California MLPA Master Plan Science Advisory Team
Evaluation of Benefits to Marine Mammals from Round 2 MPA Proposals for the MLPA South Coast Study Region

Approved June 18, 2009

The objective of this evaluation is to assess what benefits associated with goals 1,2 and 4 of the California Marine Life Protection Act (MLPA) are achieved by proposed marine protected areas (MPAs) as they apply to marine mammals in the MLPA South Coast Study Region. These evaluation methods were adapted from the methods used to evaluate benefits to marine mammals in the MLPA North Central Coast Study Region. Species used in each evaluation have been adjusted to reflect the species diversity in the south coast . Proposed MPAs are evaluated for benefits, specifically for pinnipeds. Pinnipeds, which include seals and sea lions, are a subset of marine mammals that congregate onshore at traditional locations to rest at 'haul out sites' and breed at 'rookeries'. These terrestrial sites fall within the intertidal or supratidal zones of the mainland and islands. A range of habitats are represented at these sites, including substrates such as hard rock, cobble and sand.

With one exception, cetaceans are not included in these analyses because they generally range more widely than the species assemblages used to evaluate MPAs and are not likely to directly benefit from the establishment of MPAs. The cetaceans most likely to be observed in MPAs are gray whales, which migrate seasonally through the study region, and the common bottlenose and long-beaked common dolphins, which have distributions largely within state waters off the mainland and around the Channel Islands. Because these species are unlikely to reside within any single MPA for more than a few days, they may be considered species likely to benefit but not among the species most likely to benefit. The exception to the evaluation of cetaceans is the coastal stock of the common bottlenose dolphin. This stock inhabits waters within approximately one nautical mile of the shore and the south coast study region represents a large portion of its range within which there are identifiable, preferred use areas. Therefore, potential foraging benefits for this stock are evaluated.

Sea otters are included in the evaluation because their distribution historically included the south coast study region and MPAs may provide protection of their preferred habitat, and thus, provide benefits to them. Currently, sea otters are found seasonally between Rincon Point and Point Conception and year-round at San Nicolas Island. Male sea otters travel south of Point Conception in the spring and fall, but travel north again during the mating season. From 1987 to 1990, an effort was made to relocate southern sea otters to San Nicolas Island, and a population of about 40 sea otters continues to persist off the Island.

Pinnipeds would benefit from the placement of MPAs because of the reduction of disturbance from human activities on or adjacent to rookeries or haul out sites. Although MPAs do not restrict human access or vessel transit, the restrictions on allowable activities within MPAs are likely to result in fewer extractive users that access these areas. Vessel traffic, including motorized and non-motorized, can cause significant levels of disturbance to marine mammals (e.g. Allen et al. 1985, Suryan and Harvey 1999, Thompson et al. 2001, Johnson and Acevedo-Gutierrez 2007). Disturbances can lead to reductions in productivity or site abandonment. Disturbances at foraging areas can disrupt feeding activities and cause animals to leave the area, further reducing feeding and leading to additional energy expenditures.

Methods

Evaluations follow the methods described in the *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA South Coast Study Region* (revised June 5, 2009). The MLPA South Coast Study Region evaluation uses the five bioregions identified by the MLPA Master Plan Science Advisory Team. The evaluation includes analyzing the potential benefits to: 1) breeding areas, 2) resting areas, and 3) foraging areas of pinnipeds. The foraging component is applied only to harbor seal rookeries, as these animals forage close to breeding areas and are most likely to benefit from MPAs. We also assess the benefits of "special closures" that exist in the study region. Special closures may be designed to create a buffer around natural features such as islands or headlands. These special closures restrict human access to discreet areas, thus activities such as kayaking, whale watching, and fishing, are prohibited inside special closures either seasonally or year-round.

Assessing the benefit provided to pinnipeds by MPAs of different protection levels is not easily comparable due to data limitations for pinnipeds, and due to varied activities associated with lower levels of protection (such as kelp harvesting, lobster trapping and finfish fishing). The analyses, therefore, include only those pinnipeds haul out sites and rookeries that fall within the very high protection zone (state marine reserves or SMRs) and do not include MPAs with lower levels of protection. This assumes that most potential activities that might affect pinnipeds would be reduced by the SMR status. We recognize, however, that protection of an area as a SMR does not address all potential sources of human activities. We also recognize that lower levels of protection could also provide some measure of protection. Data to evaluate potential impacts are limited, and therefore, these analyses provide a summary of the potential added value to pinnipeds for proposed SMRs.

Population in this evaluation refers to the number of animals that use a site for breeding or resting. A haul out site is a location where seals and sea lions come onshore to rest. A rookery is where seals and sea lions come onshore to give birth, raise their young, molt, and breed. Many sites serve as both haul outs and rookeries.

Breeding Sites

For breeding sites, or rookeries, the four species likely to benefit from MPAs include: California sea lions, northern fur seals, northern elephant seals, and harbor seals. These species are sensitive to disturbance from human activities when breeding.

Numbers of pinniped rookeries within each region are shown in Table 1. These analyses draw on information from the following data and/or sources: survey data from Mark Lowry from NOAA Fisheries (pers. com.), survey data from Sharon Melin from NOAA (pers. com.), and the NOAA Biogeographic Assessment.

Resting Sites

Data used for analyses of resting or haul out sites were from survey data from Mark Lowry from NOAA Fisheries (pers. com.). For haul out sites, species likely to benefit from MPAs include California sea lions, harbor seals, northern fur seals and northern elephant seals.

Northern fur seals are included in this analysis although they typically use resting sites only during the breeding season and are at sea during the non-breeding season ranging widely along the continental shelf.

The number of pinnipeds within each bioregion are shown in Table 2. Evaluations include numbers of species (species diversity), numbers of pinnipeds, and percentages of bioregional haul-out populations (Table 3). In this document, percentages cited are the percentages of the bioregional populations.

Foraging Areas

Pinnipeds – Harbor seals are the only focal species most likely to benefit from increases to forage base. In nearshore areas, harbor seals forage near their haul out or rookery sites, and may repeatedly visit specific foraging areas (Jones 1981, Harvey and Torok 1994, Harvey et al. 1995, Thompson et al. 1998). Harbor seals forage on whatever is locally abundant, and they feed over a variety of habitats where they pursue rockfish, anchovies, squid and several other prey.

To evaluate MPAs, GIS software was used to create buffers along three miles of coast and to three miles offshore from haul outs and rookeries; this was thought to encompass most of the harbor seal's foraging range. Three miles-by-three-mile buffers were overlaid with MPAs and the area of overlap determined. The proportions of the foraging range overlapping MPAs were then weighted based on the proportion of the regional population (Table 5). The values are unitless.

Other marine mammal species were not considered in the nearshore foraging analysis because their foraging ranges are broad and often in pelagic waters beyond the 3-mile state limit. For example, northern elephant seals and northern fur seals forage over deep waters far offshore (Loughlin et al. 1987, Le Boeuf and Laws 1994).

California sea lions were included in the neritic foraging analysis (see *Draft Evaluation of Benefits to Marine Birds in the MLPA South Coast Study Region, California, June 17, 2009*). A composite map of at-sea densities for California sea lions, coastal bottlenose dolphins and 11 seabirds was created to show neritic foraging 'hot spots' (Figure 3b). At-sea seabird and California sea lion distributions were taken from Mason et al. (2007). Evaluation includes the area of foraging 'hot spots' captured in proposed SMRs and SMCAs meeting allowed take guidelines for this analysis as outlined in Table 9.2 of *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA South Coast Study Region* (revised June 5, 2009).

Cetaceans – Potential foraging 'hot spots' for coastal bottlenose dolphins were identified using dolphin encounter rates collected by NOAA's National Marine Fisheries Service, Southwest Fisheries Science Center and published in the biogeographical assessment for the Channel Islands National Marine Sanctuary (Figure 3a). Coastal bottlenose dolphin 'hot spots' were included in the composite map for marine bird and mammal foraging 'hot spots' referenced above (Figure 3b). Evaluation includes the area of foraging 'hot spots' captured in proposed SMRs and SMCAs meeting allowed take guidelines for this analysis as outlined in Table 9.2 of

Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA South Coast Study Region (revised June 5, 2009).

Kelp Habitat

Sea otters use kelp to rest and feed. Potential benefits to sea otters are evaluated as the percent of kelp habitat in the study area occurring within proposed MPAs. Evaluation includes kelp habitat captured in proposed SMRs north of Rincon Point, the area currently used by sea otters, proposed SMRs in the North Mainland bioregion and the study region overall, to accommodate for population movement and the potential for otters to expand their range.

Results

Seven species of pinnipeds occur in the south coast study region (California sea lion, northern elephant seal, harbor seal, northern fur seal, Guadalupe fur seal and, on very rare occasion, Steller sea lions and ribbon seals). California sea lions, northern elephant seals, harbor seals and northern fur seals are known to breed in the study region, mostly at the Channel Islands, especially San Miguel, Santa Barbara, and San Nicolas islands, although harbor seals and northern elephant seals also have rookeries on the mainland. Because harbor seal census data are collected during the molt period, systematic documentation of rookery locations on the Channel Islands are not available. Similarly, California sea lions along the mainland coast are not included in the census and so no data for populations resting or breeding sites are available.

Breeding and Resting Sites

The set of existing MPAs includes SMRs in the West and Mid Channel Island bioregions. All pinniped species occur on the islands within these bioregions and all breed there. The proposed SMRs include 4 to 12% of the pinniped populations that live outside the West Channel Islands bioregion with Lapis 1 having the highest percent and External B the lowest (Table 3, Figure 1).

The MPA proposals include SMRs where northern elephant seals and Pacific harbor seals breed along the South and North Mainland coast. Only the Lapis 1 proposal includes a proposed SMR that includes the only South Mainland rookery for harbor seals. All proposals except External Proposal B include the North Mainland bioregion's northern elephant seal rookeries in proposed SMRs (Table 4).

See the Appendix I for the number of pinnipeds, by species, within each proposed MPA by proposal and Appendix II for number of rookeries within each proposed MPA by proposal.

Foraging Areas

Pinnipeds – The potential benefit from SMRs protecting likely foraging areas for Pacific harbor seals is summarized by the weighted foraging index, which is unitless (Table 5, Figure 2). All proposals increase the foraging benefit by 2 to 14 units over the existing MPA array. The Lapis

1 proposal provides the greatest increase to potential foraging benefits with additional SMRs proposed in the North and South Mainland, and East Channel Islands bioregions.

Cetaceans – The coastal bottlenose dolphin use patterns in the south coast study region are equated to encounter rates (i.e., number of animals sighted per km searched) estimated from aerial survey data collected from 1990 to 2000 (Figure 3a). These data are available from NOAA's Channel Islands National Marine Sanctuary biogeographic assessment at http://ccma.nos.noaa.gov/products/biogeography/cinms/. The percent of the foraging 'hot spots' (Figure 3b) included within the boundaries of proposed MPAs comprise 20-70 square miles within the south coast study region. All proposed arrays increase the likely foraging benefits over the existing MPAs with the Topaz proposal having the greatest amount of likely foraging areas captured within MPAs and External Proposal B having the lowest (Table 6).

Kelp Habitat

Kelp habitat was identified and analyzed as described in the *Draft Habitat Evaluations of the Round 2 Draft MPA Proposals for the MLPA South Coast Study Region*. Approximately 8.5 to 23.4% of kelp habitat within the North Mainland bioregion currently used by sea otters, which is north of Rincon Point, is included in proposed SMRs (Table 7). Additional kelp habitat within SMRs proposed for the entire North Mainland bioregion, including south of Rincon Point, ranges from 6.1 to 21.4%, and from 12.4 to 17.2% for the study region overall. The Opal group's proposal has the greatest amount of kelp in SMRs and External Proposal B the lowest.

Table 1. Numbers of pinniped rookeries within each south coast study region bioregion.

Bioregion	No. of Species	Total Pinniped Rookeries	CA Sea Lion Rookeries	N. Fur Seal Rookeries	N. Elephant Seal Rookeries	Harbor Seal Rookeries
East Channel Islands	2	4	3	0	1	N/A
Mid Channel Islands	3	10	6	0	4	N/A
North Mainland	2	5	N/A	0	1	4
South Mainland	1	1	N/A	0	0	1
West Channel Islands	4	58	19	2	37	N/A
Study Region Total	4	78	28	2	43	5

Note: N = northern and CA = California

Table 2. Number of pinnipeds at resting, or haul out, sites within each south coast study region bioregion.

Bioregion	No. of Species	Total Pinnipeds	California Sea Lion	N. Fur Seal	N. Elephant Seal	Harbor Seal
North Mainland	2	1431	N/A	0	8	1423
South Mainland	1	121	N/A	0	0	121
East Channel Islands	2	6022	5432	0	293	297

Bioregion	No. of Species	Total Pinnipeds	California Sea Lion	N. Fur Seal	N. Elephant Seal	Harbor Seal
Mid Channel Islands	3	11316	9192	0	76	2048
West Channel Islands	4	163668	116780	11180	31851	3857
Study Region Total	4	182558	131404	11180	32228	7746

Note: N = northern and CA = California

Table 3. Comparison between proposals of number of species and number and percentage of animals within proposed state marine reserves by bioregion.

Bioregion	No. of Species	CA Sea Lion	CA Sea Lion %	N. Fur Seal	N. Fur Seal %	N. Elephant Seal	N. Elephant Seal %	Harbor Seal	Harbor Seal %
North Mainland									
Lapis 1	2	N/A	-	0	0.00%	8	100.00%	459	32.26%
Lapis 2	2	N/A	-	0	0.00%	8	100.00%	459	32.26%
Opal	2	N/A	-	0	0.00%	8	100.00%	459	32.26%
Topaz	2	N/A	-	0	0.00%	8	100.00%	459	32.26%
External A	2	N/A	-	0	0.00%	8	100.00%	459	32.26%
South Mainland									
Lapis 1	1	N/A	-	0	0.00%	0	0.00%	121	100.00%
Mid Channel Islands									
Proposal 0	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
Lapis 1	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
Lapis 2	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
Opal	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
Topaz	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
External A	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
External B	2	5502	59.86%	0	0.00%	61	80.26%	0	0.00%
West Channel Islands									
Proposal 0	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%
Lapis 1	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%
Lapis 2	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%

Bioregion	No. of Species	CA Sea Lion	CA Sea Lion %	N. Fur Seal	N. Fur Seal %	N. Elephant Seal	N. Elephant Seal %	Harbor Seal	Harbor Seal %
Opal	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%
Topaz	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%
External A	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%
External B	4	36039	30.86%	6768	60.54%	4594	14.42%	450	11.67%

Note: N = northern and CA = California

Figure 1. Comparison by proposal of percent pinniped population captured in state marine reserves, excluding the West Channel Islands bioregion pinniped population.

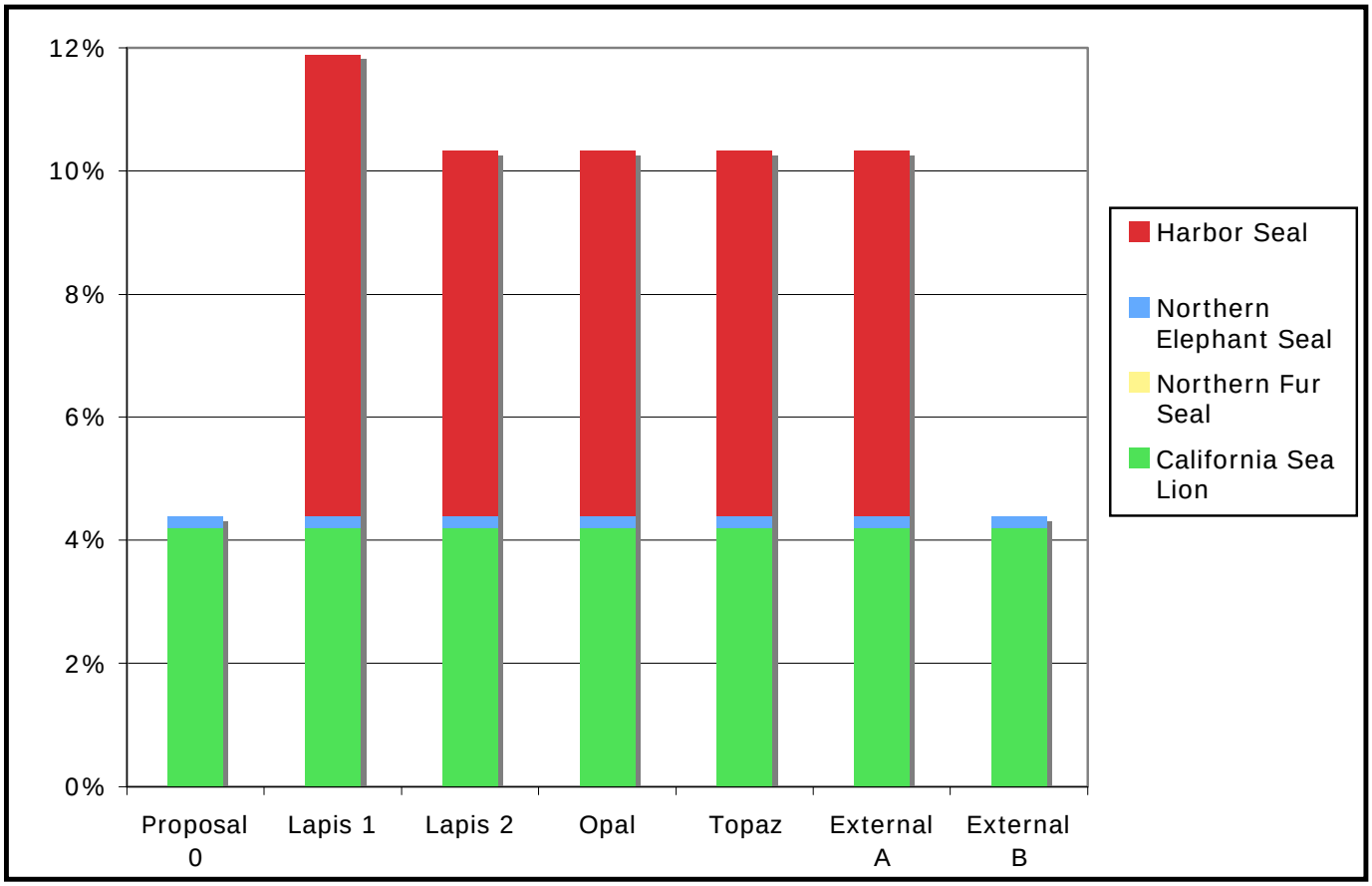

Table 4. Comparison between proposals of number of rookeries within proposed state marine reserves by species and bioregion.

	California Sea Lion	Northern Fur Seal	Northern Elephant Seal	Harbor Seal
		North Mainland		
Proposal 0	N/A	0	0	0
Lapis 1	N/A	0	1	2
Lapis 2	N/A	0	1	2
Opal	N/A	0	1	2
Topaz	N/A	0	1	2
External A	N/A	0	1	2
External B	N/A	0	0	0
		South Mainland		
Lapis 1	N/A	0	0	1
		Mid Channel Islands		
All Proposals	1	0	1	N/A
		West Channel Islands		
All Proposals	1	1	5	N/A

Table 5. Comparison between proposals of the harbor seal foraging index within proposed state marine reserves and pending military closures by bioregion.

	North Mainland	South Mainland	East Channel Islands	East Channel Islands - Military Closures	Mid Channel Islands	West Channel Islands
Proposal 0	0.00	0.00	0.00	0.00	2.46	8.47
Lapis 1	4.47	7.42	2.23	0.16	2.46	8.47
Lapis 2	4.69	0.95	2.23	0.16	2.46	8.47
Opal	2.42	1.22	2.81	0.16	2.46	8.47
Topaz	4.47	1.70	0.00	0.16	2.46	8.47
External A	4.59	0.77	0.00	0.16	2.46	8.47
External B	1.55	0.00	0.00	0.16	2.46	8.47

Figure 2. Comparison between proposals of the harbor seal foraging index within proposed state marine reserves and pending military closures by bioregion.

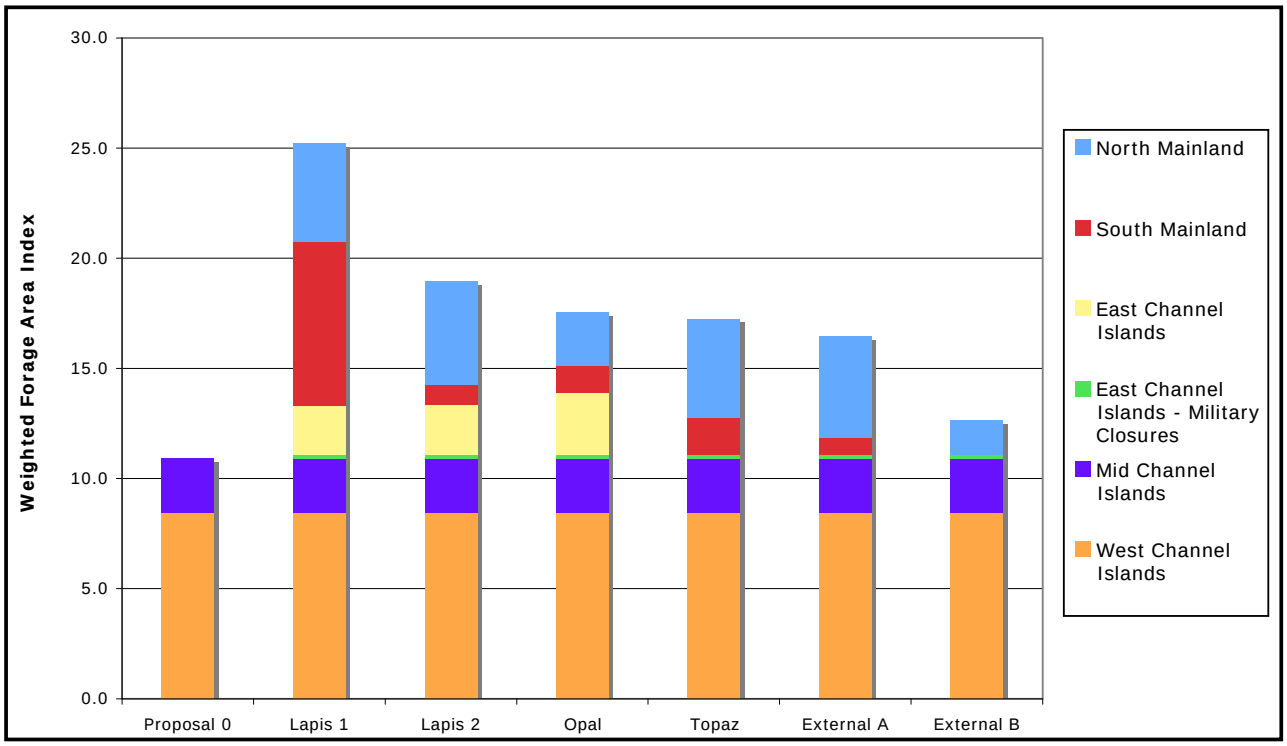

Figure 3. (a) Encounter rates for coastal bottlenose dolphins.

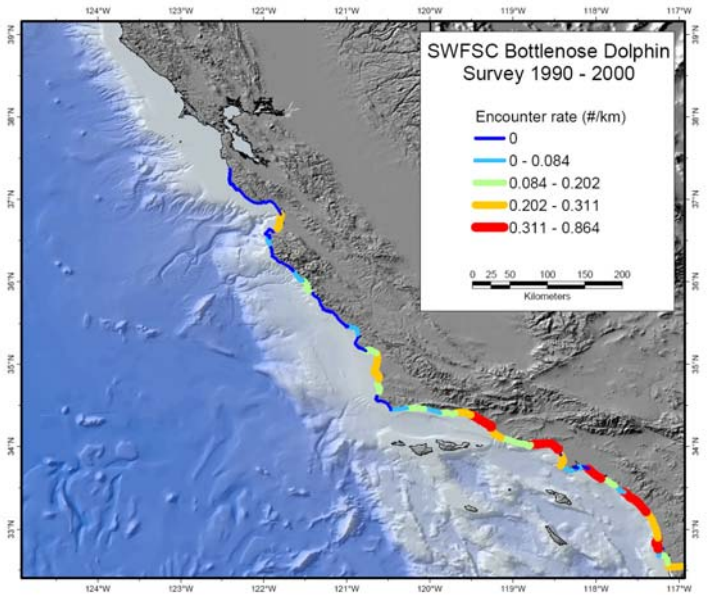

Figure 3. (b) Potential neritic foraging 'hot spots' for coastal bottlenose dolphins (BNDO), California sea lion and 11 species of seabirds.

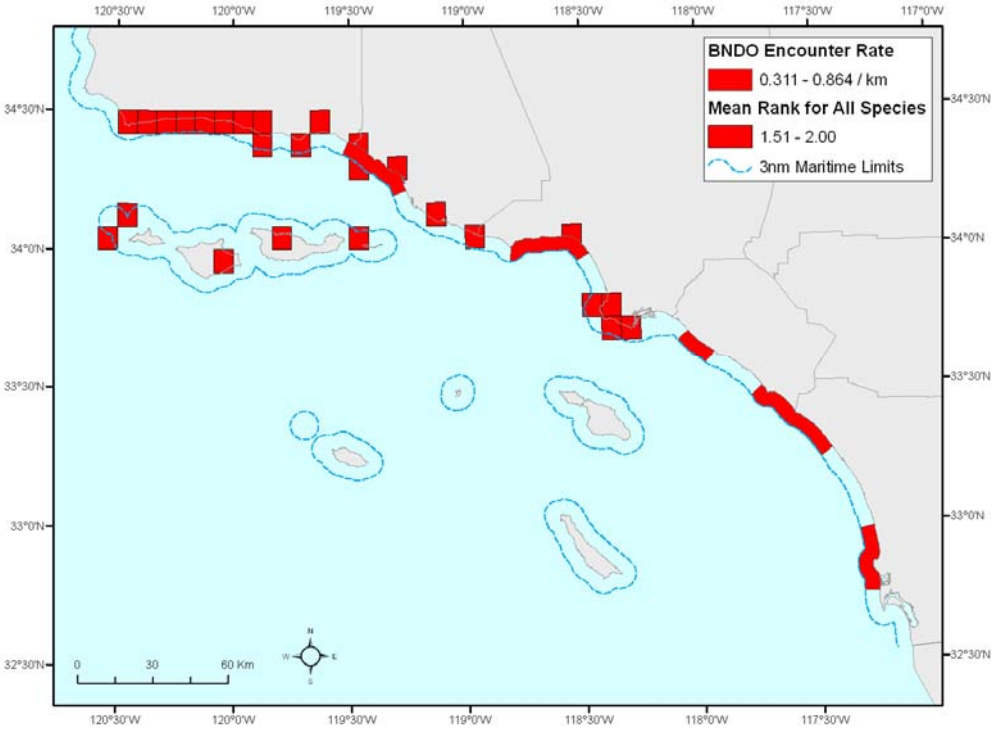

Table 6. Comparison of proposals to total contributions of neritic foraging area 'hot spots' for 11 species of breeding seabirds and 2 marine mammals in the study region. Units are statute square miles.

	North Mainland	South Mainland	Mid Channel Islands	West Channel Islands
Proposal 0	0.01	0.00	5.80	15.65
Lapis 1	29.63	18.28	5.80	15.65
Lapis 2	34.54	11.85	5.80	15.65
Opal	23.04	16.24	5.80	15.65
Topaz	30.98	19.85	5.80	15.65
External A	21.67	22.38	5.80	15.65
External B	0.16	4.84	5.80	15.65

Table 7. Comparison of proposals to total contribution of kelp habitat within proposed state marine reserves.[1]

	Linear Kelp Persistence (statute miles)	% of Linear Kelp Persistence Available
Sea Otter Use Area (North of Rincon Point)		
Proposal 0	0.00	0.0%
Lapis 1	3.64	18.6%
Lapis 2	3.64	18.6%
Opal	4.61	23.4%
Topaz	3.64	18.6%
External A	2.75	14.0%
External B	1.68	8.5%
Sea Otter Habitat (North Mainland)		
Proposal 0	0.00	0.0%
Lapis 1	4.26	15.5%
Lapis 2	3.68	13.3%
Opal	5.91	21.4%
Topaz	4.19	15.2%
External A	2.79	10.1%
External B	1.68	6.1%
Sea Otter Habitat (Study Region)		
Proposal 0	11.33	6.2%
Lapis 1	27.92	15.3%
Lapis 2	24.75	13.6%
Opal	31.32	17.2%
Topaz	27.10	14.9%
External A	23.67	13.0%
External B	22.54	12.4%

[1] *State marine conservation areas allowing only research take were also included in the analysis.*

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APPENDICES

Appendix I. Summary of numbers of pinnipeds and percent of bioregion totals within proposed MPAs.

Only state marine reserves were included in Table 3. Proposals and MPAs not listed did not contain pinniped resting, or haul out, locations.

Note that N = northern and CA = California in the tables of this appendix.

a) North Mainland

	MPA Name	N. Elephant Seal	N. Elephant Seal %	Harbor Seal	Harbor Seal %
Lapis 1	Point Conception/Humqaq SMR	8	100.00%	459	32.26%
	Mugu Lagoon SMRMA	0	0.00%	803	56.43%
Lapis 2	Point Conception/Humqaq SMR	8	100.00%	459	32.26%
	Mugu Lagoon SMRMA	0	0.00%	803	56.43%
Opal	Point Conception SMR	8	100.00%	459	32.26%
Topaz	Point Conception SMR	8	100.00%	459	32.26%
	Naples SMCA	0	0.00%	36	2.53%
	Magu/ Muwu Lagoon SMRMA	0	0.00%	803	56.43%
External A	Point Conception SMR	8	100.00%	459	32.26%
External B	Mugu Lagoon SMRMA	0	0.00%	803	56.43%

b) South Mainland

	MPA Name	Harbor Seal	Harbor Seal %
Lapis 1	La Jolla SMR 2	121	100.00%

c) East Channel Islands

	MPA Name	CA Sea Lion	CA Sea Lion %	Harbor Seal	Harbor Seal %
Topaz	Farnsworth SMCA	0	0.00%	152	51.18%
External B	Charles F Holder Catalina SMCA	357	6.57%	193	64.98%
	Farnsworth Portion B SMCA	0	0.00%	152	51.18%

d) Mid-Channel Islands

	MPA Name	CASea Lion	CA Sea Lion %	N. Elephant Seal	N. Elephant Seal %	Harbor Seal	Harbor Seal %
All Proposals	Anacapa Island SMR	102	1.11%	0	0.00%	0	0.00%
	Anacapa Island SMCA	0	0.00%	0	0.00%	100	0.05%
	Gull Island SMR	709	7.71%	0	0.00%	0	0.00%
	Santa Barbara Island SMR	4691	51.03%	61	80.26%	0	0.00%

e) West Channel Islands

	MPA Name	CA Sea Lion	CA Sea Lion %	N. Fur Seal	N. Fur Seal %	N. Elephant Seal	N. Elephant Seal %	Harbor Seal	Harbor Seal %
All Proposals	Richardson Rock SMR	387	0.33%	0	0.00%	0	0.00%	0	0.00%
	Harris Point SMR	0	0.00%	0	0.00%	179	0.56%	247	6.40%
	Carrington Point SMR	0	0.00%	0	0.00%	0	0.00%	45	1.17%
	Judith Rock SMR	35624	30.51%	6768	60.54%	2856	8.97%	30	0.78%
	South Point SMR	28	0.02%	0	0.00%	1559	4.89%	128	3.32%

Appendix II. Summary by proposal of number of rookeries by species within proposed MPAs.

Only rookeries in SMRs were included in Table 4. Proposals and MPAs not listed did not contain a pinniped rookery.

Bioregion	MPA Name	California Sea Lion	Northern Fur Seal	Northern Elephant Seal	Harbor Seal
		North Mainland			
Lapis 1	Point Conception/Humqaq SMR	N/A	0	1	2
	Mugu Lagoon SMRMA	N/A	0	0	1
Lapis 2	Point Conception/Humqaq SMR	N/A	0	1	2
	Mugu Lagoon SMRMA	N/A	0	0	1
Opal	Point Conception SMR	N/A	0	1	0
Topaz	Point Conception SMR	N/A	0	1	2
	Naples SMCA	N/A	0	0	0
	Magu/ Muwu Lagoon SMRMA	N/A	0	0	1
External A	Point Conception SMR	N/A	0	1	2
External B	Mugu Lagoon SMRMA	N/A	0	0	1
		South Mainland			
Lapis 1	La Jolla SMR 2	N/A	0	0	1
		Mid Channel Islands			
All Proposals	Santa Barbara Island SMR	1	0	1	N/A
		West Channel Islands			
All Proposals	Harris Point SMR	0	0	3	N/A
	Judith Rock SMR	1	1	1	N/A
	South Point SMR	0	0	1	N/A