

# ***DRAFT***

## **EVALUATION OF POTENTIAL BENEFITS TO SEABIRDS FROM PROPOSED MARINE PROTECTED AREAS IN THE MLPA NORTH CENTRAL COAST STUDY REGION, CALIFORNIA**

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In this document, draft proposed marine protected areas (MPAs) for the MLPA North Central Coast Study Region (NCCSR) are evaluated for their potential benefits to seabirds in relation to Goal 2 of the California Marine Life Protection Act. Evaluations follow the methods described in “Methods Used to Evaluate Draft MPA Proposals in the North Central Coast Study Region (Draft)” from January 7, 2008. One change from that document is that no rankings of level of benefit (e.g., high, medium, low, none) have been given because the variability in population sizes between species made categorizations too subjective and potentially misleading. Information includes all species (where appropriate) and species most likely to benefit. Evaluations are subdivided by subregions (or, bioregions; North; South; and Farallon Islands) because of the large differences in species composition and abundances between these areas.

As upper trophic level predators, seabirds are important components of marine ecosystems. Seabird diets vary, but generally include various juvenile fish and invertebrates that are locally abundant. In central California, important seabird prey include rockfish, anchovies, various flatfish, cottids, tomcod, krill, mysid shrimp and squid, among others (e.g., Ainley et al. 1990). Seabirds have been recognized as an efficient monitoring tool for ocean conditions and, in some cases, for predicting stocks of important fisheries (e.g., Ainley and Boekelheide 1990, Cairns 1992, Sydeman et al. 2001, Mills et al. 2007, Roth et al. 2007). Ecologies of the different species of seabirds vary. For example, many species such as albatrosses, shearwaters, and petrels only come to land to breed and spend the remainder of their lives at sea. Many other species, such as most pelicans, cormorants, and gulls, come to shore on a daily basis to rest, preen, or bath. For pelicans and cormorants, trips ashore are essential for survival because their wettable plumage must be dried to avoid hypothermia. For most species, breeding habitats are on offshore rocks, islands, or mainland cliffs free of mammalian predators.

Seabirds may benefit in several ways from marine protected areas in the NCCSR. For example, most species are known to be sensitive to human disturbance to varying degrees (summarized in Carney and Sydeman 1999). Impacts of human disturbance are known to be greatest at breeding sites, where reproduction can be dramatically affected. Because most seabirds are colonial breeders (e.g., nesting in high concentrations), high proportions of populations can be affected by severe or frequent disturbances. Similarly, seabirds and other waterbirds often concentrate at resting sites (“roosts”) and foraging areas where they can be sensitive to disturbance (e.g., Jaques et al. 1996, Kuletz 1996, Rodgers and Schwikert 2002, Jaques and Strong 2002, Speckman 2004, Peters and Otis 2006). Because of these sensitivities, many observers have recommended disturbance-free “buffer zones” or other management actions around colonies, roosts, or

important foraging areas (Carney and Sydeman 1999, Jaques and Strong 2002, Rodgers and Schwikert 2002, Ronconi and St. Clair 2002).

At seabird and other waterbird breeding colonies and roosts, impacts to birds tend to be most pronounced when humans enter the immediate area. Responses vary by species and location, but for many species intrusion results in most if not all birds fleeing from the immediate area. Birds on nests often will flee, leaving the eggs or chicks behind. During that time, nest contents are susceptible to predators such as gulls. While some birds return to nests once an intruder has gone, others tend to abandon nesting efforts. For example, Brandt's Cormorants have been observed to abandon nests en masse from even single events of human intrusion to the colony (McChesney 1997). Many studies have documented reductions in breeding success and colony attendance, as well as colony abandonment, resulting from human intrusion (Carney and Sydeman 1999).

Although often not as easily identified, activities such as close approaches to colonies and roosts, and loud noises can evoke responses similar to direct human intrusions. Close approaches can include humans on foot, boats, low-flying aircraft, motor vehicles, surfers, or other sources (e.g., Jaques et al. 1996, Carney and Sydeman 1999, Jaques and Strong 2002). Studies of such disturbances on seabirds and other waterbirds have shown various results that often depend on species, location, habitat, and level of habituation to human activity. However, several studies have shown reductions in breeding success or population sizes as a result of such human disturbance (e.g., Wallace and Wallace 1998, Carney and Sydeman 1999, Thayer et al. 1999, Beale and Monaghan 2004, Bouton et al. 2005, Rojek et al. 2007). In some cases, reductions in breeding success from disturbance can occur in the absence of visible behavioral changes (Beale and Monaghan 2004).

Disturbance at breeding sites prior to or early in the breeding season can also preclude site use. For example, upon arriving at the colony site to breed, Brown Pelicans will abandon the site quickly if disturbed (Anderson and Keith 1980). Brandt's Cormorants also will abandon disturbed sites for long periods, sometimes lasting years (McChesney 1997, pers. obs.; Wallace and Wallace 1998). When protected from disturbance, seabirds can quickly colonize desirable habitats.

Seabirds may benefit from MPAs if restrictions on fishing result in reduced boating activities and resulting disturbances at breeding colonies, roosts, and in some cases, foraging areas. For example, at study colonies in central California, most boats approaching close to colonies are recreational fishing boats that are either fishing or transiting between nearby fishing spots (USFWS unpubl. data; G. McChesney, pers. obs.). At Point Reyes in 2007, 93% (n = 43) of vessels approaching within 1,500 feet of colonies were either private or charter fishing boats. Most boats remained beyond the limits of the Point Reyes Headlands Marine Conservation Area, which does not permit recreational fishing within 1,000 feet of most of the headlands. However, since MPAs do not restrict access, their utility for protecting seabird colonies may be limited.

Seabirds also may benefit from MPAs if increases in their forage base occur as a result of the MPAs. Since the species most likely to benefit mainly forage on juvenile fish, increased recruitment of prey species would be a needed result to benefit these seabird species. These species are sensitive to changes in prey availability that can have dramatic effects on breeding success, survivorship, and population status (Ainley and Boekelheide 1990, Nur and Sydeman 1999, Sydeman et al. 2001). For example, the Pelagic Cormorant and Pigeon Guillemot colonies at the South Farallon Islands have undergone declines in reproductive performance and population size, apparently due to decreased prey availability. These reductions are consistent with a decline in the numbers of juvenile rockfish fed to chicks that began in the early 1990s (Sydeman et al. 2001, Warzybok et al. 2007).

## **METHODS**

Evaluations included all proposed MPAs, including SMRs, SMCAs, and SMPs. However, SMPs are not viewed as a benefit to seabirds since disturbance from recreational activities may increase impacts to seabirds. Thus, in relation to benefits to seabirds, comparisons between MPA proposal packages did not include SMPs. Because SMCAs permit certain types of fishing activities, they may not benefit seabirds to the same level as SMRs. However, all SMCAs proposed prohibit fishing of groundfish. Since groundfish fishing is the most common of nearshore fishing from boats (at least from Point Reyes south), benefits to colonies from these SMCAs may be similar to SMRs although this may vary by location. Thus, proposed SMCAs were not treated separately from proposed SMRs in comparisons<sup>1</sup>.

### **Seabird Breeding Colonies**

Data used for these analyses mainly were from colony survey data in the draft NOAA Biogeographic Assessment for the Cordell Bank, Gulf of the Farallones, and Monterey Bay National Marine Sanctuaries provided to the MLPA process. Included are population estimates from the last statewide seabird colony survey in 1989 (Carter et al. 1992) except for colonies with more recent estimates (up to 2004) provided by several sources. For breeding colonies, species most likely to benefit include Brandt's Cormorant, Pelagic Cormorant, Double-crested Cormorant, Common Murre, and Pigeon Guillemot because of their higher sensitivity to disturbance from boating and other human activities (Carter et al. 1984, McChesney 1997, Wallace and Wallace 1998, Carney and Sydeman 1999, Ronconi and St. Clair 2002, Rojek et al. 2007; G. McChesney, pers. obs.). Brandt's Cormorant, Double-crested Cormorant, and Common Murre breed in dense concentrations mainly on the flatter or more gently sloped portions of offshore rocks but sometimes on steep cliffs, including on the mainland. Pelagic Cormorants nest in lower density clusters on cliff ledges. Pigeon Guillemots nest underground in rock crevices or burrows, but congregate on the ground surface and waters adjacent to

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<sup>1</sup> The evaluation methodology for marine birds differs from that used for the evaluation of potential benefits to marine mammals. Given the more limited data available on how human activities impact marine mammals, only state marine reserves are included in the marine mammal evaluation.

colonies. These congregations will flush and scatter at the approach of boats (see Ronconi and St. Clair 2002 for the similar Black Guillemot).

Evaluations include numbers of species (species diversity), numbers of birds, and percentages of subregional populations breeding within each draft MPA proposed (Tables 2-6) and subregional totals for each draft MPA proposal (Table 7). A short comparison of draft proposals is also provided. In this document, percentages cited are the percentages of the subregional populations. However, one breeding species, the Marbled Murrelet, is not included because these birds nest inland in old-growth forests.

### **Seabird Foraging Areas**

Focal species most likely to benefit from increases in forage base were examined: Brandt's Cormorant, Pelagic Cormorant, and Pigeon Guillemot. During the breeding season, these species mainly forage within a few miles of colonies (Briggs et al. 1987, Ewins 1993, Hobson 1997, Mason et al. 2007). Along the mainland coast, most foraging occurs within about one mile from shore. In areas with broad continental shelves, birds forage farther from shore more often, especially Brandt's Cormorants (Briggs et al. 1987, Ainley et al. 1990). At the offshore Farallon Islands, Pelagic Cormorants and Pigeon Guillemot s forage mainly within a radius of about 3 miles from the colony. Brandt's Cormorants also forage largely within this zone, but will forage more widely when prey resources near the islands are low (Ainley et al. 1990). Species that were not evaluated forage more widely, often beyond the 3-mile state limit, and on more mobile prey such as anchovies and sauries, or krill (Ainley et al. 1990). An exception to this is the federally threatened Marbled Murrelet. The southernmost population of this species nests inland in old-growth forests of the Santa Cruz Mountains, near the southern limit of the NCCSR. Birds forage in adjacent nearshore habitats, mostly on juvenile fish and krill (Becker et al. 2007). Murrelets may benefit from MPAs if recruitment and availability of their preferred prey (e.g., juvenile rockfish) increase as a result of MPAs. Also, murrelets can be impacted from boat disturbance at foraging areas (Kuletz 1996, Speckman et al. 2004), so reductions in boating activity may provide benefits to the species.

The favored foraging habitats for Pelagic Cormorants and Pigeon Guillemots are among submerged reefs, where they feed on juvenile rockfish and other small fish and invertebrates (Ainley et al. 1990; Appendix 2). Brandt's Cormorants feed over a variety of habitats, including submerged reefs and soft bottom, but prefer midwater depth zones but favor midwater over soft bottom habitats where they feed on a wide variety of prey including juvenile rockfish, anchovies, Pacific Tomcod, sanddabs, and squid (Ainley et al. 1990, Wallace and Wallace 1998; Appendix 2).

To evaluate draft proposed MPAs, GIS software were used to create buffers along three miles of coast and to one mile offshore from colonies in the North and South subregions. This is thought to encompass most of the foraging ranges for these species during the breeding season. In the Farallon Islands subregion, buffers included all areas within three miles of the islands based on

known foraging distributions (Ainley et al. 1990; Draft NOAA Biogeographic Assessment). For the Brandt's Cormorant, we recognize that a buffer of three miles encompasses a smaller portion of the foraging range, but outside of this range these birds likely forage more on pelagic wetfish and other more mobile species less likely to benefit from these proposed MPAs.

Three mile-by-one mile colony buffers were overlaid with MPAs and the area of overlap determined. For each species, proportions of the foraging range overlapping MPAs were then weighted based on the proportion of the subregional population breeding at that colony. Final weighted values are reported.

### **Major Seabird Roosts**

Seabirds come to land and rest, or roost, on a variety of habitats including offshore rocks, coastal cliffs, beaches, and river mouths. Not all species regularly roost on land outside the breeding colonies but for some species it is energetically essential to come to land daily or nearly so to rest, sleep, preen, or dry their feathers. Many birds actually spend a substantial part of their time on land at roosts during both the breeding season and nonbreeding season. In the NCCSR, common seabirds at roost sites include Brown Pelican, three species of cormorant, and four species of gulls, among others. Access to undisturbed roosting habitat near major foraging areas is important during all parts of the seabird life cycle.

In the NCCSR, little broad-scale data are available on seabird roost sites although several are recognized as important. However, broad-scale data is available for the endangered Brown Pelican from surveys conducted intermittently from 1986 to 2000 by D. L. Jaques and others. These surveys were conducted in the fall during the period of peak pelican abundance. Since pelicans often share roost sites with other seabirds, roost sites for the Brown Pelican were used as a surrogate for all seabirds. Pelicans also serve as a good indicator species for roosts because of their high sensitivity to disturbance (Anderson and Keith 1980, Jaques et al. 1996, Jaques and Strong 2002, Rodgers and Schwikert 2002). In the recovery plan for the endangered California Brown Pelican, protection of roost sites was identified as a primary objective (USFWS 1983).

Data for this evaluation were obtained from a summary of major pelican roosts between Bodega and Cambria (San Luis Obispo County) prepared for the Gulf of the Farallones National Marine Sanctuary, augmented with additional data from roosts between Bodega and Point Arena (D. L. Jaques, Pacific Eco Logic, Astoria, Oregon, unpubl. data). Data were available for major roosts (i.e., >100 birds) only and categorized as: >100 birds; >500 birds; or >1000 birds. Evaluations were based on the numbers of major roosts in each roost size category included within each proposed MPA.

## **RESULTS**

### **Seabird Breeding Colonies**

Numbers of breeding seabirds and numbers of species breeding in each subregion are summarized in Table 1, and numbers of each species at each colony are in Appendix 1. Twelve species, and over 335,000 birds, breed within the NCCSR. Abundances and species diversity vary between subregions. Overall abundance and diversity is highest in the Farallon Islands Subregion. Numbers are lowest in the North Subregion, mainly because of a lack of suitable island breeding habitats but possibly because of other factors as well (e.g., low prey availability). However, the Pelagic Cormorant predominates in this subregion where abundant cliff-breeding and rocky foraging habitats exist. The South Subregion also has several large colonies.

Numbers and percentages of subregional populations of all species and species most likely to benefit for each MPA proposal are summarized in Tables 2-6, and comparisons between draft MPA proposals are shown in Table 7. Proposed MPAs that encompass the 20 largest colonies in the NCCSR are in Table 8. These colonies include 99% of all the seabirds breeding in the NCCSR. In particular, major concentrations occur at: Fish Rocks; Gualala River area; Russian River area; Bodega Rock; Bird Rock (off Tomales Point); Point Reyes; Drakes Bay area (Point Resistance to Double Point); mouth of the Golden Gate; Devil's Slide; and the Farallon Islands.

*North subregion* – Total numbers of breeding birds (976-1872) and species (4-7) included in MPAs varied between proposals. Draft Proposal 3 covers the greatest number of species and greatest number of total birds, 25% of the subregional population of all seabirds. This is largely because of the large Brandt's, Pelagic, and Double-crested Cormorant colonies encompassed within the Russian River SMCA. Draft Proposal 3 is also the only proposal to cover a large Brandt's Cormorant colony. Other draft proposals covered smaller portions or none of this area, the largest colony complex in the subregion.

Pelagic Cormorants are widespread breeders in this subregion, although some colonies contain high concentrations (Appendix 1). Numbers of Pelagic Cormorants within draft MPA proposals varied, ranging from 515 (Draft External Proposal A) to 995 (Draft Proposal 4) breeding birds or 18.2-35.2% of the subregional population, respectively. Larger numbers in Draft Proposal 4 resulted mainly from colonies covered at both Russian River Rocks and the unique Sea Lion Cove SMR. Most Double-crested Cormorants breed on rocks and cliffs near the Russian River mouth. Coverage of Double-crested Cormorant colonies was similar among most proposals, except Draft Proposal 1 included no colonies. Pigeon Guillemots are scattered in fairly low numbers throughout the North Subregion, and numbers were fairly similar between proposals, ranging from 75-138 birds or 13.3-18.0% of the subregional population. Common Murres do not breed in the North Subregion.

No proposals encompass the largest and most diverse seabird colony in the subregion, Fish Rocks, with about 900 breeding birds of nine species. Other major colonies not included in any proposals are Gualala Point Island (5 species, 324 birds, mostly Brandt's Cormorants), Bodega Rock (4 species, 778 birds, mostly Brandt's Cormorants), and Bird Rock (7 species, 894 birds).

*South subregion* - Total numbers of breeding birds included in MPA proposals ranged from 43,061 to 60,792, or 60-85% of the subregional populations for all species (Table 7). All

proposals cover the largest and most diverse (9 species) seabird colony in the subregion, Point Reyes. For all birds and for species most likely to benefit, numbers of birds covered fell within two main groups: lower coverage in Draft Proposal 2 and Draft External A; and greater coverage within Draft Proposals 1, 3, and 4. In particular, Draft Proposals 1 and 4 cover the same colonies and protect the largest numbers of total birds and for all species most likely to benefit. These proposed MPAs encompass the large and diverse Point Reyes, Double Point Rocks, and Devil's Slide Rock & Mainland colonies (Table 8). However, the higher protection status within the Fitzgerald – Devils Slide SMR of Draft Proposal 4 may provide greater benefits to the seabird colonies within this area than the Devils Slide SMCA of Proposal 1. Double-crested Cormorants do not breed on the outer coast of the South Subregion, although colonies occur close by within San Francisco Bay and Merced Lake in San Francisco.

*Farallon Islands subregion* – Two recognized colonies occur within this region. The North Farallon Islands is made up of four islets. The South Farallon Islands includes the main island of Southeast Farallon, West End, and several smaller islets including Sugarloaf and Saddle Rock. Owing to an abundance of varying breeding habitat types and close access to abundant food, the South Farallon Islands is not only the largest seabird breeding colony in the NCCSR but is the largest colony in the contiguous United States. Birds breed over most of these islands, with higher concentrations on the north and west sides of the islands. The North Farallon Islands is the second largest colony in the NCCSR and is primarily comprised of Common Murres, which nest in high densities on all islets.

All proposals enclose all, or nearly all, of the South Farallon Islands colony. However, draft Proposal 4 and Draft External Proposal A provide additional coverage around all sides of the islands. Draft Proposals 1 and 3 cut close to the small islets on the north end of the islands, where large numbers of Common Murres and Pelagic Cormorants breed. Draft Proposal 2 does not enclose the northern portions of the islands, important for both seabirds and marine mammals.

Draft Proposals 1, 3 and 4 enclose the North Farallon Islands. With the high protection afforded to all the Farallon Islands, Draft Proposal 4 likely would provide the highest level of benefit to seabirds.

### **Seabird Foraging Areas**

Weighted contributions to seabird foraging areas for species most likely to benefit are summarized for each draft MPA proposal in Tables 9-13, and comparisons between draft MPA proposals are shown in Table 14.

#### *North subregion -*

For all species, Draft Proposal 3 had the highest foraging area values. For both the Brandt's and Double-crested Cormorants, Draft Proposal 1 had the lowest values whereas Draft External Proposal A had the lowest values for Pelagic Cormorant and Draft Proposal 2 had the lowest value for Pigeon Guillemot. Higher values in Draft Proposal 3 largely resulted from the larger

area covered by MPAs in the Russian River area. Weighted foraging areas ranged from 0.94 to 1.99 for Brandt's Cormorant, from 1.12 to 2.13 for Pelagic Cormorant, from 0.61 to 5.30 for Double-crested Cormorant, and from 0.96 to 1.25 for Pigeon Guillemot.

*South subregion* – For all species except Double-crested Cormorant, Draft Proposal 3 had the highest and Draft External Proposal A had the lowest weighted foraging area values. Weighted foraging areas ranged from 2.68 to 4.81 for the Brandt's Cormorant, from 2.03 to 3.21 for Pelagic Cormorant, and from 3.11 to 4.82 for Pigeon Guillemot. For these species, higher values mainly resulted from MPAs in the Point Reyes and Devil's Slide areas. All proposals covered unweighted amounts of Double-crested Cormorant habitat, all within the Drakes-Limantour Estero where breeding birds from as far as the South Farallon Islands to feed.

*Farallon Islands subregion* - For the three focal species, Draft Proposal 3 had the highest and Draft Proposal 2 had the lowest foraging area values. Weighted foraging areas ranged from 6.92 to 28.12 for Brandt's Cormorant, from 6.11 to 28.14 for Pelagic Cormorant, and from 6.43 to 28.13 for Pigeon Guillemot.

### **Major Seabird Roosts**

Numbers of roosts within each proposed MPA are summarized in Table 15. A comparison of roost coverage by draft MPA proposal is shown in Table 16.

*North subregion* – Draft Proposal 3 contains the highest numbers of roosts while others had one or none (Draft Proposal 1). All roosts covered were in the Russian River area.

*South subregion* - Numbers of roosts within draft MPA proposals ranged from 1 (Draft Proposal 2) to 5 (Draft Proposal 1).

*Farallon Islands subregion* – All but one draft proposal captured the very large pelican roost at the South Farallon Islands. Draft Proposal 2 did not because most pelicans roost at the northwest end of the island chain, outside the boundaries of the proposed MPA boundaries.

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Table 1. Numbers of breeding seabirds of 12 species within each of the three bioregions of the NCCSR.<sup>1</sup>

Bioregion	No. Species	Total	LHSP	ASSP	BRCO	PECO	DCCO	BLOY	WEGU	COMU	PIGU	CAAU	RHAU	TUPU
North	11	7588	110	15	2344	2823	450	129	927	0	768	P <sup>2</sup>	11	15
South	9	71321	0	65	2963	887	0	19	452	65609	1316	0	6	4
Farallon Islands	12	256645	1400	1990	17116	504	1122	30	15127	199328	541	18843	516	128
Total	12	335554	1510	2070	22423	4214	1572	178	16506	264937	2625	18843	533	147

<sup>1</sup> Species codes: LHSP – Leach’s Storm-Petrel, ASSP – Ashy Storm-Petrel, BRCO – Brandt’s Cormorant, PECO – Pelagic Cormorant, DCCO – Double-crested Cormorant, BLOY – Black Oystercatcher, WEGU – Western Gull, COMU – Common Murre, PIGU - Pigeon Guillemot, CAAU - Cassin’s Auklet, RHAU - Rhinoceros Auklet, TUPU - Tufted Puffin.

<sup>2</sup> Probably breeding.

Table 2. Proposal 1 (EC) summary of numbers of breeding birds and percent of subregional totals for all birds and for species most likely to benefit. See Table 1 for species codes. MPAs not shown did not include breeding sites for any of these species.

Name	No. Species	Total Birds	Total Birds Pct	BRCO	BRCO Pct	PECO	PECO Pct	DCCO	DCCO Pct	COMU	COMU Pct	PIGU	PIGU Pct
<b>North subregion</b>													
Pt Arena SMR	4	217	2.9%	0	0.0%	154	5.5%	0	0.0%	0		52	6.8%
Saunder's Reef inshore SMCA	2	75	1.0%	0	0.0%	62	2.2%	0	0.0%	0		13	1.7%
Sea Ranch to Salt Point SMR	3	521	6.9%	0	0.0%	390	13.8%	0	0.0%	0		73	9.5%
<b>South subregion</b>													
Point Reyes Headland SMR	9	43061	60.4%	1160	39.1%	266	30.0%	0	-	40810	62.2%	616	46.8%
Double Point SMR	6	16235	22.8%	328	11.1%	9	1.0%	0	-	15818	24.1%	22	1.7%
Devil's Slide SMCA	6	1496	2.1%	692	23.4%	114	12.9%	0	-	380	0.6%	288	21.9%
<b>Farallon Islands Region</b>													
N Farallon Island SMR	6	72203	28.1%	102	0.6%	62	12.3%	0	0.0%	71929	36.1%	42	7.8%
SE Farallon SMR	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%

Table 3. Proposal 2 (JD) summary of numbers of breeding birds and percent of subregional totals for all birds and for species most likely to benefit. See Table 1 for species codes. MPAs not shown did not include breeding sites for any of these species.

Name	No. Species	Total Birds	Total Birds Pct	BRCO	BRCO Pct	PECO	PECO Pct	DCCO	DCCO Pct	COMU	COMU Pct	PIGU	PIGU Pct
<b>North subregion</b>													
Pt Arena SMR	4	217	2.9%	0	0.0%	154	5.5%	0	0.0%	0	-	52	6.8%
Saunders Reef Inshore SMCA	2	75	1.0%	0	0.0%	62	2.2%	0	0.0%	0	-	13	1.7%
Black Point SMR	4	153	2.0%	0	0.0%	84	3.0%	0	0.00	0	-	42	5.5%
Salt Point SMP	3	220	2.9%	0	0.0%	200	7.1%	0	0.0%	0	-	4	0.5%
Russian River SMCA	5	414	5.5%	2	0.1%	125	4.4%	238	52.9%	0	-	5	0.7%
Bodega Head SMR	3	121	1.6%	0	0.0%	103	3.7%	0	0.0%	0	-	2	0.3%
<b>South subregion</b>													
Pt Reyes SMR	9	43061	60.4%	1160	39.2%	266	30.0%	0	-	40810	62.2%	616	46.8%
<b>Farallon Islands subregion</b>													
SE Farallon SMR <sup>1</sup>	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%

<sup>1</sup> Proposal does not cover entire colony but numbers reflect whole colony counts; i.e., were not adjusted.

Table 4. Proposal 3 (TC) summary of numbers of breeding birds and percent of subregional totals for all birds and for species most likely to benefit. See Table 1 for species codes. MPAs not shown did not include breeding sites for any of these species.

Name	No. Species	Total Birds	Total Birds Pct	BRCO	BRCO Pct	PECO	PECO Pct	DCCO	DCCO Pct	COMU	COMU Pct	PIGU	PIGU Pct
<b>North subregion</b>													
Point Arena SMR <sup>1</sup>	3	37	0.01%	0	0.0%	33	1.2%	0	0.0%	0	-	2	0.3%
Saunder's Reef inshore SMCA	2	75	1.0%	0	0.0%	62	2.2%	0	0.0%	0	-	13	1.7%
Black Point SMR	3	148	2.0%	0	0.0%	106	3.8%	0	0.0%	0	-	27	3.5%
Salt Point SMP	3	220	2.9%	0	0.0%	200	7.1%	0	0.0%	0	-	4	0.5%
Russian River SMCA	7	1491	19.7%	438	18.7%	449	15.9%	386	85.8%	0	-	31	4.0%
Bodega Head SMR	3	121	1.6%	0	0.0%	103	3.7%	0	0.0%	0	-	2	0.3%
<b>South subregion</b>													
Pt Reyes SMR	9	43061	60.4%	1160	39.2%	266	30.0%	0	-	40810	62.2%	616	46.8%
Duxbury SMR	6	16235	22.8%	0	0.0%	5	0.6%	0	-	0	0.0%	2	0.3%
Moss Beach SMR	2	7	0.01%	102	0.6%	62	12.3%	0	-	71929	36.1%	42	7.9%
<b>Farallon Islands subregion</b>													
N Farallon SMR	6	72203	28.1%	102	0.6%	62	12.3%	0	0.0%	71929	36.1%	42	7.8%
SE Farallon SMR	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%

<sup>1</sup> Numbers adjusted from whole colony estimates to reflect only the portion of the colony covered by the MPA.

Table 5. Proposal 4 (JC) summary of numbers of breeding birds and percent of subregional totals for all birds and for species most likely to benefit. See Table 1 for species codes. MPAs not shown did not include breeding sites for any of these species.

Name	No. Species	Total Birds	Total Birds Pct	BRCO	BRCO Pct	PECO	PECO Pct	DCCO	DCCO Pct	COMU	COMU Pct	PIGU	PIGU Pct
<b>North subregion</b>													
Point Arena SMR	4	217	2.9%	0	0.0%	154	5.5%	0	0.0%	0	-	52	6.8%
Sea Lion Cove SMR <sup>1</sup>	4	273	3.6%	0	0.0%	245	8.7%	0	0.0%	0	-	12	1.6%
Saunder's Reef SMCA	2	75	1.0%	0	0.0%	62	2.2%	0	0.0%	0	-	13	1.7%
Black to Salt Point SMR	4	368	4.8%	0	0.0%	306	10.8%	0	0.0%	0	-	31	4.0%
Salt Point SMP	4	142	1.9%	0	0.0%	110	3.9%	0	0.0%	0	-	10	1.3%
Russian River SMR	5	414	5.5%	2	0.1%	125	4.4%	238	52.9%	0	-	5	0.7%
Bodega Head SMR	3	121	1.6%	0	0.0%	103	3.7%	0	0.0%	0	-	2	0.3%
<b>South subregion</b>													
Pt Reyes SMR	9	43061	60.4%	1160	39.2%	266	30.0%	0	-	40810	62.2%	616	46.8%
Double Point SMR	6	16235	22.8%	328	11.1%	9	1.0%	0	-	15818	24.1%	22	1.7%
Fitzgerald - Devils Slide SMR	5	1496	2.1%	692	23.4%	114	12.9%	0	-	380	0.6%	288	21.9%
<b>Farallon Islands subregion</b>													
N Farallon SMR	6	72203	28.1%	102	0.6%	62	12.3%	0	0.00%	71929	36.1%	42	7.8%
SE Farallon SMR	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%

<sup>1</sup> Numbers account for portion of Sea Lion Rocks to Arena Cove colony covered within SMR.

Table 6. Proposal External A (XA) summary of numbers of breeding birds and percent of subregional totals for all birds and for species most likely to benefit. See Table 1 for species codes. MPAs not shown did not include breeding sites for any of these species.

Name	No. Species	Total Birds	Total Birds Pct	BRCO	BRCO Pct	PECO	PECO Pct	DCCO	DCCO Pct	COMU	COMU Pct	PIGU	PIGU Pct
<b>North subregion</b>													
Arena Rock SMR	4	217	2.9%	0	0.0%	154	5.5%	0	0.0%	0	-	52	6.8%
Black Point SMCA	1	9	0.12%	0	0.00%	9	0.32%	0	0.00%	0		0	0.00%
Black Point SMR	4	215	2.8%	0	0.0%	124	4.4%	0	0.0%	0	-	54	7.0%
Russian River SMR	5	414	5.5%	2	0.1%	125	4.4%	238	52.9%	0	-	5	0.7%
Bodega Head SMR	3	121	1.6%	0	0.0%	103	3.7%	0	0.0%	0	-	2	0.3%
<b>South subregion</b>													
Point Reyes SMR	9	43061	60.4%	1160	39.2%	266	30.0%	0	-	40810	62.2%	616	46.8%
<b>Farallon Islands subregion</b>													
SE Farallon SMR	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%

Table 7. Comparison between proposals of numbers and percentages of seabirds breeding within MPAs in each subregion, North Central Coast Study Region.<sup>1</sup>

Name	No. Species	Total Birds	Total Birds Pct	BRCO	BRCO Pct	PECO	PECO Pct	DCCO	DCCO Pct	COMU	COMU Pct	PIGU	PIGU Pct
<b>North subregion</b>													
Proposal 1	4	813	10.7%	0	0.0%	606	21.5%	0	0.0%	0	-	138	18.0%
Proposal 2	6	980	12.9%	2	0.1%	528	18.7%	238	52.9%	0	-	114	14.8%
Proposal 3	7	1872	24.7%	438	18.7%	753	26.7%	386	85.8%	0	-	75	13.3%
Proposal 4	6	1326	17.5%	2	0.1%	885	31.3%	238	52.9%	0	-	105	13.7%
External Proposal A	6	976	12.9%	2	0.1%	515	18.2%	238	52.9%	0	-	113	14.7%
<b>South subregion</b>													
Proposal 1	9	60792	85.2%	2180	73.6%	389	43.9%	0	-	57008	86.9%	926	70.4%
Proposal 2	9	43061	60.4%	1160	39.2%	266	30.0%	0	-	40810	62.2%	616	46.8%
Proposal 3	9	59303	83.2%	1488	50.2%	282	31.8%	0	-	56628	86.3%	640	48.6%
Proposal 4	9	60792	85.2%	2180	73.6%	389	43.9%	0	-	57008	86.9%	926	70.4%
External Proposal A	9	43061	60.4%	1160	39.1%	266	30.0%	0	-	40810	62.2%	616	46.8%
<b>Farallon Islands subregion</b>													
Proposal 1	12	256645	100.0%	17116	100.0%	504	100.0%	1122	100.0%	199328	100.0%	541	100.0%
Proposal 2 <sup>2</sup>	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%
Proposal 3	12	256645	100.0%	17116	100.0%	504	100.0%	1122	100.0%	199328	100.0%	541	100.0%
Proposal 4	12	256645	100.0%	17116	100.0%	504	100.0%	1122	100.0%	199328	100.0%	541	100.0%
External Proposal A	12	184442	71.9%	17014	99.4%	442	87.7%	1122	100.0%	127399	63.9%	499	92.2%

<sup>1</sup> Does not include birds breeding within State Marine Parks because these may actually impact seabird breeding colonies.

<sup>2</sup> Proposal does not cover entire colony but numbers reflect whole colony counts; i.e., were not adjusted.



Table 8. The 20 largest seabird colonies in the NCCSR and those included within the boundaries of draft proposed MPAs. Numbers of breeding birds at each colony are shown in Appendix 1.

Colony Name	Proposal 1 (EC)	Proposal 2 (JD)	Proposal 3 (TC)	Proposal 4 (JC)	Proposal External A
<b>North subregion</b>					
Point Arena	Point Arena SMR	Point Arena SMR	Point Arena SMR (part) <sup>2</sup>	Point Arena SMR	Arena Rock SMR
Sea Lion Rocks to Arena Cove				Sea Lion Cove SMR (part) <sup>2</sup>	
Fish Rocks					
Collins Landing to Gualala River					
Gualala Point Island					
Russian Gulch			Russian River SMCA		
Russian River Rocks		Russian River SMCA	Russian River SMCA	Russian River SMR (part) <sup>2</sup>	Russian River SMR (part) <sup>2</sup>
Arched Rock <sup>1</sup>			Russian River SMCA		
Gull Rock <sup>1</sup>			Russian River SMCA		
Bodega Rock					
Dillon Beach Rocks					
Bird Rock					
<b>South subregion</b>					
Point Reyes	Point Reyes Headland SMR	Point Reyes SMR	Point Reyes SMR	Point Reyes SMR	Point Reyes SMR
Point Resistance					
Millers Point Rocks					
Double Point Rocks	Double Point SMR		Duxbury SMR	Double Point SMR	
Lobos Rock and Land's End					
Seal Rocks					
Devil's Slide Rock & Mainland	Devil's Slide SMCA			Fitzgerald Devils Slide SMR	
<b>Farallon Islands subregion</b>					
North Farallon Islands	N. Farallon Island SMR		North Farallon SMR	North Farallon SMR	
South Farallon Islands	S.E. Farallon SMR	South Farallon Island SMR (part) <sup>2</sup>	S.E. Farallon SMR	S.E. Farallon SMR	

<sup>1</sup> Arched Rock and Gull Rock are considered as a "colony complex."

<sup>2</sup> Part of colony included in proposed MPA.

Table 9. Draft Proposal 1 weighted contributions to foraging areas for three species of breeding seabirds within each proposed MPA. MPAs not shown did not contribute to foraging area for any of these species.

MPA Name	Brandt's Cormorant	Pelagic Cormorant	Pigeon Guillemot
<b>North subregion</b>			
Pt Arena SMCA	0.00	0.11	0.06
Pt Arena SMR	0.00	0.28	0.15
Saunder's Reef inshore SMCA	0.07	0.21	0.30
Del Mar Landing SMP	0.01	0.01	0.01
Sea Ranch to Salt Point SMR	0.00	0.66	0.41
Salt Point SMP	0.00	0.13	0.03
Russian River Reserve	0.13	0.11	0.03
Bodega Head SMR	0.71	0.21	0.12
Clam Island SMRMA	0.03	0.01	0.03
<b>South subregion</b>			
Point Reyes Headland SMR	2.11	1.62	2.53
Point Reyes Headland SMCA	0.46	0.35	0.55
Drakes-Limantour Estero SMR	0.00	0.00	0.00
Double Point SMR	0.57	0.14	0.14
Double Point SMCA	0.11	0.03	0.02
Duxbury Reef SMCA	0.03	0.00	0.00
Bolinas Lagoon SMR	0.00	0.00	0.00
Devil's Slide SMCA	0.95	0.58	0.87
Fitzgerald SMR	0.18	0.11	0.10
<b>Farallon Islands subregion</b>			
N Farallon Island SMR	0.07	1.40	0.88
SE Farallon SMCA	6.44	5.68	5.97
SE Farallon SMR	3.76	3.32	3.49

Table 10. Draft Proposal 2 weighted contributions to foraging areas for three species of breeding seabirds within each proposed MPA. MPAs not shown did not contribute to foraging area for any of these species.

MPA Name	Brandt's Cormorant	Pelagic Cormorant	Pigeon Guillemot
<b>North subregion</b>			
Pt Arena SMR	0.00	0.34	0.18
Saunders Reef Offshore SMCA	0.00	0.01	0.01
Saunders Reef Inshore SMCA	0.00	0.15	0.17
Black Point SMR	0.00	0.21	0.33
Salt Point SMP	0.00	0.23	0.04
Gerstle Cove SMR	0.00	0.00	0.00
Russian River SMR	0.07	0.05	0.01
Russian River SMCA	0.16	0.15	0.04
Bodega Head SMR	0.63	0.15	0.11
Bodega Head SMCA	0.38	0.08	0.10
<b>South subregion</b>			
Pt Reyes SMR	1.25	0.95	1.49
Pt Reyes SMCA	2.05	1.57	2.46
Drakes Bay SMR	0.00	0.00	0.00
Fitzgerald SMR	0.17	0.11	0.09
<b>Farallon Islands subregion</b>			
South East Farallon Island SMR	3.01	2.65	2.79
South East Farallon Island SMCA	3.92	3.45	3.63

<sup>1</sup> Drakes Estero is recognized as a foraging area for Farallon Islands breeding Double-crested Cormorants.

Table 11. Draft Proposal 3 weighted contributions to foraging areas for three species of breeding seabirds within each proposed MPA. MPAs not shown did not contribute to foraging area for any of these species.

MPA Name	Brandt's Cormorant	Pelagic Cormorant	Pigeon Guillemot
<b>North subregion</b>			
Point Arena SMR	0.00	0.29	0.15
Saunder's Reef inshore SMCA	0.07	0.21	0.29
Del Mar Landing SMP	0.01	0.01	0.01
Black Point SMR	0.00	0.38	0.35
Salt Point SMP	0.00	0.37	0.05
Gerstle Cove SMCA	0.00	0.00	0.00
Russian River SMCA	0.89	0.98	0.25
Charter Beach SMCA	0.00	0.01	0.00
Bodega Head SMR	1.03	0.26	0.21
<b>South subregion</b>			
Point Reyes SMR	2.95	2.26	3.53
Point Reyes SMCA	0.62	0.48	0.74
Drakes Estero SMR	0.00	0.00	0.01
Duxbury SMR	0.64	0.15	0.15
Duxbury SMCA	0.06	0.02	0.01
Bolinas Lagoon SMR	0.00	0.00	0.00
Moss Beach SMR	0.53	0.30	0.38
<b>Farallon Islands subregion</b>			
N Farallon SMCA	0.02	0.32	0.20
N Farallon SMR	0.05	1.10	0.69
Farallones SMCA	18.18	18.01	18.08
SE Farallon SMCA	4.45	3.92	4.12
SE Farallon SMR	5.42	4.78	5.03

Table 12. Draft Proposal 4 weighted contributions to foraging areas for three species of breeding seabirds within each proposed MPA. MPAs not shown did not contribute to foraging area for any of these species.

MPA Name	Brandt's Cormorant	Pelagic Cormorant	Pigeon Guillemot
<b>North subregion</b>			
Point Arena SMR	0.00	0.41	0.22
Sea Lion Cove SMR	0.00	0.02	0.01
Saunders Reef SMCA	0.08	0.21	0.31
Del Mar Landing SMR	0.01	0.01	0.01
Black to Salt Point SMR	0.00	0.71	0.33
Gerstle Cove SMR	0.00	0.00	0.00
Salt Point SMP	0.00	0.14	0.04
Russian River SMR	0.24	0.21	0.05
Bodega SMR	0.95	0.24	0.18
<b>South subregion</b>			
Point Reyes SMCA	0.62	0.48	0.74
Point Reyes SMR	1.89	1.45	2.26
Drakes Estero SMR	0.00	0.00	0.01
Double Point SMR	0.56	0.14	0.14
Double Point SMCA	0.12	0.03	0.03
Duxbury SMCA	0.04	0.00	0.01
Fitzgerald - Devils Slide SMR	1.07	0.65	0.91
San Gregorio SMR	0.01	0.30	0.05
<b>Farallon Islands subregion</b>			
North Farallon SMR	0.06	1.18	0.75
Southeast Farallon SMCA	3.34	2.94	3.10
Southeast Farallon SMR	9.04	7.98	8.39

Table 13. Draft Proposal External A weighted contributions to foraging areas for three species of breeding seabirds within each proposed MPA. MPAs not shown did not contribute to foraging area for any of these species.

MPA Name	Brandt's Cormorant	Pelagic Cormorant	Pigeon Guillemot
<b>North subregion</b>			
Arena Rock SMR	0.00	0.34	0.18
Black Point SMCA	0.20	0.12	0.26
Black Point SMR	0.08	0.22	0.37
Gerstle Cove SMR	0.00	0.00	0.00
Russian River SMR	0.24	0.21	0.05
Bodega Head SMR	0.63	0.15	0.11
Bodega Head SMCA	0.38	0.08	0.10
<b>South subregion</b>			
Point Reyes SMR	1.89	1.45	2.26
Point Reyes SMCA	0.62	0.48	0.74
Limantour SMR	0.00	0.00	0.01
Bolinas Lagoon SMR	0.00	0.00	0.00
Fitzgerald SMR	0.17	0.11	0.09
<b>Farallon Islands subregion</b>			
Southeast Farallone SMR	4.02	3.55	3.73
Southeast Farallone SMCA	5.42	4.78	5.03

Table 14. Comparisons of draft MPA proposals to total contributions of weighted foraging areas for three species of breeding seabirds in the North Central Coast Study Region. Does not include foraging areas inside SMPs.

Proposal	Brandt's Cormorant	Pelagic Cormorant	Pigeon Guillemot
<b>North subregion</b>			
Proposal 1	0.94	1.58	1.12
Proposal 2	1.24	1.14	0.96
Proposal 3	1.99	2.13	1.25
Proposal 4	1.28	1.82	1.12
Proposal External A	1.53	1.12	1.08
<b>South subregion</b>			
Proposal 1	4.41	2.83	4.20
Proposal 2	3.47	2.63	4.04
Proposal 3	4.81	3.21	4.82
Proposal 4	4.30	3.05	4.15
Proposal External A	2.68	2.03	3.11
<b>Farallon Islands subregion</b>			
Proposal 1	10.19	8.99	9.46
Proposal 2	6.92	6.11	6.43
Proposal 3	28.12	28.14	28.13
Proposal 4	12.43	12.10	12.23
Proposal External A	9.44	8.32	8.75

Table 15. Summary of numbers of major Brown Pelican roosts by roost size category included within draft proposed MPAs in the North Central Coast Study Region. Draft proposed MPAs not containing major Brown Pelican roosts are not shown.

<b>MPA Name</b>	<b>Roost Size</b>	<b>No. Roosts</b>
<b>North subregion</b>		
<i>Proposal 2</i>		
Russian River SMCA	>100	1
<i>Proposal 3</i>		
Russian River SMCA	>100	3
<i>Proposal 4</i>		
Russian River SMR	>100	1
<i>Proposal External A</i>		
Russian River SMR	>100	1
<b>South subregion</b>		
<i>Proposal 1</i>		
Point Reyes Headland SMR	>100	1
Double Point SMR	>100	1
Bolinas Lagoon SMR	>100	1
Devil's Slide SMCA	>100	2
<i>Proposal 2</i>		
Pt Reyes SMR	>100	1
<i>Proposal 3</i>		
Point Reyes SMR	>100	1
Duxbury SMR	>100	1
Bolinas Lagoon SMR	>100	1
<i>Proposal 4</i>		
Point Reyes SMR	>100	1
Double Point SMR	>100	1
Fitzgerald - Devils Slide SMR	>100	2
<i>External Proposal A</i>		
Point Reyes SMR	>100	1
Bolinas Lagoon SMR	>100	1
<b>Farallon Islands Region</b>		
<i>Proposal 1</i>		
SE Farallon SMR	>1000	1
<i>Proposal 3</i>		
SE Farallon SMR	>1000	1
<i>Proposal 4</i>		
Southeast Farallon SMR	>1000	1
<i>External Proposal A</i>		



Southeast Farallone SMR	>1000	1
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Table 16. Numbers of major Brown Pelican roosts included in each draft MPA proposal, North Central Coast Study Region.

<b>Proposal</b>	<b>Roost Size</b>	<b>No. Roosts</b>
<b>North subregion</b>		
Proposal 1	-	0
Proposal 2	>100	1
Proposal 3	>100	3
Proposal 4	>100	1
Proposal External A	>100	1
<b>South subregion</b>		
Proposal 1	>100	5
Proposal 2	>100	1
Proposal 3	>100	3
Proposal 4	>100	4
Proposal External A	>100	2
<b>Farallon Islands subregion</b>		
Proposal 1	>1000	1
Proposal 2	-	0
Proposal 3	>1000	1
Proposal 4	>1000	1
Proposal External A	>1000	1

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*Gerry McChesney, MLPA Master Plan Science Advisory Team*  
*January 2008*

Appendix 1. List of seabird breeding colonies within the MLPA North Central Coast Study Region. Includes total colony size (total number of breeding birds) and numbers of breeding birds of each species. Colonies are listed north to south along the mainland, then Farallon Islands. The top 20 colonies in the study region are shown in bold.<sup>1</sup>

Colony Name	California Colony Code	No. Species	Total Colony Size	% of Regional Pop.	Leach's Storm-Petrel	Ashy Storm-Petrel	Brandt's Cormorant	Double-crested Cormorant	Pelagic Cormorant	Black Oystercatcher	Western Gull	Common Murre	Pigeon Guillemot	Cassin's Auklet	Rhinoceros Auklet	Tufted Puffin
<b>Point Arena</b>	<b>ME-384-01</b>	<b>4</b>	<b>217</b>	<b>0.065%</b>	-	-	-	-	<b>154</b>	<b>7</b>	<b>4</b>	-	<b>52</b>	-	-	-
Sea Lion Rocks	ME-384-02	4	131	0.039%	-	-	-	-	106	4	9	-	12	-	-	-
<b>Sea Lion Rocks to Arena Cove</b>	<b>ME-384-03</b>	<b>3</b>	<b>203</b>	<b>0.060%</b>	-	-	-	-	<b>183</b>	<b>4</b>	<b>16</b>	-	-	-	-	-
Moat Cove	ME-384-04	1	10	0.003%	-	-	-	-	H	-	-	-	10	-	-	-
Section 30 Cove	ME-384-05	2	50	0.015%	-	-	-	-	42	-	-	-	8	-	-	-
Saunders Landing	ME-384-06	2	28	0.008%	-	-	-	-	20	-	-	-	8	-	-	-
Iverson Point	ME-384-07	2	47	0.014%	-	-	-	-	42	H	-	-	5	-	-	-
Triplet Gulch	ME-384-08	3	178	0.053%	-	-	-	-	119	H	4	-	55	-	-	-
Fish Rock Cove	ME-384-09	2	34	0.010%	-	-	H	-	33	1	-	-	-	-	-	-
<b>Fish Rocks</b>	<b>ME-384-10</b>	<b>9</b>	<b>905</b>	<b>0.270%</b>	<b>100</b>	-	<b>368</b>	-	<b>123</b>	<b>6</b>	<b>170</b>	-	<b>119</b>	<b>P</b>	<b>4</b>	<b>15</b>
<b>Collins Landing to Gualala River</b>	<b>ME-384-11</b>	<b>3</b>	<b>281</b>	<b>0.084%</b>	-	-	-	-	<b>187</b>	<b>4</b>	<b>H</b>	-	<b>90</b>	-	-	-
<b>Gualala Point Island</b>	<b>SO-384-01</b>	<b>5</b>	<b>324</b>	<b>0.097%</b>	-	-	<b>264</b>	-	<b>4</b>	<b>1</b>	<b>26</b>	-	<b>29</b>	-	-	-
Del Mar Point	SO-384-02	1	9	0.003%	-	-	-	-	9	-	-	-	-	-	-	-
Sea Ranch	SO-384-03	4	153	0.046%	-	-	-	-	84	11	16	-	42	-	-	-
Black Point to Stewart's Point	SO-384-04	4	62	0.018%	-	-	-	-	40	4	6	-	12	-	-	-
Stewart's Point to Rocky Point	SO-382-01	4	86	0.026%	-	-	-	-	66	1	4	-	15	-	-	-
Horseshoe Cove	SO-382-02	3	125	0.037%	-	-	-	-	121	-	2	-	2	-	-	-
Cannon Gulch to Stump Beach	SO-382-03	3	95	0.028%	-	-	-	-	79	14	-	-	2	-	-	-
Gerstle Cove to Stillwater Cove	SO-382-04	4	142	0.042%	-	-	-	-	110	6	16	-	10	-	-	-
Bench Mark 125 to Timber Cove	SO-382-05	4	106	0.032%	-	-	-	-	62	2	32	-	10	-	-	-
Windermere Point to Jewell Gulch	SO-382-06	4	49	0.015%	-	-	-	-	40	1	6	-	2	-	-	-
Northwest Cape Rocks	SO-382-07	2	53	0.016%	-	-	-	-	H	1	52	-	-	-	-	-
<b>Russian Gulch</b>	<b>SO-382-08</b>	<b>5</b>	<b>376</b>	<b>0.112%</b>	-	-	-	<b>80</b>	<b>227</b>	<b>7</b>	<b>42</b>	-	<b>20</b>	-	-	-
<b>Russian River Rocks</b>	<b>SO-382-09</b>	<b>6</b>	<b>414</b>	<b>0.123%</b>	-	-	<b>P</b>	<b>238</b>	<b>125</b>	<b>2</b>	<b>44</b>	-	<b>5</b>	-	-	-
Goat Rock to Peaked Hill	SO-382-10	2	7	0.002%	-	-	-	-	-	1	6	-	-	-	-	-
<b>Arched Rock<sup>2</sup></b>	<b>SO-382-11</b>	<b>4</b>	<b>481</b>	<b>0.143%</b>	-	-	<b>436</b>	-	<b>9</b>	-	<b>34</b>	-	<b>2</b>	-	-	<b>H</b>
Peaked Hill	SO-382-12	4	53	0.016%	-	-	-	-	44	1	6	-	2	-	-	-
<b>Gull Rock<sup>2</sup></b>	<b>SO-382-13</b>	<b>7</b>	<b>160</b>	<b>0.048%</b>	<b>10</b>	-	<b>P</b>	<b>68</b>	<b>44</b>	<b>2</b>	<b>34</b>	-	<b>2</b>	-	-	-
Shell-Wright Beach Rocks	SO-382-14	5	200	0.060%	-	-	-	32	55	20	88	-	5	-	-	-
Duncan Point to Arched Rock	SO-382-15	3	174	0.052%	-	-	-	-	136	4	34	-	H	-	-	-
Bodega Head	SO-380-01	4	121	0.036%	-	-	-	-	103	6	10	-	2	-	-	-
<b>Bodega Rock</b>	<b>SO-380-02</b>	<b>4</b>	<b>778</b>	<b>0.232%</b>	-	-	<b>722</b>	-	-	<b>H</b>	<b>24</b>	-	<b>30</b>	-	<b>2</b>	-

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Colony Name	California Colony Code	No. Species	Total Colony Size	% of Regional Pop.	Leach's Storm-Petrel	Ashy Storm-Petrel	Brandt's Cormorant	Double-crested Cormorant	Pelagic Cormorant	Black Oystercatcher	Western Gull	Common Murre	Pigeon Guillemot	Cassin's Auklet	Rhinoceros Auklet	Tufted Puffin
Bodega Harbor	SO-380-03	2	14	0.004%	-	-	-	-	-	-	12	-	2	-	-	-
Pinnacle Rock	SO-380-04	5	84	0.025%	-	-	-	-	51	2	2	-	27	-	2	-
Sonoma-Marín County Line	MA-380-01	4	128	0.038%	-	-	H	-	84	5	14	-	25	-	-	-
<b>Dillon Beach Rocks</b>	<b>MA-380-02</b>	<b>6</b>	<b>230</b>	<b>0.069%</b>	-	-	<b>P</b>	<b>32</b>	<b>143</b>	<b>3</b>	<b>32</b>	-	<b>20</b>	-	-	-
Tomales Point	MA-380-03	3	150	0.045%	-	-	-	-	141	3	6	-	H	-	-	-
<b>Bird Rock</b>	<b>MA-380-04</b>	<b>7</b>	<b>894</b>	<b>0.266%</b>	-	<b>15</b>	<b>550</b>	-	<b>37</b>	<b>6</b>	<b>168</b>	-	<b>115</b>	-	<b>3</b>	<b>H</b>
Elephant Rock Complex	MA-380-05	2	36	0.011%	-	-	-	-	H	-	8	-	28	-	-	-
<b>Point Reyes</b>	<b>MA-374-01</b>	<b>9</b>	<b>43,061</b>	<b>12.833%</b>	-	<b>15</b>	<b>1,160</b>	-	<b>266</b>	<b>6</b>	<b>178</b>	<b>40,810</b>	<b>616</b>	-	<b>6</b>	<b>4</b>
Coast Campground South	MA-374-02	1	63	0.019%	-	-	-	-	-	-	-	-	63	-	-	-
<b>Point Resistance</b>	<b>MA-374-03</b>	<b>4</b>	<b>7,177</b>	<b>2.139%</b>	-	-	<b>28</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>8</b>	<b>7,091</b>	<b>50</b>	-	-	-
<b>Millers Point Rocks</b>	<b>MA-374-04</b>	<b>6</b>	<b>1,951</b>	<b>0.581%</b>	-	-	<b>296</b>	-	<b>59</b>	<b>1</b>	<b>30</b>	<b>1,510</b>	<b>55</b>	-	-	-
<b>Double Point Rocks</b>	<b>MA-374-05</b>	<b>6</b>	<b>16,235</b>	<b>4.838%</b>	-	<b>50</b>	<b>328</b>	-	<b>9</b>	<b>H</b>	<b>8</b>	<b>15,818</b>	<b>22</b>	-	-	-
Stinson Beach to Rocky Point	MA-374-06	1	6	0.002%	-	-	-	-	-	-	6	-	-	-	-	-
Gull Rock Area	MA-374-07	4	23	0.007%	-	-	-	-	9	1	6	-	7	-	-	-
Muir Beach Headlands to Tennessee Cove	MA-374-08	4	97	0.029%	-	-	-	-	42	1	20	-	34	-	-	-
Bird Island	MA-374-09	3	62	0.018%	-	-	P	-	-	1	56	-	5	-	-	-
Point Bonita	MA-374-10	3	171	0.051%	-	-	-	-	95	-	10	-	66	-	-	-
Bonita Cove	MA-374-11	3	10	0.003%	-	-	-	-	2	-	6	-	2	-	-	-
Point Diablo Bluffs and Needles	MA-374-12	2	49	0.015%	-	-	-	-	15	-	34	-	H	-	-	-
Fort Point Rock to Helmut Rock	SF-374-01	1	6	0.002%	-	-	-	-	-	-	6	-	-	-	-	-
<b>Lobos Rock and Land's End</b>	<b>SF-374-02</b>	<b>3</b>	<b>270</b>	<b>0.080%</b>	-	-	<b>238</b>	-	-	-	<b>14</b>	-	<b>18</b>	-	-	-
<b>Seal Rocks</b>	<b>SF-374-03</b>	<b>3</b>	<b>233</b>	<b>0.069%</b>	-	-	<b>184</b>	<b>H</b>	-	<b>3</b>	<b>46</b>	-	<b>H</b>	-	-	-
Eel Rock Cliffs	SF-372-05	1	9	0.003%	-	-	-	-	9	-	-	-	H	-	-	-
Mussel Rock Area	SM-374-01	2	11	0.003%	-	-	-	-	-	1	-	-	10	-	-	-
Mori Point	SM-372-01	2	49	0.015%	-	-	-	-	31	-	-	-	18	-	-	-
San Pedro Rock	SM-372-02	3	142	0.042%	-	-	H	-	H	2	12	H	128	-	-	H
<b>Devil's Slide Rock and Mainland</b>	<b>SM-372-03</b>	<b>5</b>	<b>1,354</b>	<b>0.404%</b>	-	-	<b>692</b>	-	<b>114</b>	<b>H</b>	<b>8</b>	<b>380</b>	<b>160</b>	-	-	-
Pillar Point	SM-372-04	2	7	0.002%	-	-	-	H	5	-	-	-	2	-	-	-
Seal Rock Cliffs	SM-372-06	4	174	0.052%	-	-	37	-	123	H	2	-	12	-	-	-
Martin's Beach	SM-372-07	3	129	0.038%	-	-	H	-	108	1	-	-	20	-	-	-
Pomponio Beach to Pescadero Beach	SM-370-01	2	22	0.007%	-	-	-	-	-	2	-	-	20	-	-	-
Pigeon Point	SM-370-02	2	10	0.003%	-	-	-	-	-	H	2	-	8	-	-	-
<b>North Farallon Islands</b>	<b>SF-FAI-01</b>	<b>6</b>	<b>72,203</b>	<b>21.518%</b>	-	-	<b>102</b>	-	<b>62</b>	-	<b>32</b>	<b>71,929</b>	<b>42</b>	<b>36</b>	-	-
<b>South Farallon Islands</b>	<b>SF-FAI-02</b>	<b>12</b>	<b>184,442</b>	<b>54.966%</b>	<b>1,400</b>	<b>1,990</b>	<b>17,014</b>	<b>1,122</b>	<b>442</b>	<b>30</b>	<b>15,095</b>	<b>127,399</b>	<b>499</b>	<b>18,807</b>	<b>516</b>	<b>128</b>
<b>TOTAL</b>	-	<b>12</b>	<b>335,554</b>	<b>100.00%</b>	<b>1,510</b>	<b>2,070</b>	<b>22,419</b>	<b>1,572</b>	<b>4,214</b>	<b>178</b>	<b>16,506</b>	<b>264,937</b>	<b>2,625</b>	<b>18,843</b>	<b>533</b>	<b>147</b>

<sup>1</sup>P, Present in small numbers but not estimated, or present during the period 1989-2004 but not breeding in last year surveyed;

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H, historically nesting species (prior to 1989).

A dash (-) indicates the species has not been recorded breeding at the colony.

<sup>2</sup> Arched Rock and Gull Rock are considered a “colony complex.”

Appendix 2. Known important prey items of Brandt’s cormorant, pelagic cormorant, and pigeon guillemot in north-central California. Most fish taken by seabirds are in the juvenile stage.<sup>1</sup>

Species	Fish	Preferred foraging habitat
Brandt’s cormorant	<b>Fish</b> Short-belly rockfish <i>Sebastes jordani</i> Yellowtail rockfish <i>Sebastes flavidus</i> Other rockfish <i>Sebastes</i> spp. Pacific sandlance <i>Ammodytes hexapterus</i> Plainfin midshipman <i>Porichthys notatus</i> Speckled sanddab <i>Citharichthys stigmaeus</i> <i>Hemilepidotus</i> spp. White seaperch <i>Phanerodon furcatus</i> Northern anchovy <i>Engraulis mordax</i> Pacific herring <i>Clupea pallasii</i> Pacific staghorn sculpin <i>Leptocottus armatus</i> <i>Hemilepidotus</i> spp. (Cottidae) Other sculpins (Cottidae) Pacific tomcod <i>Microgadus proximus</i> Northern Pacific hake <i>Merluccius productus</i> Shiner perch <i>Cymatogaster aggregata</i> Pacific tomcod <i>Microgadus proximus</i> Spotted cusk-eel <i>Chilara taylori</i> Butter sole <i>Isopsetta isolepis</i> Rex sole <i>Glyptocephalus zachirus</i> English sole <i>Parophrys vetulus</i> <b>Invertebrates</b> Market squid <i>Loligo opalescens</i>	Soft bottom
Pelagic cormorant	<b>Fish</b> Short-belly rockfish <i>Sebastes jordani</i> Yellowtail rockfish <i>Sebastes flavidus</i> Other rockfish <i>Sebastes</i> spp. Sculpins (Cottidae) <i>Coryphopterus nicholsii</i> <i>Chilara taylori</i> <b>Invertebrates</b> Mysid shrimp <i>Spirontocaris</i> sp.	Submerged reefs
Pigeon guillemot	<b>Fish</b> Rockfish <i>Sebastes</i> spp. Pacific sanddab <i>Citharichthys sordidus</i> Blennies (Clinidae) Sculpins (Cottidae) Gunnels (Pholidae) Spotted cusk-eel <i>Chilara taylori</i> <b>Invertebrates</b> Red octopus <i>Octopus rufescens</i>	Submerged reefs

<sup>1</sup> Data on seabird prey items from Ainley et al. (1990) and PRBO Conservation Science (unpubl. data).