WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

Amendment 13 to the Fishery Management Plan for the Crustacean Fisheries of the Western Pacific Region

Management of *Heterocarpus* spp. Fisheries, Including Federal Permitting and Reporting Requirements

Including an Environmental Assessment

November 21, 2008

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Photo by James F. Schlais

From “Shrimping Hawaiian Style.” O`ahu Magazine, volume 7, number 2, March-April 1983, p. 17.

Included caption:
“Hawaiian Deep Sea Shrimp are sorted and tailed by crew members aboard the F/V EASY RIDER TOO, then boxed and frozen, a finished product ready for the consumer. The scientific name for the shrimp most commonly (caught) is ***Heterocarpus laevigatus***.”

SUMMARY

Several deepwater shrimp species of the genus *Heterocarpus* occur in the Western Pacific Region, primarily at depths between 350 m and 1200 m. Also referred to as pandalid shrimp or smooth nylon shrimp, they are harvested commercially for their sweet flavor and tender texture, and mainly for sushi markets in Asia, Europe, and the U.S. Worldwide, a deepwater shrimp fishery does not seem to have started until the early 1960s. Since then, the global capture of deepwater shrimp has increased from only a few hundred tons in the early 1960s to a high of over 35,000 tons in 2000.

In the Western Pacific region, this fishery has operated intermittently, including some operations in Hawaii that have operated occasionally since the 1960s. Other places in the region such as Guam have attempted a small scale fishery for deepwater shrimp in the 1970's and Commonwealth of the Northern Mariana Islands (CNMI) has also had a deepwater shrimp fishery during the mid-1990s, around Saipan and Tinian. In general, these operations have consisted of one to four vessels and have been rather sporadic. Gear loss and a short shelf life and history of inconsistent quality, have led to fluctuating market demand. Also, known fishing areas tend to be limited and subject to reduced catch rates following initially high harvests. At this point, vessels leave the fishery for two to five years while the biomass increases enough to make the fishery profitable again. The rapid appearance and disappearance of these operations as well as depletion of an area have become a concern for fishery and resource managers.

The preferred alternative in this amendment would add *Heterocarpus* spp. as Management Unit Species (MUS) under the Crustaceans FMP, with Federal permitting and reporting requirements. Many species of the genus *Heterocarpus* are caught in the fishery and difficulties in identification and lack of information makes it sensible to include all species in the designation. In this manner, information on the harvests (including bycatch) of these species would be collected and made available to fishery scientists and managers. This would result in an improved understanding of these fisheries and their impact on marine resources, including the larger marine ecosystem. Although resource concerns for *Heterocarpus* spp. have not arisen to date, because it is not an MUS there are no mechanisms in place to implement management measures should they become necessary.

In addition to the preferred alternative, this document examines several alternatives for the management of *Heterocarpus* spp. in the Western Pacific Region. It also designates Essential Fish Habitat (EFH) for *Heterocarpus* spp. as required under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Amendment 13, including an Environmental Assessment, will be made available for public review and comment from Council and through www.regulations.gov. NMFS will consider public comments on the EA that are received within 60-day public comment period for Amendment 13.

Table 1: Summary of the Alternatives

Alternative	Description of the Alternative
Alternative 1- No Action	Alternative 1 would maintain the current list of Crustacean Management Unit Species and would not add *Heterocarpus* spp. to the MUS list. No Federal permits or reporting requirements would be implemented.
Alternative 2-Add *Heterocarpus* spp. as an MUS	Alternative 2 would add the deepwater shrimp genus, *Heterocarpus* spp., as a Management Unit Species under the Crustaceans FMP.
Alternative 3-Add *Heterocarpus* spp. as an MUS with Federal permitting and reporting requirements (Preferred)	Alternative 3 would add the deepwater shrimp genus, *Heterocarpus* spp., as a Management Unit Species under the Crustaceans FMP and would require any persons fishing for *Heterocarpus* spp. in EEZ waters around the Western Pacific Region to obtain a Federal permit and to submit Federal logbooks to the National Marine Fisheries Service (NMFS).

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CML	State of Hawaii Commercial Marine License
CNMI	Commonwealth of the Northern Marianas Islands
CPD	Commercial Purchase Database
CZMA	Coastal Zone Management Act
DAWR	Department of Agriculture and Wildlife Resources (Guam)
DFW	Division of Fish and Wildlife (CNMI)
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
EO	Executive Order
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
HAPC	Habitat Area of Particular Concern
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
Monument	Northwestern Hawaiian Islands National Marine Monument
MSA or MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
MUS	Management Unit Species
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
OY	Optimum Yield
PIFSC	NMFS Pacific Islands Fisheries Science Center
PIRO	NMFS Pacific Islands Regional Office
PRA	Paperwork Reduction Act
SFA	Sustainable Fisheries Act
SPR	Spawning Potential Ratio
WPRFMC	Western Pacific Regional Fishery Management Council(or Council)
VMS	Vessel Monitoring System

1.0 INTRODUCTION

1.1 Responsible Agencies

The Western Pacific Regional Fishery Management Council was established by the Magnuson-Stevens Fishery and Conservation Management Act (MSA) to develop Fishery Management Plans (FMPs) for fisheries operating in the U.S. Exclusive Economic Zone (EEZ) seaward of American Samoa, Guam, Hawaii, the Northern Mariana Islands and the U.S. possessions in the Pacific.[1] Once an FMP is approved by the Secretary of Commerce, it is implemented by Federal regulations which are enforced by the National Marine Fisheries Service and the U.S. Coast Guard, in cooperation with state, territorial and commonwealth agencies. For further information contact:

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1.2 Overview of the Crustaceans Fishery Management Plan and Amendments

Initial provisions of the Crustaceans FMP, which was first named the FMP for "Spiny Lobster Fisheries of the Western Pacific Region," went into effect March 9, 1983 (48 FR 5560, 7 February 1983). The FMP implemented the following management measures for the Northwestern Hawaiian Islands (NWHI) management area: Federal permit requirements; minimum size limit for spiny lobsters; gear restrictions; prohibition on the harvest of egg-bearing female spiny lobsters; closure of waters within 20 nm of Laysan Island, all NWHI waters shallower than 10 fm and all NWHI lagoons, to fishing for spiny lobsters; mandatory logbook program; and, a requirement to carry a fishery observer if directed by the National Marine Fisheries Service (NMFS). The FMP also implemented permit, data reporting, and observer requirements within Federal waters around the Main Hawaiian Islands (MHI), American Samoa, and Guam. Management Unit Species (MUS) under the initial FMP were *Panulirus marginatus* (spiny lobster), *P. penicillatus* (spiny lobster), family *Scyllaridae* (slipper lobster), and *Ranina ranina* (Kona crab). In addition, the following permit areas were designated:

- Crustaceans Permit Area 1 (Permit Area 1): the EEZ off the Northwestern Hawaiian Islands.
- Crustaceans Permit Area 2 (Permit Area 2): the EEZ off the Main Hawaiian Islands.

[1] Howland, Baker, Jarvis, Wake and Johnston Islands, Palmyra and Midway Atolls and Kingman Reef, referred to here as the Pacific Remote Island Areas, or PRIA.

- Crustaceans Permit Area 3 (Permit Area 3): the EEZ off the Territory of Guam and the EEZ off the Territory of American Samoa (the EEZ off the Commonwealth of the Northern Mariana Islands and the EEZ off the Pacific Remote Island Areas (PRIA) were added in Amendment 12).
- Crustaceans Permit Area 1 Vessel Monitoring System (VMS) Subarea: an area within the EEZ off the NWHI 50 nm from the center geographical positions of the islands and reefs in the NWHI as follows: Nihoa Island 23°05' N. lat., 161°55' W. long.; Necker Island 23°35' N. lat., 164°40' W. long.; French Frigate Shoals 23°45' N. lat., 166°15' W. long; Garner Pinnacles 25°00' N. lat., 168°00' W. long.; Maro Reef 25°25' N. lat., 170°35' W. long.; Laysan Island 25°45' N. lat., 171°45' W. long; Lisianski Island 26°00' N. lat., 173°55' W. long.; Pearl and Hermes Reef 27°50' N. lat., 175°50' W. long.; Midway Islands 28°14' N. lat., 177°22' W. long.; and Kure Island 28°25' N. lat., 178°20' W. long. The remainder of the VMS subarea is delimited by parallel lines tangent to and connecting the 50–nm areas around the following: from Nihoa Island to Necker Island; from French Frigate Shoals to Gardner Pinnacles; from Gardner Pinnacles to Maro Reef; from Laysan Island to Lisianski Island; and from Lisianski Island to Pearl and Hermes Reef.

Amendment 1 (1983) adopted the State of Hawaii's lobster fishing regulations for the Federal waters around the MHI.

Amendment 2 (1983) modified the allowable trap opening dimensions with the intent of minimizing the risk of harm to the Hawaiian monk seal while allowing sufficient flexibility in trap design.

Amendment 3 (1985) revised the minimum spiny lobster size specifications for the NWHI management area, switching from a carapace length-based limit (7.7 cm) to a limit on tail width (5.0 cm).

Amendment 4 (1986) applied the existing NWHI closed areas to slipper lobsters.

Amendment 5 (1987) implemented a minimum size for slipper lobster (5.6 cm tail width), required the release of egg-bearing female slipper lobsters, required escape vents in all lobster traps, and revised some of the permit application and reporting requirements. It also changed the name of the FMP from "Spiny Lobster Fisheries" to "Crustaceans Fisheries."

Amendment 6 (1991) defined recruitment overfishing for lobster stocks in terms of reference points that are expressed in terms of the spawning potential ratio (SPR), the ratio of the spawning potential per recruit in a given area at present to that in an unfished condition. The minimum SPR threshold, below which the stock would be considered recruitment overfished, is 20%.

An emergency action was taken by NMFS to close the fishery from May 8, 1991 through August 12, 1991 (56 FR 21961, May 13, 1991) in response to indications that NWHI

lobster stocks were approaching an overfished condition. The closure was extended until November 12, 1991 through another emergency action.

Amendment 7 (1992) established a NWHI limited access program, an adjustable fleet-wide NWHI annual lobster harvest guideline, and a closed season (January through June) in the NWHI fishery in response to the indications of lobster stock decline in 1990 and 1991. Participation was limited to 15 permits (and vessels), with permits issued according to criteria based on historical and current participation. Permits were made freely transferable, with permit renewal contingent on meeting minimum landings requirements over a two-year period. Other measures include a maximum limit on the number of traps per vessel (1,100), revisions to reporting requirements, and certain other provisions.

Amendment 8 (1994) eliminated the NWHI minimum landings requirements for permit renewal, allowed the catch per unit effort target that is used to set the harvest guideline to be changed through the framework process and modified reporting requirements.

Amendment 9 (1997) established a system by which the annual harvest guideline would be set based on a constant percent of the population (i.e., it is proportional to the estimated exploitable population size) that is set based on a specified acceptable risk of overfishing. Amendment 9 set this risk level at 10% (which was found through simulation results to be associated with a constant harvest rate of 13% per year) and specified that annual harvest guidelines be published by NMFS no later than February 28 of each year. In-season adjustment procedures were eliminated. The amendment also eliminated minimum size limits and prohibitions on harvesting of egg bearing females (to ensure that they are counted against the annual harvest guideline) and provided a mechanism for certain regulatory adjustments to be made through framework procedures of the FMP. Amendment 9 became effective as of June 26, 1997 (62 FR 35449, July 1, 1997) and also implemented a VMS program for the NWHI crustacean fishery. This rule allowed vessels with active VMS systems to remain on open lobster grounds until closed rather than requiring that they exit the area prior to this date.

Amendment 10 addressed new requirements under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were immediately approved included designations of essential fish habitat and descriptions of bycatch and of some fishing communities. Those provisions became effective on February 3, 1999 (64 FR 19067, April 19, 1999). Remaining portions that were approved on August 5, 2003 (68 FR 46112) were provisions regarding Hawaii fishing communities, overfishing definitions, and bycatch.

Regulatory Amendment 1 to the FMP was effective July 23, 1998 - December 31, 1998 and established 1998 NWHI harvest guidelines on a bank-specific basis (Necker Island, Gardner Pinnacles, Maro Reef, and all remaining NWHI lobster fishing grounds combined).

Regulatory Amendment 2 to the FMP became effective July 2, 1999 (64 FR 36820, July 8, 1999) and made the bank-specific method of determining NWHI harvest guidelines

permanent, in recognition of differences in fishing effort and recruitment in each of the four areas.

An emergency rule published by NMFS and effective July 1, 2000 through December 1, 2000 (65 FR 39314, June 26, 2000) closed the NWHI fishery as a precautionary measure to protect lobster stocks because of shortcomings in understanding the dynamics of the NWHI lobster populations, the increasing uncertainty in population model parameter estimates, and the lack of appreciable rebuilding of the lobster population despite significant reductions in fishing effort throughout the NWHI. The closure was continued through the 2006 seasons through announcements by NMFS on February 22, 2001 (66 FR 11156), March 15, 2002 (67 FR 11678) February 21, 2003, (68 FR 8490), and March 16, 2004 (69 FR 12303) that no annual harvest guidelines for the NWHI management areas would be issued for those years. The actions were taken because of continuing uncertainty about the status and dynamics of the lobster populations and the models used to describe them.

Amendment 11 was prepared and transmitted to NMFS for approval in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. This amendment prohibits the harvest of Crustacean Management Unit Species (CMUS) in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems establishes such areas around Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed for the NWHI, but all measures proposed in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve established in 2000. Accordingly, NMFS issued a Record of Decision on June 14, 2002 that partially approved the Coral Reef Ecosystems FMP and Amendment 11 to the Crustaceans FMP. A final rule implementing the Coral Reef Ecosystem FMP (including Amendment 11 to the Crustaceans FMP) was published on February 24, 2004 (69 FR 8336).

Amendment 12 included Federal waters around the Commonwealth of the Northern Mariana Islands (CNMI) and the Pacific Remote Island Areas (PRIA) under the FMP and included these areas in Crustaceans Permit Area 3 and became effective September 12, 2006 (71 FR 53605).

Of relevance to the management of the NWHI crustacean fishery is the Northwestern Hawaiian Island Marine National Monument (NWHI monument), established on June 15, 2006, through Presidential Proclamation No. 8031. The Monument was established by President George W. Bush to set apart and reserve the NWHI for the purpose of protecting the historic objects, landmarks, prehistoric structures and other objects of historic or scientific interest that are situated upon lands owned and controlled by the Federal Government of the United States.

1.3 Roles and Responsibilities for the Proposed Crustaceans FMP Management Measures

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the principal Federal statute regarding management of U.S. domestic marine fisheries. The MSA authorizes the regional fishery management councils to provide advice and recommendations to the Secretary of Commerce through the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). In accordance with the provisions of the MSA, the Council is recommending approval of the proposed measures for the *Heterocarpus* spp. fisheries in the western Pacific. The Council developed this FMP amendment and EA in coordination with Council members, Council staff, scientific working groups, NMFS and other fishery scientists and resource managers, and with input from members of the public. NMFS is the primary Federal agency responsible for stewardship for the nation's living marine resources and will be the lead agency for implementing any action selected. The Council will continue to manage western Pacific fisheries in accordance with the FMPs.

The area of impact includes the geographic area in the U.S. EEZ in the western Pacific. The proposed measures would apply to Federal waters of the U.S. EEZ around American Samoa, Guam, Hawaii, the CNMI, and the PRIA.

Deepwater shrimp (*Heterocarpus* spp.) habitats are not mapped in detail, but in general, lie in deeper waters of the EEZ along offshore slopes from 350 m to more than 1000 m. The fishery takes place in waters that lie within Federal, state, and territorial jurisdictions.

None of the proposed management measures require complementary state or territorial regulations to be effective in managing the fishery.

1.4 Decision to be Made

NOAA is responsible for considering the Council's recommendations and the analysis in this FMP amendment and EA. After considering public comments on the proposed FMP Amendment and EA, and after ensuring compliance with other applicable laws, the Secretary will approve, partially approve, or disapprove the amendment."

1.5 Public Review Process and Schedule

At its 133rd meeting in Pago Pago, American Samoa, the Council discussed adding *Heterocarpus* spp. to the Crustaceans FMP as an MUS. Subsequently, the Council took Initial Action at its 135th Meeting in Honolulu, Hawaii on this issue. At its 136th Meeting in December 2006, the Council took final action to recommend that *Heterocarpus* spp. be added to the Crustaceans FMP as a Management Unit Species and that Federal permitting and reporting be required under the FMP. Amendment 13, including an EA, will be made available for public review and comment from Council and through www.regulations.gov. NMFS will consider public comments on the EA that are received within 60-day public comment period for Amendment 13.

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1.7 Purpose and Need for Action

The purpose of this action is to improve the understanding and monitoring of *Heterocarpus* spp. harvests in Federal waters of the Western Pacific Region.

The deepwater shrimp fishery is often referred to as a "pulse fishery" with high temporal variability in landings and participation, and there are no mechanisms in place to implement management controls should they become necessary. The concern with a pulse fishery is that it can rapidly appear and potentially deplete an area of this species of which little is known. Domestic vessels fishing in Exclusive Economic Zone (EEZ) waters or landing marine fishery resources in the Western Pacific Region are subject to the Council's jurisdiction. However, because deepwater shrimp are not included as a management unit species under any FMP there is no mechanism in place at this time for Federal management of this fishery.

Finally, with the advent of the Council's shift to Fishery Ecosystem Plans (FEP), there is a greater need to understand ecosystem function and the role of deepwater shrimps in the ecology of Pacific archipelagic systems.

1.8 Management Objectives

The objective of this action is to enable the future management of deepwater shrimp fisheries in the Western Pacific Region and to improve monitoring of these species under the Crustaceans FMP.

2.0 MANAGEMENT ALTERNATIVES

2.1 Description of the Alternatives

2.1.1 Alternative 1- No Action

Alternative 1 would maintain the current list of Crustacean Management Unit Species as listed in Table 2 and would not add *Heterocarpus* spp. to the MUS list. The fishery would continue to operate as described in Section 3 and no Federal permitting or reporting would be required.

Table 2: Existing Crustacean Management Unit Species List

Scientific Name	Common Name
Panulirus marginatus	Hawaiian Spiny Lobster
Panulirus pencillatus	Spiny Lobster
family Scyllaridae	Slipper Lobsters
Ranina ranina	Kona Crab

2.1.2 Alternative 2-Add *Heterocarpus* spp. as an MUS

Alternative 2 would add the deepwater shrimp, *Heterocarpus* spp., as a management unit species under the Crustaceans FMP (see Table 3). Essential Fish Habitat (EFH) would be designated for *Heterocarpus* as shown in Table 4 and described in section 3.4.3

Table 3: Proposed Crustacean Management Unit Species list

Scientific Name	Common Name
Panulirus marginatus	Hawaiian Spiny Lobster
Panulirus pencillatus	Spiny Lobster
family Scyllaridae	Slipper Lobsters
Ranina ranina	Kona Crab
Heterocarpus spp.	Deepwater Shrimp

2.1.3 Alternative 3-Add *Heterocarpus* spp. as an MUS and Federal permitting and reporting requirements (Preferred)

Alternative 3 would add the deepwater shrimp genus, *Heterocarpus* spp., as an MUS under the Crustaceans FMP (see Table 3). This alternative would also require any person fishing for *Heterocarpus* spp. in the Western Pacific Region's EEZ waters to obtain a Federal permit and to report their catch on Federal logbooks to the NMFS. Essential Fish

Habitat (EFH) would be designated for *Heterocarpus* as shown in Table 4 and described in section 3.4.3

3.0 AFFECTED ENVIRONMENT

3.1 Target Species

The biology of *Heterocarpus* spp. or pandalid shrimps has been reviewed in detail by King (1993) from which this section is adapted. Unlike shallow-water penaeid shrimps, *Heterocarpus* shrimps have a lifespan in excess of a year, and some species such as *H. laevigatus*, may have life spans of up to eight years. He suggests that the natural mortality rates of *H. laevigatus* are about 50% per year. King also reports that *H. laevigatus* matures at about 75% of its maximum size or between 4-5 years old.

Sub-artic *Heterocarpus* shrimps have been suggested to be protandrous hermaphrodites (Butler 1964 in King and Moffit 1984), which means being male for the first few years of life and then changing to female for the last year or two of life. However, measuring the length of male appendages of several species of *Heterocarpus* in the Mariana Archipelago, Moffitt and Polovina (1987) found that length of the male appendage increased with carapace length, which shows that tropical deepwater shrimp are not protandrous hermaphrodites. Observations by Dailey and Ralston (1986) suggest that *Heterocarpus* shrimps may be semelparous, i.e. reproducing only once in their lifetime then dying. In the Mariana Archipelago, the length at maturity for *H. ensifer* was calculated at 22.2 mm Carapace Length (CL), 35.7 mm CL for *H. laevigatus*, and 31 mm CL for *H. longirostrus* (Moffitt and Polovina 1987).

This semelparity and the relatively long life spans and delayed maturity of some species suggests that *Heterocarpus* shrimps are vulnerable to over-exploitation. Ralston (1986) observed that catch rates of *H. laevigatus* in the Mariana Archipelago declined by about 50% in a two week period during an intensive trapping experiment, suggesting that the species may be vulnerable to moderate levels of trapping. Known fishing areas tend to be limited and subject to reduced catch rates following initially high harvests. At this point, vessels leave the fishery for two to five years while the biomass increases enough to make the fishery profitable again.

3.1.1 Ecology of *Heterocarpus* Shrimps

Deepwater shrimps have been found on most Pacific Islands, inhabiting the outer reef slope down to depths of about 1000 m or greater. In the Mariana Archipelago, for example, *H. ensifer* is found in depths of between 350-550 m, *H. laevigatus* at depths between 500-900 m, and *H. longirostrus* at depths of 900 m and greater (Moffitt and Polovina 1987). Little is known of the trophic relationships of deepwater shrimps. *Heterocarpus* shrimps have been observed in fishes as diverse as obligate demersal deep-slope snappers and open ocean pelagic tunas (King 1993). King also notes that *H. sibogae* feeds on other demersal crustaceans, fish, foraminiferans, and even small, mid-water squid, but little is known about the diets of other *Heterocarpus* spp.

3.1.2 Potential Habitat and Occurrence of *Heterocarpus* in the Western Pacific Region

American Samoa

Because of the steepness of Tutuila and the other islands that make up American Samoa, most of the available benthic habitat is composed of fringing coral reefs, a limited reef slope, and a few offshore banks. The islands are fringed by narrow reef flats (50–500 m wide) that drop to a depth of 3 to 6 meters and descend gradually to 40 meters. From this depth, the ocean bottom drops rapidly, reaching depths of 1,000 meters within 1 to 3 kilometers from shore. The following four banks around Tutuila have been identified: Taputapu, Mataula, Leone West Banks, and Steps Point (Severance and Franco 1989). NMFS PIFSC conducted sampling at 10 shrimp trapping stations at depths ranging between 200 and 510 fathoms around American Samoa in 1987 (NOAA Ship Townsend Cromwell cruise 87-01). The gear used was large pyramid single set traps and some *Heterocarpus* were present in every trap haul. Unpublished results from the cruise showed that deepwater shrimp may be more abundant in some places than others, but always around wherever traps are set (PIFSC unpublished).

CNMI

A total of 579 square kilometers of banks and reefs has been estimated in the waters surrounding CNMI (Hunter 1995). The submerged seamounts 120 nautical miles west of the emergent islands likely support a large area of habitat for deepwater shrimp. Moffitt and Polovina (1987) found several *Heterocarpus* spp. at depths 350 m and greater within the Marianas Archipelago. *H. laevigatus* had the highest CPUE at 2.33 kg/trap (max) and was also recorded as the largest of the shrimp caught, with an average carapace length of 38.2 mm (size range: 13-61mm; Moffitt and Polovina 1987).

Guam

Deepwater banks are located at several locations around the island, four of which are located in Federal waters (Rota Bank to the north and Galvez, Santa Rosa, and White Tuna Bank to the south (Donaldson 1995; Hunter 1995; Myers 1997). As stated above, Moffitt and Polovina (1987) found several species of *Heterocarpus* within the Mariana Archipelago.

Hawaii

Within the Hawaii Archipelago, there are numerous banks and seamounts—with the majority located in the NWHI—that provide depth ranges suitable for the occurrence of deepwater shrimp. In the MHI, the largest bank in Federal waters is Penguin Bank, which is located southeast of Oahu. *Heterocarpus* shrimps are known to occur within the Hawaii Archipelago, with *H. ensifer* believed to be the most abundant species (Struhsaker and Aasted 1974). Deepwater shrimp are also known to inhabit the steep outer reef slopes of islands (King 1993)

PRIA

Most of the PRIA are surrounded by a narrow-fringing reef that drops steeply very close to the shore. Based on historical fishery landings, deepwater shrimps are known to occur in the PRIA of Palmyra and Kingman Reef.

3.1.3 Management Program

Maximum Sustainable Yield (MSY) for the deepwater shrimp has been estimated for the Mariana Archipelago at 200 kg/nmi^2 (Moffit and Polovina 1987 in King 1993) and for The Hawaiian Islands at 40 kg/nmi^2 (Tagami and Ralston 1988 in King 1993). There are no available estimates of MSY values for deepwater shrimp in American Samoa or the PRIA because of the lack of fishing and the lack of research.

Permitting and data collection measures are being proposed under the preferred alternative. Under the approach that utilizes the best available scientific information, the Council, in coordination with NMFS, will develop and refine the estimates or proxies of MSY for the proposed MUS as information becomes available. It is anticipated that a risk-based assessment process will be used in coordination with the development of the Council's Fishery Ecosystem Plans (FEPs) to rank the risk of overfishing associated with each species or species group. In general, this will establish the order in which species stock assessments will be completed and MSY values estimated.

Optimum Yield (OY), and an overfishing/overfished control rule are undetermined. Due to an undetermined OY, Total Allowable Level of Foreign Fishing (TALFF) cannot be determined at this time. National Standard 3, as implemented in 50 C.F.R. § 600.320, allows a management unit to contain stocks of fish for which there is not enough information available to specify MSY and OY, so that data on these species may be collected under the FMP.

Under the preferred alternative, permits and logbooks would be used to determine bycatch in the fishery. Currently, there is little information about bycatch associated with this fishery and what is known comes primarily from research sampling.

3.2 Fisheries

3.2.1 Overview of Global Deepwater Shrimp Fishery

Worldwide, deepwater shrimp fisheries do not seem to have started until the early 1960s. Since then, the global capture of deepwater shrimp has increased from only a few hundred tons in the early 1960s to a high of over 35,000 tons in 2000 (FAO 2006). From 1993 – 2002, there was a steady increase in global capture of the genus of *Pandalus* shrimps, with an average of 28,733 tons over the ten year span (See Figure 1). Globally, shrimp capture fisheries account for more than 11 million dollars, of which deepwater marine shrimp account for a very small portion (FAO 2006). Adding *Heterocarpus* spp. as an MUS under the FMP would aid in avoiding overfishing of this resource and ensuring a sustainable fishery.

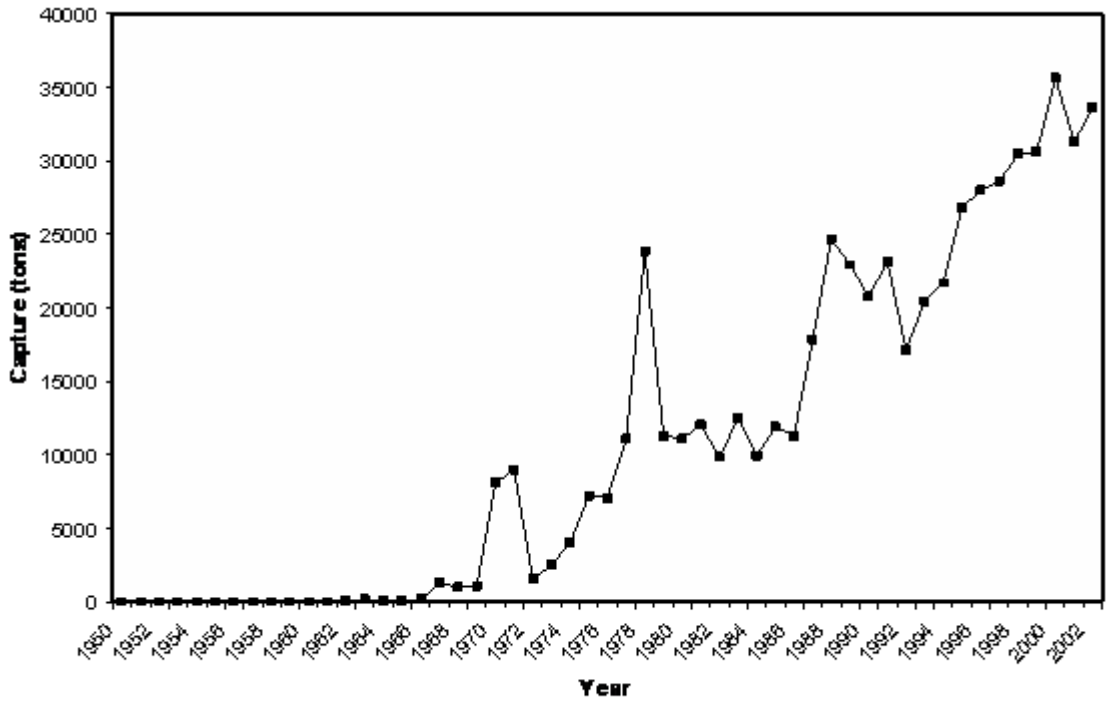

Figure 1:Global Capture of the genus of *Pandalus* shrimps from 1950-2002 (Source: FAO 2006)

3.2.2 Types of Fishing Gear Used

Deepwater shrimps are caught using either trawls or traps. In areas where there is a continental shelf adjacent to a land mass, trawls are more effective. In Pacific island areas where there are more steep slopes, baited traps are more efficient (King 1993). Traps are primarily used in the Western Pacific Region to catch deepwater shrimp.

Traps are made from steel, wire, and/or plastic with conical entrances that allow the shrimp to get into the trap, but not out. Trap lines are marked with flags and spaced out at approximately 30 meters apart. The traps are left out overnight to fish and collected the next day (King 1993). In Hawaii, shrimp trapping vessels have employed large pyramidal traps of about 2 m^3 in volume, setting up to 50 traps per day (Polovina 1993).

There is little information available on the impacts of the shrimp fishery traps on habitat and other species. Potential impacts of the traps could include snagging and ghost fishing. Lost traps could also provide habitat for other organisms. Increased data collection could provide a better understanding of commercial trap loss and further research is needed to assess these impacts.

3.2.3 Deepwater Shrimp Fisheries in the Western Pacific Region

Throughout the Pacific, deepwater shrimp fisheries have been sporadic in nature (Hastie and Saunders 1992). The reasons for this are manifold. Gear loss has been a common

problem and made many past ventures unprofitable. A second difficulty is the short shelf life and a history of inconsistent quality, leading to fluctuating market demand for the product. Lastly, these fisheries generally experience local depletion on known fishing grounds, which leads to much lower catch rates. This localized depletion appears to be short-term and the fishery returns every so often after the resource rebounds. Based on research conducted in the Mariana Archipelago, Moffitt and Polovina (1987) estimated that harvest levels of 0.2 t/nm² of deepwater shrimp may be sustainable for many island areas in the Pacific.

American Samoa

The existence of a deepwater shrimp fishery in American Samoa has never been reported.

CNMI

A deepwater shrimp fishery was undertaken in CNMI during the mid-1990s, with trapping occurring on flat areas near steep banks at depths greater than 350 meters mostly on grounds around Saipan and Tinian (Ostazeski 1997). Two fishing companies began fishing for deepwater shrimp in May of 1994. While three species of *Heterocarpus* shrimp are known to occur at varying depths in the waters around CNMI (*Heterocarpus ensifer* (366–550 m), *Heterocarpus laevigatus* (550–915 m), and *Heterocarpus longirostris* (> 915 m), the most commercially valuable and subsequently targeted shrimp is the largest species, *Heterocarpus laevigatus* (Moffitt and Polovina 1987).

One CNMI company stopped fishing in June of 1995 after fishing a total of 193 days. The second company began in December of 1995 and had fished 20 days by March of 1996 when non-Commercial Purchase Database (CPD) data collection ceased (Ostazeski 1997). The first company cited loss of gear as the reason for exiting the fishery. They were using oval plastic Fathom Plus traps which weighed 7 kg and experienced a trap loss of 3.5% per set with an average of 12.7 traps per string (range of 3 to 40 traps per string). The second company experienced no trap losses in 61 sets and 1561 traps deployed. Traps used by this company were lightweight with nylon netting. These traps weighed only 2.5 kg and if they became entangled on the bottom, they could tear away and still be recovered. Trap size was smaller and catch per trap was on average 76% of the plastic traps, but they were able to deploy many more traps per string without fear of gear loss. As the fishing grounds exploited are relatively close to Saipan and because neither vessel had freezer capabilities, shrimp were kept on ice for 12-48 hours before being brought to market.

Between May of 1994 and February of 1996, 12,160 kilograms of deepwater shrimp were landed. Of these, more than 97 percent were *Heterocarpus laevigatus*, with the remainder being *Heterocarpus ensifer*. Bycatch included a few deepwater eels (*Synaphobranchus* spp.) and dogfish sharks. A large number of two species of geryonid crabs were also caught. The crabs are a marketable incidental catch and could contribute to the success of any deepwater shrimp fishery. Strong currents, rough bottom topography, and fishing depth all contributed to gear loss, which has been experienced by this fishery in the past. While other banks might have abundant stocks, unfamiliarity with them could lead to even greater gear loss.

The CNMI Division of Fish and Wildlife (DFW) conducted a data collection project specifically for the deepwater shrimp fishery between May of 1994 and June of 1995. Catch and effort data was gathered for both types of traps, as well as bycatch data. Depth ranges for the fishery as well as depth of greatest abundance were recorded. Sex ratios and reproductive cycles were determined from 1,533 *H. laevigatus* examined (Ostazeski 1997). Research has also been conducted to create a depletion model which would estimate catchability and would help determine the commercial viability of this fishery. It is likely that much shrimp went directly to an export market and was not caught by the CPD. The Northern Mariana Islands Division of Fish and Wildlife (DFW) monitors the commercial fishery by summarizing sales ticket receipts from commercial establishments. DFW staff routinely distributes and collects invoice books from 80 participating local fish purchasers on Saipan, including fish markets, stores, restaurants, government agencies and roadside vendors. There are no local or Federal permitting or reporting requirements in place for these fisheries.

Guam

In the 1970's, one small scale, deepwater shrimp fishery was attempted in Guam, but no known operations have occurred since (Wilder 1979). The Division of Aquatic and Wildlife (DAWR) administers an offshore creel survey program that provides comprehensive estimates of island-wide catch and effort for all the major fishing methods used in commercial and recreational fishing. In 1982, the Western Pacific Fisheries Information Network (WPacFIN) began working with the Guam Fishermen's Cooperative Association to improve their invoicing system and obtain data on all fish purchases on a voluntary basis. Data are also collected from a major fish wholesaler and several retailers who make purchases directly from fishermen. These businesses voluntarily provide data to WPacFIN using invoices (trip tickets) provided by DAWR. There are no local or Federal permitting or reporting requirements in place for these fisheries.

Hawaii

In Hawaii, an intermittent deepwater shrimp fishery began in 1967 (Tagami and Ralston 1988) and continues to be vary from year to year with an average of 3 vessels reporting the catch of deepwater shrimp to the state of Hawaii. Vessels ranged in size from 7.5 to 40 m in length, though the number of smaller vessels increased as larger vessels left the fishery (Tagami and Barrows 1988). To date, the highest landings (~275,000 lbs) of deepwater shrimp in Hawaii occurred in 1984, however, in 1989 nearly 270,000 lbs were landed, with an estimated ex-vessel value of more than $1 million. In 2005, vessels from the Pacific Northwest fished for *Heterocarpus* spp. in Hawaii and landed over 100,000 lbs. Between 1982 and 2005, the cumulative landings of *H. laevigatus* amounted to over 1.5 million lbs, while during the same time period, *H. ensifer* landings totaled over 20,000 lbs.

The State of Hawaii requires that any person who for commercial purposes takes marine life, whether caught or taken within or outside of the state, must first obtain a commercial

marine license. Vessels that fish in the PRIAs and then land their catch in Hawaii are required to report their catch on the State's C-3 form.

The State of Hawaii's Division of Aquatic Resources (HDAR) maintains a commercial landings database. The location of fishing effort is referenced by numbered geographic areas based on commercial fisheries statistical charts (Smith 1993). There are no local permitting and reporting requirement for recreational fisheries, and there is no Federal permitting and reporting requirement for the deepwater shrimp fishery.

PRIA

In 1999, one vessel left Hawaii to explore the lobster fishery in Palmyra and Kingman Reef waters. In addition, this vessel deployed traps at 300-800 m to target deepwater shrimp and red crab (*Chaceon* spp.). Although there is a danger of losing gear when setting this deep, the operation did not lose many traps and the CPUE was very high, at approximately 30 kg/trap. Detailed fishery data has been collected by this vessel for deepwater shrimp around Palmyra and it is believed that this is the only information on the deepwater shrimp fishery at Palmyra. Data from this trip is unavailable due to Federal and State of Hawaii confidentiality policies. Data on crustacean fisheries around the PRIA is not collected. There are no local or Federal permitting or reporting requirements in place for the deepwater shrimp fishery.

3.2.4 Processing of Deepwater Shrimp

In general, shrimp are considered luxury food items; therefore care in handling is practiced. Smaller vessels normally wash the shrimp and store them in iced sea-water for transportation to protect the shrimp from enzyme-induced reactions (King 1993). Larger vessels have the space on board to process the shrimp by quick freezing them, which preserves their quality and allows them to be easily exported.

Different processing methods are acceptable for different uses of deepwater shrimp. The Japanese market requires shrimp to be presentable and undamaged, which means whole, individually quick frozen, shrimp are best. Local markets, restaurants, and hotels use whole, fresh, chilled shrimp. Shrimp tails are less likely to be used because of low meat recovery rates which is not commercially attractive (Oishi 1983).

3.2.5 Estimated Management Costs

The estimated management costs for fishery conservation and management was $3,203,800 for the NMFS PIFSC, PIRO, and Council combined in 2003 (WPRFMC 2004). Future estimated costs for these three organizations are $7,396,000 which include staff resources. Assuming that these resources are allocated equally across the current five fishery management plans, the current estimated management cost for the Crustaceans FMP would be approximately $1,479,200. This estimate is for fishery conservation and management only and does not include costs for NEPA, enforcement, protected species recovery and management, education, outreach and communication, administration, or data management.

3.3 Protected Species

Protected species are considered to include those species listed as endangered or threatened under the ESA, as well as all marine mammals and seabirds.

3.3.1 Marine Mammals

Protected marine mammals fall into two categories: species listed under the ESA and those species which are not listed, but otherwise protected under the Marine Mammal Protection Act (MMPA). Cetaceans and pinnipeds are discussed separately in the sections below.

Listed Cetaceans

There are six species of cetaceans listed under the ESA that are known to occur within the U.S. EEZ waters of the Western Pacific Region. These species are the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), and right whale (*Eubalaena glacialis*).

Although these species may be found within the area and could interact with crustacean fisheries of the Western Pacific Region, no reported or observed interactions have occurred. There could be some direct impacts from routine vessel operations such as a low-level risk of behavioral disturbances, collisions, or entanglements with trap lines that may be set relatively infrequently in waters frequented by cetaceans. However no such impacts of cetacean entanglements in trap lines have been reported or observed to date.

Other Cetaceans

Cetaceans that are not listed under the ESA but are protected under the MMPA and occur in the Western Pacific Region are as follows:

Blainsville beaked whale *(Mesoplodon densirostris*)
Bottlenose dolphin (*Tursiops truncatus)*
Bryde's whale (*Balaenoptera edeni*)
Cuvier's beaked whale (*Ziphius cavirostris*)
Dwarf sperm whale (*Kogia simus*)
False killer whale (*Pseudorca crassidens*)
Killer whale (*Orcinus orca*)
Melon-headed whale (*Peponocephala electra*)
Pygmy killer whale (*Feresa attenuata*)
Pygmy sperm whale (*Kogia breviceps*)
Risso's dolphin *(Grampus griseus*)
Rough-toothed dolphin (*Steno bredanensis*)
Short-finned pilot whale (*Globicephala macrorhynchus*)
Spinner dolphin (*Stenella longirostris*)
Spotted dolphin (*Stenella attenuata*)
Striped dolphin (*Stenella coeruleoalba*)
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)
Minke Whale (*Balaenoptera acutorostrata*)

Common Dolphin (*Delphinus delphis*)
Fraser's Dolphin (*Lagenodelphis hosei*)

Although the species listed above may be found within the area and could interact with crustacean fisheries in the Western Pacific Region, no reported or observed interactions have occurred. There could be some indirect impacts from routine vessel operations such as a low-level risk of behavioral disturbances, collisions, or entanglements with in fishing gear, however no such impacts have been reported or observed. There is no current expectation of future interactions between these species and the crustacean fisheries and therefore, they will not be described in greater detail in this document.

Listed Pinniped: The Hawaiian Monk Seal

In 1976, the Hawaiian monk seal was listed as endangered under the ESA following a 50% decline in beach counts from the late 1950s to the mid-1970s (41 FR 33922). It was also designated a depleted species in 1976 under the MMPA. The Hawaiian monk seal is the most endangered pinniped in U.S. waters and is second only to the northern right whale as the nation's most endangered marine mammal (Marine Mammal Commission 1999). The Hawaiian monk seal is also the only endangered marine mammal that exists wholly within the jurisdiction of the United States.

Under the ESA, critical habitat may be designated to afford protection or special management consideration to physical or biological features essential to the conservation of a listed species. In May 1988, NMFS designated critical habitat for the Hawaiian monk seal out from shore to 20 fathoms in 10 areas of the NWHI. Critical habitat for this species includes "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms around the following: Pearl and Hermes Reef, Kure Atoll, Midway Islands, except Sand Island and its harbor, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island" (53 FR 18990, May 26, 1988, 50 CFR § 226.201).

Critical habitat was designated in order to enhance the protection of habitat used by Hawaiian monk seals for pupping and nursing, areas where pups learn to swim and forage, and major haul-out areas where population growth occurs.

Monk seals are phocids, and are one of the most primitive genera of seals. They are brown to silver in color, depending upon age and molt status, and can weigh up to 270 kg. Adult females are slightly larger than adult males. Monk seals are solitary, and it is thought they can live up to 30 years. Females reach breeding age at about 5 to 10 years of age, depending on their condition, and can give birth about once every year. An estimated 40-80% of adult females give birth in a given year (NMFS unpub. data. 2001). After birth, pups nurse for 5-6 weeks, during which time the mother rarely, if at all, leaves the pup to feed. At weaning, the mother leaves and the pup must subsequently forage independently. Newly weaned pups tend to stay in the reef shallows, entering into more diverse and deeper waters to forage as they gain experience. Monk seals may stay on land up to about two weeks during their annual molt. Hawaiian monk seals are non-migratory,

but recent studies show their home ranges may be extensive (Abernathy and Siniff 1998). Counts of individuals on shore compared with enumerated subpopulations at some of the NWHI indicate that Hawaiian monk seals spend about one-third of their time on land and about two thirds in the water (Forney et al. 2000).

The Hawaiian monk seal breeds only in the Hawaiian Archipelago, with most monk seals inhabiting the remote, largely uninhabited atolls and surrounding waters of the NWHI. More than 90 percent of all pups are born at six major breeding colonies located at French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island, Kure Atoll and Midway Atoll. A few births also occur annually at Necker, Nihoa, and Niihau Islands and increasingly in the MHI. NMFS researchers have also observed Hawaiian monk seals at Gardner Pinnacles and Maro Reef. Although Hawaiian monk seals occasionally move between islands, females generally return to their natal colony to pup. Since 1990, there has been an increase in the number of Hawaiian monk seal sightings and births in the Main Hawaiian Islands (HMSRT 1999; Johanos 2000). A 2001 aerial survey determined a minimum abundance of 52 seals in the MHI (Baker and Johanos, 2000). Additional sightings and at least one birth have occurred at Johnston Atoll, including eleven adult males that were translocated to Johnston Atoll (nine from Laysan Island[1] and two from FFS) over the past 30 years.

Hawaiian monk seals feed on a wide variety of teleosts, cephalopods and crustaceans, indicating that they are highly opportunistic feeders (Rice 1964; MacDonald 1982; Goodman-Lowe 1998). Research to identify prey species has been conducted using several methods: collection of potential prey items and blubber samples for fatty acid analysis; Crittercam[2] recording of foraging behavior; correlation of dive/depth/location profiles with potential prey species habitat; and analysis of Hawaiian monk seal scat and spew samples for identifiable hard parts of prey. To date, completed studies indicate that Hawaiian monk seals feed upon a diverse array of prey items, with no single species being the most significant to the continued existence of the Hawaiian monk seal.

An ongoing NMFS study using quantitative fatty acid signature analysis to identify which prey items are most important to the various age and sex components of the several island populations of Hawaiian monk seals has revealed similar results to that of Goodman-Lowe (1998). The study suggests that Hawaiian monk seals in the Main Hawaiian Islands, directly feed on *Heterocarpus* and on deepwater bottomfish that are also known to prey on *Heterocarpus* (unpublished report, NMFS Pacific Islands Fisheries Science Center, Honolulu). Another study indicates that monk seals are opportunistic feeders that

[1]Nine adult male Hawaiian monk seals that had been identified as participating in mobbing behavior were translocated to Johnston Atoll by the NMFS in 1984. This was an attempt to reduce the frequency and/or severity of mobbing incidents involving injury or death of female seals, not to equalize the sex ratio at Laysan Island.

[2]A Crittercam is a self-contained video camera that has been mounted on a Hawaiian monk seal to record its foraging behavior.

prey upon a variety of species (Iverson 2000). The dietary importance of *Heterocarpus* spp. needs further analysis.

A female monk seal, tagged as a pup on Laysan, appeared at Johnston Atoll in 1968. It was the first to be recorded outside the Hawaiian Archipelago. It stayed until at least mid-August 1972 and in 1969 an untagged female hauled out and pupped. After the female left a month or so later, the pup remained until it died in 1971. Marks indicate that the cause of death was probably a shark attack (Amerson and Shelton, 1976). More recently another female has been seen at Johnston Atoll from July to September 1999 (O'Daniel, U.S.FWS, Johnston Atoll National Wildlife Refuge 2000, pers comm).

One direct interaction between a monk seal and lobster fishing gear occurred in 1986 and resulted in mortality from entanglement in the bridle rope of a NWHI lobster trap (NMFS, unpublished data, 1986). Since monk seal protective measures were implemented via an amendment to the Crustaceans FMP, there have been no reports of interactions between monk seals and lobster gear.

Hawaiian monk seals have the ability to dive to the depths at which *Heterocarpus* spp. is commonly caught (300-500 m) and where traps may be deployed, but no interactions have been reported. Although the Hawaiian monk seal may be found within the area and could interact with *Heterocarpus* fisheries in the Western Pacific Region, no reported or observed interactions have occurred. There could some direct impacts from routine vessel operations such as a low-level risk of behavioral disturbances, collisions, or entanglements with fishing gear, however no such impacts have been reported or observed. There is no current expectation of future interactions between the Hawaiian monk seal and the crustacean fisheries and therefore, they will not be described in greater detail in this document.

3.3.2 Sea Turtles

All sea turtles are designated as either threatened or endangered under the Endangered Species Act. The five species of sea turtles known to be present in the area are: the leatherback (*Dermochelys coriacea*), the olive ridley (*Lepidochelys olivacea*), the hawksbill *(Eretmochelys imbricata*), the loggerhead (*Caretta caretta*), and the green turtle (*Chelonia mydas*).

Leatherback turtles and hawksbill turtles are classified as endangered. The breeding populations of Mexico olive ridley turtles are currently listed as endangered, while all other olive ridley populations are listed as threatened. The loggerhead turtles and the green turtles are listed as threatened (note that the green turtle is listed as threatened under the ESA throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico).

Leatherbacks have the most extensive range of any living reptile and have been reported circumglobally from latitudes 71°N to 42°S in the Pacific and in all other major oceans. The diet of the leatherback turtle generally consists of cnidarians (i.e., medusae and siphonophores) in the pelagic environment, although foraging may occur at depth (Hartog

1980, *In* NMFS and U.S.FWS 1998). They forage widely in temperate waters except during the nesting season, when gravid females return to beaches to lay eggs. Typically, leatherbacks are found in convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters. Leatherbacks have maximum dive depths of over 1,000 m (Lutcavage and Lutz 1997).

The loggerhead turtle is a cosmopolitan species found in temperate and subtropical waters and inhabiting continental shelves, bays, estuaries and lagoons. Major nesting grounds are generally located in warm temperate and subtropical regions, generally north of 25°N or south of 25°S latitude in the Pacific Ocean. For their first several years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and sub-adult loggerheads feed on pelagic crustaceans, mollusks, fish and algae. As they age, loggerheads begin to move into shallower waters, where, as adults, they forage over a variety of hard and soft bottom habitats and can dive to depths of up to 233 m (Lutcavage and Lutz 1997).

The olive ridley is one of the smallest living sea turtles (carapace length usually between 60 and 70 cm) and is regarded as the most abundant sea turtle in the world. Since the directed harvesting of sea turtles was stopped in the early 1990s, the nesting populations in Mexico seem to be recovering, with females nesting in record numbers in recent years. The olive ridley turtle is omnivorous and identified prey include a variety of benthic and pelagic items such as shrimp, jellyfish, crabs, snails and fish, as well as algae and sea grass. Olive Ridley turtles have a maximum dive depth of 290 m (Lutcavage and Lutz 1997).

Hawksbill sea turtles (*Eretmochelys imbricate*) are circumtropical in distribution, generally occurring from latitudes 30° N to 30° S within the Atlantic, Pacific, and Indian Oceans and associated bodies of water (NMFS 1998). Hawksbills have a relatively unique diet of sponges (Meylan 1985, 1988). While data are somewhat limited on their diet in the Pacific, it is well documented that in the Caribbean hawksbill turtles are selective spongivores, preferring particular sponge species over others (Dam and Diez 1997b). Foraging dive durations are often a function of turtle size, with larger turtles diving deeper and longer. At a study site also in the northern Caribbean, foraging dives were made only during the day and dive durations ranged from 19 to 26 minutes at depths of 8–10 meters. At night, resting dives ranged from 35 to 47 minutes in duration (Dam and Diez 1997a).

Green sea turtles in Hawaii are genetically distinct and geographically isolated from other green sea turtle populations in the Pacific. The Hawaiian green sea turtle population has increased significantly over the last 35 years (Balazs & Chalupka, 2004). More than 90% of nesting activity occurs at French Frigate Shoals in the NWHI. Data from satellite tagging, tag/recapture studies and genetic research indicates that Hawaiian green sea turtles migrate to the NWHI to breed from MHI foraging and developmental habitats where they forage predominately on algae and sea grasses.

3.3.3 Seabirds

Hawaii

The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. More than 99% of the world's Laysan albatross (*Phoebastria immutabilis*) and 98% of the world's black-footed albatross (*P. nigripes*) return to the NWHI to reproduce. Of the 18 species of seabirds recorded in the NWHI, only the short-tailed albatross (*P. albatrus*) is listed as endangered under the ESA. Short-tailed albatross nest predominately at Torishima and Tsubame-zaki Islands, Japan with a current population size of approximately 2,000 individuals (FWS 2005). Land-based sighting records indicate that 15 short-tailed albatrosses have visited the NWHI over the past 60 years. Five of these visits were between 1994 and 1999 (NMFS 1999).

Seabirds known to occur around Hawaii include short-tailed, black-footed, and Laysan albatrosses; Christmas, Newell's, flesh-footed, wedge-tailed, and sooty shearwaters; and masked, brown, and red-footed boobies; tropicbirds; frigatebirds; terns; and petrels.

Marianas Islands

According to Pratt et al. (1987), the following seabirds have been sighted and are considered residents of the CNMI; wedge-tailed shearwater (*Puffinus pacificus*), white-tailed tropicbird (*Phaethon lepturus*), red-tailed tropicbird (*Phaethon lepturus*), masked booby (*sula dactylatra*) and brown booby (*Sula leucogaster*). None of these birds are endangered and there have been no reported interactions with the local bottomfish or crustacean fisheries.

The following seabirds have been sighted and are considered visitors to the CNMI; streaked shearwater (*Calonectris leucomelas*), short-tailed shearwater (*Puffinus tenuirostris*), Christmas shearwater (*Puffinus nativitatis*), Newell's shearwater (*Puffinus auricularis*), Audobon's shearwater (*Puffinus iherminieri*), Leach's storm-petrel (*Oceanodroma leucorhoa*), Matsudaira's storm-petral (*Oceanodroma matsudairae*), and the red-footed booby (*Sula sula*). Of these, only the Newell's shearwater is listed as endangered under the ESA. There have been no reported interactions with the local fisheries and any of these seabirds.

There have been no sightings of the endangered short-tailed albatross (*Diomedea albatrus*) in the CNMI although the CNMI is within the range of the Japan breeding colony at Torishima, Japan.

American Samoa

The following seabirds have been sighted and are considered residents of American Samoa (i.e breeding populations): Wedge-tailed Shearwaters (*Puffinus pacificus);* Audubon's Shearwater (*Puffinus lherminieri)*; Christmas Shearwater (*Puffinus nativitatis)*; Tahiti Petrel (*Pseudobulweria rostrata)*; Herald Petrel (*Pterodroma heraldica)*; Collared Petrel (*Pterodroma brevipes)*; Red-footed Booby (*Sula Sula)*; Brown Booby (*Sula leucogaster)*; Masked Booby (*Sula dactylatra)*; White-tailed Tropicbird (*Phaethon lepturus)*; Red-tailed Tropicbird (*Phaethon rubricauda)*; Great Frigatebird (*Fregata minor)*; Lesser Frigatebird (*Fregata ariel)*; Sooty Tern (*Sterna*

fuscata); Brown Noddy (*Anous stolidus)*; Black Noddy (*Anous minutus)*; Blue-gray Noddy (*Procelsterna cerulean)*; Common Fairy-Tern (White Tern) (*Gygis alba)*

The following seabirds have been sighted and considered visitors/vagrants to the American Samoa Islands: Short-tailed Shearwater *(Puffinus tenuirostris)*; Mottled Petrel (*Pterodroma inexpectata);* Phoenix Petrel (*Pterodroma alba)*; White-bellied Storm Petrel (*Fregetta grallaria)*; Polynesian Storm Petrel (Pratt - resident) (*Nesofregetta fuliginosa)*; Laughing Gull (*Larus atricilla)*; Black-naped Tern (*Sterna sumatrana)*

PRIA
Seabirds found in the PRIA include the black-footed albatross (*Phoebastria nigripes*), Laysan albatross (*Phoebastria immutabilis*), masked booby (*Sula dactylatra*), brown booby (*Sula leucogaster*), red-footed booby (*Sula sula*), wedge-tailed shearwater (*Puffinus pacificus*), Christmas shearwater (*Puffinus nativitatis*), petrels (*Pseudobulweria* spp., *Pterodroma* spp.), tropicbirds (*Phaethon* spp.), frigatebirds (*Fregata* spp.), and noddies (*Anous* spp.)

3.4 Essential Fish Habitat Identifications and Descriptions

3.4.1 Background on the Essential Fish Habitat Requirement

In 1996, the U.S. Congress reauthorized the Magnuson Fishery Conservation and Management Act (Magnuson Act) through the enactment of the Sustainable Fisheries Act (SFA). The SFA made significant revisions to the Magnuson Act (now known as the Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act) making it necessary for Regional Fishery Management Councils (Councils) to incorporate new requirements to end overfishing, reduce bycatch, and identify and define fishing sectors, fishing communities and protect habitat.

In particular, the 1996 SFA added the requirement that any fishery management plan (FMP) developed by a Regional Fishery Management Council shall:

> *Describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), 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.*

NMFS published a final rule implementing the EFH requirements of the Magnuson-Stevens Act on January 17, 2002 (67 FR 2343).

The NMFS guidelines defines essential fish habitat (EFH) as:

> *Those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting 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 habitats 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 the Councils in implementing the EFH provision of the Magnuson-Stevens Act sets forth four broad tasks, and requires that FMPs:

- Identify and describe (through text and maps), EFH for each life stage of all species managed under the FMP;
- Describe and evaluate the potential adverse effects to EFH from any fishing activity and minimize to the extent practicable, any such adverse effects;
- Identify activities other than fishing that may adversely affect EFH; and
- Identify actions to encourage the conservation and enhancement of EFH.

The final rule also provides guidance on what type of information should be used and how such information should be organized in order to identify and describe EFH. This includes data on life history, patterns of temporal and spatial variation, environmental and habitat variables that control or limit distribution abundance, reproduction, growth survival and productivity and specific habitat gaps and deficits in data quality. The guidelines state that the quality of available data should be rated using the following four-level system:

Level 1:	All that is known is where a species occurs based on distribution data for all or part of the geographic range of the species.
Level 2:	Data on habitat-related densities or relative abundance of the species are available.
Level 3:	Data on growth, reproduction or survival rates within habitats are available.
Level 4:	Production rates by habitat are available.

With higher quality data, those habitats most highly valued by a species can be identified, allowing a more precise designation of EFH. Habitats of intermediate and low value may be essential depending on the health of the fish population and the ecosystem. For example, if a species is overfished, and habitat loss or degradation is thought to contribute to its overfished condition, all habitats currently used by the species may be essential.

Habitat Areas of Particular Concern

The NMFS guidelines suggest Councils should identify specific types or areas of habitat within EFH as Habitat Areas of Particular Concern (HAPC) based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat
- The extent to which the habitat is sensitive to human induced environmental degradation
- Whether, and to what extent, development activities are or will be stressing the habitat type; and
- The rarity of the habitat type

3.4.2 General Distribution and Habitat Descriptions for *Heterocarpus* Species

Adult deepwater shrimp species of the genus *Heterocarpus* have been reported throughout tropical waters of the Pacific including Hawaii (Clark 1972, Struhsaker and Aasted; 1974, Daley and Ralston 1986; Gooding et al. 1988; Tagami and Barrows 1988; Moffitt and Parrish 1992; Ralston and Tagami 1992; Polovina 1993), Guam (Wilder 1977), Western Samoa (King 1980), and the Northern Mariana Islands (Moffitt 1983, Ralston 1986). They are generally found in benthic deepwater habitats between 200-900 meters in depth, primarily on the steep outer reef slopes which surround the islands and deepwater banks. However, because they are found at such deep depths, accurate description and characterization of preferred habitats are difficult to obtain and virtually non-existent in the scientific literature.

The distribution of these species tends to be stratified by depth with each species occupying different but often overlapping depths (Ralston 1986). Eight species belonging to the genus *Heterocarpus* (*Heterocarpus ensifer, H. laevigatus, H. sibogae, H. gibbosus, H. lepidus, H. dorsalis, H. tricarinatus and H. longirostris*) have been reported from the Western Pacific Region, although *Heterocarpus ensifer* and *H. laevigatus* have been the primary focus of fishery operations and research surveys.

Hawaii

Around Hawaii, *Heterocarpus laevigatus* and *H. ensifer* have been reported in both the MHI and the NWHI (Gooding 1984; Daley and Ralston 1986; Ralston and Tagami 1992; Moffitt and Parrish 1992). Submersible surveys of shrimp densities on different habitats in the MHI reported that *Heterocarpus ensifer* tended to group around large anemones and other benthic relief over an otherwise flat, sandy bottom and were very active in the presence of a baited trap (Gooding et. al., 1988; Moffitt and Parrish, 1992; Ralston and Tagami, 1992). However, *Heterocarpus laevigatus* were solitary and showed little activity around baited traps and greater densities of *Heterocarpus laevigatus* were observed on volcanic substrata rather than on coralline substrata (Moffitt and Parrish, 1992).

Trapping surveys in the MHI reported that the exploitable biomass of *H. laevigatus* was greatest at 460- 640 meters and negligible amounts occurred shallower than 350 meters or deeper than 830 meters (Ralston and Tagami, 1992). In the NWHI, the highest catch rates for *H. laevigatus* were made between 500 and 800 meters while the highest catch rates for *H. ensifer* occurred between 350 and 600 meters (Gooding 1984). Specific information pertaining to habitat characteristics in the MHI or the NWHI were not reported in any detail.

Mariana Archipelago

In the Mariana Archipelago, shrimp trapping surveys conducted at 22 islands and banks between 1982 and 1984 reported the presence of all eight species of *Heterocarpus: Heterocarpus ensifer, H. laevigatus* and *H. longirostris* comprised 99 percent of the catch while *H. tricarinatus, H. gibbosus* and *H. sibogae* were rare (Moffitt and Polovina 1987). Maximum depths according to Moffitt and Polovina are *H. ensifer* 366 m, *H. laevigatus*

777 m, and *H. longirostris* 1052 m. Similar depth ranges were reported for *H. ensifer* and *H. laevigatus* in Guam (Wilder 1977).

American Samoa
There is no information on *Heterocarpus* around American Samoa. However, King (1980) reported that trapping surveys on steep slopes between 250 and 700 m in Western Samoa yielded six species of deepwater shrimp with *H. ensifer* and *H. laevigatus* possessing the greatest commercial potential.

PRIA
There have been no surveys of deepwater shrimps conducted in any non-Hawaii PRIA. However, *Heterocarpus ensifer, H. laevigatus* and *H. gibbosus* have been reported from the Northern Gilbert Islands, Kiribati, which is at the same latitude and roughly 800 miles east of Howland and Jarvis Islands (Crutz and Preston 1987).

3.4.3 EFH Designations for *Heterocarpus* Species

To reduce the complexity and the number of EFH identifications required for each individual species and life stages of the genus *Heterocarpus* in the Western Pacific Region, and based upon the above information, the Council has recommended EFH for the complete assemblage of adult and juvenile *Heterocarpus* spp. as the outer reef slopes between 300 and 700 meters surrounding every island and submerged banks in the Western Pacific Region. (see Appendix A: EFH Maps).

The species complex designations includes all eight species of deepwater shrimp extant in the Western Pacific Region (*Heterocarpus ensifer, H. laevigatus, H. sibogae, H. gibbosus, H. Lepidus, H. dorsalis, H. tricarinatus and H. longirostris*). This designation is consistent with the Code of Federal Regulations (CFR) §600.815 (a)(1)(iv)(E).

At present, there are not enough data on the relative productivity of different habitats of *Heterocarpus* to develop EFH designations based on Level 3 (growth, reproduction and survival rates by habitat area) or Level 4 (production rates by habitat) data. In fact, there are little to no data available concerning growth rates, reproductive potentials and natural mortality rates at each life history stage.

The relationship between egg production, larval settlement and stock recruitment is also poorly understood and only available for a few specific sites (Wilder 1977; Clarke 1972; Moffitt and Polovina 1987). Mature shrimps may undergo a depth related seasonal migration in synchrony with reproduction and a shift into deeper waters from depths of about 550 meters to 700 meters. For these reasons the Council has designated EFH for *Heterocarpus* spp. eggs and larvae as the water column and outer reef slopes between 550 and 700 meters in the Western Pacific Region.

Habitat Areas of Particular Concern
Although trapping surveys at specific locations throughout the Western Pacific Region have identified depth ranges at which exploitable biomass and catch per unit effort is greatest for several *Heterocarpus* spp., there is not sufficient information to determine the

importance of the ecological function provided by habitat. Additionally, the Region's outer reef slopes between 300 and 700 meters are remote from human activities and are not believed to be sensitive to human induced environmental degradation or vulnerable to development activities. For these reasons, the Council has not designated any HAPC for *Heterocarpus* spp. at this time.

Table 4: Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for species managed under Western Pacific FMPs.
Proposed additions to the Western Pacific Region EFH are underlined.

SPECIES GROUP (FMP)	**EFH (juveniles and adults)**	**EFH (eggs and larvae)**	**HAPC**
Pelagics	Water column down to 1,000 m	Water column down to 200 m	Water column down to 1,000 m that lies above seamounts and banks.
Bottomfish	Water column and bottom habitat out to a depth of 400 m	Water column down to 400 m	All escarpments and slopes between 40-280 m, and three known areas of juvenile opakapaka habitat
Seamount Groundfish	Water column and bottom from 80 to 600 m, bounded by 29°-35°N and 171°E -179°W (adults only)	Epipelagic zone (0-200 nm) bounded by 29°-35°N and 171°E -179°W (includes juveniles)	Not identified
Precious Corals	Keahole, Makapuu, Kaena, Wespac, Brooks, and 180 Fathom gold/red coral beds, and Milolii, S. Kauai and Auau Channel black coral beds	Not applicable	Makapuu, Wespac, and Brooks Bank beds, and the Auau Channel
Crustaceans Spiny and slipper lobster	Bottom habitat from shoreline to a depth of 100 m	Water column down to 150 m	All banks within the Northwestern Hawaiian Islands with summits less than 30 m

SPECIES GROUP (FMP)	EFH (juveniles and adults)	EFH (eggs and larvae)	HAPC
Crustaceans *Heterocarpus* shrimps	Outer reef slopes at depths between 300-700 m	Water column and associated outer reef slopes between 550 and 700 m	Not identified
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 100 m	Water column and benthic substrate to a depth of 100 m	All Marine Protected Areas identified in the FMP, all PRIAs, many specific areas of coral reef habitat (see FMP)

4.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

4.1 Impacts to Physical Environment, EFH, HAPC

For each of the proposed alternatives, the implementation of its associated action will not have any short-term direct impacts to the physical environment, EFH, or HAPC of areas or species within the Western Pacific Region as they focus on data collection and fishery monitoring rather than changes to fishery operations. Fishery operations have recently landed over 100,000 lbs of deepwater shrimp in Hawaii as recently as 2005. Although anecdotal reports of operations in other areas of the Western Pacific do not suggest landings as high as in Hawaii, there are no data available from these operations.

Alternative 1 (no action) would not implement Federal management of known or prospective deepwater shrimp fisheries operating within the Western Pacific Region. The fishery is known to use traps which can be lost and become physical debris. Vessels engaged in the shrimp fishery have a limited potential for accidental groundings or releases of fuel or other chemicals. While these incidents are not unique to the deepwater shrimp fishery, they generally have a very low likelihood of occurring, limiting impacts to the physical environment, EFH, and HAPC. The fishery is currently not known to impact HAPC or EFH and adding *Heterocarpus* spp. (Alternative 2) to the list of MUS under the Crustaceans FMP would enable the Council to develop management measures, as appropriate, for deepwater shrimp fisheries in the region. This alternative would not result in significant adverse impacts to the physical environment. However, it would allow the Council to provide management measures if they are needed to prevent adverse effects by the shrimp fishery on the physical environment including areas designated as HAPC and EFH. In addition to the improved fishery management benefits of Alternative 2 describe above, adding *Heterocarpus* spp. to the list of MUS and requiring Federal permits and reporting under the Crustaceans FMP (Alternative 3) would provide data on shrimp fisheries in the Region. With this information, fishery scientists and the Council would be more informed of the impacts of deepwater shrimp fisheries on the physical

environment, including EFH and HAPC for all MUS listed under the existing FMPs. In the longer term, this information would improve the understanding of these fisheries and resources. The implementation of Alternative 3 would not result in significant adverse impacts to the physical environment, and would provide additional information to ensure that physical impacts that may be occurring are properly addressed in the future. The effects of fishing using traps and trawls to fish for *Heterocarpus* spp. in the region is unknown and appropriate research should be conducted to quantify potential impacts on benthic habitats. The data collection proposed by the preferred alternative could reveal more information on the effects of traps or other gears on EFH.

4.2 Impacts to Target and Non-target Species

Alternative 1 would not implement Federal monitoring and management of fisheries targeting *Heterocarpus* spp. in the Western Pacific Region, which could lead to overfishing of the species if fisheries resumed. It is anticipated that the no-action alternative would have long-term negative impacts to the sustainability of the target species due to the potential for overfishing. Non-target species are anticipated to be impacted as it relates to indirect effects of the fisheries operating to harvest *Heterocarpus* spp. Alternative 2 would allow for Federal management of deepwater shrimp fisheries if available information indicated that this was necessary. Alternative 2 would have similar negative impacts as the no-action alternative if Federal management is not deemed necessary. If the available information indicates that Federal management is necessary, then positive impacts are anticipated to occur as the target species are managed and monitored. In addition to improved target and non-target species management described for Alternative 2, Alternative 3 would help ensure that the *Heterocarpus* spp. fishery would be sustainably managed by implementing a comprehensive monitoring program of the harvests of target and non-target species associated with the harvest of *Heterocarpus* spp.. Data would be collected to identify target species catch, non-target species interaction, and potential impacts of the fishery.

4.3 Impacts to Public Health and Safety

None of the alternatives are anticipated to have significant adverse impacts on public health or safety because they are not anticipated to result in significant changes in current fishery operations. Adding *Heterocarpus* spp. as an MUS, as would occur with the implementation of Alternatives 2 or 3, would allow better monitoring of the fishery and provide a vehicle for future regulations to protect public health and safety as needed.

4.4 Impacts to Protected Species

The direct and indirect impacts on threatened and endangered species, marine mammals, and seabirds by deepwater shrimp fisheries are not anticipated to be significant under any of the alternatives as according to best available science *Heterocarpus* spp. are not believed to be important prey items for any protected species. Hawaiian monk seals consume Heterocarpus spp, but the degree to which they are consumed is not known and further analysis is needed. Deepwater shrimp fisheries around Pacific island areas are primarily trap fisheries, and therefore have the potential to entangle protected species. Alternative 1 would not provide for Federal management of the deepwater shrimp fishery operations in the Western Pacific Region to manage potential adverse impacts to

protected species, if needed. Alternatives 2 and 3 both provide a mechanism for Federal management of the fishery. Both alternatives would allow the Council to regulate deepwater shrimp fishing effort, as needed, including implementing gear restrictions or other fishery modifications that may be needed to manage potential adverse impacts to protected species. Neither alternative 2 nor 3 is anticipated to increase current fishing effort. Alternative 3 also implements Federal permit and reporting requirements. Included in these requirements is the obligation to report all protected species interactions.

Sea turtles are not believed (or documented in the literature) to prey upon *Heterocarpus* spp. as sea turtles generally forage near the sea surface or in shallow waters, whereas deepwater shrimp traps are deployed in depths greater than 300 m. The leatherback turtle is the only turtle known to dive to the depths where *Heterocarpus* spp. is commonly caught, but they are known surface feeders that feed on cnidarians. Although the species listed above may be found within the geographical area and could potentially interact with crustacean fisheries in the Western Pacific Region, no reported or observed interactions have occurred to date. Trap fisheries are not a known threat to sea turtle populations, and although there could be some direct impacts from routine vessel operations such as a low-level risk of behavioral disturbances or collisions, no such impacts have been reported or observed. Based on diving demographics combined with foraging preferences, the expectation for adverse interactions between these species and the deepwater shrimp fisheries are very low and therefore, they will not be described in greater detail in this document.

Although the seabird species listed in section 3.3.3 may be found within the area and could interact with deepwater shrimp fisheries in the Western Pacific Region, no reported or observed interactions have occurred. There could be some direct impacts from routine vessel operations such as a low-level risk of behavioral disturbances or entanglements with fishing gear, however no such impacts have been reported or observed. The expectation of adverse interactions between seabirds and the deepwater shrimp fisheries is very low.

4.5 Social and Economic Impacts

Alternative 1 is the status quo, and this alternative could be expected to result in a slow decline in the shrimp fishery if effort continues or expands over the long-term. Ultimately, overfishing could occur with adverse effects on fishery participants, and local fishing communities. The fishery does not contribute substantially to the national economy so the impacts of this worst case projection is not expected to be significant on a national level. Adding *Heterocarpus* spp. as an MUS under the FMP as provided for under Alternatives 2 and 3, would help prevent overfishing and ensure a sustainably managed fishery, which has benefits for the fishery participants, fishing communities and the nation.

Impacts on fishery participants would be greatest under Alternative 3, as it requires Federal permits and reports. However, such requirements are expected to have minor effects as the processes to obtain Federal permits and submit Federal catch reports is not

excessively burdensome or expensive. The preferred alternative contains regulatory compliance requirements for *Heterocarpus* spp. fishery vessel operators to obtain Federal permits and to submit Federal catch reports. This would be an additional economic and time burden on fishery participants. The Council anticipates that initial permit applications would require 0.5 hours per applicant, with renewals requiring an additional 0.5 hours annually. The cost for Federal permits has not been determined but would represent only the administrative cost and is anticipated to be less than $80 per permit. Based on experience in other fisheries, the time requirement for filling out Federal catch reports, the Council anticipates this to be approximately 20 minutes per fishing day.

Data is currently collected in American Samoa, Guam, and CNMI by voluntary creel and vendor surveys. Due to funding shortfalls, these creel surveys are episodic and do not capture all the data, but make estimates based upon available samples. In Hawaii, commercial fishermen report their data to the State of Hawaii, but recreational fishing data comes from a creel-type survey administered by the NMFS and State of Hawaii. Large scale shrimp fishermen in Hawaii are very infrequent, fish for a relatively short amount of time and leave the fishery before the data is analyzed. The preferred alternative would require Federal permits and reports that captures complete data that is not currently available. This would affect an average of 3 fishermen a year with an additional 2 or 3 fishermen during large scale pulses.

4.7 Environmental Justice

None of the alternatives considered would result in a significant and adverse impact on the environment or the health of members of minority or low-income populations. The adverse impacts of insufficient fishery management would be shared equally by all participants in the fishery.

4.8 Climate Change

The deepwater shrimp fishery is not likely to be affected by sea level changes, and there is no likely impact of climate change on the success of implementing improved fishery management measures for the deepwater shrimp fishery in the western Pacific. The preferred alternative, Alternative 3, would provide information that could be used by scientists to help understand biological and oceanographic processes affecting the fisheries. None of the alternatives would result in significant adverse contributions to local or global climate changes. The measures are largely administrative and would help ensure that the fishery is managed for long-term sustainability.

4.9 Cumulative Impacts

None of the action alternatives would have individually insignificant, but cumulatively significant, impacts. The addition of *Heterocarpus* spp. as MUS is an administrative measure that would allow the Council to provide future management measures that would affect deepwater shrimp fishermen. Future management actions by the Council as a result of this action would be made in coordination with affected parties and the public. There is currently a low level of sporadic participation in the fishery. Permitting and reporting requirements are expected to require nominal cost and time and are not additive because there is currently no reporting or permit required for this fishery.

5.0 CONSISTENCY WITH OTHER APPLICABLE LAWS AND STATUTES

5.1 National Environmental Policy Act (NEPA)

This amendment to the Council's Crustaceans FMP has been written and organized in a manner that meets NEPA requirements, and thus is a consolidated NEPA document, including an Environmental Assessment, as described in the NOAA Administrative Order (NAO) 216-6, Section 6.03.a.2.

5.1.1 Purpose and Need for Action

The purpose and need for this action are described in Section 1.5.

5.1.2 Alternatives

The alternatives for this action are described in Section 2.0.

5.1.3 Affected Environment

The affected environment for this action is described in section 3.0

5.1.4 Environmental Impacts of the Alternatives

The environmental impacts of the alternatives for this action are described in section 4.0

5.1.5 Preparers, Coordination, and Public Review

A list of preparers is provided in Section 1.4. Public involvement, coordination through Council meetings, and the opportunity for public comment on the EA, are described in section 1.3.

5.2 Consistency of the preferred alternative with the National Standards for Fishery Conservation and Management

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The preferred alternative is consistent with National Standard 1 in that by adding *Heterocarpus* spp. shrimps to the Crustaceans MUS, the Council would be able to regulate fishing on these species, estimate Maximum Sustainable Yield (MSY) and Optimum Yield (OY) for the Western Pacific Region, and take actions to prevent overfishing of the stock.

Implementation of a Federal permit and reporting system for the *Heterocarpus* spp. fishery is consistent with National Standard 1 as it would improve the accuracy and timeliness of information on the volume of *Heterocarpus* spp. caught by these vessels. Federalizing the *Heterocarpus* spp. fishery would also establish the institutional framework necessary to directly regulate *Heterocarpus* spp. catches by these vessels to prevent overfishing should this become necessary.

National Standard 2 states that conservation and management measures shall be based upon the best scientific information available.

The preferred alternative is consistent with National Standard 2 because it is based on the best scientific information available. Most of the research on deepwater shrimps in the Pacific has been conducted by the National Marine Fisheries Service Pacific Islands Fisheries Science Center (PIFSC), or under the auspices of the Secretariat of the Pacific Community, both of which are recognised centers of excellence for fisheries research and development.

The implementation of Federal permit and logbook program for *Heterocarpus* spp. fishery would improve the accuracy and timeliness of information as well obtain information about the volume of landings of *Heterocarpus* spp. and interactions of the fishery with other species and protected resources in the Western Pacific Region. This will improve both the quality and the quantity of information available to fishery scientists and managers.

National Standard 3 states that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The preferred alternative is consistent with National Standard 3 because *Heterocarpus* shrimp stocks would be managed throughout their range, and *Heterocarpus* spp. would be managed as a unit. National Standard 3 also allows a management unit to contain stocks of fish for which there is not enough information available to specify MSY and OY, so that data on these species may be collected under the FMP.

National Standard 4 states that conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The preferred alternative is consistent with National Standard 4 because it would not discriminate between residents of different States or allocate fishing privileges among any fishermen based upon their residence.

*National Standard 5 states that conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpos*e.

The preferred alternative is consistent with National Standard 5 because it would allow fishing operations to continue to operate as efficiently as possible. Other than placing a new permit and reporting requirement on participants the action in no way restricts fishing activities. To the extent that these new requirements impose additional costs, and

thereby reduce efficiency, the impacts are outweighed by the benefits obtained from the information collected.

National Standard 6 states that conservation and management action shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches.

The preferred alternative is consistent with National Standard 6 because including deepwater shrimps in the Crustaceans MUS would allow for the targeted regulation of any fishing activity, particularly if fishing increases on this resource.

National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The preferred alternative is consistent with National Standard 7 because it would achieve its objective in a manner that minimizes costs and avoids unnecessary duplication. The implementation of a Federal permit and logbook program for *Heterocarpus* spp. fishing vessels may seem duplicative and costly with its potential for overlap; however, a feature of successful data collection in U.S. fisheries has been the availability of multiple data streams on individual fisheries, (e.g. logbooks, local catch and dealer reports for Hawaii, and creel surveys for American Samoa, Guam, and CNMI). Such overlapping data streams permit cross referencing and validation of different data sources. The preferred alternative would also Federally require reporting uniformly throughout the EEZ and would apply to areas without local reporting requirements (CNMI), or sectors of the fishery that are not currently captured (Recreational fishing in Hawaii). In this manner, the preferred alternative would provide a mechanism for filling in potential data gaps.

National Standard 8 states that conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The preferred alternative is consistent with National Standard 8 because it would not adversely affect fishing communities. By adding these species to the Crustaceans FMP the Council gains the ability to sustain *Heterocarpus* spp. resources for the long-term, thus benefiting fishing communities that harvest deepwater shrimp..

National Standard 9 states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided minimize the mortality of such bycatch.

The preferred alternative is consistent with National Standard 9 because its reporting requirement includes an obligation to report all bycatch. Although bycatch appears low,

specific information will allow fishery scientists and the Council to assess and minimize bycatch and its morality to the extent possible.

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The preferred alternative is consistent with National Standard 10 because it would not promote any changes to current fishing practices for deepwater shrimps or increase risks to fishery participants. Increased data collection could also provide additional information on fishing practices and methods and thus a better understanding of the potential risks taken in harvesting deepwater shrimp in the region.

5.3 Regulatory Flexibility Act

In order to meet the requirements of the Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (RFA) requires government agencies to assess the impact of their regulatory actions on small businesses and other small entities via the preparation of Regulatory Flexibility Analyses.

The Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (RFA) requires government agencies to assess the impact of regulatory actions on small businesses and other small organizations. Based on the minor impact of these measures on potentially affected current and future fishery participants, the Council believes that this action is not significant (i.e. it will not have a significant impact on a substantial number of small entities) for the purposes of the Regulatory Flexibility Act and no Initial Regulatory Flexibility Analysis has been prepared.

5.4 Executive Order 12866

In order to meet the requirements of Executive Order 12866 (E.O. 12866), a Regulatory Impact Review is required for all regulatory actions that are of public interest. This review provides an overview of the problem, policy objectives, and anticipated impacts of the action, and ensures that management alternatives are systematically and comprehensively evaluated such that the public welfare can be enhanced in the most efficient and cost effective way. In accordance with E.O. 12866, the following is set forth: (1) This rule is not likely to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) This rule is not likely to create any serious inconsistencies or otherwise interfere with any action taken or planned by another agency; (3) This rule is not likely to materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; (4) This rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order. Based on these findings, this rule is believed not to be significant under E.O. 12866.

5.5 Coastal Zone Management Act

CZMA requires a determination that an FMP or amendment has no effect on the land or water uses or natural resources of the coastal zone, or is consistent to the maximum extent practicable with the enforceable policies of an affected state's coastal zone management program. A copy of this document will be submitted to the appropriate Western Pacific Region agencies for their review and concurrence with the Council determination that the preferred alternative would improve understanding of the *Heterocarpus* spp. deepwater shrimp fishery and provide a management basis to help ensure sustainability of the resource, and so, is consistent to the maximum extent practicable, with each state, commonwealth or territory's coastal zone management program.

5.6 Endangered Species Act

As the preferred alternative is purely administrative and would not permit or restrict any activities beyond those presently occurring, implementation of the proposed action will not adversely affect any ESA listed species or critical habitat necessary for the continued existence and recovery of those species. As the actions described in this document do not implement activities that would result in the incidental taking of any ESA listed species, or adverse modification of designated critical habitat, the Council believes that formal consultation under Section 7 of the ESA is not required to adopt this amendment. However, NMFS may choose to conduct an informal consultation. NMFS concluded an informal consultation under the ESA for proposed Amendment 13 on November 19, 2007, and concluded that the action is not likely to adversely affect ESA-listed marine species or their habitats. This conclusion was based on the finding that the effects of the proposed action are expected to be insignificant or discountable. That consultation noted that consultation must be reinitiated if: 1) a take occurs; 2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; 3) the identified action is subsequently modified in a manner causing effects to listed species or critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

Marine species listed as endangered or threatened under the Endangered Species Act (ESA) (Public Law 93-205; 87 Stat. 884) that have been observed in the waters in the Western Pacific Region are:

- All Pacific sea turtles including the following: olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), hawksbill turtles (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), and green sea turtles (*Chelonia mydas*).
- The following marine mammals: The blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), and right whale (*Eubalaena glacialis*). In addition, one endangered pinniped, the Hawaiian monk seal (*Monachus schauinslandi*).
- The following seabird: Short-tailed albatross (*Diomedea albatrus)*

The List of Fisheries for 2008, published pursuant to 50 CFR 229, classifies the Hawaii shrimp trap fishery as a Category III fishery under Section 118 of the MMPA (72 FR 66048; November 27, 2007). A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Additionally, informal consultation under section 7 of the Endangered Species Act (ESA) was completed for this action on November 19, 2007, in which NMFS determined that the proposed action is not likely to adversely affect ESA-listed marine species, including marine mammals, or their habitats. Thus, fishing activities conducted under Amendment 13 to the Crustaceans FMP would not affect marine mammals in any manner not considered or authorized by the commercial fishing take exemption under section 118 of the Marine Mammal Protection Act.

5.7 Essential Fish Habitat Identification and Description

The preferred alternative is not expected to have adverse impacts on essential fish habitat (EFH) or habitat areas of particular concern (HAPC) for species managed under the Pelagics, Bottomfish and Seamount Groundfish, Precious Corals, Crustaceans, or Coral Reef Ecosystems Western Pacific Fishery Management Plans (Table 3) because it is not expected to affect the fishing operations or catches of any fisheries, and thus is not likely to lead to substantial physical, chemical, or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey. Moreover, the preferred alternative would not result in a change in fishing gear or strategy that will impact EFH. For the same reason, the preferred alternative is not anticipated to cause substantial damage to the ocean and coastal habitat. The preferred alternative will increase monitoring and implement a mechanism for the implementation of future management measures should they become necessary.

5.8 Paperwork Reduction Act

The purpose of the PRA is to minimize the burden on the public. The Act is intended to ensure that the information collected under the proposed action is needed and collected in an efficient manner (44 U.S.C. 3501(1)). This action would create a permitting and reporting requirement for all participants in the deepwater shrimp fishery who target *Heterocarpus* spp. within the EEZ waters of the Western Pacific Region.

The preferred alternative considered here contains regulatory compliance requirements for *Heterocarpus* spp. fishery vessel operators to obtain Federal permits and to submit Federal catch reports. The Council anticipates that initial permit applications would require 0.5 hours per applicant, with renewals requiring an additional 0.5 hours annually. The cost for Federal permits has not been determined but would represent only the administrative cost and is anticipated to be less than $80 per permit. Based on experience in other fisheries, the time requirement for filling out Federal catch reports, the Council anticipates this to be approximately 20 minutes per fishing day. With an average of 3 participants per year taking an expected 10 trips per year would equal to a total of 30 trips per year by the entire fishery. With a maximum of 6 participants taking an expected 10 trips per year, the maximum trips for the entire fishery per year would equal to 60.

5.9 Executive Order 12612 (Federalism)

The regulatory measures in this document do not contain policies with Federalism implications under E.O. 13132

5.10 Executive Order 13089 (Coral Reef Protection)

The regulatory measures in this document are consistent with E.O.13089, which is intended to preserve and protect the biodiversity, health, heritage, and social and economic value of U.S. coral reef ecosystems and the marine environment.

5.11 Information Quality Act

To the extent possible, this information complies with the Information Quality Act and NOAA standards (NOAA Information Quality Guidelines, September 30, 2002) that recognize information quality is composed of three elements - utility, integrity and objectivity. Central to the preparation of this regulatory amendment is objectivity which consists of two distinct elements: presentation and substance. The presentation element includes whether disseminated information is presented in an accurate, clear, complete, and unbiased manner and in a proper context. The substance element involves a focus on ensuring accurate, reliable, and unbiased information. In a scientific, financial, or statistical context, the original and supporting data shall be generated, and the analytic results shall be developed, using sound statistical and research methods.

At the same time, however, the Federal government has recognized, "information quality comes at a cost. In this context, agencies are required to weigh the costs and the benefits of higher information quality in the development of information, and the level of quality to which the information disseminated will be held." (OMB Guidelines, pp. 8452-8453).

One of the important potential costs in acquiring "perfect" information (which is never available), is the cost of delay in decision- making. While the precautionary principle suggests that decisions should be made in favor of the environmental amenity at risk (in this case, marine ecosystems), this does not suggest that perfect information is required for management and conservation measures to proceed. In brief, it does suggest that caution be taken but that it not lead to paralysis until perfect information is available. This document has used the best available information and made a broad presentation of it. The process of public review of this document provides an opportunity for comment and challenge to this information, as well as for the provision of additional information.

5.12 Executive Order 12630 (Takings)

This amendment will allow the deepwater shrimp fishery to be regulated under the MSA via its inclusion in the Crustaceans FMP. The Crustaceans FMP outlines restrictions on the use of destructive fishing gears. Under the Crustaceans FMP, MUS may not be taken by means of poisons, drugs or other chemicals, spears, nets, hooks, or explosives. These gears are not currently being used in the areas affected by the amendment and their prohibition should not be considered a taking under E.O. 12630.

6.0 PROPOSED REGULATIONS

*Red/underline indicates new text to current regulations.

Subpart B—Western Pacific Fisheries—General

§ 665.12 Definitions.

Crustaceans management unit species means spiny lobster (*Panulirus marginatus* or *Panulirus penicillatus*), slipper lobster (family *Scyllaridae*), ~~and~~ Kona crab (*Ranina ranina*), and deepwater shrimp (*Heterocarpus* spp.).

Subpart D—Western Pacific Crustacean Fisheries

§ 665.41 Permits

(a) Applicability. (1) The owner of any vessel used to fish for lobster or *Heterocarpus* spp. in Permit Area 1 must have a limited access permit (for lobsters) or crustaceans permit (for *Heterocarpus* spp.) issued for such vessel. Only one lobster permit will be assigned to any vessel.

(2) The owner of any vessel used to fish for lobster or *Heterocarpus* spp. in Permit Area 2, Permit Area 3, or Permit Area 4 must have a permit issued for that vessel.

§ 665.42 Prohibitions.
(c) in Permit Areas 1, 2, 3 or 4, it is unlawful for any person to:

(1) fish for, take, or retain *Heterocarpus* spp. without a crustaceans permit issued under §665.41;

(2) falsify or fail to make, keep, maintain, or submit a Federal logbook of harvests of *Heterocarpus* spp. in Permit Areas 1, 2, 3, or 4 as required under *§665.14.*

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