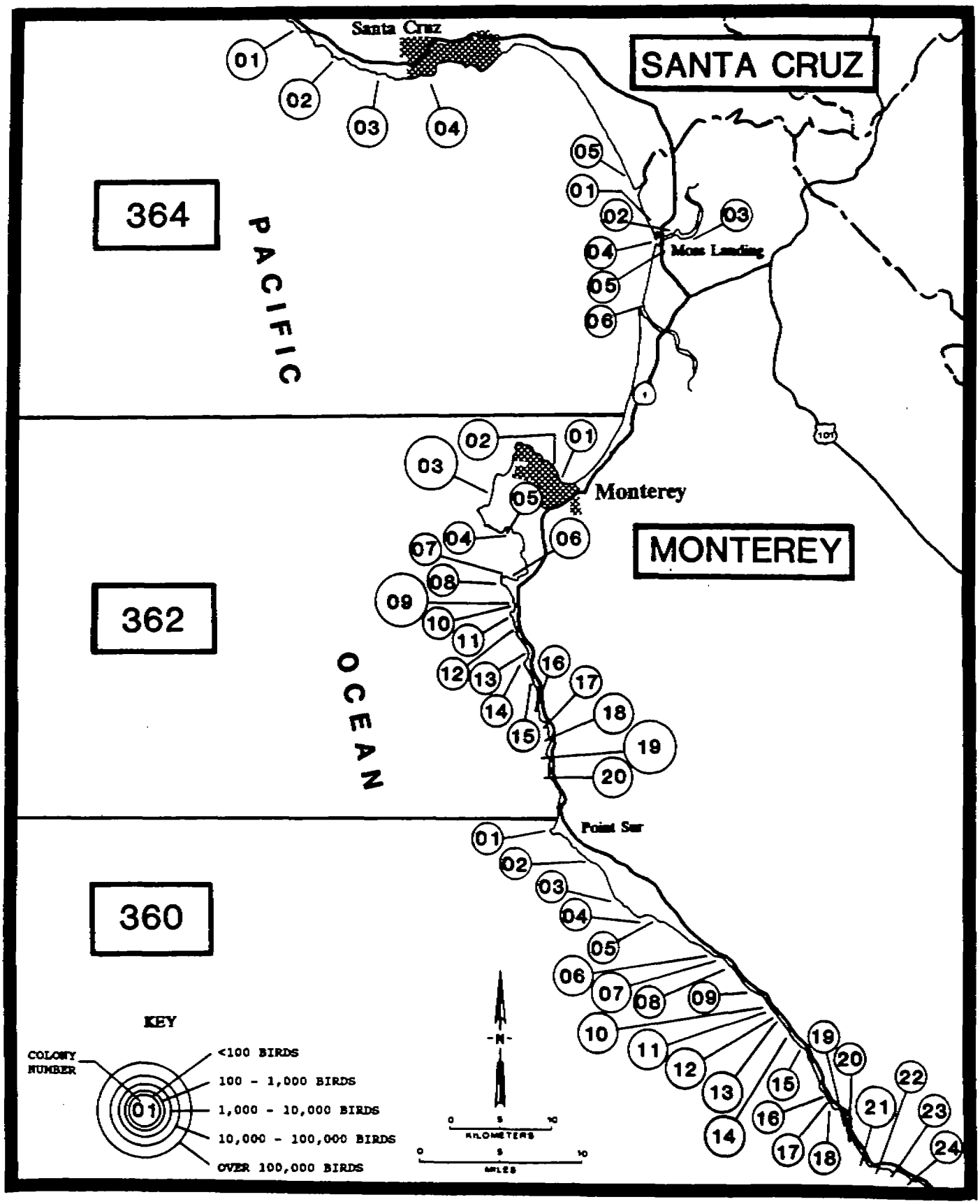
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	450	ND	0	900	05/16/90(Bell 1990)
Pigeon Guillemot*	0	3	3	5	06/06/89,01
TOTAL				905	
Historically-nesting species (most recent known date)					
Heermann's Gull	1	2	0	2	1981(Howell et al. 1983)

USFWS MAP BLOCK
454
Monterey

The map on the facing page is an index to the locations of colonies within USFWS Map Block 454, Monterey. All colonies on this map are numbered consecutively from north to south within counties in 20′ latitude California Map Blocks (i.e. 364 = 36°40′ to 37°00′N; 362 = 36°20′ to 36°40′N; 360 = 36°00 to 36°20′N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Doubled-crested Cormorant	36	0.2%
Brandt's Cormorant	11,661	71.0%
Pelagic Cormorant	635	3.9%
Black Oystercatcher	47	0.3%
Western Gull	520	3.2%
Forster's Tern	H	0.0%
Least Tern	H	0.0%
Caspian Tern	20	0.1%
Common Murre	1,663	10.1%
Pigeon Guillemot	1,775	10.8%
Marbled Murrelet	58	0.4%
Tufted Puffin	H	0.0%
Unidentified alcid	4	<0.1%
Total	16,419	


SANTA CRUZ
MONTEREY
364
362
360
PACIFIC
OCEAN
Santa Cruz
Moss Landing
Monterey
Point Sur
KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
N
KILOMETERS
MILES

CENTRAL CALIFORNIA
USFWS MAP BLOCK 454: MONTEREY
(Includes California Map Blocks 364, 362 and 360)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
* - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **SC-364-01** Colony Name: **Davenport to Sand Hill Bluff** (Davenport to Point Santa Cruz [Part])
USFWS Colony Number: **454-021, 454-038**
Latitude: 36°59'45"N Map Number: 74, 121
Longitude: 122°10'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	6	7	0	13	06/08/89,01
Blk. Oystercatcher	0	1	0	1	06/08/89,01
Pigeon Guillemot	0	198	3	495	06/08/89,01
TOTAL				509	

CA Colony Number: **SC-364-02** Colony Name: **Sand Hill Bluff to Needle Rock Point** (Davenport to Point Santa Cruz [Part])
USFWS Colony Number: **454-021, 454-039**
Latitude: 36°58'01"N Map Number: 121, 122
Longitude: 122°07'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	6	0	2	06/08/89,01
Blk. Oystercatcher	0	3	0	3	06/08/89,01
Pigeon Guillemot	0	98	2	245	06/08/89,01
TOTAL				250	

CA Colony Number: **SC-364-03** Colony Name: **Needle Rock Point to Terrace Point** (Davenport to Point Santa Cruz [Part])
USFWS Colony Number: **454-021, 454-040**
Latitude: 36°57'09"N Map Number: 122
Longitude: 122°05'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	14	27	0	31	06/08/89,01
Blk. Oystercatcher	0	6	0	6	06/08/89,01
Western Gull	3	4	0	6	06/08/89,01
Pigeon Guillemot	0	93	5	232	06/08/89,01
TOTAL				275	

CA Colony Number: **SC-364-04** Colony Name: **Terrace Point to Point Santa Cruz** (Davenport to Point Santa Cruz [Part])
USFWS Colony Number: **454-021, 454-041**
Latitude: 36°57'09"N Map Number: 123
Longitude: 122°02'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	06/08/89,01
Western Gull	1	2	0	2	06/08/89,01
Pigeon Guillemot	0	82	34	205	06/08/89,01;06/08/89,02
TOTAL				208	

CA Colony Number: **SC-364-05** Colony Name: **Palm Beach**
USFWS Colony Number: **454-056***
Latitude: 36°52'00"N Map Number: 124
Longitude: 121°49'05"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	ND	12	0	12	1956(Atwood et al. 1979)

CA Colony Number: **MO-364-01** Colony Name: **Salinas River Old Mouth**
USFWS Colony Number: **454-057***
Latitude: 36°49'12"N Map Number: 125
Longitude: 121°47'34"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	ND	ND	0	X	1956(Atwood et al. 1979)

CA Colony Number: **MO-364-02** Colony Name: **Elkhorn Slough Salt Ponds**
USFWS Colony Number: **454-003**
Latitude: 36°49'04"N Map Number: 125
Longitude: 121°46'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	5	15	0	10	06/10/89,02
TOTAL				10	
Historically-nesting species (most recent known date)					
Forster's Tern	ND	ND	ND	95	1980(Sowls et al. 1980)
Caspian Tern	ND	ND	ND	180	1980(Sowls et al. 1980)

CA Colony Number: **MO-364-03** Colony Name: **Elkhorn Slough Estuarine Reserve**
USFWS Colony Number: **454-058***
Latitude: 36°49'03"N Map Number: 126
Longitude: 121°44'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	8	16	0	16	06/10/89,02
Caspian Tern	10	ND	0	20	1991 (D. Serdeholy, pers. comm.)
TOTAL				36	

CA Colony Number: **MO-364-04** Colony Name: **Moss Landing Harbor**
USFWS Colony Number: **454-042***
Latitude: 36°48'28"N Map Number: 125
Longitude: 121°47'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	8	9	0	16	06/10/89,02
TOTAL				16	

CA Colony Number: **MO-364-05** Colony Name: **Moro Cojo Slough**
USFWS Colony Number: **454-059***
Latitude: 36°47'49"N Map Number: 125
Longitude: 121°46'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	ND	ND	0	X	1930's(Harvey 1982)

CA Colony Number: **MO-364-06** Colony Name: **Salinas River New Mouth**
USFWS Colony Number: **454-060***
Latitude: 36°44′25"N Map Number: 127
Longitude: 121°47′58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Forster's Tern	ND	ND	0	X	1949(H. Cogswell, unpubl. data)
Least Tern	ND	ND	0	X	1937(Atwood et al. 1979)
Caspian Tern	ND	ND	0	X	1983(J. Warriner, unpubl. data)

CA Colony Number: **MO-362-01** Colony Name: **Monterey Harbor**
USFWS Colony Number: **454-043***
Latitude: 36°36′22"N Map Number: 128
Longitude: 121°53′26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	12	18	0	24	06/10/89,01;06/12/89,02
Pigeon Guillemot	5	14	0	35	06/10/89,01
TOTAL				59	

CA Colony Number: **MO-362-02** Colony Name: **Cannery Row**
USFWS Colony Number: **454-044***
Latitude: 36°36′47"N Map Number: 128
Longitude: 121°53′48"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	90	ND	0	198	06/11/89,02
Western Gull	43	99	0	86	06/10/89,01;06/11/89,02; 06/12/89,02
Pigeon Guillemot	2	35	10	88	06/10/89,01;06/12/89,02
TOTAL				372	

CA Colony Number: **MO-362-03** Colony Name: **Bird Rock**
USFWS Colony Number: **454-006**
Latitude: 36°35′31"N Map Number: 129
Longitude: 121°57′59"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1205	1492	0	2651	05/24/89,04
Blk. Oystercatcher	0	2	0	2	06/10/89,02
Western Gull	8	14	0	16	06/10/89,02
TOTAL				2669	

CA Colony Number: **MO-362-04** Colony Name: **North Carmel Bay**
USFWS Colony Number: **454-045***
Latitude: 36°33'56"N Map Number: 129
Longitude: 121°56'37"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	22	4	9	06/10/89,01
Western Gull	3	6	1	6	06/10/89,01
TOTAL				15	

CA Colony Number: **MO-362-05** Colony Name: **Pescadero Rock**
USFWS Colony Number: **454-022**
Latitude: 36°33'43"N Map Number: 129
Longitude: 121°56'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	1	2	06/10/89,03
Western Gull	10	16	0	20	06/10/89,03
Pigeon Guillemot*	0	9	0	22	06/10/89,03
TOTAL				44	
Historically-nesting species (most recent known date)					
Tufted Puffin*	ND	ND	ND	X	1890's (Loomis 1895)

CA Colony Number: **MO-362-06** Colony Name: **"Guillemot Island Area"**
USFWS Colony Number: **454-023**
Latitude: 36°31'45"N Map Number: 130
Longitude: 121°56'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	252	333	0	554	05/24/89,04
Pelagic Cormorant	9	14	0	20	06/10/89,01
Blk. Oystercatcher	0	10	0	10	06/10/89,01;06/10/89,02
Western Gull	15	40	5	30	06/10/89,01
Pigeon Guillemot	0	7	5	18	06/10/89,01
TOTAL				632	

CA Colony Number: **MO-362-07** Colony Name: **Pinnacle Point Area**
USFWS Colony Number: **454-007**
Latitude: 36°31'35"N Map Number: 130
Longitude: 121°57'14"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	15	19	0	33	06/10/89,01
Blk. Oystercatcher	0	3	2	3	06/10/89,01;06/11/89,01
Western Gull	5	25	0	10	06/10/89,01;06/11/89,01
TOTAL				46	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	200	1979(Sowls et al. 1980)
Pigeon Guillemot	ND	ND	ND	100	1979(Sowls et al. 1980)

CA Colony Number: **MO-362-08** Colony Name: **Sand Hill Cove**
USFWS Colony Number: **454-008**
Latitude: 36°31'01"N Map Number: 130
Longitude: 121°57'01"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	8	15	5	18	06/10/89,02;06/11/89,01
Blk. Oystercatcher	0	1	0	1	06/11/89,01
Western Gull	2	3	0	4	06/11/89,01
TOTAL				23	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	20	1980(Sowls et al. 1980)

CA Colony Number: **MO-362-09** Colony Name: **Bird Island**
USFWS Colony Number: **454-009**
Latitude: 36°30'25"N Map Number: 130
Longitude: 121°56'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	2796	3174	0	6151	05/24/89,04;06/10/89,02;
Pelagic Cormorant	2	3	1	4	06/11/89,01
Blk. Oystercatcher	0	2	1	2	06/11/89,01
Western Gull	45	131	0	90	05/24/89,04;06/10/89,02; 06/11/89,01
Pigeon Guillemot	0	2	0	5	06/11/89,01
TOTAL				6252	
Historically-nesting species (most recent known date)					
Brown Pelican	ND	ND	ND	6	1966(Baldridge 1973)

CA Colony Number: **MO-362-10** Colony Name: **Carmel Highlands**
USFWS Colony Number: **454-046***
Latitude: 36°30'00"N Map Number: 130
Longitude: 121°56'23"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	1	0	2	06/11/89,01
Blk. Oystercatcher	0	1	1	1	06/11/89,01
TOTAL				3	

CA Colony Number: **MO-362-11** Colony Name: **Yankee Point**
USFWS Colony Number: **454-024**
Latitude: 36°29'29"N Map Number: 131
Longitude: 121°56'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	06/11/89,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	8	1979(Sowls et al. 1980)
Pigeon Guillemot	ND	ND	ND	X	1979(Sowls et al. 1980)

CA Colony Number: **MO-362-12** Colony Name: **Yankee Point South**
USFWS Colony Number: **454-047***
Latitude: 36°28'47"N Map Number: 131
Longitude: 121°56'18"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	3	14	2	7	06/11/89,01
Blk. Oystercatcher	0	5	1	5	06/11/89,01
Western Gull	9	14	0	18	06/11/89,01
Pigeon Guillemot	0	1	0	2	06/11/89,01
TOTAL				32	

CA Colony Number: **MO-362-13** Colony Name: **"Soberanes Creek Rocks"**
USFWS Colony Number: **454-026**
Latitude: 36°27'18"N Map Number: 131
Longitude: 121°55'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	21	23	0	46	06/11/89,01
Blk. Oystercatcher*	0	1	1	1	06/11/89,01
Western Gull	3	9	0	6	06/11/89,01
Pigeon Guillemot	0	6	0	15	06/11/89,01
TOTAL				68	

CA Colony Number: **MO-362-14** Colony Name: **Lobos Rocks**
USFWS Colony Number: **454-025**
Latitude: 36°27'18"N Map Number: 131
Longitude: 121°56'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	0	4	0	4	06/11/89,01
Western Gull	2	6	0	4	06/11/89,01
Pigeon Guillemot*	0	3	0	8	06/11/89,01
TOTAL				16	

CA Colony Number: **MO-362-15** Colony Name: **"Soberanes Point South"**
USFWS Colony Number: **454-027**
Latitude: 36°26'47"N Map Number: 131, 132
Longitude: 121°55'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	3	7	0	7	06/21/89,01
Western Gull	0	1	1	1	06/19/89,02
Pigeon Guillemot*	0	4	0	7	06/21/89,01
TOTAL				15	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	4	1979(Sowls et al. 1980)

CA Colony Number: **MO-362-16** Colony Name: **Kasler Point North**
USFWS Colony Number: **454-048***
Latitude: 36°24'47"N Map Number: 132
Longitude: 121°54'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	06/21/89,01
Western Gull	1	1	0	2	06/19/89,02
Pigeon Guillemot	0	2	1	3	06/21/89,01
TOTAL				6	

CA Colony Number: **MO-362-17** Colony Name: **Rocky Point**
USFWS Colony Number: **454-028**
Latitude: 36°24'06"N Map Number: 132
Longitude: 121°54'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	8	0	6	06/19/89,02
Pigeon Guillemot	0	10	0	17	06/21/89,01
TOTAL				23	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	6	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	4	1979(Sowls et al. 1980)

CA Colony Number: **MO-362-18** Colony Name: **"Bench Mark-227X"**
USFWS Colony Number: **454-029**
Latitude: 36°23'21"N Map Number: 133
Longitude: 121°54'13"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	14	17	2	35	06/19/89,02;06/21/89,01
Western Gull	19	24	0	38	06/19/89,02
Pigeon Guillemot	0	21	0	36	06/21/89,01
Unid. alcid	ND	ND	3	4	06/19/89,02
TOTAL				113	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-362-19** Colony Name: **Castle Rocks and Mainland**
USFWS Colony Number: **454-010**
Latitude: 36°22'35"N Map Number: 133
Longitude: 121°54'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	341	ND	0	750	05/24/89,04;06/21/89,01
Pelagic Cormorant	20	42	1	46	05/24/89,04;06/19/89,02; 06/21/89,01
Western Gull	1	16	4	12	06/19/89,02;06/21/89,01
Common Murre	ND	625	0	1050	05/24/89,04;06/19/89,02
Pigeon Guillemot	0	11	0	19	06/21/89,01
TOTAL				1877	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	6	1980(Sowls et al. 1980)

CA Colony Number: **MO-362-20** Colony Name: **Hurricane Point Rocks**
USFWS Colony Number: **454-011**
Latitude: 36°21'40"N Map Number: 133
Longitude: 121°54'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	13	18	0	29	05/24/89,04
Western Gull	3	14	5	14	06/19/89,02;06/21/89,01
Common Murre	ND	365	0	613	05/24/89,04
Pigeon Guillemot	0	12	3	20	06/21/89,01
TOTAL				676	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	50	1980(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	10	1980(Sowls et al. 1980)
Tufted Puffin	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **MO-360-01** Colony Name: **Point Sur**
USFWS Colony Number: **454-012**
Latitude: 36°18'22"N Map Number: 134
Longitude: 121°53'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	15	20	0	33	06/21/89,01
Pigeon Guillemot	0	2	0	3	06/21/89,01
TOTAL				36	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1980(Sowls et al. 1980)
Western Gull	ND	ND	ND	6	1980(Sowls et al. 1980)

CA Colony Number: **MO-360-02** Colony Name: **"Molera Rock"**
USFWS Colony Number: **454-030**
Latitude: 36°16'45"N Map Number: 134
Longitude: 121°51'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	4	13	0	8	06/21/89,01
Pigeon Guillemot	0	2	0	5	06/21/89,01
TOTAL				13	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	26	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-03** Colony Name: **Cooper Point and Islands**
USFWS Colony Number: **454-031**
Latitude: 36°14'55"N Map Number: 135
Longitude: 121°50'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	17	21	0	37	06/21/89,01
Pelagic Cormorant	8	9	0	18	06/21/89,01
Western Gull*	0	1	0	1	06/21/89,01
Pigeon Guillemot	0	7	0	18	06/21/89,01
TOTAL				74	

CA Colony Number: **MO-360-04** Colony Name: **Pfeiffer Point**
USFWS Colony Number: **454-032**
Latitude: 36°13'59"N Map Number: 135
Longitude: 121°48'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	4	0	9	06/21/89,01
Pigeon Guillemot	0	2	0	5	06/21/89,01
TOTAL				14	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	6	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-05** Colony Name: **Wreck Beach South**
USFWS Colony Number: **454-049***
Latitude: 36°13'56"N Map Number: 135
Longitude: 121°47'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	5	4	0	11	06/20/89,01
Western Gull	1	2	0	2	06/20/89,01
Pigeon Guillemot	0	5	0	8	06/20/89,01
TOTAL				21	

CA Colony Number: **MO-360-06** Colony Name: **Grimes Point**
USFWS Colony Number: **454-033**
Latitude: 36°12'20"N Map Number: 136
Longitude: 121°44'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	89	106	0	196	05/24/89,04
Western Gull	2	3	0	4	06/20/89,01
TOTAL				200	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	20	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-07** Colony Name: **Lafler Rock and Mainland**
USFWS Colony Number: **454-034**
Latitude: 36°12'00"N Map Number: 136
Longitude: 121°43'36"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	107	136	0	235	05/24/89,04;06/19/89,02
Pelagic Cormorant	0	2	1	4	06/20/89,01
TOTAL				239	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	20	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-08** Colony Name: **"Torre Canyon Rocks"**
USFWS Colony Number: **454-013**
Latitude: 36°11'25"N Map Number: 136
Longitude: 121°42'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	7	8	1	15	06/20/89,01
Blk. Oystercatcher	0	1	1	1	06/20/89,01
TOTAL				16	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	125	1970(Sowls et al. 1980)

CA Colony Number: **MO-360-09** Colony Name: **Partington Point**
USFWS Colony Number: **454-050***
Latitude: 36°10'43"N Map Number: 136
Longitude: 121°42'01"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	10	1	14	06/20/89,01
Pigeon Guillemot	0	2	0	5	06/20/89,01
TOTAL				19	

CA Colony Number: **MO-360-10** Colony Name: **"Partington Ridge North"**
USFWS Colony Number: **454-014**
Latitude: 36°10'06"N Map Number: 137
Longitude: 121°41'14"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	2	2	0	5	06/19/89,02
Brandt's Cormorant	78	113	0	172	06/19/89,02;06/20/89,01
Pelagic Cormorant	1	1	0	2	06/19/89,02
Blk. Oystercatcher	0	1	1	1	06/19/89,02
Western Gull	2	7	2	7	06/19/89,02;06/20/89,01
Pigeon Guillemot	0	7	2	18	06/20/89,01
TOTAL				205	

CA Colony Number: **MO-360-11** Colony Name: **McWay Rocks**
USFWS Colony Number: **454-015**
Latitude: 36°09'46"N Map Number: 137
Longitude: 121°40'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	48	56	0	106	05/24/89,04
Western Gull	7	ND	0	14	06/19/89,02
Pigeon Guillemot	0	6	4	15	06/20/89,01
TOTAL				135	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-12** Colony Name: **"Partington Ridge South"**
USFWS Colony Number: **454-035**
Latitude: 36°09'36"N Map Number: 137
Longitude: 121°40'25"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	7	7	0	15	06/20/89,01
Western Gull	0	6	3	8	06/20/89,01
Pigeon Guillemot	0	66	0	165	06/20/89,01;06/21/89,01
TOTAL				188	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	20	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-13** Colony Name: **"Anderson Canyon Rocks"**
USFWS Colony Number: **454-016**
Latitude: 36°09'07"N Map Number: 137
Longitude: 121°39'53"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant*	2	2	0	5	06/20/89,01
Brandt's Cormorant	146	165	0	321	06/20/89,01
Pelagic Cormorant	12	12	3	26	06/20/89,01
Western Gull*	1	8	1	2	06/20/89,01
Pigeon Guillemot*	0	13	0	32	06/20/89,01
TOTAL				386	

CA Colony Number: **MO-360-14** Colony Name: **"Burns Creek Rocks"**
USFWS Colony Number: **454-017**
Latitude: 36°08'29"N Map Number: 137
Longitude: 121°39'28"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	147	163	0	323	05/24/89,04;06/19/89,02
Blk. Oystercatcher*	0	1	0	1	06/20/89,01
Western Gull	1	4	0	2	06/19/89,01
Pigeon Guillemot	0	5	0	12	06/20/89,01
TOTAL				338	

CA Colony Number: **MO-360-15** Colony Name: **Buck Creek**
USFWS Colony Number: **454-051***
Latitude: 36°08'06"N Map Number: 137
Longitude: 121°38'53"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	10	4	2	06/20/89,01
TOTAL				2	

CA Colony Number: **MO-360-16** Colony Name: **Dolan Rock**
USFWS Colony Number: **454-018**
Latitude: 36°05'06"N Map Number: 138
Longitude: 121°37'02"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	06/20/89,01
TOTAL				0	

Historically-nesting species (most recent known date)

Brandt's Cormorant	ND	ND	ND	100	1970(Sowls et al. 1980)

CA Colony Number: **MO-360-17** Colony Name: **Bench Mark 223**
USFWS Colony Number: **454-052***
Latitude: 36°04'55"N Map Number: 138
Longitude: 121°36'53"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	5	0	0	11	06/20/89,01
TOTAL				11	

CA Colony Number: **MO-360-18** Colony Name: **Square Black Rock**
USFWS Colony Number: **454-019**
Latitude: 36°04'21"N Map Number: 138
Longitude: 121°36'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	05/24/89,04;06/20/89,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	20-40	1970(Sowls et al. 1980)

CA Colony Number: **MO-360-19** Colony Name: **Gamboa Point**
USFWS Colony Number: **454-053***
Latitude: 36°02'51"N Map Number: 139
Longitude: 121°35'14"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	1	1	06/20/89,01
Western Gull	2	12	0	4	06/20/89,01
TOTAL				5	

CA Colony Number: **MO-360-20** Colony Name: **"Bench Mark 247"**
USFWS Colony Number: **454-036**
Latitude: 36°02'11"N Map Number: 139
Longitude: 121°34'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	06/20/89,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	6	1979(Sowls et al. 1980)

CA Colony Number: **MO-360-21** Colony Name: **Lopez Rock**
USFWS Colony Number: **454-020**
Latitude: 36°01'34"N Map Number: 139
Longitude: 121°34'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	52	78	0	114	05/24/89,04
TOTAL				114	

CA Colony Number: **MO-360-22** Colony Name: **Lopez Point South**
USFWS Colony Number: **454-054***
Latitude: 36°01'13"N Map Number: 140
Longitude: 121°33'34"W

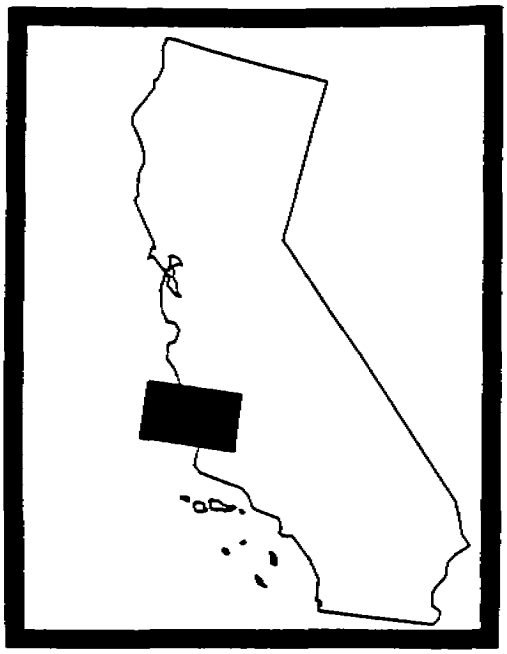
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	6	1	2	06/20/89,01
TOTAL				2	

CA Colony Number: **MO-360-23** Colony Name: **"Rockland Landing North"**
USFWS Colony Number: **454-037**
Latitude: 36°00'57"N Map Number: 140
Longitude: 121°32'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant*	11	13	0	26	06/20/89,01
Brandt's Cormorant	3	3	0	7	06/20/89,01
Pelagic Cormorant	15	45	2	33	06/20/89,01
Western Gull*	0	6	2	7	06/20/89,01
TOTAL				73	

CA Colony Number: **MO-360-24** Colony Name: **Rockland Landing**
USFWS Colony Number: **454-055***
Latitude: 36°00'26"N Map Number: 140
Longitude: 121°31'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	8	0	2	06/18/89,01
Western Gull	3	4	0	6	06/18/89,01
Pigeon Guillemot	0	10	0	17	06/18/89,01
TOTAL				25	

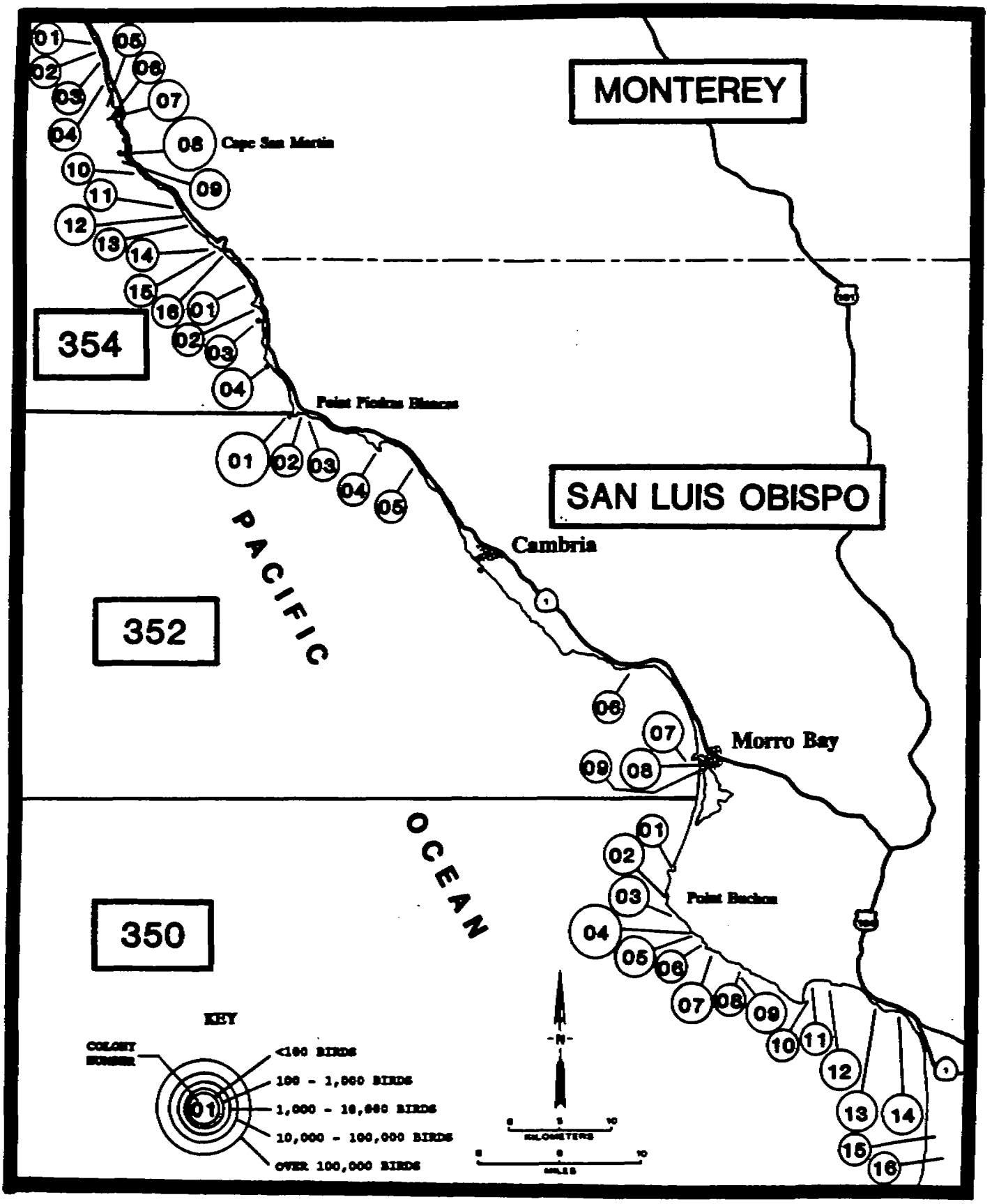


USFWS MAP BLOCK
477
San Luis Obispo

The map on the facing page is an index to the locations of colonies within USFWS Map Block 477, San Luis Obispo. All colonies on this map are numbered consecutively from north to south within counties in 20′ latitude California Map Blocks (i.e. 354 = 35°40′ to 36°00′N; 352 = 35°20′ to 35°40′N; 350 = 35°00 to 35°20′N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989:

Doubled-crested Cormorant	357	3.3%
Brandt's Cormorant	7,621	71.4%
Pelagic Cormorant	604	5.7%
Black Oystercatcher	63	0.6%
Western Gull	895	8.4%
Heermann's Gull	H	0.0%
Least Tern	6	0.1%
Pigeon Guillemot	1,116	10.5%
Rhinoceros Auklet	9	0.1%
Tufted Puffin	H	0.0%
Total	10,671	


MONTEREY
SAN LUIS OBISPO
354
352
350
Cape San Martin
Point Piedras Blancas
Cambria
Morro Bay
Point Buchon
PACIFIC
OCEAN
KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
-N-
KILOMETERS
MILES

CENTRAL CALIFORNIA
USFWS MAP BLOCK 477: SAN LUIS OBISPO
(Includes California Map Blocks 354, 352 and 350)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **MO-354-01** Colony Name: **Kirk Creek to Mill Creek**
USFWS Colony Number: **477-039***
Latitude: 35°59'51"N Map Number: 141
Longitude: 121°29'33"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	2	1	2	06/18/89,01
TOTAL				2	

CA Colony Number: **MO-354-02** Colony Name: **"36 North"**
USFWS Colony Number: **477-013**
Latitude: 35°58'36"N Map Number: 141
Longitude: 121°29'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	06/18/89,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	6	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-03** Colony Name: **"Larus Rock"**
USFWS Colony Number: **477-014**
Latitude: 35°57'44"N Map Number: 141
Longitude: 121°29'01"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	2	1	2	06/18/89,01
Pigeon Guillemot*	0	1	0	2	06/18/89,01
TOTAL				4	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	2	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-04** Colony Name: **Unnamed Point**
USFWS Colony Number: **477-015**
Latitude: 35°57'00"N Map Number: 141
Longitude: 121°28'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	06/18/89,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	6	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)
Western Gull	ND	ND	ND	4	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-05** Colony Name: **Gorda Area**
USFWS Colony Number: **477-040***
Latitude: 35°55'55"N Map Number: 142
Longitude: 121°28'59"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	06/18/89,01
Western Gull	4	6	0	8	06/18/89,01
Pigeon Guillemot	0	2	0	5	06/18/89,01
TOTAL				14	

CA Colony Number: **MO-354-06** Colony Name: **Small rocks and mainland north and east of Plaskett Rock**
USFWS Colony Number: **477-001**
Latitude: 35°55'16"N Map Number: 142
Longitude: 121°28'22"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	4	0	2	06/19/89,02
Blk. Oystercatcher	2	6	1	6	06/18/89,03
Western Gull	13	20	0	26	06/18/89,03
Pigeon Guillemot	0	16	2	40	06/18/89,03;06/19/89,02
TOTAL				74	

CA Colony Number: **MO-354-07** Colony Name: **Plaskett Rock**
USFWS Colony Number: **477-002**
Latitude: 35°55'14"N Map Number: 142
Longitude: 121°28'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	386	437	0	849	05/24/89,04
Blk. Oystercatcher	0	1	0	1	06/19/89,02
Western Gull	1	9	2	5	06/18/89,01;06/19/89,02
TOTAL				855	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	10	1979(Sowls et al. 1980)
Pigeon Guillemot	ND	ND	ND	20	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-08** Colony Name: **Cape San Martin**
USFWS Colony Number: **477-003**
Latitude: 35°53'17"N Map Number: 143
Longitude: 121°27'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	1	1	0	2	06/18/89,01
Brandt's Cormorant	341	460	0	750	05/24/89,04
Pelagic Cormorant	8	6	0	18	06/19/89,02
Western Gull	174	259	1	349	05/24/89,04;06/18/89,01
TOTAL				1119	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	4	1979(Sowls et al. 1980)
Pigeon Guillemot	ND	ND	ND	8	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-09** Colony Name: **Unnamed Rock**
USFWS Colony Number: **477-004**
Latitude: 35°53'05"N Map Number: 143
Longitude: 121°27'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	125	186	0	275	05/24/89,04
Western Gull	2	4	0	4	05/24/89,04
TOTAL				279	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	2	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-10** Colony Name: **Mainland point across from Bird Rock**
USFWS Colony Number: **477-016**
Latitude: 35°52'37"N Map Number: 143
Longitude: 121°26'59"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	12	ND	0	26	06/18/89,01
Pigeon Guillemot*	0	2	0	5	06/18/89,01
TOTAL				31	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-11** Colony Name: **Point north of Redwood Gulch**
USFWS Colony Number: **477-017**
Latitude: 35°50'20"N Map Number: 144
Longitude: 121°24'04"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	5	2	2	06/18/89,01
Western Gull*	1	1	0	2	06/18/89,01
TOTAL				4	

CA Colony Number: **MO-354-12** Colony Name: **"Redwood Gulch Rock"**
USFWS Colony Number: **477-005**
Latitude: 35°49'32"N Map Number: 144
Longitude: 121°23'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	169	265	0	372	05/24/89,04
Western Gull*	1	3	2	2	06/19/89,02
TOTAL				374	
Historically-nesting species (most recent known date)					
Pigeon Guillemot	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-13** Colony Name: **Seastack south of Redwood Gulch**
USFWS Colony Number: **477-018**
Latitude: 35°49'30"N Map Number: 144
Longitude: 121°23'22"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	4	0	9	06/18/89,01
Western Gull	3	9	3	6	06/18/89,01
TOTAL				15	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	X	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-14** Colony Name: **"Unmapped Island"**
USFWS Colony Number: **477-019**
Latitude: 35°48'20"N Map Number: 144
Longitude: 121°22'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	14	25	0	31	05/24/89,04
Western Gull*	0	2	1	3	06/18/89,01
Pigeon Guillemot	0	2	0	5	06/18/89,01
TOTAL				39	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	56	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-15** Colony Name: **"Salmon Creek"**
USFWS Colony Number: **477-020**
Latitude: 35°48'31"N Map Number: 144
Longitude: 121°21'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	06/18/89,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	12	1979(Sowls et al. 1980)

CA Colony Number: **MO-354-16** Colony Name: **Arched peninsula south of Salmon Creek**
USFWS Colony Number: **477-021**
Latitude: 35°48'05"N Map Number: 144
Longitude: 121°21'14"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	11	12	0	24	06/18/89,01
Pigeon Guillemot	0	11	0	28	06/18/89,01
TOTAL				52	

CA Colony Number: **SL-354-01** Colony Name: **"Ragged Point Lodge Colony"**
USFWS Colony Number: **477-022**
Latitude: 35°46'53"N Map Number: 145
Longitude: 121°19'56"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	3	0	8	06/18/89,01
TOTAL				8	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	46	1979(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)
Western Gull	ND	ND	ND	14	1979(Sowls et al. 1980)

CA Colony Number: **SL-354-02** Colony Name: **Ragged Point South**
USFWS Colony Number: **477-041***
Latitude: 35°45′24"N Map Number: 145
Longitude: 121°19′28"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	2	0	2	06/18/89,01
TOTAL				2	

CA Colony Number: **SL-354-03** Colony Name: **"3 Rocks"**
USFWS Colony Number: **477-023**
Latitude: 35°45′06"N Map Number: 145
Longitude: 121°19′07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	22	23	0	48	06/18/89,01
Blk. Oystercatcher*	0	2	1	2	06/18/89,01
Western Gull	6	22	6	12	06/18/89,01
TOTAL				62	

CA Colony Number: **SL-354-04** Colony Name: **La Cruz Rock**
USFWS Colony Number: **477-006**
Latitude: 35°42′23"N Map Number: 146
Longitude: 121°18′45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	308	408	0	678	05/24/89,04
Western Gull	0	12	0	18	06/18/89,01
TOTAL				696	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **SL-352-01** Colony Name: **Piedras Blancas Island**
USFWS Colony Number: **477-007**
Latitude: 35°39′52"N Map Number: 147
Longitude: 121°17′18"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1194	1377	0	2627	05/24/89,04
Blk. Oystercatcher	0	1	1	1	06/12/89,01
Western Gull	17	54	0	34	06/12/89,01
Pigeon Guillemot	0	17	5	29	06/12/89,01
Rhinoceros Auklet*	0	3	0	3	06/12/89,01
TOTAL				2694	
Historically-nesting species (most recent known date)					
Tufted Puffin	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **SL-352-02** Colony Name: **Point Piedras Blancas**
USFWS Colony Number: **477-042***
Latitude: 35°39'45"N Map Number: 147
Longitude: 121°16'53"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	0	2	06/12/89,01
Western Gull	1	2	0	2	06/12/89,01
TOTAL				4	

CA Colony Number: **SL-352-03** Colony Name: **Two rocks south of Point Piedras Blancas**
USFWS Colony Number: **477-024**
Latitude: 35°39'30"N Map Number: 147
Longitude: 121°16'02"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant*	3	6	0	7	06/12/89,01
Blk. Oystercatcher*	0	1	1	1	06/12/89,01
Western Gull	7	34	0	14	06/12/89,01
Pigeon Guillemot	0	2	0	5	06/12/89,01
TOTAL				27	

CA Colony Number: **SL-352-04** Colony Name: **Point San Simeon**
USFWS Colony Number: **477-038**
Latitude: 35°38'00"N Map Number: 148
Longitude: 121°12'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	0	1	0	1	06/12/89,01
Western Gull*	5	7	0	10	06/12/89,01
Pigeon Guillemot	0	25	1	42	06/12/89,01
TOTAL				53	

CA Colony Number: **SL-352-05** Colony Name: **South San Simeon**
USFWS Colony Number: **477-043***
Latitude: 35°37'05"N Map Number: 148
Longitude: 121°09'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	9	1	22	06/12/89,01
TOTAL				22	

CA Colony Number: **SL-352-06** Colony Name: **Island south of Cayucos Point**
USFWS Colony Number: **477-025**
Latitude: 35°26'45"N Map Number: 149
Longitude: 120°55'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	6	1	6	06/12/89,01
TOTAL				6	

CA Colony Number: **SL-352-07** Colony Name: **Morro Rock and Pillar Rock**
USFWS Colony Number: **477-026**
Latitude: 35°22'13"N Map Number: 150
Longitude: 120°52'08"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant*	10	20	0	24	06/13/89,01
Brandt's Cormorant*	53	59	0	117	06/13/89,01
Pelagic Cormorant	24	78	0	53	06/13/89,01
Western Gull	57	322	0	114	06/13/89,01
Pigeon Guillemot	0	14	0	24	06/13/89,01
TOTAL				332	
Historically-nesting species (most recent known date)					
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **SL-352-08** Colony Name: **Fairbank Point**
USFWS Colony Number: **477-044***
Latitude: 35°21'05"N Map Number: 150
Longitude: 120°50'38"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant	138	150	0	331	06/13/89,01
TOTAL				331	

CA Colony Number: **SL-352-09** Colony Name: **Morro Bay Spit**
USFWS Colony Number: **477-046***
Latitude: 35°21'33"N Map Number: 150
Longitude: 120°51'24"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	1	1	0	2	1983(CDFG, unpubl. data)

CA Colony Number: **SL-350-01** Colony Name: **Spooner's Cove**
USFWS Colony Number: **477-027**
Latitude: 35°16'21"N Map Number: 151
Longitude: 120°53'57"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	33	10	56	06/13/89,01
TOTAL				56	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1980(Sowls et al. 1980)

CA Colony Number: **SL-350-02** Colony Name: **Point Buchon**
USFWS Colony Number: **477-009**
Latitude: 35°15'20"N Map Number: 151
Longitude: 120°53'58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	22	34	0	48	06/15/89,02;06/17/89,09
Blk. Oystercatcher	2	6	1	6	06/15/89,02;06/17/89,09
Western Gull*	12	49	3	40	06/15/89,02;06/17/89,09
Pigeon Guillemot	0	60	6	102	06/17/89,09
TOTAL				196	

CA Colony Number: **SL-350-03** Colony Name: **Unnamed Rocks**
USFWS Colony Number: **477-010**
Latitude: 35°14'40"N Map Number: 151
Longitude: 120°53'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	79	106	0	174	06/15/89,02;06/17/89,01
Blk. Oystercatcher	1	6	0	6	06/15/89,02
Western Gull	21	110	0	49	06/15/89,02;06/17/89,01
Pigeon Guillemot	0	97	3	242	06/15/89,02;06/17/89,01
TOTAL				471	

CA Colony Number: **SL-350-04** Colony Name: **"Pup Rock and adjacent mainland"**
USFWS Colony Number: **477-028**
Latitude: 35°13'18"N Map Number: 152
Longitude: 120°52'13"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	595	729	0	1309	05/24/89,04
Blk. Oystercatcher	0	2	0	2	06/17/89,09
Western Gull	22	71	0	44	06/15/89,02;06/17/89,09
TOTAL				1355	

CA Colony Number: **SL-350-05** Colony Name: **Lion Rock**
USFWS Colony Number: **477-011**
Latitude: 35°13'03"N Map Number: 152
Longitude: 120°52'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	126	155	0	277	05/24/89,04
Blk. Oystercatcher	0	1	0	1	06/15/89,02
Western Gull	12	45	0	24	06/15/89,02
Pigeon Guillemot	0	7	0	18	06/14/89,02
TOTAL				320	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	30	1972(Sowls et al. 1980)

CA Colony Number: **SL-350-06** Colony Name: **Diablo Rock and adjacent mainland**
USFWS Colony Number: **477-029**
Latitude: 35°12'36"N Map Number: 152
Longitude: 120°51'38"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	7	12	0	15	06/14/89,02
Western Gull	13	25	0	26	06/14/89,02;06/15/89,02
Pigeon Guillemot	3	3	0	5	06/15/89,02
TOTAL				46	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	16	1980(Sowls et al. 1980)
Blk. Oystercatcher	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **SL-350-07** Colony Name: **Diablo Canyon Nuclear Power Plant South**
USFWS Colony Number: **477-030**
Latitude: 35°12'07"N Map Number: 152
Longitude: 120°50'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	52	71	0	114	06/15/89,02;06/17/89,02
Blk. Oystercatcher	0	1	0	1	06/17/89,02
Western Gull	14	20	0	28	06/17/89,02
Pigeon Guillemot	2	19	0	48	06/17/89,02
TOTAL				191	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	ND	ND	ND	100	1980(Sowls et al. 1980)

CA Colony Number: **SL-350-08** Colony Name: **"Double Rock Region"**
USFWS Colony Number: **477-031**
Latitude: 35°11'39"N Map Number: 153
Longitude: 120°50'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	8	20	0	18	06/14/89,02;06/17/89,01
Blk. Oystercatcher*	0	3	0	3	06/14/89,02;06/17/89,01
Western Gull*	3	3	0	6	06/14/89,02;06/15/89,01
Pigeon Guillemot*	0	2	1	5	06/14/89,02
TOTAL				32	

CA Colony Number: **SL-350-09** Colony Name: **Pecho Rock**
USFWS Colony Number: **477-032**
Latitude: 35°10'45"N Map Number: 153
Longitude: 120°49'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	146	194	0	321	05/24/89,04
Western Gull	0	12	0	14	06/15/89,02
TOTAL				335	
Historically-nesting species (most recent known date)					
Tufted Puffin*	ND	ND	ND	X	1909(Willett 1909)

CA Colony Number: **SL-350-10** Colony Name: **Smith and Whaler Islands**
USFWS Colony Number: **477-033**
Latitude: 35°09'00"N Map Number: 154
Longitude: 120°45'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	06/18/89,01
Pigeon Guillemot	2	7	0	18	06/18/89,01
TOTAL				19	
Historically-nesting species (most recent known date)					
Western Gull	ND	ND	ND	2	1979(Sowls et al. 1980)

CA Colony Number: **SL-350-11** Colony Name: **Port San Luis**
USFWS Colony Number: **477-045***
Latitude: 35°10'42"N Map Number: 154
Longitude: 120°44'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	06/16/89,01
Pigeon Guillemot	0	11	4	19	06/16/89,01;06/17/89,01
TOTAL				20	

CA Colony Number: **SL-350-12** Colony Name: **Fossil Point**
USFWS Colony Number: **477-034**
Latitude: 35°10'26"N Map Number: 154
Longitude: 120°43'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	21	85	0	46	06/17/89,01
Blk. Oystercatcher	1	7	0	7	06/16/89,01
Western Gull	5	24	0	21	06/16/89,01;06/17/89,01
Pigeon Guillemot	0	77	17	131	06/16/89,01
TOTAL				205	

CA Colony Number: **SL-350-13** Colony Name: **"Shell Beach Rocks"**
USFWS Colony Number: **477-035**
Latitude: 35°09'06"N Map Number: 155
Longitude: 120°40'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	4	11	1	11	06/14/89,02
Western Gull	9	19	0	18	06/14/89,02
Pigeon Guillemot	0	90	5	153	06/14/89,02
Rhinoceros Auklet*	0	5	0	5	06/14/89,02
TOTAL				187	
Historically-nesting species (most recent known date)					
Pelagic Cormorant	ND	ND	ND	4	1979(Sowls et al. 1980)
Heermann's Gull	ND	ND	ND	X	1980(Sowls et al. 1980)

CA Colony Number: **SL-350-14** Colony Name: **"North Pismo Beach Rocks"**
USFWS Colony Number: **477-036**
Latitude: 35°08'57"N Map Number: 155
Longitude: 120°39'23"W

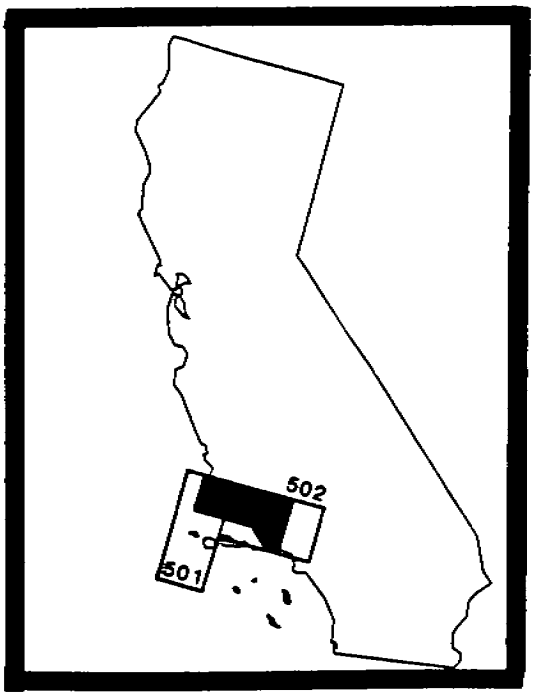
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	7	14	0	15	06/14/89,02
Blk. Oystercatcher	2	3	0	3	06/13/89,02;06/14/89,02
Western Gull	5	10	0	10	06/13/89,02;06/14/89,02
Pigeon Guillemot	0	61	14	104	06/14/89,02
Rhinoceros Auklet*	0	1	0	1	06/14/89,02
TOTAL				133	

CA Colony Number: **SL-350-15** Colony Name: **Oso Flaco Lake North**
USFWS Colony Number: **477-047***
Latitude: 35°02'57"N Map Number: 156
Longitude: 120°37'16"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	3	6	0	6	1990(D. Brewer, unpubl. data)
TOTAL				6	

CA Colony Number: **SL-350-16** Colony Name: **Oso Flaco Lake South**
USFWS Colony Number: **477-037**
Latitude: 35°01'14"N Map Number: 156
Longitude: 120°37'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	1989(Massey 1989)
TOTAL				0	
Historically-nesting species (most recent known date)					
Least Tern	ND	2	1	X	1982(Bevier 1982)



SANTA BARBARA AND VENTURA COUNTIES MAINLAND AREA

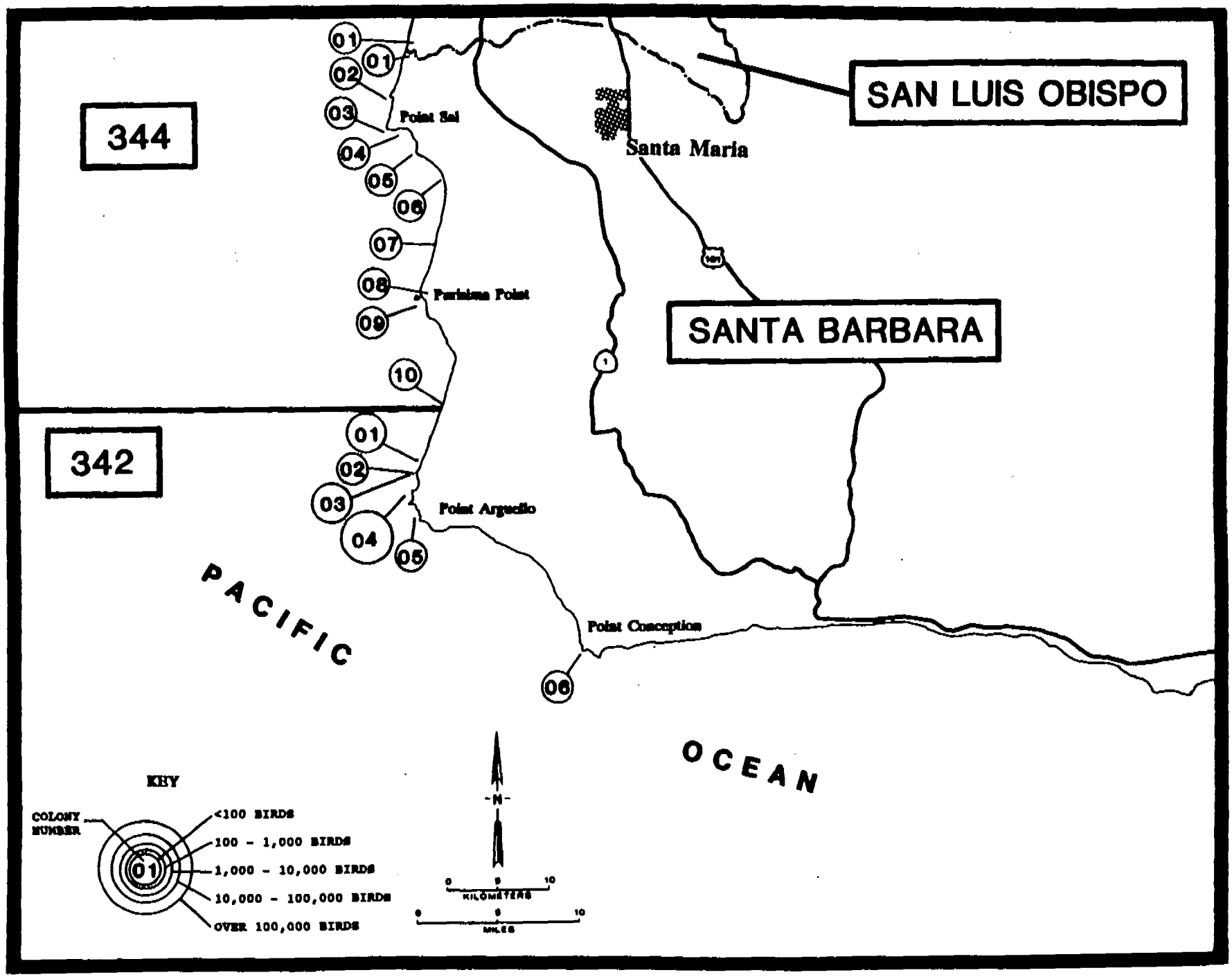
USFWS MAP BLOCKS

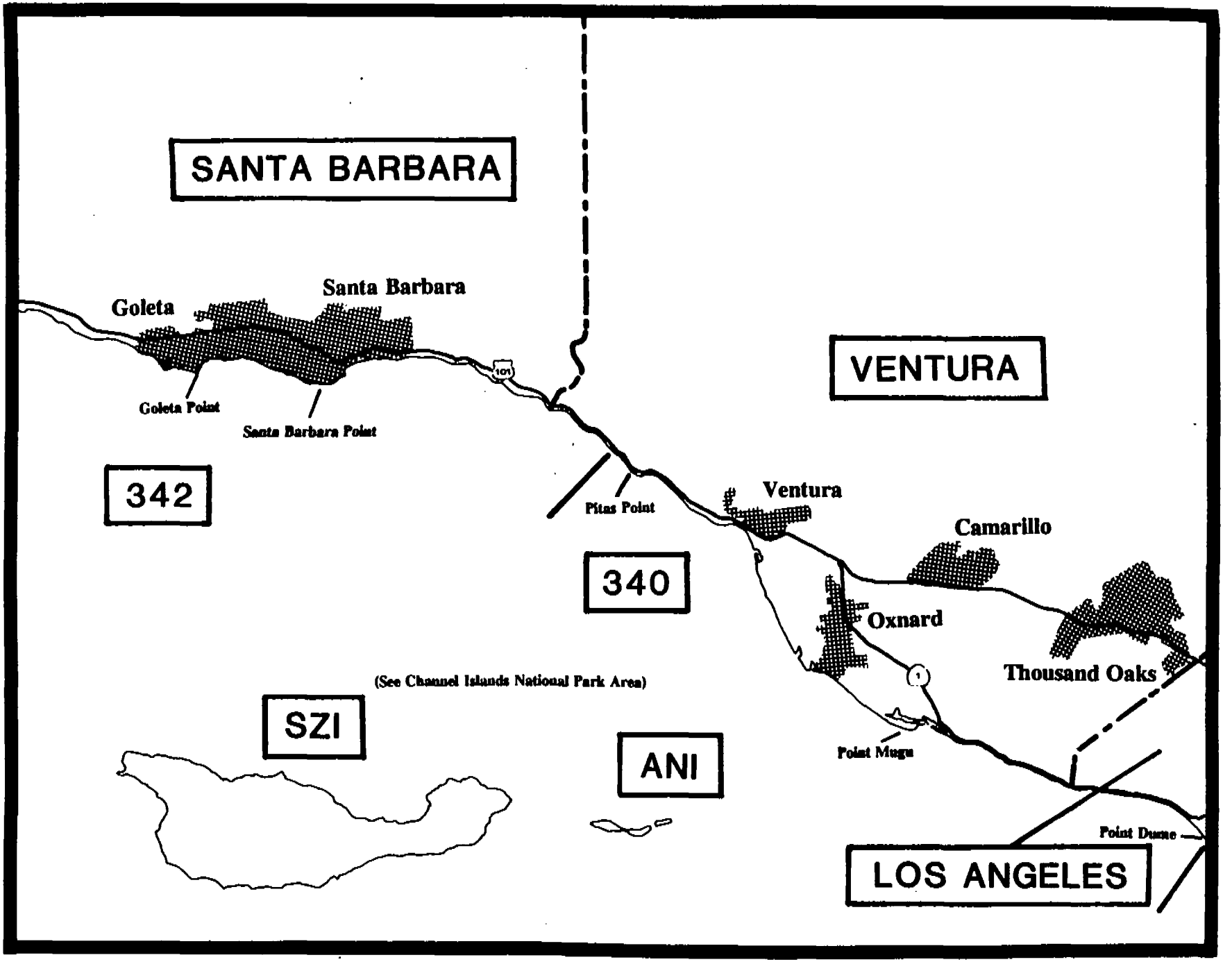
501 (North) Santa Maria
and
502 (North) Los Angeles

The map on the facing and next page are indices to the locations of colonies within the northern halves of USFWS Map Blocks 501 (Santa Maria) and 502 (Los Angeles). All colonies on this map are numbered consecutively from north to south within counties in 20′ latitude California Map Blocks (i.e. 344 = 34°40′ to 35°00′N; 342 = 34°20′ to 34°40′N; 340 = 34°00′ to 34°20′N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1989-1991:

Pelagic Cormorant	112	6.1%
Black Oystercatcher	11	0.6%
Western Gull	28	1.5%
Least Tern	88 (I)	4.8%
Pigeon Guillemot	1,564	85.2%
Rhinoceros Auklet	32	1.7%
Total	1,835	


344
342
SAN LUIS OBISPO
SANTA BARBARA
Santa Maria
Point Sal
Purisima Point
Point Arguello
Point Conception
PACIFIC
OCEAN
01
02
03
04
05
06
07
08
09
10
KEY
COLONY NUMBER
<100 BIRDS
100 - 1,000 BIRDS
1,000 - 10,000 BIRDS
10,000 - 100,000 BIRDS
OVER 100,000 BIRDS
N
KILOMETERS
MILES


SANTA BARBARA
Goleta
Santa Barbara
Goleta Point
Santa Barbara Point
101
342
VENTURA
Pitas Point
Ventura
Camarillo
340
Oxnard
Thousand Oaks
(See Channel Islands National Park Area)
SZI
ANI
Point Mugu
Point Dume
LOS ANGELES

SOUTHERN CALIFORNIA
SANTA BARBARA AND VENTURA COUNTIES MAINLAND AREA

USFWS MAP BLOCKS 501 ([MAINLAND] SANTA MARIA) AND 502 ([MAINLAND] LOS ANGELES)
(Includes California Map Blocks 344, 342 and 340)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
* - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **SL-344-01** Colony Name: **Guadalupe Dunes North**
USFWS Colony Number: **501-023***
Latitude: 34°59'08"N Map Number: 157
Longitude: 120°38'19"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	ND	ND	0	X	1989(Massey 1989)
TOTAL				0	

CA Colony Number: **SB-344-01** Colony Name: **Guadalupe Dunes South**
USFWS Colony Number: **501-001**
Latitude: 34°57'12"N Map Number: 158
Longitude: 120°38'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	ND	30-40	0	40	1989(Massey 1989)
TOTAL				40	

CA Colony Number: **SB-344-02** Colony Name: **Mussel Point**
USFWS Colony Number: **501-017***
Latitude: 34°55'48"N Map Number: 159
Longitude: 120°39'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	0	4	4	9	06/17/89,01
Western Gull	0	5	0	7	06/17/89,01
Pigeon Guillemot	0	2	0	5	06/17/89,01
TOTAL				21	

CA Colony Number: **SB-344-03** Colony Name: **Point Sal**
USFWS Colony Number: **501-018***
Latitude: 34°54'12"N Map Number: 159
Longitude: 120°40'12"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	3	0	4	06/17/89,01
Pigeon Guillemot	0	18	5	45	06/17/89,01
Rhinoceros Auklet	0	3	0	3	06/17/89,01
TOTAL				52	

CA Colony Number: **SB-344-04** Colony Name: **Lion Rock at Point Sal**
USFWS Colony Number: **501-008**
Latitude: 34°53'55"N Map Number: 159
Longitude: 120°39'50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant*	0	2	2	4	06/17/89,01
Western Gull*	1	4	0	2	06/17/89,01
Pigeon Guillemot*	0	2	0	5	06/17/89,01
TOTAL				11	

CA Colony Number: **SB-344-05** Colony Name: **Point Sal Beach South**
USFWS Colony Number: **501-019***
Latitude: 34°53'29"N Map Number: 159
Longitude: 120°38'28"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	3	0	8	06/17/89,01
TOTAL				8	

CA Colony Number: **SB-344-06** Colony Name: **Lions Head South**
USFWS Colony Number: **501-020***
Latitude: 34°51'43"N Map Number: 160
Longitude: 120°36'43"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	2	0	5	06/17/89,01
TOTAL				5	

CA Colony Number: **SB-344-07** Colony Name: **San Antonio Creek** (San Antonio Creek and Purisima Point [Part])
USFWS Colony Number: **501-003, 501-024**
Latitude: 34°47'16"N Map Number: 161
Longitude: 120°37'16"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	ND	6	0	6	1989(Massey 1989)
TOTAL				6	

CA Colony Number: **SB-344-08** Colony Name: **Purisima Point** (San Creek and Purisima Point [Part])
USFWS Colony Number: **501-003, 501-025**
Latitude: 34°45'21"N Map Number: 162
Longitude: 120°37'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern	22	36	0	36	1989(Massey 1989)
TOTAL				36	

CA Colony Number: **SB-344-09** Colony Name: **Purisima Point South**
USFWS Colony Number: **501-021***
Latitude: 34°45'00"N Map Number: 162
Longitude: 120°37'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	3	4	0	7	06/17/89,01
Western Gull	0	5	2	7	06/15/89,02;06/17/89,01
Pigeon Guillemot	0	10	6	25	06/15/89,02;06/17/89,01
TOTAL				39	

CA Colony Number: **SB-344-10** Colony Name: **Santa Ynez Estuary**
USFWS Colony Number: **501-002**
Latitude: 34°41'23"N Map Number: 163
Longitude: 120°36'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Least Tern*	ND	6	0	6	1989(Massey 1989)
TOTAL				6	

CA Colony Number: **SB-342-01** Colony Name: **North Honda**
USFWS Colony Number: **501-022***
Latitude: 34°37'13"N Map Number: 164
Longitude: 120°37'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	79	0	198	06/17/89,01
TOTAL				198	

CA Colony Number: **SB-342-02** Colony Name: **Mainland and rocks east of Destroyer Rock**
USFWS Colony Number: **501-010**
Latitude: 34°36′00"N Map Number: 164
Longitude: 120°38′26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	0	1	0	1	06/15/89,02
Pigeon Guillemot	1	59	13	148	06/15/89,02;06/17/89,01
Rhinoceros Auklet*	0	5	0	5	06/15/89,02
TOTAL				154	

CA Colony Number: **SB-342-03** Colony Name: **Destroyer Rock**
USFWS Colony Number: **501-009**
Latitude: 34°36′10"N Map Number: 164
Longitude: 120°38′40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pigeon Guillemot	0	26	6	65	06/17/89,01
TOTAL				65	

CA Colony Number: **SB-342-04** Colony Name: **Point Arguello**
USFWS Colony Number: **501-011**
Latitude: 34°34′38"N Map Number: 165
Longitude: 120°38′49"W

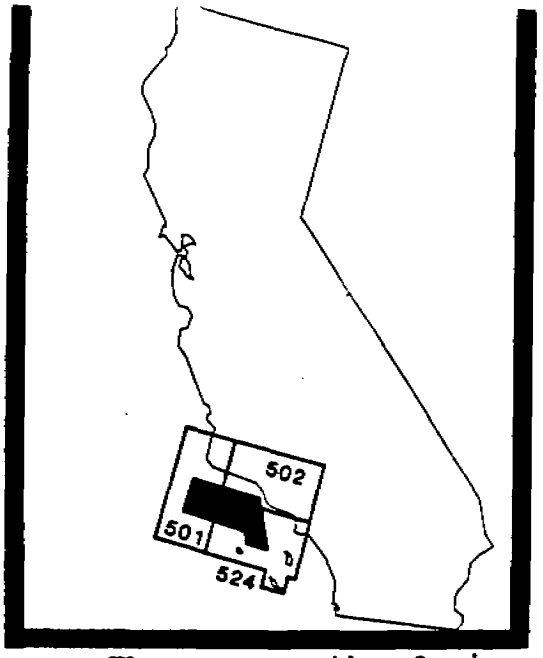
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	42	54	3	92	06/15/89,02;06/16/89,01; 06/17/89,01
Blk. Oystercatcher	2	6	0	6	06/15/89,02
Western Gull	3	6	0	6	06/15/89,02;06/17/89,01
Pigeon Guillemot	0	386	39	953	06/15/89,02;06/16/89,01; 06/17/89,01
Rhinoceros Auklet	0	24	1	24	06/16/89,01
TOTAL				1081	

CA Colony Number: **SB-342-05** Colony Name: **Rocky Point**
USFWS Colony Number: **501-012**
Latitude: 34°33′45"N Map Number: 165
Longitude: 120°38′11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	0	2	06/16/89,01
Pigeon Guillemot	0	31	13	78	06/17/89,01
TOTAL				80	

CA Colony Number: **SB-342-06** Colony Name: **Point Conception**
USFWS Colony Number: **501-013**
Latitude: 34°26'54"N Map Number: 166
Longitude: 120°28'13"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	0	2	06/16/89,01
Western Gull*	0	2	1	2	06/16/89,01
Pigeon Guillemot	0	17	5	29	06/16/89,01
TOTAL				33	



CHANNEL ISLANDS NATIONAL PARK AREA

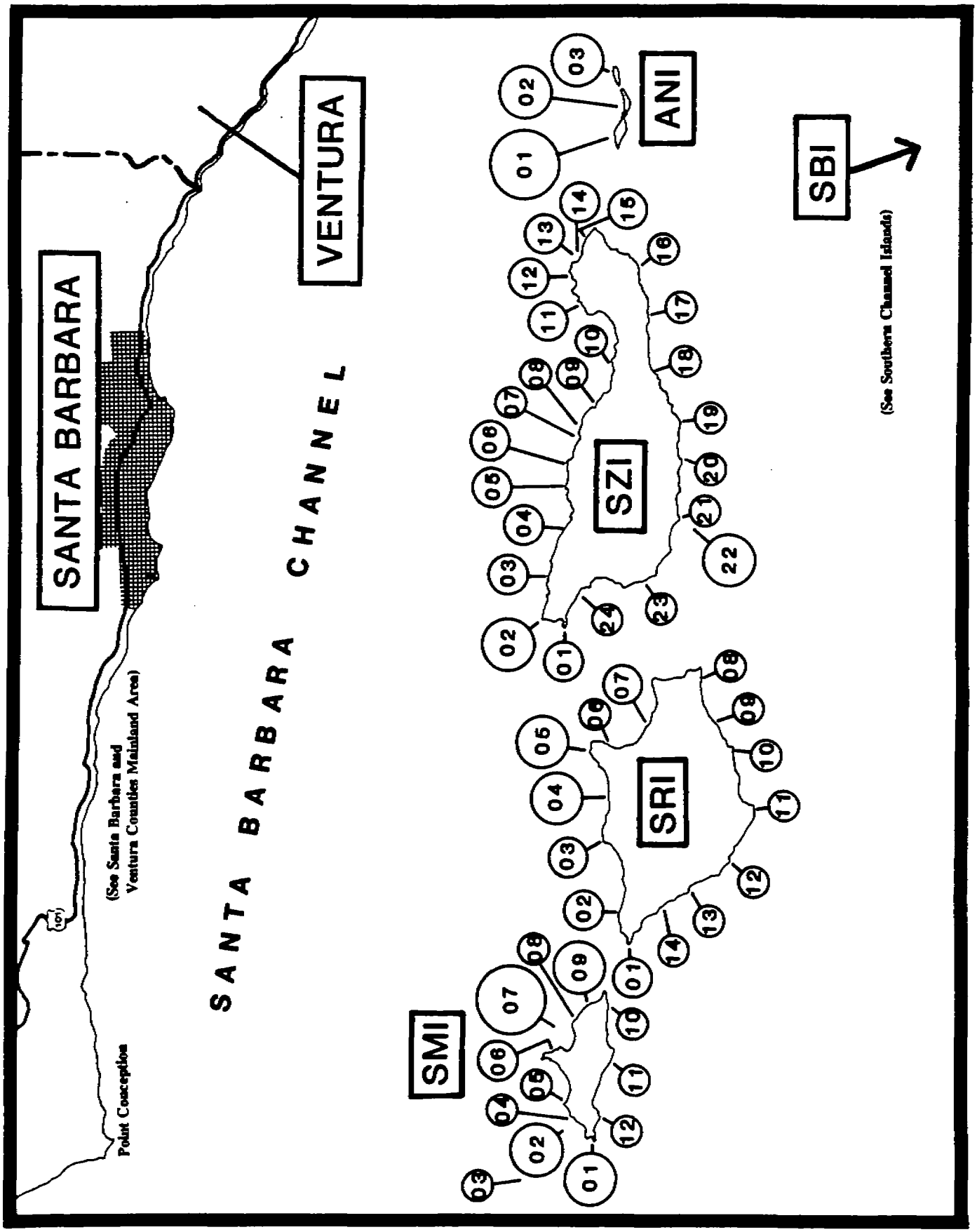
USFWS MAP BLOCKS

501 (Islands) Santa Maria,
502 (Islands) Los Angeles,
and
524 (Islands) Long Beach

The map on the facing page is an index to the locations of colonies within the Channel Islands National Park area, including San Miguel (SMI), Santa Rosa (SRI), Santa Cruz (SZI), Anacapa (ANI), and Santa Barbara (SBI) islands (see map for the Southern Channel Islands for SBI). Colonies are located within the southern halves of USFWS Map Blocks 501 (Santa Maria) and 502 (Los Angeles), plus the northern islands of Block 524 (Long Beach). In the tables following the map, colonies are presented in the above island order. At each island, colonies are numbered in a clockwise direction, starting at the northwest corner. Estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1991:

Leach's Storm-petrel	318	0.4%
Ashy Storm-petrel	3135	3.7%
Black Storm-petrel	274	0.3%
Brown Pelican	11,916	14.2%
Double-crested Cormorant	2,463	2.9%
Brandt's Cormorant	24,220	28.8%
Pelagic Cormorant	2,687	3.2%
Black Oystercatcher	267	0.3%
Black x American Oystercatcher	3	<0.1%
American Oystercatcher	H	0.0%
Western Gull	21,252	25.3%
Pigeon Guillemot	3,218	3.8%
Xantus' Murrelet	1,760	2.1%
Cassin's Auklet	12,566	14.9%
Rhinoceros Auklet	19	<0.1%
Tufted Puffin	10	<0.1%
Unidentified Cormorant	2	<0.1
Unidentified Alcid	17	<0.1%
Total	84,127	


SANTA BARBARA
VENTURA
SANTA BARBARA CHANNEL
(See Santa Barbara and Ventura Counties Mainland Area)
Point Conception
SMI
SRI
SZI
ANI
SBI
(See Southern Channel Islands)

SOUTHERN CALIFORNIA
CHANNEL ISLANDS NATIONAL PARK AREA

USFWS MAP BLOCKS 501 ([ISLANDS] SANTA MARIA), 502 ([ISLANDS] LOS ANGELES), AND 524 ([NORTH ISLANDS] LONG BEACH)
(Includes San Miguel Island [SMI], Santa Rosa Island [SRI], Santa Cruz Island [SZI], Anacapa Island [ANI], and Santa Barbara Island [SBI])

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **SB-SMI-01** Colony Name: **Point Bennett**
USFWS Colony Number: **501-014**
Latitude: 34°02'01"N Map Number: 167
Longitude: 120°26'37"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	996	1210	0	2191	05/17/91,04;06/15/91,04
Pelagic Cormorant	79	85	25	174	05/10/91,02
Blk. Oystercatcher	0	6	0	6	05/10/91,02
Western Gull	277	476	42	638	05/10/91,02
Cassin's Auklet	0	0	13	20	1991(R. DeLong, pers. comm.)
Unid. alcid	0	0	6	9	05/10/91,05
TOTAL				3038	

CA Colony Number: **SB-SMI-02** Colony Name: **Castle Rock**
USFWS Colony Number: **501-005**
Latitude: 34°03'17"N Map Number: 167
Longitude: 120°26'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel*	0	0	0	X	1968(Hunt et al. 1979)
Ashy Storm-petrel	1	1	0	200	1975-1977(Hunt et al. 1979)
Brandt's Cormorant	1962	2618	0	4316	05/17/91,04;06/15/91,04
Pelagic Cormorant	48	86	3	106	05/08/91,01
Blk. Oystercatcher	0	2	0	2	05/08/91,01
Western Gull	52	151	11	126	05/08/91,01
Pigeon Guillemot	0	102	16	255	05/08/91,01
Xantus' Murrelet	1	1	0	2	1968(Crossin and Brownell 1968)
Cassin's Auklet	0	0	1743	2614	10/21/91,05
Rhinoceros Auklet*	0	1	0	1	06/10/91,01
TOTAL				7622	

CA Colony Number: **SB-SMI-03** Colony Name: **Richardson Rock**
USFWS Colony Number: **501-026***
Latitude: 34°06'05"N Map Number: 168
Longitude: 120°31'06"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	6	70	0	17	05/11/91,01
Pigeon Guillemot	0	9	0	22	05/11/91,01
TOTAL				39	

CA Colony Number: **SB-SMI-04** Colony Name: **Northwest San Miguel Island**
USFWS Colony Number: **501-027***
Latitude: 34°02'51"N Map Number: 167
Longitude: 120°25'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	11	38	38	31	05/11/91,01
Pelagic Cormorant	23	32	0	51	05/11/91,01
TOTAL				82	

CA Colony Number: **SB-SMI-05** Colony Name: **Simonton Cove**
USFWS Colony Number: **501-028***
Latitude: 34°02'58"N Map Number: 169
Longitude: 120°23'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	2	0	2	05/11/91,01
Blk. Oystercatcher	1	5	0	7	05/11/91,01;1991 (G. Page, pers. comm.)
Western Gull	19	56	0	38	05/11/91,01
TOTAL				47	

CA Colony Number: **SB-SMI-06** Colony Name: **Harris Point to Cuyler Harbor**
USFWS Colony Number: **501-015**
Latitude: 34°04'02"N Map Number: 170
Longitude: 120°21'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	0	3	1	P	1976(Hunt et al. 1979)
Brandt's Cormorant	1	6	0	3	05/11/91,01
Pelagic Cormorant	89	173	7	196	05/11/91,01
Blk. Oystercatcher	4	27	1	27	05/11/91,01;06/07/91,03; 07/12/91,01
Western Gull	27	98	22	98	05/11/91,01;06/07/91,03; 07/12/91,01
Pigeon Guillemot	0	146	19	365	05/11/91,01
Xantus' Murrelet	0	0	0	P	1975-1977(Hunt et al. 1979)
Cassin's Auklet*	2	1	17	28	05/11/91,05
Rhinoceros Auklet*	0	3	0	3	07/12/91,01
TOTAL				720	

CA Colony Number: **SB-SMI-07** Colony Name: **Prince Island**
USFWS Colony Number: **501-004**
Latitude: 34°03'29"N Map Number: 170
Longitude: 120°20'00"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel	0	7	0	114	1991,07
Ashy Storm-petrel	10	309	0	1154	1991,07
Black Storm-petrel*	0	ND	0	P	07/08/91,10;07/10/91,10
Dbl.-cr. Cormorant	230	259	0	552	06/15/91,04
Brandt's Cormorant	1601	1998	0	3522	06/15/91,04
Pelagic Cormorant	20	33	1	44	06/10/91,01
Blk. Oystercatcher	0	8	0	8	05/11/91,01
Western Gull	31	676	0	916	05/11/91,01
Pigeon Guillemot	0	238	1	405	05/11/91,01
Xantus' Murrelet	0	0	0	150	1975-1977(Hunt et al. 1979)
Cassin's Auklet	0	85	5948	8922	10/22/91,05
Rhinoceros Auklet*	0	15	0	15	06/09/91,01
Tufted Puffin*	0	4	3	10	06/08/91,01
TOTAL				15812	
Historically-nesting species (most recent known date)					
Brown Pelican	200	ND	ND	400	1939(Sumner 1939)
Common Murre	ND	ND	ND	X	1912(Wright and Snyder 1913)

CA Colony Number: **SB-SMI-08** Colony Name: **Hoffman Point Area**
USFWS Colony Number: **501-029***
Latitude: 34°02'42"N Map Number: 170
Longitude: 120°21'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	5	13	0	14	05/11/91,01
Pelagic Cormorant	7	14	0	15	05/11/91,01
Blk. Oystercatcher	0	4	0	4	05/11/91,01
Western Gull	0	4	2	4	05/11/91,01
Pigeon Guillemot	0	14	2	35	05/11/91,01
TOTAL				72	

CA Colony Number: **SB-SMI-09** Colony Name: **Bay Point Area**
USFWS Colony Number: **501-016**
Latitude: 34°02'11"N Map Number: 171
Longitude: 120°18'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	2548	3938	0	5606	06/15/91,04
Pelagic Cormorant	11	15	0	24	05/11/91,01
Blk. Oystercatcher	0	1	0	1	05/11/91,01
Western Gull*	0	2	3	6	05/11/91,01
Pigeon Guillemot	0	9	0	22	05/11/91,01
TOTAL				5659	

CA Colony Number: **SB-SMI-10** Colony Name: **Cardwell Point West**
USFWS Colony Number: **501-030***
Latitude: 34°01'13"N Map Number: 171
Longitude: 120°21'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	21	22	0	46	05/11/91,01
Blk. Oystercatcher	0	2	0	2	05/11/91,01
TOTAL				48	

CA Colony Number: **SB-SMI-11** Colony Name: **Crook Point to Tyler Bight**
USFWS Colony Number: **501-031***
Latitude: 34°01'11"N Map Number: 172
Longitude: 120°22'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	7	10	0	15	05/11/91,01
Blk. Oystercatcher	0	2	0	2	05/11/91,01
Western Gull	2	19	6	16	05/11/91,01
TOTAL				33	

CA Colony Number: **SB-SMI-12** Colony Name: **Tyler Bight to Adam's Cove**
USFWS Colony Number: **501-032***
Latitude: 34°01'35"N Map Number: 167
Longitude: 120°25'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	8	10	0	18	05/11/91,01
Western Gull	5	42	20	50	05/11/91,01
Pigeon Guillemot	0	4	0	10	05/11/91,01
TOTAL				78	

CA Colony Number: **SB-SRI-01** Colony Name: **Sandy Point** (Sandy Point to Carrington Point [Part])
USFWS Colony Number: **501-007, 501-033**
Latitude: 34°01'35"N Map Number: 167
Longitude: 120°25'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	86	189	0	241	05/12/91,01
Pelagic Cormorant	11	35	2	24	05/12/91,01
Blk. Oystercatcher	0	3	1	3	05/12/91,01
Western Gull	0	3	3	6	05/12/91,01
TOTAL				274	

CA Colony Number: **SB-SRI-02** Colony Name: **Northwest Santa Rosa Island** (Sandy Point to Carrington Point [Part])
USFWS Colony Number: **501-007, 501-034**

Latitude: 34°00'29"N Map Number: 173
Longitude: 120°12'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	371	513	0	823	05/12/91,01;05/17/91,04; 06/15/91,04
Pelagic Cormorant	38	55	0	84	05/12/91,01;06/15/91,04
Blk. Oystercatcher	0	2	0	2	05/12/91,01
Western Gull	7	34	8	30	05/12/91,01;06/15/91,04
TOTAL				939	

CA Colony Number: **SB-SRI-03** Colony Name: **Brockway Point Area** (Sandy Point to Carrington Point [Part])
USFWS Colony Number: **501-007, 501-035**

Latitude: 34°01'27"N Map Number: 174
Longitude: 120°08'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	49	100	3	108	05/12/91,01
Blk. Oystercatcher	0	4	0	4	05/12/91,01
Western Gull	2	8	3	10	05/12/91,01
Pigeon Guillemot	0	3	0	8	05/12/91,01
TOTAL				130	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	352	ND	ND	704	1977(Hunt et al. 1977)

CA Colony Number: **SB-SRI-04** Colony Name: **Canada Verde to Santa Rosa Island W Base** (Sandy Point to Carrington Point [Part])
USFWS Colony Number: **501-007, 501-036**

Latitude: 34°01'10"N Map Number: 175
Longitude: 120°06'08"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	919	1267	0	2030	05/12/91,01;06/15/91,04
Pelagic Cormorant	202	266	3	444	05/12/91,01;06/15/91,04
Blk. Oystercatcher	0	3	0	3	05/12/91,01
Western Gull	10	22	3	26	05/12/91,01;05/17/91,04
Pigeon Guillemot	0	26	6	65	05/12/91,01
TOTAL				2568	

CA Colony Number: **SB-SRI-05** Colony Name: **Carrington Point** (Sandy Point to Carrington Point [Part])
USFWS Colony Number: **501-007, 501-037**
Latitude: 34°02'13"N Map Number: 176
Longitude: 120°03'08"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	703	891	0	1547	05/12/91,01;05/17/91,04; 06/15/91,04
Pelagic Cormorant	90	109	1	198	05/12/91,01;05/17/91,04
Blk. Oystercatcher	0	4	0	4	05/12/91,01
Western Gull	12	37	6	36	05/12/91,01;06/15/91,04
Pigeon Guillemot	0	52	2	130	05/12/91,01
TOTAL				1915	

CA Colony Number: **SB-SRI-06** Colony Name: **North Becher's Bay**
USFWS Colony Number: **501-038***
Latitude: 34°01'19"N Map Number: 176
Longitude: 120°02'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	11	42	0	24	05/09/91,01
Blk. Oystercatcher	0	2	0	2	05/12/91,01
Western Gull	10	46	7	34	05/09/91,01;05/12/91,01
TOTAL				60	

CA Colony Number: **SB-SRI-07** Colony Name: **South Becher's Bay**
USFWS Colony Number: **501-039***
Latitude: 33°59'17"N Map Number: 177
Longitude: 120°01'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	59	180	1	130	05/09/91,01
Blk. Oystercatcher	0	2	0	2	05/09/91,01
Western Gull	2	7	1	6	05/09/91,01
Pigeon Guillemot	0	45	0	76	05/09/91,01
TOTAL				214	

CA Colony Number: **SB-SRI-08** Colony Name: **East Point Area**
USFWS Colony Number: **524-014***
Latitude: 33°56'32"N Map Number: 178
Longitude: 119°58'27"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	2	7	0	4	05/09/91,01
TOTAL				4	

CA Colony Number: **SB-SRI-09** Colony Name: **Sierra Pablo Area**
USFWS Colony Number: **501-040***
Latitude: 33°55'55"N Map Number: 179
Longitude: 120°01'20"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1	1	0	3	05/09/91,01
Pelagic Cormorant	28	48	0	62	05/09/91,01
Blk. Oystercatcher	0	2	0	2	05/09/91,01
Western Gull	0	2	2	4	05/09/91,01
Pigeon Guillemot	0	3	0	8	05/09/91,01
TOTAL				79	

CA Colony Number: **SB-SRI-10** Colony Name: **Ford Point to Wreck Canyon**
USFWS Colony Number: **501-041***
Latitude: 33°54'51"N Map Number: 179
Longitude: 120°03'31"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	11	34	0	24	05/09/91,01
TOTAL				24	

CA Colony Number: **SB-SRI-11** Colony Name: **South Point Area**
USFWS Colony Number: **501-042***
Latitude: 33°53'46"N Map Number: 180
Longitude: 120°06'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1	1	0	3	05/12/91,01
Pelagic Cormorant	4	6	0	9	05/09/91,01;05/12/91,01
Blk. Oystercatcher	0	5	0	5	05/12/91,01
Western Gull	1	55	2	6	05/12/91,01
TOTAL				23	

CA Colony Number: **SB-SRI-12** Colony Name: **Cluster Point South**
USFWS Colony Number: **501-043***
Latitude: 33°54'51"N Map Number: 181
Longitude: 120°09'21"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	2	2	0	4	05/12/91,01
TOTAL				4	

CA Colony Number: **SB-SRI-13** Colony Name: **Bee Rock Mainland Area**
USFWS Colony Number: **501-044***
Latitude: 33°57'07"N Map Number: 182
Longitude: 120°11'43"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1	6	0	3	05/12/91,01
Pelagic Cormorant	13	18	0	29	05/12/91,01
Blk. Oystercatcher	0	1	1	1	05/12/91,01
Western Gull	1	57	4	10	05/12/91,01
TOTAL				43	

CA Colony Number: **SB-SRI-14** Colony Name: **Southwest Santa Rosa Island**
USFWS Colony Number: **501-045***
Latitude: 33°58'55"N Map Number: 182
Longitude: 120°13'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	8	39	1	18	05/12/91,01
Blk. Oystercatcher	0	1	0	1	05/12/91,01
Western Gull	0	2	1	2	05/12/91,01
TOTAL				21	

CA Colony Number: **SB-SZI-01** Colony Name: **Fraser Point** (Kinton Point to Diablo Point [Part])
USFWS Colony Number: **502-014, 502-015**
Latitude: 34°03'32"N Map Number: 183
Longitude: 119°55'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	24	107	0	67	05/13/91,01
Pelagic Cormorant	26	34	6	57	05/13/91,01
Blk. Oystercatcher	0	8	1	8	05/13/91,01
Western Gull	2	19	5	14	05/13/91,01
Pigeon Guillemot	0	25	1	62	05/13/91,01
TOTAL				208	

CA Colony Number: **SB-SZI-02** Colony Name: **West Point Area** (Kinton Point to Diablo Point [Part])
USFWS Colony Number: **502-014, 502-016**

Latitude: 34°04'33"N Map Number: 183
Longitude: 119°54'34"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	464	823	1	1299	05/13/91,01
Pelagic Cormorant	29	50	0	64	05/13/91,01
Blk. Oystercatcher	0	1	0	1	05/13/91,01
Western Gull	25	118	60	170	05/13/91,01
Pigeon Guillemot	0	181	11	452	05/13/91,01
TOTAL				1986	
Historically-nesting species (most recent known date)					
Tufted Puffin	ND	ND	ND	X	1912(Wright and Snyder 1913)

CA Colony Number: **SB-SZI-03** Colony Name: **Profile Point Area** (Kinton Point to Diablo Point [Part])
USFWS Colony Number: **502-014, 502-017**

Latitude: 34°04'16"N Map Number: 184
Longitude: 119°52'22"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel*	4	1	0	8	05/06/91,06;05/13/91,03
Brandt's Cormorant	24	59	0	67	05/06/91,01
Pelagic Cormorant	26	32	0	57	05/06/91,01
Blk. Oystercatcher	2	20	2	20	05/06/91,01;05/13/91,03
BxA Oystercatcher*	0	1	0	1	05/06/91,01
Western Gull	4	45	14	36	05/06/91,01
Pigeon Guillemot	14	146	4	365	05/06/91,01;05/13/91,06
TOTAL				554	

CA Colony Number: **SB-SZI-04** Colony Name: **Cueva Valdaze Area** (Kinton Point to Diablo Point [Part])
USFWS Colony Number: **502-014, 502-018**

Latitude: 34°03'32"N Map Number: 185
Longitude: 119°49'32"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	16	19	0	45	05/05/91,01
Pelagic Cormorant	10	23	5	22	05/05/91,01;05/06/91,01
Blk. Oystercatcher	0	8	2	8	05/05/91,01;05/06/91,01
Western Gull	11	42	21	64	05/05/91,01;05/06/91,01
Pigeon Guillemot	0	65	4	129	05/05/91,01;05/06/91,01
TOTAL				268	

CA Colony Number: **SB-SZI-05** Colony Name: **Arch Rock to Diablo Point**
USFWS Colony Number: **502-014, 502-019** (Kinton Point to Diablo Point [Part])
Latitude: 34°03'18"N Map Number: 186
Longitude: 119°46'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	14	18	1	31	05/05/91,01
Blk. Oystercatcher	1	7	2	7	05/05/91,03
Western Gull	7	109	54	122	05/05/91,01
Pigeon Guillemot	0	33	0	82	05/05/91,01
TOTAL				242	

CA Colony Number: **SB-SZI-06** Colony Name: **Diablo Rocks** (Kinton Point to Diablo Point [Part])
USFWS Colony Number: **502-014, 502-020**
Latitude: 34°03'28"N Map Number: 186
Longitude: 119°45'56"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	4	0	0	20	1976(Hunt et al. 1979)
Blk. Oystercatcher	2	4	0	4	05/05/91,01
Western Gull	27	32	4	62	05/05/91,01
Pigeon Guillemot	0	4	0	10	05/05/91,01
Cassin's Auklet	1	1	18	28	05/05/91,01
TOTAL				124	

CA Colony Number: **SB-SZI-07** Colony Name: **Fry's Harbor to Twin Harbors**
USFWS Colony Number: **502-021***
Latitude: 34°02'53"N Map Number: 187
Longitude: 119°44'19"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	4	7	0	9	05/05/91,01
Blk. Oystercatcher	0	6	0	6	05/05/91,01
Western Gull	0	63	16	32	05/05/91,01
Pigeon Guillemot	0	4	0	10	05/05/91,01
TOTAL				57	

CA Colony Number: **SB-SZI-08** Colony Name: **"Sppit Rock"**
USFWS Colony Number: **502-013**
Latitude: 34°02'49"N Map Number: 187
Longitude: 119°43'19"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	8	0	0	40	1976-1977(Hunt et al. 1979)
Blk. Oystercatcher	0	4	0	4	05/05/91,03
Western Gull*	8	36	0	16	05/05/91,03
Cassin's Auklet	3	0	0	10	1977(Hunt et al. 1979)
TOTAL				70	

CA Colony Number: **SB-SZI-09** Colony Name: **Pelican Bay Area**
USFWS Colony Number: **502-022***
Latitude: 34°02'04"N Map Number: 187
Longitude: 119°42'12"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	5	0	5	05/05/91,01
Western Gull	0	15	7	14	05/05/91,01
Pigeon Guillemot	0	1	0	2	05/05/91,01
TOTAL				21	

CA Colony Number: **SB-SZI-10** Colony Name: **Prisoner's Harbor Area**
USFWS Colony Number: **502-023***
Latitude: 34°01'05"N Map Number: 188
Longitude: 119°39'27"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	0	0	2	05/05/91,01
Blk. Oystercatcher	0	9	0	9	05/05/91,01
Western Gull	2	36	7	18	05/05/91,01
Pigeon Guillemot	0	8	0	20	05/05/91,01
TOTAL				49	

CA Colony Number: **SB-SZI-11** Colony Name: **Coche Point Northeast**
USFWS Colony Number: **502-012, 502-024** (Coche Point to Cavern Point [Part])
Latitude: 34°02'36"N Map Number: 189
Longitude: 119°35'55"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	7	19	0	20	05/05/91,01
Pelagic Cormorant*	6	15	0	13	05/05/91,06
Blk. Oystercatcher*	2	11	1	11	05/05/91,06
Western Gull	1	190	71	144	05/05/91,06
Pigeon Guillemot	0	35	0	88	05/05/91,06
TOTAL				276	

CA Colony Number: **SB-SZI-12** Colony Name: **Cavern Point Area** (Coche Point to Cavern Point [Part])
USFWS Colony Number: **502-012, 502-025**
Latitude: 34°03'05"N Map Number: 190
Longitude: 119°34'10"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant*	12	24	1	34	05/05/91,01
Pelagic Cormorant*	7	18	2	15	05/05/91,01
Blk. Oystercatcher*	0	2	0	2	05/05/91,01
Western Gull	12	92	40	104	05/05/91,01
Pigeon Guillemot	0	48	4	82	05/05/91,01
TOTAL				237	

CA Colony Number: **SB-SZI-13** Colony Name: **Scorpion Anchorage**
USFWS Colony Number: **502-026***
Latitude: 34°02'46"N Map Number: 190
Longitude: 119°33'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1	2	0	3	05/04/91,01
Pelagic Cormorant	7	7	0	15	05/04/91,01
Blk. Oystercatcher	0	4	0	4	05/04/91,01;05/05/91,01
Western Gull	0	32	5	10	05/04/91,01;05/05/91,01
Pigeon Guillemot	0	37	15	91	05/04/91,01;05/05/91,01
TOTAL				123	

CA Colony Number: **SB-SZI-14** Colony Name: **Scorpion Rocks**
USFWS Colony Number: **502-010**
Latitude: 34°02'52"N Map Number: 190
Longitude: 119°32'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	0	63	93	140	1991,05
Pelagic Cormorant*	9	11	2	20	05/04/91,06
Blk. Oystercatcher	0	1	0	1	05/04/91,01
Western Gull	63	18	14	154	05/02/91,06;05/04/91,03
Pigeon Guillemot	0	11	3	28	05/02/91,06
Xantus' Murrelet	0	0	0	18	05/03/91,10; 05/20/91,10
Cassin's Auklet	0	44	364	546	1991,05
TOTAL				907	
Historically-nesting species (most recent known date)					
Brown Pelican	80	ND	ND	160	1975(Anderson et al. 1975)
Dbl.-cr. Cormorant	ND	ND	ND	X	1895(Beck 1899)

CA Colony Number: **SB-SZI-15** Colony Name: **San Pedro Point Area**
USFWS Colony Number: **502-027***
Latitude: 34°02'27"N Map Number: 191
Longitude: 119°31'48"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	5	12	0	14	05/05/91,01
Pelagic Cormorant	51	54	0	112	05/02/91,01;05/05/91,01
Blk. Oystercatcher	0	5	0	5	05/02/91,01;05/05/91,01
Western Gull	5	20	4	18	05/02/91,01;05/05/91,01
Pigeon Guillemot	0	16	4	34	05/02/91,01;05/05/91,01
TOTAL				183	

CA Colony Number: **SB-SZI-16** Colony Name: **Sandstone Point West**
USFWS Colony Number: **524-015***
Latitude: 33°59'19"N Map Number: 192
Longitude: 119°35'36"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	3	2	4	05/02/91,01
TOTAL				4	

CA Colony Number: **SB-SZI-17** Colony Name: **Isthmus South**
USFWS Colony Number: **524-016***
Latitude: 33°59'16"N Map Number: 192
Longitude: 119°37'58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	1	2	1	2	05/02/91,01
Blk. Oystercatcher	0	5	2	5	05/02/91,01
TOTAL				7	

CA Colony Number: **SB-SZI-18** Colony Name: **Valley Anchorage to Coches Prietas Anchorage**
USFWS Colony Number: **524-017***
Latitude: 33°58'44"N Map Number: 193
Longitude: 119°40'51"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	5	1	5	05/02/91,01
BxA Oystercatcher	0	1	0	1	05/02/91,01
Western Gull	1	27	10	22	05/02/91,01
Xantus' Murrelet	0	0	0	P	1982(Hunt and Ingram 1982)
TOTAL				28	

CA Colony Number: **SB-SZI-19** Colony Name: **Bowen Point Area**
USFWS Colony Number: **524-018***
Latitude: 33°57'40"N Map Number: 194
Longitude: 119°42'58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	2	3	0	4	05/03/91,01
Blk. Oystercatcher	0	1	0	1	05/03/91,01
Western Gull	0	14	5	10	05/03/91,01
TOTAL				15	

CA Colony Number: **SB-SZI-20** Colony Name: **Willows Anchorage Rocks**
USFWS Colony Number: **524-019*** **[Chuck's Choice]**
Latitude: 33°57'38"N Map Number: 194
Longitude: 119°45'07"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	3	51	74	111	10/23/91,05
Blk. Oystercatcher	0	4	1	4	05/03/91,06
Western Gull	0	12	9	18	05/03/91,06
Xantus' Murrelet	3	0	0	6	10/23/91,05
Cassin's Auklet	4	0	1	10	10/23/91,05
TOTAL				149	

CA Colony Number: **SB-SZI-21** Colony Name: **Punta Arena**
USFWS Colony Number: **524-020***
Latitude: 33°57'44"N Map Number: 195
Longitude: 119°48'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	1	0	1	05/03/91,01
Unid. alcid	0	0	5	8	05/03/91,01
TOTAL				9	

CA Colony Number: **SB-SZI-22** Colony Name: **Gull Island**
USFWS Colony Number: **524-001**
Latitude: 33°57'01"N Map Number: 195
Longitude: 119°49'28"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Ashy Storm-petrel	1	0	0	2	1977(Hunt et al. 1979)
Brandt's Cormorant	723	870	0	1591	06/15/91,04
Pelagic Cormorant	10	14	0	22	05/03/91,01
Blk. Oystercatcher	0	6	1	6	05/03/91,01
Western Gull	19	50	62	162	05/03/91,01
Pigeon Guillemot*	0	1	0	2	05/03/91,01
Xantus' Murrelet	1	0	0	2	1976(Hunt et al. 1979)
Cassin's Auklet	3	0	88	132	10/24/91,05
TOTAL				1919	

CA Colony Number: **SB-SZI-23** Colony Name: **Kinton Point to Posa Anchorage**
USFWS Colony Number: **524-021***
Latitude: 33°59'34"N Map Number: 196
Longitude: 119°52'45"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	1	2	05/03/91,01
Western Gull	0	15	5	10	05/03/91,01
TOTAL				12	

CA Colony Number: **SB-SZI-24** Colony Name: **Black Point Northwest**
USFWS Colony Number: **502-014, 502-028** (Kinton Point to Diablo Point [Part])
Latitude: 34°02'42"N Map Number: 197
Longitude: 119°53'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant	7	13	1	15	05/03/91,01
Blk. Oystercatcher	1	4	0	4	05/03/91,01
Western Gull	0	32	17	34	05/03/91,01
Pigeon Guillemot	0	1	0	2	05/03/91,01
TOTAL				55	

CA Colony Number: **VE-ANI-01** Colony Name: **Anacapa Island-West**
USFWS Colony Number: **502-007**
Latitude: 34°00'41"N Map Number: 198
Longitude: 119°25'19"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brown Pelican	5340	0	0	10680	1991(Gress 1992)
Dbl.-cr. Cormorant	360	0	0	720	1991(F. Gress, unpubl. data)
Brandt's Cormorant	24	17	0	60	05/20/91,01;1991 (F. Gress, unpubl. data)
Pelagic Cormorant	69	57	0	146	05/20/91,01;1991 (F. Gress, unpubl. data)
Blk. Oystercatcher	1	15	0	15	05/20/91,01
Western Gull	231	704	493	1448	05/20/91,01;1991 (F. Gress, unpubl. data)
Pigeon Guillemot	6	14	3	47	05/20/91,01;1991 (F. Gress, unpubl. data)
Xantus' Murrelet*	ND	ND	ND	X	1991(F. Gress, unpubl. data)
TOTAL				13116	

CA Colony Number: **VE-ANI-02** Colony Name: **Anacapa Island-Middle**
USFWS Colony Number: **502-008**
Latitude: 34°00'17"N Map Number: 199
Longitude: 119°23'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	1	8	0	3	05/20/91,01
Pelagic Cormorant	38	55	0	84	05/20/91,01
Blk. Oystercatcher	0	14	1	14	05/20/91,01
BxA Oystercatcher*	0	1	0	1	05/20/91,01
Western Gull	1530	1517	1625	6310	05/19/91,03;05/20/91,01; 05/25/91,03
Pigeon Guillemot	2	0	0	4	1991(F. Gress, unpubl. data)
TOTAL				6416	

CA Colony Number: **VE-ANI-03** Colony Name: **Anacapa Island-East**
USFWS Colony Number: **502-009**
Latitude: 34°00'51"N Map Number: 199
Longitude: 119°22'02"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Pelagic Cormorant*	45	59	0	98	05/20/91,01;1991 (F. Gress, unpubl. data)
Blk. Oystercatcher	0	5	0	5	05/20/91,01
Western Gull	933	428	325	2516	05/20/91,01;05/24/91,03
Pigeon Guillemot	4	6	0	23	05/20/91,01;1991 (F. Gress, unpubl. data)
Xantus' Murrelet	0	0	0	40	1975-1977(Sowls et al. 1980)
TOTAL				2682	
Historically-nesting species (most recent known date)					
Unid. Storm-petrel*	ND	ND	ND	P	1912(Wright and Snyder 1913)
Brown Pelican	500	ND	ND	1000	1928(Hunt et al. 1979)
Cassin's Auklet*	ND	ND	ND	X	1910(Willett 1910)
Tufted Puffin*	ND	ND	ND	X	1913(Howell 1917)

CA Colony Number: **SB-SBI-01** Colony Name: **Shag Rock**
USFWS Colony Number: **524-007**
Latitude: 33°29'15"N Map Number: 200
Longitude: 119°02'05"W

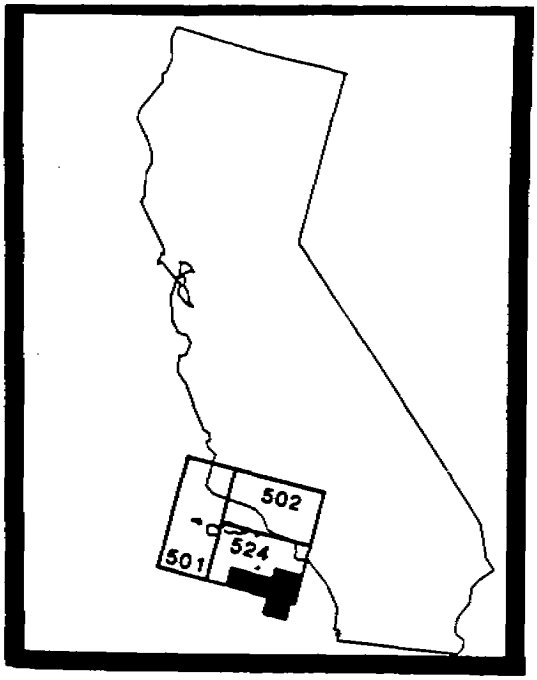
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Dbl.-cr. Cormorant*	4	9	1	10	05/21/91,01
Brandt's Cormorant*	2	4	0	6	05/21/91,01
Pelagic Cormorant*	2	3	0	4	04/13/91,01
Blk. Oystercatcher*	0	2	0	2	05/21/91,01
Western Gull	42	0	0	84	05/22/91,03
Pigeon Guillemot*	0	3	2	8	05/21/91,01
Xantus' Murrelet	4	2	11	16	05/22/91,03
Cassin's Auklet*	0	0	1	2	05/22/91,03
TOTAL				132	
Historically-nesting species (most recent known date)					
Tufted Puffin*	ND	5	ND	X	1912(Wright and Synder 1913)

CA Colony Number: **SB-SBI-02** Colony Name: **Santa Barbara Island**
USFWS Colony Number: **524-008**
Latitude: 33°28'37"N Map Number: 200
Longitude: 119°02'03"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel*	0	9	0	167	1991,07
Ashy Storm-petrel	1	314	0	874	1991,07
Black Storm-petrel	0	51	0	200	1991,07
Brown Pelican	618	2	0	1236	06/15/91,04;1991 (T. Ingram, unpubl. data)
Dbl.-cr. Cormorant	320	370	0	768	06/15/91,04
Brandt's Cormorant*	252	336	44	577	05/21/91,01;06/15/91,04
Pelagic Cormorant	19	26	1	42	04/13/91,01;05/21/91,01
Blk. Oystercatcher	0	16	4	16	04/13/91,01;05/21/91,01
Western Gull	3460	642	300	7520	1991,03
Pigeon Guillemot	6	96	24	238	05/21/91,01
Xantus' Murrelet	0	0	1421	1402	1991,05
Cassin's Auklet	0	22	66	132	1991,05
Unid. cormorant	1	1	0	2	05/21/91,01
TOTAL				13174	
Historically-nesting species (most recent known date)					
Am. Oystercatcher*	ND	ND	ND	P	1863(Baird et al. 1884, Grinnell and Miller 1944)
Rhinoceros Auklet*	ND	ND	ND	P	(Baird et al. 1884, Howell 1917)
Tufted Puffin	ND	ND	ND	12	1897(Grinnell 1897)

CA Colony Number: **SB-SBI-03** Colony Name: **Sutil Island**
USFWS Colony Number: **524-009**
Latitude: 33°28′50"N Map Number: 200
Longitude: 119°02′50"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Lch. Storm-petrel*	0	3	0	37	1991,07
Ashy Storm-petrel	0	83	0	586	1991,07
Black Storm-petrel	0	36	0	74	1991,07
Dbl.-cr. Cormorant	172	250	0	413	06/15/91,04
Brandt's Cormorant*	30	63	0	84	05/21/91,01
Blk. Oystercatcher	0	4	2	4	04/13/91,01
Western Gull	37	44	0	74	05/21/91,01
Pigeon Guillemot	0	15	2	38	04/13/91,01
Xantus' Murrelet	0	0	127	126	1991,05
Cassin's Auklet	0	9	81	122	1991,05
TOTAL				1558	



SOUTHERN CHANNEL ISLANDS

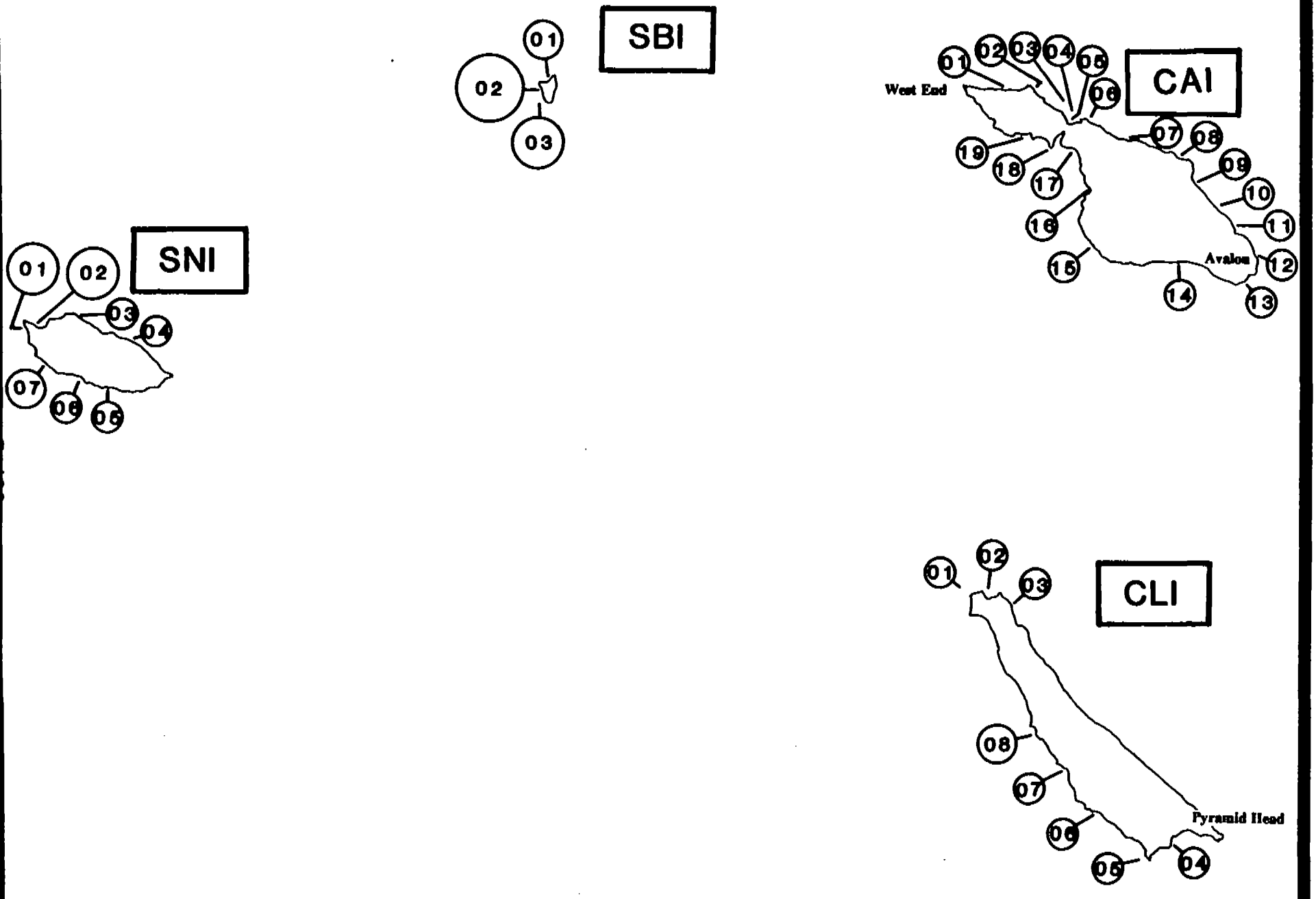
USFWS MAP BLOCK

524 (South Islands)
Long Beach

The map on the facing page is an index to the locations of colonies on the Southern Channel Islands, including San Nicolas (SNI), San Clemente (CLI) and Santa Catalina (CAI) islands. Santa Barbara Island (SBI) is shown on this map but data are summarized in the preceding section (Channel Islands National Park area). Colonies are located on USFWS Map Block 524 (Long Beach). In the tables following this map, colonies are presented in the above island order. At each island, colonies are numbered in a clockwise direction, starting at the northwest corner. Estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1991:

Black Storm-petrel	P	0.0%
Brown Pelican	PH	0.0%
Double-crested Cormorant	H	0.0%
Brandt's Cormorant	5,145	44.4%
Black Oystercatcher	27	0.2%
Western Gull	6,412	55.4%
Xantus' Murrelet	X	0.0%
Total	11,584	


SBI
01
02
03
CAI
West End
Avalon
01
02
03
04
05
06
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09
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11
12
13
14
15
16
17
18
19
SNI
01
02
03
04
05
06
07
CLI
Pyramid Head
01
02
03
04
05
06
07
08

SOUTHERN CALIFORNIA
SOUTHERN CHANNEL ISLANDS AREA

USFWS MAP BLOCK 524: [SOUTH ISLANDS] LONG BEACH
(Includes San Nicolas Island [SNI], San Clemente Island [CLI], and Santa Catalina Island [CAI])

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
***** - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: **VE-SNI-01** Colony Name: **Vizcaino Point South** (San Nicolas Island [Part])
USFWS Colony Number: **524-011, 524-022**
Latitude: 33°16'21"N Map Number: 201
Longitude: 119°34'21"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	3	0	3	05/27/91,02
Western Gull	2819	0	0	5638	05/27/91,02
TOTAL				5641	

CA Colony Number: **VE-SNI-02** Colony Name: **Vizcaino Point East** (San Nicolas Island [Part])
USFWS Colony Number: **524-011, 524-023**
Latitude: 33°16'28"N Map Number: 201
Longitude: 119°34'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	2313	2950	0	5089	06/15/91,04
TOTAL				5089	

CA Colony Number: **VE-SNI-03** Colony Name: **Thousand Springs Area** (San
USFWS Colony Number: **524-011, 524-024** Nicolas Island [Part])
Latitude: 33°16'53"N Map Number: 202
Longitude: 119°31'24"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	3	0	3	
Western Gull	0	4	2	4	
TOTAL				7	

CA Colony Number: **VE-SNI-04** Colony Name: **Light Point West** (San
USFWS Colony Number: **524-011, 524-025** Nicolas Island [Part])
Latitude: 33°15'39"N Map Number: 202
Longitude: 119°28'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	2	0	2	05/26/91,01
TOTAL				2	

CA Colony Number: **VE-SNI-05** Colony Name: **Dutch Harbor Area** (San
USFWS Colony Number: **524-011, 524-026** Nicolas Island [Part])
Latitude: 33°13'12"N Map Number: 203
Longitude: 119°29'09"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	2	0	2	05/26/91,02
Western Gull	3	6	0	6	05/26/91,01
TOTAL				8	

CA Colony Number: **VE-SNI-06** Colony Name: **Elephant Seal Beach Area**
USFWS Colony Number: **524-011, 524-027** (San Nicolas Island [Part])
Latitude: 33°13'49"N Map Number: 204
Longitude: 119°31'29"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	3	0	3	05/26/91,02
Western Gull	42	207	1	86	05/26/91,01;05/26/91,02
TOTAL				89	

CA Colony Number: **VE-SNI-07** Colony Name: **Cormorant Rock Area** (San Nicolas Island [Part])
USFWS Colony Number: **524-011, 524-028**
Latitude: 33°14'33"N Map Number: 201
Longitude: 119°33'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	0	12	4	12	05/26/91,02
Western Gull	86	331	65	302	05/26/91,02
TOTAL				314	
Historically-nesting species (most recent known date)					
Brown Pelican*	ND	ND	ND	P	1945(Rett 1947, Hunt et al. 1979
Dbl.-cr. Cormorant*	ND	ND	ND	P	1962-1964(Townsend 1968)
Brandt's Cormorant	50	ND	ND	100	1976(Hunt et al. 1979)

CA Colony Number: **LA-CLI-01** Colony Name: **Castle Rock**
USFWS Colony Number: **524-029***
Latitude: 33°02'03"N Map Number: 215
Longitude: 118°36'52"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	5	1	2	05/29/91,01
TOTAL				2	
Historically-nesting species (most recent known date)					
Brandt's Cormorant*	1	ND	ND	2	1975(Hunt et al. 1979)

CA Colony Number: **LA-CLI-02** Colony Name: **Bird Rock** (Bird Rock and Northwest San Clemente Island [Part])
USFWS Colony Number: **524-012, 524-030**
Latitude: 33°02'15"N Map Number: 215
Longitude: 118°35'24"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	22	80	5	54	05/29/91,01
TOTAL				54	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	15	ND	ND	30	1974(Jorgenson and Ferguson 1984)

CA Colony Number: **LA-CLI-03** Colony Name: **Northwest Harbor to Wilson Cove** (Bird Rock and Northwest San Clemente Island [Part])
USFWS Colony Number: **524-012, 524-031**
Latitude: 33°01'14"N Map Number: 215
Longitude: 118°33'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	5	0	6	05/29/91,01
Xantus' Murrelet*	ND	ND	ND	X	1977(Hunt et al. 1979)
TOTAL				6	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	2	ND	ND	4	1976(Hunt et al.1979)

CA Colony Number: **LA-CLI-04** Colony Name: **Pyramid Cove**
USFWS Colony Number: **524-032***
Latitude: 32°49'14"N Map Number: 216
Longitude: 118°24'05"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
No nesting birds	0	0	0	0	05/29/91,01
TOTAL				0	
Historically-nesting species (most recent known date)					
Brandt's Cormorant*	2	ND	ND	4	1976(Hunt et al. 1979)

CA Colony Number: **LA-CLI-05** Colony Name: **China Point Island**
USFWS Colony Number: **524-033***
Latitude: 32°48'13"N Map Number: 216
Longitude: 118°25'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	7	0	2	05/29/91,03
TOTAL				2	

CA Colony Number: **LA-CLI-06** Colony Name: **Lost Point South**
USFWS Colony Number: **524-034***
Latitude: 32°50'43"N Map Number: 217
Longitude: 118°29'05"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Brandt's Cormorant	20	57	0	56	05/29/91,01
Western Gull	1	5	1	4	05/29/91,01
TOTAL				60	

CA Colony Number: **LA-CLI-07** Colony Name: **Mail Point South** (Seal Cove to Lost Point [Part])
USFWS Colony Number: **524-013, 524-035**
Latitude: 32°52'47"N Map Number: 218
Longitude: 118°30'30"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	27	5	14	05/29/91,01
TOTAL				14	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	4	ND	ND	8	1976(Hunt et al. 1979)

CA Colony Number: **LA-CLI-08** Colony Name: **Seal Cove Area** (Seal Cove to Lost Point [Part])
USFWS Colony Number: **524-013, 524-036**
Latitude: 32°54'16"N Map Number: 218
Longitude: 118°31'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Black Storm-petrel*	0	1	3	X	05/29/91,03
Blk. Oystercatcher	1	2	0	2	05/29/91,03
Western Gull	59	85	9	136	05/29/91,03
Xantus' Murrelet	1	ND	ND	X	1976(Hunt et al. 1979)
TOTAL				138	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	13	ND	ND	26	1976(Hunt et al. 1979)

CA Colony Number: **LA-CAI-01** Colony Name: **Lorenzo Beach to Stony Point**
USFWS Colony Number: **524-037***
Latitude: 33°28'25"N Map Number: 205
Longitude: 118°33'40"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	05/31/91,01
TOTAL				2	

CA Colony Number: **LA-CAI-02** Colony Name: **Indian Rock & Emerald Bay**
USFWS Colony Number: **524-038***
Latitude: 33°27'57"N Map Number: 205
Longitude: 118°31'32"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	6	11	0	12	05/31/91,01
TOTAL				12	

CA Colony Number: **LA-CAI-03** Colony Name: **Ship Rock**
USFWS Colony Number: **524-039***
Latitude: 33°27′47"N Map Number: 206
Longitude: 118°29′27"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	0	2	1	2	05/31/91,03
TOTAL				2	
Historically-nesting species (most recent known date)					
Dbl.-cr. Cormorant	ND	ND	ND	X	(Howell 1917)
Brandt's Cormorant	ND	ND	ND	X	(Howell 1917)

CA Colony Number: **LA-CAI-04** Colony Name: **Bird Rock**
USFWS Colony Number: **524-010**
Latitude: 33°27′04"N Map Number: 206
Longitude: 118°29′11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher*	1	2	1	2	05/31/91,03
Western Gull	25	0	0	50	05/31/91,03
TOTAL				52	
Historically-nesting species (most recent known date)					
Brandt's Cormorant	5	ND	ND	X	1904(Willett 1912)
Xantus' Murrelet	1	2	0	2	1967(Hunt et al. 1979)

CA Colony Number: **LA-CAI-05** Colony Name: **Isthmus Cove Area**
USFWS Colony Number: **524-040***
Latitude: 33°26′43"N Map Number: 206
Longitude: 118°29′54"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	6	14	3	18	05/31/91,01
TOTAL				18	

CA Colony Number: **LA-CAI-06** Colony Name: **Blue Cavern Point to Spouting Cave**
USFWS Colony Number: **524-041***
Latitude: 33°26′45"N Map Number: 206
Longitude: 118°28′31"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	7	0	6	05/31/91,01
TOTAL				6	

CA Colony Number: **LA-CAI-07** Colony Name: **Empire Landing Area**
USFWS Colony Number: **524-042***
Latitude: 33°25'46"N Map Number: 207
Longitude: 118°26'17"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	3	0	4	05/31/91,01
TOTAL				4	

CA Colony Number: **LA-CAI-08** Colony Name: **Italian Gardens**
USFWS Colony Number: **524-043***
Latitude: 33°24'50"N Map Number: 208
Longitude: 118°23'01"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	05/31/91,01
TOTAL				2	

CA Colony Number: **LA-CAI-09** Colony Name: **Whites Landing**
USFWS Colony Number: **524-044***
Latitude: 33°23'45"N Map Number: 208
Longitude: 118°22'11"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	3	0	4	05/31/91,01
TOTAL				4	

CA Colony Number: **LA-CAI-10** Colony Name: **Toyon Bay**
USFWS Colony Number: **524-045***
Latitude: 33°22'30"N Map Number: 209
Longitude: 118°21'13"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	3	1	4	05/31/91,01
TOTAL				4	

CA Colony Number: **LA-CAI-11** Colony Name: **Descanso Bay**
USFWS Colony Number: **524-046***
Latitude: 33°21'06"N Map Number: 209
Longitude: 118°19'41"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	1	0	2	05/31/91,01
TOTAL				2	

CA Colony Number: **LA-CAI-12** Colony Name: **Pebbly Beach South**
USFWS Colony Number: **524-047***
Latitude: 33°19'52"N Map Number: 210
Longitude: 118°18'26"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	163	0	2	05/31/91,01
TOTAL				2	

CA Colony Number: **LA-CAI-13** Colony Name: **East End Light**
USFWS Colony Number: **524-048***
Latitude: 33°18'10"N Map Number: 210
Longitude: 118°18'49"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	6	0	2	05/31/91,01
TOTAL				2	

CA Colony Number: **LA-CAI-14** Colony Name: **Silver Canyon Landing Area**
USFWS Colony Number: **524-049***
Latitude: 33°19'12"N Map Number: 211
Longitude: 118°23'46"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	4	5	0	8	05/31/91,01
TOTAL				8	

CA Colony Number: **LA-CAI-15** Colony Name: **China Point North**
USFWS Colony Number: **524-050***
Latitude: 33°19'56"N Map Number: 212
Longitude: 118°28'15"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	15	0	4	05/31/91,01
TOTAL				4	

CA Colony Number: **LA-CAI-16** Colony Name: **Little Harbor Area**
USFWS Colony Number: **524-051***
Latitude: 33°23'13"N Map Number: 213
Longitude: 118°28'39"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	10	2	10	05/31/91,01
TOTAL				10	

CA Colony Number: **LA-CAI-17** Colony Name: **Catalina Harbor East**
USFWS Colony Number: **524-052***
Latitude: 33°25'06"N Map Number: 213
Longitude: 118°29'13"W

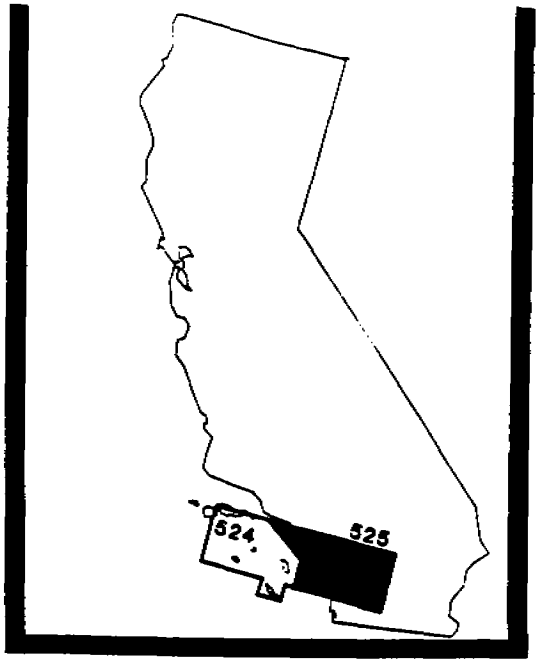
SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	5	1	6	05/31/91,01
TOTAL				6	

CA Colony Number: **LA-CAI-18** Colony Name: **Catalina Head**
USFWS Colony Number: **524-053***
Latitude: 33°25'23"N Map Number: 214
Longitude: 118°30'47"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	7	3	8	05/31/91,01
TOTAL				8	

CA Colony Number: **LA-CAI-19** Colony Name: **Cape Cortes to Whale Rock**
USFWS Colony Number: **524-054***
Latitude: 33°26'02"N Map Number: 214
Longitude: 118°32'35"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	7	3	10	05/31/91,01
TOTAL				10	



LOS ANGELES AND ORANGE COUNTIES MAINLAND AREA

USFWS MAP BLOCKS

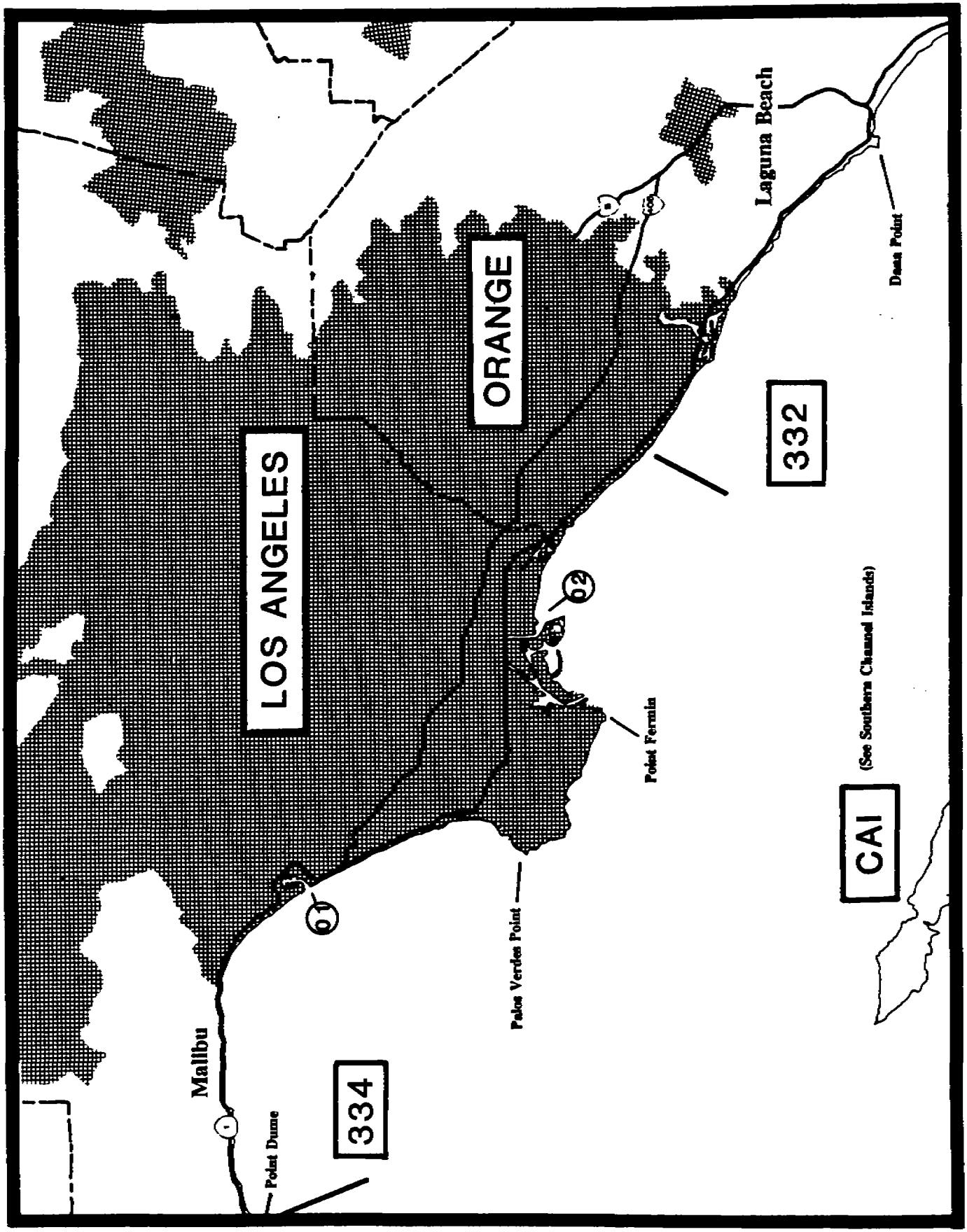
524 (Mainland) Long Beach
and
525 Santa Ana

The map on the facing page is the northern part of the index to the locations of colonies within mainland portion of USFWS Map Blocks 524 (Long Beach) and 525 (Santa Ana). The southern part of the index is found on the map at the front of the next section of tables (San Diego). All colonies on this map are numbered consecutively from north to south within counties in 20' latitude California Map Blocks (i.e. 334 = 33°40' to 34°00'N; 332 = 33°20' to 33°40'N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1991:

Black Oystercatcher	13	ND%
Western Gull	4	ND%
Total	ND	

(Tern colonies will be included in the revision)


LOS ANGELES
ORANGE
Laguna Beach
Dana Point
332
334
Malibu
Point Dume
Palos Verdes Point
Point Fermin
CAI
(See Southern Channel Islands)
01
02

SOUTHERN CALIFORNIA
USFWS MAP BLOCKS 524 ([MAINLAND] LONG BEACH) AND 525 (SANTA ANA)
(Includes California Map Blocks 334, 332 and 330)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
* - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: Colony Name: **Marina Del Rey Breakwater**
USFWS Colony Number: **524-055***
Latitude: 33°57'38"N Map Number: 219
Longitude: 118°27'44"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	2	0	2	06/29/91,01
TOTAL				2	

CA Colony Number: Colony Name: **San Pedro Bay**
USFWS Colony Number: **524-056***
Latitude: 33°44'31"N Map Number: 220
Longitude: 118°10'19"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Blk. Oystercatcher	1	11	0	11	06/30/91,03
Western Gull	2	4	0	4	06/30/91,03
TOTAL				15	

USFWS MAP BLOCK

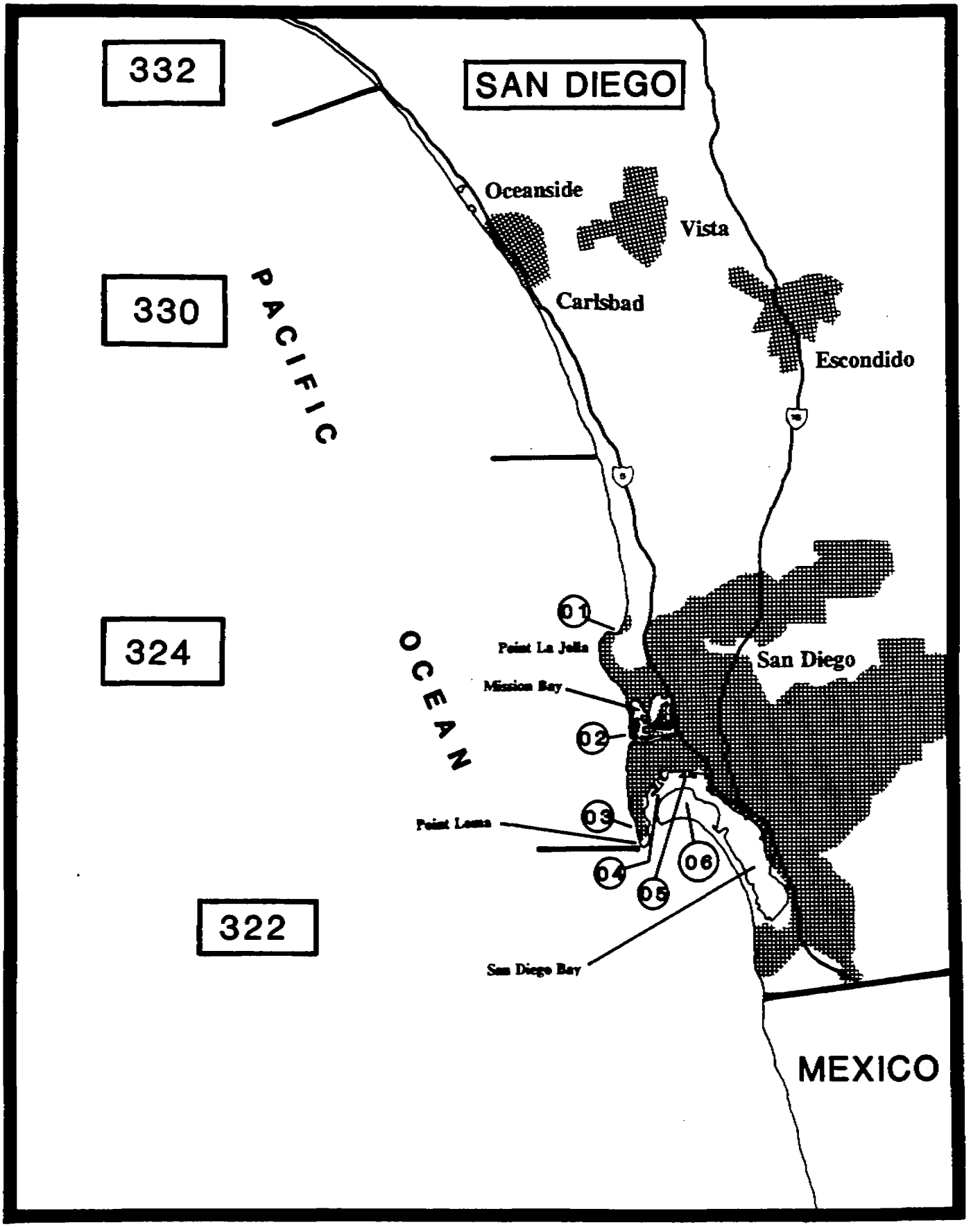
545 San Diego

The map on the facing page is an index to the locations of colonies within USFWS Map Blocks 525 (Santa Ana) and 545 (San Diego). Data for colonies in USFWS Map Block 525 (California Map Blocks 332 and 330) are found in the preceding section of tables. All colonies on this map are numbered consecutively from north to south along the coast within counties in 20' latitude California Map Blocks (i.e. 332 = 33°20' to 33°40'N; 330 = 33°00' to 33°20'N; 324 = 32°40' to 33°00'N; 322 = 32°20' to 32°40'N). In the tables following this map, estimates of the numbers of breeding birds are presented under "Total Birds" for each species at each colony, in order from north to south according to the CA colony number. In San Diego Bay, colonies are numbered in a clockwise direction within each CA map Block, starting at Point Loma and ending at the North Island breakwater. Detailed locations of all colonies and subcolonies are indicated on sections of 7.5" quadrangle USGS topographic maps in Volume II of this report.

Numbers of breeding seabirds will vary from year to year. Below are the approximate numbers and percentages of breeding seabirds within this region in 1991:

Western Gull.....288 ND%
Total.....ND

(Tern colonies will be included in the revision)


332
SAN DIEGO
Oceanside
Vista
330
PACIFIC
Carlsbad
Escondido
OCEAN
01
Point La Jolla
San Diego
324
Mission Bay
02
03
Point Loma
04
06
05
322
San Diego Bay
MEXICO

SOUTHERN CALIFORNIA
USFWS MAP BLOCK 545: SAN DIEGO
(Includes California Map Blocks 324 and 320)

KEY TO TABLES:

NEST - Raw count of the number of nests on the census day(s).
BIRD - Raw count of the number of birds on the census day(s).
SITE - Raw count of the number of possible nest sites on the census day(s).
TOTAL BIRDS - Non-rounded estimate of the total number of breeding birds in the census year (i.e. raw count(s) often adjusted with correction factor(s) [see methods]). Other codes: X, present and breeding; P, probably or possibly breeding.
CENSUS DATE - Date (i.e. month/day/year) of census(es).
CENSUS METHOD - See "How to use maps and tables" section for codes. Most common codes are: 01, boat census; 02, mainland census; 03, landed on island (includes boat census); 04, aerial photo census; 05, burrow/crevice census; 07, mistnetting (mark-recapture).
* - Newly-discovered colony, newly-discovered nesting species at a known colony, or newly-reported historical nesting.
ND - No data were collected or a complete count was not available.
Historically-nesting species - Species were not found nesting in 1989-1991 but nesting has been recorded previously; most recent nesting data are indicated.
For additional explanation of tables, see "How to use maps and tables" section.

CA Colony Number: Colony Name: **La Jolla**
USFWS Colony Number: **545-009**
Latitude: 32°50'55"N Map Number: 221
Longitude: 117°15'56"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	3	5	0	6	07/03/91,01
TOTAL				6	
Historically-nesting species (most recent known date)					
Dbl.-cr. Cormorant*	ND	ND	ND	P	1930(Michener 1931)
Brandt's Cormorant	ND	ND	ND	6	1980(Sowls et al. 1980)

CA Colony Number: Colony Name: **Sea World**
USFWS Colony Number: **545-010***
Latitude: 32°45'57"N Map Number: 222
Longitude: 117°13'42"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	3	0	4	07/13/91,02
TOTAL				4	

CA Colony Number: Colony Name: **Point Loma**
USFWS Colony Number: **545-011***
Latitude: 32°40'44"N Map Number: 223
Longitude: 117°14'48"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	7	4	10	07/11/91,01
TOTAL				10	

CA Colony Number: Colony Name: **Shelter Island Area**
USFWS Colony Number: **545-012***
Latitude: 32°42'59"N Map Number: 224
Longitude: 117°13'18"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	2	9	3	10	07/12/91,01
TOTAL				10	

CA Colony Number: Colony Name: **Harbor Island**
USFWS Colony Number: **545-013***
Latitude: 32°43'32"N Map Number: 224
Longitude: 117°11'56"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	1	4	1	4	07/12/91,01
TOTAL				4	

CA Colony Number: Colony Name: **North Island Naval Air Station** (North San Diego Bay [Part])
USFWS Colony Number: **545-003, 545-014**
Latitude: 32°42'37"N Map Number: 224
Longitude: 117°12'58"W

SPECIES	NEST	BIRD	SITE	TOTAL BIRDS	CENSUS DATE, METHOD
Western Gull	127	11	0	254	07/12/91,01;1991 (W. Everett and C. Winchell, unpubl. data)
TOTAL				254	

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Index 1. Alphabetized index to the names of seabird colonies in California.

COLONY NO. CA	USFWS	COLONY NAME	LATITUDE	LONGITUDE	DATA PAGE	MAP NO.
SFB-AL-10	429-010	Alameda Naval Air Station	37°47'12"N	122°19'49"W	358	100
SFB-AL-01	429-067	Albany Hill Cove	37°53'33"N	122°18'49"W	356	97
ME-390-07	379-029	Albion Cove to Navarro River	39°12'30"N	123°46'20"W	316	36
SFB-SF-11	429-036	Alcatraz Island	37°49'34"N	122°25'20"W	370	120
SFB-SR-10	429-099	Alviso Plant, Pond No. A1	37°26'11"N	122°05'07"W	365	112
SFB-SR-03	430-004	Alviso Plant, Pond No. A16	37°26'31"N	121°57'43"W	364	109
SFB-SR-01	430-002	Alviso Plant, Pond No. A17	37°27'33"N	121°58'03"W	363	109
SFB-SR-02	430-003	Alviso Plant, Pond No. A18	37°26'49"N	121°56'33"W	364	109
SFB-SR-08	429-097	Alviso Plant, Pond No. A5	37°26'37"N	122°01'23"W	365	111
SFB-SR-07	429-096	Alviso Plant, Pond No. A6	37°27'24"N	122°01'26"W	365	111
SFB-SR-06	429-095	Alviso Plant, Pond No. A7	37°26'29"N	122°00'27"W	364	111
SFB-SR-05	430-006	Alviso Plant, Pond No. A8	37°25'43"N	121°59'42"W	364	110
SFB-SR-09	429-098	Alviso Plant, Pond No. B2	37°26'22"N	122°02'52"W	365	111
SFB-SR-04	430-005	Alviso Plant, Pond Nos. A9 and A10	37°26'57"N	121°59'34"W	364	109
VE-ANI-03	502-009	Anacapa Island-East	34°00'51"N	119°22'02"W	429	199
VE-ANI-02	502-008	Anacapa Island-Middle	34°00'17"N	119°23'39"W	429	199
VE-ANI-01	502-007	Anacapa Island-West	34°00'41"N	119°25'19"W	428	198
MO-360-13	454-016	Anderson Canyon Rocks	36°09'07"N	121°39'53"W	385	137
ME-394-03	379-013	Anderson Cliffs	39°52'30"N	123°54'30"W	309	25
SFB-MA-04	429-056	Angel Island	37°51'18"N	122°26'24"W	348	76
SM-370-04	429-023	Ano Nuevo Island	37°06'30"N	122°20'09"W	344	72
HU-404-01	325-066	Arcata Bay Sand Islands	40°50'36"N	124°07'13"W	303	15
SB-SZI-05	502-019	Arch Rock to Diablo Point	34°03'18"N	119°46'39"W	423	186
SO-382-11	404-006	Arched Rock	38°25'53"N	123°07'32"W	329	52
MO-354-16	477-021	Arched peninsula south of Salmon Creek	35°48'05"N	121°21'14"W	394	144
SFB-SM-03	429-103	Bair Island, Pond No. A10	37°31'01"N	122°13'52"W	366	114
SFB-SM-04	429-104	Bair Island, Pond No. A9	37°30'58"N	122°14'17"W	367	114
SFB-SM-06	429-106	Bair Island, Pond No. B1(East)	37°32'12"N	122°12'25"W	367	114
SFB-SM-05	429-105	Bair Island, Pond No. B3	37°31'42"N	122°14'03"W	367	114
SFB-AL-11	429-076	Ballena Bay	37°46'00"N	122°17'13"W	358	100
SFB-AL-16	429-015	Baumberg Plant No. 1, Pond No. 10	37°36'41"N	122°08'41"W	359	104
SFB-AL-19	429-082	Baumberg Plant No. 1, Pond No. 6B	37°35'53"N	122°06'39"W	360	105
SFB-AL-18	429-081	Baumberg Plant No. 1, Pond No. 8A	37°35'49"N	122°07'52"W	360	104
SFB-AL-20	429-083	Baumberg Plant No. 1, Pond Nos. 1, 2, and 7	37°35'08"N	122°07'30"W	360	106
SFB-AL-17	429-080	Baumberg Plant No. 1, Pond Nos. 10 and 11	37°36'42"N	122°08'17"W	359	104
SFB-AL-21	429-084	Baumberg Plant No. 1, Pond Nos. 2, 4, and 7	37°34'49"N	122°07'06"W	360	106
SFB-AL-22	429-085	Baumberg Plant No. 1, Pond Nos. 4, 5, and 7	37°34'51"N	122°06'33"W	361	106
SFB-AL-04	429-070	Bay Bridge "Toll Plaza Point"	37°49'52"N	122°18'47"W	357	99
SFB-AL-12	429-077	Bay Farm Island	37°44'36"N	122°15'00"W	358	102
SB-SMI-09	501-016	Bay Point Area	34°02'11"N	120°18'51"W	416	171
SB-SRI-13	501-044	Bee Rock Mainland Area	33°57'07"N	120°11'43"W	421	182
SO-382-05	404-031	Bench Mark 125 to Timber Cove	38°32'20"N	123°17'00"W	327	49
MO-360-17	454-052	Bench Mark 223	36°04'55"N	121°36'53"W	386	138
MO-360-20	454-036	Bench Mark 247	36°02'11"N	121°34'45"W	386	139
MO-362-18	454-029	Bench Mark-227X	36°23'21"N	121°54'13"W	380	133
SFB-SM-07	404-059	Benicia Point to Army Point	38°02'32"N	122°09'08"W	352	86
SFB-AL-03	429-069	Berkeley Pier	37°51'15"N	122°20'29"W	356	98
SFB-AL-02	429-068	Berkeley Yacht Harbor Breakwaters	37°51'59"N	122°19'06"W	356	98
MO-362-09	454-009	Bird Island	36°30'25"N	121°56'33"W	378	130
MA-374-09	429-007	Bird Island	37°49'27"N	122°32'09"W	338	63
LA-CAI-04	524-010	Bird Rock	33°27'04"N	118°29'11"W	439	206
MO-362-03	454-006	Bird Rock	36°35'31"N	121°57'59"W	376	129
MA-380-04	404-010	Bird Rock	38°13'49"N	122°59'35"W	333	56
LA-CLI-02	524-030	Bird Rock	33°02'15"N	118°35'24"W	436	215
SB-SZI-24	502-028	Black Point Northwest	34°02'42"N	119°53'26"W	428	197
SO-384-04	404-026	Black Point to Stewart's Point	38°40'00"N	123°25'15"W	326	47
HU-410-14	325-024	Blank Rock	41°03'15"N	124°09'26"W	298	14
LA-CAI-06	524-041	Blue Cavern Point to Spouting Caves	33°26'45"N	118°28'31"W	439	206
SFB-MA-05	429-057	Bluff Point to Paradise Cay	37°53'47"N	122°27'37"W	348	77
SO-380-03	404-045	Bodega Harbor	38°19'21"N	123°02'30"W	331	54
SO-380-01	404-038	Bodega Head	38°18'00"N	123°03'45"W	331	54

Index 1. Continued.

SO-380-02	404-008	Bodega Rock	38°17'48"N	123°02'50"W	331	54
ME-390-12	379-031	Bonee Cliffs	39°07'00"N	123°42'45"W	318	38
MA-374-11	429-027	Bonita Cove	37°49'30"N	122°31'00"W	339	63
SB-SZI-19	524-018	Bowen Point Area	33°57'40"N	119°42'58"W	427	194
ME-390-15	379-033	Bridgeport Landing	39°03'45"N	123°41'50"W	318	39
SB-SRI-03	501-035	Brockway Point Area	34°01'27"N	120°08'29"W	418	174
SFB-CC-17	429-065	Brooks Island Area	37°53'47"N	122°21'16"W	356	96
MO-360-15	454-051	Buck Creek	36°08'06"N	121°38'53"W	385	137
MO-360-14	454-017	Burns Creek Rocks	36°08'29"N	121°39'28"W	385	137
SB-SRI-04	501-036	Canada Verde to SRI W Base	34°01'10"N	120°06'08"W	418	175
MO-362-02	454-044	Cannery Row	36°36'47"N	121°53'48"W	376	128
SO-382-03	404-029	Cannon Gulch to Stump Beach	38°35'30"N	123°20'30"W	327	48
LA-CAI-19	524-054	Cape Cortes to Whale Rock	33°26'02"N	118°32'35"W	442	214
MO-354-08	477-003	Cape San Martin	35°53'17"N	121°27'55"W	392	143
ME-394-08	379-002	Cape Vizcaino	39°43'34"N	123°49'55"W	310	28
SB-SMI-10	501-030	Cardwell Point West	34°01'13"N	120°21'03"W	417	171
MO-362-10	454-046	Carmel Highlands	36°30'00"N	121°56'23"W	378	130
SB-SRI-05	501-037	Carrington Point	34°02'13"N	120°03'08"W	419	176
ME-390-11	379-009	Caskett Rock	39°07'49"N	123°43'39"W	317	37
ME-392-09	379-023	Casper Anchorage	39°22'00"N	123°49'10"W	313	33
ME-392-10	379-037	Casper Anchorage to Point Cabrillo	39°21'27"N	123°49'25"W	313	33
LA-CLI-01	524-029	Castle Rock	33°02'03"N	118°36'52"W	436	215
DN-414-06	325-006	Castle Rock	41°45'37"N	124°15'00"W	288	3
SB-SMI-02	501-005	Castle Rock	34°03'17"N	120°26'26"W	414	167
MO-362-19	454-010	Castle Rocks and Mainland	36°22'35"N	121°54'25"W	381	133
SFB-CC-11	429-060	Castro Point Area	37°56'08"N	122°24'55"W	354	95
SFB-CC-13	429-062	Castro Rocks	37°55'57"N	122°24'57"W	355	95
LA-CAI-17	524-052	Catalina Harbor East	33°25'06"N	118°29'13"W	442	213
LA-CAI-18	524-053	Catalina Head	33°25'23"N	118°30'47"W	442	214
LA-CAI-13	524-048	Catalina Island East End Light	33°18'10"N	118°18'49"W	441	210
ME-390-09	379-030	Cavanaugh Cove to Gunderson Rock	39°08'00"N	123°44'00"W	317	37
SB-SZI-12	502-025	Cavern Point Area	34°03'05"N	119°34'10"W	425	190
HU-404-03	325-068	Central Humboldt Bay	40°47'48"N	124°11'09"W	304	16
ME-392-02	379-019	Chadbourne Rocks	39°37'02"N	123°47'00"W	311	30
SFB-SR-11	429-100	Charleston Slough	37°26'33"N	122°05'22"W	366	112
LA-CLI-05	524-033	China Point Island	32°48'13"N	118°25'49"W	437	216
LA-CAI-15	524-050	China Point North	33°19'56"N	118°28'15"W	441	212
ME-394-09	379-003	Chris Rocks	39°42'51"N	123°48'07"W	310	28
SB-SRI-12	501-043	Cluster Point South	33°54'51"N	120°09'21"W	420	181
MA-374-02	429-042	Coast Campground South	38°00'52"N	122°51'14"W	336	59
SB-SZI-11	502-024	Coche Point Northeast	34°02'36"N	119°35'55"W	424	189
ME-384-11	404-023	Collins Landing to Gualala River	38°46'00"N	123°32'40"W	325	44
SFB-SN-06	404-058	Commodore Jones Point to Benicia Point	38°02'37"N	122°09'54"W	351	86
DN-414-01	325-001	Cone Rock	41°58'21"N	124°13'02"W	286	1
MO-360-03	454-031	Cooper Point and Islands	36°14'55"N	121°50'10"W	382	135
HU-400-03	325-056	Cormorant Hotel	40°02'10"N	124°04'50"W	305	22
HU-410-02	325-015	Cormorant Rock	41°08'32"N	124°09'39"W	294	12
VE-SMI-07	524-028	Cormorant Rock Area	33°14'33"N	119°33'17"W	436	201
SB-SMI-11	501-031	Crook Point to Tyler Bight	34°01'11"N	120°22'30"W	417	172
SB-SZI-04	502-018	Cueva Valdaze Area	34°03'32"N	119°49'32"W	422	185
SC-364-01	454-038	Davenport to Sand Hill Bluff	36°59'45"N	122°10'33"W	373	121
SFB-CC-06	404-064	Davis Point Unocal Wharves	38°03'16"N	122°15'15"W	353	93
SO-384-02	404-024	Delmar Point	38°44'15"N	123°31'00"W	326	45
LA-CAI-11	524-046	Descanso Bay	33°21'06"N	118°19'41"W	440	209
SB-342-03	501-009	Destroyer Rock	34°36'10"N	120°38'40"W	409	164
ME-390-08	379-007	Devil's Basin	39°10'14"N	123°44'50"W	316	36
SM-372-03	429-014	Devil's Slide Rock	37°34'28"N	122°31'39"W	342	67
SL-350-07	477-030	Diablo Canyon Nuclear Power Plant South	35°12'07"N	120°50'39"W	399	152
SB-SZI-06	502-020	Diablo Rock	34°03'28"N	119°45'56"W	423	186
SL-350-06	477-029	Diablo Rock and adjacent mainland	35°12'36"N	120°51'38"W	399	152
MA-380-02	404-009	Dillon Beach Rocks	38°16'26"N	122°59'11"W	332	55
MO-360-16	454-018	Dolan Rock	36°05'06"N	121°37'02"W	385	138
SFB-SA-01	405-002	Donlon Island	38°01'45"N	121°46'50"W	352	89
MA-374-05	429-003	Double Point Rocks	37°56'51"N	122°47'08"W	337	60
SFB-SF-01	429-110	Double Rock	37°43'14"N	122°22'52"W	368	118
SL-350-08	477-031	Double Rock Region	35°11'39"N	120°50'29"W	400	153
HU-410-01	325-063	Dry Lagoon Cliffs	41°14'08"N	124°06'23"W	294	11

Index 1. Continued.

SO-382-15	404-037	Duncan Point to Arched Rock	38°22'30"N	123°05'00"W	331	53
VE-SNI-05	524-026	Dutch Harbor Area	33°13'12"N	119°29'09"W	435	203
SB-SRI-08	524-014	East Point Area	33°56'32"N	119°58'27"W	419	178
SFB-CC-09	404-067	East San Pablo Bay Ship Channel	38°01'48"N	122°22'18"W	354	80
DN-414-11	325-047	Easy Triangle Rocks	41°40'22"N	124°08'30"W	289	5
SFB-CC-05	404-063	Eckley to Selby	38°03'27"N	122°13'11"W	353	92
SM-372-05	429-031	Eel Rock Cliffs	37°24'15"N	122°25'30"W	342	69
SC-370-02	429-050	El Jarro Point to Davenport	37°01'05"N	122°12'23"W	344	74
MA-380-05	404-041	Elephant Rock Complex	38°11'00"N	122°58'00"W	333	57
VE-SNI-06	524-027	Elephant Seal Beach Area	33°13'49"N	119°31'29"W	435	204
MO-364-03	454-058	Elkhorn Slough Estuarine Reserve	36°49'03"N	121°44'25"W	375	126
MO-364-02	454-003	Elkhorn Slough Salt Ponds	36°49'04"N	121°46'30"W	375	125
LA-CAI-07	524-042	Empire Landing Area	33°25'46"N	118°26'17"W	440	207
SL-352-08	477-044	Fairbank Point	35°21'05"N	120°50'38"W	397	150
HU-402-01	325-040	False Cape Rocks	40°30'38"N	124°23'40"W	304	18
DN-412-08	325-060	False Klamath Cove to Pine Point	41°35'00"N	124°05'51"W	292	7
DN-412-07	325-010	False Klamath Rock	41°35'40"N	124°06'36"W	292	7
ME-384-09	404-022	Fish Rock Cove	38°47'45"N	123°35'20"W	324	43
ME-384-10	404-003	Fish Rocks	38°48'00"N	123°35'31"W	325	43
HU-410-13	325-023	Flatiron Rock	41°03'34"N	124°09'39"W	298	13
DN-412-10	325-011	Flint Rock Head	41°31'31"N	124°05'00"W	292	8
DN-412-05	325-050	Footsteps Rock	41°37'00"N	124°07'10"W	291	6
SB-SRI-10	501-041	Ford Point to Wreck Canyon	33°54'51"N	120°03'31"W	420	179
SF-374-01	429-044	Fort Point Rock to Helmut Rock	37°48'16"N	122°28'38"W	340	65
SL-350-12	477-034	Fossil Point	35°10'26"N	120°43'26"W	401	154
SB-SZI-01	502-015	Fraser Point	34°03'32"N	119°55'35"W	421	183
SB-SZI-07	502-021	Fry's Harbor to Twin Harbors	34°02'53"N	119°44'19"W	423	187
MO-360-19	454-053	Gamboa Point	36°02'51"N	121°35'14"W	386	139
SM-370-03	429-048	Gazos Creek North	37°10'23"N	122°22'00"W	343	71
ME-392-06	379-022	Georgia Pacific	39°27'00"N	123°48'45"W	312	32
SO-382-04	404-030	Gerstle Cove to Stillwater Cove	38°33'00"N	123°18'45"W	327	49
ME-390-01	379-006	Goat Island Area	39°18'28"N	123°48'49"W	314	34
SO-382-10	404-044	Goat Rock to Peaked Hill	38°26'14"N	123°07'30"W	329	52
MO-354-05	477-040	Gorda Area	35°55'55"N	121°28'59"W	391	142
SFB-AL-09	429-075	Government Island Area	37°47'05"N	122°15'18"W	358	101
HU-410-09	325-020	Green Rock	41°04'32"N	124°09'48"W	296	13
SC-370-01	429-049	Greyhound Rock to El Jarro Point	37°03'31"N	122°15'00"W	344	73
MO-360-06	454-033	Grimes Point	36°12'20"N	121°44'15"W	383	136
SL-344-01	501-023	Guadalupe Dunes North	34°59'08"N	120°38'19"W	406	157
SB-344-01	501-001	Guadalupe Dunes South	34°57'12"N	120°38'44"W	406	158
SO-384-01	404-004	Gualala Point Island	38°45'04"N	123°31'42"W	325	45
MO-362-06	454-023	Guillemot Island Area	36°31'45"N	121°56'47"W	377	130
SB-SZI-22	524-001	Gull Island	33°57'01"N	119°49'28"W	427	195
SO-382-13	404-035	Gull Rock	38°25'30"N	123°07'10"W	330	52
MA-374-07	429-025	Gull Rock Area	37°52'35"N	122°37'00"W	338	61
	545-013	Harbor Island	32°43'32"N	117°11'56"W	449	224
ME-394-10	379-017	Hardy Rock and Union Landing	39°42'20"N	123°48'20"W	311	29
SB-SNI-06	501-015	Harris Point to Cuyler Harbor	34°04'02"N	120°21'47"W	415	170
SFB-AL-15	429-079	Hayward Marsh, Basin 3A	37°37'47"N	122°08'44"W	359	104
SFB-CC-07	404-065	Hercules Wharf	38°01'23"N	122°17'29"W	354	93
DN-412-12	325-061	High Bluff South	41°30'29"N	124°04'40"W	293	8
ME-394-02	379-012	High Tip	39°55'30"N	123°57'10"W	308	24
SB-SNI-08	501-029	Hoffman Point Area	34°02'42"N	120°21'52"W	416	170
SO-382-02	404-028	Horseshoe Cove	38°36'30"N	123°22'10"W	327	48
HU-404-04	325-065	Humboldt Bay Duck Blinds	40°43'03"N	124°14'06"W	304	17
DN-414-02	325-002	Hunter Rocks	41°57'22"N	124°12'41"W	286	1
SFB-SF-02	429-111	Hunter's Point	37°43'42"N	122°21'22"W	368	118
MO-362-20	454-011	Hurricane Point Rocks	36°21'40"N	121°54'25"W	381	133
LA-CAI-02	524-038	Indian Rock and Emerald Bay	33°27'57"N	118°31'32"W	438	205
SFB-MA-03	404-052	Island No. 2	38°09'56"N	122°19'09"W	350	82
SL-352-06	477-025	Island south of Cayucos Point	35°26'45"N	120°55'51"W	397	149
LA-CAI-05	524-040	Isthmus Cove Area	33°26'43"N	118°29'54"W	439	206
LA-CAI-08	524-043	Italian Gardens	33°24'50"N	118°23'01"W	440	208
ME-384-07	404-002	Iverson Landing	38°50'39"N	123°38'37"W	324	42
SFB-AL-28	429-091	KGO Radio Towers	37°31'31"N	122°06'00"W	362	107
MO-362-16	454-048	Kasler Point North	36°24'47"N	121°54'52"W	380	132
ME-392-04	379-004	Kibesillah Rock	39°34'49"N	123°46'51"W	312	31

Index 1. Continued.

SB-SZI-23	524-021	Kinton Point to Posa Anchorage	33°59'34"N	119°52'45"W	428	196
MO-354-01	477-039	Kirk Creek to Mill Creek	35°59'51"N	121°29'33"W	390	141
SFB-SN-01	404-053	Knight Island	38°08'16"N	122°17'58"W	350	83
SL-354-04	477-006	La Cruz Rock	35°42'23"N	121°18'45"W	395	146
	545-009	La Jolla	32°50'55"N	117°15'56"W	448	221
MO-360-07	454-034	Lafler Rock and Mainland	36°12'00"N	121°43'36"W	383	136
MO-354-03	477-014	Larus Rock	35°57'44"N	121°29'01"W	391	141
SFB-SF-03	429-112	Lash Lighter Basin	37°44'24"N	122°22'05"W	368	118
DN-412-04	325-049	Last Chance Rock	41°38'05"N	124°07'30"W	291	6
VE-SNI-04	524-025	Light Point West	33°15'39"N	119°28'26"W	435	202
SL-350-05	477-011	Lion Rock	35°13'03"N	120°52'17"W	399	152
SB-344-04	501-008	Lion Rock at Point Sal	34°53'55"N	120°39'50"W	407	159
SB-344-06	501-020	Lions Head South	34°51'43"N	120°36'43"W	407	160
LA-CAI-16	524-051	Little Harbor Area	33°23'13"N	118°28'39"W	441	213
SFB-NA-01	404-050	Little Island	38°10'52"N	122°20'31"W	350	82
MU-410-11	325-022	Little Pewetole Rock	41°04'00"N	124°09'00"W	297	13
MU-410-19	325-035	Little River Rock	41°02'08"N	124°07'16"W	300	14
SF-374-02	429-029	Lobos Rock and Lands End	37°47'15"N	122°30'20"W	340	65
MO-362-14	454-025	Lobos Rocks	36°27'18"N	121°56'10"W	379	131
MO-360-22	454-054	Lopez Point South	36°01'13"N	121°33'34"W	387	140
MO-360-21	454-020	Lopez Rock	36°01'34"N	121°34'46"W	386	139
LA-CAI-01	524-037	Lorenzo Beach to Stony Point	33°28'25"N	118°33'40"W	438	205
LA-CLI-06	524-034	Lost Point South	32°50'43"N	118°29'05"W	437	217
LA-CLI-07	524-035	Mail Point South	32°52'47"N	118°30'30"W	438	218
MO-354-10	477-016	Mainland Point across from Bird Rock	35°52'37"N	121°26'59"W	393	143
SB-342-02	501-010	Mainland and rocks east of Destroyer Rock	34°36'00"N	120°38'26"W	409	164
ME-390-16	379-034	Mallo Pass Creek	39°02'20"N	123°41'50"W	319	39
SFB-SN-05	404-057	Mare Island Strait	38°04'40"N	122°14'43"W	351	85
SFB-MA-11	404-048	Marin County-West San Pablo Bay Ship Channel	38°04'17"N	122°25'38"W	349	80
SFB-MA-07	429-059	Marin Islands	37°57'57"N	122°28'15"W	348	78
	524-055	Marina Del Rey Breakwater	33°57'38"N	118°27'44"W	445	219
SM-372-07	429-033	Martin's Beach	37°22'00"N	122°24'30"W	343	69
MO-360-11	454-015	McWay Rocks	36°09'46"N	121°40'44"W	384	137
ME-390-02	379-025	Mendocino	39°18'10"N	123°47'50"W	314	34
ME-390-03	379-026	Mendocino Bay	39°17'30"N	123°47'40"W	315	35
ME-390-04	379-038	Mendocino Bay South	39°17'17"N	123°48'07"W	315	35
DN-412-03	325-059	Midway Point to Damnation Creek	41°39'19"N	124°07'57"W	290	5
MA-374-04	429-002	Millers Point Rocks	37°58'53"N	122°48'35"W	337	59
ME-394-04	379-014	Mistake Point to Big White Rock	39°51'30"N	123°53'30"W	309	25
ME-392-08	379-036	Mitchell Creek to Casper Point	39°23'01"N	123°49'11"W	313	33
ME-384-04	404-018	Moat Cove	38°53'10"N	123°41'00"W	323	41
MO-360-02	454-030	Molera Rock	36°16'45"N	121°51'30"W	382	134
MO-362-01	454-043	Monterey Harbor	36°36'22"N	121°53'26"W	376	128
SM-372-01	429-046	Mori Point	37°37'05"N	122°29'47"W	341	67
MO-364-05	454-059	Moro Cojo Slough	36°47'49"N	121°46'40"W	375	125
SL-352-09	477-046	Morro Bay Spit	35°21'33"N	120°51'24"W	397	150
SL-352-07	477-026	Morro Rock and Pillar Rock	35°22'13"N	120°52'08"W	397	150
MO-364-04	454-042	Moss Landing Harbor	36°48'28"N	121°47'06"W	375	125
SFB-SN-08	404-060	Mothball Fleet	38°05'00"N	122°05'00"W	352	87
MA-374-08	429-026	Muir Beach Headlands to Tennessee Cove	37°51'00"N	122°33'45"W	338	62
SFB-AL-14	429-078	Mulford Landing Channel	37°41'26"N	122°11'51"W	359	103
SB-344-02	501-017	Mussel Point	34°55'48"N	120°39'46"W	407	159
SM-374-01	429-045	Mussel Rock Area	37°40'00"N	122°29'47"W	341	66
SC-364-03	454-040	Needle Rock Point to Terrace Point	36°57'09"N	122°05'06"W	374	122
SFB-CC-04	404-062	Nevada Dock	38°02'11"N	122°10'22"W	353	86
ME-392-05	379-005	Newport Rocks	39°34'49"N	123°46'51"W	312	31
SB-SRI-06	501-038	North Becher's Bay	34°01'19"N	120°02'46"W	419	176
MO-362-04	454-045	North Carmel Bay	36°33'56"N	121°56'37"W	377	129
SF-FAI-01	429-051	North Farallon Islands	37°46'04"N	123°05'56"W	339	64
SB-342-01	501-022	North Nonda	34°37'13"N	120°37'55"W	408	164
	545-014	North Island Naval Air Station	32°42'37"N	117°12'58"W	449	224
SL-350-14	477-036	North Pismo Beach Rocks	35°08'57"N	120°39'23"W	401	155
SFB-SN-03	404-055	North San Pablo Bay Radar Target	38°06'04"N	122°19'40"W	351	84
SFB-SN-04	404-056	Northeast San Pablo Bay Beacon	38°04'17"N	122°17'17"W	351	84
SO-382-07	404-032	Northwest Cape Rocks	38°30'40"N	123°15'17"W	328	50
LA-CLI-03	524-031	Northwest Harbor to Wilson Cove	33°01'14"N	118°33'49"W	437	215
SB-SNI-04	501-027	Northwest San Miguel Island	34°02'51"N	120°25'39"W	414	167

Index 1. Continued.

SB-SRI-02	501-034	Northwest Santa Rosa Island	34°00'29"N	120°12'47"W	418	173
NE-392-07	379-035	Noyo Bay	39°25'35"N	123°48'55"W	313	32
SFB-AL-08	429-074	Oakland Inner Harbor	37°47'27"N	122°18'07"W	357	100
SFB-AL-13	429-011	Oakland International Airport	37°43'22"N	122°14'42"W	359	102
SFB-AL-07	429-073	Oakland Middle Harbor	37°48'01"N	122°21'50"W	357	99
SFB-AL-06	429-072	Oakland Outer Harbor	37°48'59"N	122°19'25"W	357	99
HU-404-02	325-067	Old Arcata Wharf	40°50'43"N	124°06'32"W	303	15
SL-350-15	477-047	Oso Flaco Lake North	35°02'57"N	120°37'16"W	401	156
SL-350-16	477-037	Oso Flaco Lake South	35°01'14"N	120°37'26"W	402	156
SFB-SM-09	429-109	Oyster Point Area	37°39'01"N	122°22'49"W	368	117
SC-364-05	454-056	Palm Beach	36°52'00"N	121°49'05"W	374	124
HU-410-04	325-052	Palmer's Point to Scotty Point	41°07'00"N	124°10'00"W	295	12
MO-360-09	454-050	Partington Point	36°10'43"N	121°42'01"W	383	136
MO-360-10	454-014	Partington Ridge North	36°10'06"N	121°41'14"W	384	137
MO-360-12	454-035	Partington Ridge South	36°09'36"N	121°40'25"W	384	137
SO-382-12	404-034	Peaked Hill	38°25'45"N	123°07'10"W	330	52
LA-CAI-12	524-047	Pebbly Beach South	33°19'52"N	118°18'26"W	441	210
SL-350-09	477-032	Pecho Rock	35°10'45"N	120°49'00"W	400	153
SB-SZI-09	502-022	Pelican Bay Area	34°02'04"N	119°42'12"W	424	187
SFB-MA-03	429-055	Peninsula Point and Cone Rock	37°51'44"N	122°27'25"W	348	75
MO-362-05	454-022	Pescadero Rock	36°33'43"N	121°56'33"W	377	129
HU-410-12	325-064	Pewetole Island	41°03'49"N	124°09'03"W	297	13
MO-360-04	454-032	Pfeiffer Point	36°13'59"N	121°48'33"W	382	135
SL-352-01	477-007	Piedras Blancas Island	35°39'52"N	121°17'18"W	395	147
SFB-SF-10	429-037	Pier 45	37°48'34"N	122°25'00"W	370	120
SM-370-02	429-034	Pigeon Point	37°10'55"N	122°23'20"W	343	71
SM-372-04	429-030	Pillar Point	37°29'30"N	122°29'55"W	342	68
HU-410-16	325-026	Pilot Rock	41°03'06"N	124°09'09"W	299	14
MO-362-07	454-007	Pinnacle Point Area	36°31'35"N	121°57'14"W	377	130
SO-380-04	404-039	Pinnacle Rock	38°18'20"N	123°01'10"W	332	54
SFB-CC-08	404-066	Pinole Point	38°00'25"N	122°21'46"W	354	94
SFB-CC-01	405-003	Pittsburg Pacific Gas and Electric Plant	38°02'17"N	121°54'29"W	352	90
SFB-AL-30	429-093	Plant No. 1, Pond No. 1	37°31'32"N	122°04'37"W	363	107
SFB-AL-24	429-087	Plant No. 1, Pond No. 1A	37°34'02"N	122°07'07"W	361	106
SFB-AL-23	429-086	Plant No. 1, Pond No. 1A-Northwest	37°34'07"N	122°07'27"W	361	106
SFB-AL-25	429-088	Plant No. 1, Pond No. 2A	37°33'36"N	122°07'24"W	361	106
SFB-AL-29	429-092	Plant No. 1, Pond No. 3	37°30'45"N	122°06'02"W	362	107
SFB-AL-26	429-089	Plant No. 1, Pond No. 3A	37°33'14"N	122°06'40"W	362	106
SFB-AL-27	429-090	Plant No. 1, Pond Nos. 4, 5, 6, and 7	37°32'03"N	122°06'10"W	362	107
SFB-AL-31	429-094	Plant No. 2, Pond Nos. 11 and 26	37°29'50"N	122°02'42"W	363	108
SFB-AL-32	430-001	Plant No. 2, Pond Nos. 4 and 5	37°28'27"N	121°59'17"W	363	109
MO-354-07	477-002	Plaskett Rock	35°55'14"N	121°28'41"W	392	142
NE-384-01	404-017	Point Arena	38°57'20"N	123°44'30"W	322	40
SB-342-04	501-011	Point Arguello	34°34'38"N	120°38'49"W	409	165
SB-SMI-01	501-014	Point Bennett	34°02'01"N	120°26'37"W	413	167
MA-374-10	429-008	Point Bonita	37°48'55"N	122°31'40"W	339	63
SL-350-02	477-009	Point Buchon	35°15'20"N	120°53'58"W	398	151
NE-392-11	379-024	Point Cabrillo to Jack Peters Gulch	39°20'00"N	123°49'00"W	314	34
SB-342-06	501-013	Point Conception	34°26'54"N	120°28'13"W	410	166
MA-374-12	429-028	Point Diablo Bluffs and Needles	37°49'30"N	122°29'00"W	339	63
	545-011	Point Lomo	32°40'44"N	117°14'48"W	449	223
NE-394-01	379-011	Point No Pass	39°58'40"N	123°59'40"W	308	23
SL-352-02	477-042	Point Piedras Blancas	35°39'45"N	121°16'53"W	396	147
MA-374-03	429-024	Point Resistance	37°59'55"N	122°49'40"W	337	59
MA-374-01	429-001	Point Reyes	37°59'30"N	123°59'00"W	336	58
DN-414-05	325-057	Point Saint George	41°47'00"N	124°15'00"W	287	3
DN-414-04	325-044	Point Saint George Lighthouse	41°50'00"N	124°22'00"W	287	2
SB-344-03	501-018	Point Sal	34°54'12"N	120°40'12"W	407	159
SB-344-05	501-019	Point Sal Beach South	34°53'29"N	120°38'28"W	407	159
SFB-MA-06	429-058	Point San Quentin	37°56'48"N	122°28'20"W	348	78
SL-352-04	477-038	Point San Simeon	35°38'00"N	121°12'00"W	396	148
MO-360-01	454-012	Point Sur	36°18'22"N	121°53'39"W	381	134
MO-354-11	477-017	Point north of Redwood Gulch	35°50'20"N	121°24'04"W	393	144
SM-370-01	429-047	Pomponio Beach to Pescadero Beach	37°16'42"N	122°24'30"W	343	70
SFB-CC-02	405-004	Port Chicago Allied Chemical Company	38°02'56"N	121°59'09"W	353	91
SL-350-11	477-045	Port San Luis	35°10'42"N	120°44'44"W	400	154
SFB-SF-04	429-113	Potrero Point	37°45'19"N	122°22'47"W	369	119

Index 1. Continued.

DN-414-03	325-003	Prince Island	41°57'04"N	124°12'41"W	287	1
SB-SMI-07	501-004	Prince Island	34°03'29"N	120°20'00"W	416	170
HU-410-17	325-027	Prisoner Rock	41°03'07"N	124°08'34"W	299	14
SB-SZI-10	502-023	Prisoner's Harbor Area	34°01'05"N	119°39'27"W	424	188
SB-SZI-03	502-017	Profile Point Area	34°04'16"N	119°52'22"W	422	184
HU-410-10	325-021	Puffin Rock	41°04'18"N	124°09'32"W	297	13
SB-SZI-21	524-020	Punta Arena	33°57'44"N	119°48'45"W	427	195
SM-370-05	429-022	Punta del Ano Nuevo	37°07'07"N	122°20'09"W	344	72
SL-350-04	477-028	Pup Rock and adjacent mainland	35°13'18"N	120°52'13"W	398	152
SB-344-08	501-025	Purisima Point	34°45'21"N	120°37'47"W	408	162
SB-344-09	501-021	Purisima Point South	34°45'00"N	120°37'44"W	408	162
LA-CLI-04	524-032	Pyramid Cove	32°49'14"N	118°24'05"W	437	216
DN-412-09	325-051	Radar Station Rocks	41°33'30"N	124°06'00"W	292	7
SL-354-01	477-022	Ragged Point Lodge Colony	35°46'53"N	121°19'56"W	394	145
SL-354-02	477-041	Ragged Point South	35°45'24"N	121°19'28"W	395	145
SFB-MA-09	404-046	Rat Rock	38°00'16"N	122°27'40"W	349	79
SFB-CC-14	429-039	Red Rock	37°55'45"N	122°25'50"W	355	95
HU-412-01	325-013	Redding Rock	41°20'29"N	124°10'26"W	294	10
SFB-SM-01	429-101	Redwood City Plant, Pond No. 1	37°29'51"N	122°08'59"W	366	113
SFB-SM-02	429-102	Redwood City Plant, Pond No. 3	37°29'15"N	122°08'48"W	366	113
MO-354-12	477-005	Redwood Gulch Rock	35°49'32"N	121°23'29"W	393	144
SB-SMI-03	501-026	Richardson Rock	34°06'05"N	120°31'06"W	414	168
SFB-CC-16	429-064	Richmond Harbor Entrance Channel	37°54'18"N	122°22'38"W	355	96
SFB-CC-18	429-066	Richmond Inner Harbor	37°54'36"N	122°21'42"W	356	96
SFB-CC-12	429-061	Richmond-San Rafael Bridge	37°56'01"N	122°25'26"W	355	95
DN-412-01	325-048	Rock R ["Humpback Rock"]	41°40'00"N	124°08'30"W	290	5
MO-360-24	454-055	Rockland Landing	36°00'26"N	121°31'06"W	387	140
MO-360-23	454-037	Rockland Landing North	36°00'57"N	121°32'30"W	387	140
ME-394-07	379-001	Rockport Rocks	39°44'10"N	123°50'00"W	310	28
SB-342-05	501-012	Rocky Point	34°33'45"N	120°38'11"W	409	165
MO-362-17	454-028	Rocky Point	36°24'06"N	121°54'40"W	380	132
SFB-MA-02	404-051	Russ Island	38°10'57"N	122°19'17"W	350	82
SO-382-08	404-033	Russian Gulch	38°28'00"N	123°09'36"W	328	51
SO-382-09	404-005	Russian River Rocks	38°27'14"N	123°08'34"W	329	51
MO-364-06	454-060	Salinas River New Mouth	36°44'25"N	121°47'58"W	376	127
MO-364-01	454-057	Salinas River Old Mouth	36°49'12"N	121°47'34"W	374	125
MO-354-15	477-020	Salmon Creek	35°48'31"N	121°21'47"W	394	144
SB-344-07	501-024	San Antonio Creek	34°47'16"N	120°37'16"W	408	161
SFB-SM-08	429-108	San Francisco Bay Ship Channel	37°40'05"N	122°21'31"W	368	116
SFB-SF-09	429-117	San Francisco Piers North	37°48'27"N	122°24'00"W	370	120
SFB-SF-05	429-114	San Francisco Piers South	37°46'51"N	122°22'59"W	369	119
SFB-AL-05	429-071	San Francisco-Oakland Bay Bridge East	37°49'10"N	122°20'31"W	357	99
SFB-SF-06	429-115	San Francisco-Oakland Bay Bridge West	37°48'03"N	122°22'26"W	369	99
SFB-SM-07	429-107	San Mateo Bridge and Pacific Gas & Electric Towers	37°35'24"N	122°14'40"W	367	115
	524-056	San Pedro Bay	33°44'31"N	118°10'19"W	445	220
SB-SZI-15	502-027	San Pedro Point Area	34°02'27"N	119°31'48"W	426	191
SM-372-02	429-013	San Pedro Rock	37°35'43"N	122°31'20"W	341	67
SC-364-02	454-039	Sand Hill Bluff to Needle Rock Point	36°58'01"N	122°07'46"W	373	121
MO-362-08	454-008	Sand Hill Cove Area	36°31'01"N	121°57'01"W	378	130
SB-SZI-16	524-015	Sandstone Point West	33°59'19"N	119°35'36"W	426	192
SB-SRI-01	501-033	Sandy Point	34°00'00"N	120°14'50"W	417	173
SB-SBI-02	524-008	Santa Barbara Island	33°28'37"N	119°02'03"W	430	200
SB-SZI-17	524-016	Santa Cruz Island Isthmus South	33°59'16"N	119°37'58"W	426	192
SB-344-10	501-002	Santa Ynez Estuary	34°41'23"N	120°36'06"W	408	163
ME-384-06	404-020	Saunders Landing	38°51'13"N	123°39'05"W	323	42
SFB-MA-02	429-054	Sausalito Point Area	37°51'22"N	122°28'34"W	347	75
ME-390-06	379-028	Schoolhouse Creek to Albion River	39°15'00"N	123°46'30"W	316	35
SB-SZI-13	502-026	Scorpion Anchorage	34°02'46"N	119°33'03"W	425	190
SB-SZI-14	502-010	Scorpion Rocks	34°02'52"N	119°32'47"W	425	190
HU-410-06	325-053	Scotty Point to Megwill Point	41°05'00"N	124°10'00"W	295	13
HU-410-05	325-017	Sea Gull Rock	41°05'21"N	124°09'07"W	295	12
ME-384-02	404-001	Sea Lion Rock	38°56'07"N	123°43'45"W	322	40
HU-410-07	325-018	Sea Lion Rock	41°05'40"N	124°09'49"W	296	13
ME-384-03	404-042	Sea Lion Rocks to Arena Cove	38°55'41"N	123°43'45"W	323	40
HU-400-02	325-043	Sea Lion [Gulch] Rock	40°14'20"N	124°19'54"W	305	21
SO-384-03	404-025	Sea Ranch	38°42'00"N	123°27'30"W	326	46
	545-010	Sea World	32°45'57"N	117°13'42"W	448	222

Index 1. Continued.

LA-CLI-08	524-036	Seal Cove Area	32°54'16"N	118°31'44"W	438	218
SM-372-06	429-032	Seal Rock Cliffs	37°23'00"N	122°25'00"W	342	69
SF-374-03	429-009	Seal Rocks	37°46'42"N	122°30'53"W	341	65
MO-354-13	477-018	Seastack south of Redwood Gulch	35°49'30"N	121°23'22"W	393	144
ME-384-05	404-019	Section 30 Cove	38°52'59"N	123°40'10"W	323	41
SB-SBI-01	524-007	Shag Rock	33°29'15"N	119°02'05"W	430	200
SL-350-13	477-035	Shell Beach Rocks	35°09'06"N	120°40'11"W	401	155
SO-382-14	404-036	Shell-Wright Beach Rocks	38°25'00"N	123°06'00"W	330	52
	545-012	Shelter Island Area	32°42'59"N	117°13'18"W	449	224
LA-CAI-03	524-039	Ship Rock	33°27'47"N	118°29'27"W	439	206
SB-SRI-09	501-040	Sierra Pablo Area	33°55'55"N	120°01'20"W	420	179
LA-CAI-14	524-049	Silver Canyon Landing Area	33°19'12"N	118°23'46"W	441	211
SB-SMI-05	501-028	Simonton Cove	34°02'58"N	120°23'49"W	415	169
DN-412-02	325-009	Sister Rocks	41°39'29"N	124°08'47"W	290	5
MO-354-06	477-001	Small rocks & mainland north & east of Plaskett Rk	35°55'16"N	121°28'22"W	391	142
SL-350-10	477-033	Smith and Whaler Islands	35°09'00"N	120°45'15"W	400	154
MO-362-13	454-026	Soberanes Creek Rocks	36°27'18"N	121°55'35"W	379	131
MO-362-15	454-027	Soberanes Point South	36°26'47"N	121°55'35"W	380	131
ME-394-06	379-016	Soldier Frank Point	39°45'18"N	123°50'15"W	309	27
SFB-SO-01	404-049	Sonoma County-West San Pablo Bay Ship Channel	38°06'36"N	122°27'52"W	349	81
MA-380-01	404-040	Sonoma-Marin County Line	38°17'20"N	123°00'20"W	332	55
SB-SRI-07	501-039	South Becher's Bay	33°59'17"N	120°01'35"W	419	177
SF-FAI-02	429-052	South Farallon Islands	37°42'00"N	123°00'00"W	340	64
SB-SRI-11	501-042	South Point Area	33°53'46"N	120°06'49"W	420	180
SL-352-05	477-043	South San Simeon	35°37'05"N	121°09'11"W	396	148
SFB-MA-10	404-047	Southwest San Pablo Bay Duck Blinds	38°02'15"N	122°28'03"W	349	80
SB-SRI-14	501-045	Southwest Santa Rosa Island	33°58'55"N	120°13'07"W	421	182
DN-412-13	325-062	Split Rock	41°28'35"N	124°03'58"W	293	9
SL-350-01	477-027	Spooner's Cove	35°16'21"N	120°53'57"W	398	151
SB-SZI-08	502-013	Sppit Rock	34°02'49"N	119°43'19"W	424	187
MO-360-18	454-019	Square Black Rock	36°04'21"N	121°36'35"W	386	138
SFB-CC-15	429-063	Standard Oil Long Wharf	37°55'31"N	122°24'14"W	355	95
MU-402-03	325-042	Steamboat Rock	40°24'54"N	124°24'09"W	305	19
SO-382-01	404-027	Stewart's Point to Rocky Point	38°39'00"N	123°38'45"W	326	47
MA-374-06	429-043	Stinson Beach to Rocky Point	37°53'08"N	122°37'38"W	338	61
ME-392-03	379-020	Strawberry Cove	39°35'37"N	123°47'10"W	311	31
MU-402-02	325-041	Sugarloaf Island	40°26'18"N	124°24'41"W	304	19
SFB-CC-03	404-061	Suisun Point Area	38°02'15"N	122°07'06"W	353	86
SB-SBI-03	524-009	Sutil Island	33°28'50"N	119°02'50"W	431	200
SC-364-04	454-041	Terrace Point to Santa Cruz	36°57'09"N	122°02'30"W	374	123
SFB-CC-10	429-040	The Brothers	37°57'47"N	122°26'00"W	354	95
SFB-MA-08	429-041	The Sisters and Point Pedro	37°59'22"N	122°26'25"W	349	79
MO-354-02	477-013	Thirty-six (36) North	35°58'36"N	121°29'15"W	390	141
VE-SNI-03	524-024	Thousand Springs Area	33°16'53"N	119°31'24"W	435	202
SL-354-03	477-023	Three (3) Rocks	35°45'06"N	121°19'07"W	395	145
MU-400-01	325-055	Three Brothers and Hair Seal Rocks	40°19'40"N	124°21'58"W	305	20
ME-390-14	379-032	Three-three-three (333) Point	39°05'00"N	123°42'30"W	318	38
DN-414-07	325-007	Tolowa Rocks	41°45'15"N	124°14'00"W	288	3
MA-380-03	404-011	Tomales Point	38°12'13"N	122°57'39"W	333	56
MO-360-08	454-013	Torre Canyon Rocks	36°11'25"N	121°42'46"W	383	136
LA-CAI-10	524-045	Toyon Bay	33°22'30"N	118°21'13"W	440	209
SFB-SF-08	429-116	Treasure Island	37°49'48"N	122°21'53"W	369	99
MU-410-18	325-054	Trinidad Bay Rocks	41°03'00"N	124°08'00"W	299	14
MU-410-15	325-025	Trinidad Head	41°03'09"N	124°08'58"W	298	14
ME-384-08	404-021	Triplett Gulch	38°49'00"N	123°36'15"W	324	43
SL-352-03	477-024	Two rocks south of Point Piedras Blancas	35°39'30"N	121°16'02"W	396	147
SB-SMI-12	501-032	Tyler Bight to Adam's Cove	34°01'35"N	120°25'35"W	417	167
MO-354-14	477-019	Unmapped Island	35°48'20"N	121°22'26"W	394	144
MO-354-04	477-015	Unnamed Point	35°57'00"N	121°28'51"W	391	141
MO-354-09	477-004	Unnamed Rock	35°53'05"N	121°27'46"W	392	143
SL-350-03	477-010	Unnamed Rocks	35°14'40"N	120°53'39"W	398	151
DN-414-10	325-046	Unnamed Small Rocks	41°42'00"N	124°08'00"W	289	5
ME-394-05	379-015	Usal Bay	39°48'45"N	123°50'30"W	309	26
SB-SZI-18	524-017	Valley Anchorage to Coches Prietos Anchorage	33°58'44"N	119°40'51"W	426	193
ME-390-05	379-027	Van Damme Cove	39°16'10"N	123°47'28"W	315	35
VE-SNI-02	524-023	Vizcaino Point East	33°16'28"N	119°34'09"W	434	201
VE-SNI-01	524-022	Vizcaino Point South	33°16'21"N	119°34'21"W	434	201

Index 1. Continued.

HU-410-03	325-016	Wedding Rock	41·08'28"N	124·09'32"W	294	12
SB-SZI-02	502-016	West Point Area	34·04'33"N	119·54'34"W	422	183
ME-392-01	379-018	Westport	39·38'00"N	123·47'20"W	311	30
DN-414-09	325-045	Whaler I., Crescent City Bkr., Steamboat Rk, etc.	41·45'00"N	124·12'00"W	289	4
ME-390-10	379-008	Wharf Rocks	39·07'49"N	123·43'24"W	317	37
SFB-SN-09	405-001	Wheeler Island	38·04'37"N	121·57'47"W	352	88
ME-390-13	379-010	White Rock	39·05'42"N	123·43'11"W	318	38
HU-410-08	325-019	White Rock	41·05'13"N	124·09'33"W	296	13
DN-412-11	325-012	White Rock	41·30'56"N	124·05'06"W	293	8
DN-414-08	325-008	White Rock	41·44'46"N	124·13'44"W	288	4
SFB-SN-02	404-054	White Slough	38·07'39"N	122·15'41"W	351	83
LA-CAI-09	524-044	Whites Landing	33·23'45"N	118·22'11"W	440	208
SB-SZI-20	524-019	Willows Anchorage Rocks	33·57'38"N	119·45'07"W	427	194
DN-412-06	325-058	Wilson Rock	41·35'45"N	124·06'37"W	291	7
SO-382-06	404-043	Windermere Point to Jewell Gulch	38·30'20"N	123·13'00"W	328	50
MO-360-05	454-049	Wreck Beach South	36·13'56"N	121·47'30"W	382	135
MO-362-11	454-024	Yankee Point	36·29'29"N	121·56'41"W	379	131
MO-362-12	454-047	Yankee Point South	36·28'47"N	121·56'18"W	379	131
SFB-MA-01	429-053	Yellow Bluff	37·50'13"N	122·28'15"W	347	75
SFB-SF-07	429-038	Yerba Buena Island	37·48'34"N	122·22'15"W	369	99

Index 2. Index to seabird colonies in California, ordered by the USFWS colony number.

COLONY NO. USFWS	COLONY NO. CA	COLONY NAME	LATITUDE	LONGITUDE	DATA PAGE	MAP NO.
325-001	DN-414-01	Cone Rock	41°58'21"N	124°13'02"W	286	1
325-002	DN-414-02	Hunter Rocks	41°57'22"N	124°12'41"W	286	1
325-003	DN-414-03	Prince Island	41°57'04"N	124°12'41"W	287	1
325-006	DN-414-06	Castle Rock	41°45'37"N	124°15'00"W	288	3
325-007	DN-414-07	Tolowa Rocks	41°45'15"N	124°14'00"W	288	3
325-008	DN-414-08	White Rock	41°44'46"N	124°13'44"W	288	4
325-009	DN-412-02	Sister Rocks	41°39'29"N	124°08'47"W	290	5
325-010	DN-412-07	False Klamath Rock	41°35'40"N	124°06'36"W	292	7
325-011	DN-412-10	Flint Rock Head	41°31'31"N	124°05'00"W	292	8
325-012	DN-412-11	White Rock	41°30'56"N	124°05'06"W	293	8
325-013	HU-412-01	Redding Rock	41°20'29"N	124°10'26"W	294	10
325-015	HU-410-02	Cormorant Rock	41°08'32"N	124°09'39"W	294	12
325-016	HU-410-03	Wedding Rock	41°08'28"N	124°09'32"W	294	12
325-017	HU-410-05	Sea Gull Rock	41°05'21"N	124°09'07"W	295	12
325-018	HU-410-07	Sea Lion Rock	41°05'40"N	124°09'49"W	296	13
325-019	HU-410-08	White Rock	41°05'13"N	124°09'33"W	296	13
325-020	HU-410-09	Green Rock	41°04'32"N	124°09'48"W	296	13
325-021	HU-410-10	Puffin Rock	41°04'18"N	124°09'32"W	297	13
325-022	HU-410-11	Little Pewetole Rock	41°04'00"N	124°09'00"W	297	13
325-023	HU-410-13	Flatiron Rock	41°03'34"N	124°09'39"W	298	13
325-024	HU-410-14	Blank Rock	41°03'15"N	124°09'26"W	298	14
325-025	HU-410-15	Trinidad Head	41°03'09"N	124°08'58"W	298	14
325-026	HU-410-16	Pilot Rock	41°03'06"N	124°09'09"W	299	14
325-027	HU-410-17	Prisoner Rock	41°03'07"N	124°08'34"W	299	14
325-035	HU-410-19	Little River Rock	41°02'08"N	124°07'16"W	300	14
325-040	HU-402-01	False Cape Rocks	40°30'38"N	124°23'40"W	304	18
325-041	HU-402-02	Sugarloaf Island	40°26'18"N	124°24'41"W	304	19
325-042	HU-402-03	Steamboat Rock	40°24'54"N	124°24'09"W	305	19
325-043	HU-400-02	Sea Lion [Gulch] Rock	40°14'20"N	124°19'54"W	305	21
325-044	DN-414-04	Point Saint George Lighthouse	41°50'00"N	124°22'00"W	287	2
325-045	DN-414-09	Whaler I., Crescent City Bkr., Steamboat Rk, etc.	41°45'00"N	124°12'00"W	289	4
325-046	DN-414-10	Unnamed Small Rocks	41°42'00"N	124°08'00"W	289	5
325-047	DN-414-11	Easy Triangle Rocks	41°40'22"N	124°08'30"W	289	5
325-048	DN-412-01	Rock R ("Humpback Rock")	41°40'00"N	124°08'30"W	290	5
325-049	DN-412-04	Last Chance Rock	41°38'05"N	124°07'30"W	291	6
325-050	DN-412-05	Footsteps Rock	41°37'00"N	124°07'10"W	291	6
325-051	DN-412-09	Radar Station Rocks	41°33'30"N	124°06'00"W	292	7
325-052	HU-410-04	Palmer's Point to Scotty Point	41°07'00"N	124°10'00"W	295	12
325-053	HU-410-06	Scotty Point to Megwill Point	41°05'00"N	124°10'00"W	295	13
325-054	HU-410-18	Trinidad Bay Rocks	41°03'00"N	124°08'00"W	299	14
325-055	HU-400-01	Three Brothers and Hair Seal Rocks	40°19'40"N	124°21'58"W	305	20
325-056	HU-400-03	Cormorant Hotel	40°02'10"N	124°04'50"W	305	22
325-057	DN-414-05	Point Saint George	41°47'00"N	124°15'00"W	287	3
325-058	DN-412-06	Wilson Rock	41°35'45"N	124°06'37"W	291	7
325-059	DN-412-03	Midway Point to Damnation Creek	41°39'19"N	124°07'57"W	290	5
325-060	DN-412-08	False Klamath Cove to Pine Point	41°35'00"N	124°05'51"W	292	7
325-061	DN-412-12	High Bluff South	41°30'29"N	124°04'40"W	293	8
325-062	DN-412-13	Split Rock	41°28'35"N	124°03'58"W	293	9
325-063	HU-410-01	Dry Lagoon Cliffs	41°14'08"N	124°06'23"W	294	11
325-064	HU-410-12	Pewetole Island	41°03'49"N	124°09'03"W	297	13
325-065	HU-404-04	Humboldt Bay Duck Blinds	40°43'03"N	124°14'06"W	304	17
325-066	HU-404-01	Arcata Bay Sand Islands	40°50'36"N	124°07'13"W	303	15
325-067	HU-404-02	Old Arcata Wharf	40°50'43"N	124°06'32"W	303	15
325-068	HU-404-03	Central Humboldt Bay	40°47'48"N	124°11'09"W	304	16
379-001	ME-394-07	Rockport Rocks	39°44'10"N	123°50'00"W	310	28
379-002	ME-394-08	Cape Vizcaino	39°43'34"N	123°49'55"W	310	28
379-003	ME-394-09	Chris Rocks	39°42'51"N	123°48'07"W	310	28
379-004	ME-392-04	Kibesillah Rock	39°34'49"N	123°46'51"W	312	31
379-005	ME-392-05	Newport Rocks	39°34'49"N	123°46'51"W	312	31
379-006	ME-390-01	Goat Island Area	39°18'28"N	123°48'49"W	314	34
379-007	ME-390-08	Devil's Basin	39°10'14"N	123°44'50"W	316	36
379-008	ME-390-10	Wharf Rocks	39°07'49"N	123°43'24"W	317	37
379-009	ME-390-11	Caskett Rock	39°07'49"N	123°43'39"W	317	37

Index 2. Continued.

379-010	ME-390-13	White Rock	39°05'42"N	123°43'11"W	318	38
379-011	ME-394-01	Point No Pass	39°58'40"N	123°59'40"W	308	23
379-012	ME-394-02	High Tip	39°55'30"N	123°57'10"W	308	24
379-013	ME-394-03	Anderson Cliffs	39°52'30"N	123°54'30"W	309	25
379-014	ME-394-04	Mistake Point to Big White Rock	39°51'30"N	123°53'30"W	309	25
379-015	ME-394-05	Usal Bay	39°48'45"N	123°50'30"W	309	26
379-016	ME-394-06	Soldier Frank Point	39°45'18"N	123°50'15"W	309	27
379-017	ME-394-10	Hardy Rock and Union Landing	39°42'20"N	123°48'20"W	311	29
379-018	ME-392-01	Westport	39°38'00"N	123°47'20"W	311	30
379-019	ME-392-02	Chadbourne Rocks	39°37'02"N	123°47'00"W	311	30
379-020	ME-392-03	Strawberry Cove	39°35'37"N	123°47'10"W	311	31
379-022	ME-392-06	Georgia Pacific	39°27'00"N	123°48'45"W	312	32
379-023	ME-392-09	Caspar Anchorage	39°22'00"N	123°49'10"W	313	33
379-024	ME-392-11	Point Cabrillo to Jack Peters Gulch	39°20'00"N	123°49'00"W	314	34
379-025	ME-390-02	Mendocino	39°18'10"N	123°47'50"W	314	34
379-026	ME-390-03	Mendocino Bay	39°17'30"N	123°47'40"W	315	35
379-027	ME-390-05	Van Damme Cove	39°16'10"N	123°47'28"W	315	35
379-028	ME-390-06	Schoolhouse Creek to Albion River	39°15'00"N	123°46'30"W	316	35
379-029	ME-390-07	Albion Cove to Navarro River	39°12'30"N	123°46'20"W	316	36
379-030	ME-390-09	Cavanaugh Cove to Gunderson Rock	39°08'00"N	123°44'00"W	317	37
379-031	ME-390-12	Bones Cliffs	39°07'00"N	123°42'45"W	318	38
379-032	ME-390-14	Three-three-three (333) Point	39°05'00"N	123°42'30"W	318	38
379-033	ME-390-15	Bridgeport Landing	39°03'45"N	123°41'50"W	318	39
379-034	ME-390-16	Hallo Pass Creek	39°02'20"N	123°41'50"W	319	39
379-035	ME-392-07	Noyo Bay	39°25'35"N	123°48'55"W	313	32
379-036	ME-392-08	Mitchell Creek to Caspar Point	39°23'01"N	123°49'11"W	313	33
379-037	ME-392-10	Caspar Anchorage to Point Cabrillo	39°21'27"N	123°49'25"W	313	33
379-038	ME-390-04	Mendocino Bay South	39°17'17"N	123°48'07"W	315	35
404-001	ME-384-02	Sea Lion Rock	38°56'07"N	123°43'45"W	322	40
404-002	ME-384-07	Iverson Landing	38°50'39"N	123°38'37"W	324	42
404-003	ME-384-10	Fish Rocks	38°48'00"N	123°35'31"W	325	43
404-004	SO-384-01	Gualala Point Island	38°45'04"N	123°31'42"W	325	45
404-005	SO-382-09	Russian River Rocks	38°27'14"N	123°08'34"W	329	51
404-006	SO-382-11	Arched Rock	38°25'53"N	123°07'32"W	329	52
404-008	SO-380-02	Bodega Rock	38°17'48"N	123°02'50"W	331	54
404-009	MA-380-02	Dillon Beach Rocks	38°16'26"N	122°59'11"W	332	55
404-010	MA-380-04	Bird Rock	38°13'49"N	122°59'35"W	333	56
404-011	MA-380-03	Tomales Point	38°12'13"N	122°57'39"W	333	56
404-017	ME-384-01	Point Arena	38°57'20"N	123°44'30"W	322	40
404-018	ME-384-04	Moat Cove	38°53'10"N	123°41'00"W	323	41
404-019	ME-384-05	Section 30 Cove	38°52'59"N	123°40'10"W	323	41
404-020	ME-384-06	Saunders Landing	38°51'13"N	123°39'05"W	323	42
404-021	ME-384-08	Triplett Gulch	38°49'00"N	123°36'15"W	324	43
404-022	ME-384-09	Fish Rock Cove	38°47'45"N	123°35'20"W	324	43
404-023	ME-384-11	Collins Landing to Gualala River	38°46'00"N	123°32'40"W	325	44
404-024	SO-384-02	Delmar Point	38°44'15"N	123°31'00"W	326	45
404-025	SO-384-03	Sea Ranch	38°42'00"N	123°27'30"W	326	46
404-026	SO-384-04	Black Point to Stewart's Point	38°40'00"N	123°25'15"W	326	47
404-027	SO-382-01	Stewart's Point to Rocky Point	38°39'00"N	123°38'45"W	326	47
404-028	SO-382-02	Horseshoe Cove	38°36'30"N	123°22'10"W	327	48
404-029	SO-382-03	Cannon Gulch to Stump Beach	38°35'30"N	123°20'30"W	327	48
404-030	SO-382-04	Gerstle Cove to Stillwater Cove	38°33'00"N	123°18'45"W	327	49
404-031	SO-382-05	Bench Mark 125 to Timber Cove	38°32'20"N	123°17'00"W	327	49
404-032	SO-382-07	Northwest Cape Rocks	38°30'40"N	123°15'17"W	328	50
404-033	SO-382-08	Russian Gulch	38°28'00"N	123°09'36"W	328	51
404-034	SO-382-12	Peaked Hill	38°25'45"N	123°07'10"W	330	52
404-035	SO-382-13	Gull Rock	38°25'30"N	123°07'10"W	330	52
404-036	SO-382-14	Shell-Wright Beach Rocks	38°25'00"N	123°06'00"W	330	52
404-037	SO-382-15	Duncan Point to Arched Rock	38°22'30"N	123°05'00"W	331	53
404-038	SO-380-01	Bodega Head	38°18'00"N	123°03'45"W	331	54
404-039	SO-380-04	Pinnacle Rock	38°18'20"N	123°01'10"W	332	54
404-040	MA-380-01	Sonoma-Marin County Line	38°17'20"N	123°00'20"W	332	55
404-041	MA-380-05	Elephant Rock Complex	38°11'00"N	122°58'00"W	333	57
404-042	ME-384-03	Sea Lion Rocks to Arena Cove	38°55'41"N	123°43'45"W	323	40
404-043	SO-382-06	Windermere Point to Jewell Gulch	38°30'20"N	123°13'00"W	328	50
404-044	SO-382-10	Goat Rock to Peaked Hill	38°26'14"N	123°07'30"W	329	52
404-045	SO-380-03	Bodega Harbor	38°19'21"N	123°02'30"W	331	54

Index 2. Continued.

404-046	SFB-MA-09	Rat Rock	38°00'16"N	122°27'40"W	349	79
404-047	SFB-MA-10	Southwest San Pablo Bay Duck Blinds	38°02'15"N	122°28'03"W	349	80
404-048	SFB-MA-11	Marin County-West San Pablo Bay Ship Channel	38°04'17"N	122°25'38"W	349	80
404-049	SFB-SO-01	Sonoma County-West San Pablo Bay Ship Channel	38°06'36"N	122°27'52"W	349	81
404-050	SFB-MA-01	Little Island	38°10'52"N	122°20'31"W	350	82
404-051	SFB-MA-02	Russ Island	38°10'57"N	122°19'17"W	350	82
404-052	SFB-MA-03	Island No. 2	38°09'56"N	122°19'09"W	350	82
404-053	SFB-SN-01	Knight Island	38°08'16"N	122°17'58"W	350	83
404-054	SFB-SN-02	White Slough	38°07'39"N	122°15'41"W	351	83
404-055	SFB-SN-03	North San Pablo Bay Radar Target	38°06'04"N	122°19'40"W	351	84
404-056	SFB-SN-04	Northeast San Pablo Bay Beacon	38°04'17"N	122°17'17"W	351	84
404-057	SFB-SN-05	Mare Island Strait	38°04'40"N	122°14'43"W	351	85
404-058	SFB-SN-06	Commodore Jones Point to Benicia Point	38°02'37"N	122°09'54"W	351	86
404-059	SFB-SN-07	Benicia Point to Army Point	38°02'32"N	122°09'08"W	352	86
404-060	SFB-SN-08	Mothball Fleet	38°05'00"N	122°05'00"W	352	87
404-061	SFB-CC-03	Suisun Point Area	38°02'15"N	122°07'06"W	353	86
404-062	SFB-CC-04	Nevada Dock	38°02'11"N	122°10'22"W	353	86
404-063	SFB-CC-05	Eckley to Selby	38°03'27"N	122°13'11"W	353	92
404-064	SFB-CC-06	Davis Point Unocal Wharves	38°03'16"N	122°15'15"W	353	93
404-065	SFB-CC-07	Hercules Wharf	38°01'23"N	122°17'29"W	354	93
404-066	SFB-CC-08	Pinole Point	38°00'25"N	122°21'46"W	354	94
404-067	SFB-CC-09	East San Pablo Bay Ship Channel	38°01'48"N	122°22'18"W	354	80
405-001	SFB-SN-09	Wheeler Island	38°04'37"N	121°57'47"W	352	88
405-002	SFB-SA-01	Donlon Island	38°01'45"N	121°46'50"W	352	89
405-003	SFB-CC-01	Pittsburg Pacific Gas and Electric Plant	38°02'17"N	121°54'29"W	352	90
405-004	SFB-CC-02	Port Chicago Allied Chemical Company	38°02'56"N	121°59'09"W	353	91
429-001	MA-374-01	Point Reyes	37°59'30"N	123°59'00"W	336	58
429-002	MA-374-04	Millers Point Rocks	37°58'53"N	122°48'35"W	337	59
429-003	MA-374-05	Double Point Rocks	37°56'51"N	122°47'08"W	337	60
429-007	MA-374-09	Bird Island	37°49'27"N	122°32'09"W	338	63
429-008	MA-374-10	Point Bonita	37°48'55"N	122°31'40"W	339	63
429-009	SF-374-03	Seal Rocks	37°46'42"N	122°30'53"W	341	65
429-010	SFB-AL-10	Alameda Naval Air Station	37°47'12"N	122°19'49"W	358	100
429-011	SFB-AL-13	Oakland International Airport	37°43'22"N	122°14'42"W	359	102
429-013	SM-372-02	San Pedro Rock	37°35'43"N	122°31'20"W	341	67
429-014	SM-372-03	Devil's Slide Rock	37°34'28"N	122°31'39"W	342	67
429-015	SFB-AL-16	Baumberg Plant No. 1, Pond No. 10	37°36'41"N	122°08'41"W	359	104
429-022	SM-370-05	Punta del Ano Nuevo	37°07'07"N	122°20'09"W	344	72
429-023	SM-370-04	Ano Nuevo Island	37°06'30"N	122°20'09"W	344	72
429-024	MA-374-03	Point Resistance	37°59'55"N	122°49'40"W	337	59
429-025	MA-374-07	Gull Rock Area	37°52'35"N	122°37'00"W	338	61
429-026	MA-374-08	Muir Beach Headlands to Tennessee Cove	37°51'00"N	122°33'45"W	338	62
429-027	MA-374-11	Bonita Cove	37°49'30"N	122°31'00"W	339	63
429-028	MA-374-12	Point Diablo Bluffs and Needles	37°49'30"N	122°29'00"W	339	63
429-029	SF-374-02	Lobos Rock and Lands End	37°47'15"N	122°30'20"W	340	65
429-030	SM-372-04	Pillar Point	37°29'30"N	122°29'55"W	342	68
429-031	SM-372-05	Eel Rock Cliffs	37°24'15"N	122°25'30"W	342	69
429-032	SM-372-06	Seal Rock Cliffs	37°23'00"N	122°25'00"W	342	69
429-033	SM-372-07	Martin's Beach	37°22'00"N	122°24'30"W	343	69
429-034	SM-370-02	Pigeon Point	37°10'55"N	122°23'20"W	343	71
429-036	SFB-SF-11	Alcatraz Island	37°49'34"N	122°25'20"W	370	120
429-037	SFB-SF-10	Pier 45	37°48'34"N	122°25'00"W	370	120
429-038	SFB-SF-07	Yerba Buena Island	37°48'34"N	122°22'15"W	369	99
429-039	SFB-CC-14	Red Rock	37°55'45"N	122°25'50"W	355	95
429-040	SFB-CC-10	The Brothers	37°57'47"N	122°26'00"W	354	95
429-041	SFB-MA-08	The Sisters and Point Pedro	37°59'22"N	122°26'25"W	349	79
429-042	MA-374-02	Coast Campground South	38°00'52"N	122°51'14"W	336	59
429-043	MA-374-06	Stinson Beach to Rocky Point	37°53'08"N	122°37'38"W	338	61
429-044	SF-374-01	Fort Point Rock to Helmut Rock	37°48'16"N	122°28'38"W	340	65
429-045	SM-374-01	Mussel Rock Area	37°40'00"N	122°29'47"W	341	66
429-046	SM-372-01	Mori Point	37°37'05"N	122°29'47"W	341	67
429-047	SM-370-01	Pomponio Beach to Pescadero Beach	37°16'42"N	122°24'30"W	343	70
429-048	SM-370-03	Gazos Creek North	37°10'23"N	122°22'00"W	343	71
429-049	SC-370-01	Greyhound Rock to El Jarro Point	37°03'31"N	122°15'00"W	344	73
429-050	SC-370-02	El Jarro Point to Davenport	37°01'05"N	122°12'23"W	344	74
429-051	SF-FAI-01	North Farallon Islands	37°46'04"N	123°05'56"W	339	64
429-052	SF-FAI-02	South Farallon Islands	37°42'00"N	123°00'00"W	340	64

Index 2. Continued.

429-053	SFB-MA-01	Yellow Bluff	37°50'13"N	122°28'15"W	347	75
429-054	SFB-MA-02	Sausalito Point Area	37°51'22"N	122°28'34"W	347	75
429-055	SFB-MA-03	Peninsula Point and Cone Rock	37°51'44"N	122°27'25"W	348	75
429-056	SFB-MA-04	Angel Island	37°51'18"N	122°26'24"W	348	76
429-057	SFB-MA-05	Bluff Point to Paradise Cay	37°53'47"N	122°27'37"W	348	77
429-058	SFB-MA-06	Point San Quentin	37°56'48"N	122°28'20"W	348	78
429-059	SFB-MA-07	Marin Islands	37°57'57"N	122°28'15"W	348	78
429-060	SFB-CC-11	Castro Point Area	37°56'08"N	122°24'55"W	354	95
429-061	SFB-CC-12	Richmond-San Rafael Bridge	37°56'01"N	122°25'26"W	355	95
429-062	SFB-CC-13	Castro Rocks	37°55'57"N	122°24'57"W	355	95
429-063	SFB-CC-15	Standard Oil Long Wharf	37°55'31"N	122°24'14"W	355	95
429-064	SFB-CC-16	Richmond Harbor Entrance Channel	37°54'18"N	122°22'38"W	355	96
429-065	SFB-CC-17	Brooks Island Area	37°53'47"N	122°21'16"W	356	96
429-066	SFB-CC-18	Richmond Inner Harbor	37°54'36"N	122°21'42"W	356	96
429-067	SFB-AL-01	Albany Hill Cove	37°53'33"N	122°18'49"W	356	97
429-068	SFB-AL-02	Berkeley Yacht Harbor Breakwaters	37°51'59"N	122°19'06"W	356	98
429-069	SFB-AL-03	Berkeley Pier	37°51'15"N	122°20'29"W	356	98
429-070	SFB-AL-04	Bay Bridge "Toll Plaza Point"	37°49'52"N	122°18'47"W	357	99
429-071	SFB-AL-05	San Francisco-Oakland Bay Bridge East	37°49'10"N	122°20'31"W	357	99
429-072	SFB-AL-06	Oakland Outer Harbor	37°48'59"N	122°19'25"W	357	99
429-073	SFB-AL-07	Oakland Middle Harbor	37°48'01"N	122°21'50"W	357	99
429-074	SFB-AL-08	Oakland Inner Harbor	37°47'27"N	122°18'07"W	357	100
429-075	SFB-AL-09	Government Island Area	37°47'05"N	122°15'18"W	358	101
429-076	SFB-AL-11	Ballena Bay	37°46'00"N	122°17'13"W	358	100
429-077	SFB-AL-12	Bay Farm Island	37°44'36"N	122°15'00"W	358	102
429-078	SFB-AL-14	Mulford Landing Channel	37°41'26"N	122°11'51"W	359	103
429-079	SFB-AL-15	Hayward Marsh, Basin 3A	37°37'47"N	122°08'44"W	359	104
429-080	SFB-AL-17	Baumberg Plant No. 1, Pond Nos. 10 and 11	37°36'42"N	122°08'17"W	359	104
429-081	SFB-AL-18	Baumberg Plant No. 1, Pond No. 8A	37°35'49"N	122°07'52"W	360	104
429-082	SFB-AL-19	Baumberg Plant No. 1, Pond No. 6B	37°35'53"N	122°06'39"W	360	105
429-083	SFB-AL-20	Baumberg Plant No. 1, Pond Nos. 1, 2, and 7	37°35'08"N	122°07'30"W	360	106
429-084	SFB-AL-21	Baumberg Plant No. 1, Pond Nos. 2, 4, and 7	37°34'49"N	122°07'06"W	360	106
429-085	SFB-AL-22	Baumberg Plant No. 1, Pond Nos. 4, 5, and 7	37°34'51"N	122°06'33"W	361	106
429-086	SFB-AL-23	Plant No. 1, Pond No. 1A-Northwest	37°34'07"N	122°07'27"W	361	106
429-087	SFB-AL-24	Plant No. 1, Pond No. 1A	37°34'02"N	122°07'07"W	361	106
429-088	SFB-AL-25	Plant No. 1, Pond No. 2A	37°33'36"N	122°07'24"W	361	106
429-089	SFB-AL-26	Plant No. 1, Pond No. 3A	37°33'14"N	122°06'40"W	362	106
429-090	SFB-AL-27	Plant No. 1, Pond Nos. 4, 5, 6, and 7	37°32'03"N	122°06'10"W	362	107
429-091	SFB-AL-28	KGO Radio Towers	37°31'31"N	122°06'00"W	362	107
429-092	SFB-AL-29	Plant No. 1, Pond No. 3	37°30'45"N	122°06'02"W	362	107
429-093	SFB-AL-30	Plant No. 1, Pond No. 1	37°31'32"N	122°04'37"W	363	107
429-094	SFB-AL-31	Plant No. 2, Pond Nos. 11 and 26	37°29'50"N	122°02'42"W	363	108
429-095	SFB-SR-06	Alviso Plant, Pond No. A7	37°26'29"N	122°00'27"W	364	111
429-096	SFB-SR-07	Alviso Plant, Pond No. A6	37°27'24"N	122°01'26"W	365	111
429-097	SFB-SR-08	Alviso Plant, Pond No. A5	37°26'37"N	122°01'23"W	365	111
429-098	SFB-SR-09	Alviso Plant, Pond No. B2	37°26'22"N	122°02'52"W	365	111
429-099	SFB-SR-10	Alviso Plant, Pond No. A1	37°26'11"N	122°05'07"W	365	112
429-100	SFB-SR-11	Charleston Slough	37°26'33"N	122°05'22"W	366	112
429-101	SFB-SM-01	Redwood City Plant, Pond No. 1	37°29'51"N	122°08'59"W	366	113
429-102	SFB-SM-02	Redwood City Plant, Pond No. 3	37°29'15"N	122°08'48"W	366	113
429-103	SFB-SM-03	Bair Island, Pond No. A10	37°31'01"N	122°13'52"W	366	114
429-104	SFB-SM-04	Bair Island, Pond No. A9	37°30'58"N	122°14'17"W	367	114
429-105	SFB-SM-05	Bair Island, Pond No. B3	37°31'42"N	122°14'03"W	367	114
429-106	SFB-SM-06	Bair Island, Pond No. B1(East)	37°32'12"N	122°12'25"W	367	114
429-107	SFB-SM-07	San Mateo Bridge and Pacific Gas & Electric Towers	37°35'24"N	122°14'40"W	367	115
429-108	SFB-SM-08	San Francisco Bay Ship Channel	37°40'05"N	122°21'31"W	368	116
429-109	SFB-SM-09	Oyster Point Area	37°39'01"N	122°22'49"W	368	117
429-110	SFB-SF-01	Double Rock	37°43'14"N	122°22'52"W	368	118
429-111	SFB-SF-02	Hunter's Point	37°43'42"N	122°21'22"W	368	118
429-112	SFB-SF-03	Lash Lighter Basin	37°44'24"N	122°22'05"W	368	118
429-113	SFB-SF-04	Potrero Point	37°45'19"N	122°22'47"W	369	119
429-114	SFB-SF-05	San Francisco Piers South	37°46'51"N	122°22'59"W	369	119
429-115	SFB-SF-06	San Francisco-Oakland Bay Bridge West	37°48'03"N	122°22'26"W	369	99
429-116	SFB-SF-08	Treasure Island	37°49'48"N	122°21'53"W	369	99
429-117	SFB-SF-09	San Francisco Piers North	37°48'27"N	122°24'00"W	370	120
430-001	SFB-AL-32	Plant No. 2, Pond Nos. 4 and 5	37°28'27"N	121°59'17"W	363	109
430-002	SFB-SR-01	Alviso Plant, Pond No. A17	37°27'33"N	121°58'03"W	363	109

Index 2. Continued.

430-003	SFB-SR-02	Alviso Plant, Pond No. A18	37°26'49"N	121°56'33"W	364	109
430-004	SFB-SR-03	Alviso Plant, Pond No. A16	37°26'31"N	121°57'43"W	364	109
430-005	SFB-SR-04	Alviso Plant, Pond Nos. A9 and A10	37°26'57"N	121°59'34"W	364	109
430-006	SFB-SR-05	Alviso Plant, Pond No. A8	37°25'43"N	121°59'42"W	364	110
454-003	MO-364-02	Elkhorn Slough Salt Ponds	36°49'04"N	121°46'30"W	375	125
454-006	MO-362-03	Bird Rock	36°35'31"N	121°57'59"W	376	129
454-007	MO-362-07	Pinnacle Point Area	36°31'35"N	121°57'14"W	377	130
454-008	MO-362-08	Sand Hill Cove Area	36°31'01"N	121°57'01"W	378	130
454-009	MO-362-09	Bird Island	36°30'25"N	121°56'33"W	378	130
454-010	MO-362-19	Castle Rocks and Mainland	36°22'35"N	121°54'25"W	381	133
454-011	MO-362-20	Hurricane Point Rocks	36°21'40"N	121°54'25"W	381	133
454-012	MO-360-01	Point Sur	36°18'22"N	121°53'39"W	381	134
454-013	MO-360-08	Torre Canyon Rocks	36°11'25"N	121°42'46"W	383	136
454-014	MO-360-10	Partington Ridge North	36°10'06"N	121°41'14"W	384	137
454-015	MO-360-11	McWay Rocks	36°09'46"N	121°40'44"W	384	137
454-016	MO-360-13	Anderson Canyon Rocks	36°09'07"N	121°39'53"W	385	137
454-017	MO-360-14	Burns Creek Rocks	36°08'29"N	121°39'28"W	385	137
454-018	MO-360-16	Dolan Rock	36°05'06"N	121°37'02"W	385	138
454-019	MO-360-18	Square Black Rock	36°04'21"N	121°36'35"W	386	138
454-020	MO-360-21	Lopez Rock	36°01'34"N	121°34'46"W	386	139
454-022	MO-362-05	Pescadero Rock	36°33'43"N	121°56'33"W	377	129
454-023	MO-362-06	Guillemot Island Area	36°31'45"N	121°56'47"W	377	130
454-024	MO-362-11	Yankee Point	36°29'29"N	121°56'41"W	379	131
454-025	MO-362-14	Lobos Rocks	36°27'18"N	121°56'10"W	379	131
454-026	MO-362-13	Soberanes Creek Rocks	36°27'18"N	121°55'35"W	379	131
454-027	MO-362-15	Soberanes Point South	36°26'47"N	121°55'35"W	380	131
454-028	MO-362-17	Rocky Point	36°24'06"N	121°54'40"W	380	132
454-029	MO-362-18	Bench Mark-227X	36°23'21"N	121°54'13"W	380	133
454-030	MO-360-02	Molera Rock	36°16'45"N	121°51'30"W	382	134
454-031	MO-360-03	Cooper Point and Islands	36°14'55"N	121°50'10"W	382	135
454-032	MO-360-04	Pfeiffer Point	36°13'59"N	121°48'33"W	382	135
454-033	MO-360-06	Grimes Point	36°12'20"N	121°44'15"W	383	136
454-034	MO-360-07	Lafler Rock and Mainland	36°12'00"N	121°43'36"W	383	136
454-035	MO-360-12	Partington Ridge South	36°09'36"N	121°40'25"W	384	137
454-036	MO-360-20	Bench Mark 247	36°02'11"N	121°34'45"W	386	139
454-037	MO-360-23	Rockland Landing North	36°00'57"N	121°32'30"W	387	140
454-038	SC-364-01	Davenport to Sand Hill Bluff	36°59'45"N	122°10'33"W	373	121
454-039	SC-364-02	Sand Hill Bluff to Needle Rock Point	36°58'01"N	122°07'46"W	373	121
454-040	SC-364-03	Needle Rock Point to Terrace Point	36°57'09"N	122°05'06"W	374	122
454-041	SC-364-04	Terrace Point to Santa Cruz	36°57'09"N	122°02'30"W	374	123
454-042	MO-364-04	Moss Landing Harbor	36°48'28"N	121°47'06"W	375	125
454-043	MO-362-01	Monterey Harbor	36°36'22"N	121°53'26"W	376	128
454-044	MO-362-02	Cannery Row	36°36'47"N	121°53'48"W	376	128
454-045	MO-362-04	North Carmel Bay	36°33'56"N	121°56'37"W	377	129
454-046	MO-362-10	Carmel Highlands	36°30'00"N	121°56'23"W	378	130
454-047	MO-362-12	Yankee Point South	36°28'47"N	121°56'18"W	379	131
454-048	MO-362-16	Kasler Point North	36°24'47"N	121°54'52"W	380	132
454-049	MO-360-05	Wreck Beach South	36°13'56"N	121°47'30"W	382	135
454-050	MO-360-09	Partington Point	36°10'43"N	121°42'01"W	383	136
454-051	MO-360-15	Buck Creek	36°08'06"N	121°38'53"W	385	137
454-052	MO-360-17	Bench Mark 223	36°04'55"N	121°36'53"W	386	138
454-053	MO-360-19	Gamboa Point	36°02'51"N	121°35'14"W	386	139
454-054	MO-360-22	Lopez Point South	36°01'13"N	121°33'34"W	387	140
454-055	MO-360-24	Rockland Landing	36°00'26"N	121°31'06"W	387	140
454-056	SC-364-05	Palm Beach	36°52'00"N	121°49'05"W	374	124
454-057	MO-364-01	Salinas River Old Mouth	36°49'12"N	121°47'34"W	374	125
454-058	MO-364-03	Elkhorn Slough Estuarine Reserve	36°49'03"N	121°44'25"W	375	126
454-059	MO-364-05	Moro Cojo Slough	36°47'49"N	121°46'40"W	375	125
454-060	MO-364-06	Salinas River New Mouth	36°44'25"N	121°47'58"W	376	127
477-001	MO-354-06	Small rocks & mainland north & east of Plaskett Rk	35°55'16"N	121°28'22"W	391	142
477-002	MO-354-07	Plaskett Rock	35°55'14"N	121°28'41"W	392	142
477-003	MO-354-08	Cape San Martin	35°53'17"N	121°27'55"W	392	143
477-004	MO-354-09	Unnamed Rock	35°53'05"N	121°27'46"W	392	143
477-005	MO-354-12	Redwood Gulch Rock	35°49'32"N	121°23'29"W	393	144
477-006	SL-354-04	La Cruz Rock	35°42'23"N	121°18'45"W	395	146
477-007	SL-352-01	Piedras Blancas Island	35°39'52"N	121°17'18"W	395	147
477-009	SL-350-02	Point Buchon	35°15'20"N	120°53'58"W	398	151

Index 2. Continued.

477-010	SL-350-03	Unnamed Rocks	35°14'40"N	120°53'39"W	398	151
477-011	SL-350-05	Lion Rock	35°13'03"N	120°52'17"W	399	152
477-013	MO-354-02	Thirty-six (36) North	35°58'36"N	121°29'15"W	390	141
477-014	MO-354-03	Larus Rock	35°57'44"N	121°29'01"W	391	141
477-015	MO-354-04	Unnamed Point	35°57'00"N	121°28'51"W	391	141
477-016	MO-354-10	Mainland Point across from Bird Rock	35°52'37"N	121°26'59"W	393	143
477-017	MO-354-11	Point north of Redwood Gulch	35°50'20"N	121°24'04"W	393	144
477-018	MO-354-13	Seastack south of Redwood Gulch	35°49'30"N	121°23'22"W	393	144
477-019	MO-354-14	Unmapped Island	35°48'20"N	121°22'26"W	394	144
477-020	MO-354-15	Salmon Creek	35°48'31"N	121°21'47"W	394	144
477-021	MO-354-16	Arched peninsula south of Salmon Creek	35°48'05"N	121°21'14"W	394	144
477-022	SL-354-01	Ragged Point Lodge Colony	35°46'53"N	121°19'56"W	394	145
477-023	SL-354-03	Three (3) Rocks	35°45'06"N	121°19'07"W	395	145
477-024	SL-352-03	Two rocks south of Point Piedras Blancas	35°39'30"N	121°16'02"W	396	147
477-025	SL-352-06	Island south of Cayucos Point	35°26'45"N	120°55'51"W	397	149
477-026	SL-352-07	Morro Rock and Pillar Rock	35°22'13"N	120°52'08"W	397	150
477-027	SL-350-01	Spooner's Cove	35°16'21"N	120°53'57"W	398	151
477-028	SL-350-04	Pup Rock and adjacent mainland	35°13'18"N	120°52'13"W	398	152
477-029	SL-350-06	Diablo Rock and adjacent mainland	35°12'36"N	120°51'38"W	399	152
477-030	SL-350-07	Diablo Canyon Nuclear Power Plant South	35°12'07"N	120°50'39"W	399	152
477-031	SL-350-08	Double Rock Region	35°11'39"N	120°50'29"W	400	153
477-032	SL-350-09	Pecho Rock	35°10'45"N	120°49'00"W	400	153
477-033	SL-350-10	Smith and Whaler Islands	35°09'00"N	120°45'15"W	400	154
477-034	SL-350-12	Fossil Point	35°10'26"N	120°43'26"W	401	154
477-035	SL-350-13	Shell Beach Rocks	35°09'06"N	120°40'11"W	401	155
477-036	SL-350-14	North Pismo Beach Rocks	35°08'57"N	120°39'23"W	401	155
477-037	SL-350-16	Oso Flaco Lake South	35°01'14"N	120°37'26"W	402	156
477-038	SL-352-04	Point San Simeon	35°38'00"N	121°12'00"W	396	148
477-039	MO-354-01	Kirk Creek to Mill Creek	35°59'51"N	121°29'33"W	390	141
477-040	MO-354-05	Gorda Area	35°55'55"N	121°28'59"W	391	142
477-041	SL-354-02	Ragged Point South	35°45'24"N	121°19'28"W	395	145
477-042	SL-352-02	Point Piedras Blancas	35°39'45"N	121°16'53"W	396	147
477-043	SL-352-05	South San Simeon	35°37'05"N	121°09'11"W	396	148
477-044	SL-352-08	Fairbank Point	35°21'05"N	120°50'38"W	397	150
477-045	SL-350-11	Port San Luis	35°10'42"N	120°44'44"W	400	154
477-046	SL-352-09	Morro Bay Spit	35°21'33"N	120°51'24"W	397	150
477-047	SL-350-15	Oso Flaco Lake North	35°02'57"N	120°37'16"W	401	156
501-001	SB-344-01	Guadalupe Dunes South	34°57'12"N	120°38'44"W	406	158
501-002	SB-344-10	Santa Ynez Estuary	34°41'23"N	120°36'06"W	408	163
501-004	SB-SMI-07	Prince Island	34°03'29"N	120°20'00"W	416	170
501-005	SB-SMI-02	Castle Rock	34°03'17"N	120°26'26"W	414	167
501-008	SB-344-04	Lion Rock at Point Sal	34°53'55"N	120°39'50"W	407	159
501-009	SB-342-03	Destroyer Rock	34°36'10"N	120°38'40"W	409	164
501-010	SB-342-02	Mainland and rocks east of Destroyer Rock	34°36'00"N	120°38'26"W	409	164
501-011	SB-342-04	Point Arguello	34°34'38"N	120°38'49"W	409	165
501-012	SB-342-05	Rocky Point	34°33'45"N	120°38'11"W	409	165
501-013	SB-342-06	Point Conception	34°26'54"N	120°28'13"W	410	166
501-014	SB-SMI-01	Point Bennett	34°02'01"N	120°26'37"W	413	167
501-015	SB-SMI-06	Harris Point to Cuyler Harbor	34°04'02"N	120°21'47"W	415	170
501-016	SB-SMI-09	Bay Point Area	34°02'11"N	120°18'51"W	416	171
501-017	SB-344-02	Mussel Point	34°55'48"N	120°39'46"W	407	159
501-018	SB-344-03	Point Sal	34°54'12"N	120°40'12"W	407	159
501-019	SB-344-05	Point Sal Beach South	34°53'29"N	120°38'28"W	407	159
501-020	SB-344-06	Lions Head South	34°51'43"N	120°36'43"W	407	160
501-021	SB-344-09	Purisima Point South	34°45'00"N	120°37'44"W	408	162
501-022	SB-342-01	North Honda	34°37'13"N	120°37'55"W	408	164
501-023	SL-344-01	Guadalupe Dunes North	34°59'08"N	120°38'19"W	406	157
501-024	SB-344-07	San Antonio Creek	34°47'16"N	120°37'16"W	408	161
501-025	SB-344-08	Purisima Point	34°45'21"N	120°37'47"W	408	162
501-026	SB-SMI-03	Richardson Rock	34°06'05"N	120°31'06"W	414	168
501-027	SB-SMI-04	Northwest San Miguel Island	34°02'51"N	120°25'39"W	414	167
501-028	SB-SMI-05	Simonton Cove	34°02'58"N	120°23'49"W	415	169
501-029	SB-SMI-08	Hoffman Point Area	34°02'42"N	120°21'52"W	416	170
501-030	SB-SMI-10	Cardwell Point West	34°01'13"N	120°21'03"W	417	171
501-031	SB-SMI-11	Crook Point to Tyler Bight	34°01'11"N	120°22'30"W	417	172
501-032	SB-SMI-12	Tyler Bight to Adam's Cove	34°01'35"N	120°25'35"W	417	167
501-033	SB-SRI-01	Sandy Point	34°00'00"N	120°14'50"W	417	173

Index 2. Continued.

501-034	SB-SRI-02	Northwest Santa Rosa Island	34°00'29"N	120°12'47"W	418	173
501-035	SB-SRI-03	Brockway Point Area	34°01'27"N	120°08'29"W	418	174
501-036	SB-SRI-04	Canada Verde to SRI W Base	34°01'10"N	120°06'08"W	418	175
501-037	SB-SRI-05	Carrington Point	34°02'13"N	120°03'08"W	419	176
501-038	SB-SRI-06	North Becher's Bay	34°01'19"N	120°02'46"W	419	176
501-039	SB-SRI-07	South Becher's Bay	33°59'17"N	120°01'35"W	419	177
501-040	SB-SRI-09	Sierra Pablo Area	33°55'55"N	120°01'20"W	420	179
501-041	SB-SRI-10	Ford Point to Wreck Canyon	33°54'51"N	120°03'31"W	420	179
501-042	SB-SRI-11	South Point Area	33°53'46"N	120°06'49"W	420	180
501-043	SB-SRI-12	Cluster Point South	33°54'51"N	120°09'21"W	420	181
501-044	SB-SRI-13	Bee Rock Mainland Area	33°57'07"N	120°11'43"W	421	182
501-045	SB-SRI-14	Southwest Santa Rosa Island	33°58'55"N	120°13'07"W	421	182
502-007	VE-ANI-01	Anacapa Island-West	34°00'41"N	119°25'19"W	428	198
502-008	VE-ANI-02	Anacapa Island-Middle	34°00'17"N	119°23'39"W	429	199
502-009	VE-ANI-03	Anacapa Island-East	34°00'51"N	119°22'02"W	429	199
502-010	SB-SZI-14	Scorpion Rocks	34°02'52"N	119°32'47"W	425	190
502-013	SB-SZI-08	Sppit Rock	34°02'49"N	119°43'19"W	424	187
502-015	SB-SZI-01	Fraser Point	34°03'32"N	119°55'35"W	421	183
502-016	SB-SZI-02	West Point Area	34°04'33"N	119°54'34"W	422	183
502-017	SB-SZI-03	Profile Point Area	34°04'16"N	119°52'22"W	422	184
502-018	SB-SZI-04	Cueva Valdeze Area	34°03'32"N	119°49'32"W	422	185
502-019	SB-SZI-05	Arch Rock to Diablo Point	34°03'18"N	119°46'39"W	423	186
502-020	SB-SZI-06	Diablo Rock	34°03'28"N	119°45'56"W	423	186
502-021	SB-SZI-07	Fry's Harbor to Twin Harbors	34°02'53"N	119°44'19"W	423	187
502-022	SB-SZI-09	Pelican Bay Area	34°02'04"N	119°42'12"W	424	187
502-023	SB-SZI-10	Prisoner's Harbor Area	34°01'05"N	119°39'27"W	424	188
502-024	SB-SZI-11	Coche Point Northeast	34°02'36"N	119°35'55"W	424	189
502-025	SB-SZI-12	Cavern Point Area	34°03'05"N	119°34'10"W	425	190
502-026	SB-SZI-13	Scorpion Anchorage	34°02'46"N	119°33'03"W	425	190
502-027	SB-SZI-15	San Pedro Point Area	34°02'27"N	119°31'48"W	426	191
502-028	SB-SZI-24	Black Point Northwest	34°02'42"N	119°53'26"W	428	197
524-001	SB-SZI-22	Gull Island	33°57'01"N	119°49'28"W	427	195
524-007	SB-SBI-01	Shag Rock	33°29'15"N	119°02'05"W	430	200
524-008	SB-SBI-02	Santa Barbara Island	33°28'37"N	119°02'03"W	430	200
524-009	SB-SBI-03	Sutil Island	33°28'50"N	119°02'50"W	431	200
524-010	LA-CAI-04	Bird Rock	33°27'04"N	118°29'11"W	439	206
524-014	SB-SRI-08	East Point Area	33°56'32"N	119°58'27"W	419	178
524-015	SB-SZI-16	Sandstone Point West	33°59'19"N	119°35'36"W	426	192
524-016	SB-SZI-17	Santa Cruz Island Isthmus South	33°59'16"N	119°37'58"W	426	192
524-017	SB-SZI-18	Valley Anchorage to Coches Prietos Anchorage	33°58'44"N	119°40'51"W	426	193
524-018	SB-SZI-19	Bowen Point Area	33°57'40"N	119°42'58"W	427	194
524-019	SB-SZI-20	Willows Anchorage Rocks	33°57'38"N	119°45'07"W	427	194
524-020	SB-SZI-21	Punta Arena	33°57'44"N	119°48'45"W	427	195
524-021	SB-SZI-23	Kinton Point to Posa Anchorage	33°59'34"N	119°52'45"W	428	196
524-022	VE-SNI-01	Vizcaino Point South	33°16'21"N	119°34'21"W	434	201
524-023	VE-SNI-02	Vizcaino Point East	33°16'28"N	119°34'09"W	434	201
524-024	VE-SNI-03	Thousand Springs Area	33°16'53"N	119°31'24"W	435	202
524-025	VE-SNI-04	Light Point West	33°15'39"N	119°28'26"W	435	202
524-026	VE-SNI-05	Dutch Harbor Area	33°13'12"N	119°29'09"W	435	203
524-027	VE-SNI-06	Elephant Seal Beach Area	33°13'49"N	119°31'29"W	435	204
524-028	VE-SNI-07	Cormorant Rock Area	33°14'33"N	119°33'17"W	436	201
524-029	LA-CLI-01	Castle Rock	33°02'03"N	118°36'52"W	436	215
524-030	LA-CLI-02	Bird Rock	33°02'15"N	118°35'24"W	436	215
524-031	LA-CLI-03	Northwest Harbor to Wilson Cove	33°01'14"N	118°33'49"W	437	215
524-032	LA-CLI-04	Pyramid Cove	32°49'14"N	118°24'05"W	437	216
524-033	LA-CLI-05	China Point Island	32°48'13"N	118°25'49"W	437	216
524-034	LA-CLI-06	Lost Point South	32°50'43"N	118°29'05"W	437	217
524-035	LA-CLI-07	Mail Point South	32°52'47"N	118°30'30"W	438	218
524-036	LA-CLI-08	Seal Cove Area	32°54'16"N	118°31'44"W	438	218
524-037	LA-CAI-01	Lorenzo Beach to Stony Point	33°28'25"N	118°33'40"W	438	205
524-038	LA-CAI-02	Indian Rock and Emerald Bay	33°27'57"N	118°31'32"W	438	205
524-039	LA-CAI-03	Ship Rock	33°27'47"N	118°29'27"W	439	206
524-040	LA-CAI-05	Isthmus Cove Area	33°26'43"N	118°29'54"W	439	206
524-041	LA-CAI-06	Blue Cavern Point to Spouting Caves	33°26'45"N	118°28'31"W	439	206
524-042	LA-CAI-07	Empire Landing Area	33°25'46"N	118°26'17"W	440	207
524-043	LA-CAI-08	Italian Gardens	33°24'50"N	118°23'01"W	440	208
524-044	LA-CAI-09	Whites Landing	33°23'45"N	118°22'11"W	440	208

Index 2. Continued.

524-045	LA-CAI-10	Toyon Bay	33°22'30"N	118°21'13"W	440	209
524-046	LA-CAI-11	Descanso Bay	33°21'06"N	118°19'41"W	440	209
524-047	LA-CAI-12	Pebbly Beach South	33°19'52"N	118°18'26"W	441	210
524-048	LA-CAI-13	Catalina Island East End Light	33°18'10"N	118°18'49"W	441	210
524-049	LA-CAI-14	Silver Canyon Landing Area	33°19'12"N	118°23'46"W	441	211
524-050	LA-CAI-15	China Point North	33°19'56"N	118°28'15"W	441	212
524-051	LA-CAI-16	Little Harbor Area	33°23'13"N	118°28'39"W	441	213
524-052	LA-CAI-17	Catalina Harbor East	33°25'06"N	118°29'13"W	442	213
524-053	LA-CAI-18	Catalina Head	33°25'23"N	118°30'47"W	442	214
524-054	LA-CAI-19	Cape Cortes to Whale Rock	33°26'02"N	118°32'35"W	442	214
524-055		Marina Del Rey Breakwater	33°57'38"N	118°27'44"W	445	219
524-056		San Pedro Bay	33°44'31"N	118°10'19"W	445	220
545-009		La Jolla	32°50'55"N	117°15'56"W	448	221
545-010		Sea World	32°45'57"N	117°13'42"W	448	222
545-011		Point Loma	32°40'44"N	117°14'48"W	449	223
545-012		Shelter Island Area	32°42'59"N	117°13'18"W	449	224
545-013		Harbor Island	32°43'32"N	117°11'56"W	449	224
545-014		North Island Naval Air Station	32°42'37"N	117°12'58"W	449	224

Index 3. Index to seabird colonies in California, ordered by CA colony number from north to south.

COLONY NO. CA	USFWS	COLONY NAME	LATITUDE	LONGITUDE	DATA PAGE	MAP NO.
DN-414-01	325-001	Cone Rock	41°58'21"N	124°13'02"W	286	1
DN-414-02	325-002	Hunter Rocks	41°57'22"N	124°12'41"W	286	1
DN-414-03	325-003	Prince Island	41°57'04"N	124°12'41"W	287	1
DN-414-04	325-044	Point Saint George Lighthouse	41°50'00"N	124°22'00"W	287	2
DN-414-05	325-057	Point Saint George	41°47'00"N	124°15'00"W	287	3
DN-414-06	325-006	Castle Rock	41°45'37"N	124°15'00"W	288	3
DN-414-07	325-007	Tolowa Rocks	41°45'15"N	124°14'00"W	288	3
DN-414-08	325-008	White Rock	41°44'46"N	124°13'44"W	288	4
DN-414-09	325-045	Whaler I., Crescent City Bkr., Steamboat Rk, etc.	41°45'00"N	124°12'00"W	289	4
DN-414-10	325-046	Unnamed Small Rocks	41°42'00"N	124°08'00"W	289	5
DN-414-11	325-047	Easy Triangle Rocks	41°40'22"N	124°08'30"W	289	5
DN-412-01	325-048	Rock R ["Humpback Rock"]	41°40'00"N	124°08'30"W	290	5
DN-412-02	325-009	Sister Rocks	41°39'29"N	124°08'47"W	290	5
DN-412-03	325-059	Midway Point to Damnation Creek	41°39'19"N	124°07'57"W	290	5
DN-412-04	325-049	Last Chance Rock	41°38'05"N	124°07'30"W	291	6
DN-412-05	325-050	Footsteps Rock	41°37'00"N	124°07'10"W	291	6
DN-412-06	325-058	Wilson Rock	41°35'45"N	124°06'37"W	291	7
DN-412-07	325-010	False Klamath Rock	41°35'40"N	124°06'36"W	292	7
DN-412-08	325-060	False Klamath Cove to Pine Point	41°35'00"N	124°05'51"W	292	7
DN-412-09	325-051	Radar Station Rocks	41°33'30"N	124°06'00"W	292	7
DN-412-10	325-011	Flint Rock Head	41°31'31"N	124°05'00"W	292	8
DN-412-11	325-012	White Rock	41°30'56"N	124°05'06"W	293	8
DN-412-12	325-061	High Bluff South	41°30'29"N	124°04'40"W	293	8
DN-412-13	325-062	Split Rock	41°28'35"N	124°03'58"W	293	9
HU-412-01	325-013	Redding Rock	41°20'29"N	124°10'26"W	294	10
HU-410-01	325-063	Dry Lagoon Cliffs	41°14'08"N	124°06'23"W	294	11
HU-410-02	325-015	Cormorant Rock	41°08'32"N	124°09'39"W	294	12
HU-410-03	325-016	Wedding Rock	41°08'28"N	124°09'32"W	294	12
HU-410-04	325-052	Palmer's Point to Scotty Point	41°07'00"N	124°10'00"W	295	12
HU-410-05	325-017	Sea Gull Rock	41°05'21"N	124°09'07"W	295	12
HU-410-06	325-053	Scotty Point to Megwill Point	41°05'00"N	124°10'00"W	295	13
HU-410-07	325-018	Sea Lion Rock	41°05'40"N	124°09'49"W	296	13
HU-410-08	325-019	White Rock	41°05'13"N	124°09'33"W	296	13
HU-410-09	325-020	Green Rock	41°04'32"N	124°09'48"W	296	13
HU-410-10	325-021	Puffin Rock	41°04'18"N	124°09'32"W	297	13
HU-410-11	325-022	Little Pewetole Rock	41°04'00"N	124°09'00"W	297	13
HU-410-12	325-064	Pewetole Island	41°03'49"N	124°09'03"W	297	13
HU-410-13	325-023	Flatiron Rock	41°03'34"N	124°09'39"W	298	13
HU-410-14	325-024	Blank Rock	41°03'15"N	124°09'26"W	298	14
HU-410-15	325-025	Trinidad Head	41°03'09"N	124°08'58"W	298	14
HU-410-16	325-026	Pilot Rock	41°03'06"N	124°09'09"W	299	14
HU-410-17	325-027	Prisoner Rock	41°03'07"N	124°08'34"W	299	14
HU-410-18	325-054	Trinidad Bay Rocks	41°03'00"N	124°08'00"W	299	14
HU-410-19	325-035	Little River Rock	41°02'08"N	124°07'16"W	300	14
HU-404-01	325-066	Arcata Bay Sand Islands	40°50'36"N	124°07'13"W	303	15
HU-404-02	325-067	Old Arcata Wharf	40°50'43"N	124°06'32"W	303	15
HU-404-03	325-068	Central Humboldt Bay	40°47'48"N	124°11'09"W	304	16
HU-404-04	325-065	Humboldt Bay Duck Blinds	40°43'03"N	124°14'06"W	304	17
HU-402-01	325-040	False Cape Rocks	40°30'38"N	124°23'40"W	304	18
HU-402-02	325-041	Sugarloaf Island	40°26'18"N	124°24'41"W	304	19
HU-402-03	325-042	Steamboat Rock	40°24'54"N	124°24'09"W	305	19
HU-400-01	325-055	Three Brothers and Hair Seal Rocks	40°19'40"N	124°21'58"W	305	20
HU-400-02	325-043	Sea Lion [Gulch] Rock	40°14'20"N	124°19'54"W	305	21
HU-400-03	325-056	Cormorant Hotel	40°02'10"N	124°04'50"W	305	22
ME-394-01	379-011	Point No Pass	39°58'40"N	123°59'40"W	308	23
ME-394-02	379-012	High Tip	39°55'30"N	123°57'10"W	308	24
ME-394-03	379-013	Anderson Cliffs	39°52'30"N	123°54'30"W	309	25
ME-394-04	379-014	Mistake Point to Big White Rock	39°51'30"N	123°53'30"W	309	25
ME-394-05	379-015	Usal Bay	39°48'45"N	123°50'30"W	309	26
ME-394-06	379-016	Soldier Frank Point	39°45'18"N	123°50'15"W	309	27
ME-394-07	379-001	Rockport Rocks	39°44'10"N	123°50'00"W	310	28
ME-394-08	379-002	Cape Vizcaino	39°43'34"N	123°49'55"W	310	28
ME-394-09	379-003	Chris Rocks	39°42'51"N	123°48'07"W	310	28

Index 3. Continued.

NE-394-10	379-017	Hardy Rock and Union Landing	39°42'20"N	123°48'20"W	311	29
NE-392-01	379-018	Westport	39°38'00"N	123°47'20"W	311	30
NE-392-02	379-019	Chadbourne Rocks	39°37'02"N	123°47'00"W	311	30
NE-392-03	379-020	Strawberry Cove	39°35'37"N	123°47'10"W	311	31
NE-392-04	379-004	Kibesillah Rock	39°34'49"N	123°46'51"W	312	31
NE-392-05	379-005	Newport Rocks	39°34'49"N	123°46'51"W	312	31
NE-392-06	379-022	Georgia Pacific	39°27'00"N	123°48'45"W	312	32
NE-392-07	379-035	Noyo Bay	39°25'35"N	123°48'55"W	313	32
NE-392-08	379-036	Mitchell Creek to Caspar Point	39°23'01"N	123°49'11"W	313	33
NE-392-09	379-023	Caspar Anchorage	39°22'00"N	123°49'10"W	313	33
NE-392-10	379-037	Caspar Anchorage to Point Cabrillo	39°21'27"N	123°49'25"W	313	33
NE-392-11	379-024	Point Cabrillo to Jack Peters Gulch	39°20'00"N	123°49'00"W	314	34
NE-390-01	379-006	Goat Island Area	39°18'28"N	123°48'49"W	314	34
NE-390-02	379-025	Mendocino	39°18'10"N	123°47'50"W	314	34
NE-390-03	379-026	Mendocino Bay	39°17'30"N	123°47'40"W	315	35
NE-390-04	379-038	Mendocino Bay South	39°17'17"N	123°48'07"W	315	35
NE-390-05	379-027	Van Damme Cove	39°16'10"N	123°47'28"W	315	35
NE-390-06	379-028	Schoolhouse Creek to Albion River	39°15'00"N	123°46'30"W	316	35
NE-390-07	379-029	Albion Cove to Navarro River	39°12'30"N	123°46'20"W	316	36
NE-390-08	379-007	Devil's Basin	39°10'14"N	123°44'50"W	316	36
NE-390-09	379-030	Cavanaugh Cove to Gunderson Rock	39°08'00"N	123°44'00"W	317	37
NE-390-10	379-008	Wharf Rocks	39°07'49"N	123°43'24"W	317	37
NE-390-11	379-009	Caskett Rock	39°07'49"N	123°43'39"W	317	37
NE-390-12	379-031	Bones Cliffs	39°07'00"N	123°42'45"W	318	38
NE-390-13	379-010	White Rock	39°05'42"N	123°43'11"W	318	38
NE-390-14	379-032	Three-three-three (333) Point	39°05'00"N	123°42'30"W	318	38
NE-390-15	379-033	Bridgeport Landing	39°03'45"N	123°41'50"W	318	39
NE-390-16	379-034	Mallo Pass Creek	39°02'20"N	123°41'50"W	319	39
NE-384-01	404-017	Point Arena	38°57'20"N	123°44'30"W	322	40
NE-384-02	404-001	Sea Lion Rock	38°56'07"N	123°43'45"W	322	40
NE-384-03	404-042	Sea Lion Rocks to Arena Cove	38°55'41"N	123°43'45"W	323	40
NE-384-04	404-018	Moat Cove	38°53'10"N	123°41'00"W	323	41
NE-384-05	404-019	Section 30 Cove	38°52'59"N	123°40'10"W	323	41
NE-384-06	404-020	Saunders Landing	38°51'13"N	123°39'05"W	323	42
NE-384-07	404-002	Iverson Landing	38°50'39"N	123°38'37"W	324	42
NE-384-08	404-021	Triplett Gulch	38°49'00"N	123°36'15"W	324	43
NE-384-09	404-022	Fish Rock Cove	38°47'45"N	123°35'20"W	324	43
NE-384-10	404-003	Fish Rocks	38°48'00"N	123°35'31"W	325	43
NE-384-11	404-023	Collins Landing to Gualala River	38°46'00"N	123°32'40"W	325	44
SO-384-01	404-004	Gualala Point Island	38°45'04"N	123°31'42"W	325	45
SO-384-02	404-024	Delmar Point	38°44'15"N	123°31'00"W	326	45
SO-384-03	404-025	Sea Ranch	38°42'00"N	123°27'30"W	326	46
SO-384-04	404-026	Black Point to Stewart's Point	38°40'00"N	123°25'15"W	326	47
SO-382-01	404-027	Stewart's Point to Rocky Point	38°39'00"N	123°38'45"W	326	47
SO-382-02	404-028	Horseshoe Cove	38°36'30"N	123°22'10"W	327	48
SO-382-03	404-029	Cannon Gulch to Stump Beach	38°35'30"N	123°20'30"W	327	48
SO-382-04	404-030	Gerstle Cove to Stillwater Cove	38°33'00"N	123°18'45"W	327	49
SO-382-05	404-031	Bench Mark 125 to Timber Cove	38°32'20"N	123°17'00"W	327	49
SO-382-06	404-043	Windermere Point to Jewell Gulch	38°30'20"N	123°13'00"W	328	50
SO-382-07	404-032	Northwest Cape Rocks	38°30'40"N	123°15'17"W	328	50
SO-382-08	404-033	Russian Gulch	38°28'00"N	123°09'36"W	328	51
SO-382-09	404-005	Russian River Rocks	38°27'14"N	123°08'34"W	329	51
SO-382-10	404-044	Goat Rock to Peaked Hill	38°26'14"N	123°07'30"W	329	52
SO-382-11	404-006	Arched Rock	38°25'53"N	123°07'32"W	329	52
SO-382-12	404-034	Peaked Hill	38°25'45"N	123°07'10"W	330	52
SO-382-13	404-035	Gull Rock	38°25'30"N	123°07'10"W	330	52
SO-382-14	404-036	Shell-Wright Beach Rocks	38°25'00"N	123°06'00"W	330	52
SO-382-15	404-037	Duncan Point to Arched Rock	38°22'30"N	123°05'00"W	331	53
SO-380-01	404-038	Bodega Head	38°18'00"N	123°03'45"W	331	54
SO-380-02	404-008	Bodega Rock	38°17'48"N	123°02'50"W	331	54
SO-380-03	404-045	Bodega Harbor	38°19'21"N	123°02'30"W	331	54
SO-380-04	404-039	Pinnacle Rock	38°18'20"N	123°01'10"W	332	54
MA-380-01	404-040	Sonoma-Marin County Line	38°17'20"N	123°00'20"W	332	55
MA-380-02	404-009	Dillon Beach Rocks	38°16'26"N	122°59'11"W	332	55
MA-380-03	404-011	Tomales Point	38°12'13"N	122°57'39"W	333	56
MA-380-04	404-010	Bird Rock	38°13'49"N	122°59'35"W	333	56
MA-380-05	404-041	Elephant Rock Complex	38°11'00"N	122°58'00"W	333	57

Index 3. Continued.

MA-374-01	429-001	Point Reyes	37°59'30"N	123°59'00"W	336	58
MA-374-02	429-042	Coast Campground South	38°00'52"N	122°51'14"W	336	59
MA-374-03	429-024	Point Resistance	37°59'55"N	122°49'40"W	337	59
MA-374-04	429-002	Millers Point Rocks	37°58'53"N	122°48'35"W	337	59
MA-374-05	429-003	Double Point Rocks	37°56'51"N	122°47'08"W	337	60
MA-374-06	429-043	Stinson Beach to Rocky Point	37°53'08"N	122°37'38"W	338	61
MA-374-07	429-025	Gull Rock Area	37°52'35"N	122°37'00"W	338	61
MA-374-08	429-026	Muir Beach Headlands to Tennessee Cove	37°51'00"N	122°33'45"W	338	62
MA-374-09	429-007	Bird Island	37°49'27"N	122°32'09"W	338	63
MA-374-10	429-008	Point Bonita	37°48'55"N	122°31'40"W	339	63
MA-374-11	429-027	Bonita Cove	37°49'30"N	122°31'00"W	339	63
MA-374-12	429-028	Point Diablo Bluffs and Needles	37°49'30"N	122°29'00"W	339	63
SF-FAI-01	429-051	North Farallon Islands	37°46'04"N	123°05'56"W	339	64
SF-FAI-02	429-052	South Farallon Islands	37°42'00"N	123°00'00"W	340	64
SF-374-01	429-044	Fort Point Rock to Helmut Rock	37°48'16"N	122°28'38"W	340	65
SF-374-02	429-029	Lobos Rock and Lands End	37°47'15"N	122°30'20"W	340	65
SF-374-03	429-009	Seal Rocks	37°46'42"N	122°30'53"W	341	65
SM-374-01	429-045	Mussel Rock Area	37°40'00"N	122°29'47"W	341	66
SM-372-01	429-046	Mori Point	37°37'05"N	122°29'47"W	341	67
SM-372-02	429-013	San Pedro Rock	37°35'43"N	122°31'20"W	341	67
SM-372-03	429-014	Devil's Slide Rock	37°34'28"N	122°31'39"W	342	67
SM-372-04	429-030	Pillar Point	37°29'30"N	122°29'55"W	342	68
SM-372-05	429-031	Eel Rock Cliffs	37°24'15"N	122°25'30"W	342	69
SM-372-06	429-032	Seal Rock Cliffs	37°23'00"N	122°25'00"W	342	69
SM-372-07	429-033	Martin's Beach	37°22'00"N	122°24'30"W	343	69
SM-370-01	429-047	Pomponio Beach to Pescadero Beach	37°16'42"N	122°24'30"W	343	70
SM-370-02	429-034	Pigeon Point	37°10'55"N	122°23'20"W	343	71
SM-370-03	429-048	Gazos Creek North	37°10'23"N	122°22'00"W	343	71
SM-370-04	429-023	Ano Nuevo Island	37°06'30"N	122°20'09"W	344	72
SM-370-05	429-022	Punta del Ano Nuevo	37°07'07"N	122°20'09"W	344	72
SC-370-01	429-049	Greyhound Rock to El Jarro Point	37°03'31"N	122°15'00"W	344	73
SC-370-02	429-050	El Jarro Point to Davenport	37°01'05"N	122°12'23"W	344	74
SFB-MA-01	429-053	Yellow Bluff	37°50'13"N	122°28'15"W	347	75
SFB-MA-02	429-054	Sausalito Point Area	37°51'22"N	122°28'34"W	347	75
SFB-MA-03	429-055	Peninsula Point and Cone Rock	37°51'44"N	122°27'25"W	348	75
SFB-MA-04	429-056	Angel Island	37°51'18"N	122°26'24"W	348	76
SFB-MA-05	429-057	Bluff Point to Paradise Cay	37°53'47"N	122°27'37"W	348	77
SFB-MA-06	429-058	Point San Quentin	37°56'48"N	122°28'20"W	348	78
SFB-MA-07	429-059	Marin Islands	37°57'57"N	122°28'15"W	348	78
SFB-MA-08	429-041	The Sisters and Point Pedro	37°59'22"N	122°26'25"W	349	79
SFB-MA-09	404-046	Rat Rock	38°00'16"N	122°27'40"W	349	79
SFB-MA-10	404-047	Southwest San Pablo Bay Duck Blinds	38°02'15"N	122°28'03"W	349	80
SFB-MA-11	404-048	Marin County-West San Pablo Bay Ship Channel	38°04'17"N	122°25'38"W	349	80
SFB-SO-01	404-049	Sonoma County-West San Pablo Bay Ship Channel	38°06'36"N	122°27'52"W	349	81
SFB-MA-01	404-050	Little Island	38°10'52"N	122°20'31"W	350	82
SFB-MA-02	404-051	Russ Island	38°10'57"N	122°19'17"W	350	82
SFB-MA-03	404-052	Island No. 2	38°09'56"N	122°19'09"W	350	82
SFB-SN-01	404-053	Knight Island	38°08'16"N	122°17'58"W	350	83
SFB-SN-02	404-054	White Slough	38°07'39"N	122°15'41"W	351	83
SFB-SN-03	404-055	North San Pablo Bay Radar Target	38°06'04"N	122°19'40"W	351	84
SFB-SN-04	404-056	Northeast San Pablo Bay Beacon	38°04'17"N	122°17'17"W	351	84
SFB-SN-05	404-057	Mare Island Strait	38°04'40"N	122°14'43"W	351	85
SFB-SN-06	404-058	Commodore Jones Point to Benicia Point	38°02'37"N	122°09'54"W	351	86
SFB-SN-07	404-059	Benicia Point to Army Point	38°02'32"N	122°09'08"W	352	86
SFB-SN-08	404-060	Mothball Fleet	38°05'00"N	122°05'00"W	352	87
SFB-SN-09	405-001	Wheeler Island	38°04'37"N	121°57'47"W	352	88
SFB-SA-01	405-002	Donlon Island	38°01'45"N	121°46'50"W	352	89
SFB-CC-01	405-003	Pittsburg Pacific Gas and Electric Plant	38°02'17"N	121°54'29"W	352	90
SFB-CC-02	405-004	Port Chicago Allied Chemical Company	38°02'56"N	121°59'09"W	353	91
SFB-CC-03	404-061	Suisun Point Area	38°02'15"N	122°07'06"W	353	86
SFB-CC-04	404-062	Nevada Dock	38°02'11"N	122°10'22"W	353	86
SFB-CC-05	404-063	Eckley to Selby	38°03'27"N	122°13'11"W	353	92
SFB-CC-06	404-064	Davis Point Unocal Wharves	38°03'16"N	122°15'15"W	353	93
SFB-CC-07	404-065	Hercules Wharf	38°01'23"N	122°17'29"W	354	93
SFB-CC-08	404-066	Pinole Point	38°00'25"N	122°21'46"W	354	94
SFB-CC-09	404-067	East San Pablo Bay Ship Channel	38°01'48"N	122°22'18"W	354	80
SFB-CC-10	429-040	The Brothers	37°57'47"N	122°26'00"W	354	95

Index 3. Continued.

SFB-CC-11	429-060	Castro Point Area	37°56'08"N	122°24'55"W	354	95
SFB-CC-12	429-061	Richmond-San Rafael Bridge	37°56'01"N	122°25'26"W	355	95
SFB-CC-13	429-062	Castro Rocks	37°55'57"N	122°24'57"W	355	95
SFB-CC-14	429-039	Red Rock	37°55'45"N	122°25'50"W	355	95
SFB-CC-15	429-063	Standard Oil Long Wharf	37°55'31"N	122°24'14"W	355	95
SFB-CC-16	429-064	Richmond Harbor Entrance Channel	37°54'18"N	122°22'38"W	355	96
SFB-CC-17	429-065	Brooks Island Area	37°53'47"N	122°21'16"W	356	96
SFB-CC-18	429-066	Richmond Inner Harbor	37°54'36"N	122°21'42"W	356	96
SFB-AL-01	429-067	Albany Hill Cove	37°53'33"N	122°18'49"W	356	97
SFB-AL-02	429-068	Berkeley Yacht Harbor Breakwaters	37°51'59"N	122°19'06"W	356	98
SFB-AL-03	429-069	Berkeley Pier	37°51'15"N	122°20'29"W	356	98
SFB-AL-04	429-070	Bay Bridge "Toll Plaza Point"	37°49'52"N	122°18'47"W	357	99
SFB-AL-05	429-071	San Francisco-Oakland Bay Bridge East	37°49'10"N	122°20'31"W	357	99
SFB-AL-06	429-072	Oakland Outer Harbor	37°48'59"N	122°19'25"W	357	99
SFB-AL-07	429-073	Oakland Middle Harbor	37°48'01"N	122°21'50"W	357	99
SFB-AL-08	429-074	Oakland Inner Harbor	37°47'27"N	122°18'07"W	357	100
SFB-AL-09	429-075	Government Island Area	37°47'05"N	122°15'18"W	358	101
SFB-AL-10	429-010	Alameda Naval Air Station	37°47'12"N	122°19'49"W	358	100
SFB-AL-11	429-076	Ballena Bay	37°46'00"N	122°17'13"W	358	100
SFB-AL-12	429-077	Bay Farm Island	37°44'36"N	122°15'00"W	358	102
SFB-AL-13	429-011	Oakland International Airport	37°43'22"N	122°14'42"W	359	102
SFB-AL-14	429-078	Mulford Landing Channel	37°41'26"N	122°11'51"W	359	103
SFB-AL-15	429-079	Hayward Marsh, Basin 3A	37°37'47"N	122°08'44"W	359	104
SFB-AL-16	429-015	Baumberg Plant No. 1, Pond No. 10	37°36'41"N	122°08'41"W	359	104
SFB-AL-17	429-080	Baumberg Plant No. 1, Pond Nos. 10 and 11	37°36'42"N	122°08'17"W	359	104
SFB-AL-18	429-081	Baumberg Plant No. 1, Pond No. 8A	37°35'49"N	122°07'52"W	360	104
SFB-AL-19	429-082	Baumberg Plant No. 1, Pond No. 6B	37°35'53"N	122°06'39"W	360	105
SFB-AL-20	429-083	Baumberg Plant No. 1, Pond Nos. 1, 2, and 7	37°35'08"N	122°07'30"W	360	106
SFB-AL-21	429-084	Baumberg Plant No. 1, Pond Nos. 2, 4, and 7	37°34'49"N	122°07'06"W	360	106
SFB-AL-22	429-085	Baumberg Plant No. 1, Pond Nos. 4, 5, and 7	37°34'51"N	122°06'33"W	361	106
SFB-AL-23	429-086	Plant No. 1, Pond No. 1A-Northwest	37°34'07"N	122°07'27"W	361	106
SFB-AL-24	429-087	Plant No. 1, Pond No. 1A	37°34'02"N	122°07'07"W	361	106
SFB-AL-25	429-088	Plant No. 1, Pond No. 2A	37°33'36"N	122°07'24"W	361	106
SFB-AL-26	429-089	Plant No. 1, Pond No. 3A	37°33'14"N	122°06'40"W	362	106
SFB-AL-27	429-090	Plant No. 1, Pond Nos. 4, 5, 6, and 7	37°32'03"N	122°06'10"W	362	107
SFB-AL-28	429-091	KGO Radio Towers	37°31'31"N	122°06'00"W	362	107
SFB-AL-29	429-092	Plant No. 1, Pond No. 3	37°30'45"N	122°06'02"W	362	107
SFB-AL-30	429-093	Plant No. 1, Pond No. 1	37°31'32"N	122°04'37"W	363	107
SFB-AL-31	429-094	Plant No. 2, Pond Nos. 11 and 26	37°29'50"N	122°02'42"W	363	108
SFB-AL-32	430-001	Plant No. 2, Pond Nos. 4 and 5	37°28'27"N	121°59'17"W	363	109
SFB-SR-01	430-002	Alviso Plant, Pond No. A17	37°27'33"N	121°58'03"W	363	109
SFB-SR-02	430-003	Alviso Plant, Pond No. A18	37°26'49"N	121°56'33"W	364	109
SFB-SR-03	430-004	Alviso Plant, Pond No. A16	37°26'31"N	121°57'43"W	364	109
SFB-SR-04	430-005	Alviso Plant, Pond Nos. A9 and A10	37°26'57"N	121°59'34"W	364	109
SFB-SR-05	430-006	Alviso Plant, Pond No. A8	37°25'43"N	121°59'42"W	364	110
SFB-SR-06	429-095	Alviso Plant, Pond No. A7	37°26'29"N	122°00'27"W	364	111
SFB-SR-07	429-096	Alviso Plant, Pond No. A6	37°27'24"N	122°01'26"W	365	111
SFB-SR-08	429-097	Alviso Plant, Pond No. A5	37°26'37"N	122°01'23"W	365	111
SFB-SR-09	429-098	Alviso Plant, Pond No. B2	37°26'22"N	122°02'52"W	365	111
SFB-SR-10	429-099	Alviso Plant, Pond No. A1	37°26'11"N	122°05'07"W	365	112
SFB-SR-11	429-100	Charleston Slough	37°26'33"N	122°05'22"W	366	112
SFB-SM-01	429-101	Redwood City Plant, Pond No. 1	37°29'51"N	122°08'59"W	366	113
SFB-SM-02	429-102	Redwood City Plant, Pond No. 3	37°29'15"N	122°08'48"W	366	113
SFB-SM-03	429-103	Bair Island, Pond No. A10	37°31'01"N	122°13'52"W	366	114
SFB-SM-04	429-104	Bair Island, Pond No. A9	37°30'58"N	122°14'17"W	367	114
SFB-SM-05	429-105	Bair Island, Pond No. B3	37°31'42"N	122°14'03"W	367	114
SFB-SM-06	429-106	Bair Island, Pond No. B1(East)	37°32'12"N	122°12'25"W	367	114
SFB-SM-07	429-107	San Mateo Bridge and Pacific Gas & Electric Towers	37°35'24"N	122°14'40"W	367	115
SFB-SM-08	429-108	San Francisco Bay Ship Channel	37°40'05"N	122°21'31"W	368	116
SFB-SM-09	429-109	Oyster Point Area	37°39'01"N	122°22'49"W	368	117
SFB-SF-01	429-110	Double Rock	37°43'14"N	122°22'52"W	368	118
SFB-SF-02	429-111	Hunter's Point	37°43'42"N	122°21'22"W	368	118
SFB-SF-03	429-112	Lash Lighter Basin	37°44'24"N	122°22'05"W	368	118
SFB-SF-04	429-113	Potrero Point	37°45'19"N	122°22'47"W	369	119
SFB-SF-05	429-114	San Francisco Piers South	37°46'51"N	122°22'59"W	369	119
SFB-SF-06	429-115	San Francisco-Oakland Bay Bridge West	37°48'03"N	122°22'26"W	369	99
SFB-SF-07	429-038	Yerba Buena Island	37°48'34"N	122°22'15"W	369	99

Index 3. Continued.

SFB-SF-08	429-116	Treasure Island	37°49'48"N	122°21'53"W	369	99
SFB-SF-09	429-117	San Francisco Piers North	37°48'27"N	122°24'00"W	370	120
SFB-SF-10	429-037	Pier 45	37°48'34"N	122°25'00"W	370	120
SFB-SF-11	429-036	Alcatraz Island	37°49'34"N	122°25'20"W	370	120
SC-364-01	454-038	Davenport to Sand Hill Bluff	36°59'45"N	122°10'33"W	373	121
SC-364-02	454-039	Sand Hill Bluff to Needle Rock Point	36°58'01"N	122°07'46"W	373	121
SC-364-03	454-040	Needle Rock Point to Terrace Point	36°57'09"N	122°05'06"W	374	122
SC-364-04	454-041	Terrace Point to Santa Cruz	36°57'09"N	122°02'30"W	374	123
SC-364-05	454-056	Palm Beach	36°52'00"N	121°49'05"W	374	124
MO-364-01	454-057	Salinas River Old Mouth	36°49'12"N	121°47'34"W	374	125
MO-364-02	454-003	Elkhorn Slough Salt Ponds	36°49'04"N	121°46'30"W	375	125
MO-364-03	454-058	Elkhorn Slough Estuarine Reserve	36°49'03"N	121°44'25"W	375	126
MO-364-04	454-042	Moss Landing Harbor	36°48'28"N	121°47'06"W	375	125
MO-364-05	454-059	Moro Cojo Slough	36°47'49"N	121°46'40"W	375	125
MO-364-06	454-060	Salinas River New Mouth	36°44'25"N	121°47'58"W	376	127
MO-362-01	454-043	Monterey Harbor	36°36'22"N	121°53'26"W	376	128
MO-362-02	454-044	Cannery Row	36°36'47"N	121°53'48"W	376	128
MO-362-03	454-006	Bird Rock	36°35'31"N	121°57'59"W	376	129
MO-362-04	454-045	North Carmel Bay	36°33'56"N	121°56'37"W	377	129
MO-362-05	454-022	Pescadero Rock	36°33'43"N	121°56'33"W	377	129
MO-362-06	454-023	Guillemot Island Area	36°31'45"N	121°56'47"W	377	130
MO-362-07	454-007	Pinnacle Point Area	36°31'35"N	121°57'14"W	377	130
MO-362-08	454-008	Sand Hill Cove Area	36°31'01"N	121°57'01"W	378	130
MO-362-09	454-009	Bird Island	36°30'25"N	121°56'33"W	378	130
MO-362-10	454-046	Carmel Highlands	36°30'00"N	121°56'23"W	378	130
MO-362-11	454-024	Yankee Point	36°29'29"N	121°56'41"W	379	131
MO-362-12	454-047	Yankee Point South	36°28'47"N	121°56'18"W	379	131
MO-362-13	454-026	Soberanes Creek Rocks	36°27'18"N	121°55'35"W	379	131
MO-362-14	454-025	Lobos Rocks	36°27'18"N	121°56'10"W	379	131
MO-362-15	454-027	Soberanes Point South	36°26'47"N	121°55'35"W	380	131
MO-362-16	454-048	Kasler Point North	36°24'47"N	121°54'52"W	380	132
MO-362-17	454-028	Rocky Point	36°24'06"N	121°54'40"W	380	132
MO-362-18	454-029	Bench Mark-227X	36°23'21"N	121°54'13"W	380	133
MO-362-19	454-010	Castle Rocks and Mainland	36°22'35"N	121°54'25"W	381	133
MO-362-20	454-011	Hurricane Point Rocks	36°21'40"N	121°54'25"W	381	133
MO-360-01	454-012	Point Sur	36°18'22"N	121°53'39"W	381	134
MO-360-02	454-030	Molera Rock	36°16'45"N	121°51'30"W	382	134
MO-360-03	454-031	Cooper Point and Islands	36°14'55"N	121°50'10"W	382	135
MO-360-04	454-032	Pfeiffer Point	36°13'59"N	121°48'33"W	382	135
MO-360-05	454-049	Wreck Beach South	36°13'56"N	121°47'30"W	382	135
MO-360-06	454-033	Grimes Point	36°12'20"N	121°44'15"W	383	136
MO-360-07	454-034	Lafler Rock and Mainland	36°12'00"N	121°43'36"W	383	136
MO-360-08	454-013	Torre Canyon Rocks	36°11'25"N	121°42'46"W	383	136
MO-360-09	454-050	Partington Point	36°10'43"N	121°42'01"W	383	136
MO-360-10	454-014	Partington Ridge North	36°10'06"N	121°41'14"W	384	137
MO-360-11	454-015	McWay Rocks	36°09'46"N	121°40'44"W	384	137
MO-360-12	454-035	Partington Ridge South	36°09'36"N	121°40'25"W	384	137
MO-360-13	454-016	Anderson Canyon Rocks	36°09'07"N	121°39'53"W	385	137
MO-360-14	454-017	Burns Creek Rocks	36°08'29"N	121°39'28"W	385	137
MO-360-15	454-051	Buck Creek	36°08'06"N	121°38'53"W	385	137
MO-360-16	454-018	Dolan Rock	36°05'06"N	121°37'02"W	385	138
MO-360-17	454-052	Bench Mark 223	36°04'55"N	121°36'53"W	386	138
MO-360-18	454-019	Square Black Rock	36°04'21"N	121°36'35"W	386	138
MO-360-19	454-053	Gamboa Point	36°02'51"N	121°35'14"W	386	139
MO-360-20	454-036	Bench Mark 247	36°02'11"N	121°34'45"W	386	139
MO-360-21	454-020	Lopez Rock	36°01'34"N	121°34'46"W	386	139
MO-360-22	454-054	Lopez Point South	36°01'13"N	121°33'34"W	387	140
MO-360-23	454-037	Rockland Landing North	36°00'57"N	121°32'30"W	387	140
MO-360-24	454-055	Rockland Landing	36°00'26"N	121°31'06"W	387	140
MO-354-01	477-039	Kirk Creek to Mill Creek	35°59'51"N	121°29'33"W	390	141
MO-354-02	477-013	Thirty-six (36) North	35°58'36"N	121°29'15"W	390	141
MO-354-03	477-014	Larus Rock	35°57'44"N	121°29'01"W	391	141
MO-354-04	477-015	Unnamed Point	35°57'00"N	121°28'51"W	391	141
MO-354-05	477-040	Gorda Area	35°55'55"N	121°28'59"W	391	142
MO-354-06	477-001	Small rocks & mainland north & east of Plaskett Rk	35°55'16"N	121°28'22"W	391	142
MO-354-07	477-002	Plaskett Rock	35°55'14"N	121°28'41"W	392	142
MO-354-08	477-003	Cape San Martin	35°53'17"N	121°27'55"W	392	143

Index 3. Continued.

MO-354-09	477-004	Unnamed Rock	35°53'05"N	121°27'46"W	392	143
MO-354-10	477-016	Mainland Point across from Bird Rock	35°52'37"N	121°26'59"W	393	143
MO-354-11	477-017	Point north of Redwood Gulch	35°50'20"N	121°24'04"W	393	144
MO-354-12	477-005	Redwood Gulch Rock	35°49'32"N	121°23'29"W	393	144
MO-354-13	477-018	Seestack south of Redwood Gulch	35°49'30"N	121°23'22"W	393	144
MO-354-14	477-019	Unmapped Island	35°48'20"N	121°22'26"W	394	144
MO-354-15	477-020	Salmon Creek	35°48'31"N	121°21'47"W	394	144
MO-354-16	477-021	Arched peninsula south of Salmon Creek	35°48'05"N	121°21'14"W	394	144
SL-354-01	477-022	Ragged Point Lodge Colony	35°46'53"N	121°19'56"W	394	145
SL-354-02	477-041	Ragged Point South	35°45'24"N	121°19'28"W	395	145
SL-354-03	477-023	Three (3) Rocks	35°45'06"N	121°19'07"W	395	145
SL-354-04	477-006	La Cruz Rock	35°42'23"N	121°18'45"W	395	146
SL-352-01	477-007	Piedras Blancas Island	35°39'52"N	121°17'18"W	395	147
SL-352-02	477-042	Point Piedras Blancas	35°39'45"N	121°16'53"W	396	147
SL-352-03	477-024	Two rocks south of Point Piedras Blancas	35°39'30"N	121°16'02"W	396	147
SL-352-04	477-038	Point San Simeon	35°38'00"N	121°12'00"W	396	148
SL-352-05	477-043	South San Simeon	35°37'05"N	121°09'11"W	396	148
SL-352-06	477-025	Island south of Cayucos Point	35°26'45"N	120°55'51"W	397	149
SL-352-07	477-026	Morro Rock and Pillar Rock	35°22'13"N	120°52'08"W	397	150
SL-352-08	477-044	Fairbank Point	35°21'05"N	120°50'38"W	397	150
SL-352-09	477-046	Morro Bay Spit	35°21'33"N	120°51'24"W	397	150
SL-350-01	477-027	Spooner's Cove	35°16'21"N	120°53'57"W	398	151
SL-350-02	477-009	Point Buchon	35°15'20"N	120°53'58"W	398	151
SL-350-03	477-010	Unnamed Rocks	35°14'40"N	120°53'39"W	398	151
SL-350-04	477-028	Pup Rock and adjacent mainland	35°13'18"N	120°52'13"W	398	152
SL-350-05	477-011	Lion Rock	35°13'03"N	120°52'17"W	399	152
SL-350-06	477-029	Diablo Rock and adjacent mainland	35°12'36"N	120°51'38"W	399	152
SL-350-07	477-030	Diablo Canyon Nuclear Power Plant South	35°12'07"N	120°50'39"W	399	152
SL-350-08	477-031	Double Rock Region	35°11'39"N	120°50'29"W	400	153
SL-350-09	477-032	Pecho Rock	35°10'45"N	120°49'00"W	400	153
SL-350-10	477-033	Smith and Whaler Islands	35°09'00"N	120°45'15"W	400	154
SL-350-11	477-045	Port San Luis	35°10'42"N	120°44'44"W	400	154
SL-350-12	477-034	Fossil Point	35°10'26"N	120°43'26"W	401	154
SL-350-13	477-035	Shell Beach Rocks	35°09'06"N	120°40'11"W	401	155
SL-350-14	477-036	North Pismo Beach Rocks	35°08'57"N	120°39'23"W	401	155
SL-350-15	477-047	Oso Flaco Lake North	35°02'57"N	120°37'16"W	401	156
SL-350-16	477-037	Oso Flaco Lake South	35°01'14"N	120°37'26"W	402	156
SL-344-01	501-023	Guadalupe Dunes North	34°59'08"N	120°38'19"W	406	157
SB-344-01	501-001	Guadalupe Dunes South	34°57'12"N	120°38'44"W	406	158
SB-344-02	501-017	Mussel Point	34°55'48"N	120°39'46"W	407	159
SB-344-03	501-018	Point Sal	34°54'12"N	120°40'12"W	407	159
SB-344-04	501-008	Lion Rock at Point Sal	34°53'55"N	120°39'50"W	407	159
SB-344-05	501-019	Point Sal Beach South	34°53'29"N	120°38'28"W	407	159
SB-344-06	501-020	Lions Head South	34°51'43"N	120°36'43"W	407	160
SB-344-07	501-024	San Antonio Creek	34°47'16"N	120°37'16"W	408	161
SB-344-08	501-025	Purisima Point	34°45'21"N	120°37'47"W	408	162
SB-344-09	501-021	Purisima Point South	34°45'00"N	120°37'44"W	408	162
SB-344-10	501-002	Santa Ynez Estuary	34°41'23"N	120°36'06"W	408	163
SB-342-01	501-022	North Honda	34°37'13"N	120°37'55"W	408	164
SB-342-02	501-010	Mainland and rocks east of Destroyer Rock	34°36'00"N	120°38'26"W	409	164
SB-342-03	501-009	Destroyer Rock	34°36'10"N	120°38'40"W	409	164
SB-342-04	501-011	Point Arguello	34°34'38"N	120°38'49"W	409	165
SB-342-05	501-012	Rocky Point	34°33'45"N	120°38'11"W	409	165
SB-342-06	501-013	Point Conception	34°26'54"N	120°28'13"W	410	166
SB-SMI-01	501-014	Point Bennett	34°02'01"N	120°26'37"W	413	167
SB-SMI-02	501-005	Castle Rock	34°03'17"N	120°26'26"W	414	167
SB-SMI-03	501-026	Richardson Rock	34°06'05"N	120°31'06"W	414	168
SB-SMI-04	501-027	Northwest San Miguel Island	34°02'51"N	120°25'39"W	414	167
SB-SMI-05	501-028	Simonton Cove	34°02'58"N	120°23'49"W	415	169
SB-SMI-06	501-015	Harris Point to Cuyler Harbor	34°04'02"N	120°21'47"W	415	170
SB-SMI-07	501-004	Prince Island	34°03'29"N	120°20'00"W	416	170
SB-SMI-08	501-029	Hoffman Point Area	34°02'42"N	120°21'52"W	416	170
SB-SMI-09	501-016	Bay Point Area	34°02'11"N	120°18'51"W	416	171
SB-SMI-10	501-030	Cardwell Point West	34°01'13"N	120°21'03"W	417	171
SB-SMI-11	501-031	Crook Point to Tyler Bight	34°01'11"N	120°22'30"W	417	172
SB-SMI-12	501-032	Tyler Bight to Adam's Cove	34°01'35"N	120°25'35"W	417	167
SB-SRI-01	501-033	Sandy Point	34°00'00"N	120°14'50"W	417	173

Index 3. Continued.

SB-SRI-02	501-034	Northwest Santa Rosa Island	34°00'29"N	120°12'47"W	418	173
SB-SRI-03	501-035	Brockway Point Area	34°01'27"N	120°08'29"W	418	174
SB-SRI-04	501-036	Canada Verde to SRI W Base	34°01'10"N	120°06'08"W	418	175
SB-SRI-05	501-037	Carrington Point	34°02'13"N	120°03'08"W	419	176
SB-SRI-06	501-038	North Becher's Bay	34°01'19"N	120°02'46"W	419	176
SB-SRI-07	501-039	South Becher's Bay	33°59'17"N	120°01'35"W	419	177
SB-SRI-08	524-014	East Point Area	33°56'32"N	119°58'27"W	419	178
SB-SRI-09	501-040	Sierra Pablo Area	33°55'55"N	120°01'20"W	420	179
SB-SRI-10	501-041	Ford Point to Wreck Canyon	33°54'51"N	120°03'31"W	420	179
SB-SRI-11	501-042	South Point Area	33°53'46"N	120°06'49"W	420	180
SB-SRI-12	501-043	Cluster Point South	33°54'51"N	120°09'21"W	420	181
SB-SRI-13	501-044	Bee Rock Mainland Area	33°57'07"N	120°11'43"W	421	182
SB-SRI-14	501-045	Southwest Santa Rosa Island	33°58'55"N	120°13'07"W	421	182
SB-SZI-01	502-015	Fraser Point	34°03'32"N	119°55'35"W	421	183
SB-SZI-02	502-016	West Point Area	34°04'33"N	119°54'34"W	422	183
SB-SZI-03	502-017	Profile Point Area	34°04'16"N	119°52'22"W	422	184
SB-SZI-04	502-018	Cueva Valdaze Area	34°03'32"N	119°49'32"W	422	185
SB-SZI-05	502-019	Arch Rock to Diablo Point	34°03'18"N	119°46'39"W	423	186
SB-SZI-06	502-020	Diablo Rock	34°03'28"N	119°45'56"W	423	186
SB-SZI-07	502-021	Fry's Harbor to Twin Harbors	34°02'53"N	119°44'19"W	423	187
SB-SZI-08	502-013	Sppit Rock	34°02'49"N	119°43'19"W	424	187
SB-SZI-09	502-022	Pelican Bay Area	34°02'04"N	119°42'12"W	424	187
SB-SZI-10	502-023	Prisoner's Harbor Area	34°01'05"N	119°39'27"W	424	188
SB-SZI-11	502-024	Coche Point Northeast	34°02'36"N	119°35'55"W	424	189
SB-SZI-12	502-025	Cavern Point Area	34°03'05"N	119°34'10"W	425	190
SB-SZI-13	502-026	Scorpion Anchorage	34°02'46"N	119°33'03"W	425	190
SB-SZI-14	502-010	Scorpion Rocks	34°02'52"N	119°32'47"W	425	190
SB-SZI-15	502-027	San Pedro Point Area	34°02'27"N	119°31'48"W	426	191
SB-SZI-16	524-015	Sandstone Point West	33°59'19"N	119°35'36"W	426	192
SB-SZI-17	524-016	Santa Cruz Island Isthmus South	33°59'16"N	119°37'58"W	426	192
SB-SZI-18	524-017	Valley Anchorage to Coches Prietos Anchorage	33°58'44"N	119°40'51"W	426	193
SB-SZI-19	524-018	Bowen Point Area	33°57'40"N	119°42'58"W	427	194
SB-SZI-20	524-019	Willows Anchorage Rocks	33°57'38"N	119°45'07"W	427	194
SB-SZI-21	524-020	Punta Arena	33°57'44"N	119°48'45"W	427	195
SB-SZI-22	524-001	Gull Island	33°57'01"N	119°49'28"W	427	195
SB-SZI-23	524-021	Kinton Point to Posa Anchorage	33°59'34"N	119°52'45"W	428	196
SB-SZI-24	502-028	Black Point Northwest	34°02'42"N	119°53'26"W	428	197
VE-AMI-01	502-007	Anacapa Island-West	34°00'41"N	119°25'19"W	428	198
VE-AMI-02	502-008	Anacapa Island-Middle	34°00'17"N	119°23'39"W	429	199
VE-AMI-03	502-009	Anacapa Island-East	34°00'51"N	119°22'02"W	429	199
SB-SBI-01	524-007	Shag Rock	33°29'15"N	119°02'05"W	430	200
SB-SBI-02	524-008	Santa Barbara Island	33°28'37"N	119°02'03"W	430	200
SB-SBI-03	524-009	Sutil Island	33°28'50"N	119°02'50"W	431	200
VE-SNI-01	524-022	Vizcaino Point South	33°16'21"N	119°34'21"W	434	201
VE-SNI-02	524-023	Vizcaino Point East	33°16'28"N	119°34'09"W	434	201
VE-SNI-03	524-024	Thousand Springs Area	33°16'53"N	119°31'24"W	435	202
VE-SNI-04	524-025	Light Point West	33°15'39"N	119°28'26"W	435	202
VE-SNI-05	524-026	Dutch Harbor Area	33°13'12"N	119°29'09"W	435	203
VE-SNI-06	524-027	Elephant Seal Beach Area	33°13'49"N	119°31'29"W	435	204
VE-SNI-07	524-028	Cormorant Rock Area	33°14'33"N	119°33'17"W	436	201
LA-CAI-01	524-037	Lorenzo Beach to Stony Point	33°28'25"N	118°33'40"W	438	205
LA-CAI-02	524-038	Indian Rock and Emerald Bay	33°27'57"N	118°31'32"W	438	205
LA-CAI-03	524-039	Ship Rock	33°27'47"N	118°29'27"W	439	206
LA-CAI-04	524-010	Bird Rock	33°27'04"N	118°29'11"W	439	206
LA-CAI-05	524-040	Isthmus Cove Area	33°26'43"N	118°29'54"W	439	206
LA-CAI-06	524-041	Blue Cavern Point to Spouting Caves	33°26'45"N	118°28'31"W	439	206
LA-CAI-07	524-042	Empire Landing Area	33°25'46"N	118°26'17"W	440	207
LA-CAI-08	524-043	Italian Gardens	33°24'50"N	118°23'01"W	440	208
LA-CAI-09	524-044	Whites Landing	33°23'45"N	118°22'11"W	440	208
LA-CAI-10	524-045	Toyon Bay	33°22'30"N	118°21'13"W	440	209
LA-CAI-11	524-046	Descanso Bay	33°21'06"N	118°19'41"W	440	209
LA-CAI-12	524-047	Pebbly Beach South	33°19'52"N	118°18'26"W	441	210
LA-CAI-13	524-048	Catalina Island East End Light	33°18'10"N	118°18'49"W	441	210
LA-CAI-14	524-049	Silver Canyon Landing Area	33°19'12"N	118°23'46"W	441	211
LA-CAI-15	524-050	China Point North	33°19'56"N	118°28'15"W	441	212
LA-CAI-16	524-051	Little Harbor Area	33°23'13"N	118°28'39"W	441	213
LA-CAI-17	524-052	Catalina Harbor East	33°25'06"N	118°29'13"W	442	213

Index 3. Continued.

LA-CAI-18	524-053	Catalina Head	33·25'23"N	118·30'47"W	442	214
LA-CAI-19	524-054	Cape Cortes to Whale Rock	33·26'02"N	118·32'35"W	442	214
LA-CLI-01	524-029	Castle Rock	33·02'03"N	118·36'52"W	436	215
LA-CLI-02	524-030	Bird Rock	33·02'15"N	118·35'24"W	436	215
LA-CLI-03	524-031	Northwest Harbor to Wilson Cove	33·01'14"N	118·33'49"W	437	215
LA-CLI-04	524-032	Pyramid Cove	32·49'14"N	118·24'05"W	437	216
LA-CLI-05	524-033	China Point Island	32·48'13"N	118·25'49"W	437	216
LA-CLI-06	524-034	Lost Point South	32·50'43"N	118·29'05"W	437	217
LA-CLI-07	524-035	Mail Point South	32·52'47"N	118·30'30"W	438	218
LA-CLI-08	524-036	Seal Cove Area	32·54'16"N	118·31'44"W	438	218
	524-055	Marina Del Rey Breakwater	33·57'38"N	118·27'44"W	445	219
	524-056	San Pedro Bay	33·44'31"N	118·10'19"W	445	220
	545-009	La Jolla	32·50'55"N	117·15'56"W	448	221
	545-010	Sea World	32·45'57"N	117·13'42"W	448	222
	545-011	Point Loma	32·40'44"N	117·14'48"W	449	223
	545-012	Shelter Island Area	32·42'59"N	117·13'18"W	449	224
	545-013	Harbor Island	32·43'32"N	117·11'56"W	449	224
	545-014	North Island Naval Air Station	32·42'37"N	117·12'58"W	449	224