APPENDIX F
ESSENTIAL FISH HABITAT ASSESSMENT

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Essential Fish Habitat and Managed Species

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801-1882) established regional Fishery Management Councils and mandated that Fishery Management Plans (FMPs) be developed to responsibly manage exploited fish and invertebrate species in Federal waters of the U.S. When Congress reauthorized this Act in 1996 as the Sustainable Fisheries Act, several reforms and changes were made. One change was to charge the National Marine Fisheries Service (NMFS) with designating and conserving Essential Fish Habitat (EFH) for species managed under existing FMPs. This is intended to minimize, to the extent practicable, any adverse effects on habitat caused by fishing or non-fishing activities, and to identify other actions to encourage the conservation and enhancement of such habitat.

EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (16 U.S.C. § 1801[10]). The EFH final rule summarizing EFH regulations (50 CFR Part 600) outlines an additional interpretation of the EFH definition as follows:

- Waters, as defined previously, include "aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate."
- Substrate includes “sediment, hard bottom, structures underlying the waters, and associated biological communities.”
- Necessary is defined as “the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem.”
- Fish includes “finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds,” whereas “spawning, breeding, feeding or growth to maturity” cover the complete life cycle of those species of interest.

The Pacific Fishery Management Council (PFMC) is the FMC responsible for managing fisheries and habitat in the marine waters of California. The PFMC has produced FMPs for mixed groups of species that include EFH descriptions.

Within the EFH designated for various species, particular areas termed Habitat Areas of Particular Concern (HAPC) are also identified. HAPCs either play important roles in the life history (e.g., spawning areas) of federally managed fish species or are especially vulnerable to degradation from fishing or other human activities. In many cases, HAPCs represent areas where detailed information is available on the structure and function within the larger EFH.

The PFMC has produced FMPs for mixed groups of fishery species that occur in the Project area for at least a portion of their life cycles. The following accounts briefly describe the EFH, EFH conservation zones, and HAPCs for these species groups and life stages including the following:

- Groundfishes;
- Coastal Pelagic Fishes;
- Highly Migratory Fishes; and
- Salmons.

Groundfishes

The groundfish assemblage offshore California is diverse, with greater than 80 species federally managed (PFMC 2005). Major groups of fishes include sharks, skates, ratfish, morid cods, grenadiers, roundfish, rockfishes, scorpionfishes, thornyheads, and flatfishes. The groundfish species complex is detailed in **Table F-1**.

The overall extent of groundfish EFH for all species is identified as all waters and substrate within the following areas:

- Depths less than or equal to 3,500 meters (m) (1,914 fathoms) to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 parts per thousand (ppt) during the period of average annual low flow.
- Seamounts at depths greater than 3,500 m as mapped in the EFH assessment using geographic information systems (GIS).
- Areas designated as HAPCs not already identified by the above criteria.

EFH for the groundfish fishery includes areas protected from destructive fishing methods (particularly bottom trawling) within designated EFH conservation areas (**Figure F-1**). A map of HAPCs along the California coast is presented in **Figure F-2**.

Coastal Pelagic Species

Coastal pelagic species inhabit the water column from nearshore to the open ocean. The coastal pelagic assemblage offshore California includes midwater invertebrates and fishes. The primary invertebrate is the market squid (*Loligo opalescens*), followed by shrimp-like crustaceans called euphausids, more commonly known as krill. Krill are small pelagic crustaceans that are a very important prey source for a host of fishes (including managed fishery species), mammals, and birds. Krill were not targeted by any California fisheries, but in 2008 the PFMC, through Amendment 12 to the Coastal Pelagic Fishery Management Plan, banned all harvest of krill, and defined EFH to prevent the development of krill fisheries similar to those that occur in other parts of the world (PFMC 2008).

Coastal pelagic species are managed by the PFMC and California Department of Fish and Wildlife (CDFW). In addition, FMPs exist for Pacific sardine, Pacific bonito, northern anchovy, and jack mackerel (PFMC 2011).

Table F-1. Groundfish Species Complex

Species Group	Species
Sharks	leopard shark, *Triakis semifasciata* soupfin shark, *Galeorhinus zyopterus* spiny dogfish, *Squalus acanthias*
Skates	big skate ,*Rajabinoculata* California skate, *R.inornata* longnose skate, *R.rhina*
Ratfish	Ratfish, *Hydrolagus colliei*
Morids	finescale codling, *Antimora microlepis*
Grenadiers	Pacific rattail, *Coryphaenoides acrolepis*
Roundfish	Cabezon, *Scorpaenichthys marmoratus,* kelp greenling, *Hexagrammos decagrammus* Lingcod ,*Ophiodon elongates* Pacific cod, *Gadus macrocephalus* Pacific whiting, *Merluccius productus,* Sablefish, *Anoplopoma fimbria*
Rockfish	aurora rockfish, *Sebastes aurora* bank rockfish, *S. rufus* black rockfish, *S. melanops* black and yellow rockfish, *S. chrysomelas* blackgill rockfish, *S. melanostomus* blue rockfish, *S. mystinus* Bocaccio, *S. paucispinis* bronzespotted rockfish, *S. gilli* brown rockfish, *S. auriculatus* calico rockfish, *S. dalli* canary rockfish, *S. pinniger* chilipepper, *S. goodei* China rockfish, *S. nebulosus* copper rockfish, *S. caurinus* cowcod, *S. levis* darkblotched rockfish, *S. crameri*
Rockfish (continued)	kelp rockfish, *S. atrovirens* Mexican rockfish, *S. macdonaldi* olive rockfish, *S. serranoides* Pacific ocean perch, *S. alutus* pink rockfish, *S. eos* quillback rockfish, *S. maliger* redbanded rockfish, *S. babcocki* redstripe rockfish, *S. proriger* rosethorn rockfish, *S. helvomaculatus* rosy rockfish, *S. rosaceus* rougheye rockfish, *S. aleutianus* sharpchin rockfish, *S. zacentrus* shortbelly rockfish, *S. jordani* shortraker rockfish, *S. borealis* silvergray rockfish, *S. brevispinis* speckled rockfish, *S. ovalis* splitnose rockfish, *S. diploproa* squarespot rockfish, *S. hopkinsi* starry rockfish, *S. constellatus* stripetail rockfish, *S. saxicola* tiger rockfish, *S. nigrocinctus* treefish, *S. serriceps* vermilion rockfish, *S. miniatus* widow rockfish, *S. entomelas* yelloweye rockfish, *S. ruberrimus* yellowmouth rockfish, *S. reedi* yellowtail rockfish, *S. flavidus*
Scorpionfish	California scorpionfish, *Scorpaena guttata*
Thornyheads	longspine thornyhead, *Sebastolobus altivelis* shortspine thornyhead, *Sebastolobus alascanus*

Species Group	Species	Species Group	Species
Flatfish	arrowtooth flounder (arrowtooth turbot), *Atheresthes stomias* Dover sole, *Microstomus pacificus* English sole, *Parophrys vetulus* petrale sole, *Eopsetta jordani* starry flounder *Platichthys stellatus* butter sole, *Isopsetta isolepis* curlfin sole, *Pleuronichthys decurrens* flathead sole, *Hippoglossoides elassodon* Pacific sanddab, *Citharichthys sordidus* rex sole, *Glyptocephalus zachirus* rock sole, *Lepidopsetta bilineata* sand sole, *Psettichthys melanostictus* Pacific halibut, *Hippoglossus stenolepis*, is managed by the International Pacific Halibut Commission (IPHC)		

Figure F-1. Essential Fish Habitat (EFH) Conservation Areas for the Groundfish Fishery off the California Coast (Source: PFMC 2005)

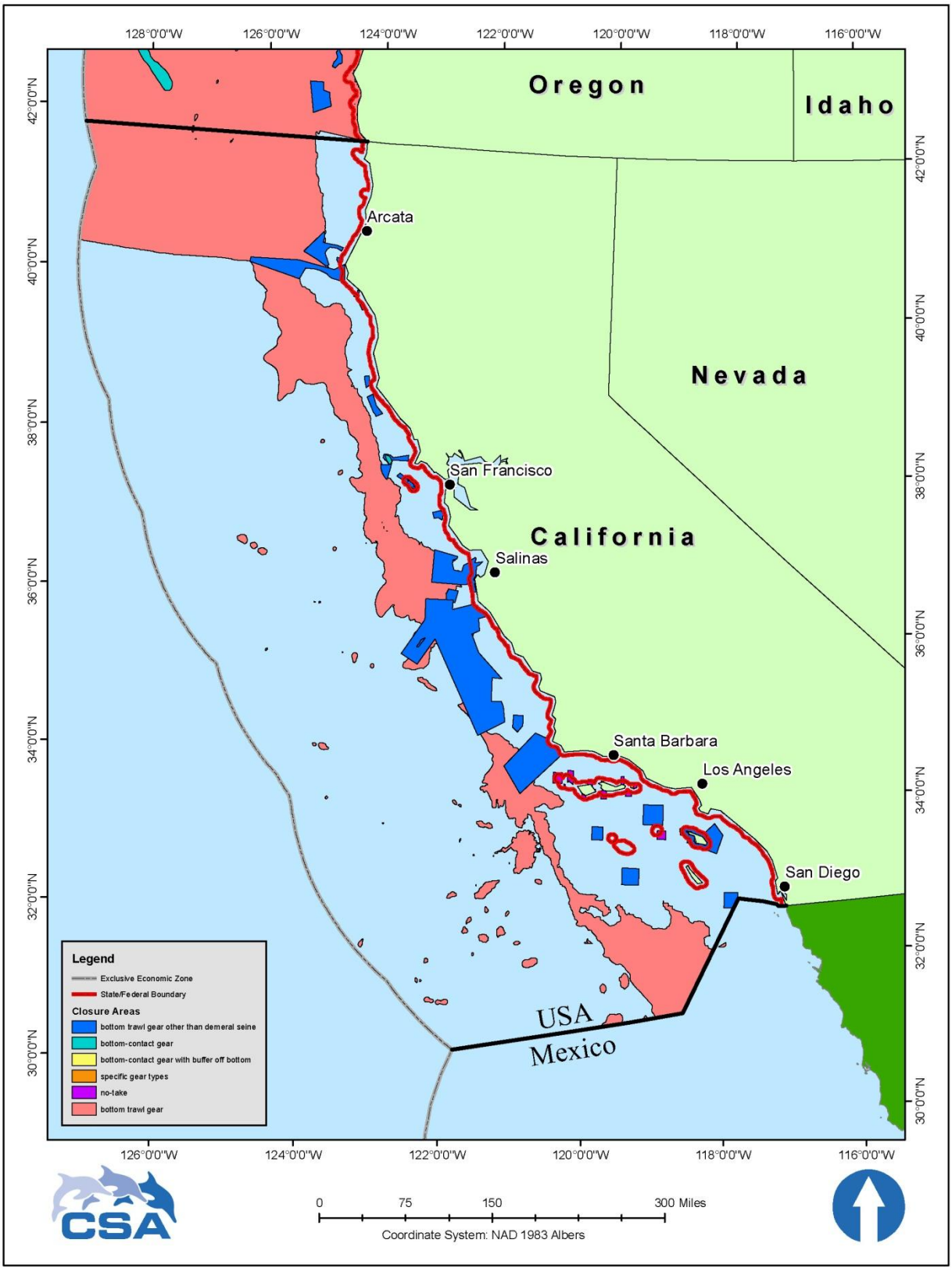
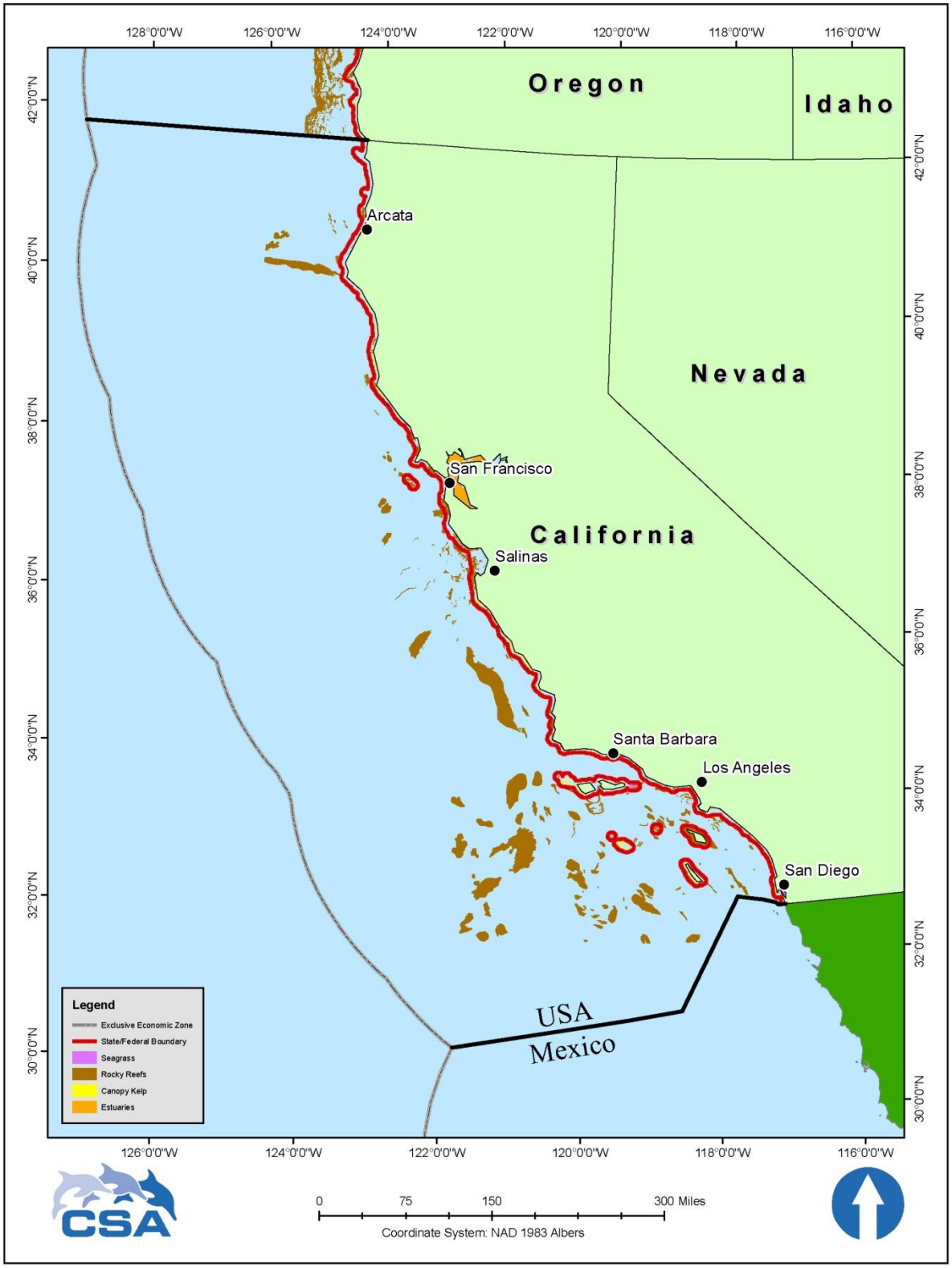


Figure F-2. Habitat Areas of Particular Concern (HAPC) for the Groundfish Fishery off the California Coast (Source: PFMC 2005)



Highly Migratory Species

The highly migratory species group is composed of sharks, tunas, and billfishes (PFMC 2007). EFH descriptions for shark species including blue shark, bigeye thresher shark, pelagic thresher shark, common thresher shark, shortfin mako shark are presented in **Table F-2**.

EFH for highly migratory bony fishes include albacore, skipjack tuna, yellowfin tuna, bluefin tuna, bigeye tuna, dolphinfish, striped marlin, and broadbill swordfish, and are listed in **Table F-3**.

Pacific Salmon

The Pacific salmon species applicable to the Project area are Chinook and coho species. Pacific salmon have an anadromous life history that extends from the open ocean to upland creeks, rivers, and lakes. EFH in the marine environment, including the Project area, is very general; it extends from the high tide line offshore to the Exclusive Economic Zone (EEZ).

Table F-2. Shark Species and Life Stages with Essential Fish Habitat Identified off California, in or near the Project Area (Source: PFMC 2007)

Species	Neonate/Early Juveniles	Late Juveniles/Subadults	Adults
Bigeye thresher shark (*Alopias superciliosus)*	Not in area	Late juveniles/subadults (males: >115 cm FL and <155 cm FL; females: <189 cm FL): Coastal and oceanic waters in epi- and mesopelagic zones from the U.S.-Mexico border north to 37° N latitude off Davenport, CA. South of 34° N latitude from the 100 fm isobath to the 2000 fm and north of 34° N the 800 fm isobath out to the 2200 fm isobath.	Adults (males: >154 cm FL; females: >188 cm FL): Coastal and oceanic waters epi-and mesopelagic zones from the U.S.-Mexico border north to 45° N latitude off Cascade Head, OR. In Southern California south of 34° N latitude from the 100 fm isobath out to the 2,000 fm isobath. North of 34° N latitude from the 800 fm isobath out to the outer EEZ boundary.
Pelagic thresher shark (*Alopias pelagicus)*	Not in area	Late juveniles/subadults (males: >136 cm FL and <162 cm FL): Epipelagic and predominantly oceanic waters along coastal California from the U.S.-Mexico border as far north as 34° N latitude, from the 100 fm isobath about out to the Santa Rosa-Cortes Ridge, particularly between San Diego and Long Beach (line extends south from Ridge to a point on the EEZ boundary at 31° 36' N and 118° 45' W).	Adults (females: >161 cm FL [predominantly adult females]): Epipelagic and predominantly oceanic waters along coastal California from the U.S.-Mexico border as far north as 34° N latitude, from the 100 fm isobaths about out to the Santa Rosa-Cortes Ridge, particularly between San Diego and Long Beach (line extends south from Ridge to a point on the EEZ boundary at 31° 36' N and 118° 45' W). Associates with SSTs of 21°C or warmer in near surface waters from the U.S.-Mexico EEZ border north to off Pigeon Point, CA.

Species	Neonate/Early Juveniles	Late Juveniles/Subadults	Adults
Common thresher shark (*Alopias vulpinus*)	Neonate/early juveniles (<102 cm FL): Epipelagic, neritic and oceanic waters off beaches, in shallow bays, in near surface waters from the U.S.-Mexico EEZ border north to off Santa Cruz (37° N) over bottom depths of 6 to 400 fm, particularly in water less than 100 fm deep and to a lesser extent further offshore between 200-300 fm.	Late juveniles/subadults (>101 cm FL and <167 cm FL): Epipelagic, neritic and oceanic waters off beaches and open coast bays and offshore, in near-surface waters from the U.S.-Mexico EEZ border north to off Pigeon Point, California (37° 10' N) from the 6 fm to 1,400 fm isobaths.	Adults (>166 cm FL): Epipelagic, neritic and oceanic waters off beaches and open coast bays, in near surface waters from the U.S.-Mexico EEZ border north seasonally to Cape Flattery, WA from the 40 fm isobath westward to about 127°30'W longitude north of the Mendocino Escarpment and from the 40 to 1,900 fm isobath south of the Mendocino Escarpment.
Blue shark (*Prionace glauca*)	Neonate/early juveniles (<83 cm FL): Epipelagic, oceanic waters from the U.S.-Mexico border north of the U.S.-Canada border from the 1,000 fm isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 100 fm isobath south of 34° N latitude.	Late juveniles/subadults (males: >82 cm FL and <167 cm FL; females: <153 cm FL): Epipelagic, oceanic waters from the U.S.-Mexico border north to 37° N latitude (off Santa Cruz, CA) from the 100 fm isobath seaward to the outer boundary of the EEZ and beyond; and north to the U.S.-Canada border from the 1,000 fm isobath seaward to the EEZ outer boundary.	Adults (males: >166 cm FL; females: >152 cm FL): Epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border from the 1,000 fm isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 200 fm isobath south of 37° N latitude off Santa Cruz, CA.
Shortfin mako (*Isurus oxyrinchus*)	Neonate/early juveniles (<101 cm FL): Oceanic and epipelagic waters of the U.S. west coast from the100 fm isobath out to the 2,000 fm isobath (and possibly beyond) from the Mexico border to Point Pinos, CA, especially the SCB, from the 1,000 fm isobath out to 2,000 fm isobath from Monterey Bay north to Cape Mendocino; and from the 1,000 fm isobath out to the EEZ boundary north of Cape Mendocino to 46° 30' N latitude. Occupies northerly habitat during warm water years.	Late juveniles/subadults (males: >100 cm FL and <180 cm FL; females: <249 cm FL): Oceanic and epipelagic waters from the U.S.-Mexico EEZ border north to 46° 30' N latitude from the 100 fm isobaths out to the EEZ boundary north to San Francisco (38° N), and from 1,000 fm out to the EEZ boundary north to San Francisco (38° N) and from 1,000 fm out to the EEZ boundary north of San Francisco.	Adults (males: >179 cm FL; females: >248 cm FL [most adults within the U.S.-west coast EEZ are males]): Epipelagic oceanic waters from the U.S.-Mexico EEZ border north to 46° 30' N latitude extending from the 400 fm isobath out to the EEZ boundary south of Point Conception, from 1000 fm isobath out to the EEZ boundary and beyond north of Point Conception, and from the 1000 fm isobath out to the EEZ boundary and beyond, north of Point Conception, CA.

Table F-3. Highly Migratory Species and Life Stages with Essential Fish Habitat Identified off California, in or near the Project Area (Source: PFMC 2007)

Species	Eggs and Larvae	Juveniles	Adults
Albacore tuna (*Thunnus alalunga*)	None in area	Juvenile (<85 cm FL): Oceanic, epipelagic waters generally beyond the 100 fm isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Habitat concentrations off Southern and Central California and the area of the Columbia River Plume area.	Adult (>84 cm FL): Oceanic, epipelagic waters generally beyond the 100 fm isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Associated with SSTs between 14°C and 25°C in waters of the North Pacific Transition.
Bigeye tuna (*Thunnus obesus*)	None in area	Juvenile (<100 cm FL): Oceanic, epipelagic and mesopelagic waters beyond the 200 fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border north to Point Conception, CA, some years extending northward to Monterey Bay (37° N latitude). Associated with SSTs between 13°C and 29°C with optimum between 17°C and 22°C. Habitat concentrated in the SCB primarily south of 34° N latitude from the 100 fm isobath out to the 1000 fm isobath.	Adult (>100 cm FL): Oceanic, epipelagic and mesopelagic waters beyond the 200 fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border north to Point Conception, CA, some years extending northward to Monterey Bay (37°N latitude). Associated with SSTs between 13°C and 29°C with optimum between 17°C and 22°C. Habitat concentrated in the SCB primarily south of 34° N latitude from the 100 fm isobath out to the 1000 fm isobath.
Bluefin tuna (*Thunnus thynnus*)	None in area	Juvenile (<150 cm FL and 60 kg): Oceanic, epipelagic waters beyond the 100 fm isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Associated with SSTs between 14°C and 23°C. Northerly migratory extension appears dependent on position of the North Pacific Subarctic Boundary.	Adult (>150 cm FL and 60 kg): No regular habitat within the U.S. west coast EEZ, although large fish are occasionally caught in the vicinity of the Channel Islands off Southern California and rarely off the Central California coast.

Species	Eggs and Larvae	Juveniles	Adults
Skipjack tuna (*Katsuwonus pelamis*)	None in area	None in area	Adult: Oceanic, epipelagic waters beyond the 400 fm isobath out to the EEZ boundary from the U.S.-Mexico EEZ border northward to Point Conception, CA, and northward beyond the 1,000 fm isobath north to about 40° N latitude. Associated with SSTs between 18°C and 20°C. Habitat concentrated, esp. in warm years, in the SCB primarily south of 33° N latitude.
Yellowfin tuna (*Thunnus albacares*)	None in area	Juvenile (males: <69 cm FL; females: <92 cm FL): Oceanic, epipelagic waters from the U.S.-Mexico EEZ border north to Point Conception, CA, some years extending northward to Monterey Bay (37° N latitude). South of Point Conception from the 100 fm isobath out to the EEZ boundary; north of Point Conception from 300 fm isobath out to the EEZ boundary. Associated with SSTs between 18° to 31°C.	Adult (males: >69 cm FL; females: >92cm FL): Adult yellowfin tuna do not regularly occupy habitat within the U.S. west coast EEZ.
Dolphinfish (*Coryphaena hippurus*)	Spawning, eggs and larvae (<13.7 cm FL): Primarily outside of the U.S. west coast EEZ. Spawning restricted to water >24°C; off southern Baja California, Mexico, with peak larval production in August and September.	Juveniles and subadults (>13.6 cm FL and <35 cm FL): Epipelagic (<30 m deep) and predominantly oceanic waters offshore the 6 fm isobath along coastal California from the U.S. Mexico border generally as far north as Point Conception, CA (34° 34' N) and within the U.S.-west coast EEZ primarily east of the Santa Rosa-Cortes Ridge (line extends from Point Conception south-southeast to a point on the EEZ boundary at 31° 36' N and 118° 45' W). Prefer SSTs 20°C and higher during warm water incursions.	Adults (>34 cm FL): Epipelagic (<30 m deep) and predominantly oceanic waters offshore the 6 fm isobath along coastal California from the U.S. Mexico border generally as far north as Point Conception, CA (34° 34' N) and within the U.S. west coast EEZ primarily east of the Santa Rosa-Cortes Ridge (line extends from Point Conception south-southeast to a point on the EEZ boundary at 31° 36' N and 118° 45' W). Prefer SSTs 20°C and higher during warm water incursions.

Species	Eggs and Larvae	Juveniles	Adults
Striped marlin (*Kajikia audax*)	None in area	None in area	Adult (>150 cm EFL or 171 JFL): Oceanic, epipelagic waters of the SCB, above the thermocline, from the 200 fm isobath from the U.S.-Mexico EEZ border to about 34° 09' N latitude (Pt. Hueneme, CA), east of the Santa Rosa-Cortes Ridge (line from South Point, Santa Rosa Island, southeast to the EEZ boundary at approx. 31° 36' N and 118° 45' W). Preferred water temperature regimes bounded by 68° to 78°F (20-25°C).
Broadbill swordfish (*Xiphias gladius*)	None in area	Juvenile (males: <102 EFL or 118 cm JFL; females: <144 cm EFL or <163 JFL): Oceanic, epipelagic and mesopelagic waters from the U.S.-Mexico EEZ border north to 41° N latitude. In the SCB primarily south of the Santa Barbara Channel Islands from the 400 fm isobath out to the EEZ boundary. North of Point Conception from the 1000 fm isobath westward to the EEZ outer boundary and northward to 41° N latitude.	Adult (males: >102 cm EFL or 117 JFL; females: >144 cm EFL or 162 JFL): Oceanic, epipelagic and mesopelagic waters out to the EEZ boundary inshore to the 400 fm isobath in Southern and Central California from the U.S.-Mexico EEZ border north to 37° N latitude; beyond the 1000 fm isobath northward to 46° 40' N.

Acronyms and Abbreviations: cm FL = centimeters fork length; fm = fathom; EEZ= Exclusive Economic Zone; SCB = Southern California Bight; SST= sea surface temperature; kg = kilogram; m = meter; EFL = eye to fork length; JFL = jaw to fork length.

References

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