

# **MANAGEMENT OF KRILL AS AN ESSENTIAL COMPONENT OF THE CALIFORNIA CURRENT ECOSYSTEM**

## **AMENDMENT 12 TO THE COASTAL PELAGIC SPECIES FISHERY MANAGEMENT PLAN**

### **ENVIRONMENTAL ASSESSMENT, REGULATORY IMPACT REVIEW & REGULATORY FLEXIBILITY ANALYSIS**

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SOUTHWEST REGION**

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### 3.3 Essential Fish Habitat

#### 3.3.1 MSA Requirements

Section 303(a)(7) of the MSA requires that FMPs describe and identify EFH, 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)).

NMFS has published regulations for implementation of the EFH requirements. These 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.

In sum, 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. 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.

The Council proposes that EFH be established consistent with option 2 below. The following discussion is provided to summarize the alternatives considered and presented to the public to solicit public comment.

### **3.3.2 Data Sources and Methods**

Data and information to describe krill EFH were obtained primarily from the scientific literature, as well as through consultation with krill researchers (Appendix A) and examination of data on geographic catch densities off California for the years 1950-2002 provided by E. Brinton and A. Townsend, SIO, Pelagic Invertebrates Collection (pers. comm., La Jolla, CA 6/6/2005). The majority of these data are level 1 data, where all that is known is where a species occurs based on distribution data for all or part of the geographic range of the species (presence/absence). Some preliminary data are also available on aerial densities of relative abundance (Level 2, see SIO reference above). Little is known of growth, reproduction or survival rates within habitats (Level 3); or habitat-dependent production rates quantified by habitat quantities, qualities and specific locations (Level 4).

### **3.3.3 Description and Analysis of EFH Alternatives: Proposed Action and Options Considered**

Option 1. Status Quo. Do not designate EFH.

Because Amendment 12 incorporated krill as a MUS in the CPS FMP; the option of not identifying EFH is not acceptable. The MSA requires designation of EFH for all MUS in FMPs.

Option 2. Adopt EFH as described below (Proposed Action)

The designation of essential habitat for krill is based on information about EFH for the two principal species. It was not possible at the time that this amendment was being developed to discern consistent differences in distribution of the various life stages, other than coastwide, the larvae of both species tend to occur closer to shore, often over the shelf. It is recommended that these designations be updated on final analysis and publication of the SIO 50-year time series of maps showing spatial densities of these and other euphausiid species in the CalCOFI sampling area (E. Brinton, SIO, unpub. data, personal commun. 6/8/05).

Isobaths (depth contours) are used below as outer boundaries of EFH, but only because they roughly approximate the outer bounds of reported densest concentrations of the populations, and because static boundaries are preferred for the legal definition of EFH. These contours also roughly form the outer boundaries of some of the major upwelling areas (though perhaps not some of the larger offshore jets), within which consistently high concentrations of phytoplankton occur (Fig. 15). The boundaries are not meant to imply the strict association of these highly dynamic macropktonic species with fixed bottom topography.

A review of the literature and available data on krill aggregating areas and reproductive swarms, with high densities of predators such as salmon, seabirds and large baleen whales, revealed certain krill-rich upwelling areas to be especially important. Dense krill swarms and predator aggregations are reported most consistently within the ocean boundaries of the following NOAA National Marine Sanctuaries (NMS): Olympic Coast NMS off Washington (Calambokidis 2004) and Cordell Bank NMS, Gulf of the Farallones NMS (Chess et al 1988; Smith and Adams 1988; Kieckhefer 1992; Schoenherr 1991; Adams 2001; Howard 2001) and Channel Islands NMS in California (Armsrong and Smith 1997; Fiedler et al. 1998; Croll et al 1998). (Fig. 14).

Additionally, the following other high-density krill and krill predator areas have been reported: Heceta Bank and Cape Blanco areas, Oregon (Ainley et al. 2005; Ressler 2005; Tynan et al 2005) and Bodega Canyon (Howard 2001). A confluence within these areas of rich, upwelled unstratified water and topological features such as submarine canyons, banks, and island shelves may not only provide rich feeding areas for krill, but may also contain features necessary for krill patches to be exploited by baleen whales, fish and seabirds, by concentrating and trapping krill over the shelf as they attempt to descend to the depths during the day (Chess et al. 1988; Fieldler et al. 1998; Ressler et al. 2005)

After considering this information, the Council agreed to propose the following designations of EFH for krill.

#### *Euphausia pacifica* EFH (Fig. 16)

Larvae, juveniles and adults: From the baseline from which the shoreline is measured seaward to the 1000 fm (1,829 m) isobath, from the U.S.- Mexico north to the U.S.-Canada border, from the surface to 400 m deep, from the U.S.- Mexico north to the U.S.-Canada border (Fig. 16). Highest concentrations occur within the inner third of the EEZ, but can be advected into offshore waters in phytoplankton-rich upwelling jets (Fig. 15) that are known to occur seaward to the outer boundary of the EEZ and beyond.

#### *Thysanoessa spinifera* EFH (Fig. 17)

Larvae, juveniles and adults: From the baseline from which the shoreline is measured seaward to the 500 fm (914 m) isobath, from the U.S.- Mexico north to the U.S.-Canada border, from the surface to 100 m deep. Largest concentrations in waters less than 200 m deep, although individuals, especially larvae and juveniles, can be found far seaward of the shelf, probably advected there by upwelling jets (Figs. 15, 17).

#### Other krill species

Larvae, juveniles and adults: From the baseline from which the shoreline is measured seaward to the 1000 fm (1,829 m) isobath, from the U.S.- Mexico north to the U.S.-Canada border, from the surface to 400 m deep, from the U.S.- Mexico north to the U.S.-Canada border. No biological, social or economic impacts are expected beyond administrative costs of reviewing federally regulated projects for potential impacts on this habitat, where krill and krill predators concentrate.

Option 3: Designate the full EEZ as EFH

There is little statistical basis for designating EFH beyond the areas identified above. However, it is conceivable that krill exist throughout the EEZ even if not in concentrations that support a forage role or that support reproduction or other life stages.

### **3.3.4 Habitat Areas of Particular Concern (HAPCs)**

The Council considered the following HAPC options:

HAPC Option 1. Status Quo—Do not designate HAPCs

HAPC Option 2. Designate HAPC to consist of the ocean area within the boundaries of Cordell Bank, Gulf of the Farallones, Monterey Bay, Channel Islands, and Olympic Coast NMS. These sanctuaries encompass the most important consistently krill-rich areas around California islands as well as important submarine canyons, bank, shelf and slope areas (e.g., Gulf of the Farallones, Pescadero Canyon, Ascension Canyon, Monterey Bay Canyon area, Channel Islands).

HAPC Option 3. Designate HAPC for krill to consist of the ocean area within the boundaries of Cordell Bank, Gulf of the Farallones, Monterey Bay, Channel Islands and Olympic Coast NMS, and Heceta Bank area (east of longitude 125° 30' W Long, between 43° 50' and 44° 50' Lat), off Cape Blanco (east of longitude 125° 30' between 42° 20' and 43° 000' Lat), and the Bodega Canyon area as HAPCs. This is similar to Option 2, but also includes three additional known important krill areas outside of Sanctuary boundaries.

HAPC Option 4. Designate HAPC for krill to consist of the ocean area within the boundaries of Cordell Bank, Gulf of the Farallones, Monterey Bay, Channel Islands and Olympic Coast NMS as HAPCs and all other waters of the EEZ Federal coastal and island waters off Washington, Oregon and California out to 60 nm from shore. This would cover all the areas Option 1, the highest krill density areas in Option 2, and add other inshore island, shelf, bank and slope areas along the coast suspected of supporting high densities of krill and krill predators within the EEZ.

In the process of reviewing the literature and available data on habitat use and preferences of krill, an effort was made to determine specific areas within U.S. West Coast EEZ EFH that satisfied the criteria of being 1) sensitive or vulnerable to environmental stress, 2) rare, or 3) particularly important ecologically. As noted above, this included a review of the literature and available data on krill aggregating areas and reproductive swarms, with high densities of predators such as salmon, seabirds and large baleen whales, revealed certain krill-rich upwelling areas to be especially important.

The Council concluded that it was not necessary at this time to propose designation of any specific HAPC. All the prospective high quality areas identified in the literature review and meetings with scientists would be included in the proposed designations of EFH.