# California MLPA Master Plan Science Advisory Team
# List of Species Likely to Benefit from
# Marine Protected Areas in the MLPA North Central Coast Study Region
***(revised October 3, 2007)***

The Marine Life Protection Act (MLPA) requires that species likely to benefit from marine protected areas (MPAs) be identified; identification of these species will contribute to the identification of habitat areas that will support achieving the goals of the MLPA. The draft *Marine Life Protection Act Master Plan for Marine Protected Areas (July 2006)* includes a broad list of species likely to benefit from protection within MPAs. The master plan also indicates that regional lists will be developed by the master plan science advisory team (SAT) for each study region of the California coast.

Attached to this document are the list of species likely to benefit for the MLPA North Central Coast Study Region (Alder Creek/Point Arena in Mendocino County to Pigeon Point in San Mateo County), as well as a list of the species *most likely to benefit* for the study region. These lists were adopted by the SAT on October 1, 2007, but may be modified by the SAT in the future as more information becomes available.

Species are included in the list of species likely to benefit if they meet one or more of these conditions:

- They occur in the MLPA North Central Coast Study Region.
- They are taken directly or indirectly in commercial or recreational fisheries.
- They have life history characteristics that make them more conducive to protection by MPAs, such as: sedentary behavior, long life spans, slow growth, or association with habitats that need additional spatial protection. An MPA would be expected to increase the species abundance or spawning biomass if the species is at an abnormally low abundance or abnormally low size frequency (i.e. below the range of natural fluctuations).

While this list is approximate, there are other species that may benefit or even diminish by establishing an MPA. In addition, it should be noted that many species have not yet been assessed for abundance or size frequency or their full life history requirements are not yet known.

The SAT defined the species *most likely to benefit* as those likely to show a detectable change in local population as a result of MPA implementation. Species are included in the species most likely to benefit list if they meet one or more of the following conditions:

- There is evidence for direct fishing effects on the species in question (e.g., the species is targeted by a fishery, known to be taken as bycatch in a local fishery, or fishing reduces important resources required of a species).
- The species suffers negative impacts associated with human activities other than fishing.
- A significant proportion of the species distribution occurs within habitats represented in the study region.

**Table 1: Invertebrate species MOST likely to benefit from marine protected areas in the MLPA North Central Coast Study Region**

| | |
|---|---|
| abalone, red* | *Haliotis rufescens* |
| clam, littleneck* (tomales bay cockle) | *Protothaca staminea* |
| limpets* | *Lottia gigantea* |
| mussels, native* | *Mytilus californianus* |
| snail, turban* | *Tegula funebralis* |
| urchin, red* | *Strongylocentrotus franciscanus* |

**Table 2: Fish species MOST likely to benefit from marine protected areas in the MLPA North Central Coast Study Region**

| | |
|---|---|
| cabezon* | *Scorpaenichthys marmoratus* |
| eel, wolf* | *Anarrhichthys ocellatus* |
| flounder, starry* | *Platichthys stellatus* |
| greenling, kelp* | *Hexagrammos decagrammus* |
| greenling, rock* | *Hexagrammos lagocephalus* |
| lingcod* | *Ophiodon elongatus* |
| prickleback, monkeyface* | *Cebidichthys violaceus* |
| prickleback, rock* | *Xiphister mucosus* |
| ray, bat* | *Myliobatis californicus* |
| rockfish, black* | *Sebastes melanops* |
| rockfish, black-and-yellow* | *Sebastes chrysomelas* |
| rockfish, blue* | *Sebastes mystinus* |
| rockfish, bocaccio* | *Sebastes paucispinis* |
| rockfish, brown* | *Sebastes auriculatus* |
| rockfish, calico* | *Sebastes dalli* |
| rockfish, china* | *Sebastes nebulosus* |
| rockfish, copper* | *Sebastes caurinus* |
| rockfish, flag* | *Sebastes rubrivinctus* |
| rockfish, gopher* | *Sebastes carnatus* |
| rockfish, grass* | *Sebastes rastrelliger* |
| rockfish, greenspotted* | *Sebastes chlorostictus* |
| rockfish, kelp* | *Sebastes atrovirens* |
| rockfish, olive* | *Sebastes serranoides* |
| rockfish, quillback* | *Sebastes maliger* |
| rockfish, rosy* | *Sebastes rosaceus* |
| rockfish, speckled* | *Sebastes ovalis* |
| rockfish, squarespot* | *Sebastes hopkinsi* |
| rockfish, starry* | *Sebastes constellatus* |
| rockfish, treefish* | *Sebastes serriceps* |
| rockfish, vermilion* | *Sebastes miniatus* |
| rockfish, yelloweye* | Sebastes ruberrimus |

| | |
|---|---|
| rockfish, yellowtail* | Sebastes flavidus |
| smelt, surf* | *Hypomesus pretiosus* |
| surfperch, calico* | *Amphistichus koelzi* |
| surfperch, black* | *Emibiotoca jacksoni* |
| surfperch, pile* | *Damalichthys vacca* |
| surfperch, rainbow* | *Hypsurus caryi* |
| surfperch, redtailed* | *Amphistichus rhodoterus* |
| surfperch, rubberlip* | *Phacochilus toxotes* |
| surfperch, shiner* | *Cymatogaster aggregata* |
| surfperch, striped* | *Embiotoca lateralis* |
| surfperch, walleye* | *Hyperprosopon argenteum* |
| surfperch, white* | *Phanerodon furcatus* |

**Table 3: Bird and Mammal species MOST likely to benefit from marine protected areas in the MLPA North Central Coast Study Region**

| | |
|---|---|
| brant (goose) | *Branta bernicla* |
| cormorant, Brandt's | *Phalacrocorax penicillatus* |
| cormorant, double-crested | *Phalacrocorax auritus* |
| cormorant, pelagic | *Phalacrocorax pelagicus* |
| grebe, Western/Clark's | *Aechmophorus occidentalis, clarkii* |
| guillemot, pigeon | *Cepphus columba* |
| murre, common | *Uria aalge* |
| murrelet, marbled | *Brachyramphus marmoratus* |
| oystercatcher, black | *Haematopus bachmani* |
| plover, snowy | *Charadrius alexandrinus* |
| porpoise, harbor | *Phocoena phocena* |
| sandpiper, western | *Calidris mauri* |
| scaup, lesser | *Aythya affinis* |
| scoter, surf | *Melanitta perspicillata* |
| sea lion, Steller | *Eumetopias jubatus* |
| sea otter, southern | *Enhydra lutris* |
| seal, harbor | *Phoca vitulina* |
| surfbird | *Aphriza virgata* |
| willet | *Catoptrophorus semipalmatus* |

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***Revised October 2, 2007***

| | | Most likely to benefit | Primary bottom type | Shallow depth (m) | Deepest depth (m) | Sm-mod adult home range (<20 km) | Currently mod-large take | Historic mod-large take | Low pop. estimate (<40% unfished) | Size structure shifted toward sm indiv | Vulnerable life history | Life stage to benefit (e.g., spawning, nursery area) | Habitat impacted (by human activity) | Ecologically important (keystone or habitat forming) | **Comments** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Invertebrates** | | | | | | | | | | | | | | | |
| abalone, black | *Haliotis cracherodii* | | Rock | 0 | 6 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | Only benefit in areas absent of sea otters |
| abalone, red | *Haliotis rufescens* | X | Rock | 0 | 61 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Short-lived, non-feeding larval stage, Only benefit in areas absent of sea otters |
| barnacles, gooseneck | *Pollicipes polymerus* | | Rock | 0 | 1 | 1 | 1 | ND | ND | ND | 0 | 0 | 1 | 1 | Habitat forming, some intertidal take |
| chiton, giant | *Cryptochiton stelleri* | | Rock | 0 | 20 | 1 | ND | 1 | ND | ND | 1 | 0 | 0 | 0 | low recruitment rate and long life span (O'Clair and O'Clair 1998), historically harvested by Native Americans, current harvest is unknown |
| clam, gaper | *Tresus nuttallii* | | Sandy mud | 0 | 30 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| clam, geoduck | *Panopea generosa* | | Sandy mud | 0 | 110 | 1 | ND | ND | ND | ND | 1 | 0 | 0 | 0 | Rare but occasionally found in Tomales bay, long lived |
| clam, littleneck (tomales bay cockle) | *Protothaca staminea* | X | Coarse Sand | 0 | 0 | 1 | 1 | 1 | ND | 1 | 0 | 0 | 1 | 0 | Manila littleneck clam is particularly abundant in San Francisco Bay and other estuaries to the north in the intertidal* |
| clam, washington | *Saxidomus nuttali* | | Sand, mud | 0 | 5 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| corals | | | Rock | 12 | 152 | 1 | 0 | 0 | ND | ND | 1 | 0 | 1 | 1 | Possible impacts from trawling or other bottom contact |
| crab, brown rock | *Cancer antennarius* | | Both | 0 | 101 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | Only benefit in areas absent of sea otters |
| crab, dungeness | *Cancer magister* | | Sand | 0 | 230 | 0 | 1 | 1 | ND | 0 | 0 | 0 | 0 | 0 | Due to management regime, no size shift |
| crab, red rock | *Cancer productus* | | Both | 0 | 229 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | Only benefit in areas absent of sea otters |
| crab, sand | *Emerita analoga* | | Sand | 0 | 0 | 1 | 0 | 0 | ND | ND | 0 | 0 | 0 | 0 | |
| limpets | *Lottia gigantea* | X | Rock | 0 | 30 | 1 | 1 | 0 | ND | 1 | 0 | 0 | 1 | 1 | Rec harvest, removal impacts other species |
| mussels, native | *Mytilus californianus* | X | Rock | 0 | 40 | 1 | 0 | 0 | ND | ND | 0 | 0 | 1 | 1 | Removal impacts other species |
| octopus spp. | *Octopus spp.* | | Rock | 0 | 30 | ND | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| oyster, native | *Ostrea conchaphila (lurida)* | | Rock | 0 | 30 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | Restoration efforts in Tomales Bay |
| prawn, spot | *Pandalus platyceros* | | Sand | 46 | 488 | 1 | 0 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| scallop, rock | *Hinnites giganteus* | | Rock | 0 | 30 | 1 | ND | ND | ND | ND | 1 | 0 | 0 | 0 | Evidence of positive impact in Southern CA reserves |
| sea cucumbers | *Parastichopus californicus* | | | | | 1 | 0 | 1 | ND | ND | 0 | 0 | 0 | 0 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| sea pens | | | Sand | 8 | 91 | 1 | 0 | 0 | ND | ND | 1 | 0 | 1 | 1 | Possible impacts from trawling or other bottom contact |
| sea stars | *Pisaster ochraceous, Pycnopodia helianthoides* | | Both | 0 | 183 | 1 | 0 | 0 | ND | ND | 0 | 0 | 1 | 1 | Keystone species in intertidal |
| shrimp, blue mud | *Upogebia pugettensis* | | Sand | 0 | 0 | 1 | 0 | ND | ND | ND | 0 | 0 | 1 | 0 | |
| shrimp, ghost | *Callianassa californiensis* | | Sand | 0 | 0 | 1 | 0 | 0 | ND | ND | 0 | 0 | 1 | 0 | Fish bait |
| shrimp, pink | *Pandalus jordani* | | Pelagic | 45 | 370 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| snail, moon | *Polinices lewisii* | | Sand | 0 | 152 | 1 | 0 | 0 | ND | ND | 0 | 0 | 1 | 0 | |
| snail, turban | *Tegula funebralis* | X | Rock | 0 | 76 | 1 | 1 | 0 | ND | ND | 0 | 0 | 1 | 0 | Often taken in intertidal (KN) |
| sponges | | | Rock | 0 | 610 | 1 | 0 | 0 | ND | ND | 1 | 0 | 1 | 1 | Possible impacts from trawling or other bottom contact |
| squid, market | *Loligo opalescens* | | Pelagic, Sand | 0 | 0 | 0 | 1 | 1 | 0 | ND | 0 | 0 | 0 | 1 | Both forage species and predators on small fishes; vulnerable to large-scale changes in the environment driven by El Nino Southern Oscillation events** |
| urchin, purple | *Strongylocentrotus purpuratus* | | Both | 0 | 92 | 1 | 0 | 0 | 0 | ND | 0 | 0 | 0 | 1 | Only benefit in areas absent of sea otters, removal impacts other species |
| urchin, red | *Strongylocentrotus franciscanus* | X | Both | 0 | 90 | 1 | 1 | 0 | 0 | ND | 0 | 0 | 0 | 1 | Only benefit in areas absent of sea otters, removal impacts other species |
| worm, inkeeper | *Urechis caupo* | | Sand | 0 | ND | 1 | 1 | 0 | ND | ND | 0 | 0 | 1 | 0 | Harvested for bait, abundance decreasing locally in Bodega harbor (KN) |
| worms | | | Both | 0 | 183 | 1 | 0 | 0 | ND | ND | 0 | 0 | 1 | 0 | |
| worms, phoronid | *Phoronopsis viridis* | | Sand | 0 | 30 | 1 | 0 | 0 | ND | ND | 0 | 0 | 0 | 1 | Rare worldwide but abundant in the region (KN) |
| worms, phragmatopoma | *Phragmatopoma spp.* | | Both | 0 | ND | 1 | 0 | 0 | 0 | ND | 0 | 0 | 1 | 1 | Reef building polychaete |
| **Plants and Algae** | | | | | | | | | | | | | | | |
| algae, red | *Porphyra spp.* | | Rock | 0 | ND | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | (Nori), localized commercial take, habitat forming, some cultural take |
| eel grass | *Zostera marina* | | Sand | 0 | 3 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Important but will an MPA protect? Biggest threats are sedimentation and nutrient loading. What about disturbance from boats? |
| kelp, bull | *Nereocystis luetkeana* | | Rock | 0 | 18 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | Potential for harvest |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| kelp, winged | *Alaria marginata* | | Rock | 0 | ND | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | Localized commercial take, habitat forming |
| other intertidal algal species | *Laminaria spp.* | | Rock | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | Localized commercial take, habitat forming |
| other intertidal algal species | *Hedophyllum sessile* | | Rock | 0 | ND | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | Localized commercial take, habitat forming |
| other intertidal algal species | *Lessoniopsis littorallis* | | Rock | 0 | ND | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | Localized commercial take, habitat forming |
| rock weeds | *Order Fucales including Fucus spp.* | | Rock | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | Will only benefit in no-transit areas (reduce trampling) - localized commercial take, habitat forming |
| sea palm | *Postelsia palmaeformis* | | Rock | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | Commercial and cultural take; possibly double protection will reduce recreational poaching |
| surf grass | *Phyllospadix scouleri & P. torreyi* | | Rock | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | Important but will an MPA protect? Biggest threats are sedimentation and nutrient loading. |
| **Fishes** | | | | | | | | | | | | | | | |
| cabezon | *Scorpaenichthys marmoratus* | X | Rock | 0 | 110 | 1 | 1 | 1 | 0 | ND | 0 | 0 | 0 | 0 | |
| croaker, white | *Genyonemus lineatus* | | Sand | 0 | 238 | 0 | 1 | 0 | ND | ND | 0 | 0 | 0 | 0 | Are these abundant enough to be fished in the region? |
| eel, wolf | *Anarrhichthys ocellatus* | X | Rock | 0 | 226 | 1 | 0 | 0 | ND | ND | 0 | 1 | 0 | 0 | Sedentary; mate-for-life? Large size, potential forage increase without urchin harvest |
| flounder, starry | *Platichthys stellatus* | X | Sand | 1 | 600 | ND | 1 | 1 | 0 | ND | 0 | 0 | 1 | 0 | Estuarine nurseries, don't appear to move much (Love 1991) |
| goby, tidewater | *Eucyclogobius newberryi* | | Sand | 0 | 3 | 1 | 0 | 0 | 1 | ND | 0 | 0 | 1 | 0 | Endangered? |
| greenling, kelp | *Hexagrammos decagrammus* | X | Rock | 0 | 130 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| greenling, rock | *Hexagrammos lagocephalus* | X | Rock | 0 | 80 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | Recreational catch from piers |
| hagfish, Pacific | *Eptatretus stoutii* | | Sand, Rock | 16 | 966 | 0 | 0 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| halibut, California | *Paralichthys californicus* | | Sand | 0 | 281 | 0 | 1 | 1 | 0 | ND | 0 | 1 | 0 | 0 | Nursery and spawning aggregations |
| halibut, Pacific | *Hippoglossus stenolepis* | | Sand, Rock | 6 | 1100 | 0 | 1 | 1 | ND | ND | 0 | 1 | 0 | 0 | Rare but caught incidentally and marketed - young recruit to shallow waters |
| herring, Pacific | *Culpea pallasi* | | Both | 0 | 302 | 0 | 0 | 1 | ND | ND | 1 | 1 | 1 | 0 | Spawning aggregations in estuaries, populations subject to environmental fluctuations |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lingcod | *Ophiodon elongatus* | X | Rock | 0 | 475 | 1 | 1 | 1 | 1 | ND | 0 | 1 | 0 | 0 | Reproductive aggregations |
| longjaw mudsucker | *Gillichthys mirabilis* | | sand | 0 | 10 | 1 | 0 | 0 | 0 | ND | 0 | 0 | 1 | 0 | Fished for bait, highly territorial in estuaries |
| prickleback, monkeyface | *Cebidichthys violaceus* | X | Rock | 0 | 24 | 1 | 0 | 1 | ND | ND | 1 | 0 | 1 | 0 | Homing; tidepools; large TL; potential local depletion |
| prickleback, rock | *Xiphister mucosus* | X | Rock | 0 | 18 | 1 | 0 | ND | ND | ND | 1 | 0 | 1 | 0 | potential local depletion |
| ray, bat | *Myliobatis californicus* | X | Sand, Rock | 0 | 108 | 0 | 0 | 0 | ND | ND | 1 | 1 | 1 | 1 | Aggregate to spawn and breed inshore. Top predator. Digging in sand has profound impact on invertebrate community. |
| rockfish, bank | *Sebastes rufus* | | Rock | 31 | 454 | ND | 1 | 1 | ND | 1 | 1 | 0 | 0 | 0 | Declines in pop size and age/length in fishery preferred depth mostly deeper than state waters |
| rockfish, black | *Sebastes melanops* | X | Rock | 0 | 366 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Per Steve Ralston, CA population likely below 40% |
| rockfish, black-and-yellow | *Sebastes chrysomelas* | X | Rock | 0 | 37 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, blue | *Sebastes mystinus* | X | Rock | 0 | 549 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | Filter barnacle larvae (Gaines and Roughgarden) |
| rockfish, bocaccio | *Sebastes paucispinis* | X | Rock | 0 | 481 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | Top predator; adults with low movement. Declining lengths in central CA CPFV (Mason 1998) |
| rockfish, brown | *Sebastes auriculatus* | X | Rock | 0 | 146 | 1 | 1 | 1 | ND | 0 | 1 | 0 | 0 | 0 | Locally important in places like San Franisco Bay since 1850 |
| rockfish, calico | *Sebastes dalli* | X | Rock | 0 | 305 | 1 | 0 | 0 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, canary | Sebastes pinniger | | Rock | 0 | 439 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Declining lengths in central CA CPFV (Mason 1998) preferred depth mostly deeper than state waters |
| rockfish, chilipepper | Sebastes goodei | | rock | 0 | 491 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | Declining lengths in central CA CPFV (Mason 1998), preferred depth mostly deeper than state waters |
| rockfish, china | *Sebastes nebulosus* | X | rock | 3 | 128 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, copper | *Sebastes caurinus* | X | Rock | 0 | 185 | 1 | 1 | 1 | ND | 1 | 1 | 0 | 0 | 0 | |
| rockfish, flag | *Sebastes rubrivinctus* | X | Rock | 30 | 418 | 1 | 0 | 0 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, gopher | *Sebastes carnatus* | X | Rock | 0 | 86 | 1 | 1 | 1 | 0 | ND | 1 | 0 | 0 | 0 | |
| rockfish, grass | *Sebastes rastrelliger* | X | Rock | 0 | 46 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, greenspotted | *Sebastes chlorostictus* | X | Both | 30 | 379 | 1 | 0 | 1 | ND | ND | 1 | 0 | 0 | 0 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| rockfish, greenstriped | Sebastes elongatus | | Sand/ Interface | 12 | 1145 | 1 | 0 | 1 | ND | ND | 1 | 0 | 0 | 0 | Preferred depth mostly deeper than state waters |
| rockfish, kelp | *Sebastes atrovirens* | X | Rock | 0 | 58 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, olive | *Sebastes serranoides* | X | Rock | 0 | 172 | 1 | 1 | 1 | ND | 1 | 1 | 0 | 0 | 0 | |
| rockfish, quillback | *Sebastes maliger* | X | rock | 5 | 274 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, rosy | *Sebastes rosaceus* | X | Rock | 7 | 263 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, speckled | *Sebastes ovalis* | X | Rock | 30 | 366 | 1 | 0 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, squarespot | *Sebastes hopkinsi* | X | Rock | 18 | 305 | 1 | 0 | 0 | 0 | ND | 1 | 0 | 0 | 0 | |
| rockfish, starry | *Sebastes constellatus* | X | Rock | 15 | 274 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, treefish | *Sebastes serriceps* | X | Rock | 0 | 98 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | |
| rockfish, vermilion | *Sebastes miniatus* | X | Rock | 0 | 439 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | Southern CA declines in length (Love et al.) |
| rockfish, widow | Sebastes entomelas | | Rock | 0 | 800 | 0 | 0 | 1 | 1 | ND | 1 | 1 | 0 | 0 | Preferred range mostly deeper than state waters - known to aggregate around pinnacles/seamounts |
| rockfish, yelloweye | Sebastes ruberrimus | X | Rock | 15 | 549 | 1 | 0 | 1 | 1 | ND | 1 | 0 | 0 | 1 | Preferred range mostly deeper than state waters. Top predator. |
| rockfish, yellowtail | Sebastes flavidus | X | Rock | 0 | 549 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | Preferred range mostly deeper than state waters - declining lengths in central CA CPFV (Mason 1998) |
| sanddab, Pacific | *Citharichthys sordidus* | | Sand | 0 | 549 | 0 | 1 | 1 | 0 | ND | 0 | 0 | 0 | 0 | Recreational catch |
| seabass, giant | *Stereolepis gigas* | | Rock | 6 | 46 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Already protected but some incidental catch and gear can kill even those thrown back |
| seabass, white | *Atractoscion nobilis* | | Both | 0 | 120 | ND | 1 | 1 | ND | ND | | 1 | 1 | 0 | Seagrass beds as nursery grounds, historic fishery in Tomales Bay |
| shark, broadnose sevengill | *Notorynchus cepidianus* | | Sand | 0 | 136 | 0 | 0 | 0 | ND | ND | 0 | 1 | 1 | 0 | Estuarine nurseries, recreational and some commercial catch (Ebert, 2003) |
| shark, brown smoothhound | *Mustelus henlei* | | Sand | 0 | 281 | 0 | 1 | 1 | ND | ND | 1 | 1 | 1 | 0 | Inshore nursery, recreational and some commercial in estuaries? |
| shark, leopard | *Triakis semifasciata* | | Sand | 0 | 157 | 0 | 1 | 0 | ND | ND | 1 | 1 | 1 | 0 | Estuarine pupping and nursery grounds. Very common in kelp beds, often up in water column in kelp beds at night. |

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| | | Most likely to benefit | Primary bottom type | Shallow depth (m) | Deepest depth (m) | Sm-mod adult home range (<20 km) | Currently mod-large take | Historic mod-large take | Low pop. estimate (<40% unfished) | Size structure shifted toward sm indiv | Vulnerable life history | Life stage to benefit (e.g., spawning, nursery area) | Habitat impacted (by human activity) | Ecologically important (keystone or habitat forming) | **Comments** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| skate, big | *Raja binoculata* | | Sand | 2 | 800 | 0 | 1 | 0 | ND | ND | 1 | 0 | 0 | 0 | Low fecundity, recreational catch and bycatch, wing meat sold (Ebert 2003) |
| skate, California | *Raja inornata* | | Sand | 13 | 1600 | 0 | 1 | 0 | ND | ND | 1 | 0 | 0 | 0 | Recreational catch and bycatch wing meat sold (Ebert 2003) |
| skate, longnose | *Raja rhina* | | Sand | 9 | 1069 | 0 | 1 | 0 | ND | ND | 1 | 0 | 0 | 0 | Low fecundity |
| smelt, surf | *Hypomesus pretiosus* | X | Sand | 0 | 9 | 0 | 1 | 1 | ND | ND | 0 | 1 | 1 | 0 | Spawn in surfzone, distinct local spawning populations |
| smelt, top- | *Antherinops affinis* | | Sand | 0 | 26 | ND | 0 | 0 | ND | ND | 0 | 1 | 1 | 0 | Eggs laid on plants in backwater |
| sole, Dover | *Microstomus pacificus* | | Sand | 2 | 1372 | 0 | 1 | 1 | 0 | ND | 0 | 0 | 0 | 0 | Nursery and spawning nearshore, otherwise a deeper water spp. |
| sole, English | *Pleuronectes vetulus* | | Sand | 0 | 549 | 1 | 1 | 1 | 0 | ND | 0 | 0 | 0 | 0 | Limited movement (Love 1991) |
| sole, petrale | Eopsetta jordani | | Sand | 0 | 549 | 0 | 1 | 1 | 1 | ND | 0 | 0 | 0 | 0 | Preferred range is mostly deeper than state waters |
| sole, rex | Glyptocephauls zachirus | | Sand | 0 | 1145 | 0 | 1 | 1 | 0 | ND | 0 | 0 | 0 | 0 | Preferred range is mostly deeper than state waters |
| sole, rock | *Lepidopsetta bilineata* | | Rock | 0 | 579 | 1 | 1 | 1 | 0 | ND | 1 | 0 | 0 | 0 | Variable recruitment based on oceanographic factors, small range of adult movement (Love 1991) |
| sole, sand | *Psettichthys melanostictus* | | Sand | 0 | 325 | ND | 1 | 1 | ND | ND | 0 | 1 | 0 | 0 | Juveniles in estuaries |
| surfperc, calico | *Amphistichus koelzi* | X | Sand | 0 | 10 | 1 | 0 | 0 | ND | ND | 0 | 0 | 0 | 0 | Sandy beaches; piers |
| surfperch, black | *Emibiotoca jacksoni* | X | Rock | 0 | 46 | 1 | 1 | 1 | ND | ND | 1 | 0 | 1 | 0 | Piers; jetties; estuaries; kelp; low fecundity |
| surfperch, pile | *Damalichthys vacca* | X | Rock | 0 | 90 | 1 | 1 | 1 | ND | ND | 1 | 0 | 0 | 0 | Piers; jetties; estuaries; kelp; low fecundity |
| surfperch, rainbow | *Hypsurus caryi* | X | Rock | 0 | 50 | ND | 0 | 0 | ND | ND | 1 | 0 | 1 | 0 | Harbors; eelgrass. Some evidence they move inshore and offshore, movements are not known; low fecundity. |
| surfperch, redtailed | *Amphistichus rhodoterus* | X | Sand | 0 | 24 | 1 | 0 | 0 | ND | ND | 0 | 0 | 0 | 0 | Sandy beaches; piers |
| surfperch, rubberlip | *Phacochilus toxotes* | X | Rock | 0 | 50 | ND | 0 | 1 | ND | ND | 1 | 0 | 1 | 0 | Piers; jetties; kelp; low fecundity |
| surfperch, shiner | *Cymatogaster aggregata* | X | Both | 0 | 146 | ND | 1 | 1 | ND | ND | 0 | 0 | 1 | 0 | Estuaries; kelpbeds |
| surfperch, striped | *Embiotoca lateralis* | X | Rock | 0 | 50 | 0 | 1 | 1 | ND | ND | 0 | 0 | 1 | 0 | Piers; jetties; estuaries; kelp |
| surfperch, walleye | *Hyperprosopon argenteum* | X | Both | 0 | 182 | 1 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | Sandy beaches; piers |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| surfperch, white | *Phanerodon furcatus* | X | Both | 0 | 70 | 1 | 1 | 1 | ND | ND | 0 | 0 | 1 | 0 | Estuaries |
| turbot, C-O | *Pleuronectes coenosus* | | Sand | 0 | 300 | 0 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| turbot, diamond | *Hypsopsetta guttulata* | | Sand | 0 | 46 | 0 | 1 | 1 | ND | ND | 0 | 0 | 1 | 0 | Often found in estuaries and brackish water |
| turbot, hornyhead | *Pleruonichthys verticalis* | | Sand | 9 | 201 | 0 | 1 | 1 | ND | ND | 0 | 0 | 0 | 0 | |
| **Seabirds (breeding)** | | | | | | | | | | | | | | | |
| auklet, Cassin's | *Ptychoramphus aleuticus* | | Sand, mud | 0 | 80 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | potential human disturbance reduction from lights, California species of special concern. |
| auklet, rhinoceros | *Cerorhinca monocerata* | | Sand, mud | 0 | 30 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | potential for forage base increase, potential human disturbance reduction from lights, California species of special concern. |
| cormorant, Brandt's | *Phalacrocorax penicillatus* | X | Sand, mud | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | Potential for forage base increase, potential human disturbance reduction. Feeds mainly on small schooling fish (e.g., juv. rockfish, anchovy, etc.) in coastal waters. |
| cormorant, double-crested | *Phalacrocorax auritus* | X | Sand, mud | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction. Feeds mainly on small schooling fish in coastal estuaries. |
| cormorant, pelagic | *Phalacrocorax pelagicus* | X | Rock | 0 | 30 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | Potential for forage base increase, potential human disturbance reduction. Feeds mainly on small fish (e.g., juv. rockfish, cottids, ) and mysid shrimp in nearshore waters near breeding colonies. Sensitive to reductions in prey. |
| guillemot, pigeon | *Cepphus columba* | X | Rock | 0 | 30 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | Potential for forage base increase, potential human disturbance reduction. Feed on small fish (juv. Rockfish, cottids, sanddabs) in nearshore waters near colonies. Sensitive to reductions in prey. |
| murre, common | *Uria aalge* | X | Sand, mud | 0 | 183 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | Potential for forage base increase, potential human disturbance reduction. Has been impacted in past as fisheries bycatch (gill-net). Recently, some take in rockfish hook-and-line around Farallon Islands. |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| murrelet, marbled | *Brachyramphus marmoratus* | X | Sand, mud | 0 | 30 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | Significant decline in California population,potential for forage base increase, potential human disturbance reduction. Feed on small fish and zooplankton in nearshore waters. Restricted distribution. Federally threatened, state endangered |
| oystercatcher, black | *Haematopus bachmani* | | Rock | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | Potential for forage base increase, potential human disturbance reduction. Feeds on intertidal molluscs on coastal rocks, reefs. |
| storm-petrel, ashy | *Oceanodroma homochroa* | | NA | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | Potential for forage base increase, potential human disturbance reduction, restricted distribution, population declining |
| storm-petrel, Leach's | *Oceanodroma leucorhoa* | | NA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | Potential for forage base increase, potential human disturbance reduction |
| **Seabirds (migrant)** | | | | | | | | | | | | | | | |
| brant | *Branta bernicla* | X | Sand | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction. Eelgrass specialist. Winters in coastal estuaries. Declined in California due to loss of eelgrass habitat. |
| bufflehead | *Bucephala albeola* | | Sand, mud | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction. Winters in coastal estuaries. Feeds on benthic invertebrates and small fish. |
| dowitcher, long-billed | *Limnodromus scolopaceus* | | Mud, sand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential human disturbance reduction. Coastal estuaries important habitat spring-fall. Feeds on benthic invertebrates in intertidal mudflats. |
| dowitcher, short-billed | *Limnodromus griseus* | | Mud, sand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential human disturbance reduction. Coastal estuaries important habitat spring-fall. Feeds on benthic invertebrates in intertidal mudflats. |
| dunlin | *Calidris alpina* | | Mud, sand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential human disturbance reduction. Coastal estuaries important habitat spring-fall. Feeds on benthic invertebrates in intertidal mudflats. |
| godwit, marbled | *Limosa fedoa* | | Sand, mud | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential human disturbance reduction. Coastal estuaries important habitat spring-fall. Feeds on benthic invertebrates in intertidal mudflats. |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| goldeneye, common | *Bucephala clangula* | | Sand, mud | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction. Winters in coastal estuaries. Feeds on benthic invertebrates (molluscs, worms)and small fish. |
| grebe, eared | *Podiceps nigricollis* | | Sand, mud | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | potential human disturbance reduction. Mainly fall-spring. Feed on small fish in coastal waters, estuaries. |
| grebe, Western/Clark's | *Aechmophorus occidentalis, clarkii* | X | Sand, mud | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction. Mainly fall-spring. Feed on small fish in coastal waters, estuaries. |
| pelican, brown | *Pelecanus occidentalis* | | Sand, mud | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | potential human disturbance reduction, federally and state endangered - downlisting under consideration |
| plover, black-bellied | *Pluvialis squatarola* | | Mud, sand, rock | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential human disturbance reduction. Migrant and winter. Feeds on intertidal inverterbrates on mudlfats, reefs. |
| sandpiper, western | *Calidris mauri* | X | mud, sand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential human disturbance reduction. Coastal estuaries important habitat spring-fall. Feeds on benthic invertebrates in intertidal mudflats. |
| scaup, lesser | *Aythya affinis* | X | Sand, mud | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase, potential for forage base increase, potential human disturbance reduction. Coastal estuaries important wintering habitat. Feeds on benthic invertebrates (molluscs, worms) and small fish. |
| scoter, surf | *Melanitta perspicillata* | X | Sand, mud | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction, declining. Migrant and winter in nearshore coastal waters and estuaries. Feeds on benthic invertebrates (molluscs, worms) and small fish. |
| turnstone, black | *Arenaria melanocephala* | | Rock | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | Potential human disturbance reduction. Feeds on rocky intertidal invertebrates on coastal reefs, rocks. |
| turnstone, ruddy | *Arenaria interpres* | | Rock, sand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | Potential human disturbance reduction. Feeds on rocky intertidal invertebrates on coastal reefs, rocks, gravel beaches. |
| willet | *Catoptrophorus semipalmatus* | X | Sand, mud | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | Potential human disturbance reduction. Coastal estuaries important habitat spring-fall. Feeds on benthic invertebrates in intertidal mudflats. |

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| **Marine mammals** | | | | | | | | | | | | | | | |
| elephant seal, northern | Mirounga angustirostris | | Pelagic both | 0 | 300 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Breed in the area, deep divers, would forage around the Farallones, sensitive to disturbance but not as sensitive as seals and sea lions |
| porpoise, harbor | *Phocoena phocena* | X | Sand, mud | 0 | 60 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase home range is probably within the study region, potential human disturbance reduction (very shy). Has been impacted in past as fisheries bycatch (gill-net). Key into the superabundant prey - diet very similar to harbor seals |
| sea lion, California | *Zalophus californianus* | | Both | 0 | 30 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | Potential for forage base increase, potential human disturbance reduction - haul out in the area and boat activity could disturb them - key into superabundant prey - don't breed in the area except in small numbers on the Farallones |
| sea lion, Steller | *Eumetopias jubatus* | X | Both | 0 | 30 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | Ano Nuevo north central California population has declined, potential for forage base increase, potential human disturbance reduction; federally threatened - breed on Farallones and north of Fort Ross - would benefit from forage increase locally because they don't range as far as CA sealions |
| sea otter, southern | *Enhydra lutris* | X | Both | 0 | 45 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | Resident in nearshore waters, esp. kelp beds. Feeds on benthic invertebrates, fish. Potential for forage base increase, potential human disturbance reduction. Formerly more abundant and widespread. Federally threatened. Has been impacted in past as fisheries bycatch (gill-net). |
| seal, harbor | *Phoca vitulina* | X | Both | 0 | 45 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | Potential for forage base increase, potential human disturbance reduction - some bycatch and shooting still - key into superabundant prey - important link in trophic level don't feed very far offshore - foraging within a 10-12 mile area |

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| seal, northern fur | *Callorhinus ursinus* | | Pelagic | 0 | 30 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | Potential for forage base increase, potential human disturbance reduction. Recently recolonized Farallon Islands after 100+ year absence. (forage beyond state waters, McChesney) - if numbers increase they could be ecologically important around the Farallones |
| whale, gray | *Eschrichtius robustus* | | Sand, mud | 0 | 30 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | Potential for forage base increase. Potential for human disturbance reduction feed in drakes, tomales, and bodega bays - oversummer in the region - females with young take refuge near shore could benefit from safe MPAs with abundant fish - important ecosystem impact turn up the bottom with digging |
| whale, humpback | *Megaptera novaeangliae* | | Sand, mud | 0 | 200 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | Potential for forage base increase; potential for human disturbance reduction. Federally endangered. do key into certain areas in the region and feed near Point Reyes headlands, mouth of San Francisco Bay, |
| whale, minke | *Balaenoptera acutorostrata* | | Sand mud pelagic | 0 | 30 | 0 | 0 | ND | 0 | 0 | 1 | 0 | 0 | 0 | Females and calves occur in Drakes Bay and residents yea round - key into superabundant prey |

Note: Marine mammal depths are preferred foraging depths

Seabirds reference: Seabirds by Peter Pyle: pubs.usgs.gov/circ/c1198/chapters/150-161_Seabirds.pdf and National Geographic Field Guide to Birds of North America

Marine mammals reference: Farallones Marine Sanctuary Assocation http://www.farallones.org/findings/index.php and Marine Mammal Center http://www.marinemammalcenter.org/learning/education; www.afsc.noaa.gov/refm/docs/2002/ecochap.pdf

Southern Otter breeding range: http://www.baynature.com/v07n03/v07n03_etg.html

Invertebrates reference: http://www.mbayaq.org/efc/living_species, etc.

*Reference: http://72.14.253.104/search?q=cache:Lwn-nRiZce8J:www.dfg.ca.gov/Mrd/status/littleneck_clams.pdf+%22littleneck+clams%22+range&hl=en&ct=clnk&cd=2&gl=us&client=firefox-a

**Reference: http://www.blueoceaninstitute.org/seafood/species/122.htm