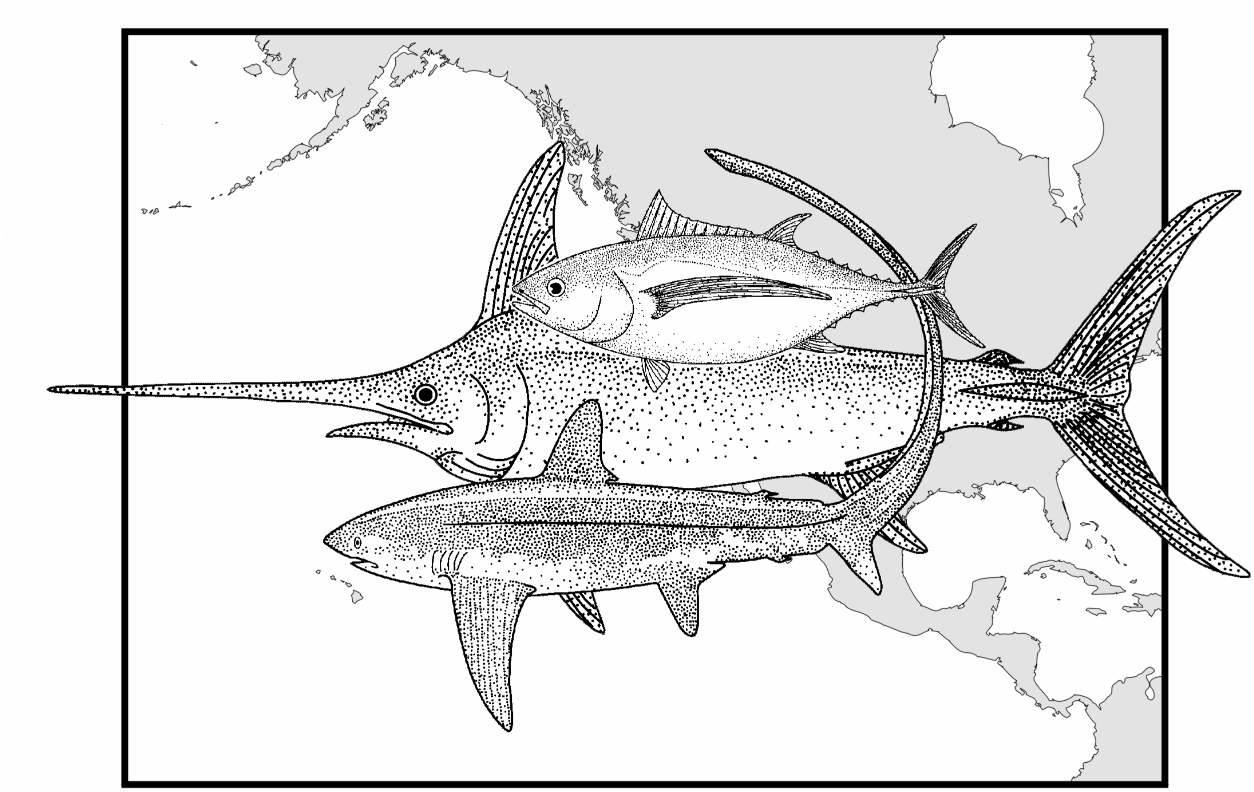
Agenda Item F.2
Attachment 3
November 2023

FISHERY MANAGEMENT PLAN FOR U.S. WEST COAST FISHERIES FOR HIGHLY MIGRATORY SPECIES



AMENDED THROUGH AMENDMENT ~~7~~8

Proposed Amendment Text, November 2023

PACIFIC FISHERY MANAGEMENT COUNCIL
7700 NE AMBASSADOR PLACE, SUITE 101
PORTLAND, OREGON 97220
WWW.PCOUNCIL.ORG

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7.0 Essential Fish Habitat (EFH)

7.1 Background

Section 303(a)(7) of the MSA, 16 U.S.C. 1801 et seq., as amended by the Sustainable Fisheries Act in 1996, requires that fishery management plans (FMPs):

Describe and identify essential fish habitat, minimize to the extent practicable adverse effects on such habitat caused by fishing and identify other actions to encourage the conservation and enhancement of such habitat.

The MSA provides the following definition:

The term 'essential fish habitat' means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity. (16 U.S.C. 1802 (10)).

The EFH regulations (at 50 C.F.R. 600 Subpart J) provide additional interpretation of the definition of essential fish habitat:

'Waters' 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' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle.

The NMFS guidelines intended to assist councils in implementing the EFH provision of the MSA set forth the following four broad tasks:

- Identify and describe EFH for all species managed under an FMP;
- Describe adverse impacts to EFH from fishing activities;
- Describe adverse impacts to EFH from non-fishing activities; and
- Recommend conservation and enhancement measures to minimize and mitigate the adverse impacts to EFH resulting from fishing and non-fishing related activities.

The EFH regulations require that EFH be described and identified within the U.S. EEZ for all life stages of each species in a fishery management unit if they occur within that zone. FMPs must describe EFH in text and/or tables and figures which provide information on the biological requirements for each life history stage of the species. According to the EFH regulations, an initial inventory of available environmental and fisheries data sources should be taken to compile information necessary to describe and identify EFH and to identify major species-specific habitat data gaps. The EFH regulations also suggest that where possible, FMPs should identify Habitat Areas of Particular Concern (HAPCs) within EFH for habitats which satisfy the criteria of being 1) sensitive or vulnerable to environmental stress, 2) are rare, or are 3) particularly important ecologically.

Conservation and enhancement measures may be recommended by NMFS during consultation with Federal agencies, as required by section 305(b) of the MSA, on projects which may potentially impact HMS EFH. Specific conservation measures, however, will be developed on a case-by-case basis. NMFS' authority includes the direct management of activities associated with fishing for marine, estuarine, and anadromous resources; NMFS' role in Federal interagency consultations with regard to non-fishing threats is, more often than not, advisory. This document does not assume any new authority or regulatory role for NMFS in the control of non-fishing activities beyond the statutory requirements to recommend measures to conserve living marine resources, including their habitats.

This chapter identifies and describes EFH for management unit species. Improved descriptions of EFH may be possible with more basic research on life history, habitat use, behavior, and distribution of life stages. Research also is needed to identify HAPC. This FMP authorizes changes to the identification and description of EFH, and of HAPCs, as new information is collected.

The FMP also authorizes the adoption of management measures to minimize adverse effects on EFH from fishing when there is evidence for such effects. Presently, however, there is no clear evidence of adverse impacts from any fisheries' practices or gear on HMS EFH. Management measures to prevent, mitigate, or minimize adverse effects from fishing activities include, but are not limited to:

Fishing gear restrictions: Seasonal and areal restrictions on the use of specified gear; gear modifications to allow escapement of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on anchoring or setting gear in sensitive localities; and prohibitions on fishing activities that cause significant physical damage in EFH.

Time/area closures: Closing areas to all fishing or specific gear types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages.

Harvest limits: Limits on the take of species that provide structural habitat for other species assemblages or communities, and limits on the take of prey species.

This FMP adopts species and stage-specific EFH designations for individual MUS as described in Section 7.2 and Appendix F. Designating EFH according to the best understanding of species' requirements enables informed assessments of the impacts of habitat alterations or disturbances.

The EFH regulations require a description of a process to periodically review and revise EFH. The Council adopted a two-phase EFH review process. Phase 1 consists of a literature review and summary of new and newly available information and data. If the information warrants consideration of updated EFH information, the review process moves to Phase 2, which consists of developing proposed EFH modifications for Council consideration. The Council's EFH review process is described in Council Operating Procedure 22.

7.2 Description of Designated EFH by Species

In general, the MUS are found in temperate waters within the Pacific Council's region. Variations in the distribution and abundance of the MUS are affected by ever-changing oceanic environmental conditions including water temperature, current patterns and the availability of food. Sea surface temperatures and habitat boundaries vary seasonally and from year to year, with some HMS much more abundant from northern California to Washington waters during the summer and warm waters years than during winter and cold water years, due to increased habitat availability within the EEZ. There are large gaps in the scientific knowledge about basic life histories and habitat requirements of a few. The migration patterns of the stocks in the Pacific Ocean are poorly understood and difficult to categorize despite extensive tagging studies for many species. Little is known about the distribution and habitat requirements of the juvenile life stages of tuna and billfish after they leave the plankton until they recruit to fisheries. Very little is known about the habitat of different life stages of most HMS which are not targeted by fisheries (e.g., certain species of sharks). For these reasons, the Council recommends a precautionary approach in designating EFH for the MUS.

7.2.1 Common Thresher Shark

Common thresher Shark EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. While common thresher sharks may occur in shallow water <12 m, they occur primarily in deeper waters, seaward of 12 m, and these shallow regions including enclosed bays and estuaries are not considered essential. Including all age classes, EFH ranges from the U.S.-Mexico Border to the U.S.-Canadian Border to approximately 100 nautical miles offshore. While small schooling fish appear to be their preferred prey, diets vary temporally and spatially and include squid and crustaceans. The high productivity and presence of diverse small schooling fish, squid and crustacean species and relatively warm shallow shelf waters make the California Current, out to approximately 100 nautical miles, a suitable habitat for feeding and growth to maturity for common thresher sharks.

- Neonate and Early Juveniles (<102 cm FL): In shallow neritic water over the continental shelf, with a geographic range extending from the U.S.-Mexico border north to Morro Bay, California (35° N), but found most frequently in the SCB. Little known of the food of early juveniles; presumably feeds on small northern anchovy and other small, schooling fishes and invertebrates. The broad continental shelf and relatively warmer waters in the SCB make this region a suitable nursery habitat for common thresher sharks.

- Late Juveniles and Subadults (males > 102 cm FL and < 188 cm FL; females >1 cm FL and < 216 cm FL): Epipelagic, neritic and oceanic. Habitat of subadults extends northward up the coast, as far north as 48° N. They are found most frequently in nearshore areas over the continental shelf, especially within the SCB. Known to feed primarily on northern anchovy, Pacific sardine, Pacific hake, Pacific mackerel, and market squid; secondarily on a variety of other fishes, squid and pelagic red crab (in warm water years). Northern anchovy was a more important prey component for juvenile fish < 160 cm FL.

- Adults (males > 181 cm FL; females > 216 cm FL): Epipelagic, neritic and oceanic waters along the west coast of North America, seasonally distributed in coastal water from the U.S.-Mexico border to the U.S.-Canadian border. Known to feed primarily on northern anchovy, Pacific sardine, Pacific hake, Pacific mackerel, and market squid; secondarily on a variety of other fishes, squid, and pelagic red crab (warm water years).

~~Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Oregon driftnet logbook data 1991-2001. Food habit information from Stick and Hreha (1989), Bedford and Haugen (1992) Preti et al. (2001).~~

- ~~Neonate/early juveniles (< 102 cm fork length [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. latitude) 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. Little known of the food of early juveniles; presumably feeds on small northern anchovy and other small, schooling fishes and invertebrates.~~
- ~~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. latitude) from the 6 fm to 1400 fm isobaths. Known to feed primarily on northern anchovy, Pacific hake, Pacific mackerel and sardine; secondarily on a variety of other fishes, squid and pelagic red crab (warm water years). Northern anchovy especially important for juvenile fish < 160 cm FL.~~

- ~~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 1900 fm isobath south of the Mendocino Escarpment. Known to feed primarily on northern anchovy, Pacific hake, Pacific mackerel and sardine; secondarily on a variety of other fishes, squid and pelagic red crab (warm water years).~~

7.2.2 *Shortfin Mako Shark*

Shortfin mako shark EFH is defined using the combination of data sources described in Appendix F as well as expert opinion. Combining all age classes, the EFH of mako sharks includes the entire U.S. EEZ seaward of the 12 m depth contour. While mako sharks may occur in shallow water <12 m, they occur primarily in deer waters and these shallow regions including bays and estuaries are not considered essential. Studies have shown that mako sharks of all sizes can feed opportunistically on a high diversity of prey. The high productivity and presence of diverse fish, squid and crustacean species and relatively warm and shallow shelf waters make the California Current a suitable feeding habitat for feeding and growth to maturity for shortfin mako sharks.

- Neonate and Early Juveniles (< 100 cm FL): The SCB ecoregion has long been considered a pupping and nursery area for mako sharks based primarily on the prevalence of juveniles in this region. Current data show that the mako shark nursery extends within the U.S. EEZ along the continental margins of the SCB ecoregion, south to the U.S.-Mexico border. The broad continental shelf and relatively warmer waters in the SCB make this region a suitable nursery habitat. A range of coastal pelagic fish species are important prey for small mako sharks. Pacific saury was the most important prey item for juvenile sharks (FL < 110 cm), followed by Pacific sardine, Pacific mackerel, and jumbo squid with diets varying over time.

- Late Juveniles and Subadults (males > 100 cm FL to < 180 cm FL; females >1 cm FL to < 249 cm FL): Epipelagic, neritic, and oceanic waters from the U.S.-Mexico border to the U.S.-Canadian border offshore to the 200 nautical mile EEZ. Mako Sharks of this size feed opportunistically on a high diversity of prey.

- Adults (males > 180 cm FL; females > 249 cm FL): Epipelagic, neritic, and oceanic waters from U.S.-Mexico border to the U.S.-Canadian border offshore to the 200 nautical mile EEZ. Studies have shown that adult mako sharks feed opportunistically on a high diversity of prey including larger and faster prey, such as marine mammals and small sharks.

~~Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Oregon driftnet logbook data 1991-2001; longline and gillnet catch data from Nakano (1994); California Department of Fish and Game tagging data; Holts and Bedford (1993); and Casey and Kohler (1992). Food habits information from Hanan et al. (1993); Eschmeyer et al. (1983); D. Holts (NMFS, SWFSC La Jolla, pers. comm. 10/16/2000).~~

- ~~Neonate/early juveniles (< 101 cm FL): Oceanic and epipelagic waters of the U.S. West Coast from the 100 fm isobath out to the 2000 fm isobath (and possibly beyond) from the Mexico border to Point Pinos, CA, especially the Southern California Bight, from the 1000 fm isobath out to 2000 fm isobath from Monterey Bay north to Cape Mendocino; and from the 1000 fm isobath out to the EEZ boundary north of Cape Mendocino to latitude 46° 30' N. latitude. Occupies northerly habitat during warm water years. Nothing documented on food of neonates; presumably feeds on small~~

~~pelagic fishes.~~

- ~~Late juveniles/subadults (> 100 cm FL and < 180 cm FL males and < 249 cm FL females): Oceanic and epipelagic waters from the U.S.-Mexico EEZ border north to 46° 30' N. latitude from the 100 fm isobath out to the EEZ boundary north to San Francisco (38° N. latitude), and from 1000 fm out to the EEZ boundary north to San Francisco (38° N. latitude) and from 1000 fm out to the EEZ boundary north of San Francisco. Shortfin mako off the West Coast reportedly feed on mackerel, sardine, bonito, anchovy, tuna, other sharks, swordfish and squid. Since the large majority of makos within the EEZ are juveniles, presumably this diet refers to primarily to juveniles and subadults.~~
- ~~Adults (> 179 cm FL males and > 248 cm FL females--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. Little is known of diet of large adults. Two adult shortfin mako over 250 cm FL were found to contain remains of a harbor seal, common dolphin, small sharks, and marlin (D. Holts, NMFS, SWFSC La Jolla, pers. comm. 10/16/2000). As with juveniles, presumably mackerel, sardine, bonito, anchovy, tunas, squid and swordfish may also be taken by adults, but existing published information on diet in our region is not broken down by mako size.~~

7.2.3 Blue Shark

Blue shark EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. Combining sexes and age classes the EFH includes the entire U.S. EEZ seaward of the 12 m depth contour. While blue sharks may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid and crustacean species and habitat along the continental margins make the California Current EFH a suitable habitat for feeding and growth to maturity for blue sharks.

- Neonate and Early Juveniles (< 83 cm FL): YOY blue sharks spend most of their time over the continental margin, but off the continental shelf. Blue shark nursery areas extend along the continental margins of the SCB ecoregion, north through Oregon (approximately 32−46.2° N). Young blue sharks off California have been found to feed heavily on pelagic cephalopods, with Gonatus spp. and paper nautiluses Argonauta spp. being the most important.

- Late Juveniles and Subadults (males > 82 cm FL and < 175 cm FL; females > 82 cm FL and < 170 cm FL): Epipelagic, oceanic waters from the U.S.-Canadian border to the U.S.–Mexican border. Within the U.S. West Coast EEZ they are known to feed on northern anchovy, Pacific hake, squid, spiny dogfish, Pacific herring, flatfishes, and opportunistically on surface-swarms of euphausiids, and inshore spawning aggregations of market squid. A recent study showed Gonatus spp. ranked first in importance followed by jumbo squid and Argonauta spp.

- Adults (males > 175 cm FL; females > 170 cm FL): Epipelagic, oceanic waters in the region from northern California to the U.S.–Mexican border. A recent study showed jumbo squid ranked first in importance followed by Gonatus spp. and Octopoteuthis spp. Larger specimens may feed on marine mammals, including pinnipeds and cetaceans. The relatively warmer and productive waters off California make this a suitable feeding habitat for adult blue sharks.

~~Based on California drift gill net logbook (1981-1991); drift net observer data (1990-1999); Nakano and~~

~~Nagasawa (1996); and Nakano (1994). Diet information based on Tricas (1979); Harvey (1989); and Brodeur et al. (1987).~~

- ~~Neonate/early juveniles (< 83 cm FL): Epipelagic, oceanic waters from the U.S. Mexico border north to the U.S. Canada border from the 1000 fm isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 100 fm isobath south of 34° N. latitude. Size specific information on diet of neonates is not available for our region.~~
- ~~Late juveniles/subadults (> 82 cm FL and < 167 cm FL males and < 153 cm FL females): 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 1000 fm isobath seaward to the EEZ outer boundary. Within the U.S. West Coast EEZ known to feed on northern anchovy, Pacific hake, squid, spiny dogfish, Pacific herring, flatfishes, and opportunistically on surface swarms of the euphausiid, *Thysanoessa spinifera*, and inshore spawning aggregations of market squid, *Loligo opalescens*.~~
- ~~Adults (> 166 cm FL males and > 152 cm FL females): Epipelagic, oceanic waters from the U.S. Mexico border north to the U.S. Canada border from the 1000 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. Although diet information is lacking for fish of this specific size group, blue sharks in coastal waters off the U.S. West Coast reportedly feed on northern anchovy, Pacific hake, squid, spiny dogfish, herring, flatfishes, and opportunistically on surface swarms of the euphausiid, *Thysanoessa spinifera*, and inshore spawning aggregations of market squid, *Loligo opalescens*.~~

7.2.4 Albacore Tuna

Albacore tuna EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. The EFH for albacore tuna includes the entire West Coast U.S. EEZ seaward of the 12 m depth contour. While albacore tuna may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid, and crustacean species make the California Current a suitable habitat for feeding and growth to maturity for juvenile albacore tuna.

- Eggs and Larvae: No habitat within the U.S. West Coast EEZ.

- Juvenile (~50 to < 85 cm FL): Oceanic, epipelagic waters from the U.S.-Mexico EEZ border north to the U.S.-Canada border. Albacore feed on small fishes (northern anchovy, rockfish species, boreal clubhook squid, and crustaceans (amphipods, euphausiids).

- Adult (>85 cm FL): Adulthood is defined by the ability to reproduce rather than size. Thus, while some fish >85 cm are landed in the EEZ these fish are not reproductively mature and thus, not adults. Following this logic, adult albacore are not found in the EEZ and consequently adult albacore EFH is not found within the U.S. West Coast EEZ.

~~Based on drift net observer data (1990-1999); California Commercial Passenger Fishing Vessel data; and Saito (1973); Laurs et al. (1974); Laurs and Lynn (1991); Bartoo and Forman (1994); and Hanan et al. (1993). Diet information from Iverson (1962) and Pinkas et al. (1971).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~

- ~~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. Reported to feed opportunistically, predominantly on fishes (e.g., Pacific saury) and squids. Associated with sea surface temperatures (SSTs) between 10°C and 20°C in waters of the North Pacific Transition Zone in dissolved oxygen saturation levels greater than 60%. Smaller (younger) fish are known to have a higher proportion of squid in their diet. In our region, may aggregate in the vicinity of upwelling fronts to feed on small fishes (northern anchovy, saury, rockfish spp., Myctophids, barracudina), squids (e.g., *Loligo, Gonatus* and *Onychoteuthis* sp.) and crustaceans (Sergestid shrimp, pelagic red crab, *Phronima* amphipods, euphausiids).~~
- ~~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 Zone in dissolved oxygen saturation levels greater than 60%. Reported to feed opportunistically, predominantly on fish (e.g., Pacific saury) and squid. Large fish tend to prey increasing more on fish and less on squid.~~

7.2.5 Bigeye Tuna

Bigeye tuna EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. The occurrence of bigeye tuna in the U.S. West Coast EEZ is not common, and typically occurs in warm water years. EFH for bigeye tuna includes oceanic, epipelagic, and mesopelagic waters from the U.S.-Mexico EEZ border north to Point Conception, CA (34° 34' N), seaward of the 12 m depth contour. Habitat is concentrated in the SCB primarily south of 34° N latitude. While bigeye tuna may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid, and crustacean species make the California Current a suitable feeding habitat for Juvenile and adult bigeye tuna.

- Eggs and Larvae: No habitat within the U.S. West Coast EEZ.

- Juvenile (< 108 cm FL): Oceanic, epipelagic, and, mesopelagic waters from the U.S.-Mexico EEZ border north to Point Conception, CA (34° 34' N). Feeding appears to be opportunistic at all life stages, with prey items consisting primarily of crustaceans, cephalopods, and fishes. Sternoptychids, gempylids, paralepidids, and myctophids are important prey items.

- Adult (>108 cm FL): Oceanic, epipelagic, and mesopelagic waters from the U.S.-Mexico EEZ border north to Point Conception, CA (34° 34' N). Feeding appears to be opportunistic at all life stages, with prey items consisting primarily of crustaceans, cephalopods, and fishes. Sternoptychids, gempylids, paralepidids, and myctophids are important prey items.

~~Based on California drift gill net observer data (1990-1999); California Commercial Passenger Fishing Vessel data; Kikawa (1961; 1957); and Alverson and Peterson (1963).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~
- ~~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 Southern California Bight primarily south of 34° N. latitude from the 100 fm isobath out to the 1000 fm isobath. Nothing is known of the diet of juvenile bigeye in the U.S. West Coast EEZ.~~

- ~~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 Southern California Bight primarily south of 34° N. latitude from the 100 fm isobath out to the 1000 fm isobath. Nothing is known of diet of adult bigeye in the U.S. West Coast EEZ.~~

7.2.6 Pacific Bluefin Tuna

Pacific bluefin tuna EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. The EFH for Pacific bluefin tuna includes the entire U.S. West Coast EEZ seaward of the 12 m depth contour. While Pacific bluefin tuna may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid and crustacean species make the California Current a suitable habitat for feeding and growth to maturity for juvenile Pacific bluefin tuna.

- Eggs and Larvae: No habitat within the U.S. West Coast EEZ.

- Juvenile and Adult (>50 cm FL): Oceanic, epipelagic waters from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Major prey of Pacific bluefin across sizes in our region are the northern anchovy, Pacific sardine, Pacific mackerel, jumbo squid, midwater eelpout, Pacific saury, squid, and pelagic red crab. Overall, this is a highly opportunistic predator that can exploit a broad range of available prey species across habitats. In a study in the eastern Pacific Ocean using gonad histology none of the females were mature although a few males were considered mature (Dewar*, et al.* 2022). Thus, males would be considered adults whereas the females of the same size would not. Regardless, from the perspective of EFH, they share the same habitat, and separation by life history stage is not useful.

~~Based on California drift gill net observer data (1990-1999); Oregon driftnet logbook data, 1992-2001; Uosaki and Bayliff (1999); Bayliff (1994); Harada (1980). Food habits based on Pinkas et al. (1971) and Bayliff (1994).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~
- ~~Juvenile - < 150 cm FL and 60 kg, Bayliff (1994); Harada (1980). 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 SST between 14°C and 23°C. Northerly migratory extension appears dependent on position of the North Pacific Subarctic Boundary. A major prey item of juvenile bluefin in our region is the northern anchovy; other food items reported from off southern California include saury, market squid, (up to 80% of stomach contents by volume), saury, squid, and hake. May feed on pelagic red crab when this species occurs in the EEZ, since it is a significant component of the diet off Mexico.~~
- ~~Adult - (≥ 150 cm FL and 60 kg, Bayliff (1994); Harada (1980). 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. Adult prey items are squids and~~

~~a variety of fishes including anchovies, herring, pompanos, mackerel, and other tunas.~~

7.2.7 Skipjack Tuna

Skipjack tuna EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. The EFH for skipjack includes the oceanic, epipelagic waters from the U.S.-Mexico border northward to Point Conception, CA (34° 34' N), seaward of the 12 m depth contour. While skipjack tuna may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid, and crustacean species make the SCB during warm years a suitable feeding habitat for adult skipjack tuna.

- Eggs and Larvae: No habitat within the U.S. West Coast EEZ.
- Juvenile: No habitat within the U.S. West Coast EEZ.
- Adult (~56 cm FL): Oceanic, epipelagic waters from the U.S.-Mexico border northward to Point Conception, CA (34° 34' N) out to the U.S. EEZ boundary. Pelagic red crab, northern anchovy, Euphausiids, Pacific saury, and squid are important components of their diets.

~~Based on California drift gill drift net observer data (1990-1999); California Commercial Passenger Fishing Vessel data; Matsumoto et al. (1984) and IATTC (2001). Diet information based largely on Alverson (1963).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~
- ~~Juvenile - No habitat within the U.S. West Coast EEZ.~~
- ~~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 1000 fm isobath north to about 40° N latitude. Associated with SSTs between 18°C and 20°C and dissolved oxygen level ≥ 3.5 ppm. Habitat concentrated, esp. in warm years, in the Southern California Bight primarily south of 33° N latitude. Off Baja California, Mexico and southern California, pelagic red crab and northern anchovy are important constituents of the diet. Euphausiids, Pacific saury, and squid are also taken.~~

7.2.8 Yellowfin Tuna

Yellowfin tuna EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. Based on landings data and information on size at maturity for Baja California, Mexico, the majority of fish occurring in the U.S. EEZ are immature although a small percentage may be adults. Yellowfin tuna EFH includes oceanic, epipelagic waters from the U.S.-Mexico border north to Point Conception, CA (34° 34' N), seaward of the 12 m depth contour. While yellowfin tuna may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid, and crustacean species make the SCB a suitable feeding habitat for yellowfin tuna.

- Eggs and Larvae: No habitat within the U.S. West Coast EEZ.

Juvenile and Adults (>35 cm): Oceanic, epipelagic waters from the U.S.-Mexico EEZ border north to Point Conception, CA (34° 34' N) out to the U.S. EEZ. Pelagic red crab is an important constituent of the diet in southern California (warm water years), as well as northern anchovy, Pacific Jack, sardine, and squid species.

~~Based on California Commercial Passenger Fishing Vessel data; drift gill net observer data (1990-1999); Uosaki and Bayliff (1999); Block et al. (1997); IATTC (1990; 2000); Schaefer (1998); N. Bartoo (SWFSC, NMFS, La Jolla, CA pers. comm.). Diet information based largely on Alverson (1963).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~
- ~~Juvenile - females: < 92 cm FL; males: < 69 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 Pt 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. Pelagic red crab is an important constituent of the diet off the west coast of Baja California, Mexico, and southern California (warm water years), and, secondarily, northern anchovy. Cephalopods also occur in the diet less frequently.~~
- ~~Adult - ≥ females: 92cm FL; males: ≥ 69 cm FL. Adult yellowfin tuna do not regularly occupy habitat within the U.S. West Coast EEZ.~~

7.2.9 Striped Marlin

Striped marlin EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. Based on catch data the majority of fish landed in the U.S. EEZ are adults. EFH for striped marlin includes oceanic, epipelagic waters of the SCB, from the U.S.-Mexico EEZ border to around Point Conception, CA (34° 34' N) seaward of the 12 m depth contour. While Striped marlin may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The relatively warmer temperature, high productivity and presence of diverse fish, squid and crustacean species make the SCB a suitable foraging habitat for adult striped marlin.

- Eggs, Larvae and Juveniles: No habitat within the U.S. West Coast EEZ.

- Subadult (males < 144 cm EFL; females <160 cm EFL): Based on landings data and the size at first reproduction few subadult striped marlin are expected in the U.S. EEZ.

- Adult (males > 144 cm EFL; females >160 cm EFL): Oceanic, epipelagic waters of the SCB, from the U.S.-Mexico EEZ border to around Point Conception CA (34° 34' N) and out to the U.S. EEZ. Diets off California include a range of fish, squid and crustaceans including Pacific saury, northern anchovy, Pacific sardine, jack mackerel, squid, and pelagic red crab.

~~Based on Uosaki and Bayliff (1999); California drift net observer data (1990-1999 and angler tag-release data (D. Holts and D. Prescott, pers. comm. NMFS, SWFSC, La Jolla, CA), and diet information from Hubbs and Wisner (1953), Nakamura (1985), Ueyanagi and Wares (1975), and Holts (2001).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~
- ~~Juvenile - No regular habitat within the U.S. West Coast EEZ.~~
- ~~Adult - > 150 cm EFL or 171 JFL. Oceanic, epipelagic waters of the Southern California Bight,~~

~~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 (a line from South Point, Santa Rosa Island, southeast to the EEZ boundary at approx. 31° 36' N. latitude and 118° 45' W. longitude). Preferred water temperature bounded by 68° to 78°F (20-25°C). Food species off California include Pacific saury, northern anchovy, Pacific sardine, jack mackerel, squid, and pelagic red crab.~~

7.2.10 Swordfish

Swordfish EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. The EFH including adults and subadults includes the entire U.S. EEZ seaward of the 12 m depth contour. While broadbill swordfish may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The high productivity and presence of diverse fish, squid, and crustacean species make the California Current a suitable habitat for feeding and growth to maturity for swordfish.

- Eggs and Larvae: No habitat within the U.S. West Coast EEZ.

- Juvenile (males <102 EFL or 118 cm LJFL; females <144 cm EFL or <163 LJFL): Oceanic, epipelagic, and mesopelagic waters from the U.S.-Mexico EEZ border north to 41° N latitude and out to the U.S. EEZ. Diet is thought to be largely opportunistic on suitable-sized prey. In the SCB, swordfish feed on jumbo squid, *Boreopacific gonate,* Barracudinas, market squid, Pacific hake, northern anchovy, and myctophids.

- Adult (males > 102 cm EFL or 117 LJFL; females > 144 cm EFL or 162 LJFL): Oceanic, epipelagic and mesopelagic waters from the U.S.-Mexico border to the U.S.-Canadian border and out to the U.S. EEZ. Large swordfish feed on similar prey as the smaller size group but jumbo squid, Gonatus spp., Luvar and Pacific hake are significantly more important.

~~Based on California drift gill net observer data (1990-1999); Oregon driftnet logbook data , 1991-2001; and DeMartini et al. (2000); diet information from Fitch and Lavenberg (1971) Mearns et al. (1981) and Sosa-Nishizaki (1998).~~

- ~~Eggs and Larvae - No habitat within the U.S. West Coast EEZ.~~
- ~~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 Southern California Bight 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 fathom isobath westward to the EEZ outer boundary and northward to 41° N. latitude. Food species within the U.S. West Coast EEZ have not been documented for this size category. Diet is thought to be largely opportunistic on suitable-sized prey. Off southern California, swordfish of unspecified size are reported to feed on Pacific hake, northern anchovy, squid, Pacific hake, jack mackerel, and shortbelly rockfish; squids are also important prey off western Baja California, Mexico.~~
- ~~(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. latitude. Food species within the U.S. West Coast EEZ have not been documented for this size category. Off southern California, swordfish of unspecified size are~~

~~reported to feed on Pacific hake, northern anchovy, squid, Pacific hake, jack mackerel, and shortbelly rockfish; squids are also important prey off western Baja California, Mexico. Large swordfish are capable of foraging in deep water and may also feed on mesopelagic fishes.~~

7.2.11 Dorado or Dolphinfish

Dolphinfish EFH is defined using a combination of data sources described in Appendix F as well as expert opinion. The EFH for dolphinfish includes the epipelagic and oceanic waters from the U.S.-Mexico border to Point Conception, CA (34° 34' N) seaward of the 12 m depth contour. While dolphinfish may occur in shallow water <12 m, they occur primarily in deeper waters and these shallow regions including bays and estuaries are not considered essential. The relatively warmer waters, high productivity, and presence of diverse fish, squid, and crustacean species make the SCB a suitable feeding for adult dolphinfish.

- Eggs, Larvae and Small Juveniles (<13.7 cm FL): Eggs and Larvae - No habitat within the U.S. West Coast EEZ. Occurrence of larvae is rare.

- Juveniles and Subadults (> 13.6 cm FL and < 35 cm FL): Based on the size composition of landings data, juveniles and subadults would be rare in the U.S. EEZ.

- Adults (>35 cm FL): Epipelagic and oceanic waters from the U.S.-Mexico border to Point Conception, CA (34° 34' N) and out to the U.S. EEZ. Flying fishes, epipelagic cephalopods, tetraodontiform fishes, and several mesopelagic fishes are important prey species.

~~Based on California Commercial Passenger Fishing Vessel catches; Norton (1999); and Ambrose (1996). Diet information based on Eschmeyer et al. (1983) and Palko at al. (1982).~~

- ~~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 (Ambrose 1996).~~
- ~~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. latitude) 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. latitude and 118° 45' W. longitude). Prefers sea surface temperatures 20°C and higher during warm water incursions. Nothing documented on the diet of juvenile dolphin within the EEZ; presumably feeds on other epipelagic fishes (e.g, small flying fish), crustaceans, and squids.~~
- ~~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. latitude) 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. latitude and 118° 45' W. longitude). Prefers sea surface temperatures 20°C and higher during warm water incursions. Nothing is known of the diet of adult dolphin within the U.S. EEZ, but in the Pacific, adult common dolphin are reportedly mainly piscivorous, with flying fish being the most important in volume and occurrence.~~

7.3 Habitat Areas of Particular Concern (HAPCs)

The EFH regulations encourage the Councils to identify specific types or discrete areas of habitat within EFH as HAPCs, based on one or more of the following considerations:

1. the importance of the ecological function provided by the habitat.
2. the extent to which the habitat is sensitive to human-induced environmental degradation.
3. whether, and to what extent, development activities are, or will be, stressing the habitat type.
4. the rarity of the habitat type.

The goal of identifying HAPCs is to provide additional focus for conservation efforts. While the HAPC designation does not add any specific regulatory process, it highlights certain habitat types that align with one or more of the considerations listed above. HAPCs should be spatially discrete, with clearly defined geographic boundaries. Councils may implement conservation actions such as time/area closures, gear restrictions, or other mechanisms to protect designated HAPCs, and a HAPC designation helps inform EFH consultations in which federally permitted projects with potential adverse impacts to HAPC are more carefully scrutinized during the consultation process on non-fishing activities.

HAPCs were considered but not adopted when the HMS FMP was originally approved. Habitats such as shark pupping grounds, nursery areas, and migratory routes were considered as potential HAPCs during the 2023 EFH review, and ultimately not recommended for inclusion. There are no HAPCs designated at this time, but through this FMP, a framework is authorized to ensure review and updating of EFH based on new scientific evidence or other information as well as incorporation of new information on HMS HAPCs as it becomes available in the future.

~~Reviewing and identifying HAPCs would entail additional management costs and an increase in data needs to survey and determine HAPC (such as shark pupping grounds), and for periodically reviewing and updating EFH designations. But incorporating a framework should save costs in the long run by avoiding the necessity of having to go through the amendment process every time new data necessitated revision. There may be some inconsistency with the Western Pacific FMP, which has a different type of framework relating to EFH, but the WPFMC management area also has regional differences in habitat utilization and a different plan development design and history.~~

Research is needed to identify HAPCs, such as shark pupping grounds, key migratory routes, feeding areas, and areas of concentration of large adult females. ~~The Council recommends adoption of EFH designations as presented without identification of HAPCs at this time, because of lack of information on specific habitat dependencies for species that may occupy critical habitat in the EEZ, such as the more coastal-occupying sharks.~~ Some of the more transitory MUS that invade the region only at the far fringes of their distributions (e.g., the tropical tunas and dorado), probably do not occupy habitats within the EEZ essential to the health and survival of their populations. If HAPCs of these species, and those of others that have more regional distributions, become identified in the future (such as shark pupping or nursery areas~~ of thresher and mako sharks~~), the Council should consider management actions to protect those habitats. ~~it is recommended that the Council make every effort to protect them, especially if found to be concentrated in localized definable areas.~~

7.4 Effects of Fishing Activities on Fish Habitat

Section 600.815(a)(2) of the final rule lists the mandatory contents of FMPs regarding fishing activities that may adversely affect EFH. The adverse effects from fishing activities may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. FMPs must include management measures which minimize adverse effects on EFH from fishing, to the extent practicable, and identify conservation and enhancement measures. FMPs must also contain an assessment of the potential adverse effects of all fishing activities in waters described as EFH. In completing this assessment, councils should use the best scientific information available, as well as other appropriate information sources, as available. This assessment should consider the relative impacts of all fishing gears and practices used in EFH on different types of habitat found within EFH. The assessment should also consider the establishment of research closure areas and other measures to evaluate the impact of any fishing activity that alters EFH.

Councils must act to minimize, prevent, or mitigate any adverse effects from fishing activities, to the extent practicable, if there is evidence that a fishing activity ~~is having an identifiable adverse effect on EFH~~ adversely affects EFH in a manner that is more than minimal and not temporary in nature. In determining whether it is practicable to minimize an adverse effect from fishing, councils should consider whether, and to what extent, the fishing activity is adversely impacting EFH, including the fishery; the nature and extent of the adverse effect on EFH; and whether the management measures are practicable, taking into consideration the long- and short-term costs and benefits to the fishery and EFH, along with other appropriate factors, consistent with National Standard 7 (conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication).

In general, fishing gear deployed in the ocean water column is not known to directly affect or alter HMS water column habitat, and any adverse impacts to HMS EFH from the presence of deployed fishing gear would be considered minimal and temporary. This would apply to other lost gear (light sticks, buoys, etc.) as well. However, habitat can be affected by inadvertent loss of gear that is left to "ghost fish," or to create marine debris that can cause harm to other species. Other potential impacts to HMS EFH include discharge of processing waste (offal) and the removal of prey species, both of which could decrease the quality of HMS EFH. These are described further below.

~~In general, fishing gear is not known to directly alter HMS water column habitat, but habitat can be affected by inadvertent loss of gear that is left to "ghost fish," or to create marine debris that can cause harm to other species in the pelagic environment (e.g., light sticks from swordfish longlining are known to be mistaken for food by abatrosses). Also, fishing activities also affect the water column through discharge of offal from fish processed at sea. These discards may redistribute prey food or attract bycatch and protected species, which then become susceptible to capture or entanglement by the gear.~~

~~Fishing activity can also cause harm when it takes place in areas where HMS congregate and are thus highly susceptible to capture during a critical life history period, e.g., when they form spawning/pupping aggregations, when adults are concentrated inshore during seasonal migration, or when young are concentrated in core nursery areas.~~

7.4.1 Impacts of Fishing Activities and Gear ~~Physical Impacts of Fishing Gears~~ on HMS EFH

HMS fisheries are associated with hydrographic structures of the water column (e.g., the marine pelagic and mesopelagic zone and convergence boundary areas between currents and major features such as the thermocline). Thus the approved gears that are used in the HMS fisheries do not contact the bottom substrate; therefore, the only opportunity for damage to benthos or EFH for any species in fishing for HMS is from lost gear. The quality of HMS EFH in the water column could potentially be degraded due to the presence of derelict gear if the impact is more than minimal and not temporary. Although derelict gear could degrade the quality of benthic habitat, the benthos is not considered EFH for HMS species. If gear is lost, diligent efforts should be made to recover the lost gear to avoid further disturbance of the underwater habitat through "ghost fishing." Under Federal law, it is illegal for any vessel to discharge plastics or garbage containing plastics into any waters, but plastic buoys, light sticks, monofilament line and netting, and other plastic items have been known to enter the system from fishing operations, mostly as a result of damage to gear. The full extent of this problem in our HMS fisheries is not known but is unlikely to have more than a minimal ~~not thought to have a significant~~ impact on HMS EFH because of the agility of these large pelagic species in avoiding debris in the open ocean, and the tendency of at least some of this material to sink to the bottom, and the relatively inert nature of plastic. Non-HMS fisheries and non-MSA managed fisheries also operate in Pacific Coast waters but are similarly unlikely to have more than a minimal effect on HMS EFH. ~~These materials may have a far greater impact on benthic and intertidal environments, or on seabirds and turtles which may ingest floating plastics mistaking them for food. Intact sections of gillnets have the potential to continue fishing in the pelagic environment for some time. When high seas squid nets were operating in the Pacific, NMFS estimated in 1991 that 0.06% of driftnets were lost each time they were set (Davis 1991).~~

It has been reported that lost and discarded sections of driftnet ball up fairly quickly and cease to ghostfish in a short period of time (Mio, *et al.* 1990), but these loose balls may trail streaming sections of net that may continue to fish for extended periods (Ignell, *et al.* 1986; Von Brandt 1984). It is most likely, however, that HMS, particularly tunas and billfish, are less vulnerable to the ghost fishing effects of streaming sections of netting than are less mobile or scavenging species which may blunder into the net (e.g. *Mola mola*) or become entangled in attempts to feed on remains of the catch (e.g. seabirds and pinnipeds). Nonetheless, sharks may be more vulnerable, and blue shark and pelagic hammerhead shark have been reported as caught in four sections of derelict squid driftnet retrieved by U.S. observers in 1985 (Ignell, *et al.* 1986).

~~There are other fishery operations off the Pacific coast which may alter species complexity in the water column. There is a large mid-water trawl fishery for Pacific whiting, primarily occurring north of 39° N. latitude.~~ Discharge of offal and processing slurry may affect EFH for HMS. Prolonged offal discards from some large-scale fisheries have redistributed prey food away from mid-water and bottom-feeding organisms to surface-feeding organisms, such as tuna, usually resulting in scavenger and seabird population increases. Offal discards in low-current environments can collect and decompose on the ocean floor, creating anoxic bottom conditions which may affect HMS. Pacific coast marine habitat is generally characterized by strong current and tide conditions, but there may be either undersea canyons affected by at-sea discard, or bays and estuaries affected by discard from shoreside processing plants. As with bottom trawling off the Pacific coast, little is known about the environmental effects of mid-water trawling and processing discards on habitat conditions. The Environmental Protection Agency (EPA) prohibits seafood processor vessels from discharging seafood processing waste in nearly 3,770 square miles of Federal waters off Oregon and Washington because of the potential for high-volume, oxygen-consuming organic waste to exacerbate hypoxia in the region (EPA NPDES Permit No. WAG520000).

The presence of prey species can contribute to waters functioning as feeding habitat, and thus the removal of prey species could conceivably affect the quality of HMS EFH. HMS species feed on a broad range of prey including fish, squid and crustaceans (Preti 2020). Prey can include anchovy, jack mackerel, Pacific hake, flatfishes, spiny Dogfish (*Squalus acanthias*), rockfishes, squids and pelagic crustaceans including euphausiids (Tricas 1979; Harvey 1989; Brodeur et al. 1987, Preti 2020). The removal of prey species by HMS fishing, other MSA-managed fishing, and non-MSA managed fishing could conceivably reduce the quality of HMS EFH. Purse seine fisheries managed under the Council's CPS FMP capture Pacific sardine, northern anchovies, Pacific mackerel, squid, and other species that serve as HMS prey. Several species captured in the directed Pacific Coast groundfish fishery or as bycatch are included in the suite of HMS prey species. Fisheries not managed under the Magnuson Act (e.g., state-managed shrimp fisheries) also capture HMS prey species, in the directed fishery or as bycatch. However, as indicated by Figure 7 below, the vast majority of HMS prey species are not under Federal or state management and thus would not be subject to fishery management measures.

The EFH literature search and review produced no information indicating that fishing adversely affects

HMS EFH via removal of HMS prey species and HMS in this FMU are known to be opportunistic feeders and switch prey. In addition,

7.4.2 Mitigation Considerations for Fishing Effects

Fishery management options to prevent, mitigate, or minimize adverse effects from fishing activities may include, but are not limited to:

Fishing gear restrictions: Seasonal and areal restrictions on the use of specified gear; gear modifications to allow escapement of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on anchoring or setting gear in sensitive areas; and prohibitions on fishing activities that cause significant physical damage in EFH.

Time/area closures: Closing areas to all fishing or specific gear types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages.

Harvest limits: Limits on the take of species that provide structural habitat for other species assemblages or communities, and limits on the take of prey species.

Compliance and Enforcement of Marine Pollution Laws: Fishers are required to save light sticks for disposal on land as required by the International Convention of the Prevention of Pollution from Ships, or MARPOL established in 1973. Annex V of the Protocol deals with plastics and garbage disposal from ships and prohibits dumping of all ship-generated plastics. The Coast Guard is in charge of enforcing MARPOL Annex V within the U.S. EEZ. All vessels, regardless of nationality, are bound by these MARPOL restrictions within the territorial waters of the treaty nations. In addition, vessels should ensure compliance with EPA NPDES permits for fish processing waste discharge.

~~Compliance and Enforcement of Seabird Mitigation Measures Related to Strategic Offal Discards: This includes, but is not limited to, strategic release of offal from vessels to distract seabirds and other protected species away from longline hooks during setting and retrieval.~~

~~There is an increasing amount of research to measure the effects of fishing activities on marine habitat, and some general conclusions about the effects of some gear types on marine habitat may be drawn from this research. However, as noted above, there has been little research on Pacific coast fisheries EFH and into the fishing effects on such habitat, especially HMS EFH, which is generally less associated with the sea bottom topography and inshore waters, as the habitats of most other species managed by the Council. Implementing measures to mitigate gear impacts on habitat may require research that specifically describes the effects of the fishing gear used in Pacific coast fisheries on marine habitat utilized by HMS. The Council may weigh the magnitude of this potential impact and develop appropriate recommendations for addressing them.~~

~~In addition to suggesting measures to restrict fishing gears and/or methods, NMFS' regulatory guidance on EFH also suggests time/area closures as possible habitat protection measures. These measures might include, but would not be limited to: closing areas to all fishing or specific gear types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages (e.g., to protect early life stages of sharks). Some of these closures may already exist, such as the exclusion of trawling within three miles of the California coastline and areas closed to commercial fishing (e.g., Santa Monica Bay). The Council may examine whether such opportunities exist for HMS and make appropriate recommendations for addressing them. The proposed action to require West Coast-based high seas~~

~~longliners to abide by the same regulations restricting the targeting of swordfish north of the equator west of 150° W. longitude will undoubtedly reduce significantly the number of lightsticks that may be inadvertently lost during fishing operations, since this gear is primarily used in swordfish longlining.~~

~~Beyond protecting natural reserves and areal closures for particular species, the Council may consider creating marine reserves closed to all fishing, should certain critical habitat areas be identified in the future, although it is recognized that most HMS move widely throughout and beyond the EEZ and reserves tend to be more practical for more sedentary species. Several no-fishing zones have been created in the North Pacific Fishery Management Council for the waters off Alaska, generally for the purposes of protecting either crab or marine mammal rookeries.~~

~~Additional research is recommended to identify adverse impacts and to quantify impacts currently occurring. Any inshore areas that are closed to fishing in order to conserve pupping and juvenile habitats would be ideal locations to study the effects of fishing gear impacts on EFH. Research in these areas is strongly advocated, and further evaluations of fishing impacts on HMS habitat will be undertaken as more research is conducted and information becomes available. Information will be reviewed annually to assess the state of knowledge in this field; the annual SAFE report (see section 3.4) will include any new information on the impacts of fishing activities on HMS EFH.~~

In considering mitigation measures to minimize impacts to EFH, the Council should include potential impacts to EFH identified and described under other Council FMPs. Research to identify and evaluate potential impacts to HMS EFH from fishing activities is recommended. This may be particularly important to protect EFH for specific HMS life stages, such as nursing and pupping grounds for sharks.

7.4.3 Findings

The most recent review of HMS EFH produced ~~As of this writing (January 16, 2003), there is~~ no evidence that HMS fishing practices or gear adversely affect EFH in a manner that is more than minimal in nature. ~~are causing identifiable adverse impacts on HMS EFH, or that other FMP fishing practices are causing identifiable adverse effects on HMS EFH~~. Therefore, the West Coast HMS FMP meets the MSA requirement to minimize to the extent practicable, the adverse effects of fishing on EFH, and no minimization measures are warranted. ~~further action is recommended at this time.~~

7.5 Effects of Non-fishing Activities on Fish Habitat

Section 600.815(a)(4) of the EFH regulations pertains to identifying non-fishing related activities that may adversely affect EFH. The section states that FMPs must identify activities that have the potential to adversely affect, directly or cumulatively, EFH quantity or quality, or both. Broad categories of activities which can adversely affect EFH include, but are not limited to: dredging, filling, excavation, mining, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. For example, Sheehan and Tasto (2001) provide a good summary of various sources of impairment of water quality and habitats in California waters. FMPs should describe known and potential adverse impacts to EFH. These descriptions should explain the mechanisms or processes that may cause adverse effects and how these may affect habitat function. A Geographic Information System (GIS) or mapping system should be used to support analyses of data and to present these data in an FMP in order to geographically depict impacts identified in this paragraph.

The MSA requires Federal agencies undertaking, permitting, or funding activities that may adversely affect EFH to consult with NMFS. Under section 305(b)(4) of the MSA, NMFS is required to provide EFH conservation and enhancement recommendations to Federal and state agencies for actions that adversely affect EFH; however, state agencies and private parties are not required to consult with NMFS. EFH consultations will be combined with existing interagency consultations and environmental review procedures that may be required under other statutes, such as the Endangered Species Act, Clean Water Act, the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Federal Power Act, or the Rivers and Harbors Act.

EFH consultation may be at either a broad programmatic level or project-specific level. Programmatic is defined as "broad" in terms of process, geography, or policy (e.g., "national level" policy, a "batch" of similar activities at a "landscape level", etc.). Where appropriate, NMFS will use a programmatic approach designed to reduce redundant paperwork and to focus on the appropriate level of analysis whenever possible. The approach would permit project activities to proceed at broad levels of resolution so long as they conform to the programmatic consultation. The wide variety of development activities over the extensive range of EFH, and the MSA requirement for a cumulative effects analysis warrants this programmatic approach.

The following are general descriptions of non-fishing activities which may directly or cumulatively, temporarily or permanently, threaten the physical, chemical, and biological properties of the habitat utilized by HMS and/or their prey. The direct result of these threats is that EFH may be eliminated, diminished, or disrupted. The list includes common activities with known or potential impacts to EFH; it is not prioritized nor is it to be considered all-inclusive. However, the potential adverse effects described below do not necessarily apply to the described activities in all cases, as the specific circumstances of the proposed activity or project must be carefully considered on a case-by-case basis. Furthermore, some of the activities described below may also have beneficial effects on habitat, which need to be considered in any analysis.

Non-fishing related effects on EFH for HMS may not be as adverse relative to other EFH types, because adults and juveniles are highly mobile, and all life stages are pelagic (in the water column near the surface and not associated with substrate) and dispersed in a wide band along the West Coast. Table 7-1 summarizes the potential adverse impacts of these non-fishing activities and conservation/enhancement measures to minimize those effects.

7.5.1 Description of Non-fishing Activities

This section describes several non-fishing activities that may adversely affect HMS EFH and provides conservation recommendations. A NMFS White Paper (Kiffney et al. 2022; NMFS-NWFSC-WP-2022-01) identifies a wide range of non-fishing activities and is incorporated by reference into the HMS FMP.

Although not described in detail here, offshore wind (OSW) energy planning and development is a prominent renewable energy national initiative. Floating OSW is the most likely design for such facilities on the U.S. West Coast. Potential adverse impacts include loss and alteration of habitat; sedimentation, siltation, and turbidity; direct impacts to marine biota; alteration of magnetic fields; and noise effects. OSW facilities require cables connecting individual turbines (inter-array cables) and transmission cables connected to the shore, both of which have potential impacts to benthic biogenic habitats. Numerous conservation measures should be considered related to OSW installation and operation. These include avoiding HAPC or other sensitive habitats, burying cables at sufficient depths to minimize impacts, conducting pre-construction and operation monitoring for impacts to species, electromagnetic effects on aquatic organisms, and minimizing noise effects. These potential impacts and conservation measures are more fully described in Kiffney et al. (2022).

Dredging

Dredging navigable waters has a periodic impact on benthic and adjacent habitats during construction and operation of marinas, harbors and ports. Periodic or constant dredging is required to maintain or create ship (e.g., ports) and boat (e.g., marinas) access to docking facilities. Dredging is also used to create navigable channels or to maintain existing channels which periodically fill with sediments from rivers, or transported by wind, wave, and tidal processes. In the process of dredging, large quantities of the seafloor are removed, disturbed, and resuspended and the biological characteristics of the seafloor are changed, and turbidity plumes may arise.

Dredging events using certain types of dredging equipment can result in increased levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column habitat utilized by HMS. These turbidity plumes of suspended particles may reduce light penetration and decrease the rate of photosynthesis, and lower the primary productivity of an aquatic area if suspended for variable periods of time. HMS may suffer reduced feeding ability if suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particles in the material may become biologically available to organisms either in the water column or through food chain processes.

Dredging, as well as the equipment used in the process (e.g., pipelines), may damage or destroy spawning, nursery habitat, and other sensitive areas important to HMS, particularly sharks, or the habitat of coastal pelagic forage fish and invertebrates that are important prey of HMS. Within bays and harbors, dredging may also modify current patterns and water circulation of the habitat by changing the direction or velocity of water flow, or otherwise changing the dimensions of the water body potentially utilized by HMS.

Dredged Material Disposal/Fills

The disposal of dredged materials resulting from dredging operations or the use of fill material in the development of harbors results in sediments (e.g., dirt, sand, mud) covering or smothering existing substrates. Usually these covered sediments are of a soft-bottom nature as opposed to rock or hard-bottom substrates.

The disposal of dredged or fill material can result in varying degrees of change in the physical, chemical, and biological characteristics of the substrate. Subsequent erosion or lateral displacement of such deposits can also adversely affect the substrate outside the perimeter of the disposal site by changing or destroying benthic habitat. The amount and composition of the discharged material and the location, method, and timing of discharges may all influence the degree of impact on potential HMS EFH or that of HMS prey species. The discharged material can also alter the chemistry of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form.

The discharge of dredged or fill material can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column thereby affecting HMS. These suspended particles may reduce light penetration and decrease the rate of photosynthesis and lower the primary productivity of an aquatic area if suspended for lengthy intervals. HMS or their prey may suffer reduced feeding ability leading to limited growth and reduced resistance to disease if high levels of suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particles in the material may become biologically available to organisms either in the water column or through food chain processes.

Fossil Fuel Production and Exploration

Oil exploration/production occurs at a wide range of water depths and usually over soft-bottom substrates, although hard-bottom habitats may also be present in the general area. Oil exploration/production areas are vulnerable to an assortment of physical, chemical, and biological disturbances as oil and gas deposits are located using high energy seismic surveys. EFH may be disrupted by the use and/or installation of anchors, chains, drilling templates, dredging, pipes, and platform legs. During actual operations, chemical contaminants may also be released into the aquatic environment.

The impacts of oil exploration-related seismic energy release may interrupt and cause HMS to disperse, which may disrupt feeding. Exploratory activities may also result in resuspension of fine-grained mineral particles, usually smaller than silt, in the water column. These suspended particles may reduce light penetration and decrease the rate of photosynthesis and lower the primary productivity of the aquatic area especially if suspended for lengthy intervals. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

The discharge of oil drilling muds can change the chemistry and physical characteristics of the receiving water at the disposal site by introducing toxic chemical constituents thereby potentially affecting HMS EFH. Changes in the clarity and the addition of contaminants can reduce or eliminate the suitability of water bodies for habituation by fish species and their prey.

Water Intake Structures

Withdrawing ocean water through the use of offshore water intake structures is a common occurrence coastwide. Water may be withdrawn to provide cooling water for coastal power generating stations or as a source of potential drinking water as in the case of desalinization plants. If not properly designed, these structures may create unnatural and vulnerable conditions to various fish life stages and their prey. Various life stages of HMS can be affected by water intake operations by entrapment through water withdrawal, impingement on intake screens, and entrainment through the heat-exchange systems or discharge plumes of both heated and cooled effluent.

Aquaculture

The culture of marine and freshwater species in coastal areas can reduce or degrade the habitats used by native stocks. The location and operation of these facilities will determine the level of impact on the marine environment.

A major concern of aquaculture operations is the discharge of organic waste from the farms. Wastes are composed primarily of feces and excess feed, and the buildup of waste products into the receiving waters depends on water depths and circulation patterns. The release of these waters may introduce nutrients or organic materials into the surrounding water body and lead to a high biochemical oxygen demand which may reduce dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms in the area. Net effects to HMS may be either positive or negative.

Aquaculture operations also have the potential to release high levels of antibiotics and disease, as well as allowing cultured organisms to escape into the environment. These events have unknown but potential adverse impacts on fish habitat.

Wastewater Discharge

The discharge of point and non-point source wastewater from activities including municipal wastewater treatment plants, power generating stations, industrial plants (e.g., pulp mills, desalination plants) and storm drains into open ocean waters, bays, or estuaries can introduce pollutants detrimental to estuarine and marine habitats. These pollutants include pathogens, nutrients, sediments, heavy metals, oxygen-demanding substances, hydrocarbons, and other toxins. Historically, wastewater discharges have been one of the largest sources of contaminants into coastal waters. However, wastewater discharges have been regulated under increasingly more stringent requirements over the last 25 years, while non-point source/stormwater runoff continues to be a significant remaining source of pollution to the coastal areas and ocean. Outfall-related changes in community structure and function, health, and abundance may result; many of these changes can be long-lasting.

Wastewater effluent and non-point source/stormwater discharges may affect the growth and condition of fish associated with wastewater outfalls when high contaminant levels (e.g., chlorinated hydrocarbons; pesticides; herbicides) are discharged. In addition, the high nutrient levels downcurrent of these outfalls may also be a concern. If contaminants are present, they may be absorbed across the gills or accumulate as a result of consuming contaminated prey. This is especially true for benthic-feeding fish frequenting wastewater discharge outfalls. Due to turbation, diffusion, and other upward transport mechanisms, buried contaminants may migrate to surface layers and become available.

Localized sources of pollution, which may affect HMS in bays and harbors along the coast, may not affect HMS stocks as a whole because HMS are distributed over large areas of the open coast and respond quickly to adverse changes in their environment by moving away.

The use of biocides (e.g., chlorine; heat treatments) or the discharge of brine as a byproduct of desalinization may reduce the suitability of water bodies for populations of fish species and their prey within the general vicinity of the discharge pipe. The impacts of chlorination and heat treatments, if any, are minimized as a result of their intermittent use and regulation pursuant to state and/or Federal national pollutant discharge elimination system (NPDES) permit requirements. These compounds may change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. In addition to chemical and thermal effects, discharge sites may adversely impact sensitive areas such as emergent marshes, seagrasses, and kelp beds if located improperly.

High discharge velocities may cause scouring at the discharge point as well as entrainment of particles with resulting turbidity plumes. Turbidity plumes may reduce light penetration and decrease the rate of photosynthesis and lower the primary production in an area if suspension persists. Fish may suffer reduced feeding ability, especially if suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

A significant portion of impacts to coastal waters may also be caused by non-point source pollution from agriculture and urban runoff. Other significant sources include faulty septic systems, forestry, marinas and recreational boating, physical changes to stream channels, and habitat degradation, especially the destruction of wetlands and vegetated areas near streams. Runoff can include heavy metals, pesticides, fertilizers, synthetic and petroleum hydrocarbons, and pet droppings. Unless proper management measures are incorporated, these contaminants can find their way into the food web through benthic infaunal communities and subsequently accumulate in numerous fish species.

Discharge of Oil or Release of Other Hazardous Substances

The discharge of oil or release of hazardous substances into estuarine and marine habitats, or exposure to a product of reactions resulting from such discharge can have both acute and chronic effects on fish resources and their prey.

Exposure to petroleum products and hazardous substances from spills or other unauthorized releases can also potentially reduce the marketability of target species. Direct contact with discharged oil or released hazardous substances (e.g., toxins; oil dispersants; mercury) or indirect exposure through from food chain processes can produce a number of biological responses in fish resources and their prey; these responses can occur in a variety of habitats including the water column, seafloor, bays, and estuaries. Chronic and large oil spills have a significant impact on fishery populations.

Mercury contamination of EFH is a potential concern because higher level predators such as HMS contaminated with this neurotoxin tend to accumulate mercury in their tissues either directly or through the food chain. Mercury is a natural occurring element, but an estimated two-thirds of environmental mercury is the result of human activities. It is a by-product of gold and zinc mining and the fossil fuel, solid waste management, and smelting industries. Other sources include cement plants and gasoline combustion. Primary sources of mercury in the U.S. are the combustion of fossil fuels (notably coal) and municipal waste incinerators. Like water, mercury can evaporate and become airborne, and because it is an element, does not break down into other substances. Once mercury escapes from the environment, it circulates in and out of the atmosphere into lakes and oceans. Harbor dredging can mix mercury contaminated sediments into the water column. Bacteria and chemical reactions in wetlands change mercury into a much more toxic form known as methylmercury. In this form it undergoes biomagnification toward the upper ends of the aquatic food chain, with HMS species such as swordfish and tunas at times known to exceed the 1 ppm action level of acceptability. State and Federal agencies now regulate industrial discharges of mercury, and mercury use in agriculture, to provide an increased margin of safety (R.J. Price. 1995. Mercury in Seafood. California Sea Grant College Program U.C.). Preventative measures include compliance with emission-related legislation to lower or eliminate incineration of mercury-bearing materials and industrial processes that promote removal of mercury from the waste stream. Little work has been done on the direct effect of mercury contamination on HMS except there is recent evidence that this toxin can effect the nervous system of fish by circumventing the blood-brain barrier that usually prevents toxins from entering the brain. Fish depend on their nervous systems to find food, communicate, migrate, orient themselves, and to recognize predators. In addition to uptake through the food chain, dissolved mercury is taken in by fish through their gills and dispersed by blood as it circulates through the body. (Environmental News Service 9/8/99 citing C. Rouleau, Environment Canada).

Other related issues include efforts to cleanup spills or releases that in themselves can create serious harm to the habitat. For example, the use of potentially toxic dispersants to break up an oil spill may adversely affect various life stages of HMS.

Coastal Development Impacts

Coastal development involves changes in land use by the construction of urban, suburban, commercial, and industrial centers and the corresponding infrastructure. Vegetated and open forested areas are removed to enhance the development potential of the land. Portions of the natural landscape are converted to impervious surfaces resulting in increased runoff volumes. Runoff from these developments include heavy metals, sediments, nutrients and organics, including synthetic and petroleum hydrocarbons, yard trimmings, litter, debris, and pet droppings. As residential, commercial, and industrial growth continues, the demand for water escalates. As ground water resources become depleted or contaminated, greater demands are placed on surface water through dam and reservoir construction or other methods of freshwater diversion. The consumptive use of redistribution of significant volumes of surface freshwater causes reduced river flows that can affect salinity regimes as saline waters intrude further upstream.

Development activities within watersheds and in coastal marine areas may impact fish habitat on both long-term and short-term scales. Runoff of toxins reduces the quality and quantity of water column and benthic EFH for HMS by the introduction of pesticides, fertilizers, petrochemicals, and construction chemicals (e.g., concrete byproducts, seals, and paints).

7.5.2 Mitigation Considerations for Non-Fishing Effects

Section 600.815(a)(6) of the EFH regulations states that FMPs must describe options to avoid, minimize, or compensate for the adverse effects and promote the conservation and enhancement of EFH. Generally, non-water-dependent actions should not be located in EFH if such actions may have adverse impacts on EFH. Activities which may result in significant adverse effects on EFH should be avoided where less environmentally harmful alternatives are available. If there are no alternatives, the impacts of these actions should be minimized. Environmentally sound engineering and management practices should be employed for all actions which may adversely affect EFH. Disposal or spillage of any material (dredge material, sludge, industrial waste, or other potentially harmful materials) which may destroy or degrade EFH should be avoided. If avoidance or minimization is not possible, or will not adequately protect EFH, compensatory mitigation to conserve and enhance EFH should be recommended. FMPs may recommend proactive measures to conserve or enhance EFH. When developing proactive measures, the Council may develop a priority ranking of the recommendations to assist Federal and state agencies undertaking such measures.

Established policies and procedures of the Council and NMFS provide the framework for conserving and enhancing essential fish habitat. This framework includes components to avoid and minimize adverse impacts; provide compensatory mitigation whenever the impact is significant and unavoidable; and incorporate enhancement. New and expanded responsibilities contained in the MSA will be met through appropriate application of these policies and principles. In assessing the potential impacts of proposed projects, the Council and NMFS are guided by the following general considerations:

- The extent to which the activity would directly and indirectly affect the occurrence, abundance, health, and continued existence of fishery resources.
- The extent to which the potential for cumulative impacts exists.
- The extent to which adverse impacts can be avoided through project modification, alternative site selection or other safeguards.
- The extent to which the activity is water dependent if loss or degradation of EFH is involved.
- The extent to which mitigation may be used to offset unavoidable loss of habitat functions and values.

The following activities have been identified as potentially, directly or indirectly, affecting the habitat utilized by all or some HMS: dredging, fills/dredge material disposal, oil/gas exploration/production, water intake structures, aquaculture, wastewater discharge, discharge of oil or release of hazardous substances, and coastal development. While we recognize that HMS, because of their more pelagic, oceanic and migratory habits, may be less vulnerable to coastal development and degradation than more coastal and benthic fishes, they are not immune. They may be indirectly affected by the disruption or tainting of key organisms within the food web upon which they depend; and being upper level predators, are also especially efficient at accumulating various toxins within their tissues. The following measures are suggested in an advisory, not mandatory, capacity as proactive conservation measures which would aid in minimization or avoidance of the adverse effects of these non-fishing activities on essential fish habitat.

Dredging

1. To the maximum extent practicable, new, as opposed to maintenance dredging, should be avoided. Activities which require dredging (such as placement of piers, docks, marinas, etc.) should be sited in deep water areas or designed in such a way as to alleviate the need for maintenance dredging. Projects should be permitted only for water dependent purposes, when no feasible alternatives are available. Open coast dredging and beach replenishment should be conducted in a manner that minimizes disruption of existing

surf grass beds, which provide habitat for certain HMS prey species.

2. Where the dredge equipment employed could cause significant long-term impacts due to entrainment of prey species, dredging in estuarine waters shallower than 20 feet in depth should be performed during the time frame when prey species are least likely to be entrained.

3. All dredging permits should reference latitude-longitude coordinates of the site so information can be incorporated into GIS for tracking cumulative impacts. Inclusion of aerial photos may also be required to help geo-reference the site and evaluate impacts over time.

4. Sediments should be tested for contaminants as per the Environmental Protection Agency and U.S. Army Corps of Engineers requirements to determine proper removal and disposal procedures.

5. The cumulative impacts of past and current dredging operations on EFH should be considered and described by Federal, state, and local resource management and permitting agencies and considered in the permitting process.

6. Where a dredging equipment type is used that is expected to create significant turbidity (e.g., clamshell), dredging should be conducted using adequate control measures to minimize turbidity.

Fills/Dredge Material Disposal

1. Upland dredge disposal sites should be considered as an alternative to offshore disposal sites. Fills should not be allowed in areas with subaquatic vegetation or other areas of high productivity. Surveys should be undertaken to identify least productive areas prior to disposal. Use of clean dredge material meeting Army Corps of Engineers and state water quality requirements for beach replenishment and other beneficial uses (e.g., creation of eelgrass beds/surf grass beds) is encouraged, but dredging itself must be carried out along the coast so as to have minimum impact on open coast surf grass beds, which provide habitat for certain prey species.

2. The cumulative impacts of past and current fill operations on EFH should be addressed by Federal, state, and local resource management and permitting agencies and considered in the permitting process.

3. Any disposal of dredge material in EFH should meet applicable state and/or Federal quality standards for such disposal.

4. When reviewing open water disposal permits for dredged material, state and Federal agencies should identify the direct and indirect impacts such projects may have on EFH. Benthic productivity should be determined by sampling prior to any discharge of fill material. Sampling design should be developed with input from state and Federal resource agencies.

5. The areal extent of the disposal site should be minimized. However, in some cases, thin layer disposal may be less deleterious. All non-avoidable, adverse impacts (other than insignificant impacts) should be fully mitigated.

6. All spoil disposal permits should reference latitude-longitude coordinates of the site so information can be incorporated into GIS systems. Inclusion of aerial photos may also be required to help geo-reference the site and evaluate impacts over time.

Oil/Gas Exploration/Production

1. Benthic productivity should be determined by sampling prior to any exploratory operations. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and Federal resource agencies.

2. Mitigation should be fully addressed for impacts.

3. Containment equipment and sufficient supplies to combat spills should be on site at all facilities that handle oil or hazardous substances.

4. Each facility should have a "Spill Contingency Plan" and all employees should be trained in how to respond to a spill.

5. To the maximum extent practicable, storage of oil and hazardous substances should be located in an area that would prevent spills from reaching the aquatic environment.

Water Intake Structures

1. New facilities which rely on surface waters for cooling should be located in areas of low productivity or areas not prone to congregating HMS and their prey. New discharge points should be located in areas which have low concentrations of living marine resources, or they should incorporate cooling towers that employ sufficient safeguards to ensure against release of blow-down pollutants into the aquatic environment in concentrations that exceed state and/or Federal limits established pursuant to state and/or Federal NPDES regulations.

2. All intake structures should be designed to minimize entrainment or impingement of prey species. Power plant intake structures should be designed to meet the "best technology available" requirements as developed pursuant to section 316b of the Clean Water Act.

3. Discharge temperatures (both heated and cooled effluent) should comply with applicable temperature limits established pursuant to state and/or Federal NPDES regulations.

Aquaculture Facilities

1. Facilities should be located in upland areas as often as possible. Tidally influenced wetlands should not be enclosed or impounded for mariculture purposes. This includes hatchery and grow-out operations. Siting of facilities should also take into account the size of the facility, the presence or absence or submerged aquatic vegetation, proximity of wild fish stocks, migratory patterns, and competing uses. Areas of high productivity should be avoided to the maximum extent possible.

2. Water intakes should be designed to avoid entrainment and impingement of fish species.

3. Water discharge should be treated to avoid contamination of the receiving water, and should be located only in areas having good mixing characteristics.

4. Where cage mariculture operations are undertaken, water depths and circulation patterns should be investigated and should be adequate to preclude the buildup of waste products, excess feed, and chemical agents.

5. Any net pen structure should have small enough webbing to prevent entanglement by prey species.

6. Measures should be taken to avoid escapement of farmed animals.

7. Mitigation should fully address all impacts.

Wastewater Discharge

1. New outfall structures should be placed offshore sufficiently far enough to prevent discharge water from impacting productive areas. Discharges should be managed to comply with applicable state and/or Federal NPDES permit requirements, including compliance with applicable technology-based and water quality-based effluent limits.

2. The establishment of management programs to address non-point source/stormwater pollution water quality issues on a watershed basis is supported and encouraged.

Discharge of Oil or Release of Hazardous Substances

1. Containment equipment and sufficient supplies to combat spills should be on-site at all facilities that handle oil or hazardous substances.

2. Facilities should have a "Spill Contingency Plan" where required by applicable local, state, Federal requirements, and employees identified in the plan as having responsibility for responding to a spill should receive appropriate training.

3. To the maximum extent practicable, storage of oil and hazardous substances should be located in an area which would prevent spills from reaching the aquatic environment.

Coastal Development Impacts

1. Prior to installation of any piers or docks, benthic productivity should be determined and areas with high productivity avoided. Sampling design should be developed with input from state and Federal resource agencies.

2. Fueling facilities should be equipped with all necessary safeguards to prevent spills. A spill response plan should be developed and gear necessary for combating spills should be located on site.

3. Filling of any aquatic areas should be curtailed as much as reasonably possible.

Table 7–1. Adverse non-fishing activities, impacts and conservation/enhancement measures for HMS EFH.

ACTIVITY	IMPACTS (Potential)	CONSERVATION MEASURES (Advisory)
1. Dredging	$ Bottom-dwelling organisms $ Turbidity plumes $ Toxins becoming biologically available $ Damage to sensitive habitats	$ Curtail/minimize new dredging activities as practicable $ Take actions to prevent impacts to flora/fauna $ Geo-reference all dredge sites $ Containment assays $ Address cumulative impacts $ Minimize turbidity

ACTIVITY	IMPACTS (Potential)	CONSERVATION MEASURES (Advisory)
2. Dredge Material Disposal/Fills	$ Bottom-dwelling organisms $ Turbidity plumes $ Toxins becoming biologically available $ Damage to sensitive habitats $ Loss of habitat function	$ Place dredge spoils upland if possible; avoid fills in productive areas $ Address cumulative impacts $ Meet applicable quality requirements for disposal of dredge material in EFH $ Identify direct and indirect impacts on EFH $ Minimize areal extent of the disposal site $ Geo-reference the site
3. Oil/Gas Exploration Production	$ Seismic energy release $ Discharge of exploratory drill muds and cuttings $ Resuspension of fine-grained mineral particles $ Composition of the substrate altered	$ Avoid areas of high productivity $ Provide mitigation $ On-site containment equipment $ Maintain "spill contingency plan" $ Keep oil and hazardous substances from reaching the aquatic environment
4. Water Intake Structures	$ Entrapment, impingement, and entrainment $ Loss of prey species	$ Locate new facilities away from productive areas $ Minimize entrainment or impingement of prey species per CWA 316(b) $ Discharge temperature to meet applicable discharge limits
5. Aquaculture	$ Discharge of pollutants from the facility $ Escapement	$ Minimize water/habitat quality impacts $ Avoid entrainment and impingement losses $ Treat and mix water discharges $ Preclude waste product buildup $ Prevent entanglement of prey species $ Prevent escapement $ Mitigate impacts
6. Wastewater Discharge	$ Wastewater effluent with high contaminant values $ High nutrient levels downcurrent of outfall $ Biocides to prevent biofouling $ Thermal effects $ Turbidity plumes $ Stormwater runoff	$ Avoid areas of high productivity with new discharge points $ Watershed management programs
7. Oil Discharge/ Hazardous Substances Release	$ Direct physical contact $ Indirect exposure resulting $ Cleanup $ Mercury Contamination	$ Maintain on-site containment equipment and supplies $ On-site "spill contingency plan" $ Prevent spills from reaching the aquatic environment $ Compliance with industrial mercury discharge standards
8. Coastal Development Impacts	$ Contaminant runoff $ Sediment runoff $ Filling of aquatic areas	$ Shoreline construction should avoid productive areas $ Prevent fuel spillage $ Curtail fills in estuaries, wetlands, and bays

7.5.3 Findings

Federal action agencies must consult with NOAA Fisheries regarding any of their actions authorized, funded or undertaken, or proposed to be authorized, funded or undertaken, that may adversely affect EFH.

For actions that were completed prior to the approval of these EFH designations for HMS, consultation is not required.

7.6 Summary

- ~~The proposed action is to adopt species- and stage-specific EFH designations for the thirteen~~ This chapter includes updated EFH information based on a review completed in 2023, for the 11 individual management unit species as described ~~in~~ above and Appendix F. EFH designations are based primarily on Level 1 (presence/absence) fishery-depending and fishery-independent data. ~~This FMP identifies and describes EFH for all MUS managed under this FMP based on available Level 1 and Level 2 data from the fisheries and from the literature on distribution and habitat preference. Some of these important habitat areas are already protected to some extent by regulatory season and area closures now in effect.~~
- No specific EFH impacts ~~problem areas~~ were identified at this time that could be addressed by fisheries management actions to protect and enhance EFH. After conducting a review ~~and analysis~~ of new and existing data on MUS' habitat and possible sources of impacts to ~~disturbance in~~ these habitats, the Council found no clear evidence of ~~significant~~ adverse impacts on HMS EFH that are more than minimal in nature. Thus no new ~~EFH~~ fishery management measures~~, and therefore no~~ or regulations are proposed.
- ~~At this time, there is no evidence that HMS fishing practices or non-fishing activities are causing adverse impacts on HMS EFH, although~~ This chapter includes updated information on non-fishing impacts and associated ~~EFH~~ conservation recommendations ~~are included~~ to mitigate the possible effects of these practices. It incorporates by reference numerous additional non-fishing impacts and associated conservation measures described in Kiffney et al. 2022.
- Current fisheries management measures to protect EFH ~~fishery habitat~~ appear to be adequate, but should future research demonstrate a need, the Council will act accordingly to protect habitat necessary to maintain a sustainable and productive fishery in the eastern Pacific region.
- No HAPCs have been designated at this time, but the FMP provides a framework which will ensure review and updating of EFH based on new scientific evidence or other information as well as incorporation of new information on HMS HAPCs as it becomes available in the future. The Council is authorized to proceed with establishing such a framework procedure for reviewing EFH and identifying HAPCs, particularly critical areas such as shark pupping and core nursery areas.

7.7 ~~Recommendations for EFH~~ Research and Information Needs

~~Very little specific information is known about the migratory corridors and habitat dependency of these large mobile fishes, how they are distributed by season and age throughout the Pacific and within the West Coast EEZ, and how oceanographic changes in habitat affect production, recruitment, and migration. More research is needed in these areas to better define EFH and HAPCs. Also, research is needed to identify specific shark habitat areas of particular concern, such as pupping grounds, key migratory routes, feeding areas, and areas of concentration of large adult female sharks. Pupping grounds and core nursery areas have not yet been identified and need further study. These areas may not only concentrate pups, but also the highly valuable pregnant females at certain times of the year. Reproductive female sharks, having run and survived the gauntlet of many years of natural and fishing mortality, are extremely valuable to the continued growth of their populations, and if concentrated in certain areas at pupping times, would be highly vulnerable to habitat perturbations. Of special relevance are thresher and mako shark pupping areas, the locations of which are currently unknown but must occur somewhere within the southern portion of the U.S. West Coast EEZ, judging from the presence of post-partum pups in the area (NMFS Driftnet Observer data; Bedford and Haugen 1992).~~

The EFH regulations state that FMPs should identify "*research and data needs for research efforts that the Councils and NMFS view as necessary to improve upon the description and identification of EFH, the identification of threats to EFH from fishing and other activities, and the development of conservation and enhancement measures for EFH*." The following are based on research needs contained in the HMS FMP and in the Council's Research and Data Needs database.

- Support efforts to better understand and describe the dynamic nature of HMS habitats, and the potential for shifts in both HMS and their prey in response to changing climate and oceanic conditions. Given that all HMS come to the U.S. EEZ to forage, understanding forage is critical to understanding HMS movements and distributions.

- Continue research that may help to identify important shark habitats such as pupping grounds, key migratory routes, feeding areas, prey species, and areas of concentration of large adult female sharks. Pupping grounds and core nursery areas have not yet been identified and need further study. These areas may not only concentrate pups, but also pregnant females at certain times of the year. This information may help to identify future HMS HAPCs.

- Support efforts to better understand the migratory corridors and habitat dependency, including benthic habitats, of HMS fishes, how they are distributed by season and age throughout the Pacific and within the West Coast EEZ, and how oceanographic changes in habitat and prey species availability affect production, recruitment, and migration. More research is needed in these areas to better define EFH and potential HAPCs.

- Support efforts to better understand the importance of deep-water canyons, offshore banks and seamounts to the various life stages of HMS stocks.

- Continue efforts to identify and evaluate potential impacts to HMS EFH from fishing activities, including efforts to quantify derelict gear in the fishery and assess its impact on the marine environment and other species.