UNITED STATES DEPARTMENT OF COMMERCE
The Deputy Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

MAY - 3 2002

Dear Reviewer,

In accordance with provisions of the National Environmental Policy Act of 1969 (NEPA), we enclose for your review the Final Environmental Impact Statement (FEIS)/Fishery Management Plan for Coral Reef Ecosystems of the Western Pacific Region (FMP), located in the Exclusive Economic Zone of the Western Pacific Region. This FEIS is prepared pursuant to NEPA to assess the environmental impacts associated with NOAA proceeding with implementation of the proposed FMP.

The FMP proposes to: (1) establish fishing permit and reporting requirements; (2) specify the use of selective, non-destructive gears and methods for harvesting management unit species; (3) designate marine protected areas, including no-take marine reserves and areas zoned for specific fishing activities allowed only with a special permit; and (4) establish a framework process to allow for future regulatory adjustments to the coral reef ecosystem management program. The FMP also would establish a formal process to allow the various fishery management plan teams, i.e., pelagics, crustaceans, bottomfish and seamount groundfish, precious coral, to coordinate their discussion of relevant fishery issues with the coral reef ecosystem plan team; facilitate consistent State and territorial level management of coral reef resources; create social, economic and political incentives for sustainable use and disincentives for non-sustainable use of coral reef resources; and foster education, public outreach and "coral reef management diplomacy." The FMP contains a definition of overfishing, designates management unit species divided into two groups: harvested coral reef taxa and non-targeted coral reef taxa; identifies essential fish habitat; describes fishing sectors; and addresses bycatch and other requirements of the Magnuson-Stevens Fishery Conservation and Management Act.

RESPONSIBLE OFFICIAL: Dr. Charles Karnella, Administrator
Pacific Islands Area Office, Southwest Region
National Marine Fisheries Service
1601 Kapiolani Blvd., Rm. 1110
Honolulu, Hawaii 96814
(808) 973-2937

Please note that this FEIS is dated for October 2001. The National Marine Fisheries Service (NMFS) headquarters received the Coral Reef Ecosystem FMP/FEIS for public review at that time but still had to resolve a few issues before formally reviewing. NMFS began its formal review of these documents on March 2002, and discovered that the essential fish habitat alternatives were not included in the FEIS. They are attached with this letter along with an errata sheet.

Any written comments or questions you may have should be submitted to the responsible official by June 10, 2002. Also, please send one copy of your comments to my staff in Room 6121, NOAA/SP, U.S. Department of Commerce, 14th and Constitution, N.W. Washington, D.C. 20230.

Sincerely,

for Scott B. Gudes,
Deputy Under Secretary for
Oceans and Atmosphere

Enclosures

Errata

Insert the following text after the "III: Maps of Coral Reef Habitat in the Western Pacific Region" heading and before the maps (p. 390) in Volume III of the "Final Fishery Management Plan for the Coral Reef Ecosystems of the Western Pacific Region":

For each of the maps listed in Chapter III of Volume III, EFH is bounded by, and displayed within, the 50 fm depth contour (the hashed area on each map). EFH may encompass all or some of the hashed area, based on the EFH text descriptions listed in Table 6.3 of Volume I, and repeated below:

For Currently Harvested Coral Reef Taxa, EFH for *Eggs and Larvae (all species)* is:

the water column from the shoreline to the outer boundary of the EEZ to a depth of 50 fm,

EXCEPT for the following species:

Carcharhinidae	(no EFH designation for egg and larval life stages)
Labridae	(EFH for eggs and larvae is designated as the water column *and all bottom habitat* from the shoreline to the outer boundary of the EEZ to a depth of 50 fm)
Octopodidae	(EFH for the egg life stage is all coral, rocky, and sand-bottom areas from 0 to 50 fm)

For Currently Harvested Coral Reef Taxa, EFH for *Adults and Juveniles (all species)* is:

all bottom habitat and the adjacent water column from 0 to 50 fm,

EXCEPT for the following species:

Holocentridae Muraenidae	(EFH for adults and juveniles is *all rocky and coral areas* and the adjacent water column from 0 to 50 fm)
Kuhliidae	(EFH for adults and juveniles is all bottom habitat and the adjacent water column *from 0 to 25 fm*)
Kyphosidae	(EFH for adults and juveniles is *all rocky and coral bottom* and the adjacent water column from *0 to 15 fm*)
Mullidae Octopodidae Polynemidae Priacanthidae	(EFH for adults and juveniles is *all rocky/coral bottom and sand-bottom habitat* and the adjacent water column from 0 to 50 fm)

Mugilidae	(EFH for adults and juveniles is *all sand and mud bottom* and the adjacent water column from *0 to 25 fm*)
Scombridae Sphyraenidae	(EFH for adults and juveniles is *only* the water column from the shoreline to the outer boundary of the EEZ to a depth of 50 fm)
Aquarium Species/Taxa	(EFH for adults and juveniles is the coral, rubble, and other hard-bottom features and the adjacent water column from 0 to 50 fm)

For Potentially Harvested Coral Reef Taxa, EFH for *all life stages and species* is:

the water column and all bottom habitat from the shoreline to the outer boundary of the EEZ to a depth of 50 fm

ESSENTIAL FISH HABITAT

EFH Designations for MUS

Due to the large gaps in scientific knowledge about the life histories and habitat requirements of many species living the coral reef ecosystem, the Council has adopted a precautionary approach in designating EFH for the Coral Reef Ecosystem MUS. Several alternative approaches for EFH designation for MUS were considered and are listed as follows (1) no action; (2) species-by-species; (3) family-by-family; (4) habitat/behavioral group; (5) reef obligate species/reef-associated species; (6) designate MUS at a higher taxonomic order; (7) representative species; (8) indicator species; (9) habitat composites; (10) designate the sessile benthos MUS (e.g., reef-building corals) as EFH for those organisms themselves and for associated species.

The Council endorses an approach to designating EFH similar to one previously used by the South Atlantic and Pacific Fishery Management Councils. MUS are linked to specific habitat "composites" (i.e., sand, live coral, seagrass beds, mangrove, etc.) for each life history stage, consistent with the depth of the ecosystem to 50 fathoms and to the limit of the EEZ. The proposed EFH may also protect the habitats of species managed under other FMPs in the Western Pacific. The habitat composite approach is described in depth as alternative 9.

Alternatives Considered in EFH Designation for MUS

Alternative 1: No action/status quo

Alternative 1 would continue the status quo. No new EFH would be designated for the Coral Reef Ecosystem and associated species in addition to those already designated for species covered under the existing Bottomfish FMP and the Crustacean FMP. This is not a viable alternative as the Magnuson-Stevens Act mandates that any FMP shall describe and identify essential fish habitat for the fishery based on the guidelines established under section 305(b)(1)(A); minimize to the extent practicable adverse effects on such habitats caused by both fishing and non-fishing activities and; identify other actions to encourage the conservation and enhancement of such habitat.

Alternative 2: Designate EFH species-by-species

Alternative 2 would attempt to identify and describe EFH for each of the thousands of MUS associated with the coral reef ecosystem. This would assume that there has been systematic sampling conducted in the Western Pacific Region to adequately identify species and their habitat requirements, densities, productivity and temporal and spacial distribution of each major life history stage. However, a great number of coral reef organisms are not yet described by science and therefore, cannot be assessed even at the level 1 guideline. In addition, those species that are known to exist are sometimes too cryptic to be noticed when macro fauna and flora are monitored. Monitoring does not presently nor is it practicable to cover more than a small percentage of total reef area and organisms. Therefore, the quality of available data necessary to

identify EFH for all coral reef associated MUS is virtually non-existent even at the level 1 guideline. Furthermore, information for the majority of MUS extant in the coral reef ecosystem cannot be assessed beyond the level 2 rating.

Alternative 3: Designate EFH family-by-family

Alternative 3 would designate EFH by family groups. Grouping MUS by families allows for broader designation of EFH and thus strengthens protection of EFH for the coral reef ecosystem, as family groups frequently utilize common habitat and exhibit similar life history characteristics. However, diversity of habitat use and dependance may be greater within some families than between families. For example, the family Lutjanidae include 16 genera and nearly 100 species in the Western Pacific Region. The range of some species in the subfamily Lutjanus are known to occur from the shoreline and have also been observed at depths below 50 fathoms (Ota and Parrish 1981). On the other hand, the range of some species in the subfamily Etelinae, such as the genus *Pristipomoides*, are believed to occur on bottom habitat from 40 meters down to a depth of 400+ meters. Based on a level 1 rating, EFH for the family Lutjanidae could arguably encompass the entire water column down to 400+ meters and to the extent of the EEZ. Consequently, a broad designation of EFH at the family level could compromise the justification of the EFH designation when information is not available beyond a Level 2 rating.

Alternative 4: Designate EFH by trophic level feeding guild associations with habitat (habitat/behavioral group)

Various studies have been conducted to analyze trophic linkages and their relationship to the function of the ecosystem as a whole. Such studies have focused on predator /prey interactions and their effects upon ecosystem dynamics. For example, Norris 1985 conducted a study of the trophic relationships of piscivorus coral reef fishes in the NWHI. He concluded that certain trophic linkages are quantitatively important to the function of the ecosystem, although there are others that are not. This uncertainty has the potential to have deleterious effects if EFH is identified and described for MUS arbitrarily. Correspondingly, this approach would present great difficulties when attempting to determine linkages that exist between kingdoms such as those shared between algae and herbivorous fish species.

Alternative 5: Designate EFH for the coral reef biological community (reef obligate/associated species)

Coral reef ecosystems are characterized not only by diversity, but gradients and subtle transitions which defy precise classification. Hence, not all resource management decisions require the same level of resolution. Some of the subtleties and details may be ignored to resolve problems of a widespread or more general nature. Such problems limit the immediate practical application of ecosystem-based management for coral reefs. Competition, recruitment limitation, and predation have all been proposed as processes that govern the distribution of fishes. Presumably the distribution of invertebrates and seaweeds in coral reef biological communities are subject to

the similar processes. Presently, the most widely accepted view is that many fishes exist as spatially divided populations in a patchy environment where local subpopulations maintain interconnection by exporting larvae to and receiving larvae from other subpopulations (Sale 1991). A pluralistic view has recently emerged where multiple processes are acknowledge as being important in structuring the fish.

Alternative 5 proposes to designate EFH for species that are known to play an important role in the ecology and dynamics within the coral reef ecosystem. Scientists recognize that reef ecosystems are organized largely by internal processes, including predator-prey trophic guilds, keystone species, indicator species, symbiotic and other biological inter-relationships that are subject to periodic natural disturbance (e.g., storm waves, floods). Identification and description for these MUS can provide a broad range of protection as this alternative would encompass a great number of fish species, invertebrates, corals and algae. However, Alternative 5 is insufficient in implementing the EFH mandate as only "important" species/ families are addressed. It may also fail to capture those species that have an important role in the ecology of the coral reef ecosystem, but have not been adequately studied by scientists.

Alternative 6: Designate EFH for MUS at higher taxonomic groups

Alternative 6 is similar to Alternative 3 (designating EFH family-by-family), except that it would designate EFH by higher taxonomic levels. Like Alternative 3, a higher taxonomic grouping of closely related species allows for broader designation of EFH and thus strengthens protection of EFH for the coral reef ecosystem, as these groups frequently utilize common habitat and exhibit similar life history characteristics. However, diversity of habitat use and dependance may be greater within some some taxonomic groups than between these taxonomic group. Consequently, a broad designation of EFH at higher taxonomic levels could compromise the justification of the EFH designation when information is not available beyond a Level 2 rating.

Alternative 7: Designate EFH based on representative (keystone) species

Keystone species are species that play a role in the food web so significant that if they are removed from the ecosystem in significant numbers, existing trophic relationships may be upset, affecting other species' stock size or viability. In coral reef ecosystems of the western Pacific, apex predators, including coastal sharks and jacks (ulua), qualify as keystone predators. For example, a study at French Frigate Shoals (FFS) in the NWHI estimated that the combined populations of two carangids (jacks or ulua) eat at least a few thousand metric tons of prey annually in a 500 km^2 of coral reef. From an ecological perspective, this must represent one of the most important top-level trophic paths in this system (Sudekum et al. 1991). The estimated combined predation pressure by these two jacks exceeds the combined estimate for the three dominant coastal shark species in the same system by a factor of about 40. Other studies and observations have shown that predation by jacks at FFS dwarfs the amount of fish removed by bottomfish hook-and-line fishing around the same atoll. When compared to the annual removal of fish at FFS, fish consumption by two jack species removed approximately 5000 times more

tons of biomass than the Bottomfish Fishery in the NWHI (Sudekum et al. 1991 and Council 2000). However, similar to Alternative 5, this alternative is insufficient in implementing the EFH mandate as only representative species/ families are addressed. It may fail to capture those species that have an important role in the ecology of the coral reef ecosystem, but have not been adequately studied by scientists.

Alternative 8: Designate EFH for environmental indicator species/families

Indicator species are species that are sensitive to changes in the environment and respond to those changes respectively. Indicator species such as *Chaetodon spp.*, are useful in the assessment of ecological conditions and have been used in monitoring the health of coral reef ecosystems where baseline data does not exist. Unfortunately, the efficacy of indicator species themselves are not solely indicative of the virility or demise of the coral reef ecosystem. Storm events, recruitment processes and other factors weigh heavily on the condition of coral reef ecosystems and are known to naturally expedite the displacement of species. Studies have further shown that marine algae out competes coral species with changes in herbivory pressures and nutrient influx. The designation of EFH based on this criteria is not scientifically sound as it would arbitrarily designate EFH for only a select number of species in the coral reef ecosystem. The lack of understanding of such interactions such as trophic level feeding guilds and predator/prey interactions frustrates efforts to define reef ecosystems, and also places constraints on monitoring and evaluation of changes caused by natural and human forces. Even when significant changes in coral reef resource abundance, size distribution and species composition attract the attention of resource managers, they are subject to varied interpretation because of the difficulty of differentiating natural from man-induced effects. There is also a lack of consensus on what constitutes "preferred" ecosystem outcomes that are clearly desirable and recognizable by managers, scientists and resource users.

Alternative 9: Designate EFH by habitat composites (Preferred Alternative)

Except for several major coral reef associated species, very little is known about the life histories, habitat utilization patterns, food habits or spawning behavior of most coral reef associated species. It is completely unrealistic and inefficient to give every small unit of coral reef an equal amount of management attention. To avoid directing the limited management resources available toward inconsequential problems, the Council needs to be able to make distinctions and to recognize the occurrence of patterns (i.e., the repetition in space and/or in time, of similar conditions and events). Classification of the reef environment according to habitat types is a logical first step toward pattern recognition. With the inclusion of factors that account for biological community structure and function, a classification system could evolve toward an ecosystem form of resource management. The most practical approach is to utilize physical attributes, and, conceptually at least, arrive at a community approach as subcategories once the latter become evident through closer scrutiny.

Three co-ordinate and interlocking factors are important in the distribution of shore and reef invertebrates: a) the degree of wave shock; b) the type of bottom; and c) the tidal exposure. These characteristics are recognized as the basis of at least one classification scheme developed for coastal water ecosystems in the Hawaiian Islands. The narrow tidal range and high wave action characteristic of nearshore environments in Hawaii render classification schemes developed for higher latitude, continental coasts inappropriate. The strong modifying influence of coral reefs on shoreline environments further reduces the applicability of such schemes. The primary effect of the presence of a reef structure is to nullify, or at least seriously modify, the concepts of open and protected coasts. The importance of wave energy in the determination of organism distribution remains unchanged but the presence and form of the reef itself determines the nature of the wave regime at and near the shore. Reef form, therefore, must be a primary category in any classification scheme for tropical coastal zones.

Physical factors affecting the distribution and abundance of coral reef species vary both spatially and temporally. Spatial factors include substratum type, and complexity and proximity to adjacent habitats (Friedlander and Parrish 1998). Physical habitat plays an important role in structuring ecological communities but its contribution has seldom been documented in the literature because of the difficulty of separating effects of habitat from other influences in the environment. Structural features of habitat may: 1) provide shelter from physical and chemical stress; 2) restrain foraging predators and interfering competitors; and 3) modify availability of resources and their rate of acquisition. Habitat complexity provides refuges and barriers that fragment the area, resulting in more heterogenous assemblages. Temporal physical factors include changes in temperature, salinity, turbidity, terrestrial runoff and wave energy. Biological characteristics include the availability of the appropriate food organisms, both in species composition and abundance and the ability of the food production system in providing a continuous level of appropriate food items.

For most Coral Reef MUS, EFH was identified based upon the Level 1 data rating, and linked with specific habitat composites (i.e. sand, live coral, seagrass beds, mangrove ect.) for each life history stage, consistent with the depth of the ecosystem to 50 fathoms and to the limit of the EEZ. This alternative would also protect the habitats of other species managed under other FMP in the Western Pacific Region and possibly achieve ecosystem management through an incremental approach.

To implement the habitat composite alternative for MUS of the Coral Reef Ecosystem FMP, Council used a two-tiered approach in designating EFH consistent with the use of habitat composites.

Currently Harvested MUS

EFH has been identified for species which are (1) currently being harvested in federal waters or (2) likely to be harvested in the near future, or (3) species of particular concern are designated as harvested MUS.

To reduce the complexity and the number of EFH identifications required for individual species and life stages, the Council has designated EFH for species assemblages pursuant to §600.320 National Standard 3- Management Unit(d)(2). The designation of these complexes is based upon the ecological relationships among species and their preferred habitat. These species complexes are grouped by the known depth distributions of individual MUS. For a broader description of the life history and habitat utilization patterns of individual Harvested MUS, see Volume III.

Potentially Harvested MUS

Table 6.4 (Volume I) summarizes the habitat types utilized by the individual species that comprise the higher taxonomic orders that have been designated as Potentially Harvested MUS. Based upon this analysis the Council has designated EFH for the Potentially Harvested MUS as all habitat composites occupied by the MUS to the extent of the coral reef ecosystem as defined in the FMP (50 fm) (see Table 6.5 in Volume I). These taxa include literally thousands of species that encompasses virtually the entire range of coral reef fauna and flora. There are large gaps in scientific knowledge about the life histories and habitat requirements of the thousands of species of organisms that comprise these taxa. In fact, a large percentage of these biota have not been described by science. Therefore, the Council has adopted a precautionary approach in designating EFH to ensure that enough habitat is protected to sustain managed species.

To reduce the complexity and the number of EFH identifications required for individual species and life stages, the Council has designated EFH for species assemblages pursuant to §600.320 National Standard 3- Management Unit(d)(2). The designation of these complexes is based upon the ecological relationships among species and their preferred habitat. These species complexes are grouped by the known depth distributions of individual MUS. For a broader description of the life history and habitat utilization patterns of Potentially Harvested MUS, see Volume III.

Alternative 10: Designate the sessile benthos MUS (e.g., reef-building corals) as EFH for those organisms themselves and for associated species

In their adult life history stage, sessile benthos (described in Volume III) generally lack mobility and form much of the habitat upon which other species depend. These organisms, such as reef building corals, algae and sponges, are instrumental in the coral reef ecosystem's primary production and are largely responsible for supporting the higher trophic levels, many with predator-prey relationships. The high degree of symbiosis begins with the zooxanthellate associations and encompass a wide degree of associations, including trophic relationships of piscivorus coral reef fishes. These linkages are believed to be quantitatively important to the function of the ecosystem as they have certain measureable effects to the function of the ecosystem as a whole. Due to these considerations, sessile benthos and their fundamental role in the ecosystem could be defined as EFH themselves. However, this is not a viable alternative as this approach would fail to identify and describe EFH for the great majority of coral reef MUS, many of which are not primarily associated with the sessile benthos MUS.

HABITAT AREAS OF PARTICULAR CONCERN

In addition to EFH, the Council also identified potential areas for designation as habitat areas of particular concern (HAPCs) within EFH. HAPCs are specific areas within EFH that are essential to the life cycle of important coral reef species. In determining whether a type of area should be designated as a HAPC, one or more of the following criteria must be met: (1) ecological function provided by the habitat is important to MUS; (2) habitat is sensitive to human-induced environmental degradation; (3) development activities are, or will be stressing the habitat or; (4) the habitat is rare.

Alternatives Considered in HAPC Designations for MUS

As mentioned earlier, large gaps in scientific knowledge about the life histories and habitat requirements of many coral reef ecosystem species places constraints in accurately designating EFH for MUS. The Council considered several alternatives to implement the EFH provision in the Coral Reef FMP which included: (1) no action; (2) Designate HAPC by habitat type based on a coral reef classification system and; (3) Designate HAPC by habitat composites based on the criteria for selection.

Alternative 1: No action/status quo

Under this alternative, no HAPC would be designated for any Coral Reef FMP MUS. This is not a viable alternative as there are many habitat types in the Western Pacific Region that meet the HAPC criteria for MUS.

Alternative 2: Designate HAPC by habitat type based on a coral reef classification system

Benthic marine habitats in the Western Pacific Region are generally divided into three major zones: littoral, sublittoral and the deep sea. Each of these zones are further divided into distinct habitats types based upon physical attributes, exposure to wave action, and terrestrial influences. Coral reef ecosystem in the Western Pacific Region contains numerous habitat types ranging from estuaries to barrier reefs and atolls. During the 1980s, a classification system for categorizing coral reef habitats was developed by AECOS Inc. (AECOS). The classification system categorized coral reef habitat based on a 4-digit numeric key which represents one of 14 specific habitat descriptions. The key is not strictly dichotomous, rather it represents a "web" which leads the user through the assignment of numbers in order, to reach each digit position. The orders or digit positions represent progressively finer scale descriptions of classification, leading ultimately to a particular habitat type and is illustrated below. A similar classification scheme is the developmental stages and will soon be implemented as a tool in the Coral Reef Assessment and Monitoring Program (CRAMP) in Hawaii (Jokiel, pers. comm. 1998).

Once habitat types are identified, they can be linked to MUS they support and then compared to the HAPC designation criteria to determine the justification of its inclusion. Unfortunately, this

classification scheme was intended exclusively for Hawaii and is presently inadequate for classifying habitat in other regions in the Pacific. As more information is gathered from other regions and incorporated into this classification scheme, this alternative may be revisited by the Council for possible inclusion as a framework measure.

Alternative 3: Designate HAPC by habitat composites based upon the criteria for selection (Preferred Alternative)

The Council considered locations to designate as potential HAPC based upon recommendations submitted by the Plan Team. The Plan Team selected certain areas that meet the NMFS criteria for HAPC and are known to support populations of MUS. The Plan Team further noted that existing protected areas in state/territorial/commonwealth waters should be considered for possible HAPC designation by virtue of their existing protected status. The Plan Team recommended that further research be conducted in the region, and that a framework provision be developed to modify and update EFH/HAPC as more information is gained. For a list of the areas that have been designated as HAPC, and the criteria met by each area, see Table 6.6 (Volume I).