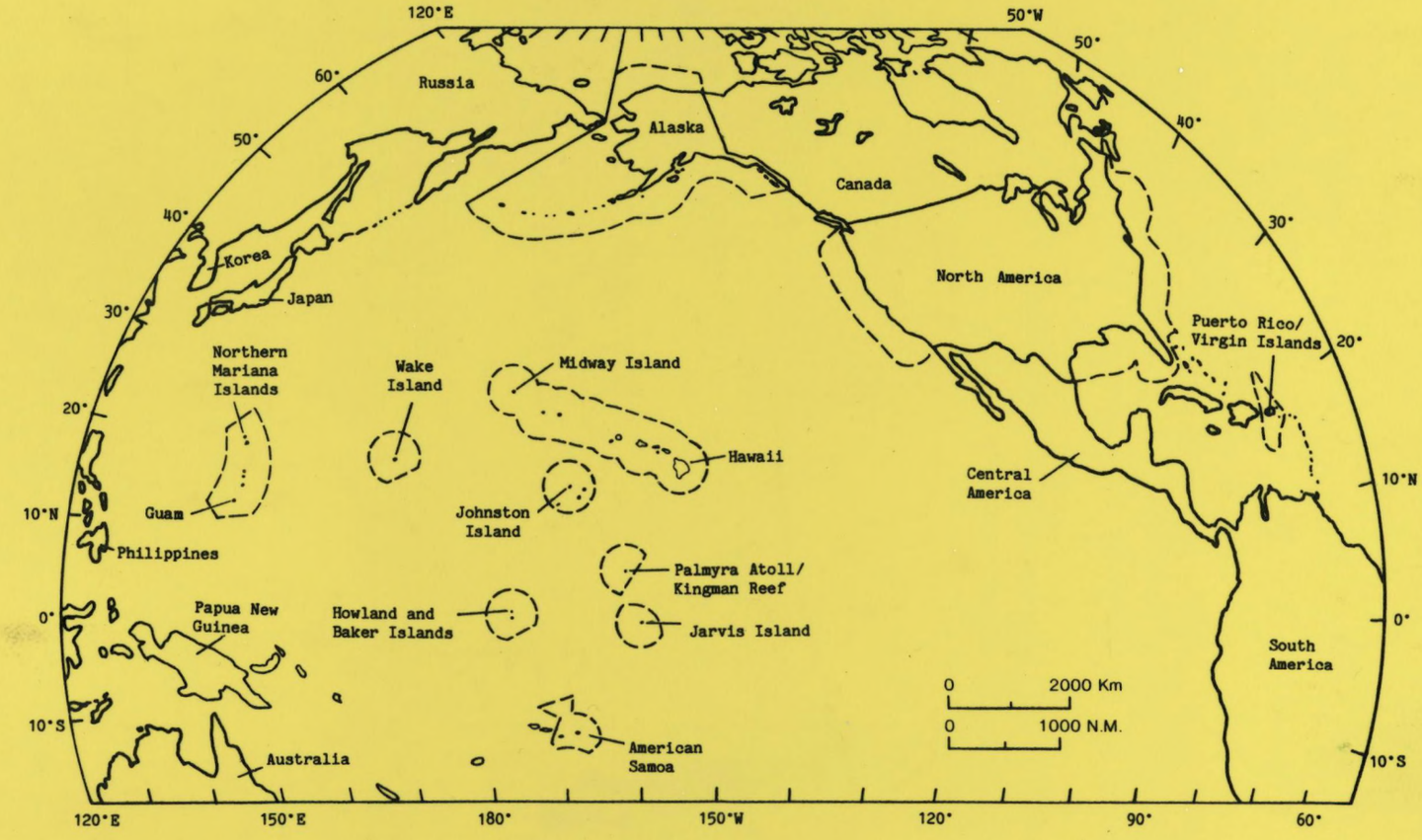
Western Pacific Fishery Management Council



Fishery Management Plan

for

Precious Corals Fisheries

of the

Western Pacific Region

FISHERY MANAGEMENT PLAN

for the

PRECIOUS CORAL FISHERIES (and ASSOCIATED NON-PRECIOUS CORALS)

of the

WESTERN PACIFIC REGION

PREPARED BY

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Executive Summary

The Fishery Conservation and Management Act of 1976 (Public Law 94-265) provides for United States exclusive management authority over the fishery resources and fisheries within a Fishery Conservation Zone (FCZ) extending from the seaward boundary of the territorial sea (3 miles from shore) to a distance of 200 nautical miles from shore. The responsibility for developing management plans for the fisheries in the FCZ is vested by the Act in eight Regional Fishery Management Councils. The Western Pacific Fishery Management Council is responsible for the fisheries off the coasts of Hawaii, Guam and American Samoa. The Council may also recommend measures to be implemented in the FCZ beyond the area of concern in the Northern Mariana Islands. Implementation and enforcement of any regulations pertinent to fishery management within the FCZ are the responsibility of the Secretary of Commerce. This Precious Corals Fishery Management Plan has been developed by the Western Pacific Fishery Management Council and will be submitted to the Secretary of Commerce for approval and implementation. The major objectives of the Plan are to obtain Optimum Yields of precious corals in the FCZ and maximize the benefits of the precious coral fisheries to the nation. Precious corals are known or believed to occur in the FCZ seaward of Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands and off other United States island possessions in the central and western Pacific Ocean.

In the Management Plan, precious coral beds are treated as separate management units. The beds are classified as Established, Conditional or Exploratory. Established Beds are those which have a history of harvest and for which firm Optimum Yields have been determined on the basis of scientific data. Conditional Beds are those for which locations and approximate area are known and for which estimates of Optimum Yield can

be derived by analogy with Established Beds but which require additional data for determination of firm Optimum Yields. Exploratory Areas comprise all other area in the FCZ of the Western Pacific Region. Only one coral bed has been studied adequately enough to be classified as Established. It is off Makapuu, Oahu, Hawaii. Five other peds are classified as Conditional, all of them off the Hawaiian Islands (See Figures 1 and2).

Management measures are prescribed for commercial harvest from all three bed categories, otherwise referred to as permit areas. There is no recreational fishery. The prescribed measures are summarized as follows: 1) Optimum Yields have been determined for pink (Corallium secundum), gold (Gerardia sp.) and babboo (Lepidisis olapa) coral populations in the Makapuu Bed. These Optimum Yields are based on estimates of Maximum Sustained Yield (MSY). Rounded estimates of MSY for the three species in the Makapuu Bed are 1,000 kg/year for pink coral, 300 kg/year for gold coral and 250 kg/year for bamboo coral. Optimum Yields have been set at double these values for twice the time, i.e. for 2 years. The adjustment to 2 year periods is proposed because of socio-economic considerations; 2) Optimum Yields for Conditional Beds are determined by their areas in relation to the area of the Makapuu Bed, assuming the same MSY per unit area, and reducing the OY to 20% of the MSY if non-selective harvesting methods are used; 3) U.S. harvesting and processing capacity and expected annual harvest and processing levels from the Makapuu Bed and all Conditional Beds are equal to the levels proposed for Optimum Yield, and therefore no surplus exists in these areas which can be allocated to foreign fisherman or to joint venture operations. Domentic processing capacity is sufficient to process expected domestic harvest; 4) Until the definitive Optimum Yields of

beds in Exploratory Areas can be determined, an initial Optimum Yield and Total Allowable Level of Foreign Fishing (TALFF) for each of those Areas (Hawaii, Samoa, Guma, and the Northern Marianas and other U.S. island possessions) is set at 1,000 kg total of all species, of which 500 kg are to be set aside as a reserve for potential domentic fishing and 500 kg are available as TALFF; 5) Other species of precious corals and associated non-precious corals which are known or are believed to occur in the FCZ are included in the plan. No specific conservation and Management measures are proposed at this time and Optimum Yields have not been determined. This plan may be amended to manage these species as more data become available and as the need arises; 6) A prohibition on the use of dredging techniques is recommended for all permit areas where selective harvesting methods are current practice and for the FCZ seaward of the main Hawaiian Islands; 7) A quota for dredging is provided in all other permit areas under specified conditions; 8) Taking of precious coral in the FCZ incidental to other fisheries is allowed for both domestic and foreign fishermen, subject to reporting requirements and return of the coral to the sea; 9) A recommendation is made to provide for closing certain coral beds to commercial or exploratory fishing as refugia or preserves, and to designate as the first such preserve the WesPac Bed, situated between Nihoa and Necker Islands, off the Northwestern Hawaiian Islands. Other refugia may be designated by amendment to this plan; 10) Permits are required for domestic and foreign fishermen, subject to extensive reporting requirements and conditions which embody the above provisions. Vessels may be required to carry observers. The proposed management measures are designed to maximize overall benefits to the nation and are consistent with the National Standards of the FCMA.

I. INTRODUCTION

This is a Fishery Management Plan (FMP) for the precious coral and associated non-precious coral fisheries within the United States Fishery Conservation Zone of the central and western Pacific region. It has been prepared by the Western Pacific Regional Fishery Management Council under the authority of the Fishery Conservation and Management Act of 1976 (FCMA) (P.L. 94-265).

The FCMA provides for the conservation and management of fishery resources of the United States by establishing a Fishery Conservation Zone of 200 nautical miles, within which the United States has exclusive management authority over all fishery resources except highly migratory species which are defined as tuna. The Act calls for the preparation and implementation of Fishery Management Plans, through which the objectives of a national fishery management program may be accomplished.

The Fishery Management Plans provide the basis for the determination of annual harvest predicated on scientific information and involving the needs of the States, the fishing industry, recreation groups, consumers, environmental organizations and other interested parties. In essence, the allowable catch of any fishery resource will be based on the Optimum Yield from that resource.

The fishery management unit in this case comprises a number of discrete populations or beds of precious corals and associated non-precious corals within the FCZ off the shores of U.S. islands in the central and western tropical and subtropical Pacific. At present only one such bed is the object of consistent exploitation by a domestic fishery. Others are or may have been subject to poorly documented harvesting by foreign fishermen, while others have been located by exploratory surveys but are not yet under exploitation.

There are undoubtedly other precious coral beds in the region which will eventually be prospected and exploited, and it is prudent to make some preliminary provision for their conservation, in view of the ease with which this resource can be depleted.

In this FMP, precious coral beds which have a history of exploitation and for which a Maximum Sustainable Yield (MSY) can be estimated based on scientific data, are designated Established Beds. Others for which only the locations and approximate area are known are called Conditional Beds, while those which are yet to be located are referred to as Exploratory Areas. (See Section IV.F.2, for fuller definition of these categories.) Under this plan, five portions of the FCZ - the portions around Hawaii, Guam, American Samoa, U.S. Possessions and the Northern Mariana Islands - are designated Exploratory Areas for purposes of setting quot for identification of and harvests from Exploratory Beds.

The major objective of the Plan is to achieve the optimum yield of precious corals which occur within the Fishery Conservation Zone (FCZ) of the United States in the Central and Western Pacific Ocean. The term optimum yield is defined in the Act as that amount of "fish" which will provide the greatest overall benefit to the Nation, and which is prescribed as such on the basis of the maximum sustained yield (MSY) as modified by any relevant economic, social or ecological factor. Species of precious corals which are considered in this document include the precious pin coral, *Corallium secundum*, the gold coral, *Gerardia* (formerly *Parazoanthus*) sp., and the bamboo coral, *Lepidisis Olapa*. (formally Keratoisis nud Other species of precious coral and other corals on the continental shel or in the FCZ are also included in the plan although no specific Conse vation and Management Measures are limited at this time to a permit and data collection requirements. Further management measures for these corals will be included in the plan sequentially on an as needed basis.

Areas considered in this document include the Hawaiian Islands, American Samoa, Guam, the Commonwealth of the Northern Marianas and other U.S. island possessions in the Central and Western Pacific Ocean.*

Included in the management plan are estimates of optimum yield for species of greatest commercial importance and recommendations for measures that are deemed necessary in order to achieve optimum yield.

II. Description of the Fishery

A. Stocks

Within the FCZ of the United States in the Pacific (Figures 1-4) the only fishery for precious corals is in the Hawaiian Islands. The fishery is based on two groups of species, one in deep water near 400 meters and another in much shallower between 40 and about 80 meters. Both fisheries are entirely commercial, i.e. non-recreational. At the present time the bulk of the catch of deep species consists of pink (*Corallium secundum*) and gold coral (*Gerardia* sp., = *Parazoanthus* sp.). A third species, bamboo coral (*Lepidisis olapa*) co-occurs with pink and gold coral and is considered to be of immediate economic potential. Other potential species of precious coral including the shallow water black corals are listed in Table I.

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*Pending amendment of the Fishery Conservation and Management Act, the Western Pacific Fishery Management Council has no statutory authority to prescribe management measures for fisheries in the Fishery Conservation Zone off the Northern Marianas or minor United States Pacific island possessions. References to management measures for precious coral fishing in those areas in this Plan are in the nature of recommendations which may be implemented by the Secretary of Commerce by actions pursuant to Sec. 201 (g) or Sec. 304 (c) of the Act.

immediate economic potential.

The shallow water fishery consists of three species of black coral *Antipathes dichotoma, Antipathes grandis* and *Antipathes ulex*. About 90% of the catch consists of the first species, 9% the second and 1% the third. Approximately 85% of all black corals harvested in the state of Hawaii are taken within the Territorial Sea.

The FMP contains specific management measures for Corallium secundu Gerardia sp. and Lepidisis olapa. Measures for black corals are currently being developed jointly by the State of Hawaii and the WPRFMC, and will be added to the plan on a sequential basis. As it appears likely that other species of precious coral and other corals in the FCZ will be subject to harvest, additional measures for these species will also be added to the plan on a sequential basis.

C. secundum and the bamboo coral *Lepidisis olapa* belong to the Order Gorgonacea in the Subclass Octocorallia of the class Anthozoa in the Phylum Coelenterata. *Gerardia* sp. and *Antipathes* spp. belong to separate Orders, Zoanthidea and Antipatharia, in the Subclass Hexacorallia, also in the class Anthozoa and the Phylum Coelenterata.

Precious corals are known to exist in Hawaii, Samoa, Guam and the Commonwealth of the Northern Marianas and other U.S. possessions, but little is known of their distribution and abundance. What little knowledge is available of the distribution and abundance of precious corals in the Western Pacific can be summarized as follows:

American Samoa — One or more species of black coral of commercial quantity and quality are known to exist at depths of 40 meters and deeper, but these stocks are within the jurisdiction of American Samoa.

Table I Actual and potential precious corals in the Western Pacfic.

Scientific name	Common name	harvest status
Corallium secundum	Pink coral	harvested
Corallium regale	Pink coral	not harvested
Corallium lacuense	Pink coral	not harvested
Gerardia sp.	Gold coral	harvested
Callogorgia gilberti	Gold coral	not harvested
Narella sp.	Gold coral	not harvested
Calyptrophora sp.	Gold coral	not harvested
*Lepidisis olapa**	Bamboo coral	not harvested
Acanella sp.	Bamboo coral	not harvested
Antipathes dichotoma	Black coral	harvested
Antipathes grandis	Black coral	harvested
Antipathes ulex	Black coral	harvested

*previously known as Keratoisis nuda

The only information available on deeper water precious corals comes from reports by fishermen. Pink coral has been reported off Cape Taputapu, but there are no data on quantity, quality and depth (Ian Swan, personal communication). Unidentified precious corals have also been reported off Fanuatapu Island at a depth of 90 m (possibly bamboo coral) and on the sides of an uncharted seamount three-fourths of a mile off the northwest tip of Falealupo at a depth of about 300 meters (Bill Travis, personal communication).

Guam and the Commonwealth of the Northern Marianas — No commercially important quantities of precious coral have been found on U.S. surveys in the Nothern Marianas (Grigg and Eldredge 1975). However, Japanese fishermen (personal communication) claim to have taken some *Corallium* off Rota, Saipan and north of Pagan Island.

Other U.S. island possessions — Japanese fishermen report that in 1975 alone, a harvest of 100 metric tons of red corals (*Corallium* spp.) was taken from grounds within 200 miles of Midway, Wake, Yap and Saipan (EIS/PMP Precious Corals, DOC, 1977). However, the magnitude of this estimate (approximately the world production in 1970) casts some doubt on its validity. On the other hand, none of the deep precious coral beds off Wake or Yap have been surveyed by U.S. scientists and only the most preliminary U.S. data are available for the Saipan and Midway areas.

Hawaii — Beds of pink, gold and/or bamboo coral have been found at six locations off the Hawaiian Archipelago (Grigg 1974) (Figures 1 & 2). These are as follows:

Description	Lat. N.	Long. W.	Area in km^2
1. Off Ke-ahole Point, Hawaii	19°46.0'	156°06.0'	0.24
2. Off Makapuu, Oahu (Fig. 5)	21°18.0'	157°35.5'	3.60
3. Off Kaena Point, Oahu	21°35.4'	158°22.9'	0.24
4. WesPac Bed, between Nihoa and Necker Islands	23°18'	162°35'	0.8
5. Brooks Bank	24°06.0'	166°48.0'	1.6
6. 180 Fathom Bank, north of Kure Is.	28°50.2'	178°53.4'	0.8

With the exception of the Makapuu Bed and those beds (if any) harvested by Japanese fishermen, all other precious coral beds within the U.S. fishery conservation zone are believed to be in an unexploited or "virgin" state. The Makapuu Bed has been harvested off and on since 1966 (see Table II, page 10). The area and the pre-fishery standing crop of pink coral in the bed are estimated to be 4.5 km^2 and 43,500 kg, respectively. Over a 10-year period only about 16% of the original standing crop of pink coral has been harvested; this averages 1.6% per year, and is below estimates of MSY (see section III-F). However, in three of four years the estimate of MSY has been exceeded (see Table II). Of the other five areas, WesPac Bed, Brooks Bank and 180 Fathom Bank are considered to hold the most promise for domestic harvesters. There are undoubtedly many other undiscovered beds, especially off the Northwestern Hawaiian Islands, where few surveys have been conducted. The large yields (see following section) are reported to have been taken by foreign fishermen from the Milwaukee Banks (Lat. 32.5°N, Long. 173.0°E), which are outside the U.S. Fishery Conservation Zone, are indications of the potential in the Northwestern Hawaiian Isalnds. Because of the sessile habit of precious corals and the large distances which separate the known beds, it is a reasonable assumption to treat each bed as a separate management unit, even though nothing is known of the relationship between stock and recruitment.

There are no known Indian or native Hawaiian traditional uses or rights associated with precious corals. If any rights or ceremonial values are identified, this plan can be amended as necessary.

B. History of Exploitation

Although a precious coral fishery has existed in the Mediterranean Sea since about 3000 B.C., precious coral was not discovered in the Pacific until the early 19th century off Japan. Historically, the primary method of fishing in both the Mediterranean Sea and off Japan has been dredging. Initially little fishing occurred off Japan until 1868, the year of the Meiji Reform. Prior to 1868, coral was confiscated from fishermen by the Shoguns, therefore little incentive existed for commercial fishing. After 1868, however, this custom was abolished and the fishermen were allowed to market coral products freely. Shortly after 1868, about 100 boats began harvesting coral, soon exhausting local grounds near Japan. Subsequent catch and effort depended on the discovery of new grounds and has been extremely variable up to the present time. The pattern of the coral fishery in Japan has been one of exploration, discovery, exploitation and depletion. In spite of the obvious need to control fishing effort, there has been no effective management of the fishery.

The extremely variable nature of the fishery is demonstrated by data for catch and effort collected in Taiwan between the years 1925 and 1940 (Anon. 1956) (Figure 6 and 7). These data show that catch and effort correlate fairly well and indicate the boom or bust nature of the fishery.

Until recent years, the precious coral fishery in the Pacific was centered off Japan, Okinawa and Taiwan (Grigg, 1971). Depletion of the beds in these areas, however, led to wide ranging exploratory efforts primarily on the part of Japanese fishermen. In 1965, Japanese coral fishermen discovered a very large bed of pink coral contiguous with the Hawaiian Archipelago on the Milwaukee Banks about 500 miles northwest of Midway Island. Milwaukee Banks including Kinmei Seamount have an area slightly greater than 300 km^2. Little data are available concerning the amount of pink coral Japanese fishermen harvested from Milwaukee Banks. However in 1969 alone, they reportedly took about 113,000 kg (H. Ozawa*, personal communication, 1970).

Prompted by the discovery of pink coral on the Milwaukee Banks, U.S. scientists in 1966 discovered a commercial bed of *Corallium secundum* between 350 and 450 m depth in the Molokai Channel off Makapuu Oahu. Shortly thereafter, a small group of fishermen began dredging this Makapuu bed on a limited scale. This activity continued on and off for about 3 years until high costs of operation and bad weather led to its discontinuation. About 1,800 kg (4,000 lb) were harvested during this period. After an abortive attempt in 1969 at harvesting with a remote T.V. camera assembly by a Seattle firm (Jacobsen Brothers), research at the University of Hawaii by the Sea Grant Program led to the development of a selective harvesting system utilizing a submersible. Maui Divers of Hawaii, Ltd. incorporated this system and began harvesting the Makapuu Bed in 1973. Total annual landings of pink and gold coral from the Makapuu Bed between 1966 and 1977 are given in Table II.[1]

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*H. Ozawa was the Managing Director of the All Nippon Coral Fishery Union in 1970.

TABLE II

Annual harvest of pink and gold coral from the Makapuu Bed[1].

Harvest (kg)

Year	Gear	Pink	Gold	Knockdown*
1966-69	Dredge	1,800	0	2700
1970-72	----------No harvesting----------			
1973	Submersible	538	0	
1974	"	2,209	734	
1975	"	1,385	621	
1976	"	400	363	
1977	"	1,421	329	
1978 (Jan-June)	"	474	50	

*During 1966 to 1969 when dredges were used in the Makapuu Bed the amount of coral dislodged from the bottom and not recovered must also be considered. Simulated harvesting trials in shallow water indicate that tangle dredges are about 40% efficient for one drag. Therefore for every kilogram harvested, 1.5 kg is assumed to have been knocked down and lost.

1. In 1977, 2.7 kg of pink coral and 106 kg of gold coral were harvested from the Kea-hole Point Bed off the island of Hawaii.

In the past, there has been no documented foreign harvest of precious coral within the U.S. conservation zone. However, in 1975 Japanese vessels reportedly harvested about 100 MT of precious corals within 200 miles of Midway, Wake, Yap and Saipan Islands (EIS/PMP Precious Corals, DOC, 1977). However, because the world landings in 1970 were only about 85 MT (H. Ozawa, personal communication), this report is somewhat doubtful. In 1976 and 1977, Taiwanese dredgers were reportedly operating on the Milwaukee Banks and may also have harvested precious corals within the U.S. Fishery Conservation Zone. On June 8, 1977, the U.S. Coast Guard reported entry of a Taiwanese coral fishing vessel, C/B Hai Tien No. 2, to Midway Island, which informed the Coast Guard that about 30 other vessels would soon be dredging in the Milwaukee Banks area. The Milwaukee Banks are approximately 280 miles northwest of the U.S. 200 mile limit. Japanese and Taiwanese vessels are presently allowed to fish on seamounts west of 180° longitude and north of 28° latitude in the FCZ for pelagic armorheads and alfonsins. Some incidental catch of precious corals may result from this activity, but retention of the incidentally caught coral is prohibited. Catches must be reported.

II.C.1 Vessels and Gear

Historically, both in the Mediterranean Sea and in the far western Pacific, the primary method used to harvest precious coral has been dredging with tangle nets. Over the long history of the fishery, gear design has varied, but it has always centered around the basic idea of a dredge (weighted tangles) (Figure 8). The weights serve to keep the dredge on the bottom as well as dislodge the coral while the nets entangle it.

Off Hawaii the first attempt to selectively harvest precious coral was by the Jacobsen Brothers in 1969 using a remotely controlled manipulator guided by a television camera. This technology proved to be uneconomical but was the first step which led to the development of a successful system of selective harvest utilizing a manned submersible. Remotely controlled vehicles for the harvest of precious coral are currently being developed by separate companies in Hawaii and Taiwan.

The vessels utilized in the coral fishery differ largely as a function of the method of collection. Foreign dredge haulers range between 40 and 100 feet in length and employ crews which vary between 3 and 20 men. Typically, the dredges are lowered and raised by line haulers which are located amidships and operated over the side of the vessel. Dredging usually is accomplished without power. The ship is simply allowed to drift positioned at right angles to the current. Japanese fishermen usually deploy from 4 to 8 dredges simultaneously. Some larger vessels are able to handle up to 16 lines at once. Given good weather, Japanese coral fishermen continue dredging 24 hours a day, rotating the crew. The same grounds are often redredged.

In 1975, about 90 Japanese vessels (of which 26 were specialized) were engaged in harvesting precious corals off Midway, Wake, Yap and Saipan (Akira Matsura*, personal communication). Most likely the entire Japanese coral fleet is considerably larger. In Taiwan, about 30 coral dredgers operate seasonally (summer) out of the Peng-hu (Pescadores) Islands.

The vessels employed by the domestic fishery off Hawaii include a two-man submersible, a towing barge (the LRT) and a 70-foot surface support and towing vessel.

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*Japanese Fishery Agency

The submersible, Star II, is launched and recovered from the LRT below the surface at a depth of about 60 feet. Three SCUBA divers are required for this operation. The coral harvesting gear on Star II consists of a coral cutter, wire basket and hydraulic claw (Figure 9). Coral which is harvested selectively is packed in the basket. Maximum payload is about 200 pounds, but the average is about 60 pounds.

II.C.2 Evaluation of Gear Performance and Efficiency

Off Hawaii in 1972, experimental trials using dredging and selective harvesting methods were conducted in the Makapuu Bed. The dredge consisted of a concrete-filled cylinder (80 lbs.) with 6-foot hanks of nylon netting attached to eyebolts (Figure 8). The selective method was Star II. Data were compared in order to evaluate the ecological and economic efficiency of both techniques (Grigg, Bartko and Brancart, 1973). The results favored the selective method. However, this was in part due to the method of dredging employed. Only one dredge was used in the test whereas Japanese fishermen may drag up to 16 dredges simultaneously.

The size frequency distribution of coral collected with the submersible was characterized by larger pieces of higher quality than fragme collected by dredging (Figure 10). On the average, one day of effort with the submersible produced a catch about 10 times the value of an equal day's effort dredging with one coral net. However, if 10 nets were deployed simultaneously, the value of the coral produced should be about the same. Hence the major advantage of utilizing a submersible was not gross production but rather selectivity.

The advantages and disadvantages of the two methods are outlined in Table III.

There are several advantages of a submersible over a dredge. First, the use of a submersible permits selective harvest; immature colonies can be avoided and other benthic species are not disturbed. Second, the capacity for selectivity allows the use of a size limit as a management tool. The advantage of this is that the maximum sustained yield at an optimum size is theoretically about twice what it is if no size limit is imposed (dredging) (see Section III-F). This is because dredging leads to growth-overfishing, that is young colonies are harvested before reaching their maximum potential for growth. Thirdly, with a submersible, nearly all the coral dislodged from the bottom is brought to the surface. Dredges, on the other hand, only recover about 40% of what is initially "knocked down".[1] Dredges, of course, can be dragged repeatedly over the same area. Hence overall recovery with a dredge could be significantly greater than 40%. For example, three replicate hauls should theoretically collect 78% of the coral, four hauls, 87% recovery. Catch per unit effort, of course, would be progressively less and at some point, depending on costs, the operation would cease to be profitable. Exactly where this point lies no doubt varies with the quality and quantity of coral in each bed. A fourth advantage of a submersible over dredging is that a larger percentage of high quality coral may be collected.

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[1]The estimate of efficiency for tangle nets is based on simulated trails in shallow waters in Kaneohe Bay, Hawaii. Recovery of planted coral on the bottom for the five trails was 35, 39, 44, 40, 42 percent producing an average recovery of 40%.

TABLE III

Advantages and disadvantages of two coral-harvesting systems

Submersible	Dredging
Advantages	
. Permits selective harvesting, i.e. little or no damage to other components of the ecosystem	. Relatively inexpensive, low capital and operating costs
. Permits the use of a size limit as an aid to conservation, however breakage makes enforcement difficult	. May be more productive per 24 hour day, if multiple dredges employed
. Practically no waste	. Able to harvest continuously
. Larger percentage of high quality coral	. Major equipment readily adaptable for other uses
Disadvantages	
. High capital and operating costs	. Nonselective harvesting, immature colonies unprotected
. Requires preparation, maintenance and repairs of expensive, specialized equipment	. Ecologically more destructive, other species and habitats disturbed
. Need for support vessels	. More wasteful, some coral dislodged from the bottom may not be recovered
. Shutdown idles high capital investment	. Larger percentage of lower-valued coral
. May have limited depth capability and not fully utilize the resource	

Advantages of dredging over a submersible include the following. First, dredging is considerably less costly than operating a submersible. In some cases, dredging may also be actually more economical since more than one dredge can be employed and because the operation may be continuous on a 24 hour basis. The equipment is also readily adaptable to other fishing technologies, which may have economic advantages in areas where diversified fishing is profitable. A submersible requires several support vessels and service and maintenance, both quite costly. A major breakdown of a submersible system or a closed season would both result in idling a significant amount of capital investment. Also, dredges have no depth limits per se while submersibles do. In Hawaii, Star II has an operational depth limit of 1200 feet (365 m) which curtails full utilization of precious corals (see Table IV). Finally, in the event that distant or deeper coral beds are discovered, selective harvesting may be economically prohibitive or simply not possible, in which case dredging may be the only feasible alternative. Exploration for beds might also be best accomplished by dredging techniques.

Depending on desired goals and varying circumstances, such as the abundance of the resource, either system might be a more "efficient" or desirable alternative. It may be more profitable for industry to utilize a submersible so as to more fully utilize the resource, or if quotas are not overly restrictive, dredging may offer clearcut economic advantages.

Hence, the benefits of selective harvest vis-a-vis dredging must be considered on a case by case basis. Clearly there are economic and social tradeoffs which may not be the same for all locations in the Pacific.

II.D.1 Global Economics of the Precious Coral Industry

Worldwide, the precious coral jewelry industry is valued at about $500 million/year (retail sales). This arises from a world production of raw coral worth between $5 - $10 million (H. Ozawa, personal communication). In 1976, about 95% of the world's production was harvested from the Pacific Ocean. Most of this coral is sold to international buyers through a system of closed auctions in Japan that are operated by coral fishing associations. World jewelry production today is dominated by Japanese and Italian manufacturers.

In Hawaii most precious coral sold in the market place is purchased by local retailers who buy polished but unset "stones" from markets in the Orient. These stones are mounted in Hawaii in order to save import taxes on finished jewelry. A survey in 1971 showed at least 15 manufacturers producing jewelry and 150 to 100 retail outlets (Poh, 1971). Since then, there has been little or no increase in the number of major manufacturers. however, the number of retail outlets has increased by a factor of about two or three.

Retail sales in 1978 in Hawaii for both imported and locally produced coral jewelry were about $20 million (Clifford Slater, personal communication). This total represents a sevenfold increase since 1969 (see Thompson, 1975). This is based on pink, black and gold coral sales. Of the pink coral, about 80% is imported from the orient in a polished but uncut state. Almost 100% of the black and gold coral sales are of locally harvested coral.

II.D.2 Domestic Commercial Harvest

The domestic fishery for pink and gold coral in Hawaii is carried out by one submersible, two support craft, and about 12 personnel. The annual harvest capacity of the fishery is at least 3000 kg of pink and gold coral combined. The actual annual harvest in the 1974-77 period averaged less than 2000 kg (Table II).

Estimates of the ex-vessel value of raw pink and gold coral are given in Table IV. Also, for purposes of management analysis, an estimate of the ex-vessel price may be determined from: the price of imported polished-unset coral, the retail price differential between pink and gold coral jewelry, the relative value of the coral gem in a jewelry setting, and the costs of production at the harvesting and processing stages. The total ex-vessel value of pink and gold coral for 1977 was $262,000 (Table IV).

Table IV — Estimated ex-vessel value of pink and gold raw precious coral harvested in Hawaii, by year, 1975-77.

Year	Pink	per/kg	Gold	per/kg	Total
1975	$190,000	$137	$71,000	$114	$261,000
1976	94,000	136	42,000	114	136,000
1977*	215,000	150	47,000	147	262,000

*Projection based on the actual in the first three quarters of the year.

The value of raw coral is determined by color, size and condition (living or dead and solid versus wormy). For pink coral, the most valuable pieces are light pink or "angelskin." Lighter pink or darker red shades are lower priced. For gold coral, the most valuable shades are dark golden-brown. No dollar value can be estimated for bamboo coral at this time.

II.D.3 Domestic Commercial Processing

The processed commercial product relevant to the Fishery Management Plan is polished-unset precious coral. The primary supply of this product is imports to Hawaii. The domestic harvest of precious coral from the Makapuu bed and other potential exploitable beds provides the domestic industry with the raw material to produce an alternate source of polished-unset precious coral. About 35 jobs are directly related to processing raw coral harvested locally.

Value added at the processing stage of producing polished-unset coral from landed raw coral is approximately 100%. That is, $100 of value is added to every $100 of raw coral processed to produce $200 worth of polished-unset precious coral. These estimates are based on the cost of imported polished-unset coral and average costs of different stages of production reported confidentially from industry sources.

The estimated value of pink and gold polished-unset coral produced in 1976 was about $423,000. This included some raw coral from previous years' inventories. In the same year the coral jewelry manufacturers imported polished-unset coral at a cost of about $1,538,000 (see Table IV).

Table V — Value of polished-unset precious coral imports to Hawaii; percent of total coral imports, by country of orgin and year, 1973-76.

	1973		1974		1975		1976	
Country	$	%	$	%	$	%	$	%
Hong Kong	59,192	11.3	66,770	13.2	17,633	3.3	64,226	
Japan	241,862	46.4	226,109	44.7	153,929	28.4	277,592	18.
Philippines	0		0		73,450	13.6	42,005	2.
Taiwan	220,496	42.3	203,354	40.8	247,167	45.7	1,130,382	73.
Others	264	0.05	7,020	1.4	49,025	9.1	23,442	1.
TOTAL	521,814	100.0	506,253	100.0	541,204	100.0	1,537,737	100.

Source — Hawaii Custom District, Report Number IA-253, 1973-76.

II.E. Employment

While the number of people directly employed in the harvesting (12) and processing (35) of locally produced precious coral in Hawaii is not great, about 800 persons are engaged to some extent in the precious coral business there. Most jobs are in wholesale and retail sales.

II.F. State and Federal Tax Revenues and Multiplier Effects

Considering the excise tax on all retail precious coral products sold in Hawaii, revenues to the State (4%) amounted to about $800,000 in 1978 (Clifford Slater, Personal communication). About 20% of this can be attributed to local production of pink and gold coral in 1978. If wholesale taxes, State and Federal income taxes and operational taxes associated with the entire industry are taken into account, State and Federal tax revenues combined are about 2.5 million annually. About $500,000 of this is based on local production.

If a multiplier effect of two (Anderson et al., 1975) is used to show the impact of the total retail sales of the industry based on local production (4 million) on the economy of the State, a figure of about $8 million annually is produced. Eight million dollars is about one tenth of one percent of the Gross State Product of $6.6 billion (Bank of Hawaii, 1976). If the total industry is considered with the same multiplier, the value is 40 million or 0.6 percent of the Gross State Product in 1976.

The relevance of economic data for the total precious coral trade of Hawaii to the management of the domestic pink coral fishery has been questioned, in view of the small contribution of domestically harvested coral to the overall business.

Some persons in the business believe that the existence of even this small fishery tends to enhance the acceptance of all precious coral products in the market by lending a background of local color to the jewelry, particularly when it is offered as souvenir items for visitors. This contention is of course, difficult to evaluate or, if valid, to quantify the effect. It is deemed, however, sufficient reason to include some data on the larger trade within which the domestic coral business operates.

II.G. Jurisdiction

The Departments of Interior and Commerce share jurisdiction over precious corals in the FCZ. Until a Fishery Management Plan is prepared and implemented to govern fishing for corals in specific areas of the FCZ, the Department of the Interior's Bureau of Land Management (BLM) maintains control over all activities including fishing which may affect viable coral communities on the outer continental shelf. The BLM has established a permit system to exercise this control. When an FMP is implemented, the jurisdiction over fishing for the corals covered in the FMP is assumed by the Department of Commerce. The BLM, however, will retain authority to control certain non-fishing activities which would affect the corals involved. These agencies are considering a Memorandum of Understanding to assure coordination of efforts and achieve sound management of corals throughout the FCZ.

Federal jurisdiction over natural resources on the Continental Shelf outside of 3 miles was established in 1953 by the passage of the Outer Continental Shelf Lands Act. This Act delegated to the Secretary of Interior the responsibility for managing natural resources of the seabed and subsoil of the outer shelf.

In the 1958 Convention on the Continental Shelf, natural resources were defined as "mineral and other non-mineral resources of the sea-bed and subsoil together with living organisms belonging to sedentary species." Had there been a need to manage precious coral fisheries in 1958, this definition would have probably been used to establish jurisdiction within the Department of Interior.

In 1964, legislation was passed which prohibited foreign fishermen from harvesting Continental Shelf fishery resources within the contiguous zone of the United States (12 miles) except as provided by international treaty or Federal permit. Known as the Bartlett Act (PL 88-308), this legislation was amended in 1971 to specifically include six species of precious coral, which thereby defined them as creatures of the Continental Shelf. Since the Bartlett Act referred to all creatures of the Continental Shelf, other species of precious coral which are sedentary and occur on the shelf, even though not specifically listed in the Act by name, were covered by the legislation. The Bartlett Act reserved harvesting rights to U.S. nationals but did not contain any provisions for management. On March 1, 1977, the Bartlett Act was replaced by P.L. 94-265, the FCMA. In 1977, policies for foreign harvest of precious corals within the Fishery Conservation Zone were established by the Secretary of Commerce and are contained in a draft Preliminary Management Plan (PMP) for precious corals and a PMP for seamount fisheries. These policies would prohibit all foreign harvest everywhere in the Central and Western Pacific FCZ except incidental to trawling on seamounts west of 180° longtitute and north or 28°N latitude. Such incidental catches of precious coral must be recorded and returned to sea.

The PMP for precious corals has not been implemented, as it provided a zero TALFF, and no foreign fishing applications were received. The seamount fishery, however, is controlled by a PMP with prohibition on retention of corals taken by trawl.

With regard to domestic fisheries, most functions within the Department of Interior having to do with marine species were transferred to the Department of Commerce (DOC) in 1970 under Reorganization Plan No. 4 prepared by President Richard M. Nixon. However, the Department of Interior (DOI) retained authority to manage natural resources, including coral communities, of the Outer Continental shelf, and will continue to do so under the previously referred to draft memorandum of understanding between DOI and DOC until the FMP is implemented. After the Secretary of Interior (Secretarial Order 2978, 40 FR 42039) placed a moratorium on the taking of any viable corals in Federal waters on September 10, 1975, the Department of Interior developed a set of regulations which presently allow U.S. commercial coral harvesters to operate in Federal waters under permits issued by the Outer Continental Shelf offices of the Bureau of Land Management of the D.O.I. (Federal Register Document-76-27063; Federal Register, Vol. 41, No. 181, September 16, 1976). See Section IV-I and Appendix IV for details on provisions of the DOI permits. Present DOI regulations concerning fishing for corals in the FCZ will be replaced by the provisions in this plan on the date that implementing regulations for this plan take effect.

In Hawaii, the State also exercises some authority under S306 of the FCMA over the harvesting of precious corals outside of 3 miles. The State adopted Regulation 41 of the Division of Fish and Game, Department of Land and Natural Resources, in July, 1977.

This Regulation establishes a quota and/or permit system for the management of pink and gold coral in the Makapuu Bed, which lies about 6 miles off the island of Oahu. The quota applies only to pink coral. The state of Hawaii's jurisdiction over the Makapuu bed as well as other interisland waters remains an unsettled issue between the State of Hawaii and the Federal Government, but the management approach in this plan is consistent in most respects with the State of Hawaii regulations.

III. Biology

A. Life History

Precious corals are characterized by great longevity, slow growth, and relatively low rates of mortality and recruitment (Grigg, 1976). As a result, unfished coral populations should be relatively stable from year to year, and moderate changes in vital rates should have comparatively small effects on total abundance. Not unexpectedly, precious coral populations recover very slowly from overharvesting, and must be exploited with caution. Evidence that precious corals do recover comes from the history of the fishery in the Mediterranean Sea, where in the 19th century beds were rotated every 9 years (Tescione, 1965). Japanese fishermen claim that more like 50 years are required for recovery in the Pacific (Japanese fishermen, personal communication).

Pink, gold, and bamboo corals and other corals covered by this plan all have larval planktonic and sessile adult stages. Larvae settle on solid substrata, where they form colonial branching colonies. The length of the larval stage for all deep species is unknown. In the species of primary commercial importance, *Corallium secundum*, the sexes are separate and the reproductive cycles are

annual with spawning occurring during summer months in Hawaii (Grigg, 1976). Very little is known about predator-prey and other ecological relationships between the sessile stages of precious corals and other plants and animals. The sparse research that has been done suggests that microzooplankton and particulate organic matter are important in the diet of gorgonians (Grigg, 1970). There are no known predators on precious corals.

A large number of commensals are known generally (Hyman, 1940) to be associated with anthozoans. Many other species of gorgonian corals as well as invertebrates and fish are known to occur within the habitat of pink, gold and bamboo corals in the Hawaiian Islands. At least 37 species in the Order Gorgonacea alone have been described from the Makapuu Bed (Grigg and Bayer,1976). Ten species of black coral (Order Antipatharia) are also known to occur in the depth zone of precious corals (300-475 m) in the Hawaiian Islands (Grigg and Opresko, 1977). None of these black corals are of commercial importance. Species of possible commercial importance although they are rarely observed in the Makapuu Bed, include the shrimp *Heterocarpus ensifer* and the fishes, *Seriola dumerilii*, (kahala) and *Etelis carbunculus* (onaga). No species of either threatened or endangered wildlife are known to occur at depths where precious corals are found in the Western Pacific (see Appendix IV).

At least two species are known to be epizoic commensals of *Corallium secundum*. These are an anemone *Palythoa* sp. and a polychaete worm, *Palynoe* sp. The anemone attaches to the skeleton but causes no injury to the coral tissue or skelton, rarely more than 2 or

3 anemones occur on the same colony. The polychaete worms live in burrows or worm runs of their own making in the coral tissue or coenenchym. They cause no injury to the skeleton or the living tissue.

III.B. Distribution and Abundance and Habitat

The distribution of precious coral beds in the Hawaiian Archipelago, Samoa, Guam, the Commonwealth of the Northern Marianas and other U.S. Pacific island possessions is described in Section II.A. of this report. The vertical or depth zonation of precious corals in Hawaiian waters is given in Table VI.

TABLE VI

Vertical zonation of species of precious corals in Hawaii

Common Name	Scientific Name	Depth range (m)
Black coral	*Antipathes dichotoma*	30 - 100[a]
" "	*Antipathes grandis*	40 - 100[a]
Pink coral	*Corallium secundum*	350 - 475[b]
Gold Coral	*Gerardia* sp.	300 - 400[b]
Bamboo Coral	*Lepidisis* olapa	330 - 475[b]

[a]Based on submersible observations.

[b]Based on submersible observations and data collected with a remotely operated television camera.

In the Hawaiian Archipelago, stocks of precious corals may be more abundant in the northwestern end of the island chain, where large areas of potential habitat exist on seamounts and banks near 400 m depth. The combined area of the Milwaukee Banks and Kinmei Seamount (400 - 500 miles northwest of Midway Island), for example, is over 300 km^2. In contrast, the area of the major bed off Oahu (Makapuu) is estimated to be 3.6 km^2. The dimensions of the Makapuu Bed actually cover about 4.5 km^2 (Figure 5). However, observations from the submersible Star II have shown that about 20% of this area includes barren patches and irregular lenses of thin sand deposits. Therefore the area used for the purpose of extrapolating density is taken as 80% of 4.5 km^2 or 3.6 km^2.

Annual harvest of *Corallium* in 1969 by the Japanese on the Milwaukee Banks was reported to be 113,000 kg (H. Ozawa, personal communication). This compares to a range of annual harvest of *Corallium* of Makapuu of 438 to 2209 kg in the years 1966 to 1976. If the highest yields for both areas are expressed on a per km^2 basis (Milwaukee = 376 kg/km^2, Makapuu = 611 kg/km^2), Makapuu actually has a higher yield. However, since comparative data on fishing effort are lacking, interpretation of these figures is difficult. Nevertheless, the habitat area and yields at the Milwaukee Banks are far greater in absolute terms than off the high islands at the southeastern end of the Archipelago.

In the high islands, beds of precious corals have been found only within island channels and off promontories such as Ke-ahole Point on the Big Island of Hawaii.

Precious corals are only found on solid substrata, which in deep water invariably occurs only where bottom currents are frequently strong (>25 cm/sec).

The only bed that has been accurately surveyed in the Hawaiian chain is off Makapuu, Oahu. In 1971, densities of commercial species were determined in an unexploited section of the bed and the size frequency distribution of pink coral was determined (Grigg, 1976). The average density of pink coral in the Makapuu Bed is 0.022 colonies/m^2. Extrapolation of this figure to the entire bed (3.6 million m^2) gives a standing crop of 79,200 colonies. The 95% confidence limits of the standing crop are 47,200 to 111,700 colonies. Conversion of standing crop of colonies to biomass ($\Sigma N_i W_i$) produced an estimate of 43,500 kg for *C. secundum* in the Makapuu Bed.

The estimates of density for gold coral *(Gerardia* sp.) and bamboo coral *(Lepidisis olapa)* in the Makapuu Bed are 0.003 colonies/m^2 and 0.01 colonies/m^2, respectively (Grigg, 1974). However, the distributional patterns of both of these species are very patchy, much more so than *Corallium secundum*, and the area where they occur is only about half that for pink coral or 1.8 km^2. The corresponding estimates of unfished abundance for gold and bamboo coral are 5,400 and 18,000 colonies, respectively. Data for the mean weight of colonies in the populations of gold and bamboo coral in the Makapuu Bed are lacking, but rough estimates are 2.2 kg for gold coral and 0.6 kg for bamboo coral. Multiplying mean weights by densities led to rough estimates of standing crop of about 11,880 kg for *Gerardia* sp. and 10,800 kg for *Lepidisis* sp.

III.C. Growth and Mortality Rates

An analysis of growth rings in the cross sections of pink coral branches suggests that colony height increases about 0.9 cm/yr, at least to an age of about 30 years (Grigg, 1976). The equation for the regression of height against time is as follows:

$$H = \alpha + BT$$

where H = height (cm)

T = Time (yr)

$\alpha = 2.63$

$B = 0.89$

A similar relation for weight 1/ as a function of height is given by the equation:

$$W = aH^b$$

where W = weight (gm) (landed weight)

a = 0.8

b = 2.27

1/ landed weights approximately 24 hours air dry.

The largest colonies of pink coral found at Makapuu are rarely more than 60 cm in height. Gold coral colonies may reach a height of 250 cm, while *Lepidisis* olapa grows to about 300 cm.

The natural mortality rate for pink coral was calculated by first converting the size-frequency distribution of the unfished stock to an age frequency distribution and then determining the rate of diminution in progressively older age classes (Grigg, 1976). The best estimate of the annual instantaneous natural mortality rate of *C. secundum*

in the Makapuu Bed turned out to be 0.066. This is equivalent to an annual survival rate of about 93% in the absence of fishing. Mortality rates for gold and bamboo coral are not available because their growth rates and age structures are unknown.

III.D. Reproduction and Recruitment

Pink corals reach sexual maturity at a height of about 12 cm (13 years), however, the data are not very precise (Grigg, 1976).. The reproductive cycle is annual with spawning taking place during June and July.

The relationship between parent stock and recruitment in pink coral is unknown. However, because pink coral is long lived, and the population is composed of many year-classes, the standing stock should be relatively stable even with moderate year-to-year fluctuations in recruitment.

An estimate of steady state recruitment of the unexploited Makapuu stock was obtained by multiplying the virgin stock size (79,200 colonies) by the best estimate of annual instantaneous natural mortality (0.066). Given steady state, the instantaneous rate of recruitment should equal the instantaneous rate of natural mortality. This gives an estimate of annual recruitment to the Makapuu Bed of 5,277 colonies.

III.E. Biomass per recruit

Biomass per recruit as a function of age was calculated in the absence of fishing using a cohort production model (Wetherall and Yong, 1977). In the model, the cohort gains weight until an age is reached where growth gains are overtaken by natural mortality losses.

This is the "critical age" at which the cohort reaches its maximum biomass in the absence of fishing. The formula for critical age is

$$T = \left(\frac{b}{M} - \frac{\alpha}{\beta} \right)$$

where b = exponential coefficient in the weight-height relationship (p.30)

M = instantaneous natural mortality rate

α = intercept of linear growth in height equation (p.30)

β = slope of linear growth in height equation (p.30)

The numerical result for pink coral is T = 31.4 years.

The corresponding maximum biomass per recruit is given by the formula

$$MBPR = e^{-(b - \frac{\alpha M}{\beta})} \; a \left(\frac{\beta^b}{M} \right)^b$$

where the new symbols are

e = base of natural logarithms
= 2.71828

a = coefficient in weight-height relationship (p.30)

For pink coral the maximum biomass per recruit, attained by a cohort at age 31.4 years, is MBPR = 237 gm. This is shown as the peak in the top curve of Figure II. Other curves in Figure II show the relationship between biomass per recruit and age when fishing takes place at constant rates (F>0) and there is no minimum age limit for harvested coral. Corresponding biomass per recruit curves for the case of a 25-year minimum harvest age are shown in Figure 12.

III.F. Yield per Recruit

When fishing is done in such a way that all colonies of a cohort are removed at once, then the yield per recruit is identical to the biomass per recruit at the harvest age. Therefore the maximum yield per recruit is achieved by harvesting all survivors in a cohort of pink coral exactly at the critical age of 31.4 years, and in this case the maximum yield per recruit (MYPR) is = 237 gm. In practice this would require applying an infinite instantaneous fishing mortality rate exactly at age 31.4 years. Since this is not feasible, the 237 gm/recruit is a theoretical upper limit to the harvest that may actually be obtained.

More realistic figures of yield per recruit are obtained by considering a fishery which applies a steady finite fishing mortality rate to all ages in the cohort above a specified minimum harvest age. The results in this case are displayed in Figure 13. The effect of an age limit of maximum yield per recruit is easily seen. For example, with a minimum harvest age of 30 years the maximum yield per recruit is essentially equal to the upper limit of 237 gm, whereas with a minimum harvest age of zero years the greatest yield per recruit possible is only 119 gm. Hence if non-selective methods of harvest (e.g., dredging) are employed, the highest yield per recruit that can be expected is only half of the maximum yield per recruit theoretically possible under selective harvesting.

III.G. Sustainable Yield and MSY

The analysis above reflects a biological management approach in which the main consideration is achieving the highest possible efficiency in utilizing biological production for a cohort.

As long as recruitment is constant or independent of stock size, a fishing policy which maximizes the yield per recruit will also maximize the total yield on a sustained basis, i.e., it will also produce the maximum sustainable yield (MSY). However, in many fisheries the level of recruitment may be strongly affected by the abundance of reproductive individuals in the stock, which is in turn determined partly by the fishing policy (such as minimum harvest age and fishing mortality rate).

Even though no specific information is available on the actual stock-recruitment relationship in pink coral, it is important to see how various hypothetical relationships would alter the analysis of best fishing policy. If recruitment is not constant, but is instead some decreasing function of spawning stock, then MSY will be reduced accordingly. Several hypothetical stock-recruitment curves are diagrammed in Figure 14. The diagonal line (curve 1) shows a proportional decline in recruitment as a direct function of spawning stock. The curves above the diagonal also show recruitment declining as a function of spawning stock, but at lesser rates, such that when the spawning stock (S) is 50% of its original level (SMAX), recruitment (R) is either 60% (curve 2), 70% (curve 3), 80% (curve 4), or 90% (curve 5) of its maximum level (RMAX). Curve 6 shows the model of constant recruitment.

Possible combinations of sustainable yield and minimum harvest age are shown in Figure 15, as computed in Wetherall and Yong (1977). The outer boundary (curve 6) gives the combination of sustainable yield and minimum harvest age for the constant recruitment case, assuming a steady recruitment of 5,000 colonies per year.

The maximum sustainable yield under this constant recruitment rate is

$$MSY = MYPR \times R$$

$$= 237 \text{ gm/recruit} \times 5{,}000 \text{ recruits/yr}$$

$$= 1185 \text{ kg/yr}$$

This assumes a minimum harvest age of about 30 years and a very high instantaneous fishing mortality rate. When selective harvesting is not possible, then the maximum possible sustainable yield is less than 600 kg/yr.

The other curves (5, 4, 3, and 2) show the outer limits of the policy space (combinations of annual sustainable yield and minimum harvest age) corresponding to the other stock- recruitment models. As the stock-recruitment curves get steeper (i.e., progressively lower rate of recruitment for a given spawning stock), the minimum age limit necessary to maintain a specified sustainable yield increases. Further, the MSY is significantly less than 1185 kg/yr when recruitment is not constant. This analysis suggests a range of conservative alternative policies which might be adopted in the absence of any understanding of the true stock-recruitment relationship.

Maximum sustainable yield for the constant recruitment case was computed above analytically using the expression

$$MSY = A \cdot D \cdot M \cdot e^{-(b - \frac{\alpha M}{B})} \cdot a \left(\frac{\beta b}{M}\right)^b$$

$$= R \cdot MYPR$$

where the new symbols are

A = area of Makapuu bed

D = average density of pink coral colonies on the bed before exploitation

M = instantaneous natural mortality rate

$R = A \times D \times M$

A rougher but quicker approach to estimating MSY is the approximation of Gulland (1970), viz.

$$MSY^* = 0.4\ M\ B_o$$

where $B_o = A \times D \times W$ = total biomass of unfished stock

and W = weighted average weight of a colony in the unexploited stock.

In the case of pink coral on the Makapuu bed

$$MSY^* = (0.4)\ (.066)\ (43{,}500)$$

$$= 1148 \text{ kg/yr}$$

The Gulland method is useful especially for gold and bamboo coral where details of population dynamics are relatively unkown. Using the guesses of unfished biomass (B_o) and substituting the pink coral natutal mortality rate (M = 0.066) in place of the unkown values, rough estimates of MSY for gold and bamboo coral were computed to be 313 kg/yr and 285 kg/yr. All estimates of MSY are summarized in Table VII. MSY cannot be estimated for other corals at this time.

TABLE VII

Estimates of MSY of precious corals in the Makapuu Bed

Species	Common name	MSY*	Rounded downward	Method of Calculation
Corallium secundum	Pink Coral	1185 kg/yr	1000 kg/yr	Cohort Production Model
" "	" "	1148 kg/yr	1000 kg/yr	Gulland
Gerardia sp.	Gold Coral	313 kg/yr	300 kg/yr	Gulland
Lepidisis olapa	Bamboo Coral	285 kg/yr	250 kg/yr	Gulland

* landed dry weight

IV. Management

A. History of Research and Management

The precious coral fishery can be traced back to the Sumerian and Minoan cultures around 3000 B.C. in the Mediterranean Sea. Through this long history, occasional efforts to manage the fishery have been made. Periods of prohibition have been attempted more than once in several places, but invariably they were unsuccessful. The pattern of fishing usually was one of exploration, discovery, exploitation and depletion. When recovery occurred, it usually was brought about unintentionally by interruption of fishing by war. Between 1879 and 1890, off the Barbary Coast in Africa, fishing grounds were rotated (closed) for 9 or 10 year periods. However, lack of enforcement eventually led to severe depletion of the beds. The selection of a 9-10-year period for recovery was based on observations of fishermen and the early research of Lacaze-Duthier (1864), who first investigated the life history of *Corallium rubrum* in the Mediterranean Sea.

Until 1970, research on precious coral in the Pacific was limited to the early work of Kishinouye (1901) on reproductive behavior and studies by Kitahara (1904), who described the coral fishery in Japan in the late 19th century. Before 1868, coral fishing in Japan was inadvertently managed by virtue of the societal customs of the Shoguns, who confiscated coral thereby eliminating incentive for a commercial fishery. After 1868, no management of the stocks was attempted in Japan, probably because fishing activity ranged far beyond local waters.

In 1963, rich beds of *Corallium* were discovered about 100 miles south of Okinawa, and the Government in Okinawa attempted to regulate the harvest by requiring permits and limiting entry into the fishery. Unfortunately, too many permits were issued and the beds were rapidly depleted. Furthermore, enforcement was lacking to prevent unlicensed fishermen from entering the fishery and this accelerated the decline.

In 1970, a Sea Grant research program was started at the University of Hawaii to investigate the ecology of precious coral and to determine the economic feasibility of developing a fishery in Hawaii. This research led to the development of a selective harvesting system which is currently in use in Hawaii (the Star II submersible and support craft). This research also generated data concerning distribution, abundance, growth, natural mortality, recruitment, and maximum sustained yield of precious corals in Hawaii and is the basis of the analysis presented in this report. A detailed account can be found in a Sea Grant Technical Report entitled "Fishery Management of Precious and Stony Corals in Hawaii" (Grigg, 1976).

The Makapuu Bed has been exploited periodically since 1966. Estimates of the harvest of pink and gold coral during this period are given in Table I. The first attempt to manage the precious coral fishery in Hawaii was by the State Division of Fish and Game. In 1977, the Division of Fish and Game passed Regulation 41, which contains provisions concerning permits, annual quotas and size limits (see Appendix II). The history of efforts to manage precious coral resources by the Federal government is given in Section II.G on Jurisdiction. The regulations of the Department of Interior which are now in effect are described in Section IV.I and Appendix III.

IV.B.1 Management Objectives and Philosophy

The major objectives of this management plan are to obtain optimum yields of precious corals in the U.S. 200-mile fishery conservation zone, and to maximize the benefits of the resource to the nation. Optimum Yield is defined in the Act as the amount of "fish" which will provide the greatest overall benefit to the nation and is prescribed on the basis of MSY as modified by socio-economic and ecological factors. Given this definition, estimates of MSY have been calculated for pink, gold and bamboo corals in the Makapuu Bed and modified according to the definition given above.

In order to obtain maximum sustained yields of precious corals, several of their biological properties must be considered. Precious coral populations are relatively stable in nature because many year classes are usually present. Annual differences in recruitment and age specific mortality rates therefore tend to be offsetting. This pattern of life history has two important consequences with respect to exploitation. First, the response of the population to exploitation

or changes in the exploitation rate is drawn out over many years (see Figs. 16 & 17). The data presented in Figures 16 and 17 were produced by simulating the past history and future condition of a fishery for C. secundum in the Makapuu bed between 1964 and 2014 (50 years). In 1978, six different rates of exploitation were applied to a model of population for one year after which it was assumed that the fishery was closed and monitored for 37 years. In the model, recruitment was assumed to be constant until a level of two-thirds the spawning biomass was reached, after which recruitment was calculated as a direct function of spawning biomass. Examination of Figures 16 and 17 reveals that about 25 years are required before the population biomass and the spawning biomass recover within 95% of original values. Thus, age structure may be in a transitional state for many years.

The second important consequence of great longevity, and the associated slow rates of turnover in the populations, is that if a stock has been overexploited for several years, a long period of reduced fishing effort is required to restore the ability of the stock to produce a maximum sustained yield (Figures 16 and 17). Because of the long recovery time of precious corals, the most prudent policy for the management of newly discovered beds would be to permit commercial exploitation in Exploratory Areas only after assessments of the virgin stocks are made. The assessment should at least include total area of the bed and estimates of density of various species present. The most economical method of obtaining this information would be fishermen operating under exploratory fishing permits with detailed reporting requirements.

IV.B.2 Specific Management Objectives

The specific objectives to be achieved by management measures adopted under this fishery management plan are as follows:

1) to allow a fishery for precious coral in the fishery conservation zone in the western Pacific but to limit the fishery so as to achieve the Optimum Yield on a continuing basis

2) to prevent overfishing and wastage of the resource

3) to encourage the use of selective harvesting methods

4) to minimize the harvest of colonies of coral which are immature

5) to minimize the harvest of colonies of coral which have not reached their full potential for growth

6) to preserve an opportunity for low-investment equipment in the fishery (dredges)

7) to encourage the discovery and exploration of new beds

8) to provide for the establishment of refugia, i.e., beds completely protected from exploitation

9) to encourage the development of new information concerning the distribution, abundance and ecology of precious corals.

IV.C. Optimum Yield

A stated purpose of the Fishery Conservation and Management Act of 1976 is to provide for preparation and implementation, in accordance with national standards, of Fishery Management Plans which will achieve and maintain, on a continuing basis, the Optimum Yield (OY) from each fishery. Calculation of OY in this management plan involves several steps. First, MSY is estimated. OY is then derived by adjusting

MSY lower or higher for ecological reasons, for example, to rebuild overfished stocks. OY may also be adjusted upward or downward depending on socio-economic considerations or information received via the public hearing process.

In the case of pink coral in the Makapuu Bed, the (downward rounded) estimate of MSY is 1,000 kg. On the basis of past harvest records, the Makapuu Bed does not appear to be in an overfished condition. Therefore, it is reasonable to base OY on MSY, with appropriate modification to include economic and social factors. See Appendix I for an economic analysis of various management options.

This analysis shows that pulse fishing is more economically efficient than fishing continuously, if there are alternative uses for the fixed factors of production. Otherwise, continuous fishing is more efficient at annual quotas of about 1,000 kg for pink coral and 300 kg for gold coral for the single firm now harvesting the Makapuu bed.

The most likely situation is that the firm now harvesting coral with a submersible in the Makapuu bed will find alternative uses for the submersible and its support vessels during zero harvest years of a pulse fishing strategy. Without adequate information on the world coral market, projections of coral prices are not available. Projections on cost changes are not available either. Therefore, assuming prices and costs change at the same rate and the fixed costs are defrayed during zero production years by alternative employment, pulse fishing is deemed the most efficient policy.

If the Optimum Yield is to be based on pulse fishing, the biological implications of different catch levels must also be examined. Although setting a 2-year quota of 2,000 kg would concentrate fishing effort in the first year and slightly reduce MSY over the long term, the decrease is negligible (Figure 18). When pulse fishing is simulated for 3- and 4-year periods (again with the entire catch in the first year), the biomass of the exploited population gradually decreases. The biological consequences of harvesting more than an average of 1,000 kg in one year are described in Section IV.F.1.B. Eight such options were tested, and in all cases the rates were not sustainable. Thus, a strategy of 2-year pulse fishing appears to be the best combination in terms of minimizing the biological risks and maximizing economic benefits. For this reason, Optimum Yields for precious corals in the Makapuu Bed have been set on the basis of 2-year quotas. Applying this criterion to pink, gold and bamboo coral gives (downward rounded) Optimum Yields of 2,000 kg, 600 kg, and 500 kg respectively for 2 years for the Makapuu Bed.

Optimum Yields are established for the Conditional Beds by assuming the same densities and population dynamics as for the Makapuu Bed, taking into account the areas of the beds relative to that of the Makapuu Bed, and reducing the resulting figure by 80%, if harvesting is to be by non-selective coral dredges. Thus the annual quotas on each of these beds will be fractions or multiples of 200 kg of pink coral, 60 kg of gold coral and 50 kg of bamboo coral proportional to the area of the bed. If fishing on a bed is by nonselective methods, the bed will be closed when the quota is filled for any one of the three species, to prevent overharvesting.

Because of the potential vulnerability of precious corals to over exploitation, a prudent policy for newly discovered and unsurveyed beds would be to fix Optimum Yields only after a careful assessment of their production potential. However, an assessment of abundance and productivity can be accomplished only after a bed has been located, and as a practical matter, neither Federal nor State agencies are likely to receive funding to search the FCZ to locate coral beds. It must be left to private interests to conduct this exploratory fishing. This in turn poses a serious management problem: there must be a limit to the amount of corals allowed to be taken from an Exploratory Area to reduce the risk of overfishing, but the limit must be large enough to provide the economic incentive to engage in exploratory fishing.

There is no statistical basis for determining this limit; rather, the limit must be a judgmental decision. With respect to abundance, it is believed that there are coral beds scattered throughout the FCZ. Reports of past foreign operations and the detection of illegal foreign operations in 1978 provide evidence of foreign interest in (and perhaps knowledge of) coral resources in the FCZ. With respect to economic incentive, precious coral ex-vessel prices were about $150/kg. in Hawaii in 1977 (see Tables II and IV). Little is known, however, about the costs of operation for a submersible or for dredging, thus, breakeven harvests for exploratory fishing cannot be estimated.

The Council's judgement is that an optimum yield of 1000 kg per year per Exploratory Area should provide sufficient incentive for both domestic and/or foreign exploratory fishing while posing little risk of overfishing. For this purpose, there are considered to be

five Exploratory Areas, comprising the FCZ off American Samoa, Guam, the Northern Marianas, and the minor U.S. island possessions in the central and western Pacific Ocean, and those portions of the FCZ off the Hawaiian Islands that are not included in Established and Conditional Beds, as defined in this Plan. A quota of 1,000 kg of combined species for each Exploratory Area is considered conservative. In Hawaii, this figure represents about one-third of the estimated MSY for these species in all Established and Conditional beds. However, it is large enough to offer an economic incentive for exploration.

IV.D. Domestic Fishing Capacity, Expected Harvest Level, and TALFF

Domestic harvest from the Makapuu bed of all corals in 1974 was nearly 3,000 kg. (see Table II). The industry was operational on a continuous basis that year. Harvests then declined for two years, but increased again in 1977. The reasons for this pattern of harvests are not known, but it appears that the popularity of coral jewelry may be increasing such that demand and prices for corals (see Table V) justify more intensive fishing.

It has been pointed out that the maximum payload of the submersible in the corals fishery is about 200 pounds, or 90 kg. (Sec. II.C.2). If it is assumed that the average haul on a dive is only one-half the maximum payload, the submersible would have had to make only 67 dives to achieve the 3,000 kg. harvest made in 1974. This number of dives can be accomplished in about 22 weeks. Thus the 3,000 kg. harvest would seem to be a minimal measure of domestic capacity. It seems reasonable to estimate that domestic capacity would be a least one-third higher (i.e. 4,000 kg.) given the right conditions of

price, harvest costs, and resource abundance.

Estimating expected domestic harvest is more difficult given the limited data available. Domestically harvested corals constitute only a small portion of the entire corals industry, and it appears that a large volume of low-priced imports could easily drive down the price and make the domestic product less competitive. On the other hand, coral jewelry is a popular item in the tourist markets, and producers may be willing to pay a premimum or engage in long-term contracts to insure a stable supply of domestically harvested corals. It also would seem reasonable to conclude that domestic producers have learned how to use the submersible more effectively since 1974, and that the same number of dives would produce more coral per dive than in 1974, assuming sufficient availability of corals for harvest. Considering all these factors, the expected annual harvest is estimated to be 3,300 kg. per year (assuming management measures permit). This represents a 10% increase over the 1974 (peak year) harvest.

The OY for the Makapuu Bed is established to be 3,100 kg. (all species combined) over a two year period. This is the most fished and best studied bed in the FCZ and is quite close to the dominant processing and retailing center of Hawaii. It also is reserved for selective fishing techniques. It appears reasonable to expect that the OY for Makapuu will be harvested in the first year of the two year period so the submersible can be employed during the second year in alternative areas or uses. Thus, there would be more than 3,000 kg/year of "idle" selective capacity available to harvest the OY from the four Conditional Beds from which corals may be harvested (the fifth Conditional Bed is to

be a refugium). If selective gear is used, OY for Conditional Beds (in aggregate) would be not more than 1,250 kg. per year, or 2,500 kg over a two year period (all species combined). If non-selective gear is used, OY would be less. Therefore it appears reasonable to conclude that domestic vessels can and will harvest the OY from Established and Conditional Beds. Therefore, the TALFF for these beds is zero.

There is no evidence to indicate that owners of U.S. vessels have either the intention or the desire to conduct exploratory fishing in the FCZ, especially seaward of Guam and American Samoa. Conditions may be somewhat more favorable off Hawaii, given the proximity of the dominant market and the possibility that a vessel fishing a Conditional Bed with dredging gear could conduct some exploratory fishing with little additional cost. Domestic interests, however, are unlikely to make any investments in vessels and gear without some assurance that corals will be available.

The Council proposes, therefore, that 500 kg. per year in each Exploratory Area be reserved for domestic fishing. Unlike reserves in other fisheries, this reserve would not be released to foreign fishing even if no domestic fishing were to occur. The reserve is sufficiently small that it could be taken in a very short time in any month of the year. It is not possible to survey the fishery to determine in advance what the domestic harvest is likely to be and how much could be released to foreign fishing, hence this reserve would not be released to foreign fishing even if no domestic

fishing were to occur. Further, corals are long-lived animals, and natural mortality rates are quite low, so there is little "waste" or loss if an amount of corals is not harvested in a given year. Finally, this permanent reserve is meant to insure that domestic interests will have the certainty of a quota for their own exploratory fishing.

The remainder of the OY for each Exploratory Area will be available for foreign fishing, i.e., the total allowable level of foreign fishing (TALFF) is 500 kg., all species combined, per Exploratory Area per year.

IV. E. Domestic Processing Capacity and Expected Processing Level

The largest annual domestic harvest since the submersible entered the fishery has been about 2940 kg. (1974). There are no indications that domestic processing capacity was insufficient to process this level of harvest. The size of the market for polished-unset coral (Table V) suggests that domestic processing would expand rapidly with increased domestic harvests. The Council believes that domestic processing capacity and expected processing levels will equal the domestic harvest for the future. There is no known or suspected interest in joint ventures involving foreign vessel processing of U.S. harvested corals.

IV. F.1 Management Measures--Options, Recommendations and Rationale

In developing a management plan for precious corals in the Western Pacific, a number of options were considered for each management provision. All options for each provision are listed below. The policies recommended by the Western Pacific Council and the rationale for these decisions are also described.

Where appropriate, reference is made to previous sections of the plan which contain more complete documentation and support for the recommendations of the Council. A draft set of suggested conservation and management measures which implement the recommendations is presented in Section IV.F.2 of the plan.

A. Gear

With regard to gear restrictions, six options were considered by the Council. They are as follows

1) To prohibit all forms of non-selective harvest (dredging) in the FCZ
2) To allow unconditional dredging everywhere in the FCZ
3) To allow conditional dredging everywhere in the FCZ
4) To allow conditional dredging in some areas where selective methods are not in current use
5) To allow unconditional selective harvest everywhere in the FCZ
6) To allow conditional selective harvest everywhere in the FCZ

Policies 4) and 6) are recommended: to allow conditional dredging in Exploratory Areas and on some Conditional Beds, excluding the FCZ seaward of the main Hawaiian Islands, i.e. south and east of a line midway between Niihau and Nihoa Islands; and to allow conditional selective harvest everywhere[1] in the FCZ. This would prohibit dredging in areas such as Makapuu, where selective harvesting methods are established and capable of taking the Optimum Yield; or Ke-ahole Point or Kaena Point, which are such small beds that dredging poses too great a risk of damage in view of the low economic return.

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[1] Except Refugia

A discussion of the advantages and disadvantages of selective and non-selective (dredging) technologies is presented in Section II.C of the plan. Where allowed, dredging would be subject to reduced quotas relative to quotas for selective methods (see below). This is because young colonies are not protected from exploitation during the period when their growth exceeds losses from natural mortality. Hence with dredging some growth-overfishing occurs. Also, with dredging full recovery of pieces knocked down does not occur (Section II.C.2). The reason an allowance for dredging is provided at all is the impracticality of utilizing selective methods in certain remote areas. Restricting harvest to selective methods could in practice close off large areas. This would be wasteful of the resource and would not produce new information concerning distribution and abundance. Both dredging and selective harvest are subject to further conditions which are outlined below.

Both options recommended are consistent with the objectives of the plan (see Section IV.B.2) and the national standards of P.L. 94-265.

B. Weight Quotas

Two options were considered: to require or not require weight quota on a per bed basis. The Council proposes to establish weight quotas for both dredging and selective harvesting methods. For dredging, the weight quota would be set equal to 20% of the quota that would apply if selective methods were in use. The rationale for this restriction is the finding that the MSY for pink coral with no size limit is approximately half what it is at optimum size of first capture (Section III.F).

Taking into account the efficiency of the dredges (40%) results in a further reduction of the quota to 20% (40% of 50%). For selective methods, the weight quotas are based on estimates of MSY (Section III.G). In the Makapuu Bed, eleven weight quotas for pink coral were considered. They are as follows: 1,000 kg/yr, 1,200 kg/yr, 2,000 kg/yr, 3,000 kg/yr, 4,000 kg/yr, 5,000 kg/yr, 6,000 kg/yr, 7,000 kg/yr, 8,000 kg/yr, 2,000 kg/2 yr, and 3,000 kg/3 yr. The option recommended is the tenth: 2,000 kg/2 yr. This option is selected because it is the most efficient quota considering all biological, economic and social factors (Section IV.D). Multiple year quotas in which fishing effort is concentrated in the first year also favor exploration in "off-years" when the equipment might otherwise not be in use. The 2-year quota is based on an estimate of MSY for pink coral, simply being double the amount for twice the time. The same formula was used to develop optimum yields for gold and bamboo coral.

For all harvest levels greater than 1,000 kg for one year, the harvest (even up to 8,000 kg) can be sustained only for several years, after which the population and catch severely decline. Two levels of harvest, 2,000 kg/yr and 4,000 kg/yr, were simulated using a computer model over a 37-year period to show the effects of these policies on both the parent population (Figure 18) and the catch (Figure 19). In the model, recruitment is assumed to be constant until a level of two-thirds the spawning biomass was reached after which it was set as a linear function of spawning biomass. In the case of continuous harvest at the 2,000 kg/yr level, the population is able to produce this yield for only 14 years after which significant

reduction occurs. The 4,000 kg/yr option leads to collapse of this level of harvest in just 5 years. In the Makapuu Bed both the 2,000 kg/yr and the 4,000 kg/yr are wasteful in the long term and are inconsistent with the national standards of FCMA.

For Conditional beds for which there are not good estimates of MSY but for which estimates of area are available, the quota, for each species of precious coral initially, could be set according to the ratio of the area of a bed to the area of the Makapuu Bed, i.e.

$$\frac{\text{Area of Bed}}{\text{Area of Makapuu Bed}} \times \frac{\text{MSY for Makapuu Bed}}{}$$

Such beds are defined as Conditional Beds. For Conditional Beds on which dredging is allowed the quota would be reduced by 80%.

For areas outside the Makapuu Bed and Conditional Beds, it is proposed to allow either nonselective or selective methods, subject to a limit of 1,000 kg. per Exploratory Area per year. The quota for Exploratory Areas is suggested on the basis of providing a minimum economic incentive for exploration (See p. 44). Of the 1000 kg per Exploratory Area per year, 500 kg are suggested to be set aside as a permanent reserve for domestic fishermen. A 500 kg quota is judged to be of sufficient value as to provide an economic incentive for exploratory fishing. For this reason the absolute amount of the quota is the same regardless of the type gear employed (selective or nonselective).

The plan envisions that a new bed identified in a Exploratory Area will be designated a Conditional Bed, with a quota based on its estimated area, once an area estimate has been made. Fishing in Exploratory Areas will be controlled by permits to be granted by the Regional Director, NMFS for a one-year term, with provision for a one-year renewal.

All weight quotas recommended in the plan are consistent

ards of P.L. 94-265. With respect to the Makapuu Bed, the quota recommended for pink coral is also consistent with State law (Appendix III), except that the quota is based on dry weight of live coral only.

C. Size Limits

The options for a size limit apply only to selective harvesting methods in the Makapuu Bed and the Conditional Beds off Kea-hole Point, Hawaii and Kaena Point, Oahu. Since dredging is allowed everywhere else, the size limit at this time can apply only to these beds. The alternatives considered were whether or not to require a size limit and if so, what it should be and whether it should be voluntary or compulsory. For pink coral, four size limits were considered: 8, 9, 10 or 11 inches in height measured from the base to the greatest vertical extremity of the colony.

For pink coral a compulsory size limit of 10 inches is proposed for beds on which only select harvesting techniques may be used. Size limits for gold and bamboo corals are not recommended at this time because of inadequate information. The rationale for selecting a 10-inch limit is based on several arguments. First, the size limit which corresponds to MSY is actually 11 inches (Section III.F). However, a slightly smaller size is favored because catch per unit effort would be greater than it is with an 11-inch limit while the effect on yield would be negligible (Figures 11 and 13). MSY is adjusted downward to account for a 10-inch size (Section III.G). Second, a 10-inch limit is consistent with current practice. Industry claims that harvesting colonies less than 10 inches is not economically practical, because the return does not justify the time spent harvesting. Third, a 10-inch size limit is equivalent to an age of 28 years, and this is approximately 15 years after colonies reach reproductive maturity. Hence, an adequate reproductive cushion (Grigg, 1976) would appear to be provided by a 10-inch size limit.

Because a size limit of 10 inches almost doubles the MSY that

would be obtained with no size limit (Section III.G and Figure 13), it promotes efficiency in the utilization of the resource, which is consistent with the national standards of P.L. 94-265, Hawaii State Division of Fish and Game Regulation 41 (Appendix III) and the objectives of this plan (Section IV.B).

Unfortunately much of the pink coral is unavoidably broken during collection, making enforcement of any size limit difficult. Breakage varies depending on handling which itself is a variable due to weather, size of the load and chance. One method that might work would be to calculate an average weight and stem diameter for colonies 10 inches in height. The weight of the load could then be divided by the average weight of a 10-inch colony. This division would produce a number that would equal the minimum number of pieces equal to or larger than the stem diameter equivalent to 10 inches in height. For example, if the stem diameter equivalent to 10 inches in height is one inch and the average weight of a 10-inch colony of pink coral is 2 pounds and if a particular day's load is 50 pounds, then at least 25 pieces in the load should measure at least one inch in maximum diameter.

The calculations for the example are as follows:

$$\frac{\text{50 lbs (catch)}}{\text{2 lbs (weight average (colony of 10 in.))}} = \text{25 pieces} \geq \text{1 inch stem diameter}$$

The Council will reconsider this size limit as a management measure if it is found that enforcement is inordinately difficult or expensive.

D. Royalties

The options considered for this provision were whether or not to impose royalty fees on the basis of the weight or value of precious coral harvested. Royalties are a feature of management regime for coral fisheries established by BLM, DOI. The recommendation is against the imposition of royalties because the FCMA states that regulations promulgated to implement fishery management plans may not require fees for domestic fishermen beyond the cost of administering the permit system. Presumably royalties would exceed the cost of administration. Also the Council sees no merit in proposing royalties for corals when no other FMP has proposed royalties. The Council considers the employment and taxes generated by the industry to be adaquate compensation to the public for use of a common property resource.

E. Incidental Catch

The options considered were whether or not to allow incidental catch of corals by vessels fishing for other species of fish and if so under what conditions. The recommendation is to allow incidental catch of all precious corals in the FCZ for both domestic and foreign fishermen, however, subject to certain conditions. It is recommended that domestic and foreign fishermen be allowed to incidentally harvest precious coral but that they be required to submit detail monthly reports of such catches to the NMFS. It is further recommended that non-retention apply for both domestic and foreign fishermen. It is also proposed that should the amount of incidental harvest of precious coral be significant (more than 50 kg per vessel per year), the Secretary of Commerce should be so notified so that more restrictive measures can be imposed on an emergency basis.

This policy seeks to encourage the development of fisheries which may take coral incidentally, such as trawling for finfish; gaining new information on coral resources from such incidental taking; and discouraging uncontrolled coral harvesting under the guise of incidental catches.

F. Refugia

With respect to Refugia or preserves, that is, beds which would be closed for some period of time to exploitation, the options considered were whether provision should be made for such preserves, and if so, which areas, if any, should be so designated at this time. It is recommended that one Refuge be established immediately. The reasons for establishing Refugia are: (1) to preserve coral beds as natural areas for purposes of research: (2) to establish control areas that could be used in the future to measure environmental impacts of coral harvesting; and (3) to establish possible reproductive reserves for enhancement of recruitment into adjacent areas. WesPac Bed, between Nihoa and Necker Islands (Lat. 23° 18.0'N, Long. 162° 35.0'W), is recommended for designation as the first such refuge because of its central location within the Hawaiian Archipelago, which favors recruitment into adjacent areas. No commercial or exploratory harvest of precious coral is permitted in Refuge areas. However, other types of fishing will be allowed subject to restrictions on incidental catch of corals (Section IV.F.1.E.).

G. Season

Seasons were also considered. The recommendation is against setting any seasonal restrictions. This decision rests on the observation that there is little biological basis for establishing a closed

season, other than to reduce fishing effort. Natural mortality rates are relatively low for pink corals and are probably also low for gold and bamboo coral as judged by their longevity. Therefore it matters little in terms of the reproductive potential of a colony whether it is harvested before, during or after the reproductive season. The reproductive season for pink coral in Hawaii is June and July (Grigg, 1976). Because reproduction is iteroparous (year after year), the impact of removing a colony in June of any given year is essentially the same as removing that colony in any other month. Hence if summer months were closed to the fishery, and the annual harvest did not change, the benefit would be insignificant. By contrast, an adverse effect could occur if the safest and most accessible months (due to weather) were not open. Summer closure could pose a hardship on the industry and discourage exploration.

H. Limited Entry

Limited entry was considered but is not recommended. There is no sign at the present time that the fishery is being overfished due to excess capital investment or to the open acess nature of the resource. In the precious coral fishery in the western Pacific, the need to increase information concerning the resource would favor entry (increased effort) so long as this did not decrease the present value of the fishery.

I. Permits and Conditions

A requirement for permits, and the conditions under which required were considered. The Council is in favor of permits, to include all conditions covered in provisions A-H as well as extensive reporting requirements.

Information is to be documented in daily log books and be provided to the appropriate representative of the Secretary of Commerce.

Permits are to be area specific with reference to Established Beds, Conditional Beds or Exploratory Areas (see next section for definitions). The duration of the permits is also area specific.

Further details concerning permits and other management measures are contained in the next section of the plan.

IV. F.2. Proposed Specific Conservation and Management Measures

The following are recommended management measures under which permits to harvest and possess precious corals and associated non-precious corals for domestic fishermen are to be granded:

Limitation of Permit

Not more than one permit shall be issued to any one person. No permit shall be valid on more than one vessel. Permits shall not be assigned or transferred from person to person nor from vessel to vessel .

Duration of Permit

Permits shall be effective from July 1st* through June 30th* or, if issued after the beginning of such term, for the remainder thereof.

Permit Areas

A permit will be required for the harvest of precious corals, including the species *Corallium secundum*, *Gerardia sp.* and *Lepidisis olapa*,

*The selection of a July 1 date for the beginning of the term for permits was made in order that the terms for Federal permits coincide with State permits.

and for nonprecious corals taken with precious corals, in any or all Western Pacific Regional Fishery Management Council (FCZ) permit areas described below.

For the purposes of this plan there are three designated permit area categories. These are:

I. ESTABLISHED BEDS (E-B) shall include only coral beds having a history of harvest and those sufficiently documented to the extent that an optimum yield quota consistent with the provisions of the FCMA of 1976 has been established.

Makapuu (Oahu) E-B-1 Permit Area shall include the waters enclosed by the lined area delineated in Figure 5.

II. CONDITIONAL BEDS (C-B) shall include known coral beds for which optimum yield quotas are derived through size relationships to the Makapuu Bed. Estimates of areas of Conditional Beds are based on data accumulated from over 200 dredge haul stations and 33 submersible dives in Star II throughout the Hawaiian Islands.

Ke-ahole Point (Hawaii), C-B-1 Permit Area, shall include the waters within a 0.24 km^2 area around a midpoint of Lat. 19° 46.0'N, Long. 156° 06.0'W.

Kaena Point (Oahu), C-B-2 Permit Area shall include the waters within a 0.24 km^2 area around a midpoint of Lat. 21° 35.4' N, Long. 158° 22.9'W.

Brooks Banks, C-B-3 Permit Area, shall include the waters within a 1.6 km^2 area around a midpoint of Lat. 24°06.0'N, Long. 166° 48.0'W.

180 Fathom Bank (northwest of Kure), C-B-4 Permit Area, shall include the waters within a 0.8 km^2 area around a midpoint of Lat. 28° 50.2'N, Long. 178° 53.4'W.

III. REFUGIA

Wespac Bed, ,R-1 Permit Area, shall include the waters within a 0.8 km^2 area around a midpoint of Lat. 23° 18.0'N, Long. 162° 35.0'W.

IV. Exploratory Permit Areas (X-P) Area shall include all beds, other than Established and Conditional Beds and Refugia in each of five areas: Hawaii, American Samoa and Guam, the Northern Marianas and the combined FCZ's around all other U.S. islands in the central and western Pacific. These may be designated X-P-H, X-P-AS, X-P-G, X-P-NM and X-P-I. A new bed located by exploratory fishing will become a Conditional Bed when sufficient data have been collected to estimate size and yield from the bed.

Season and Quotas

(1) The coral harvesting season shall open July 1 in all permit areas.

(2) Closing Date Makapuu, E-B-1, Permit Area. The coral harvesting season in Makapuu E-B Permit Area will be a 2-year period extending from July 1 of the first year through June 30 of the second year. The season shall be closed prior to June 30 of the second year by the Regional Director, NMFS if it is estimated that the season catch in Permit Areas in E-B-1 will have reached 2,000 kg of pink coral, 600 kg of gold coral, and 500 kg of bamboo coral prior to June 30. All live coral harvested will be retained by the permittee and shall be counted against the Quota.

(3) Closing date C-B-1-4 Permit Areas. Coral harvesting in Permit Areas C-B-1 through 4, shall be for one-year periods extending from July 1 through June 30. The season shall be closed prior to June 30 by the Regional Director if it is estimated that the season catch for C-B-1-4 Permit Areas will have filled the one-year quota prior to June 30. One-year quotas for dredging can be computed on the basis of the following formulas.

(i) $\frac{\text{Area of C-B-1-4 Beds}}{\text{Area of Makapuu Bed}} \times 200 \text{ kg} =$ 1-year conditional quota for pink coral

(ii) $\frac{\text{Area of C-B-1-4 Beds}}{\text{Area of Makapuu Bed}} \times 60 \text{ kg} =$ 1-year conditional quota for gold coral

(iii) $\frac{\text{Area of C-B-1-4 Beds}}{\text{Area of Makapuu Bed}} \times 50 \text{ kg} =$ 1-year conditional quota for bamboo coral

Permit Areas C-B-1-4 shall be closed to further non-selective harvesting of all species of coral whenever the OY of one species has been attained. This measure is to prevent overharvesting of the first species that could occur by way of non-selective harvest of other species.

(4) Closing date Exploratory Permit (XP) Areas. Exploratory Permit (XP) Area season shall be a one-year period extending from July 1 through June 30. Announcement of closing dates by the Regional Director in e permit area will be made not less than forty-eight (48) hours in advance of a closing date, except that if the closing date is to be June 30 there need be no announcement. Each Exploratory Permit Area will be closed to foreign fishing when the total foreign harvest of pink, gold and bamboo coral in the Area reaches 500 kg and to domestic fishing when the total harvest of the three species reaches 1,000 kg.

Gear Limitations

The use of selective harvesting methods shall be encouraged in all permit areas.

(1) In all permit areas where selective harvesting is current practice and an optimum yield has been determined, dredging techniques are prohibited.

(2) Coral dredging is prohibited in all portions of the FCZ seaward of the main Hawaiian Islands, i.e. south and east of a line midway between Niihau and Nihoa Islands.

(3) Coral dredging will be allowed in all other permit areas under specified conditions. If coral tangle dredges are to be employed, the weight quota is to be 20% of that allowed using selective methods.

Identification of Vessel

Each vessel operating under the provisions of this plan shall carry on an exposed part of the superstructure of the vessel the number of the owner's permit in fourteen-inch (14-in.) black numbers on a white background. The permittee shall keep the number clearly legible in good repair, and insure that no part of the vessel, its rigging or its fishing gear obstructs the view of the number from an enforcement vessel or aircraft.

Records

Each permittee shall keep an accurate record of his coral harvesting operations in a log book furnished by NMFS. All information requested shall be given completely and accurately.

Whenever a permittee makes a sale or delivers coral harvested under a permit, the permittee shall within 72 hours of landing mail to Regiona Director, NMFS, a copy of the NMFS log with complete harvest information for the corals

sold or delivered including:

1) area fished

2) depth of water

3) weight of coral harvested by species (landed weight, air dried for at least 24 hours)

4) fishing effort (days or hours) and dates of harvest

5) method of harvest

6) observations about the habitat (current, bottom type, bottom topography, bottom slope, proximity to land, etc.)

7) sales of precious coral including the amount by species, value, date of sale and name(s) of buyer(s), and

8) other data as specified in the permit or regulations.

Size Limitation

Makapuu Bed (E-B-1), Ke-ahole Point (C-B-1) and Kaena Point (C-B-2) Permit Areas. Any pink coral harvested from these Beds shall be from colonies of at least 10 inches in height.

All other Permit Areas. There are no size limits established.

Incidental Harvest

All domestic and foreign fishermen shall keep accurate records of all precious coral harvested incidentally. Records shall include but not be limited to: gear type and size, species harvested, landed weight, location and depth. Records shall be submitted to the NMFS on a basis specified by NMFS. Non-retention is an added requirement for both domestic and foreign fishermen.

Observers

A permittee may be required to carry a NMFS observer, particularly for fishing in exploratory areas.

Permit Cancellation

Permits shall be subject to suspension or revocation as specified by regulation.

IV.G. Enforcement

Enforcement activities will include aircraft and surface patrols and dockside inspections, and observers may be placed on foreign and domestic vessels. The NMFS estimate of requirements to achieve 95% compliance and 100% off-load inspection levels include over 1100 hours per year of aerial patrols (multi-purpose, including seamount fishery and billfish fishery) and 200 days per year of surface patrols (also multi-purpose) for the FCZ seaward of the Hawaiian Islands; 168 hours of aerial and 96 days of surface patrols off Guam and the Northern Mariana Islands; 144 hours of aerial and 48 days of surface patrols around American Samoa; and aerial and surface patrols as resources permit off U.S. Possessions. Total fishery enforcement, of which an unspecified percentage would be attributable to corals, are estimated at ten (10) agents and $275,000 for NMFS. To the extent possible, NMFS and the Coast Guard will coordinate with State enforcement authorities to prevent duplication of effort.

IV.H. Administrative Costs

It is not possible to predict with any certainty the cost of observer coverage. Foreign vessels pay the cost of U.S. observer placements, thus, there is no net cost to the U.S. Government, although

NMFS would pay the immediate costs. There has been no expression of foreign interest in fishing for corals in the FCZ; however, for the purposes of considering management costs, it is estimated that observer placement entails an estimated $2,000 per observer per month, whether on a domestic or foreign vessel.

Data collection would involve little cost, given the low level of participation in the fishery. Preparation and distribution of logbooks would cost not more than $1000, and compilation and analysis of the data probably would not cost more than $1000, per year, per area. The "cost" of recording and submitting data would be negligible. The permit system also would be easy to administer since participation is so limited. The cost would not be large enough to warrant an administrative fee. Total administrative costs are estimated to be not more than $25,000 per year as the fishery is now constituted.

IV.1. Relationship to Existing Laws

Implementation of this FMP replaces the Department of Interior's (Bureau of Land Management) regulations regarding the areas covered in ths FMP. DOI regulations for all other areas not covered by this FMP remain in effect. The regulations of the Department of Interior are described in Appendix III and below. DOI permits may be suspended or revoked if the permittee fails to comply with any of the provisions of the permit. The permittee must be bonded and pay $25.00, a non-refundable permit filing fee. In the case of commercial harvesters a fee or royalty will be assessed based upon the fair market

value of the coral. Violation of the regulation carries a fine of not more than $2,000 or imprisonment for not more than 6 months or both such fine and imprisonment for each occurrence of the violation.

The State of Hawaii has promulgated regulations for the management of pink and gold coral, which are given in Appendix II. As written, the regulations apply generally to "waters subject to the jurisdiction of the State," but they include provisions, including a catch quota for pink coral, specifically applying to the Makapuu Bed. Questions relating to State jurisdiction over that bed are beyond the scope of this Fishery Management Plan. The pink coral quota for the Makapuu Bed in the State regulations, 4,400 pounds for 2 years, is consistent with the quota defined in this Plan, except that the State specifies that this is to be wet weight of live and dead coral. The State's minimum size limit of 10 inches in colony height is also consistent with that of this FMP, except that observance of the State's limit is made voluntary. Potential conflicts between the State's regulations and the measures prescribed in this Plan will depend largely on how the extent of the State's jurisdiction may be interpreted in the future.

Local jurisdictions in the other areas covered by this Plan do not have any laws or regulations specifically for the management of coral resources or coral fisheries of the species covered by this Plan.

A determination of consistency of this plan with the CZM plan for the State of Hawaii is given in Section V.B.

There are no Indian treaty or native Hawaiian rights or other

types of native claims known to involve the precious coral resources or fisheries that will be managed in accordance with this FMP.

IV.J. Council Review and Amendment of the Plan

A review by the Council is to be conducted annually unless information is brought to the attention of the Council which indicates that emergency actions are needed to protect the resource.

As additional information on number, location, and sizes of coral beds becomes available, and as data on other species of precious coral becomes available, the Council will amend the plan as necessary.

IV.K. Future Research Needs

The Council recognizes and this plan emphasizes, the critical need for research. The most important needs for future research of precious corals in the Pacific Ocean are stock assessment and the collection of economic data. Until the extent and magnitude of the resource are defined, the development of U.S. precious coral fisheries will be hampered. Moreover, stock assessment is the first step in defining Conditional Beds and developing a strategy of management. More specifically, better information on the size of Conditional Beds and rates of growth and mortality of their precious coral populations are needed before they can be upgraded to Established Beds with correspondingly more accurate and precise estimates of MSY. Once this information is available, information regarding stock-recruitment relationships must be obtained before more effective management plans can be developed.

Other important biological research is needed to asses the impact of management decisions on the status of the resources. For example, it will be important to know the impact of harvesting precious coral on recruitment as well as on adult stocks. Records of catch and effort can be used in part to determine if overfishing has occurred. Research is also needed before the impacts of incidental catch by domestic and foreign fishermen can be assessed. Records of incidental catch coupled with television or submersible surveys would be necessary for this. Another important subject for biological research is the impact of harvesting precious corals on other benthic species which occupy the same habitat.

In terms of gear, further research is needed in two areas. First, to better evaluate the efficiency of dredges and secondly to improve methods of selective harvest using submersibles and remote vehicles. For dredges, it is important to know their efficiency so improvements in design can be made and to attain a better idea of the degree to which precious coral is knocked down but not retrieved.

In the area of economics, better data are needed in Hawaii on cost of harvest, ex-vessel value of precious coral, costs of production, total sales of precious coral jewelry produced from local production, and total sales of precious coral jewelry produced from imported coral. In regions of the FCZ other than Hawaii, market studies are needed to assess the potential of precious coral industry considering both local sources of supply and imports.

IV.L. Alternative Exploratory Areas Management Approach

The Council recognizes that its proposed method for defining optimum yield, domestic "reserve" and TALFF for Exploratory Areas constitutes a departure from the conventional approach under the FCMA. Where the "reserve" approach has been used in other plans, it has been used to accommodate the possibility that actual domestic harvest will exceed the estimated expected harvest. The reserve has been subject to release for foreign fishing if domestic catches are at or below estimated levels. The permanent, unallocable corals reserve is different in that it gurantees that a particular amount will be kept available for domestic exploratory fishing. It is believed this is necessary to provide an incentive for domestic investment in vessels, equipment and manpower. Inasmuch as there has been no documented and permitted foreign coral fishing in the FCZ and the plan would allow exploratory fishing by foreign vessels for the first time, the permanent reserve appears reasonable and equitable, and is believed to be consistent with the spirit and the letter of the FCMA.

Nonetheless, the Council appreciates that this would be a precedent-setting decision and that approval is not assured. The Council proposes therefore a second-best approach to govern domestic and foreign harvests in Exploratory Areas, as follows, if the unallocable reserve approach is disapproved:

1. Domestic vessels would be permitted to engage in test fisheries, with a limit of 500 kg. per year, all species combined, per Exploratory Area. Such test fishing would be under permits granted by the Regional Director in consultation with the Western Pacific Council

and State agencies. The Regional Director may allow dredging in Exploratory Areas, provided no dredging is permitted in the "major" Hawaiian Islands (south and east of a line midway between Niihau and Nihoa Islands).

2. Foreign vessels will be permitted to take up to 500 kg. per year, all species combined, per Exploratory Area under a scientific research plan approved by the Southwest Fisheries Center, NMFS, in consultation with the Council and State agencies. This is consistent with present NMFS policies and procedures.

V. ENVIRONMENTAL IMPACTS

V.A. Relation to National Standards

The management measures proposed herein are fully consistent with the national standards as outlined in P.L. 94-265. In brief, the management plan is designed to achieve optimum yields from each fishery; the plan is based on the best scientific information available; stocks are managed on the basis of a unit (individual beds); the plan does not discriminate between residents of different States; the plan promotes efficient utilization of the resource, the plan accounts for variation in the resource;and it is designed to minimize management costs.

V.B. Relationship of the Proposed Action to OCS and CZM

With regard to the OCS, manganese crusts and precious corals are known to co-occur at depths of 1,200 to 2,000 feet in some areas in the Hawaiian Archipelago such as the Wahoo Shelf off Oahu and the bank immediately to the southeast of French Frigate Shoals. Mining of manganese crusts could directly damage precious corals by

the effects of silt and sediments. The potential of such specific impacts have not been determined, although an assessment of the environmental impact of mining for manganese nodules in the Pacific, in general, has been completed by the Environmental Research Laboratory of NOAA (Hirota, unpublished manuscript).

The Coastal Zone Management Act (CZMA) of 1972 encourages states to establish policies and programs for the conservation of coastal resources balanced by the needs of economic development. Conservation and the rational use of living resources in the offshore coastal zone (territorial sea) are among the objectives of the National CZMA. Promotion of domestic fisheries, the development of unutilized or underutilized fishery stocks, and fisheries management according to sound conservation principles are the major objectives of the FCMA. While the geographic area of management authority and application differs under each statute, the CZMA and the FCMA embody unanimity of objectives with regard to transboundary fishery resources.

An approved CZM program has been in effect in Hawaii since 1978. State CZM policies directly relating and pertaining to the proposed action are contained in the coastal ecosystems and economic use resources categories of the Hawaii CZM statute (Act 188 of 1977, Chapter 205A, HRS, as amended). They are as follows: (1) improve the technical basis for natural resource management, (2) preserve valuable coastal (offshore) ecosystems of significant biological or economic importance, and (3) minimize adverse environmental effects from economic uses of coastal zone resources. These CZM policies are fully consistent with the objectives of this Plan and with the selected

management measures for precious corals which are: (1) to allow harvesting of precious corals in known beds and to encourage the exploration and discovery of new beds but subject to limitations to prevent overfishing, (2) to encourage the use of selective harvesting methods and also to prevent the wastage of resources by allowing dredging in those areas where large distances would make selective harvesting economically infeasible, (3) to minimize the harvest of immature colonies that have not reached their full potential for growth, (4) to provide for the establishment of refugia, and (5) to encourage the development of new information on the distribution, abundance, and ecology of precious corals so as to improve the technical basis for management. As with the Hawaii CZM program which has been established to balance the needs of economic development with the long-term conservation of coastal resources, the proposed action provides a combination of measures designed to maximize opportunities from the harvest of precious corals while minimizing the biological risks involved. The relationship of the proposed action to coastal zone management planning in Guam, American Samoa, and the Northern Mariana Islands cannot be determined at this time because CZM plans have not been completed and approved for these areas.

The Hawaii offshore CZM Program area extends from the shoreline to the seaward limit of the State's jurisdiction. While the offshore coastal zone is defined for National CZM Program purposes as not extending beyond the territorial sea of the United States, the State of Hawaii does not relinquish or in any way waive its rights, authority, or claims, present and future, over those waters within the State's

jurisdiction that exist outside the conventional 3-mile seaward boundary of the territorial sea.* Section 6 of Article IX of the State of Hawaii Constitution expressly provides: "The State shall have the power to manage and control the marine, seabed and other resources located within the boundaries of the State, including the archipelagic waters of the State, and reserves to itself all such rights outside state boundaries not specifically limited by federal or international law" (emphasis supplied). As such, the degree of State sovereignty over the management of precious corals of the Hawaiian Archipelago is dependent on a legal determination on the actual geographic extent of the State's offshore boundaries including archipelagic waters. Jurisdiction over the interisland waters and resources remains an unsettled question between the State of Hawaii and the Federal Government. The resolution of this issue is beyond the scope of this Fishery Management Plan.

Other coastal zone plans for other areas covered by this plan have not been completed at this date (July 1979).

V.C. Biological Impacts of Domestic Fishing

The management plan is based on the national standards and should not result in unacceptable biological impacts to populations of precious coral. The recommended management measures result in only

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*U.S. DOC, Office of Coastal Zone Management, *State of Hawaii Coastal Zone Management Program and Final Environmental Impact State*, 1978.

about 2% removal of precious coral populations in any harvesting period. However, the proposed regulations are based on an analysis in which natural mortality, recruitment and growth are assumed to be constant. To the extent that these parameters vary from year to year, it may be necessary to revise management measures. Also caution should be exercised because of the sampling errors inherent in the data on which the analysis is based. If significant changes in the population dynamics of any species of precious coral considered here were to occur in the future, management plans should be revised accordingly.

Biological impacts of harvesting precious corals on <u>other</u> species which occupy the same habitat can be expected to be similar to or less than the biological impacts of harvesting precious corals themselves. Even if a two year quota of pink coral were taken in one year, only about 4% of the standing crop of pink coral would be affected. For species which live on, in or around pink corals a similar impact would be expected. Similarly, other benthic species that may be damaged by non-selective methods should not suffer a proportionately greater impact than target species of precious coral. Indeed, many species of gorgonian corals have flexible skeletons and do not break as easily as pink or bamboo coral (both have calcareous skeletons) and therefore should be impacted proportionately less than calcareous precious corals. While many species of fish occur on or near the bottom in the depth zone of precious corals, none are known to depend directly or indirectly on precious corals for food or habitat space.

It is noted that there is risk in extrapolating pink coral

characteristics to other species, but this appears to be minimal and the error can be in either direction. There also is a risk of overfishing by allowing dredging. The quotas however appear to be sufficiently low that this risk is low.

Consideration has been given to the possibility of any impact of the precious coral fisheries covered by this Plan and the recommended management measures on marine mammals or endangered species. It is concluded that because of the characteristics of the precious coral habitat and the fishing techniques used to harvest precious corals there is little or no possibility of any such impact. A biological opinion from NMFS confirms this conclusion (Appendix 4). Access to the Hawaiian Islands National Wildlife Refuge is restricted and this plan should have minimal effect on those islands.

V.D. Impacts to Industry

If the Hawaii precious coral industry is to survive and prosper, it should have access to a reliable and controllable supply of raw material. The Makapuu Bed is a small fraction of the total area thought to be potentially commercially productive in the Hawaiian Archipelago. Thus an increased supply appears to be locally available which may decrease the need for some imports. With rising tourist expenditures and growth in personal income of the residents of Hawaii, expansion in the local market can be expected (Poh, 1971). In addition there is the potential of developing a larger mainland market. The potential for growth in these markets may not be realized unless imports combined with local supplies keep pace with demand.

Hence it is important for the industry to establish new sources of supply in U.S. waters to ensure a steady and reliable domestic supply of raw material.

The proposed action may slightly reduce the past annual harvesting rates for pink and gold coral. This is an unavoidable constraint imposed by the limited nature of the resource. Management measures have been proposed which take into account the economics of the industry and are designed to increase benefits to the nation. The proposed action should cause no loss in jobs, and while total production may be slightly reduced, this is considered to be favorable to the long term interest of producers and consumers.

V.E. Alternatives to the Proposed Plan

For each management measure recommended, several options were considered. These have been thoroughly discussed in Sections IV.F.1 and IV.F.2

Other conceivable alternatives listed below were not given serious consideration for the following reasons:

1. To rely on the Preliminary Management Plan indefinitely -- As noted earlier, the draft PMP for precious corals has not been implemented. Even if it were, it would provide no control over domestic fishing, nor would it provide any opportunity for foreign fishermen to develop new exploratory beds and thereby furnish much needed information on coral resources of the FCZ, as it would establish a zero TALFF. Also, failure to implement an FMP would be contrary to the intent of the FCMA.

2. To leave management of precious coral resources in the region to the State of Hawaii, which has a management regulation in place, and the Territorial Governments — The legal basis for the local governments to regulate coral fisheries which are carried on in the FCZ, if the coral is not landed in the State, is questionable, especially with regard to foreign fishermen, and the states appear to lack the capability to enforce any regulations with respect to coral beds at any distance from their shores.

3. To allow the Bureau of Land Management to continue to regulate coral fishing on the Outer Continental Shelf — The BLM regulations (see Appendix III) do not constitute a fishery management regime which would meet the requirements of the FCMA, which gives priority to the Department of Commerce in this field. This fact is also recognized in the draft Memorandum of Understanding between the Departments of Commerce and Interior on the subject of coral fishery management.

V.F. Impacts on Foreign Fishing

The proposed action may partially displace foreign precious coral harvesters from areas near Midway, Wake, Guam and the Commonwealth of the Northern Mariana Islands. The proposed plan allows foreign vessels to harvest under permit up to 500 kg of pink, gold, bamboo and other precious corals combined in exploratory areas in Hawaii, Samoa, Guam and the Northern Marianas and to incidentally harvest but not to retain precious corals incidentally harvested in other fishery operations in the United States FCZ. It therefore provides for reasonable foreign use of U.S. fish stocks having a harvestable surplus

as long as such use does not conflict unduly with the development of the U.S. precious coral industry and with long-term conservation requirements.

V.G. Adverse Impacts of Foreign Fishing

Certain kinds of foreign fishing, such as bottom trawling, will kill or harvest precious corals incidentally in certain areas. To the extent that such fishing operations are permitted and take place, a small reduction in the amount of precious coral available to U.S. harvesters will occur. Further, because most trawling operations are not efficient in capturing or recovering colonies dislodged from the bottom, there will be some wastage of the resource. Recovery of previously damaged beds may be delayed. However, the policies set by the PMP for the Seamount Groundfish Fisheries limit trawling by foreign vessels to a small portion of the FCZ where precious corals may occur, and damage (if any) would be restricted to a very small area.

V.H. Relationship Between Local Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

The proposed action provides for full commercial harvest of precious coral stocks only after they have been assessed and optimum yields have been estimated. Limited harvest is allowed so new beds may be located, and once located, may be studied to determine area of bed, abundance of corals and other critical factors. Thus precious corals are protected from negligent, wasteful over-exploitation which might lead to short-term economic gains for domestic fishermen but to long-term shortages and economic losses for U.S. industry.

V.I. Irreversible and Irretrievable Commitments of Resources Involved in the Proposed Action Should It Be Implemented

If the resource is inadvertently overexploited, commercial harvest would almost certainly cease for economic reasons before any coral species approached biological extinction. The major change in the population dynamics of precious corals that can be expected to occur as a result of harvesting is a non-irreversible shift in age structure toward younger age classes. Mean age would be somewhat reduced, but natural mortality might decrease as a consequence of pre-emption, and growth and recruitment might increase in response to reduced competition.

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VII GLOSSARY

BLM-DOI	Bureau of Land Management, U.S. Department of Interior
CZM	Coastal Zone Management
DFG	Division of Fish and Game, State of Hawaii
DOC	U.S. Department of Commerce
Domestic Fishing Capacity	Annual production capacity of domestic fishing firms
Domestic Processing Capacity	Annual production capacity of domestic processing firms
EIS	Environmental Impact Statement
Expected Harvest level	Anticipated annual harvest by domestic fishing firms
Expected Processing Level	Anticipated annual production of domestic harvesting firms
FCMA	Fishery Conservation and Management Act
FCZ	Fishery Conservation Zone
Fixed capital costs	Cost of depreciable equipment
FMP	Fishery management plan
MSY	Maximum sustained yield
Net present value	Future net income stream discounted to the present
NMFS	National Marine Fishery Service
OCS	Outer continental shelf
OY	Optimum yield
PMP	Preliminary fishery management plan
TALFF	Total allowable level of foreign fishing
WPRFMC	Western Pacific Regional Fisheries Management Council

Appendix I

Economic Analysis of Harvest Quotas and Optimum Yield

Bioeconomic models are developed to evaluate the economic efficiency of several harvest quotas under different assumptions of price changes and alternative uses for fixed factors of production. The net present value[1] under each quota is estimated for four different models. The results indicate that the net present value of pink and gold coral in the Makapuu Bed is greatest when pulse-fished, if there exist alternative uses for the fixed factors of production. If during the off years the fixed factors cannot be used in other operations, then it makes little difference if the bed is fished continuously or periodically. Different assumptions about price changes alter the results slightly.

The important assumptions of the models are: prices are determined exogenously (due to import supplies); marginal cost is constant for different levels of production; the change in average variable cost is inversely proportional to the change in the exploitable biomass from one year to the next, i.e. if the exploitable biomass declines so does catch/effort; pink and gold coral are multiple products

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[1] Net present value (NPV) = $\sum_{i=o}^{n} \frac{(R_i - C_i)}{(1 + D)^i}$ where: R_i = total revenue du... i^{th} period

C_i = total cost durin... i^{th} period

D = discount rate

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harvested in fixed proportions; and the full quota is harvested during the year (the first year in the case of the multiple-year quotas) unless the exploitable biomass falls below the quota.

Four models are evaluated over a 37-year time horizon beginning with 1978. (Shorter time horizons were considered but the qualitative results are almost identical). In the first model the imputed values, or estimated prices of pink and gold raw coral are constant over the 37-year production period and the firms incur fixed costs during periods of zero production. In the second model, prices increase at a constant rate. In the third and fourth models prices are constant and increase, respectively, but the firms do not incur fixed costs during years of zero production. In the last two models, it is assumed that there are alternative uses for the fixed factors of production. The alternative uses may include exploration and harvest of other coral beds or activities unrelated to a coral fishery.

In each model, five alternative harvest quotas for pink coral are evaluated: (1) 1,000 kg/year, (2) 2,000 kg/year, (3) 3,000 kg/year, (4) 2,000 kg/2 years, (5) 3,000 kg/3 years. Due to the assumption of fixed proportions output, a quota on pink coral implies a quota for gold coral. The quotas for gold coral are: (1) 370 kg/year, (2) 740 kg/year, (3) 1,100 kg/year, (4) 740 kg/2 years, (5) 1,100 kg/3 years.[1/] The first values tested for both pink and gold coral (1,000 kg/year and 370 kg/year) correspond to estimates of MSY for each. Subsequent values are various multiples of these values.

1/ These values do not correspond exactly to MSY or multiples of MSY for gold coral because in this analysis figures were rounded upward instead of downward as was done for MSY.

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The differentials of the discounted revenues and discounted costs (net revenue) are summed over all production years to obtain the net present value of the quota alternatives for each model. The absolute amount of the net present values is not the prime concern in this analysis. Rather, the relative outcome of the values allows some conclusions to be drawn about the economic efficiency of different quota proposals--the economic efficiency of a quota proposal being greater if the net present value is greater.

In all the models in which the quotas exceed a mean annual harvest of 1,000 kg, for pink coral the outcome is economically inefficient. This results in the long run because the harvest is not sustainable. In the short run, when the harvest is sustainable, the above outcome is due primarily to accelerating costs caused by a rapid decline in the exploitable biomass.

For the other pink coral quota alternatives (1,000 kg/year, 2,000 kg/2 years, 3,000 kg/3 years) economic efficiency varies due to changes in price and the ability to defray fixed costs. When price increases 6 percent annually relative to costs, a quota of 3,000 kg/3 years is more efficient whether fixed costs can be defrayed or not. In the case of incurring fixed costs during zero-harvest years, the annual rate increase in prices shifts the most efficient quota from 1,000 kg/year to 3,000 kg/3 years. When costs can be defrayed the most efficient quota shifts from 2,000 kg/2 years to 3,000 kg/3 years due to the price increases. These shifts can be explained by the exponential increase in the

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prices and the assumption that a 2000 kg or 3000 kg quota is harvested in the first year of the 2 or 3 year quota period. When the harvest in some years can be taken one or two years earlier the entire flow of net revenues is shifted closer to the present and, therefore becomes more valuable due to a positive rate of time preference. This impact of pulse fishing only results in the models when prices increase each year.

The impact of defraying the fixed cost when pulse fishing is negligible for the two models with increasing prices. The most efficient allocation is 3000 kg/3 years whether or not there exist alternative uses for the fixed factors of production. When prices are held constant, the ability of firms to explore and harvest other coral beds shifts the most efficient quota from 1000 kg/year to 2000 kg/2 years. This results in the models when the average total cost of harvesting coral at the Makapuu Bed decreases by employing the fixed factors of production elsewhere and defraying the cost of those factors.

Considering the characteristics of the coral harvesting firms in Hawaii and the history of the world coral market, pulse fishing the Makapuu Bed is more efficient for the existing firms. Whether or not pulse fishing at 3000 kg/3 years is overall more efficient than 2000 kg/2 years, as indicated in the models, must depend on the existence of other firms wanting to enter the fishery.

APPENDIX II

State of Hawaii
Department of Land and Natural Resources
Honolulu

DIVISION OF FISH AND GAME

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The Board of Land and Natural Resources in conformity with Chapters 187 through 190, Hawaii Revised Statutes and every other law hereunto enabling does hereby adopt the following regulation relating to the management of pink coral and gold coral.

REGULATION 41. RELATING TO THE MANAGEMENT OF PINK CORAL AND GOLD CORAL.

SECTION 1. Definitions (as used herein).

a. Pink coral means all species of coral belonging to the genus Corallium in their raw state.

b. Gold coral means all species of coral belonging to the genus Parazoanthus in their raw state (= Gerardia).

SECTION 2. Prohibition.

It shall be unlawful to take or destroy pink coral or gold coral in waters subject to the jurisdiction of the State of Hawaii, or to possess, sell or offer to sell such corals within the State of Hawaii, except as provided in this regulation.

SECTION 3. Permits

It shall be lawful with a permit issued by the Board of Land and Natural Resources under such terms and conditions as it deems necessary to:

a. take or possess pink coral or gold coral for scientific or educational purposes.

b. take or possess pink coral or gold coral for commercial or domestic purposes from the Makapuu Bed provided that the taking of pink coral (Corallium secundum) shall be subject to the provisions stipulated in Section 5, relating to the management of the Makapuu Bed pink coral resources, and provided further that such taking for commercial purposes shall be subject to the commercial fishing license requirement of Section 189-2, Hawaii Revised Statutes.

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SECTION 4. Cancellation of Permits.

The Board of Land and Natural Resources may cancel any permit issued pursuant to this regulation for any infraction of the terms and conditions of the permit as determined by the Board.

SECTION 5. Management of the Makapuu Bed (located approximately 6 miles East of Makapuu Point, Oahu) Pink Coral (Corallium secundum) Resources.

A two-year quota of 4,400 pounds dry weight is hereby established for the taking of live and dead Corallium secundum at the Makapuu Bed beginning July 1, 1977, provided that the quota shall be for the combined harvest of all permittees, and provided further that harvesters shall make every effort to collect only mature colonies ten (10) inches or larger in height.

SECTION 6. Prohibited Methods of Coral Harvesting.

It shall be unlawful to use nets, dredges, trawls, mops, explosives or any other destructive or non-selective means to take pink coral or gold coral within waters subject to the jurisdiction of the State of Hawaii.

SECTION 7. Landing of Pink Coral and Gold Coral.

All pink coral and gold coral taken:

a. in waters subject to the jurisdiction of the State of Hawaii for any purpose shall be landed in the State.

b. in waters outside of the jurisdiction of the State of Hawaii and landed in the State shall be subject to this regulation and all other applicable State laws and regulations.

SECTION 8. Possession and Sale of Pink Coral and Gold Coral Legally Obtained.

Nothing in this regulation shall be construed as making it unlawful for any person to possess or sell pink coral or gold coral obtained prior to the effective date of this regulation.

SECTION 9. Authority to Suspend the Taking of Pink Coral and/or Gold Coral.

The Division of Fish and Game shall have the authority to order an immediate suspension on the taking of all pink

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coral and/or gold coral from the Makapuu Bed when deemed necessary for the management of these coral resources on a sustainable yield basis.

SECTION 10. Penalty.

Any person who violates any of the provisions of this regulation or whoever violates the terms and conditions of any permit issued as provided for in this regulation shall be fined not more than $500.00.

SECTION 11. Severability.

Should any section, subsection, sentence, clause, or phrase of this regulation be for any reason held by a court of competent jurisdiction to be invalid, such decision shall not affect the validity of the remaining portions of this regulation.

Adopted this 27th day of May, 1977 by the Board of Land and Natural Resources.

/s/ Moses W. Kealoha
Member
Board of Land and Natural Resources

/s/ Shinichi Nakagawa
Member
Board of Land and Natural Resources

Approved this 13th day of

September, 1977.

/s/ George R. Ariyoshi
Governor of Hawaii

APPROVED AS TO FORM:

/s/ Susan Y. M. Chock
Deputy Attorney General

Date: June 23, 1977

Appendix II

PUBLICATION OF
NOTICE OF PUBLIC HEARING

Honolulu Star Bulletin/Advertiser - January 16, 1977

C E R T I F I C A T E

I hereby certify that the foregoing copy of Regulation 41, Division of Fish and Game, Department of Land and Natural Resources, is a full, true, and correct copy of the original which is on file in the office of the Division of Fish and Game of the Department of Land and Natural Resources.

/s/ William Y. Thompson
Chairman and Member
Board of Land and Natural Resources

APPENDIX III

Regulations of the Department of Interior for the Taking of Precious Coral in Federal Waters

Permits.

Requirement for a permit.

No person shall engage in any operation which directly causes damage or injury to a viable coral community that is located on the Outer Continental Shelf without having obtained a permit for said operations.

Application for a permit.

(a) Application for a permit shall be filed in the proper office of the Bureau.

(b) No specific form is required.

(c) Each application shall include:

1. The name, legal mailing address and telephone number of each person intending to participate in the operations covered by the application.

2. A description of the proposed area of the operations.

3. A map or maps, such as a National Ocean Survey Map, with a scale of not less than 1:30,000 delineating the proposed area of operations.

4. Information in detail describing the nature of the proposed operations and how the operation will be conducted.

5. If coral specimens are to be taken, the purpose of such taking, the method of taking, the currents and their velocity in the area of taking, the depth of taking, the size, estimated dry weight, and type of coral to be taken, and the estimated fair market value of the coral to be taken.

6. The approximate dates of commencement and termination of the operation.

Appendix III

7. An affirmative statement that the operation will use methods that are designed to do minimum harm and disturbance to the viable coral community covered by a permit and those viable coral communities adjacent thereto. Also, an explanation of the procedures that will be taken to assure protection of said viable coral communities during said operation.

Appendix IV

Coral Plan

OCT 5 1978

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

October 4, 1978 FSW1/JJN

TO: Wilvan G. Van Campen, Executive Director, Western Pacific Regional Fishery Management Council

FROM: Doyle E. Gates, Administrator, WPPO, NMFS

SUBJECT: Endangered species consultation concerning the fishery management plan for precious corals in the Western Pacific

This is in reference to your memorandum of September 12, 1978 concerning formal consultation between the Council and NMFS during development of FMP's. If a Federal Agency (in this case the Council) determines that an action may affect endangered or threatened marine species, it should request consultation with NMFS providing the species in question fall under the responsibility of NMFS. Upon receipt of a request for consultation, NMFS will conduct a threshold examination which usually results in a biological opinion as to whether the proposed action is likely to jeopardize the species or destroy or adversely modify its critical habitat.

We realize that you are in the process of finalizing the FMP for precious corals in the Western Pacific. Therefore, utilizing your memorandum of September 12, 1978 as a request for consultation, we offer the following biological opinion on the implication of the precious coral fishery on endangered and threatened marine species.

Endangered marine mammals (humpback whale, sperm whale, and the Hawaiian monk seal) and endangered and threatened sea turtles (leatherback and green turtle) are known for, or suspected of, inhabiting waters overlaying precious coral beds in the central and western Pacific. However, considering the methods utilized for harvesting precious corals, it is our opinion that this fishery does not constitute a threat to these endangered and threatened species or will it destroy or adversely modify their critical habitat.

cc: G. V. Howard

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Washington, D.C. 20235

JAN 16 1979

F6/TRL

1/23/79

Mr. Edwin K. Lee
Administrative Officer
Western Pacific Regional
Fishery Management Council
1164 Bishop Street
Room 1506
Honolulu, Hawaii 96813

Dear Mr. Lee:

This letter is to inform you that I concur with the October 4, 1978, memo (enclosure) to Mr. Wilvan G. Van Campen, Executive Director, from Mr. Doyle Gates, Administrator, Western Pacific Program Office, National Marine Fisheries Service, transmitting the Section 7 consultation regarding the fishery management plan for precious corals in the Western Pacific. The consultation concluded that the coral fishery does not constitute a threat to endangered or threatened species or their habitat.

Please contact my office if you require further clarification.

Sincerely,

for Terry L. Leitzell
Assistant Administrator
for Fisheries

Enclosure

FIGURE CAPTIONS

Figure 1. The southeastern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of major known beds of precious coral.

Figure 2. The northwestern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of precious coral beds.

Figure 3. The fishery conservation zone for Guam.

Figure 4. The fishery conservation zone for the islands of Samoa.

Figure 5. The precious coral bed off Makapuu, Oahu.

Figure 6. Catch of precious coral at Taiwan, 1924-1940 (Anon, 1956).

Figure 7. Effort of coral fishing in Taiwan, 1924-1940 (Anon, 1956).

Figure 8. Photo of a coral dredge.

Figure 9. The coral harvesting system on the submersible Star II consists of a wire basket, cutter and hydraulic claw (manipulator).

Figure 10. Size-frequency distribution of precious coral collected with tangle nets (A) and the submersible (B).

Figure 11. Biomass per recruit curves of *C. secundum* using a constant rate of natural mortality (M=0.066) and progressively increasing rates of fishing mortality (F) applied over all year classes. The age of entry into the fishery is zero, i.e. no age limit is applied.

Figure 12. Biomass per recruit curves for a cohort of *C. Secundum* using a constant rate of natural mortality (M=0.066) and progressively increasing rates of fishing mortality (F) applied after a minimum age of 25 years.

Figure 13 Biomass per recruit isopleths for *C. secundum* in the Makapuu Bed, given a constant rate of natural mortality of 0.066. Contour units are in grams per recruit.

Figure 14. Various spawning stock recruitment functions.

Smax = original spawning stock

S = spawning stock after fishing

Rmax = original recruitment

R = recruitment after fishing

Figure 15. MSY as a function of reduced recruitment (curves 2-6) and age at first capture.

Figure 16. Population biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given six different exploitation rates in 1978 followed by a complete closure of the bed.

Figure 17. Spawning biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given six different exploitation rates in 1978 followed by a complete closure of the bed.

Figure 18. Population biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given different rates of exploitation.

Figure 19. Yields of *C. secundum* in the Makapuu Bed between 1964 and 1977 after which different rates of harvest are simulated.

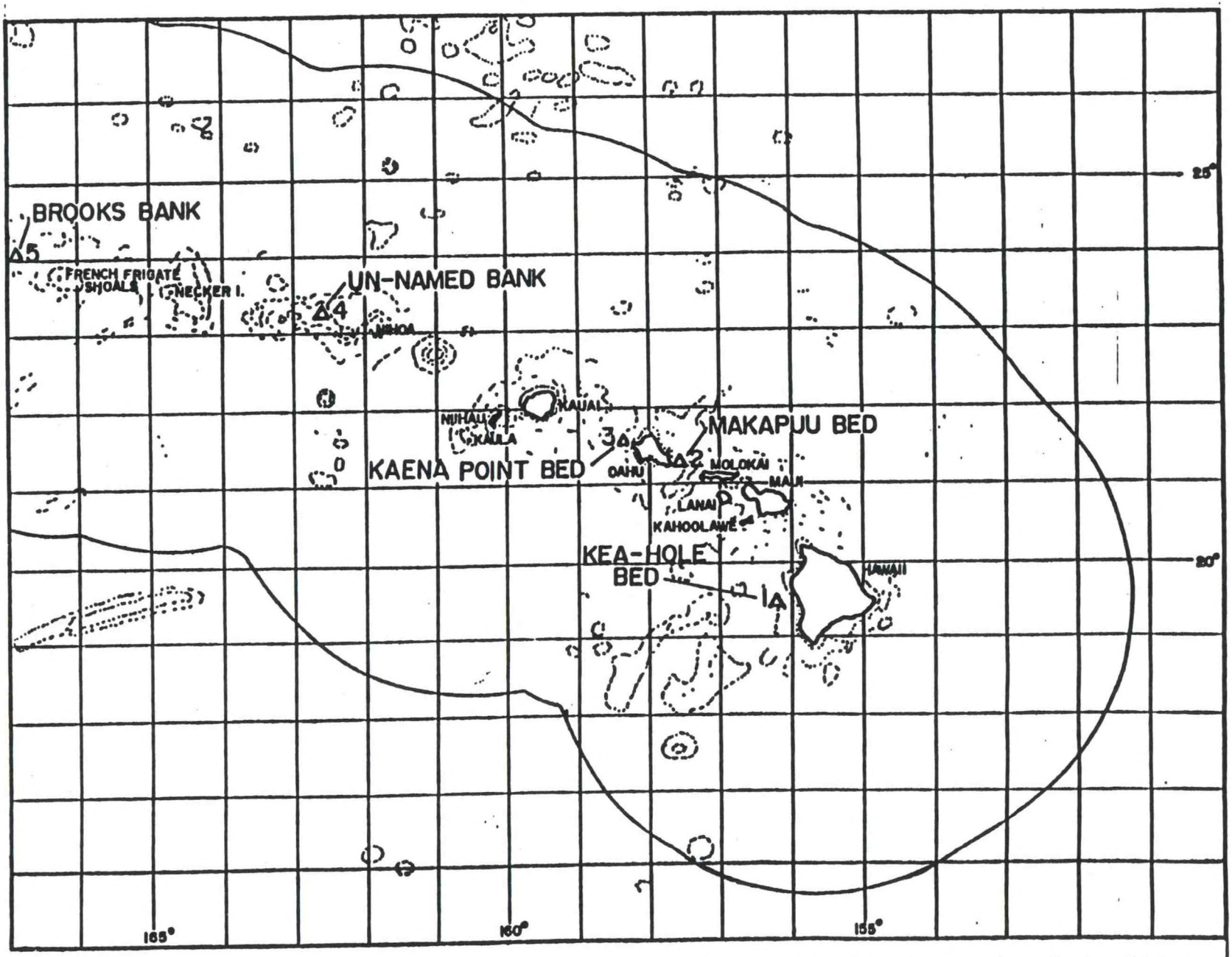


Figure 1. The southeastern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of major known beds of precious coral.

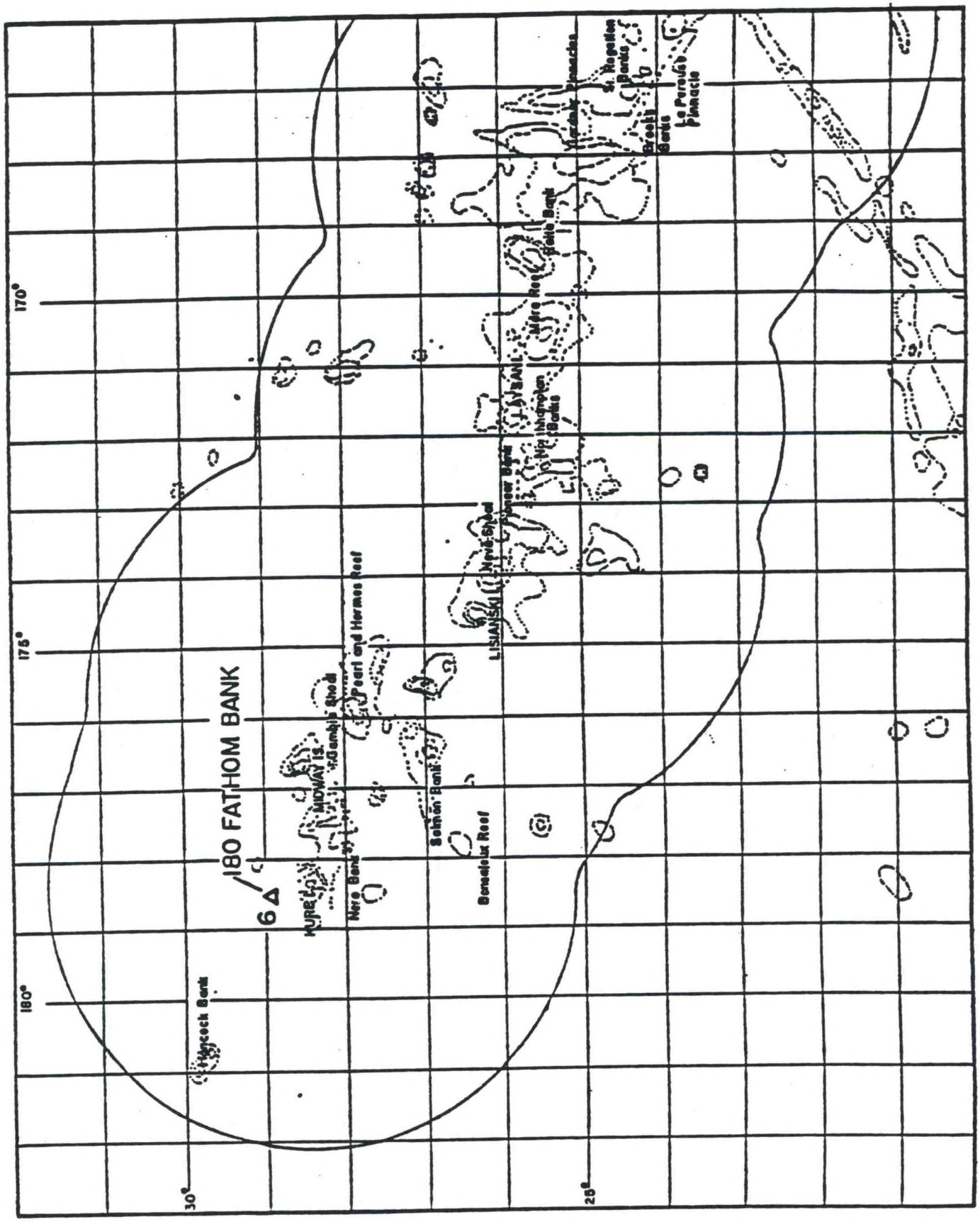


Fig. 2. The northwestern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of precious coral beds.

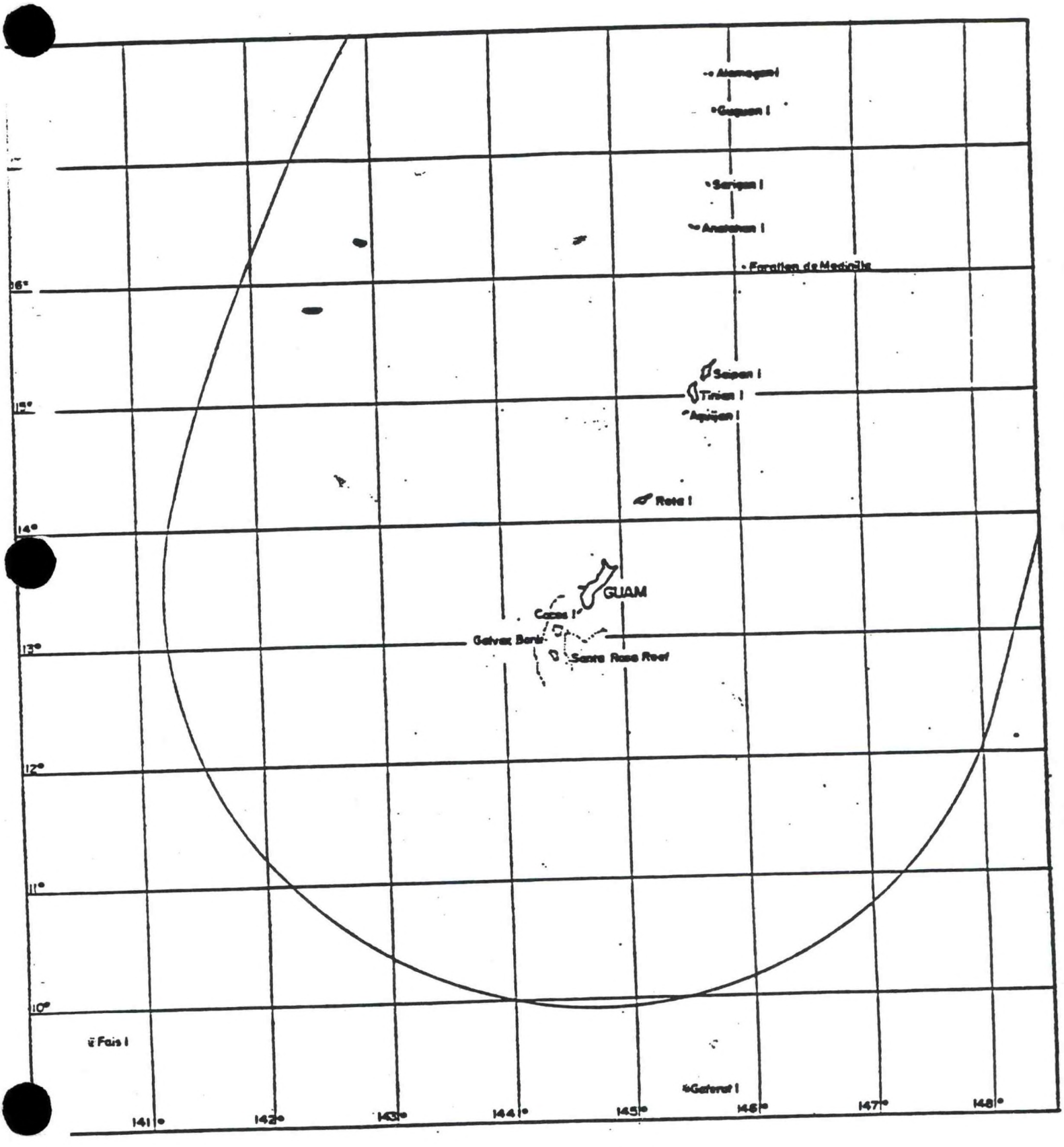


Figure 3. The fishery conservation zone for Guam.

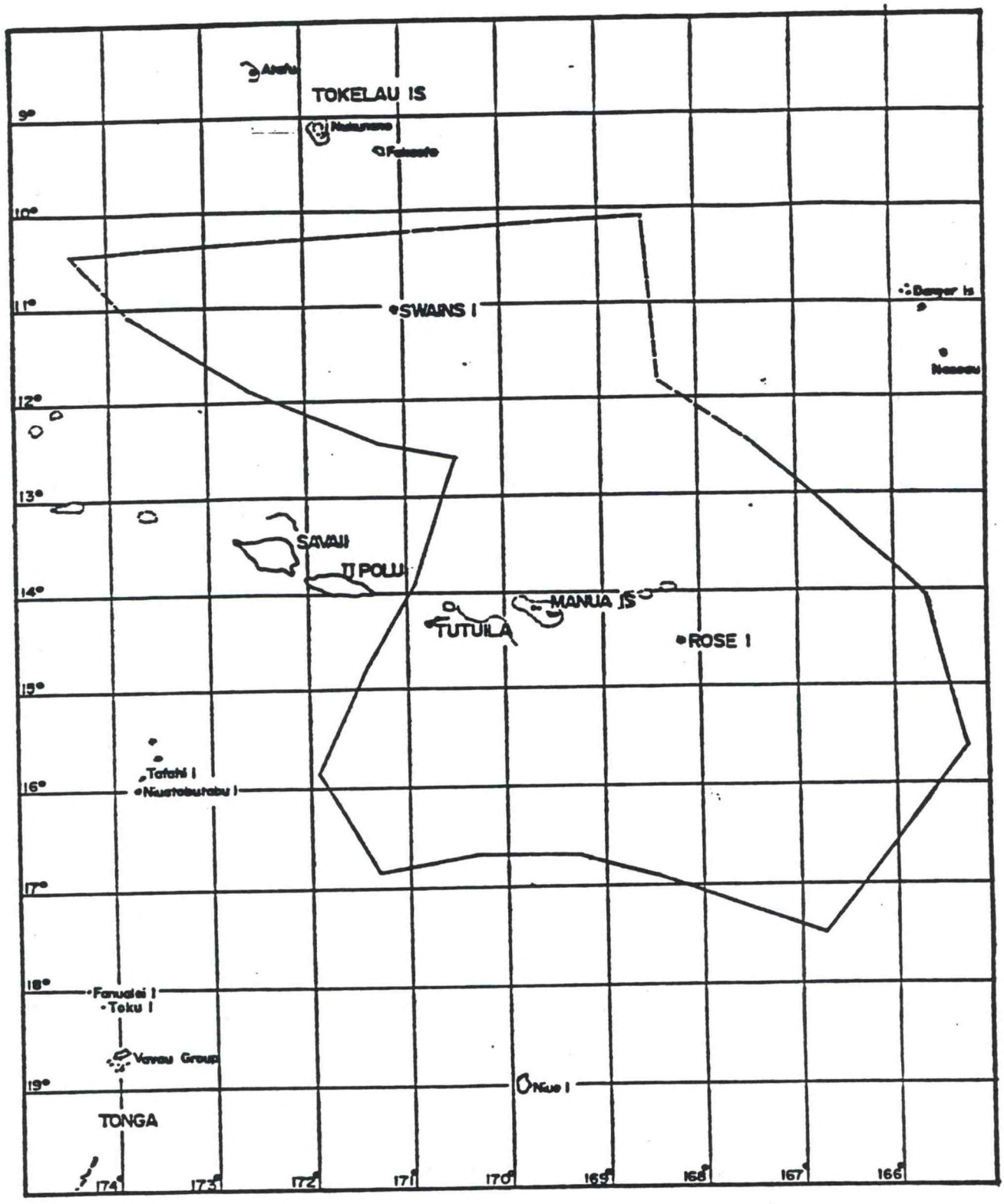


Figure 4. The fishery conservation zone for the islands of Samoa.

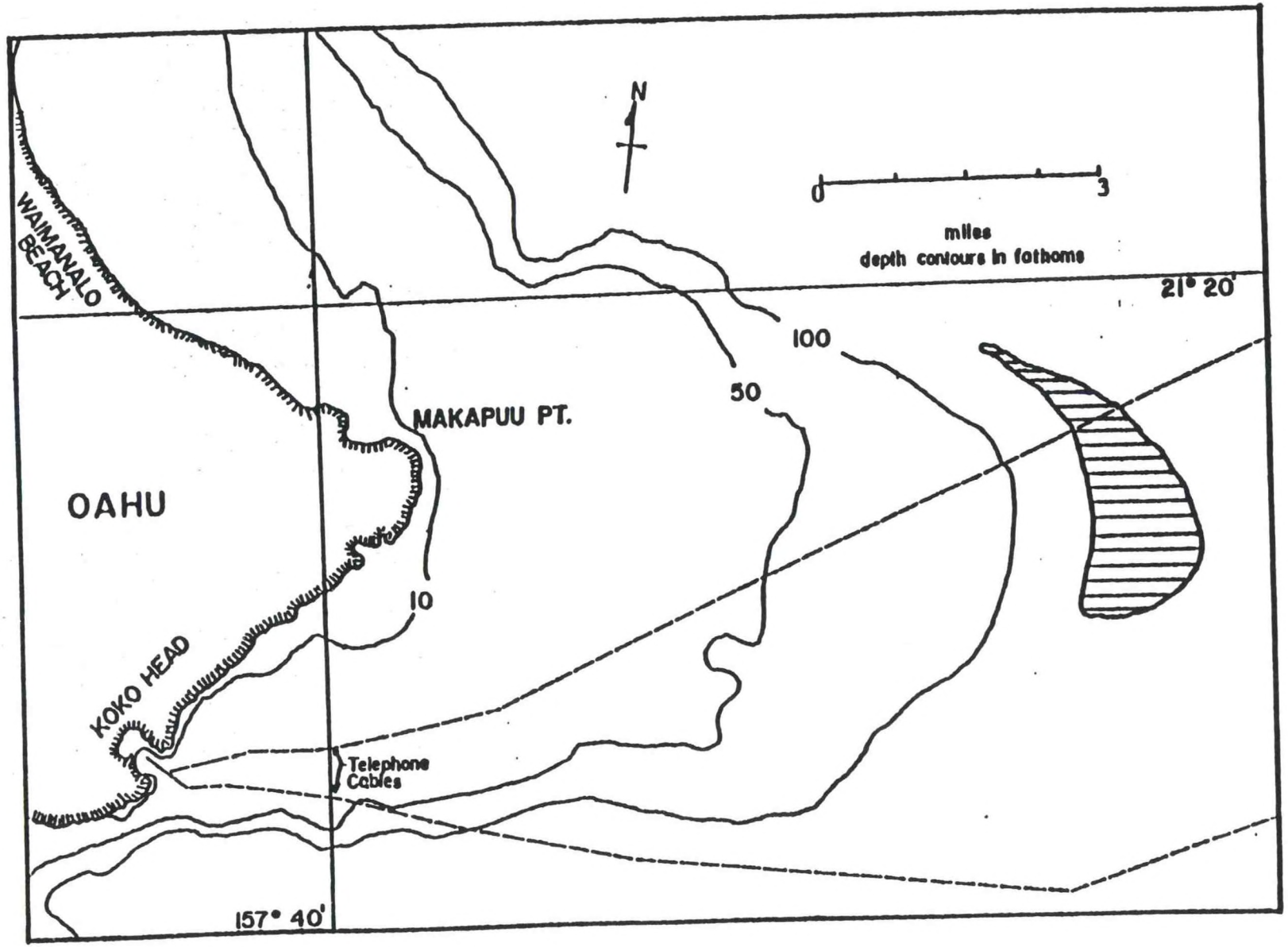


Figure 5. The precious coral bed off Makapuu, Oahu.

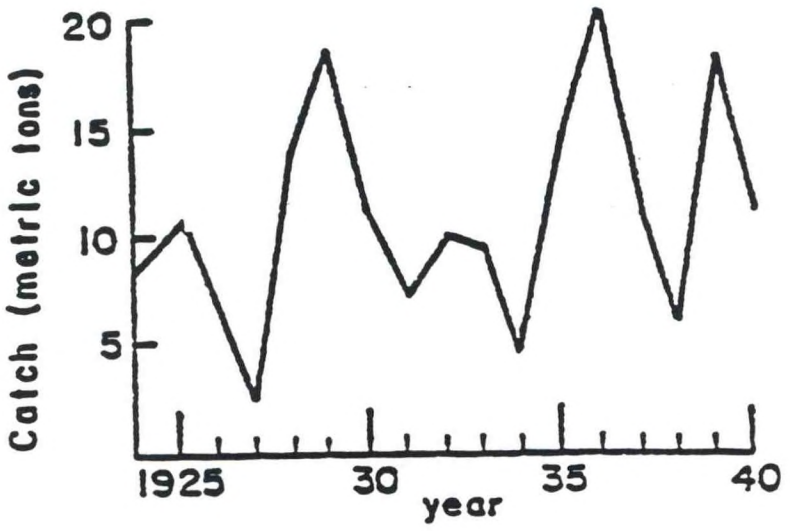


Figure 6. Catch of precious coral at Taiwan, 1924-1940 (Anon, 1956).

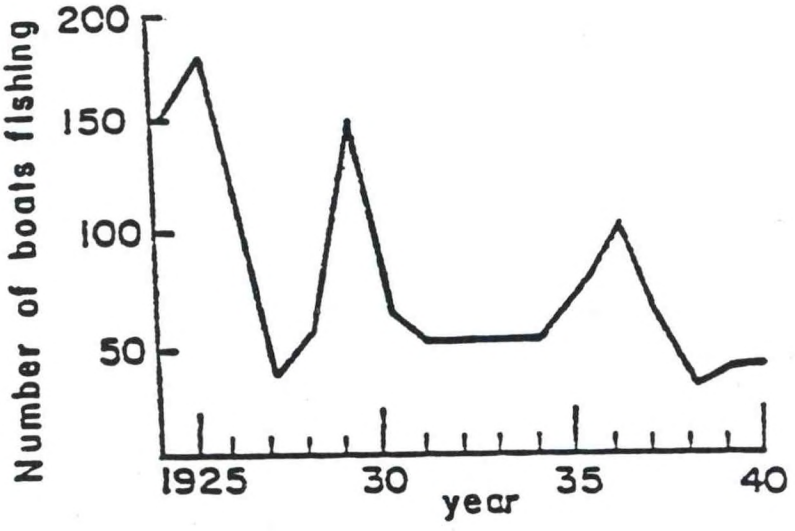


Figure 7. Effort of coral fishing in Taiwan, 1924-1940 (Anon, 1956).

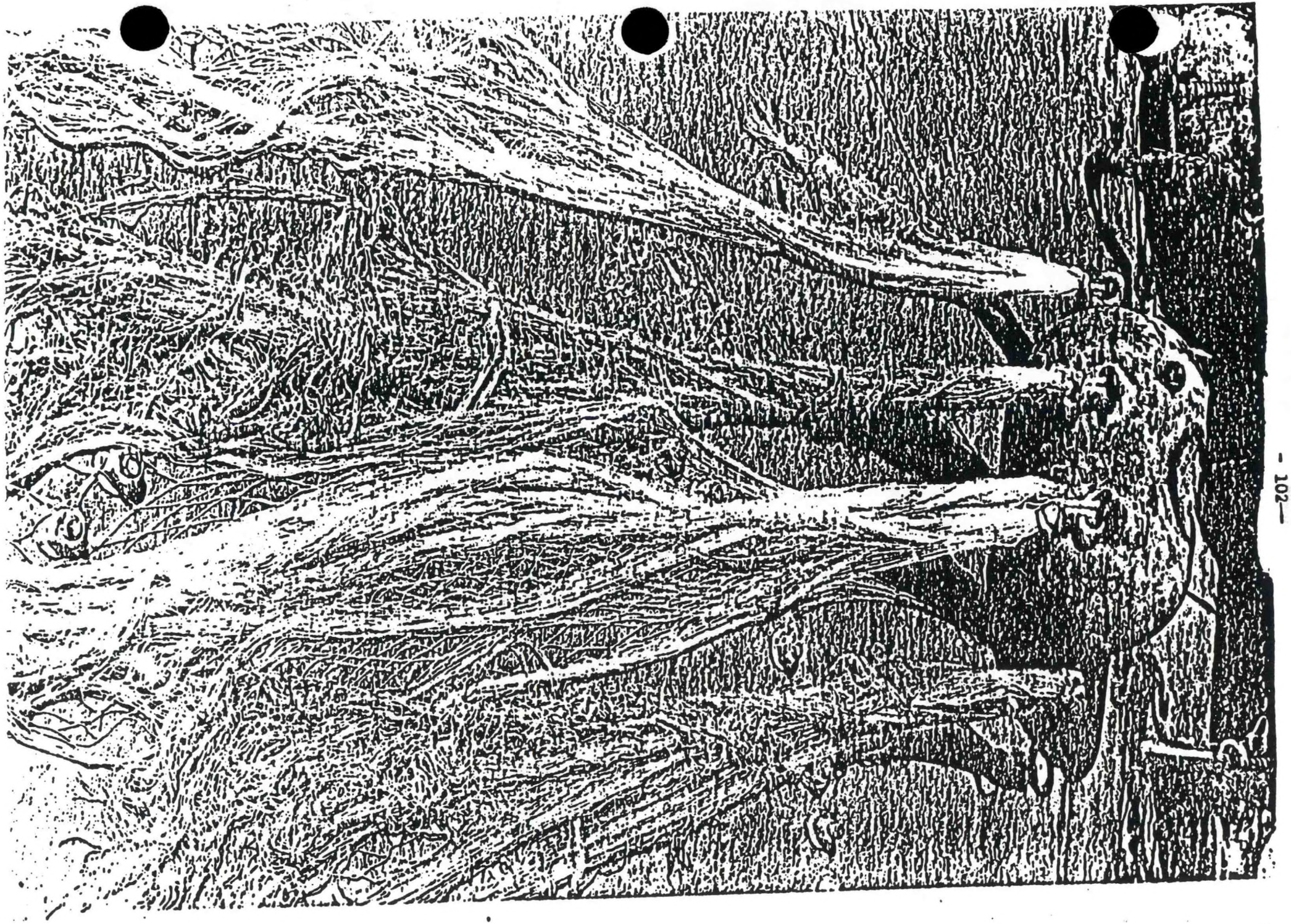
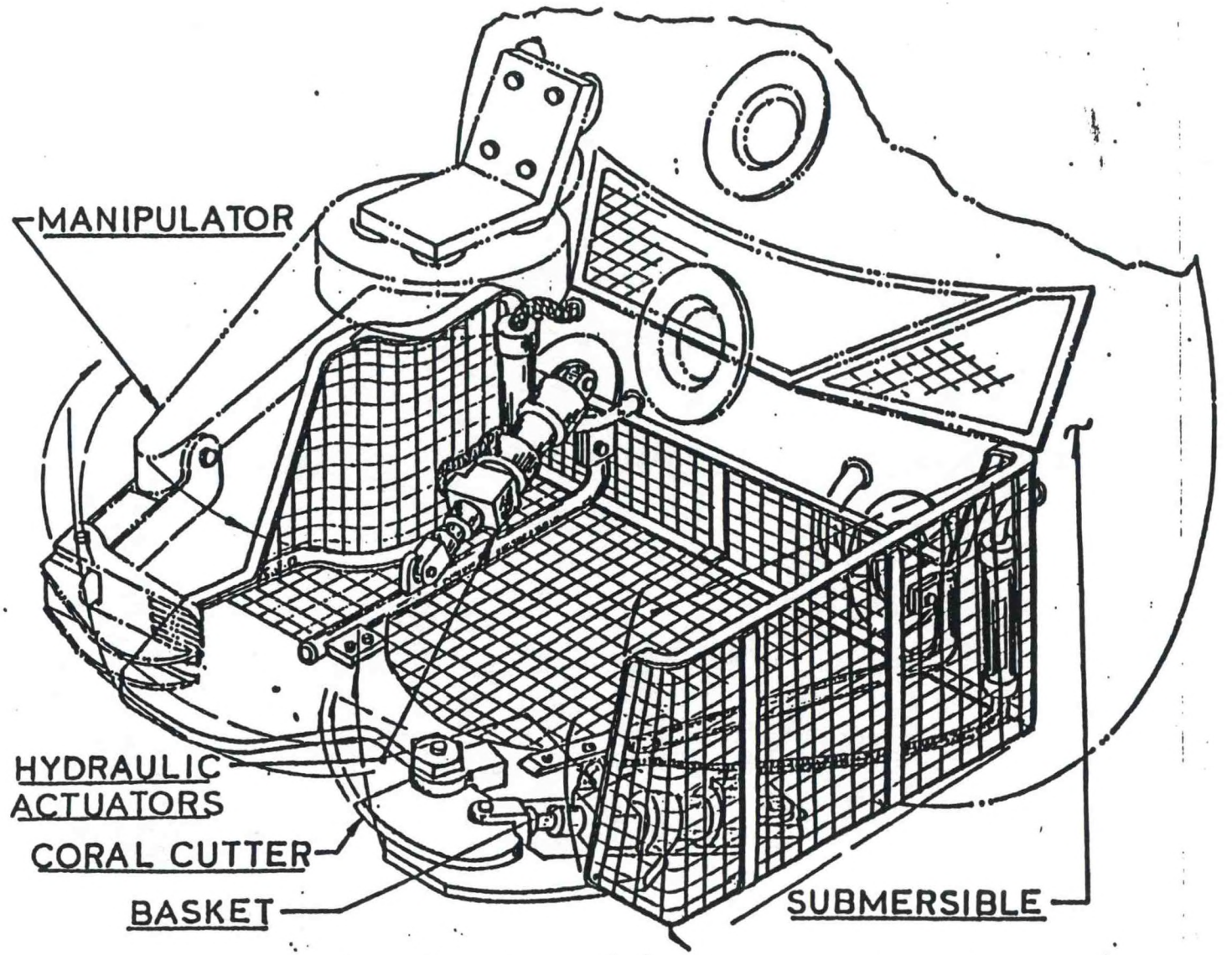


Figure 8 (photo by Mike Palmgren)



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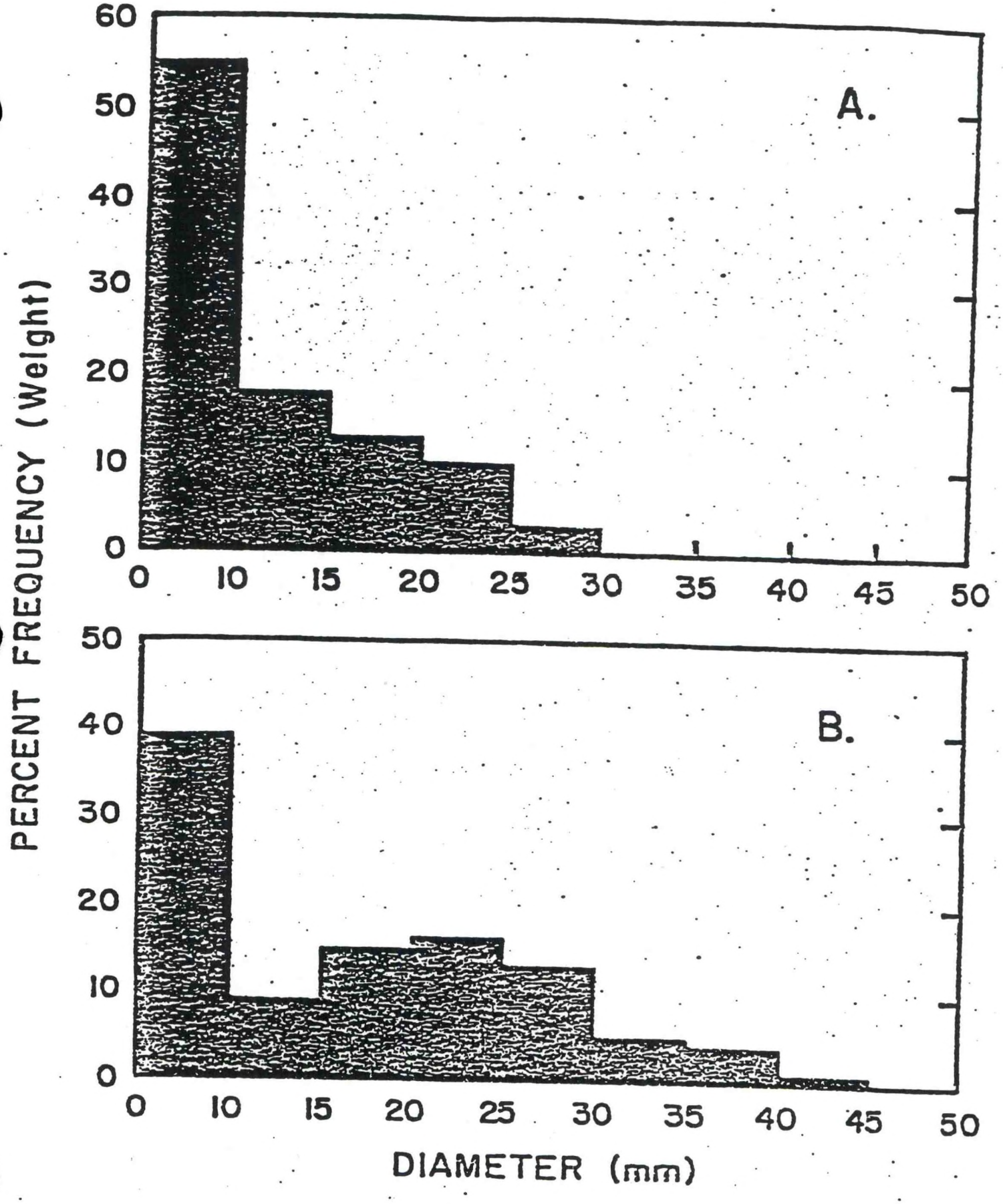
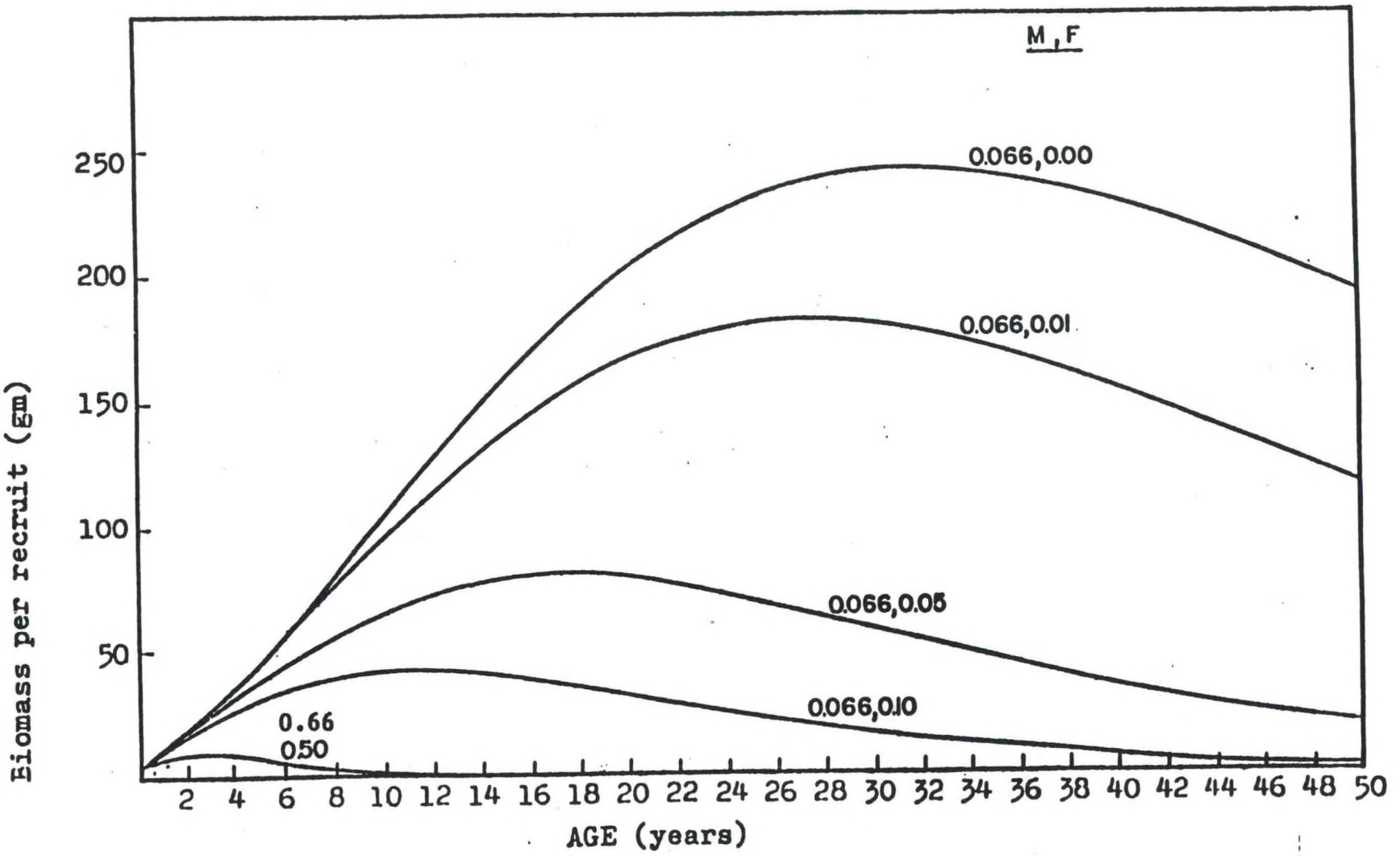


Figure 1D. Size-frequency distribution of precious coral collected with tangle nets (A) and the submersible (B).



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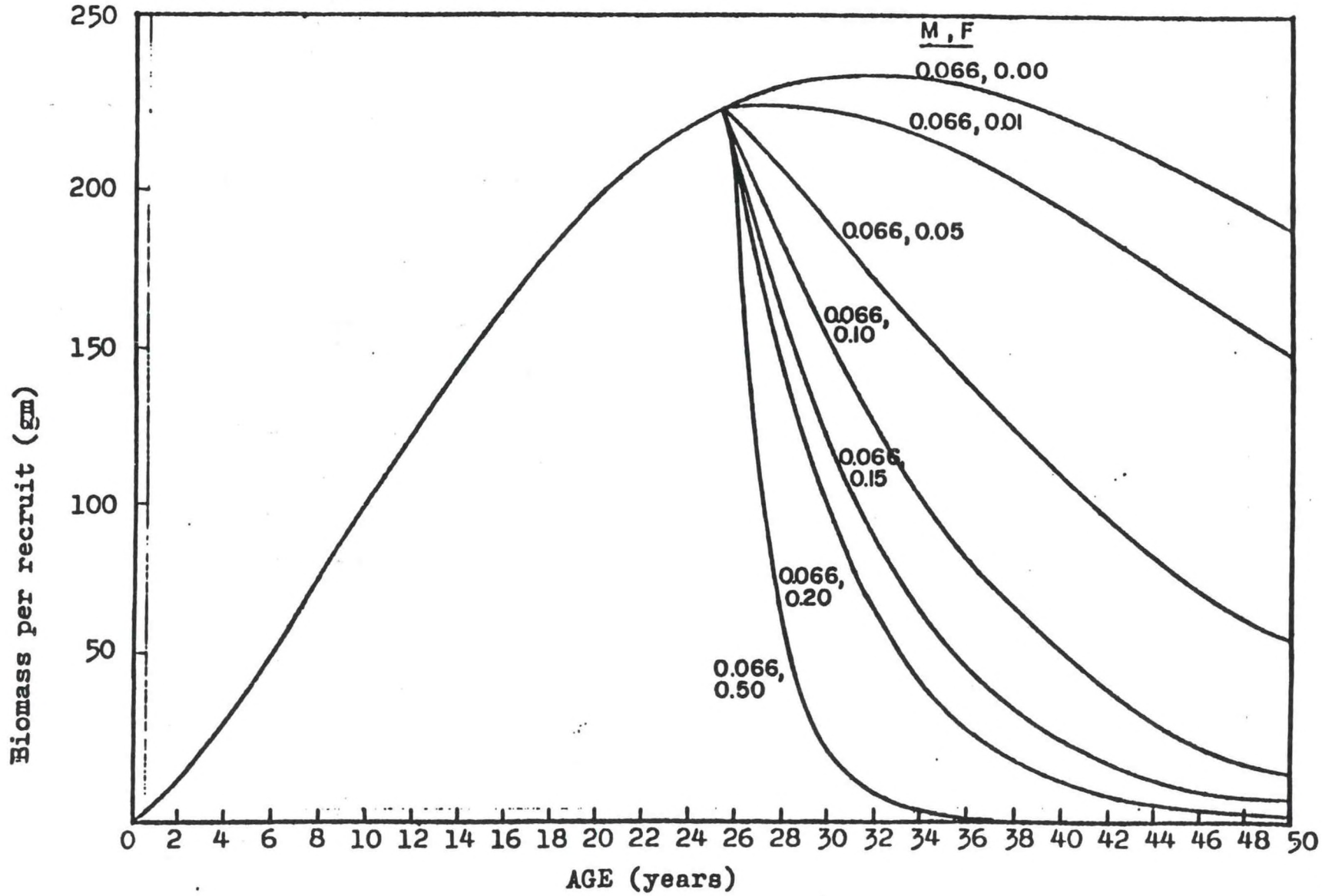

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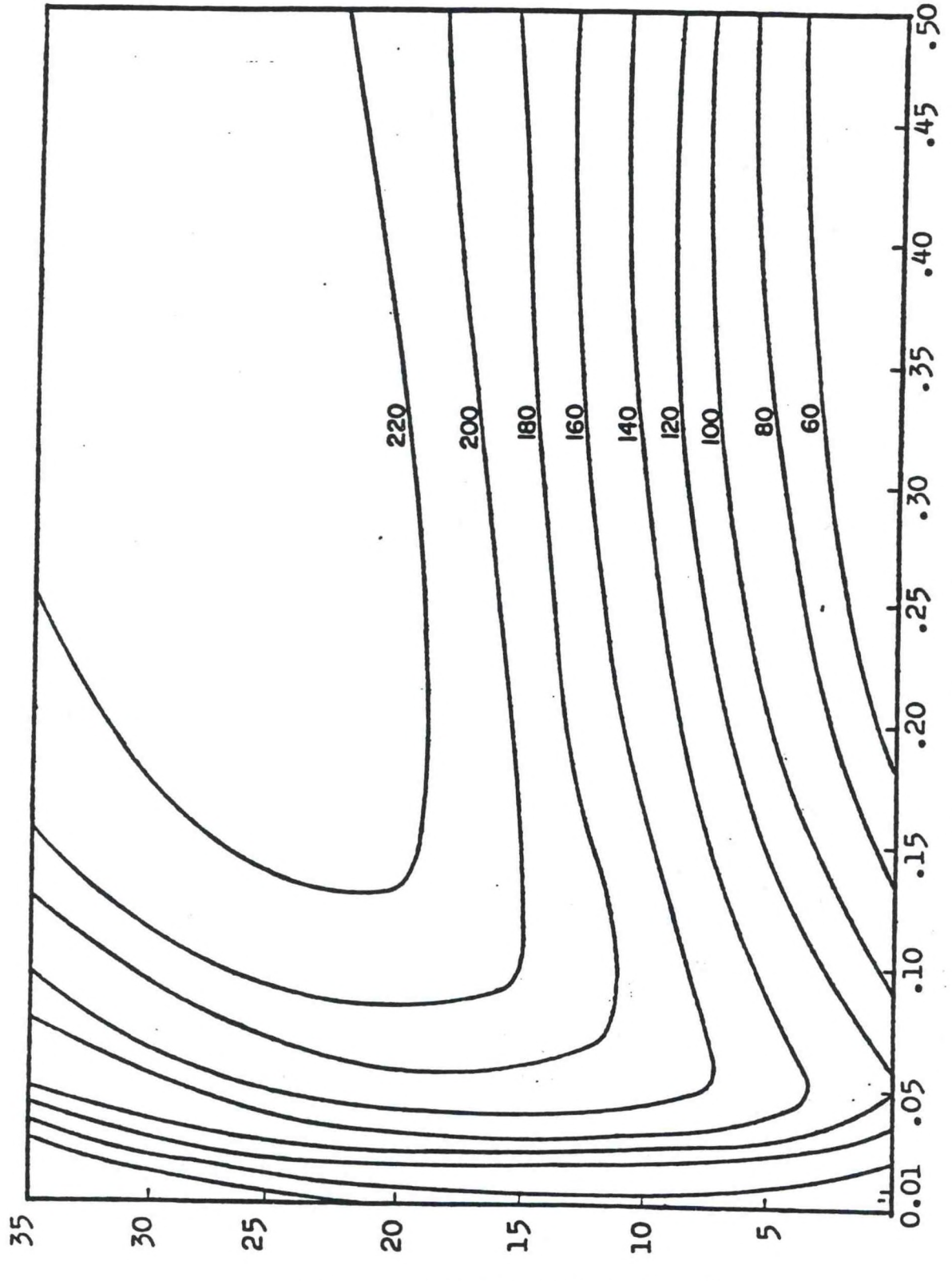
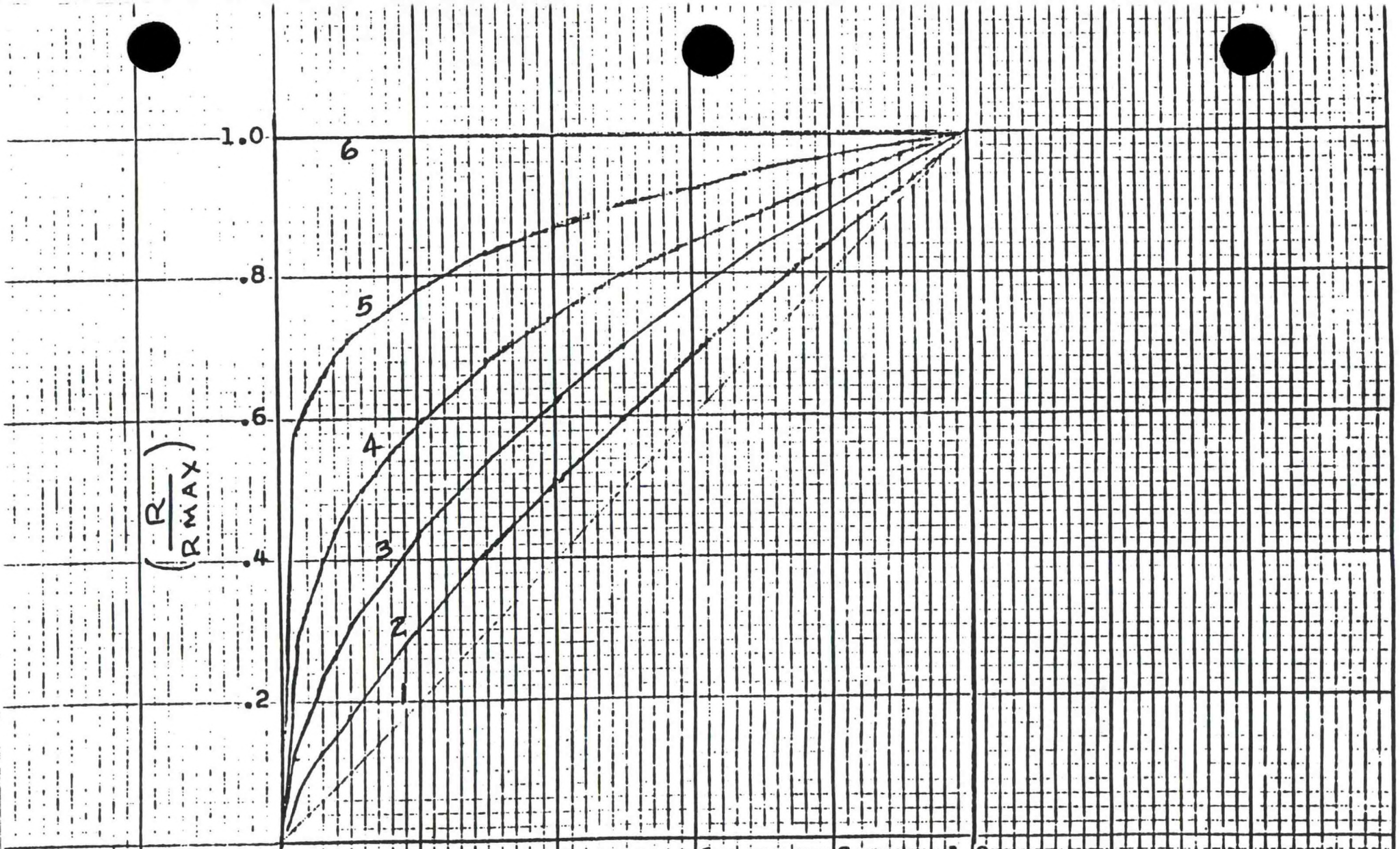


Figure 13. Yield per recruit isopleths for *C. seaundum* in the Makapuu Bed, given a constant rate of natural mortality of 0.066. Contour units are in grams per recruit.



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Smax = original spawning stock
S = spawning stock after fishing
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R = recruitment after fishing

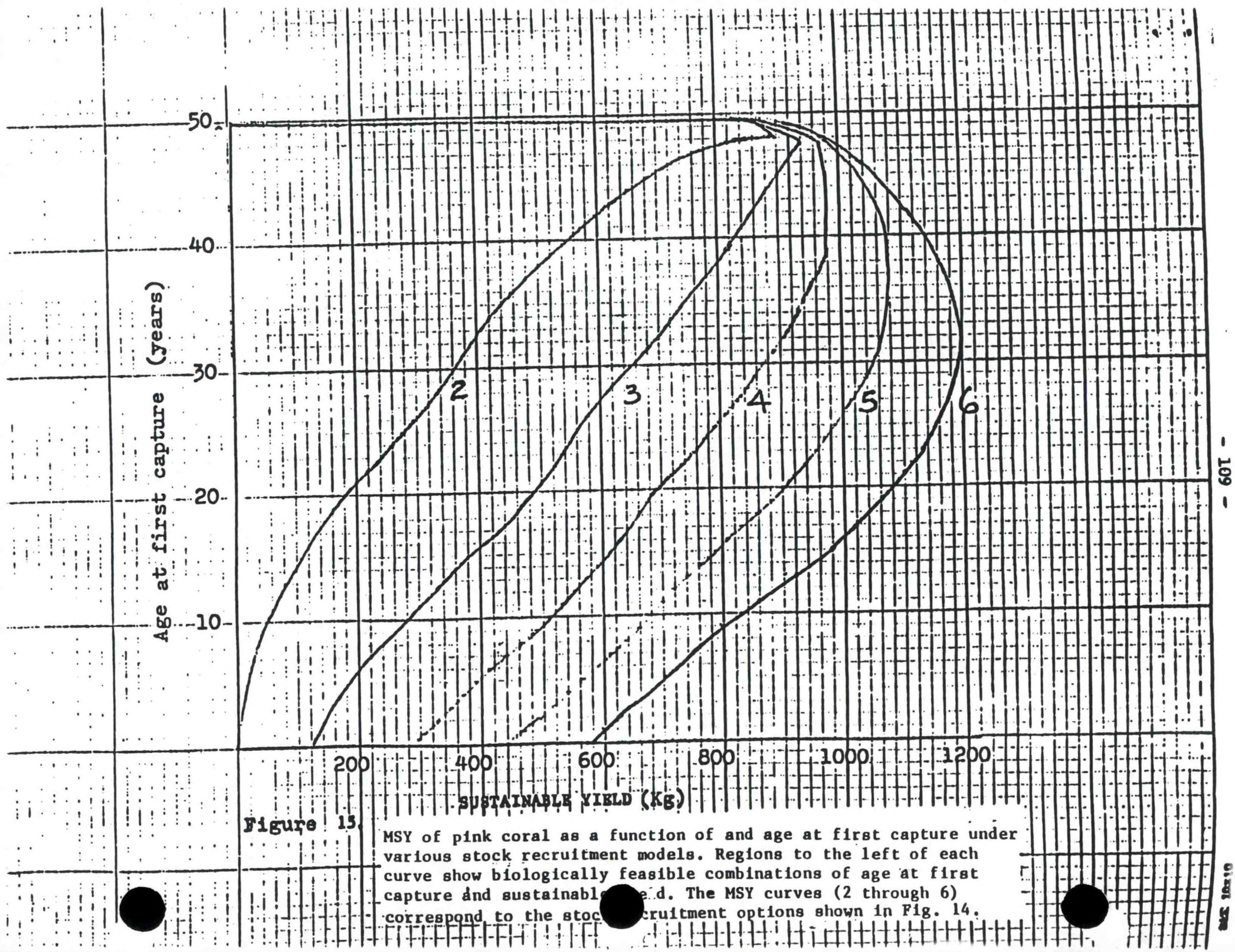
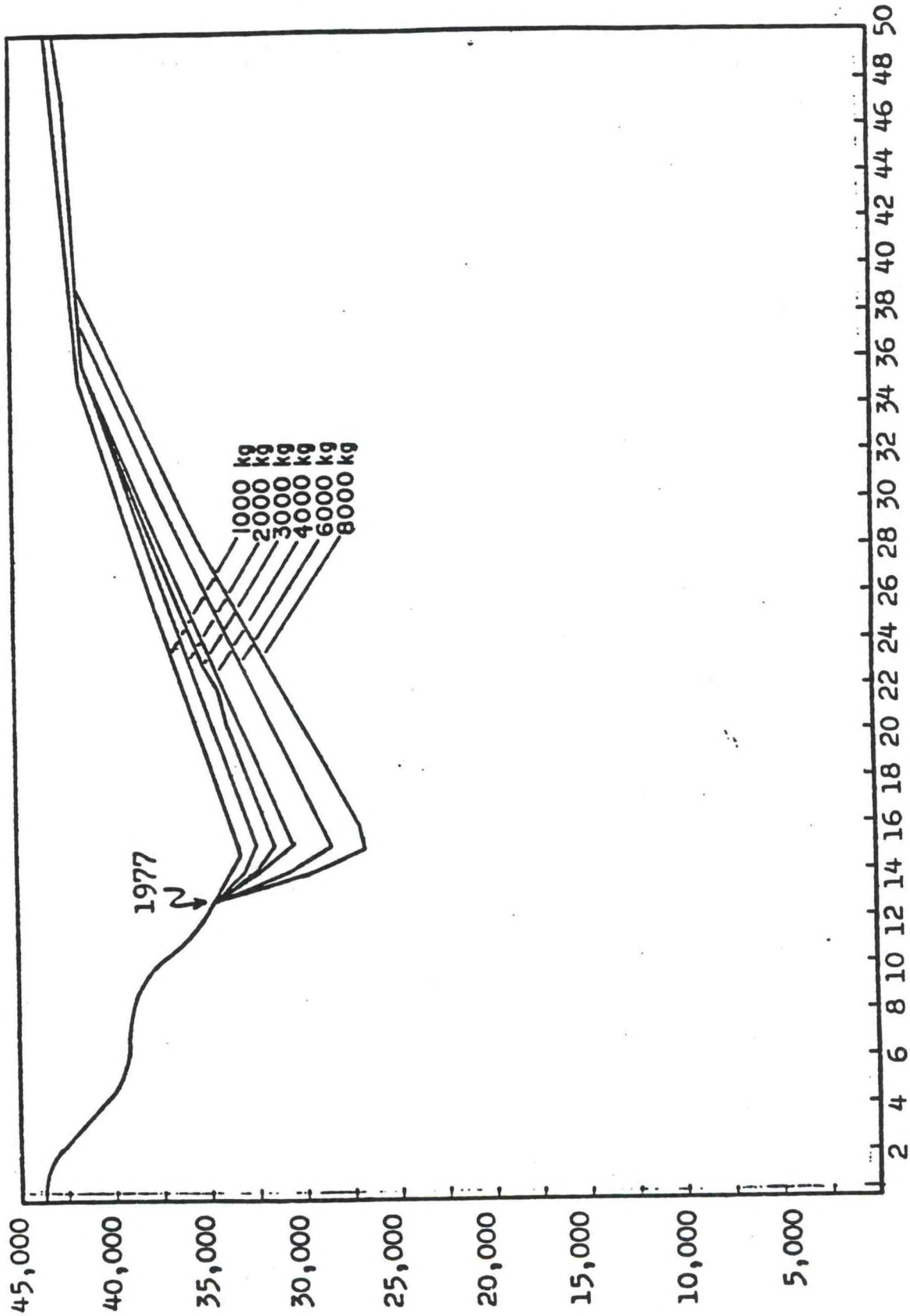


Figure 15. MSY of pink coral as a function of and age at first capture under various stock recruitment models. Regions to the left of each curve show biologically feasible combinations of age at first capture and sustainable yield. The MSY curves (2 through 6) correspond to the stock recruitment options shown in Fig. 14.



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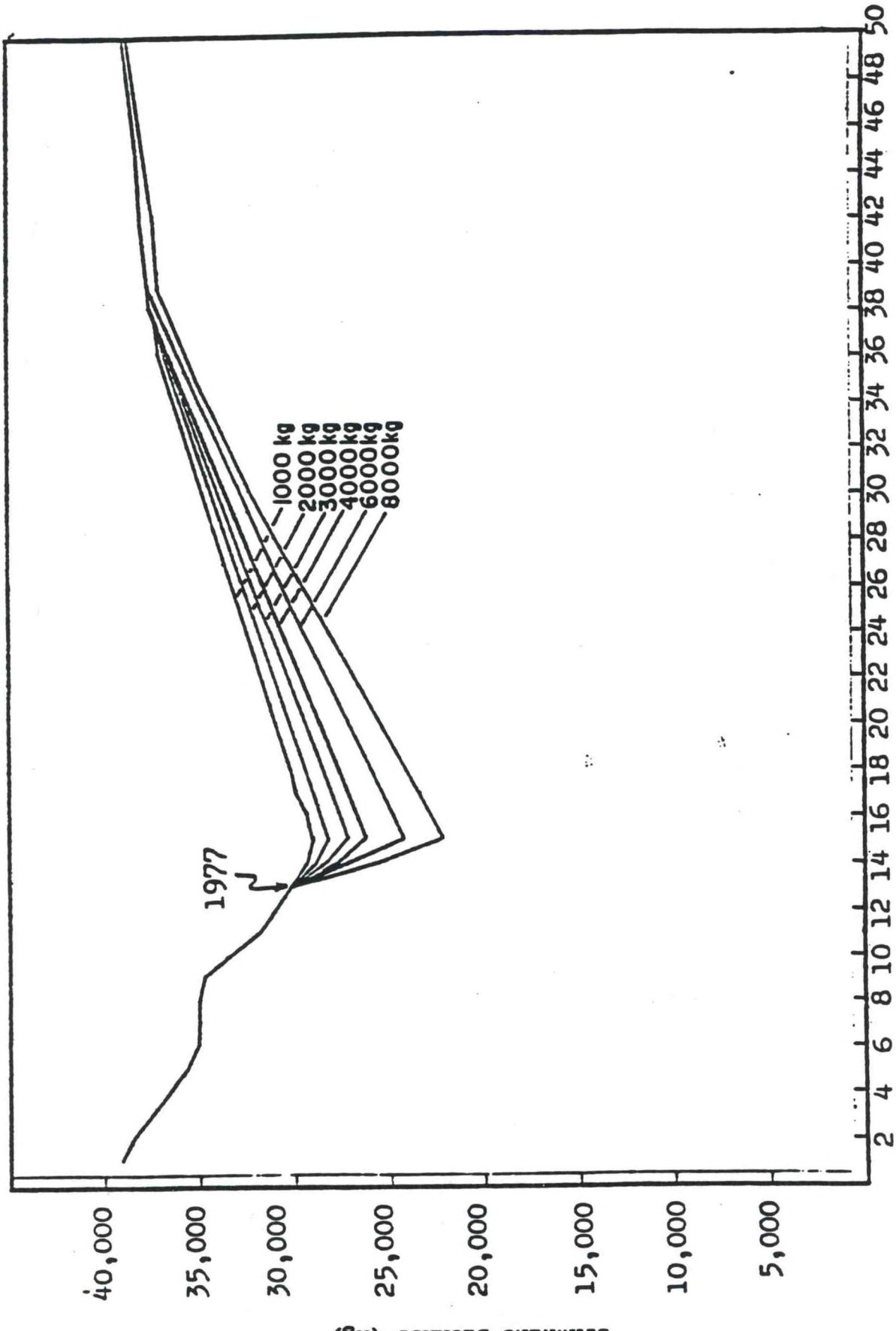

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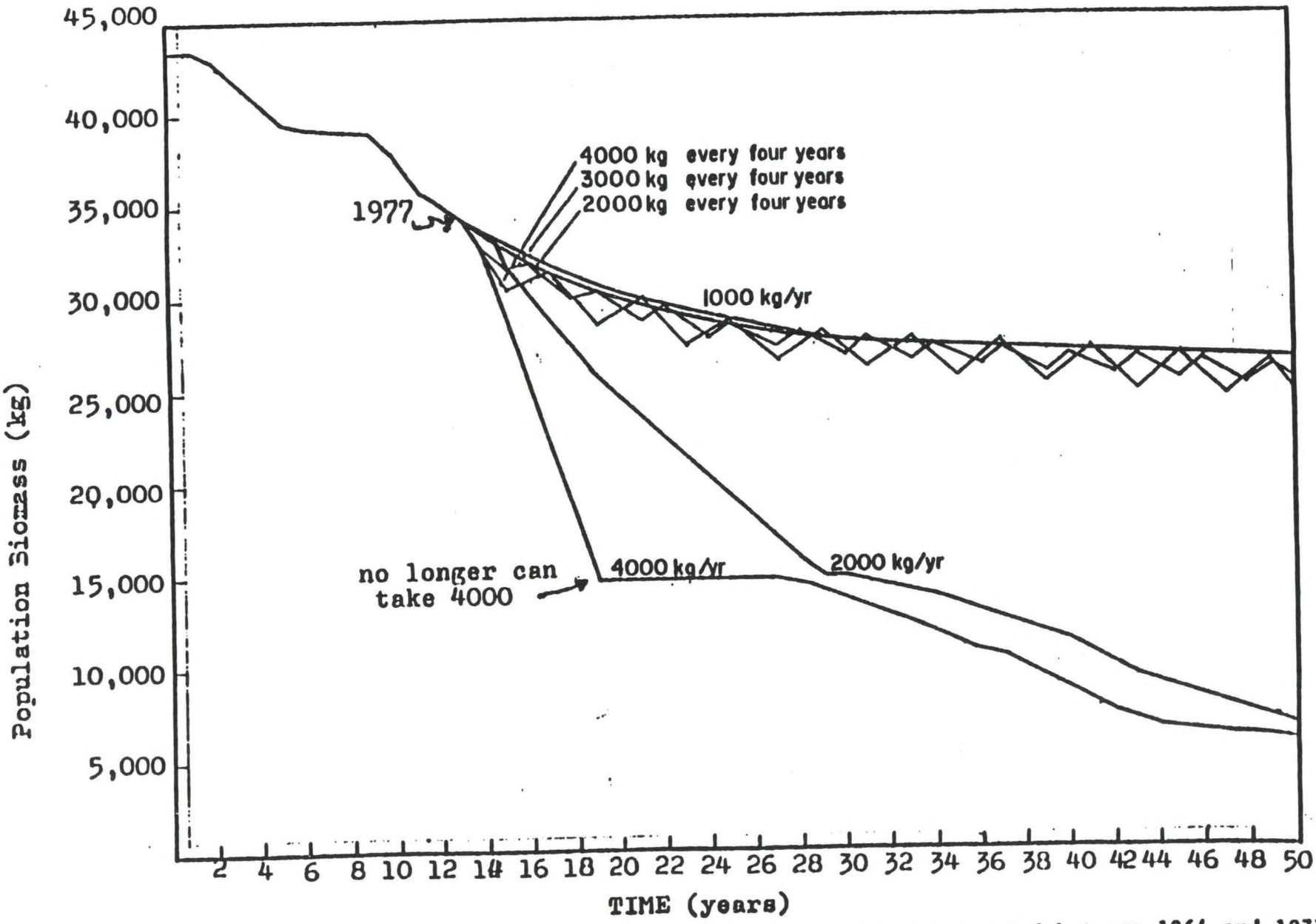

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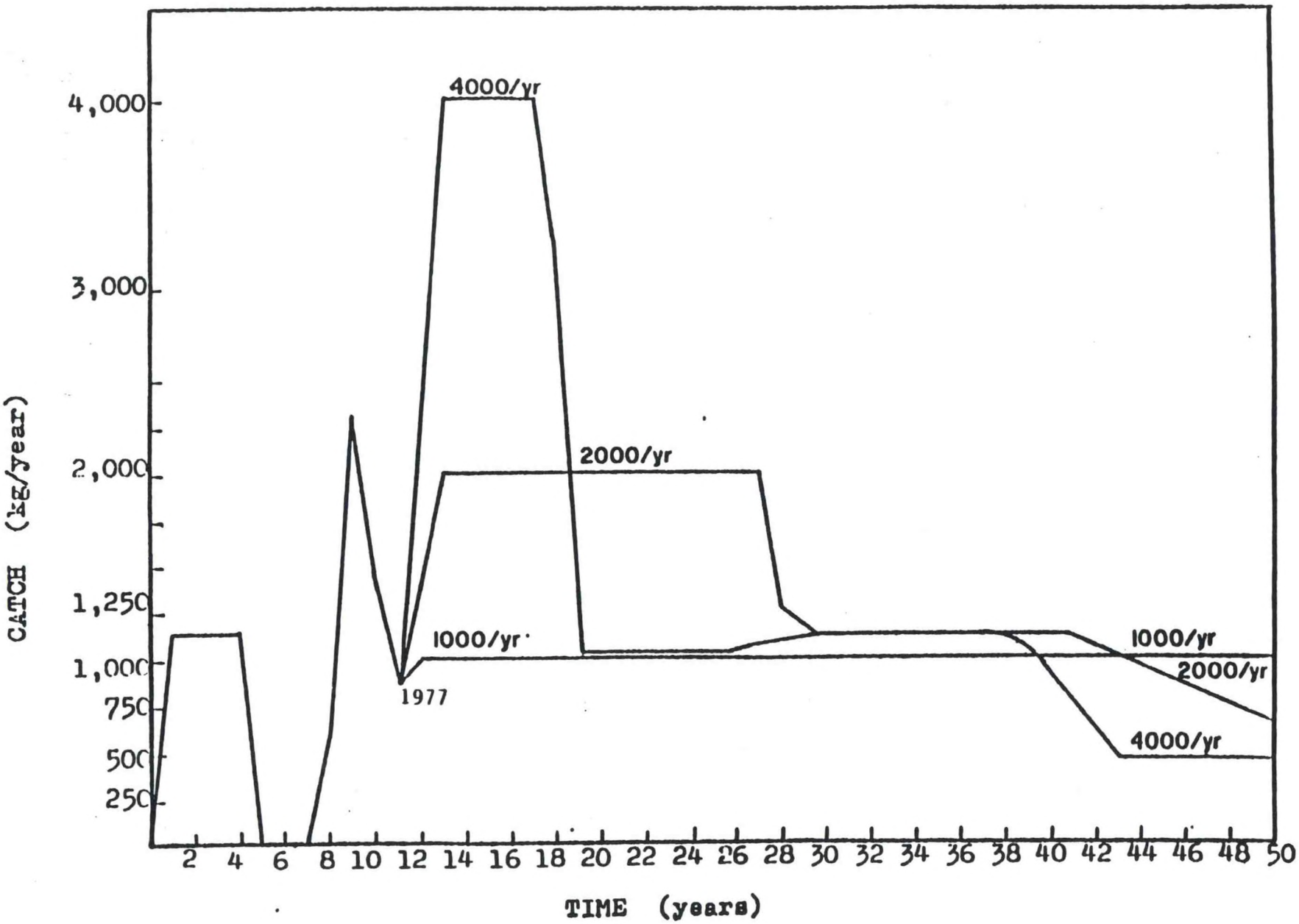

Figure 19. Yields of *C. secundum* in the Makapuu Bed between 1964 and 1977 after which different rates of harvest are simulated. See text for further explanation.

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

1164 BISHOP STREET - ROOM 1608
HONOLULU, HAWAII 96813
TELEPHONE (808) 523-1368

December 14, 1979

Terry L. Leitzell
Assistant Administrator
for Fisheries
Office of Fisheries, NOAA
Page Building No. 2, Room 400
3300 Whitehaven Street, N. W.
Washington, D. C. 20235

Dear Terry:

In view of the unique nature of the Precious Coral resource and the novel management measures recommended by the Western Pacific Fishery Management Council, and in response to questions raised by NOAA/NMFS, the Scientific and Statistical Committee and the Council at meetings held November 27-30, 1979, adopted the enclosed explanatory statements and plan clarifications.

With aloha and warm regards,

Sincerely,

Wadsworth Y. H. Yee
Chairman

Enclosures

ADDENDUM

STATEMENT OF THE SCIENTIFIC AND STATISTICAL COMMITTEE OF THE WESTERN PACIFIC FISHERY MANAGEMENT COUNCIL, IN SUPPORT AND FURTHER EXPLANATION OF THE FISHERY MANAGEMENT PLAN FOR THE PRECIOUS CORAL FISHERIES OF THE WESTERN PACIFIC REGION.

1. 500 kg optimum yield in Exploratory Areas (all species combined).

To reiterate the rationale used in defining optimum yield in Exploratory Areas, the basic premise is to create a sufficient economic incentive while minimizing the bioligical risk of overfishing. An optimum yield of 500 kg is considered sufficient to stimulate exploration but is in all likelihood a very small fraction of the precious corals present in Exploratory Areas. The reason the optimum yield in Exploratory Areas does not vary to reflect differences in efficiency between selective and non-selective gear is because it is based on the concept of a minimum economic incentive, i.e. 500 kg is considered a minimum value irrespective of the type of gear employed. Admittedly, the impact of dredging 500 kg is judged to be 5 times greater than the impact of harvesting 500 kg with selective gear. However, in either case the biological risk of overfishing the resource by harvesting 500 kg in all of each Exploratory Area (except seaward of the main Hawaiian Islands) is judged to be small and less than the benefit of the information that would be produced.

2. 2 year optimum yield.

Because the domestic capacity is approximately twice the optimum yield calculated for the Makapuu Bed and because the industry is faced with the problem of amortizing costs on an annual basis, a 2 year quota has been provided recognizing that it can be taken in one year. This will allow transfer of capital investment during the second year. The analysis outlined in the plan and illustrated in Figure 18 of the plan clearly demonstrates that the biological impact of doubling the quota for twice the time is almost identical to that of an annual quota. The SSC therefore strongly reiterates support for this measure, even though it is an example of pulse fishing which is a management measure that has not been previously used under the FCMA.

3. The environmental impact of dredging vis-a-vis selective harvest.

Quotas allowable for non-selective gear are 20% of those provided for selective gear (except in Exploratory Areas). This provision adjusts for the difference in environmental impact between the two types of gear. In other words, a 20% quota using non-selective gear is judged to be equivalent to a full quota for selective gear. A full quota would result in the taking of approximately 2% of the standing crop per year. Therefore, in the case of non-selective gear when non-precious corals are incidently harvested, even for species which have the same patterns of distribution and abundance as precious corals (such as obligate commensals), the impact on these species would be no greater than 2% of their standing crops per year. Therefore the environmental impact of dredging with quotas reduced by 80% is judged to be minimal and acceptable for all species affected.

Other reasons why conditional dredging is permitted at all, include preventing the formation of a monopoly in Hawaii, providing reasonable opportunity for the development of a precious coral fishery in under-developed

and remote areas and to provide for a possible new source of information in the future.

4. The location and selection of the refuge.

The SSC feels that adequate rationale for the selection of a refuge is given in the plan. Only one refuge was designated at this time because of the limited number (6) of known beds. If more beds are discovered in the future, it would be reasonable to establish additional refugia. The plan establishes that the plan be reviewed on an annual basis.

November 28, 1979

PLAN CLARIFICATIONS

(1) On page 70, the sentence starting on line 5 should be changed to read:

> "2. It is recommended that foreign vessels be permitted to take up to 500 kg. per year, all species combined, per Exploratory Area, under a scientific research plan approved by the Southwest Fisheries Center, NMFS, in consultation with the Council and State agencies."

(2) On page 52, the following sentence should be added after the last full paragraph.

> "As conditional beds are established in an exploratory area, the appropriateness of the quota for that exploratory area will be reevaluated."

(3) (a) On page 22, II.G. Jurisdiction, delete first paragraph. On page 24, second paragraph, delete second sentence.

(b) On page 65, under IV.1 Relationship to Existing Laws, the second sentence, commencing with "DOI regulations . . . " should be stricken.

(c) On page 77, in the paragraph numbered "3," the last sentence, beginning with "This fact is also . . . " should be deleted.

(4) The Council wishes to make clear its intention that non-selective harvesting methods not be allowed in the FCZ seaward of the main Hawaiian Islands. Therefore, the following clarifications should be added.

(a) On Page 52, the second full paragraph, the first sentence should be revised to read:

> "For areas outside the Makapuu Bed, Conditional Beds, and the FCZ seaward of the main Hawaiian Islands, it is proposed to allow either non-selective or selective methods subject to a limit of 1,000 kg per Exploratory Area per year."

(b) On page 53, in the first full paragraph, the second sentence should be revised to read:

> "Since dredging is allowed everywhere else (except in the FCZ seaward of the main Hawaiian Islands) the size limit at this time can apply only to these beds."

(5) The Council wishes to clarify that in areas where dredging is prohibited, any form of non-selective harvesting is prohibited. There, at the following places in the Plan, the term "non-selective harvesting" should be substituted for the word "dredging."

Page 49, lines 11, 12, 13, 18, 21, and 24
Page 50, lines 3, 7, 9, 14, and 22
Page 52, line 11
Page 61, line 6
Page 62, lines 2, 4, and 7
Page 70, lines 1, and 2
Page 75 line 3

ENVIRONMENTAL IMPACT STATEMENT

on the

FISHERY MANAGEMENT PLAN

for the

PRECIOUS CORAL FISHERIES (and ASSOCIATED NON-PRECIOUS CORALS)

of the

WESTERN PACIFIC REGION

Prepared by

The Western Pacific Fishery Management Council
1164 Bishop Street
Honolulu, Hawaii 96813

SEPTEMBER 1979

SUMMARY SHEET

Precious coral resources in the U. S. fishery conservation zones off the Hawaiian Islands, Guam and American Samoa

( ) Draft (X) Final Environmental Statement

Responsible Agencies:

Western Pacific Fishery Management Council
Contact: Wadsworth Y. H. Yee
1164 Bishop Street, Room 1608
Honolulu, Hawaii 96813
(800) 523-1368

National Oceanic and Atmospheric Administration
Contact: Doyle E. Gates
National Marine Fisheries Service
P. O. Box 3830
Honolulu, Hawaii 96812
(808) 946-2181

1. Name of Action (X) administrative ( ) legislative

2. Description of Action:

The proposed action is to adopt and implement a Fishery Management plan for the fisheries for all species of precious corals and other corals in the FCZ under the provisions of the Fishery Conservation and Management Act of 1976 (P. L. 94-265). This Act extends jurisdiction over fishery resources and establishes a program for their management.

The objective of the management plan is to permit and regulate fishing for precious corals within the U.S. fishery conservation zone so that the optimum yield of the coral resources will be harvested on a continuing basis. Implicit in this objective is the protection and conservation of precious coral stocks. Various management measures are considered including catch quotas, size limits, gear and seasonal restrictions, limited entry, permit and reporting requirements, and area closures. Of those considered, the management measures selected for implementation are: catch quotas, a minimum size for pink coral colonies, gear restrictions, establishment of closed beds or refugia, requirement that all coral harvesting be done under permit, and the requirement of extensive reporting of operations by permit holders. Three classes of coral beds are defined: Established Beds, which have a history of exploitation and have been studied sufficiently for the productivity of their coral populations to be specifically determined; Conditional Beds, which have been located and measured as to their approximate areas but otherwise uninvestigated; and all other beds referred to as Exploratory Areas. See figures 1 - 5 of the FMP for maps of the FCZ and precious coral beds. There is a single Established Bed, off Makapuu Point, Oahu, and biennial harvesting quotas are prescribed for each of the three types of precious coral that occur there.

For the five Conditional Beds, all in the Hawaiian Islands, annual quotas of the three corals are set for each bed. No quotas are set for non-precious coral for Established or Conditional Beds. For Exploratory Areas catch quotas of all precious corals combined are prescribed collectively for all beds that may be found in each such Area. Domestic fishing would be permitted to harvest up to 500 Kg per Exploratory Area, all species combined, from a permanent "reserve". Foreign vessels would be permitted to harvest up to 500 Kg per Exploratory Area per year.

The Exploratory Areas comprise those areas of the Fishery Conservation Zone around Hawaii, Guam, American Samoa, the Northern Marianas and the combined FCZ's of such island possessions as Wake, Johnston, Baker and Kingman Reef. WesPac Bed in the Northwestern Hawaiian Islands is designated as a refuge area closed to fishing for precious corals, in order to provide a reserve for possible reproductive replenishment of other beds and as a baseline for monitoring the effect of harvesting on coral populations. For the Makapuu Established Bed, the biennial species quotas are optimum yields which are only slightly reduced below the level of the estimated maximum sustainable yields of the populations. Only selective harvesting methods are permitted on this bed, as this permits taking the full optimum yield without risk of overfishing, and the history of the fishery shows that full exploitation of this bed by such means is economically feasible. Catch quotas for the Conditional Beds are determined by extrapolating, as far as possible, the known characteristics of the Makapuu populations to these areas. Non-selective harvesting (dredging) is permitted on the Conditional Beds (except Conditional Beds south and east of Niihau Island in the NWHI) and Exploratory Areas, for reasons of technical and economic feasibility. When such methods are used on Conditional Beds as permitted, the harvesting quotas are reduced by 80%, to compensate for losses due to harvesting undersized colonies and to incomplete recovery of the colonies which are knocked down. For the Makapuu Established Bed, and the Conditional Beds off Ke-ahole Point, Hawaii and Kaena Point, Oahu, a minimum size of pink coral colonies to be harvested will be enforced, corresponding approximately to the size at which natural mortality overtakes growth. No size limit will be applied to gold or bamboo coral, because of a lack of biological information on which to base such a requirement, nor on pink coral in areas where the permitted use of non-selective harvesting gear makes it impracticable. The plan calls for full reporting of all precious coral catch and effort data, continuing monitoring of the fisheries, and periodic review of the management measures. Foreign fishing will be permitted only in the Exploratory Areas, subject to approval of foreign permits by NMFS.

3. Summary:

(a) Environmental Impacts:

Regulation of precious coral fishing in accordance with the fishery management plan will give assurance that the long-term productivity of the resources will not be lowered by overexploitation, and that data be collected on distribution and abundance of precious corals. The

amount of coral that will be permitted to be removed from the beds in each harvesting period will be approximately commensurate with the new growth of the coral populations during that period. The accuracy of the approximation will vary depending on the degree to which research has made available firm data on the population dynamics and stock size in each case, but the information that will be generated by the reporting requirements of the management plan and by observer coverage of coral fishing operations, should steadily improve the reliability of the optimum yield estimates. The amount of coral that may be removed from each bed (using either selective or non-selective methods) in each harvesting period should be only about 2 percent of the standing crop. The risk of overfishing is believed to be slight because the quantities of corals which may be harvested are low.

There is no information to indicate that removal of the prescribed quantities of coral will significantly affect the environment of any other species. The management measures will allow continuation of the present domestic fishery at a slightly reduced level of production and will permit, although they will not particularly facilitate or encourage, expansion of the fishery to new areas. The effect on foreign fisheries cannot be clearly estimated, because the extent of foreign coral harvesting in the fishery conservation zone hitherto is not known; in any case, the potential harvest made available to foreign fishers is minimal. No particular impact of the fishery under this management system on coastal areas or land use patterns is foreseen, as the corals to be managed occur at depths averaging about 400 meters, several miles from shore at the nearest, and the product is of small bulk and innocuous character. There will be no impact on recreational activities.

(b) Adverse Environmental Impacts:

Permitting the use of dredges for harvesting precious corals in the areas other than the Makapuu Bed and two Conditional Beds in the Major Islands will have adverse environmental impacts to the extent that the quantity of pink coral that can be allowed to be taken will be only about 20% of the optimum yield that could be harvested with selective gear, such as manned submersibles, because of the loss of growth by harvesting undersized colonies and the wastage that results from failure of the dredge to recover all of the colonies that are killed. In addition, the dredge will damage or destroy a proportionately small quantity of other sessile organisms. There may also be some small adverse indirect effects on other organisms through alteration of the environment by dredging. It is unlikely that the dredges, which are tangles of netting dragged at low speed, will have a significant effect on any very mobile organisms that may inhabit the coral beds. Lastly, the catch quotas for the Conditional Beds and the Exploratory Beds are, at this initial stage of management, based on rough estimates and broad assumptions. If they are seriously in error, adverse impacts to the coral stocks of those areas could result, however, they should not be of a magnitude to cause serious long-term losses of productivity.

4. Alternatives:

Alternatives for each of the management measures were proposed and are discussed in this statement and in the FMP. The general alternative of taking no action or of postponing action would not be in accord with the letter or the spirit of the Fishery Conservation and Management Act. This would continue to leave the responsibility for management in the hands of the State of Hawaii and other local governments, which have dubious jurisdiction and enforcement capability, and the Bureau of Land Management of the Department of the Interior, which has a regulation requiring permits for activities which impinge on viable coral communities but no comprehensive program for management of coral fisheries. Failure to take action would be a dereliction of duty both to the resources and to the fishers.

5. Comments Requested:

U. S. Department of State
U. S. Coast Guard
U. S. Environmental Protection Agency
Hawaii Division of Fish and Game
Hawaii Office of Environmental Quality Control
Government of Guam
Government of American Samoa
Government of the Northern Mariana Islands
Fishing Firms
Processors
Environmental and Conservation Organizations
U. S. Department of the Interior
Other Federal Agencies

6. Hearings:

City	Time and Date 1979	Location
Chalan Kanoa Village	4:30 p.m. March 14	Grand Hotel Saipan, Northern Mariana Islands
Agana	4:30 p.m. March 15	Guam Reef Hotel Agana, Guam
Honolulu	7:00 p.m. March 21	Pagoda Hotel Honolulu, Hawaii
Lahaina	7:00 p.m. March 23	Lahaina Civic Center Lahaina, Maui, Hawaii
Pago Pago	5:00 p.m. March 27	Conference Center Pago Pago, American Samoa

7. Comments received during the public hearing process and responses to comments are given in Section XII of the EIS.

I. INTRODUCTION

This final environmental impact statement (FEIS) for the fishery management plan (FMP) for the precious coral fisheries of the Western Pacific Region describes and discusses the potential impacts of implementing conservation and management measures for the management of fisheries for three species of precious corals, within the U. S. fishery conservation zone (FCZ) around the islands of the State of Hawaii and the Territories of Guam and American Samoa. This FMP also contains recommendations for the Secretary of Commerce for coral management in the FCZ of the Northern Mariana Islands. This FMP has been prepared by the Western Pacific Fishery Management Council under the authority of the Fishery Conservation and Management Act of 1976 (the FCMA) and the DEIS has been prepared in accordance with the National Environmental Policy Act of the 1969 (the NEPA).

In the NEPA, the Congress prescribed a strategy for achieving coordination of Federal activities and environmental considerations. The Act's basic purpose is to ensure that Federal officials weigh and give due consideration to unquantified environmental values, in addition to technical and economic considerations, in policy formulation, decision-making and administrative actions. Section 102(2)(C) of the NEPA requires preparation of a detailed environmental impact statement in the case of major Federal actions that may significantly affect the quality of the human environment.

The Fishery Conservation and Management Act of 1976 (P.L. 94-265) provides for the conservation of fishery resources and the management of fisheries, except for highly migratory species, defined in the Act as tunas, by establishing exclusive United States management authority within a fishery conservation zone of 200 nautical miles and on the continental shelf within and beyond that zone. The act calls for the preparation and implementation of a management plan for each fishery, through which the objectives of a National Fishery Management Program may be accomplished.

The fishery management plans provide the basis for determination of the appropriate limits for harvests from the fisheries, predicated on scientific information and taking into consideration the needs of the States, the fishing industry, recreational groups, consumers, environmentalist organizations and any other interested parties. In essence, the plans will prescribe the allowable catch of any fishery resource on the basis of the optimum yield from that resource.

The fishery management unit in this case is a number of widely separated known beds (See Sec. II-A of the FMP for a listing of known beds) of three species of deep-water corals, and other suspected but as yet unlocated beds of the same species, in the 200-mile FCZ around United States islands in the region or on banks and seamounts of appropriate depths within the FCZ or on the continental shelf. The pink coral *(Corallium secundum)*, the gold coral *(Gerardia sp.)* and the bamboo coral *(Lepidisis olapa)*, are commonly called "precious corals" as distinguished from the reef-building stony corals. In the context of fishery management

under the FCMA, the precious corals, because of the great depths at which they occur (average about 400 meters), are mostly within the fishery conservation zone and therefore under Federal jurisdiction, while stony corals inhabit mainly shallower inshore waters under the State or Territorial jurisdiction. Other species of precious coral, such as black corals will be included in the plan on a sequential basis. At the present time, black corals are harvested in waters of the Hawaiian Islands, but approximately 85% of the catch is taken within three miles of island coastlines. The remaining catch is taken within channel waters outside of three miles between the islands of Maui and Lanai. Jurisdiction over this area is currently a subject of dispute between the State of Hawaii and the Federal Government. The Council is in favor of including black corals in the FMP for precious corals, but also favors managing the resource as a single unit. This will require developing a joint plan with the state. The state has informally agreed with this position but in testimony provided during the public hearings, it has made it clear that this action would in no way jeopardize their claim of sovereignty over channel waters. Hence, black corals are covered by the plan but will be included on a sequential basis. Other species of precious coral in the FCZ for which there is likelihood of future harvest are also covered by the plan but will be incorporated into the plan on a sequential basis.

The location and extent of precious coral resources, both within United States jurisdiction in the Western Pacific Region and in the intervening areas outside that jurisdiction, are very imperfectly known to the United States fishery scientists and administrators. One bed, located off Makapuu Point on the island of Oahu, Hawaii, has been under commercial exploitation on a small scale for the past 10 years and has been the subject of biological study, so that its dimensions and stock density are fairly well established. Five other areas in the FCZ Seaward of the Hawaii Islands have been identified as precious coral beds by exploratory dredging and their approximate areal limits have been established (See Figures 1 - 5 of the FMP). Fishermen of Japan and Taiwan are known to have ranged widely throughout the tropical and sub-tropical Pacific Ocean dredging for precious coral, and they undoubtedly have a good deal of practical knowledge of the distribution and abundance of the coral resources; this has not, however, been published or otherwise made generally available. Some of the information on foreign fishing is little more than rumor, and some exploratory dredging by American researchers in areas said to have been formerly exploited by foreign fishermen has failed to turn up signs of precious coral. The general picture that emerges from the available information, documented and undocumented, is one of relatively small, widely separated areas inhabited by precious corals. This picture may be a fact, related to special habitat requirements of the species, or it may be in large part an artifact related to the difficulty of discovering and mapping a resource of this nature. There is no reason to doubt that additional beds of precious corals will be discovered in the FCZ of the Western Pacific Region, if there is sufficient commercial and scientific interest to support the necessary prospecting.

Given the limited present knowledge of the reproduction and recruitment of precious corals and the geographical distribution of the known beds, it seems reasonable to proceed on the assumption that each bed represents a discrete, self-renewing population and to manage each bed as a unit. Ideally, each bed should be managed on the basis of its particular biological requirements and production potential. However, at the present time there is specific information on these parameters for only one coral bed, that located off Makapuu Point, Oahu. Until comparably detailed data are available for other beds, the fishery management plan proposes to manage them as if their population dynamics were analogous to the Makapuu population of precious corals.

The only use for the precious corals is for jewelry and ornaments. Domestic exploitation of the resource in the Western Pacific Region has been virtually limited to the Makapuu bed and has a history of only a little more than a decade. Early in this period, the bed was fished with dredges, which evidently proved uneconomical. In recent years the bed has been exploited only by a submersible craft operated by a Honolulu-based firm, Maui Divers of Hawaii Ltd. Of the three species for which the fishery management plan prescribes specific management measures, pink coral has been the main object of the fishery. Gold coral has been exploited to a much lesser degree, and bamboo coral has not yet been developed into a commercial product. There has been extensive and intensive exploitation of precious coral resources in the central and western tropical and sub-tropical Pacific Ocean for many years by foreign, mainly Japanese, dredgers. As mentioned earlier, this foreign fishing has not been well documented. It is known that in the 1960's Japanese fishermen carried on an intensive fishery for pink coral on the Milwaukee Banks, northwest of Midway Islands, and there are undocumented reports that they have harvested precious corals in more recent years within 200 miles of islands under United States administration, such as Midway, Wake, Yap and Saipan. Since the Fishery Conservation and Management Act took effect, Japanese dredgers have been sighted by patrol aircraft in the vicinity of the Northwest Hawaiian Islands, and a Taiwanese dredger has put in at Midway Islands for emergency repairs, so it can be assumed that the foreign fishery continues to be carried on as it has in the past, by small vessels operating singly with simple dredges and without supervision or control by their flag governments. This foreign fishing would appear to be comparable in its style to the operations of primitive placer-mining prospectors, inefficiently gathering what they can from such pockets of the resource as they may chance upon.

Because of the great depths inhabited by the precious corals and the isolated locations of a number of the known beds, there is no recreational or artisanal utilization of the resource, nor does any appear likely.

II. DESCRIPTION OF THE PROPOSED ACTION

II.1 Management Objectives

The proposed action is to implement a fishery management plan for the populations of precious corals inside the U.S. 200-mile fishery conservation zone in the Western Pacific Region, that is, around the islands of Hawaii, American Samoa and Guam. The specific objectives to be achieved by management measures adopted under this fishery management plan are as follows:

1. To allow a fishery for precious coral in the fishery conservation zone in the Western Pacific but to limit the fishery so as to achieve the Optimum Yield on a continuing basis.

2. To prevent overfishing and wastage of the resource.

3. To encourage the use of selective harvesting methods.

4. To minimize the harvest of colonies of coral which are immature.

5. To minimize the harvest of colonies of coral which have not reached their full potential for growth

6. To preserve an opportunity for low-investment equipment in the fishery (dredges).

7. To encourage the discovery and exploration of new beds.

8. To provide for the establishment of refugia, i.e., beds completely protected from exploitation.

9. To encourage the development of new information concerning the distribution, abundance and ecology of precious corals.

II.2 Optimum Yield

II.2.1 Optimum Yield Considerations

The Fishery Conservation and Management Act of 1976 establishes the optimum yield concept as the basis of fishery management, defining the optimum yield of a fishery as the quantity of fish which equals the maximum sustainable yield as modified by relevant social, economic or ecological considerations so as to provide the greatest benefit to the nation.

For the pink coral population of the Makapuu bed, the maximum sustainable yield (MSY) has been estimated to be 1,185 kg per year. This estimate is derived from the assumption of a stable annual recruitment of 5,227 colonies, the observed density of colonies per unit of area and the known area of the bed, an estimated annual

instantaneous mortality rate of 0.066, and an estimated maximum yield per recruit of 237 gm at an age of 31.4 years. This level of yield can be sustained only if a minimum limit for harvestable colony size is enforced at a size approximating that at which yield per recruit is greatest, which is of course possible only when selective harvesting methods are used. For the pink coral, the minimum size limit is set at a colony height of 10 inches. When a bed is exploited by non-selective methods, such as dredging, the sustainable yield is reduced by approximately 80%, because of the loss of potential growth of the undersized colonies that are harvested and failure of the gear to recover all of the coral colonies that it knocks down.

The optimum yield prescribed for the pink coral fishery on the Makapuu bed represents a modification of the MSY by reference to economic considerations affecting the coral harvesting industry. The 10-inch minimum colony height limit is approximately 1 inch smaller than the minimum size which would produce the theoretically highest yield per recruit. This departure from the ideal size limit is made to accommodate current practice in the fishery, where it is considered that a colony height of about 10 inches is the minimum below which harvest of the small, lower valued colonies is not an economically efficient use of the harvesting equipment. The lowered size limit will slightly improve catch rates, and the analyses presented in the fishery management plan indicate that the effect on the MSY will be negligible. To compensate for this relaxation of the theoretically most productive limit, and to provide a conservative buffer against the possibility of any errors of over-estimation in the production analyses, the optimum yield is obtained by rounding the MSY figure downward to 1,000 kg.

The major difference between the MSY of 1,000 kg of pink coral per annum and the optimum yield is that the latter is established as 2,000 kg to be taken during any part of a 2-year period rather than 1,000 kg to be harvested each year. The reason for this biennial quota rule is that it is, according to industry sources, economically infeasible to tie up the expensive specialized equipment required for selective harvesting of precious coral for only a part of each year on one coral bed, whereas the more flexible biennial schedule would permit productive employment of the submersible craft during a greater part of the available time by making it easier to deploy it in other areas after the quota for the Makapuu bed is taken. The analyses presented in the fishery management plan indicate that any lowering of the long-term MSY by this strategy would be negligible.

Optimum yields for the gold coral, based on an MSY of 300 kg per year, and for bamboo coral, based on an MSY of 250 kg per year, on the Makapuu bed have been determined by analogy with the case of pink coral and on the same rationale, although information on the size composition, growth rates and consequently the natural mortality is lacking for these species. Similarly, optimum yields of pink, gold and bamboo stocks on beds other than Makapuu, concerning which there is no information available other than in cases the approximate gross area of the bed, are calculated by considering them to bear the same relation

to the optimum yields of the Makapuu stocks that the areas of the beds bear to the area of the Makapuu bed.

The full optimum yield will be made available from the Makapuu precious coral populations by requiring that only selective harvesting methods be used there, as the history of exploitation of that bed shows that full harvesting by such methods is technically and economically feasible. On Conditional Beds, in which non-selective methods are permitted for the present, the optimum yields will most likely be only 20% of the full potential. The high cost and technological requirements of submersible craft or remote-controlled selective harvesting devices will limit their use by foreign fishermen or by the inhabitants of United States island territories of the region. Therefore, the reduced harvests that can be permitted with the simpler non-selective gear are accepted as the price of allowing the development of a domestic harvesting industry in the parts of the region where selective harvesting devices cannot at present be economically used. Any foreign fishing which may be permitted in the FCZ would improve the circumstances for development of a domestic fishery by providing information on the locations and characteristics of coral resources which are not known at present to domestic fishermen or government authorities.

Aside from the several economic considerations noted above as having affected the derivation of optimum yield from the MSY, no other social, economic or ecological factors were found to be either relevant or well enough known to cause further modification of the optimum yield.

II.2.2 Total Allowable Level of Foreign Fishing (TALFF)

In accordance with provisions of the Fishery Conservation and Management Act of 1976, foreign fishers will generally be allowed to harvest precious corals in the U.S. fishery conservation zone and from the Continental Shelf areas under U.S. jurisdiction at a level corresponding to the difference between the optimum yield established for a given coral bed and the domestic harvest from that bed. In the case of the Makapuu bed, which is the only one currently under exploitation in the FCZ of the region, the present level of harvesting effort is more than sufficient to take the entire optimum yield of 2,000 kg of pink coral within a part of the 2-year period for which this catch quota is made available, and therefore there will be no TALFF from that resource. No foreign country is known at present to be able to deploy selective harvesting gear in the Makapuu bed, where that is the only type of harvesting method to be permitted. Domestic harvesting capacity is also deemed adequate to take the entire optimum yields of gold and bamboo corals from the Makapuu bed and of all three kinds of precious corals from the five Conditional Beds which have been located and surveyed in the FCZ Seaward of the Hawaiian Islands, so no TALFF's will be provided from those resources. An optimum yield of 1,000 kg annually is established for the total of all newly discovered beds that may come under exploitation in each of the major areas of the region; the Hawaiian Islands, American Samoa, Guam, the Northern Mariana Islands (recommended for Secretarial Action, but not a part of the Council's FMP) and the various

island possessions jointly. One half of this amount is reserved for the potential development of domestic fisheries in those areas. This measure will provide the possibility of a TALFF of 500 kg of all three kinds of precious coral combined in each such exploratory area.

Given the longlived nature of precious corals, the low rate of natural mortality, and the small quantity of corals involved, there is little "waste" inherent in not taking the Optimum Yield in a single year. Therefore, none of the reserve is intended to be released to foreign fishing even if domestic vessels fail to harvest the reserve in a single year. The Council will reconsider this measure after three years of implementation to determine if the reserve approach is effective in promoting domestic fishing without a conservation risk. Thus, there is a 500 kg/year TALFF for the first three years of the FMP in Exploratory Areas. Foreign research fishing may be permitted.

II.2.3 Management Measures Adopted

After consideration of various alternative management measures, as described in section IV.F.1 of the fishery management plan, the following set of management measures is adopted for the precious coral fisheries under United States jurisdiction in the Western Pacific Region.

(a) Fishing Permits

Harvesting of precious corals will be permitted from all coral beds under U.S. jurisdiction in the Western Pacific Region, except such beds as may be designated as reserves or refugia. All persons engaged in coral harvesting will be required to have annual, area specific permits to which appropriate conditions will apply.

(b) Classification of Coral Beds

Coral beds are specific known sites in which corals are found and are classified in three categories. Beds which have been subjected to harvesting and have been sufficiently studied to determine their specific maximum sustainable yields are designated Established Beds. At present the only such bed in the Region is the one located approximately 6 miles off Makapuu Point, Oahu. Beds which have been definitely located by survey and for which the approximate total area is known but where the density, size composition and other specific characteristics have not been studied sufficiently to determine their maximum sustainable yields are designated as Conditional Beds. There are five such beds known at present, all in the Hawaiian Islands. One such bed will be designated a Refugium. All other precious coral beds still to be discovered in areas under U.S. jurisdiction in the Region are designated collectively as forming an Exploratory Permit Area in each of the five major geographical divisions of the Region — Hawaii, American Samoa, Guam, the Northern Marianas and the combined FCZ's around the remaining minor U.S. islands in the central and western Pacific Ocean.

(c) Catch Quotas

The optimum yields determined as described in section II.2.1 are applied as limits to the harvest permitted from each bed or exploratory area. For the Established Bed at Makapuu, Oahu, the quotas are 2,000 kg of pink coral, 600 kg of gold coral and 500 kg of bamboo coral per biennial quota period. For the Conditional Beds, the catch quotas are annual and are determined by reducing or increasing it by a factor corresponding to the relation which the area of the Conditional Bed bears to the area of the Makapuu Bed. In two Conditional Beds, off Kea-hole Point, Hawaii and Kaena Point, Oahu, dredging is prohibited. In Conditional Beds where non-selective methods such as dredges are allowed, the quota is to be reduced by 80% In order to prevent over-harvesting, a Conditional Bed is closed to further non-selective harvesting whenever the catch of any one of the three kinds of precious coral reaches the annual quota. For each Exploratory Area, the annual catch quota is 1,000 kg of all three precious coral varieties in total, half of which is reserved for domestic fishing. Up to 500 kg/year of all three species may be made available for foreign fishing in each Exploratory Area.

(d) Closed Areas

Provision is made for the designation of coral beds as reserves or refugia in which no harvesting of precious corals is permitted, and for the present one such refugium is established at the WesPac Bed, between Nihoa and Necker Islands of the Northwestern or Leeward Hawaiian Islands. The purpose of this measure is to provide a reproductive reserve for replenishment for beds which could be inadvertently overexploited and a baseline study area for evaluating the effects of exploitation on other coral beds.

(e) Seasons

Permitted coral harvesting may be carried on at any time of the year, no biological, technical or economic reason having been found for limiting fishing to any particular season. A harvesting season for purposes of permit validity and quota enforcement extends from July 1 through June 30 of the next year, in the case of Conditional Beds or Exploratory Permit Areas, or of the second year following, in the case of the Makapuu Established Bed. These dates were selected for congruence with the established management system of the State of Hawaii, which is based on such a fiscal year.

(f) Harvesting Methods

Only selective harvesting gear is permitted on the Makapuu Established Bed, because the history of that fishery has demonstrated that it is technically and economically feasible to take the entire optimum yield of precious corals at that location by selective methods and because the harvesting quota that can be permitted when such methods are used is five times that which can be allowed, without exceeding the

the MSY, when non-selective methods are employed. Dredging is also prohibited in the Kea-hole and Kaena Point Beds because it is judged that their small area would not produce a return sufficient to offset the biological risks associated with dredging. On all other coral beds and in Exploratory Permit Areas, dredging is permitted, with a reduction of the harvesting quotas to 20% of the nominal optimum yield, because of the losses of broken coral colonies from the dredges and the harvesting of colonies which have not reached their optimum growth. Harvesting of precious coral, under a quota limitation, by the biologically less efficient dredging method is only permitted because under the present circumstances there is judged to be no possibility of achieving anything approaching the full potential production of the coral resources or involving the people of the islands of the region in the precious coral fishery or identifying presently unknown coral beds if the use of only selective gear throughout is required. The capital investment, high operating and maintenance costs and technological expertise required for submersible craft to operate in the coral fisheries would place such harvesting methods beyond the reach of island fishers and result in a defacto monopoly of the coral resources of the region for the one firm which is now conducting selective harvesting operations. This firm's single harvesting vessel would be unlikely to be able to utilize the potential harvest from the widely separated known beds and also to carry out the exploratory fishing needed to locate other beds in the various areas of the Hawaiian Islands, American Samoa, the Marianas and the scattered island possessions intervening. Coral dredging, on the other hand, does not require a specialized vessel nor expensive or complex equipment and thus, could be readily taken up by island inhabitants who, in most areas of the region, face a need for additional economic development. The methods used for coral dredging are described in section II-C-2 of the FMP.

(g) Size Limit

For pink coral in the Makapuu Established Bed, and the Conditioned Beds off Kea-hole and Kaena Points, a 10-inch colony height is set as the minimum size limit for coral to be harvested. This limit is feasible because of the required use of selective gear and is essential to achieve the optimum yield. Biological information is inadequate to support a minimum size limit for gold or bamboo coral on the Makapuu Bed and elsewhere the permitted use on some beds of dredging, which is non-selective for colony size, precludes the imposition of a size limit.

(h) Incidental Catches

Any precious coral taken from a bed under U.S. jurisdiction in the region by fishing gear intended to catch other species, such as in trawling for finfish or shellfish, is required to be reported to the regulatory authorities and to be returned to the sea. It has been reported that trawlers fishing for deep-dwelling bottomfish species do occasionally bring up coral, but there is no documentation

of the frequency or volume of such incidental catches. The only foreign fishery now permitted in the areas of the FCZ covered by this plan is for Seamount groundfish, and that plan prohibits retention of any corals taken incidental to groundfish. The management measure will furnish quantitative data on the problem and, by ruling out retention of incidental catches will prevent their being used as a subterfuge for unlicensed coral harvesting. If incidental catches in any area are revealed to be more than 50 kg per vessel per year, more restrictive measures will be considered.

(i) Permit Conditions

Permit holders will be required to maintain and submit to the NMFS a detailed and accurate logbook covering all significant particulars of their coral harvesting operations and sales of their catches and to identify their vessels by conspicuously exhibiting their permit number on its superstructure.

II.3 Description of Environment

II.3.1 Marine Environment

The precious corals to which the above-described management measures occur at depths of 300 to 475 meters, on hard substrates which are believed to be swept clear by relatively strong currents. Several of the known beds are located off promontories of islands or in inter-island channels. The coral polyps form colonies resembling small trees, and these colonies form aggregations called beds. Within the 200-mile fishery conservation zones around islands under U.S. jurisdiction in the Western Pacific Region, six beds of precious coral have been located definitely, all in the Hawaiian Islands area, and their approximate areas have been determined. These beds are small; only two of them have an area greater than 1 square kilometer, and the largest is 3.6 km^2. There are undocumented and unconfirmed reports that precious corals have been observed or exploited in widely scattered locations in the region: off American Samoa, Guam, the Northern Marianas, Yap Island and Wake Island, but no details are available. In some cases attempts at scientific surveys in areas referred to in such reports have failed to turn up any evidence of precious corals. Undocumented reports of large past commercial production by Japanese vessels on the Milwaukee Banks, some 500 miles beyond the northwestern extreme of the Leeward Hawaiian Islands, and the large physical area of those banks lead to conjecture that precious corals may at some locations occur in much larger aggregations than have as yet been demonstrated by scientific surveys. Asian coral fishers, who have roamed the western and central Pacific for decades, undoubtedly have undocumented and unorganized information on precious coral beds that is unavailable to U.S. researchers and administrators. It must be said that in general the available information on precious coral occurrence and distribution is fragmentary and

very incomplete, and there is a high probability that further surveying and prospecting will reveal significant additional precious coral resources in the areas under U.S. jurisdiction.

Likewise, little information is available on the ecological associations of the precious corals or their significance to the lives of other organisms. Microzooplankton and particulate organic matter are important in the diet of related gorgonians, and like other anthozoan species they are associated with numerous kinds of commensal invertebrates. They are also associated with many species of other anthozoans. They have not been observed to be consistently associated with any kind of finfish or free-swimming invertebrate. There are no known predators on precious corals.

Estimates of the densitites of occurrence of precious coral colonies in their habitat based on in site observations have been made only for the Makapuu Bed, and indicate a sparse, widely separated habit of growth, which is confirmed by photographs taken from T.V. cameras and submersible craft. The estimated average densities are 0.022 colony per square meter for pink coral, 0.003 col/m^2 for gold coral and 0.01 col/m^2 for bamboo coral.

Because of the great depths at which they live, the precious corals would be expected to be insulated from some short-term drastic changes in the physical environment. For the same reason it is difficult to imagine circumstances in which man-made pollution would affect their environment, except in the unlikely event that large quantities of heavy material such as waste from manganese nodule refining, were dumped directly on a bed. Nothing is known of the effects of long-term changes in environmental conditions, such as water temperature or current velocity, on the reproduction, growth or other life activities of the precious corals. In the fishery management plan, stability of these parameters is based on the stable nature of the age frequency distribution.

As far as is known at present, the precious corals of the region have no ecological relationship with any threatened or endangered species or any marine mammal.

II.3.2 Human Environment

The precious corals do not, in the living state, form an overt part of the human environment in the region, because of the great depths which they inhabit and the isolated locations of most of the known beds. They are not within the range of observation of recreational or commercial free divers, and are seen in vivo only by the operators of the submersible vessel employed to harvest them in Hawaii, or occasionally by research scientists. It should be noted, however, that precious corals, like any species of wildlife, have scientific values apart from socio-economical considerations.

The handling and processing of the product, which is a small volume of an inert mineral skeletal material, does not obtrude itself on the public notice as the analogous operations in other fisheries often do, through cannery odors or localized pollution of harbor waters. Probably the majority of the inhabitants of the Hawaiian Islands and elsewhere in the region are unaware that there are precious coral resources in the surrounding waters, except as that fact is brought to their attention by the advertisement and display of coral jewelry on the local market.

Precious corals are rarely, if ever, harvested accidentally by any type of domestic commercial or recreational fishery practiced in the region nor has there been any indication that any group of fishermen of the region consider the precious corals in any way related to the success of their fishing operations. It is probable that foreign fishers, who from time to time carry on deep trawling for finfish in some areas of the fishery conservation zone, occasionally encounter incidentally harvested precious coral in their trawls.

The element of the human population of the region which is aware of and concerned about the precious coral resources, aside from a few scientists and administrators, primarily comprises the persons employed in the precious coral fishery and the associated processing industry and members of environmental groups. The largest firm in the Hawaiian precious coral industry employs about 308 persons, including 35 involved directly in fishing and/or processing of locally harvested coral. It is reported that there are about 15 other firms in Hawaii engaged in making jewelry from imported coral and it is estimated that as many as 500 retail outlets in the State handle coral jewelry, among other types, of which an unknown portion is made of locally harvested coral. In total, around 800 to 1,000 persons, from fishermen to retail sales clerks are employed in the coral industry in Hawaii. In other island groups of the region the involvement of the local population is much less, although most curio shops and airport terminal duty-free stores sell coral jewelry.

In considering the human environment of the precious coral fishery in the Western Pacific Region, attention must be paid to the possibility that people of islands other than those of Hawaii may become involved in the future in precious coral harvesting and perhaps in the processing of precious coral into jewelry. There is no such involvement at present, although a basis for its development may exist in that small quantities of black corals *(Antipathes spp.)* are reported to be collected by local divers at some of the islands from time to time. It is generally agreed that the people of American Samoa, Guam and the Northern Marianas, like those of the Trust Territory of the Pacific Islands, need the development of a variety of new economic activities, in order to become self-supporting, and that they must look to ocean resources as a major basis for such

development, because of the general paucity of land and terrestrial natural resources. Coral harvesting by simple methods such as dredging would be relatively easy for the island people to take up, if organized surveys by government agencies or private prospecting should reveal the existence of significant beds of coral in locations accessible to them. On the other hand, dredging as practiced on the Makapuu Bed in Hawaii in the 1960's was apparently not efficient enough to be profitable, and there is some question whether it could be made to pay in American Samoa or in the Marianas. Other simple but labor-intensive and low paying activities, such as copra making and commercial fishing, do not seem to have much appeal under the prevailing socio-economic conditions in the U.S. Territories.

The foreign coral fishermen are a part of the human environment which must be taken into account. At present, and until a management plan for precious corals is put into effect, there is no legal way for them to participate in coral fishing in areas under U.S. jurisdiction in the region. There has been no direct approach by any foreign government seeking U.S. permits for its fishermen to take precious coral in the fishery conservation zone of the region, although as mentioned above there have been sightings of Japanese boats engaged in unlicensed dredging off the Northwestern Hawaiian Islands. Given the extremely low intensity of surveillance in the region, there could be considerable undetected illegal coral fishing by foreigners. It is difficult to tell whether the failure of any foreign government to show an interest in U.S. precious coral stocks is due to their judgment that those stocks are of negligible importance compared with other resources known to them in areas outside the FCZ, or to a belief that coral can be harvested with impunity from the FCZ without getting involved with possibly onerous U.S. conservation rules and reporting requirements. Most likely the operations are of such a small scale and value, compared with other fisheries which Japanese and Taiwan fishermen engage in within the fishery conservation zone, that they have not attracted the attention of the flag governments. Observations of a Taiwanese coral dredger which put in at Midway Island in 1977 would indicate that the fishery is carried on, at least in part, by very small vessels which show no signs that the operation is a very lucrative one. In any case, available information indicates that in recent years at least 90 Japanese boats and at least 30 Taiwanese boats have engaged in precious coral harvesting in the central and western Pacific Ocean. There are no data available on the number of fishermen employed in the foreign fleets. However, it is reported that the larger dredge boats carry crews as large as 20 men. Implementation of the measures prescribed in the fishery management plan would open up the possibility for the Japanese and Taiwanese coral dredgers to engage in legal fishing for stocks of precious corals under U.S. jurisdiction, under permit, to the limited extent of 500 kg total harvest of all three types of coral combined annually in each of five major Exploratory Areas. There would be no change in the conditions governing incidental catches of coral by foreign fishermen engaged in the Seamount groundfish fisheries of

the central North Pacific, as the Federal regulations for those fisheries already require full reporting of such incidental catches and the return of the broken coral to the sea.

III. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

Implementation of the fishery management plan for precious corals would change the present situation of the precious coral fisheries, actual and potential, in the regibn by opening up the possibility for a limited legal fishery by foreign fishermen at the present time, which as noted earlier, is not possible under the provisions of the Fishery Conservation and Management Act except through the promulgation of a Fishery Management Plan or a Preliminary Fishery Management Plan. On the other hand, this action would apply a number of new controls and limitations to any harvesting of precious corals by domestic fishermen. This change in the situation of domestic fishermen is, at the present time, more theoretical than real, as the only existing domestic fishery, the Maui Divers operation off Makapuu Point, Hawaii, is being regulated by the State of Hawaii through a set of management measures similar to those established by the fishery management plan. This fishery is also subject to regulation under a permit system established by the Secretary of the Interior and administered by the Bureau of Land Management of the Department of the Interior.

According to a draft memorandum of understanding between the Departments of Commerce and the Interior, implementation of coral fishery management measures by the Secretary of Commerce, under a fishery management plan developed by the cognizant Regional Fishery Management Council, will cause the Bureau of Land Management to withdraw from managing any fishing for the coral resources concerned. The real effect of this change of administering authority is difficult to evaluate, as the BLM does not have an overall management strategy but attaches conditions to its permits on a case by case basis. In the case of the Makapuu fishery, the main changes in the management system would appear to be the change from an annual to a biennial catch quota and the possibility that the harvesters will not be required to pay royalties to the Federal Government. Appendix II of the FMP contains the BLM regulations.

The effect of implementation of the fishery management plan on the regulatory system of the State of Hawaii is more difficult to predict. It appears to be a policy of the State administration to claim jurisdiction over resources in the channels between the main islands which make up the State, on the analogy of claims to jurisdiction over "archipelagic waters" that have been advanced by certain nations in the international forum. Following this policy, the State has promulgated regulations for fishing of pink and gold coral "in waters subject to the jurisdiction of the State". With no further definition and assuming that State jurisdiction were limited to the waters within 3 nautical miles of shore, there would be no conflict with Federal policy as

expressed, for example, in the Fishery Conservation and Management Act, and probably little real effect, assuming that there is in fact little or no precious coral growing within 3 miles of the islands. However, the State regulations refer specifically to the Makapuu coral bed, which is about 6 miles off shore. The State's regulation sets a biennial quota only for pink coral from the Makapuu bed, equal to the 2,000 kg prescribed in the fishery management plan. Unless the State recedes from its claim to jurisdiction or loses a test of that claim in the courts, it appears likely that anyone harvesting coral from the Makapuu bed will have to hold permits from and make reports to both the Department of Commerce and the State of Hawaii. The same could be true of any harvesting operations that might be initiated on the bed off the northwestern point of Oahu. Potentially more troublesome to future coral fishery development are the provisions of the State regulations that any pink or gold coral landed in the State must be taken in accordance with the regulations, whether or not taken in waters subject to the State's jurisdiction, and that no dredges or other non-selective means can lawfully be used to harvest these types of coral. Depending on how the State defines the geographical boundaries of its jurisdictional claim, and the locations of any beds that may be found in future, this could bring the State and Federal authorities into conflict and jeopardize the development of a Hawaii-based fishery on beds beyond the present reach of selective harvesting gear. It should be noted that the plan will prohibit dredging in the main Hawaiian Islands, thus preventing conflicts in that area.

Guam is the only other local government of the areas covered by the fishery management plan that has specific regulations or policies relating to the precious coral fisheries. The government of Guam has established in the Guam Comprehensive Development Plan an interest in research aimed at developing fishery resources out to the legal 3 mile boundary in the FCZ. A representative of the Government of the Northern Marianas, in the status of official observer at a meeting of the Western Pacific Fishery Management Council, asked that a recommendation not be made to establish a 500 kg allowable level of foreign fishing for exploratory operations in the Fishery Conservation Zone around the Northern Marianas, apparently on the basis of the belief that foreign fishermen are well acquainted with the locations of precious coral beds in that area, so that such fishing would not be truly exploratory in nature, and also because the Northern Marianas has no voting membership on the Council. Implementation of measures for this area of the FCZ is the responsibility of the Secretary of Commerce. It is recommended in the FMP that foreign fishing be allowed in the NMI but limited to 500 kg/year for all species of precious coral combined.

The precious coral fisheries covered by the proposed action have no direct relationship, nor any demonstrable indirect relationship, to any land use plan, in the region, because the harvesting covered, by definition, occurs beyond 3 nautical miles from shore and at great depths, and the product is of small volume, non-noxious in character and is processed in workshops in general light industry areas. Harvesting vessels use

established mooring facilities and it is not forseen that they will ever require any additional or specialized harbor facilities. The objectives of the FMP are consistent with those of the Coastal Zone Management Plan of the State of Hawaii.

IV. PROBABLE IMPACTS OF THE PROPOSED ACTION ON THE ENVIRONMENT

IV.1. Biological Impact

The biological impacts of the management measures for precious corals are considered on four levels. First is the impact on the particular populations of pink, gold and bamboo corals that are to be harvested under the prescribed management measures. Second is the incidental direct impact on other organisms inhabiting the coral beds by the gear used for coral harvesting. Third is the impact on precious corals of incidental catches resulting from operations in other fisheries, such as deep trawling for Seamount groundfish. Fourth in the indirect ecological effect of the removal of precious corals on other organisms and the bottom terrain.

Harvesting of precious corals in the quantities and by the methods permitted by the proposed management measures should result in conservation of the coral stocks and their maintenance at levels that will sustain a maximum yield over long periods of time, provided that there are no drastic changes in natural environmental conditions and provided that the estimates of the main parameters of the dynamics of the coral populations are approximately correct. Admittedly, little is known of the influence of environmental factors on the corals. However, the evidence available from such studies as have been made of the age structure of the Makapuu stock indicates long-term stability. Also admittedly, the harvest quotas provided for the known but as yet unstudied Conditional Beds and for the as yet undiscovered beds in the Exploratory Areas are based on arbitrary extrapolations and may be in error. However, they are considered conservative enough to preclude serious damage to the productivity of the beds pending acquisition of more specific and precise data, and without such estimates of MSY there would be no possibility, within the terms of the FCMA, of permitting the development of fisheries which in turn should be a source of better data on which to base improved management measures. In this connection, it is pointed out that the fishery management plan calls for a periodic review of all management measures and their revision as needed.

At the second level of concern, harvesting by a manned submersible, with visual selection of the coral colonies to be removed from the substrate, as practiced at present on the Makapuu bed, should have a minimal effect on associated non-commercial anthozoan species and other organisms inhabiting the coral beds. Other "selective" methods which have been suggested may be less innocuous in this respect. For example, coral fisheries have worked on designs for a tracked vehicle which would traverse the coral beds under remote control, picking up coral colonies selected through the medium of closed-circuit television. Presumably

such a harvesting method, if it should come to be employed, would have more physical impact on the sessile organisms inhabiting the bed than does the submersible, and this added impact could fall on undersized colonies of the target species as well as on other species. If this impact proved great enough, it might be necessary to classify such gear as "semi-selective" and adjust harvesting quotas appropriately where it is used.

The greatest impact on associated organisms undoubtedly comes from the dredge, which is the harvesting device used in most precious coral fisheries in the world. Dredges, as used by Asian fishers in the Pacific, consist of a number of large stone weights which are dragged over the bottom to break off the coral colonies from the substrate and pieces of netting to entangle the broken pieces of coral so that it can be recovered. It is probable that this process does considerable damage to other sessile organisms on the beds, especially those which, like the precious corals, form colonies which rise some distance off the bottom. Little quantitative data are available on the miscellaneous incidental catches of coral dredges. On the basis of a field simulations and a theoretical analysis of the effect of non-selective harvesting on a pink coral population, the fishery management plan calls for reduction of harvesting quotas by 80% from the potential MSY to account for loss resulting from harvesting undersite colonies and imperfect recovery of colonies knocked down by the dredge. With respect to the other species commonly occurring on the beds, many are tough and flexible, unlike pink coral, which is brittle, and thus may have a certain degree of resistance to being broken off by the dredge. Field observations by Dr. Richard Grigg, HIMB, U.H., suggest that impacts on related corals are no greater than the impact on pink coral, i.e., no more than 2% of the standing crop should be affected during the harvesting period. No effects of dredging on bottom terrain are anticipated. In considering dredging more generally, it may be appropriate to point out that the standard fishing methods used in a number of fisheries, such as bottom trawling for finfishes and shrimp and dredging for clams, scallops, oysters and crabs, similarly impinge on many species other than the target species.

There is no evidence that incidental taking of precious corals by other fisheries is of a magnitude likely to have a serious effect on the coral resources, although admittedly there are few relevant observations on record. The only fishery at present in the region that would seem capable of having such an effect is the deep trawl fishery carried on by Japanese and Russians on the Seamounts of the central North Pacific. Only a small part of that fishery takes place within the fishery conservation zone under U.S. jurisdiction. The proposed action would not affect the current prohibition on retention of incidentally caught coral and requirement for detailed reporting of all incidental catches. These requirements are already included in the U.S. regulations for the foreign Seamount groundfish fisheries. The proposed coral fishery management measures also call for a close monitoring of the incidental catch problem

and for timely revision of the regulations if incidental catches in any area amount to as much as 50 kg annually.

Little can be said at the present time about the indirect ecological effects of precious coral harvesting, as there have been no quantitative studies of the eco-system on a coral bed before and after harvesting. However, insofar as only about 2 percent of the standing crop of pink coral will be subject to harvest in each harvesting period, it is reasonable that no more than this proportion of any other associated (obligate or not) species will be similarly affected.

The National Marine Fisheries Service has issued a biological opinion indicating that the plan is unlikely to jeopardize the continued existence of any endangered species (Appendix IV).

There may be some dredging around the Northwestern or Leeward Hawaiian Islands, which some individuals believe should be designated as a sanctuary due to its unique character and the presence of the Hawaiian monk seal, an endangered species. The U.S. Fish and Wildlife Service restricts access to the islands in the Hawaiian Islands National Wildlife Refuge, and the U.S. Navy restricts access to Midway Island. It appears that the Leeward Islands will be amply protected from disturbance. A limited amount of dredging around the Leeward Islands would not pose a significant risk to the islands' resources, especially since the location of the known Conditional Beds in this area are more than 25 miles offshore.

IV.2 Socio-Economic Impact

The socio-economic effects of the proposed action will probably not be great. The existing small domestic fishery will be permitted to continue on a scale approximating that of its operations in recent years, although there will have to be a minor reduction in the pink coral harvest from the Makapuu bed. However, the industry will be permitted to extend its operations to the known Conditional Beds, under quota limitations, or to operate in the Exploratory Areas to discover and develop new beds. The biennial quota system will facilitate the redeployment of harvesting equipment to these new areas during the anticipated extended lay-off period of the Makapuu bed. Thus the industry should continue to enjoy whatever impetus the availability of Hawaiian raw coral gives to the sale of coral products in general, and it may be able to develop additional domestic sources of raw material as a hedge against a possible future interruption of imported supplies. Maintenance of the productivity of the known beds at the MSY level should also be source of strength to the industry in the long term. It is impossible to predict whether there will actually be any domestic development of a dredge fishery within the limitations prescribed in the management plan; that will be determined by the economics of the industry. There was no prohibition on coral dredging anywhere in the region until the recent promulgation of the State of Hawaii's coral regulations, and yet there was no domestic dredge fishery since the operations on the Makapuu bed were abandoned,

apparently having been found to be unprofitable, in the 1960's. The provision permitting limited dredging, except on the Established Bed at Makapuu and other Conditional Beds in the main Hawaiian Islands, will at least leave open the possibility for island fishers to take up coral fishing with a simple technology that is within their abilities to finance and operate. There may be a feeling that the requirement that only selective fishing gear be used on the Makapuu bed confers a de facto monopoly of that bed on the only firm which is at present in a position to operate in that mode. However, the proposed management measures do leave open the opportunity for entry into the Makapuu bed by any operator who may acquire a selective harvesting craft, and the restriction appears justified by the fact that the bed has actually been under full exploitation for a number of years by selective fishing and by the consideration that this strategy allows for five times the potential production that would be permitted for non-selective fishing. Finally, the proposed action should contribute to stability of the industry and enhanced interest in investing in its expansion by clarifying the jurisdictional situation; that is, by substituting a cohesive and predictable management system for the ad hoc and ill-defined permit requirement of the Bureau of Land Management. It is not possible to predict clearly at this time how the conflicting claims to jurisdiction of the Secretary of Commerce and the State of Hawaii will be reconciled. Implementation of the fishery management plan should promote a clarification of that question as regards the resources of the Hawaiian area, and it will of course provide for the conservation of coral resources and the management of coral fisheries in other parts of the region where similar conflicts do not exist.

Even less can be said about the socio-economic impacts on foreign coral fisheries, because practically nothing is known of the past or present fishing operations by foreigners in the U.S. fishery conservation zone. Certainly the quotas prescribed for foreign fishing under permit -- 500 kg of all species combined annually in each of five major Exploratory Areas and nothing on the Established and Conditional Beds -- are minimal and cannot be critical to the economic viability of the foreign coral fleets. It is hoped that they will be sufficient to stimulate some fishing which, when reported as required, may provide the information on which inhabitants of the region can base a decision on whether to enter the coral fishery in their areas.

In considering the socio-economic impact it is pointed out that the total domestic fishery for pink and gold coral at present involves about 47 persons directly and that most of the personnel engaged in manufacturing and selling precious coral products are predominantly working with black coral and other imported raw material. The ex-vessel value of pink and gold coral landed in Hawaii in 1977 is estimated in the management plan at $262,000, and it is stated that this value is doubled when the coral is processed to the polished but unset state. In 1976, the value of retail sales of coral jewelry, both locally produced and imported, in Hawaii was estimated at $16 million, and the total of State and Federal taxes of all kinds paid by the industry was estimated at about $2 million.

V. ALTERNATIVES TO THE PROPOSED ACTION

A number of options were considered in the process of deciding to adopt the management measures described in section II.2.3. They are discussed, with the rationale for their adoption or rejection, in section IV.F.1 of the fishery management plan. The principal options considered but not adopted were as follows:

(a) Prohibition of Non-Selective Fishing Methods in All Areas

It was thought that such a prohibition would seriously inhibit the development of domestic fisheries, particularly in those areas of the region where fishery development is most needed, and it was considered that an appropriate reduction of the optimum yield when dredging is employed will prevent overfishing of the resources.

(b) Retention of Incidental Catches Permitted to Domestic Fishers

It was considered that this would be unreasonably discriminatory against foreign fishers and perhaps conducive to abuse in the form of deliberate unauthorized taking of coral under the guise of incidental catches. In fact, there is at present no domestic fishery in the region which takes coral incidentally.

(c) Prohibition of Any Incidental Taking of Coral

This would presumably amount to a prohibition of trawling for finfish in any area where precious coral is likely to be broken off by the trawl. This was deemed an unreasonable inhibition on the development of finfish fisheries, since there is no evidence that incidental taking of coral is a serious problem in such fisheries.

(d) Closed Season

Consideration was given to closing fishing during the reproductive season, which is June and July for pink coral in Hawaii. It was deemed unwarranted to close the fishery during the time of year when operating conditions (sea conditions) are optimum, in view of the long reproductive life of the organism.

(e) Royalties

A requirement that harvesters pay a royalty on their catch was discussed, since such a requirement is a feature of the management regime established for coral fisheries by the Bureau of Land Management. However, the Fishery Conservation and Management Act provides that regulations promulgated to implement fishery management plans may not require fees for domestic fishermen beyond the cost of administering the permit system. No royalty requirement is proposed. Whether royalties may be imposed under the FCMA is not clear.

(f) Limited Entry

The FCMA allows the inclusion of limited entry provisions in management plans under certain conditions, However, it was judged that the domestic fisheries for precious coral in the region are at a stage where stimulation of development is a greater need than a limitation of participation.

In general, it might have been considered that no action would be a reasonable alternative, since two management systems covering some of the same ground were already in place -- those of the State of Hawaii and the Bureau of Land Management (Department of the Interior). This would have been contrary to the spirit of the Fishery Conservation and Management Act, under which a Regional Fishery Management Council shall prepare a fishery management plan for each fishery in the fishery conservation zone of its region and submit such plan to the Secretary of Commerce for implementation. Furthermore, the regulations of the State of Hawaii can apply to only a small part of the region at best, and the regulation of the Bureau of Land Management is skeletal and does not provide a clear and comprehensive management system. The other local governments of the region have not, as Hawaii has, claimed jurisdiction over the waters where the precious corals occur, and their ability to enforce any management system for the coral fisheries beyond the territorial sea is doubtful in any case. Finally, it would not be feasible to leave the regulation of foreign fishing activities beyond the territorial sea to local government authorites.

VI. PROBABLE UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Assuming that the proposed management measures will succeed in their objective of conserving the precious coral populations at an appropriate level of productivity, the only avoidable adverse environmental effects that will probably ensue from their implementation are the impacts of dredge operations on non-target sessile organisms inhabiting the coral beds. At present there is very little basis for estimating the amount of such destruction that will result or its ecological significance. It may be comparable to analogous side-effects of other commercial fishing methods, such as coral dredging is reportedly done at slow speeds while drifting, and the catching part of the gear is a tangle of netting, its impact on any mobile organism will probably be less than that of any sort of trawl. The most probable adverse impact is the knocking down or tearing up of sessile colonial species for which the fishers have no use. The management plan concedes that dredging will waste potential precious coral production by knocking down colonies which have not reached their full growth and by failing to entangle and recover some percentage of the coral colonies that are knocked down and killed. The deleterious effect of this on conservation is compensated for by reducing catch quotas by 80% when dredging is employed. The loss in productive efficiency is considered an unavoidable trade-off for the opportunity to develop domestic precious coral fisheries where the considerable capital and advanced technology required for selective harvesting equipment

cannot be brought to bear. The risk of serious adverse impacts due to taking action without full information on the biology, and ecology of the coral beds is slight because the harvest quotas are so low. Even in a "worst case", one or two small beds might be severely damaged but not irreversibly.

Whatever changes may be wrought on the precious coral beds by the impacts of fishing under the proposed management measures, they can hardly be seen as directly affecting the human environment, because of the great depths at which the corals occur. As for any indirect adverse effects, there is no basis of data by which to identify them or evaluate them, if they exist.

VII. RELATIONSHIPS BETWEEN LOCAL SHORT-TERM USES AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

A basic objective of the fishery management plan is to achieve precious coral harvesting at a level of an optimum yield which will ensure sustained maximum productivity of the coral populations over the long-term. The assurance that this objective will be achieved is strongest in the case of the established pink coral bed at Makapuu, Oahu, because the firmest data on population parameters are available for that stock. In that case, the only departures from an ideal management strategy for the stock to accomodate local short-term use are the use of a biennial catch quota period, rather than an annual harvesting quota, and a reduction of the minimum colony size limit from approximately 11 inches to 10 inches. The results of a careful analysis of the available data, as presented in the FMP, indicate that the effects of these provisions on the maintenance of long-term productivity would be slight. On the other hand, economic considerations indicate that the fishery might not remain viable if the optimum yield had to be taken annually, because of the high overhead costs of maintaining the selective harvesting equipment and the constraints which annual seasons would place on its redeployment to other areas to develop new fisheries. The setting of the minimum size limit at 10 inches is a minor concession to current industry practice, and "rounding off" of MSY downward to 1,000 kg/year compensates for this concession.

The harvesting quotas established for the Conditional Beds and the Exploratory Areas, and the sanctioning of the use of non-selective harvesting methods in some of these areas, mean the acceptance of an apparently higher but unquantifiable degree of risk to the long-term productivity of the resources in the interest of making it possible to develop new fisheries in the short-term. The quotas for the Conditional Beds are set by extrapolating the density of coral colonies on the Makapuu bed, as well as their growth and mortality rates, to beds where their parameters have not been determined. If their values are significantly lower than for the Makapuu stock, there is a possibility that the prescribed quotas could result in overfishing that would affect the long-term productivity of the affected beds. In the

Exploratory Areas, the prescribed catch quotas are area-wide rather than bed-specific. Thus, in a given area the whole annual quota could conceivably be taken from a single bed, and if the bed were smaller or otherwise less productive than the Makapuu bed, localized overfishing could result. The management plan attempts to mitigate these risks by setting all quotas at conservative levels, prohibiting dredging in the major Hawaiian Islands including two small Conditional Beds, reducing the quotas by 80% where non-selective harvesting methods are used, and requiring constant monitoring of the results of management and periodic review of the management measures.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

No irretrievable and irreversible commitments of marine resources are expected as a result of the implementation of this fishery management plan for precious corals although admittedly there is a remote but finite biological risk. The long-term productivity of the single established fishing area, the Makapuu coral bed, should be well protected and it should not suffer even short-term reduction of productivity, since the biological characteristics of the coral populations there are reasonably well known and have been made the scientific basis of the whole management system. For the coral stocks of the Conditional Beds and the Exploratory Areas, there will be, as noted above, some degree of risk of temporary overfishing, pending the carrying out of surveys and biological studies that will permit a more accurate evaluation of their productivity. It seems highly unlikely that any exploitation of these beds would become economically infeasible before the populations were reduced below a level from which they could never recover. Careful monitoring of fishing results, including observer coverage and provisions for timely modification of management measures, as called for in the management plan, should eliminate any remaining risk of irreversible damage to resources. It must be borne in mind, however, that recovery of a severely overexploited bed of this slow growing colonial organism is believed to require a very long time, as much as 50 years according to some estimates quoted in the management plan. On the other hand, if permission to exploit any coral stock other than the Makapuu bed in the U.S. fishery conservation zone of the central and western Pacific Ocean were to be denied until research has defined the dynamics of each population and its specific productivity, any development of domestic coral fisheries in the region could also be very greatly delayed, especially in the less developed island communities where new economic alternatives are most needed and where resource surveys are prohibitively expensive.

IX. OTHER INTERESTS AND CONSIDERATIONS OF FEDERAL POLICY OFFSETTING ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

In addition to the policy considerations of generally promoting the expansion of domestic fishery industries and of fostering the economic development of U.S. island territories in the Pacific, so

that they may be more nearly self-supporting, the proposed action would contribute to realizing the policy expressed in the FCMA of promoting domestic full utilization of the fishery resources of the fishery conservation zone. Expansion of the domestic coral fisheries could also make a modest contribution to the balance of payments problem, by reducing the dependence of the coral jewelry manufacturing industry on imports of raw or semi-processed material, which at present is the bulk of their supply. More speculatively, a management strategy which encourages further development of deep submersibles and their use to explore new areas should produce incidental benefits to national ocean science and perhaps to national defense interests. The plan also provides a more consistent and uniform basis for management in the FCZ than current regulations.

X. CONSULTATION AND COORDINATION WITH OTHERS

The team which developed the fishery management plan consulted informally, as opportune, with members of the precious coral industry, and formally with an Advisory Sub-Panel of the Western Pacific Fishery Management Council's Federally chartered Advisory Panel. The Sub-Panel includes representatives of the precious coral industry and the public at large. The planning team's work was frequently reviewed and evaluated by the Council's Scientific and Statistical Committee, which includes biologists and economists from academic and government research institutions in the region, among them the fishery administration agencies of Hawaii, American Samoa and Guam. Representatives of the Outer Continental Shelf Office of the Bureau of Land Management participated in committee and panel meetings on occasion and were kept apprised of the development of the management plan throughout the process. The Western Pacific Program Office of NMFS and the 14th Coast Guard District staff, both in Honolulu, were constantly consulted in the course of development of the plan, particularly regarding mechanisms for implementation and enforcement.

XI. REFERENCES

In general this EIS is abstracted from the FMP, and references are made at several points to pertinent sections of the plan. A list of references to literature relevant to the plan, and copies of several related documents, are given in sections VI and VII of the FMP.

XII. COMMENTS RECEIVED THROUGH THE PUBLIC HEARING PROCESS AND RESPONSES

The EIS/FMP for precious corals in the Western Pacific was subjected to a 45 day public review. This review began March 9, 1979 and ended April 23, 1979. During this period, five public hearings were held as follows: in Saipan on March 14, in Agana, Guam on March 15, in Honolulu on March 21, in Lahaina, Maui on March 22, and in Pago Pago, Samoa on March 27.

A large number of comments were received during the public hearing process. A list of individuals, groups or government agencies from which oral or written testimony was received is given in the Table 1. Directly following the table is a summarized list of all substantive comments received with corresponding responses. The source(s) of the comment are indicated in parenthesis following each comment. In many instances the same or very similar comment was received by two or more sources. In such cases a single response is given but all sources of the comment are listed. In most cases the comments have been abbreviated in the interest of clarity and space. However, in all cases, care was exercised to preserve the intent and meaning of the comment.

Table I - Individuals, organizations and government agencies providing oral or written testimony on the DEIS/FMP

Individuals

Nolan Chock
Native Hawaiian Legal Corporation

Edward Henry

George Kent
Professer of Urban & Regional Planning & Political Science, University of Hawaii

James E. Maragos
Coral Ecologist

Clifford D. Slater
President, Maui Divers of Hawaii, Ltd.

Richard C. Wass
Fishery Biologist, Government of American Samoa

Organizations

Greenpeace

Life of the Land (LOL)

Sierra Club

Citizens Forum of Hawaii Costal Zone Management Program

Government Agencies

Hawaii

Office of Environmental Quality Control - Office of the Governor (OEQC)
Department of Health (SDOH)
County of Hawaii - Planning Department
Environmental Center - University of Hawaii (EC-UH)
Department of Land and Natural Resources (DLNR)
Department of Planning and Economic Development (DPED)

Federal

Department of the Army - Army Corps of Engineers (ACOE)
Department of Interior - Bureau of Land Management (BLM)
Department of Interior - Office of the Secretary (DOI)
Government of Guam

1. Comment: To expand statement on objectives to include protection and conservation of precious coral stocks. (ACOE, James Maragos)

   Response: Under Section IV-B-2 of the plan, Specific Management Objectives, items 2, 4, 5 and 8 deal directly with protecting and conserving precious coral stocks. The language of this section has been incorporated in the EIS.

2. Comment: Consider clarifying whether the plan provides for revised catch quotas for Conditional and Exploratory Beds once adequate information on coral population dynamics and site is obtained for each bed. (ACOE, Government of Guam)

   Response: If adequate information becomes available Conditional or Exploratory Beds would be upgraded to Established Beds and specific quotas would be set. This would require revision of the plan.

3. Comment: Justify why no size limits are given for gold or bamboo coral. (ACOE, Greenpeace, James Maragos, George Kent)

   Response: Estimates of growth rates, mortality rates and size at reproductive maturity are necessary before a size limit can be reliably set. These data are lacking for gold and bamboo coral.

4. Comment: Expand section on environmental impact of harvesting precious corals on other species which occupy the same habitat. Include in the discussion, other corals, crustaceans and fishes which might be impacted. (Ed Henry, ACOE, James Maragos, DOI, BLM, OEQC, LOL, Sierra Club)

   Response: Section IV-1 of the EIS and Section V-C have been revised to address more fully the impacts of dredging.

5. Comment: It is not clear how the plan will relate to the Northern Mariana Islands. (N.M.I.) (ACOE, James Maragos)

   Response: The Council has requested information from NMFS as to the procedure the Secretary will use to implement the Councils recommendations for the N.M.I. The FMP, however, proposes the same approach for the N.M.I. as for other parts of the FCZ.

6. Comment: Clarify whether weight quotas in the plan refer to only live precious coral or live and dead precious coral. (ACOE, James Maragos)

Response: Weight quotas in the plan refer to the total dry weight (at least 24 hours air dry) of live precious coral harvested. The mathematics on which the modeling efforts were based involve growth and mortality rates of live corals and by definition cannot be applied to dead corals. Further, the inclusion of dead coral in the quotas may remove any incentive for their being harvested since they are less valuable than live coral. From the standpoint of conservation, it is more desirable to harvest dead than live coral.

7. Comment: An appraisal of the error involved in estimating MSY would help determine confidence limits. (ACOE, DOI, Greenpeace, James Maragos)

Response: For estimates of growth and natural mortality mean values were used since they are considered to be the best scientific information available. For density, 95% confidence limits are given in Section III-B of the plan. The upper and lower 95% confidence limits are plus or minus 40% of the mean for pink coral. Mean values of density were also used in all estimates of MSY.

8. Comment: Suggest that a section on plan enforcement provisions be added to the EIS including an evaluation of penalties, fines, size limits, field surveillance and inspections, if applicable. (ACOE, LOL, Sierra Club, James Maragos)

Response: This is addressed in the Plan, but in general, the magnitude of enforcement will depend on the number of vessels which apply for permits to harvest coral in the FCZ. Penalties and fines would be levied under the terms of FMCA. Size limits and weight quotas would be enforced by dockside inspections. Field surveillance would be conducted through aerial and surface patrols.

9. Comment: Are there provisions in the plan to improve information on Conditional Beds and Exploratory Areas so as to insure against overharvesting of stocks? Are there specific information requirements and timetables? (ACOE, James Maragos, Ed Henry)

Response: Section IV-K of the FMP deals with future research needs. One is to upgrade Exploratory and Conditional Beds. No specific timetables are given for this.

10. Comment: Resolve conflicting statements on royalties in EIS and FMP; discuss pros and cons. (ACOE, NMFS, Ed Henry, BLM)

Response: The statements have been revised for consistency; pros and cons do not seem relevant since no fees can be collected in excess of costs to administer the Act. If the FCMA is amended to allow for royalities, an argument in favor of royalties would be that it is a common property resource. Arguments against are (1) that royalties are not currently imposed on any other fisheries

in the United States, and (2) that taxes and jobs generated by the fishery represent a fair return to the public for use of the resource. For these reasons, the Council elected not to propose a royalty on harvested coral.

11. Comment: Indicate rationale for designating only one known precious coral bed as a refuge. (ACOE, James Maragos)

Response: One out of six beds in the Hawaiian Archipelago was deemed to be reasonable to the Council. In three of the remaining known beds, non-selective methods of harvest are prohibited.

12. Comment: Provide more details on the simulation studies to estimate the efficiency of coral dredges. Is there a possibility that the estimate of 40% is too high, too low? (ACOE, LOL, DOI, Greenpeace, James Maragos, Ed Henry)

Response: More details on the simulation have been provided in Section II-C-II of the FMP. The variability of the efficiency of coral nets during actual fishing is probably greater than that indicated by simulation trials. This would be expected because of the variability in operating conditions due to weather and sea floor topography.

13. Comment: Quotas given in the plan for non-selective harvesting should be further reduced to account for the inefficiency of coral dredges. A figure of 20% of the quota using selective methods is recommended. (ACOE, DOI, EC-UH, James Maragos, Greenpeace, NMFS, LOL)

Response: The quota associated with dredging in Conditional Beds has been reduced to account for this factor. See Sections IV-C and IV-F-2.

14. Comment: The plan addresses only 3 species of precious corals in the Western Pacific. Other potential species of precious coral are not treated including black coral. This creates an administrative problem for DOI and could lead to duplication of effort since DOI would be responsible for regulating species not covered in the plan. (DOI, OEQC, BLM, Ed Henry)

Response: The plan has been revised to include all known and potential species of precious corals in the Western Pacific. (Sections II-A) Regulations regarding species not presently subject to harvest will be developed as needed on a sequential basis. Commercial species of black coral in Hawaii occur primarily inside of 3 miles. Regulations will be developed in cooperation with the state. Regulations for black corals will be incorporated into the plan on a sequential basis.

15. Comment: The use of dredging is contrary to the policy of the Department of Interior to "maintain the integrity of viable coral communities and their surrounding OCS environment". (DOI)

Response: In areas where coral dredges are allowed, weight quotas have been reduced by 80% of quotas using selective methods. The impact of taking 20% of selective quotas using non-selective gear is considered to be equivalent to the impact of using only selective gear. Hence, the quota reduction for non-selective gear serves to maintain the integrity of viable coral communities to the same extent as quotas using selective gear.

16. Comment: The allowance of dredging in the major Hawaiian Islands is contrary to State law. (DOI, DLNR - State of Hawaii, Ed Henry)

Response: The plan has been revised and is now consistent with State law. See Section IV-F.1-B.

17. Comment: The impacts of dredging on the environment have been too easily dismissed in both the FMP and the EIS. (DOI, Ed Henry, Greenpeace, James Maragos)

Response: Section IV-1 of the EIS and Section V-C of the FMP have been expanded to address more fully the impacts of dredging. Also, see response to Comments 15 and 32.

18. Comment: The research on which the plan is based is inadequate to justify the conclusions reached in the draft EIS/FMP. (DOI, Ed Henry)

Response: The plan is based on the best scientific information available. FCMA requires that estimates of MSY and OY be determined using the best scientific information available. The plan allows the placing of observers on fishing vessels that will insure more complete and accurate reporting of catch, effort, species composition, location of beds, and other important data. The plan also includes a section on topics in need of future research.

19. Comment: A bed should be closed to further fishing as soon as the quota for one species has been reached. (DOI, EC-UH, Greenpeace, Richard Wass, NMFS)

Response: Section IV-F-2 has been revised to require closing a Conditional Bed when the quota for any one species has been reached using non-selective methods.

20. Comment: The confidence limits on the standing crop of pink coral are not used to determine MSY or OY. (DOI)

Response: For estimates of growth and natural mortality mean values were used since they are considered to be the best scientific information available. For density, 95% confidence limits are given in Section III-B of the plan. The upper and lower 95% confidence limits are plus or minus 40% of the mean for pink coral. Mean values of density were also used in all estimates of MSY.

21. Comment: More concrete evidence is needed to support the assumption that growth rings in pink coral are annual. (DOI, James Maragos)

Response: More research is needed on this question. Annual growth rings have been found in shallow water gorgonians in California and the Caribbean. In Hawaii, annual growth rings are present in the black coral *(Antipathes dichotoma)*. The assumption that growth rings are annual in pink coral *(Corallium secundum)* is based on zoological similarity to other species which do have growth rings and the observation that the growth rate obtained by making this assumption is very close to estimates of growth by long-time commercial coral fishermen. A linear growth rate was used in the model of MSY because the width of the growth rings in pink coral *(Corallium secundum)* did not decrease with colony size.

22. Comment: Actual data on recruitment should be obtained since if it drops below present estimates, the plan should be revised. (DOI)

Response: It is economically infeasible to directly measure recruitment. Over the long-term, catch per unit effort data can be used to determine if the resource is being conserved. The plan requires that these data be reported.

23. Comment: There should be a discussion in the plan regarding environmental impact of harvesting precious coral on the Leeward Hawaiian Islands. (OEQC, Greenpeace)

Response: Only two Conditional Beds in the Leeward Hawaiian Islands have been designated. Both are about 25 miles from the nearest land in the Archipelago. No negative impacts of harvesting on Leeward Hawaiian Islands ecosystems are anticipated.

24. Comment: Harvesting should be prohibited for any species until growth rates and MSY levels have been determined. (OEQC)

Response: MSY levels have been estimated for those species on established and conditional beds. Information is not available to extend MSY's for other areas. The Council has judged that allowing limited dredging in exploratory areas is more likely to result in acquisition of data to estimate MSY's than is waiting for results of governmental surveys or research.

25. Comment: Other corals beside pink and gold coral are harvested from the Makapuu Bed. (OEQC, Ed Henry)

Response: The only species of precious coral harvested commercially from the Makapuu Bed are pink coral *(Corallium secundum)* and gold coral *(Gerardia sp.)*. Other species of precious and non-precious corals have been collected for scientific purposes from the Makapuu Bed.

26. Comment: The EIS lacks maps to indicate location of the coral beds. (OEQC)

Response: Maps are provided in the FMP and are referenced in Section I of the EIS.

27. Comment: What is the ecological role of precious coral? (OEQC)

Response: Sections IV-1 and V-C of the EIS have been revised to address more fully the ecological role of precious coral.

28. Comment: What is the rationale for allocating 500 kg quotas for TALFF and the domestic fishery in Exploratory Areas. (OEQC)

Response: Section IV-E has been revised to include a description of the rationale for selecting a 500 kg quota for TALFF and domestic fisheries in Exploratory Areas. The quota is for all species combined. Briefly, the rationale is to provide an economic incentive with minimum biological risk.

29. Comment: How will the plan be enforced? (OEQC)

Response: Both domestic and foreign fishers must obtain coral harvesting permits with provisions for observers and data reporting requirements. Dockside inspection and air and surface patrols will be among the enforcement activities undertaken.

30. Comment: The amount of pink, gold and bamboo coral harvested from each bed should be given in the plan. (OEQC, Ed Henry, DPED, LOL)

Response: Section II-B of the FMP has been revised to include data for beds other than the Makapuu Bed.

31. Comment: Requirements of the Bureau of Land Management, DOI for coral harvesting should be summarized in the plan. (OEQC, Ed Henry)

Response: BLM regulations are given in Appendix III of the FMP. Reference in the plan to these regulations can be found in Section III.

32. Comment: In terms of the impacts associated with dredging a "worst case" should be considered. (OEQC)

Response: Where coral dredging is allowed a "worst case" would probably result in no more than 4% of the populations of all species being destroyed in any one harvesting period. Also see response to comment 17.

33. Comment: What is the environmental impact of silt or sedimentation caused by dredging. (OEQC)

Response: The impact of siltation or sedimentation caused by dredging is unknown. However, since precious corals occur on cleanly swept hard substrates, it is not likely that this factor is of significance.

34. Comment: The quotas set for gold and bamboo coral are not considered conservative since they are based on too little information. (OEQC)

Reponse: The plan includes a section on future research needs in which the need for better data on growth, mortality and recruitment is treated. Present quotas are based on the best scientific information available. An absolute prohibition on harvesting for lack of information is considered by the Council to be arbitrary and counter to producing more information.

35. Comment: It should be noted that the State of Hawaii is currently assessing whether a State EIS is required. (OEQC)

Response: The FMP contains a Federal EIS which is intended to serve the same purpose.

36. Comment: The method of dredging should be described in the EIS. (OEQC)

Response: A reference has been added to Section II-2-3-f of the EIS indicating that Section II-C-2 of the FMP discusses dredging gear and techniques.

37. Comment: It should be noted that the submersible vessel used to harvest pink and gold coral is owned by the University of Hawaii. (OEQC)

Response: Ownership of the vessel is not considered a relevant factor in the management of the fishery, although costs of operations are consistent in the section on economics.

38. Comment: Black corals should be covered by the plan. (OEQC)

Response: The plan has been revised to include all known and potential species of precious corals in the Western Pacific. (Sections II-A) Regulations regarding species not presently subject to harvest will be developed as needed on a sequential basis. Commercial species of black coral in Hawaii occur primarily inside of 3 miles. Regulations for black corals will be incorporated into the plan on a sequential basis.

39. Comment: What is the basis for the annual harvest of 3,200 kg for the fishery? (OEQC)

Response: The figure of 3,200 kg given in Section II-D-2 of the FMP refers to annual harvest capacity of the fishery, not values of actual harvest given in Table II of the FMP.

40. Comment: The figures relating to the tax base of the industry are taken from an article in the Honolulu Advertiser (9-7-77). Tax figures should be based on data in the FMP. (OEQC, NMFS)

Response: Tax figures in the FMP are based on information provided by Clifford Slater, President of Maui Divers of Hawaii, Ltd. and represent his best estimate for the industry in 1976. The Council judges this to be the best information available.

41. Comment: In the FMP, the Hawaii State Regulation 41 is described as providing a quota and permit system for pink and gold coral. This is misleading since a quota is only specified for pink coral. (OEQC)

Response: Section II-G of the FMP has been revised to more accurately portray Regulation 41.

42. Comment: Unless growth rates are known for gold and bamboo corals, how can mature colonies be identified? (OEQC)

Response: Maturity can be based on size but the relationship between maturity and size and age is unknown for gold and bamboo coral. For this reason size or age limits for gold and bamboo corals are not recommended in the plan.

43. Comment: How will the plan be enforced? (OEQC)

Response: Both domestic and foreign fishers must obtain coral harvesting permits with provisions for observers and data reporting requirements. Dockside inspection and air and surface patrols will be among the enforcement activities undertaken.

44. Comment: Why are only 3 species of precious coral covered by the plan? (OEQC)

Response: The plan has been revised to include all known and potential species of precious corals in the Western Pacific. (Sections II-A) Regulations regarding species not presently subject to harvest will be developed as needed on a sequential basis. Commercial species of black coral in Hawaii occur primarily inside of 3 miles. Regulations will be developed in cooperation with the state. Regulations for black corals will be incorporated into the plan on a sequential basis.

45. Comment: The FMP/EIS should discuss any proposed discharges or solid waste disposal facilities necessary to implement the plan. (State of Hawaii, Department of Health)

Response: No proposed discharges or solid waste disposal facilities are necessary to implement the plan.

46. Comment: The plan incorrectly states that the relationship of the proposed action to coastal zone management cannot be determined because CZM plans for the region have not been completed. (Hawaii County-Planning Dept., DLNR- State of Hawaii, James Maragos, LOL, Sierra Club, NMFS, Ed Henry)

Response: When the draft was prepared no CZM plans were completed for the Western Pacific region. A Hawaii CZM plan is now available. A determination of Federal consistency with the Hawaii CZM plan has been made and included in Section V-B of the FMP. It is concluded that the objectives of the Hawaii CZM plan and the precious coral FMP for the Western Pacific are in no way contradictory.

47. Comment: The plan should describe mitigating measures in support of developing both a precious coral industry and a manganese mining industry. (Hawaii County-Planning Dept.)

Response: The Council or NOAA/NMFS have no authority to control or manage manganese mining.

48. Comment: The FMP should provide for an ongoing study to determine the ecological effect of coral harvesting, i.e. monitoring. (Hawaii County-Planning Dept., George Kent, Greenpeace, NMFS)

Response: The need for research on this topic is mentioned in Section IV-k of the plan. However, FMP's cannot "provide" for research.

49. Comment: A more definitive evaluation of the destruction caused by dredging should be made including an assessment of alternative harvesting technologies such as unmanned systems. (DPED-State of Hawaii, Ed Henry)

Response: The first point has been partially addressed in comment 4. No destruction of the bottom substrata is anticipated from dredging. Observations from the submersible Star II of areas previously dredged support this conclusion. An assessment of alternative technologies is beyond the scope of the FMP, although research needs have been recognized in Section IV-k.

50. Comment: The plan should specifically address the ecological role played by deep water coral communities. (DPED-State of Hawaii, Ed Henry, James Maragos)

Response: Section III-A has been expanded to more fully address the ecological role of deep water precious corals. See response to comment 4.

51. Comment: The plan should address possible adverse environmental and economic impacts of managing Conditional Beds on the basis of analagous information from the Makapuu Bed. (DPED-State of Hawaii)

Response: The impacts of dredging and the risks associated with management based on limited data are discussed in Section IV of the EIS.

52. Comment: Would not restricting a portion of each coral bed be better than establishing refugia? (DPED-State of Hawaii)

Response: This may be true in theory but would be virtually impossible in practice. Enforcement would also be cumbersome.

53. Comment: The plan should include black coral. (DPED)

Response: The plan has been revised to include all known and potential species of precious corals in the Western Pacific. (Sections II-A) Regulations regarding species not presently subject to harvest will be developed as needed on a sequential basis. Commercial species of black coral in Hawaii occur primarily inside of 3 miles. Regulations will be developed in cooperation with the state. Regulations for black corals will be incorporated into the plan on a sequential basis.

54. Comment: The plan should document and evaluate past research on precious corals in the Hawaiian Islands. (DPED)

Response: All pertinent available data on precious corals have been used in developing the plan. Also see response to comment 30.

55. Comment: A size limit should be set for all species of precious corals which are subject to harvest. (DPED)

Response: Biological information is inadequate for gold and bamboo coral to set a size limit. Also see response to comment 3.

56. Comment: The plan should be compared to the State CZM plan for consistency. (DPED)

Response: When the draft was prepared no CZM plans were completed for the Western Pacific region. A Hawaii CZM plan is now available. A determination of Federal consistency with the Hawaii CZM plan has been made and included in Section V-B of the FMP. It is concluded that the objectives of the Hawaii CZM plan and the precious coral FMP for the Western Pacific are in no way contradictory.

57. Comment: the plan should assess the State of Hawaii's Archipelagic claim with regard to precious coral management. (DPED)

Response: The conflict between the State of Hawaii and the Federal Government over jurisdiction of interisland waters beyond 3 miles is addressed in the Section on CEM in the FMP (Section 5-B).

58. Comment: Precious corals should be considered as part of an entire ocean community in terms of management. (DPED)

Response: The WPRFMC recognizes that fishery management must be viewed within the context of overall ocean resource management.

59. Comment: Extrapolation of the Makapuu data to Conditional Beds is subject to an extreme high degree of uncertainty, especially since beds are considered separate units. (EC-UH, Ed Henry, Sierra Club)

Response: The uncertainty associated with extrapolation of Makapuu Bed data is recognized in the EIS/FMP.

60. Comment: Quotas for Conditional Beds where non-selective methods are allowed should be reduced by 60%. (EC-UH)

Response: The quota associated with dredging in Conditional Beds has been reduced. See Sections IV-C and IV-F-2.

61. Comment: In a Conditional Bed where non-selective methods are allowed, the bed should be closed when the quota of any one species is reached. (EC-UH)

Response: Section IV-F-2 has been revised to require closing a Conditional Bed when the quota for any one species has been reached using non-selective methods.

62. Comment: If Conditional Beds are opened to fishing the plan should mandate that an assessment of their standing stock be made. (EC-UH)

Response: Such a mandate is not legally possible. However, catch records provided by fishermen would assist in such an assessment.

63. Comment: Have methods other than dredging and submersibles been considered in the plan? (EC-UH, Ed Henry)

Response: The first point has been partially addressed in comment 4. No destruction of the bottom substrata is anticipated from dredging. Observations from the submersible Star II of areas previously dredged support this conclusion. An assessment of alternative technologies is beyond the scope of the FMP, although research needs have been recognized in Section IV-K.

64. Comment: Harvest should be managed to prevent future collapse of the industry. (Greenpeace)

Response: One objective of the plan is to obtain optimum yield on a continuing basis; another is to prevent overfishing.

65. Comment: The Northwestern Hawaiian Islands including all precious coral beds in the area should be considered an ecosystem sanctuary. (Greepeace)

Response: See response to comment 23. Further, the Council received from NMFS a biological opinion that the proposed action is not likely to jeopardize the continued existence of any endangered species, including the Hawaiian monk seal. That opinion has been attached to the FMP. Inasmuch as access to the Hawaiian Islands National Wildlife Refuge and Midway Islands is strictly controlled, human disturbance to the Leeward Islands is unlikely under this FMP. The Council has no authority to designate an ecosystem sanctuary.

66. Comment: The Makapuu Coral Bed has been overexploited since the data on which the plan is based were collected. New data are needed. (Greenpeace, Ed Henry)

Response: New data would be useful. While levels of exploitation in the Makapuu Bed exceeded MSY in 1974, 1975 and 1977, this does not mean the bed has been over-exploited. During the initial years of a virgin fishery levels greater than MSY are often obtained. Also, the FMP will establish a basis for preventing overfishing in the future and collection of additional data to determine whether any changes in harvest levels or techniques are needed.

67. Comment: No size limit is set for gold and bamboo coral. This is not conservative policy. (Greenpeace, George Kent)

Response: See response to comment 3, 34 and 42.

68. Comment: Further study of gold and bamboo coral is needed before safe quotas can be set. (Greenpeace)

Response: Research needs are discussed in Section IV-k of the plan. It is believed that by allowing controlled harvest of gold and bamboo coral, better data will be provided. See responses to comments 3, 34, 42 and 67.

69. Comment: In a Conditional Bed where non-selective methods are allowed, the bed should be closed when the quota of any one species is reached. (Greenpeace)

Response: See responses to comments 19 and 61.

70. Comment: Foreign fishing may have depleted some Conditional Beds in the past and should be taken into account. (Greenpeace)

Response: Foreign fishing may have occurred, but the foreign harvest of precious corals is undocumented in the FCZ.

71. Comment: More data are needed to effectively manage precious corals. (Greenpeace)

Response: The need for research is recognized. The FCZ in the central and western Pacific Ocean, however, covers about 1.5 million square miles. Locating and assessing corals stocks in this area would be prohibitively expensive if left solely to government agencies. It is hoped that providing the opportunity to catch and retain a limited amount of corals will induce domestic and foreign vessels to carry out at least some exploratory activities. If and when beds are identified, stock assessment would be a high priority research task. See response to comment 9.

72. Comment: Dredging is wasteful and should be disallowed. (Greenpeace, Ed Henry, BLM, DLNR)

Response: See response to comment 15.

73. Same as comment 65. (Sierra Club)

74. Comment: Precious coral harvesting should be banned in all Conditional Beds and Exploratory Areas. (Greenpeace, BLM, OEQC, George Kent)

Response: The Council believes that a ban on harvesting in all Conditional and Exploratory Beds is not warranted.

75. Comment: A moratorium should be placed on the harvesting of precious coral in the Makapuu Bed until further notice. (Greenpeace)

Response: A moratorium on corals harvesting at Makapuu Bed is not necessary at this time. The FMP will control against overfishing.

76. Comment: If the plan is not amended, no dredging should be allowed anywhere. (DOI, Sierra Club, Greenpeace, Ed Henry, BLM, DLNR, NMFS, LOL)

Response: Allowance of limited dredging may result in location of new beds which subsequently may be set aside for selective harvest. See responses to comments 17 and 32.

77. Comment: If dredging is allowed quotas should be reduced. (Greenpeace)

Response: This has been done. See comments 13, 15 and 60.

78. Same as comment 69.

79. Comment: The quotas for Makapuu should be lowered to take into account past harvesting. (Greenpeace, Ed Henry)

Response: The consequences of past harvesting in the Makapuu Bed have been considered (See Figure 19). According to the model, an annual yield of 1,000 kg of pink coral is sustainable over the long-term.

80. Comment: The public should have access to all information regarding enforcement and monitoring of the plan. (Greenpeace, Ed Henry)

Response: Enforcement and monitoring data will be released to the public to the extent permitted by the FCMA and other law.

81. Comment: An immediate effort should be taken to gather new data on several aspects of the plan. (Greenpeace)

Response: Research needs are discussed in Section IV-k of the plan.

82. Comment: Harvest quotas using non-selective methods should be reduced from 50% to 20% of quotas for selective methods. (James Maragos)

Response: This has been done. See comments 13 and 15.

83. Comment: The acquisition of information by fishermen should be a requirement of the plan. (James Maragos)

Response: All catch data and other information (outlined in Section IV-F-2) must be reported.

84. Same as comment 83. (Sierra Club)

85. Comment: More discussion on royalties, fees, fines and penalties and other measures is needed. (James Maragos)

Response: The discussion in the plan on royalties has been revised. More information on enforcement measures will be contained in the regulations.

86. Comment: The protection of precious coral stocks should be an objective of the plan. (James Maragos)

Response: It is. See response to comment 1.

87. Comment: A complete listing of U.S. Pacific Island possessions revised accordingly should be included in the plan. (James Maragos)

Response: The FMP has been revised accordingly. (Section II-A)

88. Comment: Clarify how quotas for Conditional Beds or Exploratory Areas will be revised once adequate informtaion is obtained. (James Maragos)

Response: See response to comment 2.

89. Comment: The justification for not setting size limits on gold and bamboo coral is not adequate. (James Maragos)

Response: See responses to comments 3, 34 and 42.

90. Comment: In the EIS a more balanced discussion is needed between economic and environmental impacts. (James Maragos)

Response: The discussion on environmental impacts has been revised.

91. Comment: What is the timetable for including the Northern Marianas in the plan? (James Maragos)

Response: See response to comment 5.

92. Comment: More justification is needed for the reduction of yields using non-selective methods. (James Maragos)

Response: See response to comment 13.

93. Comment: Is the differentiation between live and dead coral a pertinent management consideration? (James Maragos)

Response: Live and dead coral can be distinguished by a trained enforcement officer. See response to comment 6.

94. Comment: Conditional Beds should be listed in the EIS. (James Maragos)

Response: A list is provided in the FMP. The EIS/FMP will be published as one document.

95. Comment: Why is the NMI included in some parts of the plan and not in others? (James Maragos)

Response: The FMP recommendations for the Northern Marianas Islands are intended to be complete.

96. Comment: The distinction between a bed and an area needs to be clarified. (James Maragos)

Response: Sections II-2-3b of the EIS and IV-F-2 of the FMP have been revised to clarify the distinction.

97. Comment: How accurate are the areas of Conditional Beds? (James Maragos)

Response: Area estimates are conservative because they are based on few dredge hauls. Beds probably include some unsurveyed surrounding area.

98. Comment: How will size limits be enforced? (James Maragos)

Response: Dockside examination of the catch will be the primary means of enforcement. One method is described in Section IV-F-1 of the FMP.

99. Comment: Will the number of vessels that acquire precious coral in incidental catch be sufficiently large as to warrant more stringent guidelines? (James Maragos)

Response: There are no documented instances of incidental coral harvest by trawlers and the probability is low that significant increases will occur in the near future.

100. Comment: A section on enforcement should be included in the EIS. (James Maragos)

Response: A section on regulations will be developed by the NMFS in cooperation with the Coast Guard. See responses to comments 8 and 9.

101. Comment: The term human environment includes the environmental and scientific value of precious coral. (James Maragos, Sierra Club)

Response: This is implicit in both the EIS and FMP.

102. Comment: Accurate information on population size should be obtained before exploitation is allowed. (James Maragos, DOI)

Response: The Council believes its proposals to be sufficiently conservative that risk of significant environmental damage is slight.

103. Comment: The statement in the EIS that the dredge is the harvesting device used in all coral fisheries of the world needs revision. (James Maragos)

Response: The statement has been revised.

104. Comment: More discussion is needed on the importance of precious coral as a habitat for other species. (James Maragos)

Response: Section IV-1 of the EIS and Sections III-A and V-C of the FMP have been revised accordingly.

105. Comment: The basis for rejecting royalties is vague. (James Maragos)

Response: The section on royalties has been revised to clarify why they are not recommended. See response to comment 10.

106. Same as comment 105.

107. Comment: The impact of loss of habitat for associated species caused by harvesting precious coral needs to be discussed. (James Maragos)

Response: See response to comment 15. Sections IV-1 of the EIS and III-A of the FMP have been revised accordingly.

108. Comment: It should be stated that there is a remote possibility of irreversible and irretrievable damage due to dredging. (James Maragos)

Response: This is implicit in the use of the term biological risk.

109. Comment: The statement "that dredging is prohibited in all areas where selective harvesting is current" is misleading since there is only one such area. (James Maragos)

Response: The statement is intended as general policy.

110. Comment: Why is only one bed designated as a refuge? (James Maragos)

Response: See response to comment 11.

111. Comment: How accurate and precise are the estimates of dredging efficiency of 40%. (James Maragos)

Response: Only simulated trials have been conducted in shallow water. The range of 5 trials was 35 to 44%. Research needs on this subject are described in Section IV-K of the FMP. See also the response to comment 12.

112. Comment: Dredging quotas should be reduced from 50% to 20% of quotas for selective methods. (James Maragos)

Response: The FMP has been revised in compliance with this recommendation. See response to comment 13.

113. Same as comment 112. (LOL)

114. Comment: The accuracy and confidence limits on the standing crops of Conditional Beds should be given. (James Maragos)

Response: See response to comment 97. Area is based on cumulative dredge hauls.Therefore variance and confidence limits can't be calculated.

115. Comment: Stock assessment should precede harvesting. (James Maragos, Ed Henry)

Response: The ideal situation would be to fully assess the virgin stocks. As a practical matter, however, it is necessary to identify beds and their sizes before detailed assessments can be made. Placing limits on the amount which may be taken by dredge provides a balance between no exploitation producing no data and limited harvest based on incomplete data. See Section IV-D of the FMP.

116. Comment: Clarify purpose of using the equivalent of a 10 inch size limit for pink coral. (James Maragos)

Response: Pink coral is broken during collection.

117. Comment: Explain the implications of using wet or dry weight for the quota for pink coral. (James Maragos)

Response: Data in the model are based on dry weight (at least 24 hours air dry).Therefore, dry weight should be used for setting the quota and enforcement.

118. Same as comment 111. (James Maragos)

119. Comment: The State CZM plan has been approved. (James Maragos)

Response: See response to comment 46.

120. Comment: It should be stated that a good plan will also be beneficial to foreign fishermen. (James Maragos)

Response: This is implicit in the plan, but Section V-F has been revised accordingly.

121. The plan should include royalties on harvested coral. (Ed Henry, James Maragos, George Kent, BLM, LOL)

Response: See response to comment 10.

122. Comment: The plan should disallow TALFF in Exploratory Areas. (Government of Guam, DLNR)

Response: The TALFF is provided in Exploratory Areas because it is likely there exists a surplus in these areas and because the reporting requirements of foreign fishing permits would be a source of new information on the resource.

123. Comment: The plan should contain provisions for Hawaiian or other native rights. (Nolan Chock)

Response: The plan has been revised to provide for amendment if such rights can be identified.

124. Comment: A moratorium should be placed on all coral harvesting until more research is done and an acceptable plan is implemented. (Greenpeace, DOI)

Response: If the revised plan is accepted this should satisfy the intent of this comment. Future research needs are outlined in the plan.

125. Comment: Coral harvesting should be accomplished with technology more sophisticated than in current use. (Ed Henry)

Response: Research needs on all aspects of precious corals are discussed in Section IV-k of the plan. The Star II submersible is considered to be an example of sophisticated technology by the Council. See response to comment 49.

126. Comment: Catch data provided in the plan may be in error. (Ed Henry)

Response: Catch data provided in the plan agrees with catch records on file at the Division of Fish and Game, DLNR, State of Hawaii.

127. Comment: The plan should contain instructions for concerned citizens how they may obtain coral harvesting data. (Ed Henry, LOL) - Data

Response: Concerned citizens may obtain such instructions by calling or writing the Western Pacific Regional Fisheries Management Council, 1164 Bishop Street, Room 1608, Honolulu, Hawaii, 96813, (808)523-1368. Data submitted with this plan will be confidential, but aggregate summary data may be released if the identity of institutions or firms cannot be determined from such data.

128. Comment: Maui Divers of Hawaii, Ltd. should be required to file an environmental assessment. (Ed Henry)

Response: An environmental impact statement which covers the activities of this firm is part of the EIS/FMP on precious coral fisheries of the Western Pacific.

129. Comment: A statement on domestic processing capabilities should be included in the plan. (NMFS)

Response: Section IV-E has been revised accordingly.

130. Comment: A permanent reserve for domestic fishing in Exploratory Areas may violate the national standards of the FCMA. (NMFS)

Response: The rationale for this approval is described in Section on the FMP, and the council believes it is consistent with mature standards. An approach for a domestic test fishery and foreign research fishing is suggested as an alternate to a domestic reserve.

131. Comment: Additional justification for pulse fishing is needed. (NMFS)

Response: The Council feels this question has been adequately treated in the plan. In this connection eleven (11) options were considered before choosing a biannual catch quota.

132. Comment: The fishermen should be bonded. (Ed Henry)

Response: Since bonding is ordinarily used for contract work the Council rejected this suggestion.

133. Comment: Dredging is unacceptable. (Ed Henry)

Response: See responses to comments 76, 17 and 32.

134. Comment: The mathematic model used in the plan is inappropriate and should be re-evaluated, and if determined inaccurate should be removed from consideration. (Ed Henry)

Response: All assumptions used in the model have been stated. A yield production model is used because it provides an estimate of MSY, a requirement of the FCMA. Data that might be used for other types of models are lacking.

135. Comment: WesPac Refuge should not be referred to as a Conditional Bed. (NMFS)

Response: The plan has been revised accordingly.

136. Comment: The section on economies should be revised to reflect the importance of local production in Hawaii. (NMFS)

Response: The plan has been revised in accordance with this comment.

137. Comment: Any waters tranversed by humpback whales should be part of the proposed refugia. (Sierra Club)

Response: This would in effect stop all coral fishing activity in the Hawaiian Islands and is considered to be unreasonable.

138. Comment: Catch per unit effort data could remain at high levels until an entire bed was destroyed and hence may not be a good measure by which to monitor the fishery. (DOI)

Response: In the case of harvest using a submersible, midwater currents are so variable during launch and descent to the bottom that a strategy of systematic search is not feasible. Weight quotas and size limits (where they apply) are designed to prevent overharvest.

50 CFR Parts 611, 662, and 680

Precious Corals Fishery; Proposed Regulations

AGENCY: National Oceanic and Atmospheric Administration/ Commerce.

ACTION: Proposed regulations.

SUMMARY: The purpose of this announcement is to publish the Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region (FMP) prepared and submitted by the Western Pacific Fishery Management Council and to solicit comments on the proposed regulations for domestic fishing that will implement the FMP. The FMP was approved by the Secretary of Commerce on May 20, 1980, pursuant to the Fishery Conservation and Management Act of 1976.

DATE: Comments are invited until ~~October 30, 1980.~~ Nov. 15, 1980

ADDRESS: Comments should be addressed to: Denton R. Moore, Chief, Permits and Regulations Division, National Marine Fisheries Service, 3300 Whitehaven Street NW., Washington, D.C. 20235. Telephone (202) 634–7432.

FOR FURTHER INFORMATION CONTACT: Alan W. Ford, Regional Director, Southwest Region, National Marine Fisheries Service, 300 S. Ferry Street, Terminal Island, CA 90731. Telephone 213–548–2575, or Mr. Doyle E. Gates, Administrator, Western Pacific Program Office, Southwest Region, P.O. Box 3830, 2570 Dole Street, Honolulu, HI 96812. Telephone 808–946–2181.

SUPPLEMENTARY INFORMATION: The Fishery Conservation and Management Act of 1976, Pub. L. 94–265, as amended, 16 U.S.C. 1801 et seq. (the "Act"), authorizes the Secretary of Commerce (the "Secretary") to promulgate regulations implementing approved FMPs prepared by the Regional Fishery Management Councils for their geographic areas of concern.

Pursuant to Title III of the Act, the Western Pacific Fishery Management Council prepared and submitted to the Secretary an FMP for precious corals in the fishery conservation zone (FCZ) of the central and western Pacific Ocean seaward of American Samoa, Guam, and Hawaii. The FMP was approved by the Assistant Administrator for Fisheries pursuant to an appropriate delegation of authority from the Secretary.

The FMP covers domestic and foreign fishing for species of precious corals in the FCZ of the western Pacific region. Precious corals are characterized by great longevity, slow growth, and relatively low rates of mortality and recruitment. Beds of precious corals are most often found in deep water (300–500 m.) on solid substrate where bottom currents are frequently strong. Only six beds of precious corals have been located, all in the Hawaiian Islands chain, other beds are almost certain to exist within the FCZ.

The FMP establishes a set of conservation and management measures designed to achieve a balance between protection of coral resources by limitations on harvest, and identification of beds and assessment of yield potentials by allowing a harvest.

Management Area Categories. Four categories of management areas are designated.

1. Established Beds are coral beds which have been surveyed and observed and for which estimates of maximum sustainable yield (MSY) are reasonably precise. Only selective gear would be permitted on an Established Bed. There would be one Established Bed at the initial implementation of the FMP (i.e. the Makapuu Bed), but new established beds could be designated as better dat. become available.

2. Conditional Beds are coral beds for which MSY's can be estimated by comparing their size relative to the Makapuu Bed. It is assumed that the conditions at Makapuu are representative of conditions at all other beds. There would be four Conditional Beds initially. Selective gear would be required at two small Conditional Beds. Non-selective gear could be used at the other two Conditional Beds.

3. Refugia are specific beds which are set aside to serve as baseline study areas and possible reproductive reserves. On refugium is identified initially. No coral harvesting would be permitted on Refugia Beds.

4. Exploratory Permit Areas are the unexplored portions of the FCZ in which coral beds are almost certain to exist but no beds have yet been located. There are three such areas: the portion of the FCZ seaward of American Samoa, Guam, and Hawaii, respectively. Selective or non-selective gear could be used except in the part of the Exploratory Area off the main Hawaiian Islands, i.e., south and east of a line midway between Niihau and Nihoa Islands.

The regulations define areas around beds within which selective gear would be required. These areas are larger than the beds so enforcement by aerial and vessel surveillance can be effective.

The FMP provides that as new beds are located and data become available for more accurate or precise determinations of MSY and optimum yield (OY), beds may be upgraded from Conditional or Established categories with appropriate gear restrictions.

Optimum yield. OY's and quotas are established by management area category. Except at the Makapuu Bed, where OY is established for a two-year period, OY's are set for one year

seasons from July 1 through the following June 30.

Quotas. Specific quotas are set forth in Table I of these regulations. It should be noted that. at the Conditional Beds where non-selective gear is permitted. the OY's for non-selective gear would be only one-fifth (20%) of the quota if selective gear were used. This is to account for the harvest of immature colonies and for the loss of colonies knocked down but not recovered by non-selective gear. If both selective and non-selective methods are used on a Conditional Bed. that Bed would be closed if the sum of the selective harvest plus five (5) times the non-selective harvest of any single species reaches the quota for that species: i.e.. if S + 5N = Q. where S = selective harvest of a species. N = non-selective harvest of that species. and Q = quota for that species on a Conditional Bed. that bed will be closed. A Conditional Bed will be closed to further fishing when the quota for any single species is reached if non-selective gear is used. to prevent overfishing of that species. Exploratory Areas will be closed to further fishing when the total quota is reached. irrespective of the species composition of the catch.

Permits. Vessels of the United States must have permits to engage in fishing for corals. Permits are area-specific and fishing may be conducted only under one permit at a time. Permits are obtained at no cost from the Regional Director.

Foreign Fishing. The FMP provides allowance for foreign fishing in Exploratory Areas. up to a maximum of 1000 kg. all species combined. per area. per year. so long as one-half of the quota has not been taken by domestic fishing at the midway point of the fishing year. Regulations for foreign fishing within the FCZ under this FMP have proposed in the form of amendments to Part 611. Foreign Fishing Regulations.

Reporting Requirements. Permit holders will maintain a log of their daily fishing operations and will submit to the Regional Director within 72 hours of landing coral. a copy of the logbook forms pertaining to each species of precious coral landed.

Size Limitation. Pink coral colonies harvested from the Makapuu. Kaena Point and Ke-ahole Beds must be 10 inches or greater in height. This is to insure that yield per recruit will be high and that the productive potential of the colonies will be realized. No other size limits are proposed.

Incidental Harvest. A vessel may not retain any precious corals harvested incidental to other fishing operations unless the vessel has a permit to harvest corals in the applicable area. Such catches must be reported to the Regional Director and will be counted against the applicable quota.

Northern Mariana Islands and U.S. Possessions. The FMP contains recommendations for Secretarial action to implement similar and consistent conservation and management areas for the FCZ seaward of the Commonwealth of the Northern Mariana Islands and U.S. Possessions in the Western Pacific Region. These areas are outside the Council's geographic area of responsibility. No regulations are proposed at this time.

All interested parties are encouraged to submit written comments. or data concerning the FMP and these proposed regulations. which would implement the approved plan. Comments relating to problems in implementing this management plan are particularly encouraged. Comments may be submitted to the Assistant Administrator for Fisheries. NOAA. 3300 Whitehaven Street NW.. Washington. D.C. 20235. All such submissions received before October 30. 1980. will be considered before final action is taken on the implementing regulations.

A notice of availability of the final Environmental Impact Statement associated with this FMP was published January 28. 1980 (45 FR 6472).

Note.—The Assistant Administrator has determined that this is a significant action under Executive Order 12044. and a draft regulatory analysis has been provided to the Chief Economist of the Department of Commerce. and can be obtained from the Regional Director. whose address is listed above.

The Precious Corals Fishery FMP is set forth following the proposed amendments.

Authority: 16 U.S.C. 1801 *et seq.*

Robert K. Crowell,

Deputy Executive Director. National Marine Fisheries Service.

PART 611—FOREIGN FISHING

Foreign Fishing Regulations

It is proposed to amend 50 CFR Part 611 as follows:

§ 611.20 Appendix I [Amended]

A. Amend Appendix I to Section 611.20 as follows:

Appendix 1

Species	Species code	Areas	OY	DAH	DAP	JVP = (DAH – DAP)	DNP	Reserve	TALFF
) Western Pacific Ocean Fisheries:									
C. Precious corals fishery (precious coral)	682	Hawaii	1.0	0	0	0	0	1.0	0
		Guam	1.0	0	0	0	0	1.0	0
		American Samoa	1.0	0	0	0	0	1.0	0

B. Add new § 611.82 as follows:

§ 611.82 Precious coral fishery.

(a) *Purpose* This section regulates foreign fishing under a Government International Fishery Agreement for precious corals within the United States fishery conservation zone (FCZ) seaward on Hawaii. Guam. and American Samoa.

(b) *Authorized fishery.*

(1) Allocations. Foreign vessels may engage in fishing only in accordance with applicable national allocations.

(2) *TALFF and reserves.* The total allowable levels of foreign fishing (TALFF's) for the precious coral fishery are set forth in Appendix I to § 611.20.

(3) The quotas for Exploratory Areas shall be held in reserve for harvest by vessels of the United States in the following manner:

(i) At the start of the fishing year (July). the reserve for each Exploratory Area shall equal the quota minus the

expected domestic annual harvest for that year.

(ii) As soon as practicable after December 31 each year, the Regional Director shall determine the amount harvested by vessels of the United States between July 1 and December 31 of that year.

(4) The Regional Director shall releases to TALFF an amount of coral equal to 1.000 kg. minus two times the amount harvested by vessels of the United States in that July 1–December 31 period.

(5) The Regional Director shall publish in the **Federal Register** a notice of his determination and a summary of the information on which it is based as soon as practicable after the determination is made.

(c) *Species definitions.* The term precious coral means any of the following species of coral:

Pink coral (also known as red coral)	*Corallium secundum.*
Pink coral (also known as red coral)	*Corallium regale.*
Pink coral (also known as red coral)	*Corallium laauense.*
Gold coral	*Gerardia sp.*
Gold coral	*Calligorgia gilberti.*
Gold coral	*Narella sp.*
Gold coral	*Calyptrophora sp.*
Bamboo coral	*Lepidisis olapa.*
Bamboo coral	*Acanella sp.*

(d) *Effort restrictions.* None.

(e) *Open season.* Foreign fishing authorized under this subpart may be conducted throughout the year until the national allocation has been reached. This fishery will be closed in accordance with § 611.15.

(f) *Prohibited species.* All species of fish over which the United States execises fishery management authority and for which there is no applicable national allocation are prohibited species and shall be treated in accordance with § 611.13.

(g) *Open area.* Foreign vessels may engage in fishing for precious corals in the United States FCZ seaward of Hawaii, Guam, and American Samoa, except in those coral beds designated in § 611.82(h).

(h) *Closed areas.* The following precious coral beds are closed to all foreign fishing:

	Midpoint
(1) Ke-ahole Point, Hawaii	19°46.0'N., 156°06.0'W
(2) Makapuu, Oahu, Hawaii	21°18.0'N., 157°35.5'W
(3) Kaena Point, Oahu, Hawaii	21°35.4'N., 158°33.9'W
(4) WestPac Bed	23°18.0'N., 162°35.0'W
(5) Brooks Banks	24°06.0'N., 166°48.0'W
(6) 180 Fathom Bank, N.W. of Kure Atoll	28°50.2'N., 178°53.4'W

This closure shall include an area covered by a two nautical mile radius from the midpoint of each coral bed.

(i) *Gear restrictions.* No foreign vessel fishing for coral may use gear other than:

(1) dredges with tangle nets; or

(2) selective gear. Selective gear means gear which can be used to harvest coral selectively by differentiating as to type, size, quality, or other characteristics.

(j) *Collection, maintenance and reporting of data.* In addition to the requirements of § 611.9, each foreign nation or foreign fishing vessel shall collect, maintain, or report on a timely basis, accurate data relating to fishing operations as specified in this section. All submissions required by this section shall be sent to the Regional Director, Southwest Region, National Marine Fisheries Service, 300 South Ferry Street, Terminal Island, CA 90731, or, in the case of logbook data, shall be hand delivered to the National Marine Fisheries Service observer (if an observer is on board the vessel) upon his request. The following log and reports are required:

(1) Whenever a permitted vessel delivers coral harvested under a permit, the permittee shall within 72 hours mail to the Regional Director a copy of the log with complete harvest information for the coral sold or delivered including:

(i) Name of vessel;
(ii) Call sign of vessel;
(iii) Permit number of vessel;
(iv) Area fished;
(v) Depth of water;
(vi) Weight of coral harvested by species (landed weight, air dried for at least 24 hours);
(vii) Fishing effort in hours;
(viii) Dates of harvest;
(ix) Method of harvest;
(x) Observations that may be made about the habitat (current, botton type, bottom topography, bottom slope);
(xi) Amount of coral sold by species;
(xii) Sale price;
(xiii) Date of sale; and
(xiv) Name of buyer.

(2) Annual report. Each nation whose vessels engage in the precious coral fishery shall submit by November 30 of the following fishing year, annual catch and effort statistics as follows: (i) Catch in kg by gear type by month by area to the nearest one-half degree (0.5°) latitude and by one degree (1°) longitude, by the following species groupings: pink (red), gold, bamboo, other precious coral and non-precious coral; and (ii) effort, in hours fished by month by area to the nearest one-half degree (0.5°) latitude and one degree (1 longitude.

2. It is proposed to add a new Part 68 to Title 50 CFR as follows:

PART 680—DOMESTIC PRECIOUS CORAL REGULATIONS

Subpart A—General Provisions

Sec.
680.1 Purpose and scope.
680.2 Relation to State laws.
680.3 Definitions.
680.4 Area designations.
680.5 Permits.
680.6 Recordkeeping and reporting.
680.7 Vessel information.
680.8 Prohibitions.
680.9 Enforcement.
680.10 Penalties.

Subpart B—Management Measures

680.20 Catch limitations.
680.21 Precious coral size limits.
680.22 Closures.
680.23 Area restrictions.
680.24 Gear restrictions.
680.25 Test fisheries (Reserved).

Subpart A—General Provisions

§ 680.1 Purpose and scope.

(a) The purpose of this Part is to implement the Precious Coral Fishery Management Plan developed by the Western Pacific Regional Fishery Manaement Council pursuant to the Fishery Conservation and Managemen Act of 1976, as amended (the "Act").

(b) These regulations govern fishing for precious coral by fishing vessels of the United States within the United States fishery conservation zone (FCZ) seaward of the Hawaii, Guam, and American Samoa.

(c) For those regulations governing precious coral fishing by foreign vessel see 50 CFR 611.82.

§ 680.2 Relation to state law.

This part recognizes that any State law which pertains to vessels registere under the laws of that State, while in t Western Pacific Council Precious Cora Management Area, including any State landing laws, and which is consistent with the Precious Coral Management Plan, shall continue to have force and effect respecting fishing activities addressed herein.

§ 680.3 Definitions.

In addition to the definitions in the Act, and unless the context requires otherwise, the terms used in this Part have the following meanings:

(a) *Act* means the Fishery Conservation and Management Act of 1976. as amended. (16 U.S.C. 1801–1882).

(b) *Assistant Administrator* means the Assistant Administrator for Fisheries. NOAA. or a designee.

(c) *Authorized Officer* means:

(1) Any commissioned. warrant. or petty officer of the Coast Guard:

(2) Any certified enforcement agent or special agent of the National Marine Fisheries Service:

(3) Any officer designated by the head of any Federal or State agency which has entered into an agreement with the Secretary and the Secretary of Transportation to enforce the provisions of the Act: and

(4) Any Coast Guard personnel accompanying and acting under the direction of any person described in paragraph (1) of this subsection.

(d) *Conditional Beds* means coral beds for which optimum yields are estimated. (on the basis of bed size relative to established beds).

(e) *Dead Coral* means any precious coral which contains holes from borers or is discolored or encrusted at the time of removal from the seabed.

(f) *Established Beds* means coral beds having a history of harvest. which are sufficiently documented that optimum yields have been established on the basis of biological stock assessment techniques.

(g) *Exploratory Beds* means coral beds other than established beds. conditional beds or refugia.

(h) *Fish* means finfish. mollusks. crustaceans. and all other forms of marine animal or plant life other than marine mammals. birds and highly migratory species.

(i) *Fishery Conservation Zone (FCZ)* means that area adjacent to the United States which. except where modified to accommodate international boundaries. encompasses all waters from the seaward boundary of each of the coastal states to a line each point of which is 200 nautical miles from the baseline from which the territorial sea of the United States is measured.

(j) *Fishing* means:

(1) The catching. taking. or harvesting of fish:

(2) The attempted catching. taking. or harvesting of fish:

(3) Any other activity which can reasonably be expected to result in the catching. taking. or harvesting of fish:

(4) Any operations at sea in support of or in preparation of (1) through (3) above.

(k) *Fishing Vessel* means any vessel. boat. ship. or other craft which is used for. equipped to be used for. or of a type which is normally used for fishing or for assisting or supporting a vessel engaged in fishing.

(l) *Land or Landing* means bringing fish to shore or off-loading fish from a vessel.

(m) *Live Coral* means any precious coral which is free of holes from borers. and has no discoloration or encrustation on the skeleton at the time of removal from the seabed.

(n) *Non-precious Coral* means any species of coral other than those listed below under *Precious Coral.*

(o) *Non-selective Gear* means any gear used for harvesting corals that cannot discriminate or differentiate between types. size. quality. or characteristics of living or dead corals.

(p) *Operator.* with respect to any vessel. means the master or other individual on board and in charge of that vessel.

(q) *Owner.* with respect to any vessel. means:

(1) Any person who owns that vessel in whole or in part:

(2) Any charterer of the vessel. whether bareboat. time or voyage:

(3) Any person who acts in the capacity of a charterer. including but not limited to parties to a management agreement. operating agreement. or any similar agreement that bestows control over the designation. function or operation of the vessel: or

(4) Any agent designated as such by any person described in paragraph (1). (2). or (3) of this definition.

(r) *Person* means any individual (whether or not a citizen or national of the United States). corporation. partnership. association. or other entity (whether or not organized or existing under the laws of any State). and any Federal. State. local. or foreign government or any entity of any such government.

(s) *Precious coral* means any of the following species of corals:

Pink coral (also known as Red coral).	*Corallium secundum.*
Pink coral (also known as Red coral).	*Corallium regale.*
Pink coral (also known as Red coral).	*Corallium laauense.*
Gold coral	*Gerardia sp.*
Gold coral	*Calligorgia gilberti.*
Gold coral	*Narella sp.*
Gold coral	*Calyptrophora sp.*
Bamboo coral	*Lepidisis olapa.*
Bamboo coral	*Acanella sp.*

(t) *Regional Director* means Director. Southwest Region. National Marine Fisheries Service. 300 S. Ferry Street. Terminal Island. CA 90731. or a designee.

(u) *Refugia* means coral beds that are closed to the harvest of coral.

(v) *Secretary* means the Secretary of Commerce or a designee.

(w) *Selective Gear* means any gear used for harvesting corals that can discriminate or differentiate between type. size. quality. or characteristics of living or dead corals.

(x) *State* means the State of Hawaii. the Territory of Guam. and the Territory of American Samoa.

(y) *United States fish processors* means facilities located within the United States for. and vessels of the United States used or equipped for. the processing of fish for commercial use or consumption.

(z) *United States harvested fish* means fish caught. taken. or harvested by vessels of the United States within any fishery for which a fishery management plan or preliminary fishery management plan has been implemented under the Act.

(aa) *Vessel of the United States means:*

(1) any vessel documented or numbered by the Coast Guard under United States law: or

(2) any vessel. under five-net tons. registered under the laws of any State.

(bb) *Western Pacific Council Precious Coral Management Area* means the FCZ of the United States seaward of the State of Hawaii. the Territory or Guam. and the Territory of American Samoa.

§ 680.4 Area designations.

(a) *General.* The Precious Coral Beds in the Western Pacific Council Precious Coral Management Area are divided into four categories. Each bed is designated by a permit Area Code and assigned to a category.

(b) *Categories/Permit Areas.*—(1) *Established Beds.*

Makapuu (Oahu). *Permit Area E–B–1.* which includes the waters within a radius of 2.0 nautical miles of a point at 21°18.0′ N. lat.. 157°35.5′ W. long.

(2) *Conditional Beds.* (i) *Ke-ahole Point* (Hawaii). *Permit Area C–B–1.* includes the water within a radius of 0.5 nautical miles of a point at 19°46.0′ N. lat.. 156°06.0′ W. long.

(ii) *Kaena Point* (Oahu). *Permit Area C–B–2.* includes the waters within a radius of 0.5 nautical miles of a point at 21°35.4′ N. lat.. 158°22.9′ W. long.

(iii) *Brooks Bank. Permit Area C–B–3.* includes the waters within a radius of 2.0 nautical miles of a point at 24°06.0′ N. lat.. 166° 48.0′ W. long.

(iv) *180 Fathom Bank. Permit Area C–B–4.* N. W. of Kure Atoll. includes the waters within a radius of 2.0 nautical miles of a point at 28°50.2′ N. lat.. 178°53.4′ W. long.

(3) *Refugia. Westpac Bed. Permit Area R–1.* which includes the waters

within a radius of 2.0 nautical miles of a point at 23°18.0' N. lat.. 162°35.0' W. long.

(4) *Exploratory areas.* (i) *Permit Area X–P–H* inoludes all coral beds. other than Established Beds. Conditional Beds. or Refugia. in the United States FCZ seaward of the State of Hawaii.

(ii) *Permit Area X–P–AS* includes all coral beds. other than Established Beds. Conditional Beds. or Refugia. in the United States FCZ seaward of American Samoa.

(iii) *Permit Area X–P–G* includes all coral beds. other than Established Beds. Conditional Beds. or Refugia. in the United States FCZ seaward of Guam.

§ 680.5 Permits.

(a) *General.* (1) No vessel of the United States may fish for. take. or retain precious coral in the Western Pacific Council Precious Coral Management Area unless a permit has been issued for it under this section.

(2) Each permit shall be valid for fishing only in the bed or area specified in the permit. Permit areas are described in § 680.4.

(3) Not more than one permit shall be valid for any one vessel at any one time.

(4) Not more than one permit shall be valid for one person at any one time.

(5) The holder of a valid permit to fish one bed or area may obtain a permit to fish another bed or area only upon surrendering to the Regional Director any permit previously issued under this Part.

(b) *Applications.* (1) An application for a permit under this section shall be submitted to the Regional Director by the vessel owner or operator at least 60 days prior to the date on which the applicant desires to have the permit made effective.

(2) Each applicant shall supply the following information to the Regional Director when applying for a permit. Each application shall be signed by the vessel owner or operator and contain the following information:

(i) The applicant's name. mailing address. and telephone number;

(ii) The owner's name. mailing address. and telephone number;

(iii) The operator's name. mailing address and telephone number;

(iv) The name of the vessel;

(v) The vessel's United States Coast Guard documentation number or State license number;

(vi) The radio call sign of the vessel;

(vii) The home port of the vessel;

(viii) The engine horsepower of the vessel;

(ix) The approximate fish hold capacity of the vessel;

(x) The type and quality of fishing gear used by the vessel;

(xi) The permit area in which the applicant proposes to fish;

(xii) Whether the application is for a new permit or a renewal; and

(xiii) The number and expiration date of any prior permit for the vessel issued under this section.

(c) *Fees.* No fee is required for a permit under this Part.

(d) *Change in Application Information.* Any change in the information specified in paragraph (b) of this section shall be reported to the Regional Director ten days prior to the effective date of the change.

(e) *Issuance.* (1) Within 60 days after receipt of a properly completed application the Regional Director shall determine whether to issue a permit.

(2) If an incomplete or improperly completed permit application is filed. the Regional Director shall notify in writing the applicant of the deficiency in the application. If the applicant fails to correct the deficiency within 30 days following the date of notification. the application shall be considered abandoned.

(f) *Expiration.* Permits issued under this section shall expire on June 30 following the issuance of the permit.

(g) *Renewal.* An application for a renewal of a permit shall be submitted to the Regional Director in the same manner as described in paragraph (b) of this section.

(h) *Alteration.* Any permit which has been substantially altered. erased. or multilated shall be invalid.

(i) *Replacement.* Permits may be issued to replace lost or mutilated permits. An application for a replacement permit shall not be considered a new application.

(j) *Transfer.* Permits issued under this section are not transferable or assignable to other persons. A permit is valid only for the vessel for which it is issued.

(k) *Display.* Any permit issued under this section shall be on board the vessel at all times while the vessel is fishing for coral in the FCZ. Any permit issued under this section shall be displayed for inspection upon request of any Authorized Officer.

(l) *Sanctions.* Subpart D of 50 CFR Part 621 (Civil Procedures) governs the imposition of sanctions against a permit issued under this Part. As specified in that subpart D. a permit may be revoked. modified. or suspended if the vessel for which the permit is issued is used in the commission of an offense prohibited by the Act or this Part; or if a civil penalty or criminal fine imposed under the Act. and pertaining to such a vessel. is not paid.

§ 680.6 Recordkeeping and reporting.

(a) *Logbook.* The operator of any fishing vessel fishing for precious cora subject to this Part shall:

(1) Maintain on board the fishing vessel. while fishing for precious coral an accurate and complete fishing logbook in the required format supplie by the Regional Director. recording all information specified in Section 680.6(l

(2) Make the fishing logbook availab for inspection by an Authorized Office or any employee of the National Marin Fisheries Service designated by the Regional Director to make such inspection:

(3) Keep the fishing logbook one yea after the date of the last entry in the logbook: and

(4) Within 72 hours of each landing c precious coral. submit to the Regional Director a copy of the log sheet(s) pertaining to that precious coral.

(b) *Information.* Fishing logbooks sh contain the following information for a precious coral taken under this Part:

(1) Vessel information.

(i) Name of vessel;

(ii) Call sign of vessel; and

(iii) Permit number of vessel.

(2) Fishing information.

(i) Date of harvest;

(ii) Fishing effort in hours;

(iii) Method of harvest;

(iv) Area fished;

(v) Depth of water;

(vi) Weight of coral harvested. by species (landed weight. air dried for at least 24 hours); and

(vii) Observations that may be made about the habitat (current. bottom type bottom topography. bottom slope. proximity to land. etc.).

(3) Sale information.

(i) Amount of coral sold (by species);

(ii) Sale price;

(iii) Date of sale; and

(iv) Name of buyer(s).

(4) Any other information specified i the permit.

§ 680.7 Vessel information.

(a) *Official Number.* The official number is the documentation number issued by the Coast Guard or the certification number issued by a State the Coast Guard for undocumented vessels. Each fishing vessel subject to this Part shall display its Official Number on the port and starboard side of the deckhouse or hull. and on an appropriate weather deck so as to be visible from enforcement vessels and aircraft.

(b) *Numerals.* The official number shall be affixed to each vessel subject this Part in block Arabic numerals at least 18 inches in height for fishing vessels of 65 feet in length or longer an

at least ten inches in height for all other vessels. Markings must be legible and of a color that contrasts with the background.

(c) *Duties of Operator.* The operator of each fishing vessel subject to this Part shall:

(1) Keep the displayed official number clearly legible and in good repair; and

(2) Ensure that no part of the vessel, its rigging or its fishing gear obstructs the view of the Official Number from an enforcement vessel or aircraft.

§ 680.8 Prohibitions.

(a) *Permits.* No person shall fish for, take, or retain precious coral in the Western Pacific Council Precious Coral Management Area unless either the owner or operator of the vessel from which the fishing occurs has been issued a permit under this Part and such permit is on board the vessel.

(b) *Fishing.* No person shall fish for, take, or retain any species of precious coral in the Western Pacific Council Precious Coral Management Area:

(1) By means of gear or methods prohibited by this Part;

(2) In refugia specified in this Part;

(3) In a bed for which the quota specified in this Part has been attained; or

(4) In violation of any permit issued under this Part.

(c) *Pink coral size limit.* No person shall take and retain or possess on fishing vessels any pink coral from the Makapuu Bed (Permit Area E–B–1), Keahole Point Bed (Permit Area C–B–1), or Kaena Point Bed (Permit Area C–B–2), which is less than the minimum length specified in this Part.

(d) *Possession and sale.* No person shall possess, have custody or control of, ship, transport, offer for sale, sell, purchase, import, export, or land, any species of precious coral which was taken in violation of the Act, this Part, or any regulation issued under the Act.

(e) *Presumption.* It shall be a rebuttable presumption that any precious coral found on board a fishing vessel in the Western Pacific Council Precious Coral Management Area was caught and retained in violation of this Part unless:

(1) A valid permit has been issued for the vessel pursuant to this Part, or

(2) The owner or operator of the vessel can document the origin of that coral by receipts of purchase, invoices, or other documentation.

(f) *Search and inspection.* No person shall:

(1) Refuse to permit an Authorized Officer to board a fishing vessel subject to such person's control for purposes of conducting any search or inspection in connection with the enforcement of this Act, this Part, or any other regulations issued under the Act;

(2) Forcibly assault, resist, oppose, impede, intimidate, or interfere with an Authorized Officer in the conduct of any search or inspection described in paragraph (1) of this subsection;

(3) Resist a lawful arrest for any act prohibited by this Part;

(4) Interfere with, delay, or prevent, by any means, the apprehension or arrest of another person by an Authorized Officer, knowing that such other person has committed any act prohibited by this Part; or,

(5) Violate any other provision of this Part, the Act, or any regulation or permit issued under the Act.

(g) *Transfer to foreign vessel.* No person shall transfer directly or indirectly, or attempt to so transfer, any United States harvested coral to any foreign fishing vessel, while such foreign vessel is within the FCZ, unless the foreign fishing vessel has been issued a permit under section 204 of the Act which authorizes the receipt by such vessel of United States harvested coral of the species concerned.

§ 680.9 Enforcement.

(a) *General.* The owner or operator of any fishing vessel subject to this Part shall immediately comply with instructions issued by an Authorized Officer to facilitate safe boarding and inspection of the vessel, its gear, equipment, logbook, permit, and catch for purposes of enforcing the Act and this Part.

(b) *Signals.* Upon being approached by a Coast Guard cutter or aircraft, or other vessel or aircraft authorized to enforce the Act, the operator of a fishing vessel shall be alert for signals conveying enforcement instructions. The following signals extracted from the International Code of Signals are those which may be used:

(1) "L" meaning "You should stop your vessel instantly";

(2) "SQ3" meaning "You should stop or heave to; I am going to board you"; and

(3) "AA AA AA etc." which is the call to an unknown station, to which the signaled vessel should respond by illuminating the vessel identification required by section 680.7.

(c) *Boarding.* A vessel signaled to stop or heave to for boarding shall:

(1) Stop immediately and lay to or maneuver in such a way as to permit the Authorized Officer and his party to come aboard;

(2) Provide a safe ladder for the Authorized Officer and his party;

(3) When necessary to facilitate the boarding, provide a man rope, safety line and illumination for the ladder; and

(4) Take such other action as required to ensure the safety of the Authorized Officer and his party and to facilitate the boarding.

§ 680.10 Penalties.

Any person or fishing vessel found to be in violation of this Part is subject to the civil and criminal penalty provisions and forfeiture provisions of the Act, and to 50 CFR Parts 620 (Citations) and 621 (Civil Procedures) and other applicable law.

Subpart B—Management Measures

§ 680.20 Catch limitations.

(a) *Fishing Year.* (1) The fishing year for precious coral begins on July 1 and ends on June 30 the following year, except at the Makapuu Bed, which has a two-year fishing period that begins July 1, and ends June 30 two years later. (2) The effective date for calculating the initial fishing period shall be July 1, 1980.

(b) *Quotas.* The quotas limiting the amount of precious coral which may be taken in the Western Pacific Council Precious Coral Management Area during the fishing year are as given in Table I of this section. Precious coral harvested after July 1, 1980 will be counted toward the 1980-1981 harvest quotas.

Table I.—*Quotas for Management Area Categories*

Name of coral bed	Type of bed	Harvest quota	Year	Gear restrictions
Makapuu	Established	Pink coral—2,000 kg	2	Selective only.
		Gold coral—600 kg	2	Do.
		Bamboo coral—500 kg	2	Do.
Ke-ahole Point	Conditional	Pink coral—67 kg	1	Selective only.
		Gold coral—20 kg	1	Do.
		Bamboo coral—17 kg	1	Do.
Kaena Point	Conditional	Pink coral—67 kg	1	Selective only.
		Gold coral—20 kg	1	Do.
		Bamboo coral—17 kg	1	Do.
Brooks Bank	Conditional	Pink coral [1]—444 kg	1	Selective or nonselective.
		Gold coral—133 kg	1	Do.
		Bamboo coral—111 kg	1	Do.
180 Fathom Bank	Conditional	Pink coral [1]—222 kg	1	Selective or nonselective.
		Gold coral—67 kg	1	Do.
		Bamboo coral—56 kg	1	Do.
Westpac Bed	Refuge	Zero		No fishing for coral authorized.
All	Exploratory	1,000 kg, all species combined, per area.	1	Selective or nonselective [2]

[1] Only ¼ the indicated amount would be allowed if nonservice gear is use. If both selective and nonselective methods are used, the bed will be closed when (S – SN = O), where S = selective harvest amount, N = nonselective harvest amount, and O = total harvest quota, for any single species on that bed.

[2] Selective gear only may be used in the FCZ seaward of the main Hawaiian Islands; i.e., south and east of a line midway between Nihoa and Niihau Islands. Nonselective gear or selective gear may be used in all other portions of exploratory areas.

(c) *Conditional Bed Closure.* A conditional bed shall be closed to all nonselective coral harvesting after the quota for one species of coral has been taken, as set forth in Table I.

(d) *Reserves and Reserve Release.* The quotas for Exploratory Areas shall be held in reserve for harvest by vessels of the United States in the following manner:

(1) At the start of the fishing year, the reserve for each Exploratory Area shall equal the quota minus the expected domestic annual harvest for that year.

(2) As soon as practicable after December 31 each year, the Regional Director shall determine the amount harvested by vessels of the United States between July 1 and December 31 of that year.

(3) The Regional Director shall release to TALFF an amount of precious coral equal to 1,000 kg. minus two times the amount harvested by vessels of the United States in that July 1–December 31 period.

(4) The Regional Director shall publish in the **Federal Register** a notice of his determination and a summary of the information on which it is based as soon as practicable after the determination is made.

§ 680.21 Precious coral size limit.

(a) Makapuu Bed. Pink coral harvested from the Makapuu Bed (E–B–1) shall have attained a minimum height of ten inches.

(b) Ke-ahole Point Bed. Pink coral harvested from the Ke-ahole Point Bed (C—B–1) shall have attained a minimum height of ten inches.

(c) Kaena Point Bed. Pink coral harvested from the Kaena Point Bed (C–B–2) shall have attained a minimum height of ten inches.

(d) There are no size limits for precious coral from other beds or other species.

§ 680.22 Closures.

Determinations of Closure Data.

(a) If the Regional Director determines that the harvest quota for any coral bed(s) shall be reached prior to the end of the applicable fishing year, or of the two-year fishing period at Makapuu Bed, he shall issue a field order closing the bed(s) involved by publication of a notice in the **Federal Register**, and through appropriate news media. Such field order shall indicate the reason for the closure, the bed(s) being closed, and the effective date of the closure.

(b) A closure is also effective for a permit holder upon the permit holder's actual harvest of the applicable quota.

(c) *Emergency Closures.*

(1) The Secretary may issue emergency regulations under Section 305(e) of the Act, if an emergency involving the precious coral resource is determined to exist. Emergency regulations will be announced by publication of a notice in the **Federal Register.** Information on emergency regulations will be disseminated to affected persons through appropriate news media.

(2) The Council may, at any time, make recommendations to the Secretary for emergency regulations under this section.

§ 680.23 Area and time restrictions.

(a) *Area Restrictions.* It is unlawful to fish for coral in the WestPac Bed. The specific area closed to fishing is all waters within 2 nm of the midpoint of latitude 23° 18.0′ N longitude 162° 35.0′ W.

(b) *Time Restrictions.* None.

§ 680.24 Gear restrictions.

(a) *Selective Gear.* Only selective gear may be used to harvest coral from the FCZ of the main Hawaiian Islands, i.e., south and east of a line midway between Niihau and Nihoa Islands.

(b) *Selective or Non-Selective Gear.* Either selective or non-selective gear may be used to harvest coral from Brooks Bank, 180 Fathom Bank, and from exploratory areas other than the FCZ off the main Hawaiian Islands.

Fishery Management Plan for the Precious Coral Fisheries (and Associated Nonprecious Corals) of the Western Pacific Region

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Executive Summary

The Fishery Conservation and Management Act of 1976 (Pub. L. 94–265) provides for United States exclusive management authority over the fishery resources and fisheries within a Fishery Conservation Zone (FCZ) extending from the seaward boundary of the territorial sea (3 miles from shore) to a distance of 200 nautical miles from shore. The responsibility for developing management plans for the fisheries in the FCZ is vested by the Act in eight Regional Fishery Management Councils. The Western Pacific Fishery Management Council is responsible for the fisheries off the coasts of Hawaii, Guam and American Samoa. The Council may also recommend measures to be implemented in the FCZ beyond the area of concern in the Northern Mariana Islands. Implementation and enforcement of any regulations pertinent to fishery management within the FCZ are the responsibility of the Secretary of Commerce. This Precious Corals Fishery Management Plan has been developed by the Western Pacific Fishery Management Council and will be submitted to the Secretary of Commerce for approval and implementation. The major objectives of the Plan are to obtain Optimum Yields of precious corals in the FCZ and maximize the benefits of the precious coral fisheries to the nation. Precious corals are known or believed to occur in the FCZ seaward of Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands and off other United States island possessions in the central and western Pacific Ocean.

In the Management Plan, precious coral beds are treated as separate management units. The beds are classified as Established, Conditional or Exploratory. Established Beds are those which have a history of harvest and for which Optimum Yields have been determined on the basis of scientific data. Conditional Beds are those for which locations and approximate area are known and for which estimates of Optimum Yield can be derived by analogy with Established Beds, but which require additional data for determination of Optimum Yields. Exploratory Areas comprise all other area in the FCZ of the Western Pacific Region. Only one coral bed has been studied adequately enough to be classified as Established. It is off Makapuu, Oahu, Hawaii. Five other beds are classified as Conditional, all of them off the Hawaiian Islands (See Figures 1 and 2).

Management measures are prescribed for commercial harvest from all three bed categories, otherwise referred to as permit areas. There is no recreational fishery. The prescribed measures are summarized as follows: (1) Optimum Yields have been determined for pink (*Corallium secundum*), gold (*Gerardia* sp.) and bamboo (*Lepidisis olapa*) coral populations in the Makapuu Bed. These Optimum Yields are based on estimates of Maximum Sustained Yield (MSY). Rounded estimates of MSY for the three species in the Makapuu Bed are 1,000 kg/year for pink coral, 300 kg/year for gold coral and 250 kg/year for bamboo coral. Optimum Yields have been set at double these values for twice the time, i.e. for 2 years. The adjustment to 2 year periods is proposed because of socio-economic considerations. (2) Optimum Yields for Conditional Beds are determined by their areas in relation to the area of the Makapuu Bed, assuming the same MSY per unit area, and reducing the OY to 20% of the MSY if non-selective harvesting methods are used. (3) U.S. harvesting and processing capacity and expected annual harvest and processing levels from the Makapuu Bed and all Conditional Beds are equal to the levels proposed for Optimum Yield, and therefore no surplus exists in these areas which can be allocated to foreign fisherman or to joint venture operations. Domestic processing capacity is sufficient to process expected domestic harvest. (4) Until the definitive Optimum Yields of beds in Exploratory Areas can be determined, an initial Optimum Yield for each of those Areas (Hawaii, Samoa, Guam, and the Northern Marianas and other U.S. island possessions) is set at 1,000 kg total of all species. All 1,000 kg are held in reserve for the domestic fishery during the first six months of the first year, at the end of which period the TALFF (= 1,000 − 2 × domestic catch), if any, is made available for foreign fishing. In subsequent years the DAH would equal the previous year's domestic catch and the domestic reserve = 1,000 − DAH. At the end of six months TALFF would be established to equal 1,000 kg minus two times the domestic catch in the preceding 6 months. (5) Other species of precious corals and associated non-precious corals which are known or are believed to occur in the FCZ are included in the plan. No specific conservation and management measures are proposed at this time; Optimum Yields have not been determined. This plan may be amended to manage these species as more data become available and as the need arises. (6) A prohibition on the use of dredging techniques is recommended for all permit areas where selective harvesting methods are current practice and for the FCZ seaward of the main Hawaiian Islands. (7) A quota for dredging is provided in all other permit areas under specified conditions. (8) Taking of precious coral in the FCZ incidental to other fisheries is allowed for both domestic and foreign fishermen, subject to reporting requirements and return of the coral to the sea. (9) A recommendation is made to provide for closing certain coral beds to commercial or exploratory fishing as refugia or reserves, and to designate as the first such reserve the WesPac Bed, situated between Nihoa and Necker Islands, off the Northwestern Hawaiian Islands. Other refugia may be designated by amendment to this plan. (10) Permits are required for domestic and foreign fishermen, subject to extensive reporting requirements and conditions which embody the above provisions. Vessels may be required to carry observers. The proposed management measures are designed to

maximize overall benefits to the nation and are consistent with the National Standards of the FCMA.

I. Introduction

This is a Fishery Management Plan (FMP) for the precious coral and associated non-precious coral fisheries within the United States Fishery Conservation Zone of the central and Western Pacific region. It has been prepared by the Western Pacific Regional Fishery Management Council under the authority of the Fishery Conservation and Management Act of 1976 (FCMA) (Pub. L. 94–265).

The FCMA provides for the conservation and management of fishery resources of the United States be establishing a Fishery Conservation Zone of 200 nautical miles, within which the United States has exclusive management authority over all fishery resources except highly migratory species which are defined as tuna. The Act calls for the preparation and implementation of Fishery Management Plans, through which the objectives of a national fishery management program may be accomplished.

The Fishery Management Plans provide the basis for the determination of annual harvest predicated on scientific information and involving the needs of the States, the fishing industry, recreation groups, consumers, environmental organizations and other interested parties. In essence, the allowable catch of any fishery resource will be based on the Optimum Yield from that resource.

The fishery management unit in this case comprises a number of discrete populations or beds of precious corals and associated non-precious corals within the FCZ off the shores of U.S. islands in the central and western tropical and subtropical Pacific. At present only one such bed is the object of consistent exploitation by a domestic fishery. Others are or may have been subject to poorly documented harvesting by foreign fishermen, while others have been located by exploratory surveys but are not yet under exploitation. There are undoubtedly other precious coral beds in the region which will eventually be prospected and exploited, and it is prudent to make some preliminary provision for their conservation, in view of the ease with which this resource can be overfished.

In this FMP, precious coral beds which have a history of exploitation and for which a Maximum Sustainable Yield (MSY) can be estimated based one scientific data, are designated Established Beds. Others for which only the locations and approximate area are known are called Conditional Beds, while those which are yet to be located are referred to as Explopratory Areas. (See Section IV.F.2. for fuller definition of these categories.) Under this plan, five portions of the FCZ—the portions around Hawaii, Guam, American Samoa, U.S. Possessions and the Northern Mariana Islands—are designated Exploratory Areas for purposes of setting quotas for identification of and harvests from Exploratory Beds.

The major objective of the Plan is to achieve the optimum yield of precious corals which occur within the Fishery Conservation Zone (FCZ) of the United States in the Central and Western Pacific Ocean. The term optimum yield is defined in the Act as that amount of "fish" which will provide the greatest overall benefit to the Nation, and which is prescribed as such on the basis of the maximum sustained yield (MSY) as modified by any relevant economic, social or ecological factor. Species of precious corals which are considered in this document include the precious pink coral, *Corallium secundum*, the gold coral, *Gerardia* (formerly *Parazoanthus*) sp., and the bamboo coral, *Lepidisis* (formerly *Keratoisis nuda*). Other species of precious coral and other corals on the continental shelf or in the FCZ are also include in the plan although specific Conservation and Management Measures are limited at this time to permit and data collection requirements. Further management measures for these corals will be included in the plan sequentially on an as needed basis. Areas condidered in this document include the Hawaiian Islands, American Samoa, Guam, the Commonwealth of the Northern Marianas and other U.S. island possessions in the Central and Western Pacific Ocean.*

Included in the management plan are estimates of optimum yield for species of greatest commercial importance and recommendations for measures that are deemed necessary in order to achieve optimum yield.

II. Description of the Fishery

A. Stocks

Within the FCZ of the United States in the central and western tropical Pacific (Figures 1–4), the only fishery for precious corals is in the Hawaiian Islands. The fishery is based on two groups of species, one in deep water near 400 meters and another in much shallower water between 40 and about 80 meters. Both fisheries are entirely commercial, i.e. non-recreational. At the present time the bulk of the catch of deep species consists of pink (*Corallium secundum*) and gold corals (*Gerardia* sp., = *Parazoanthus* sp.). A third species, bamboo coral (*Lepidisis olapa*) co-occurs with pink and gold coral and is considered to be of immediate economic potential. Other potential species of precious coral, including the shallow water black corals, are listed in Table I.

The shallow water fishery consists of three species of black coral *Antipathes dichotoma*, *Antipathes grandis* and *Antipathes ulex*. About 90% of the catch consists of the first species, 9% the second and 1% the third. Approximately 85% of all black corals harvested in the state of Hawaii are taken within the Territorial Sea.

The FMP contains specific management measures for *Corallium secundum*, *Gerardia* sp. and *Lepidisis olapa*. Measures for black corals are currently being developed by the State of Hawaii and the WPRFMC and will be added to the plan on a sequential basis. As it appears likely that other species of precious coral and other corals in the FCZ will be subject to harvest, additional measures for these species will also be added to the plan on a sequential basis.

Pink coral, *C. secundum*, and bamboo coral, *Lepidisis olapa*, belong to the Order Gorgonacea in the Subclass Octocoralia in the class Anthozoa in the Phylum Coelenterata. Gold coral, *Gerardia* sp., and black coral, *Antipathes* sp., belong to separate Orders, Zoanthidea and Antipathana, in the Subclass Hexacoralia also in the class Anthozoa and the Phylum Coelenterata.

Precious corals are known to exist in Hawaii, Samoa, Guam and the Commonwealth of the Northern Marianas and other U.S. possessions, but little is known of their distribution and abundance. What little knowledge is available of the distribution and abundance of precious corals in the Western Pacific can be summarized as follows:

American Samoa—One or more species black coral of commercial quantity and quality are known to exist at depths of 40 meters and deeper, but these stocks are within the jurisdiction of American Samoa.

Table I.—*Actual and potential precious coral in the Western Pacific*

Scientific name	Common name	Harvest status
Corallium secundum	Pink coral	Harvested
Corallium regale	Pink coral	Not harvested
Corallium laauense	Pink coral	Not harvested
Gerardia sp.	Gold coral	Harvested
Calligorgia gilberti	Gold coral	Not harvested
Narella sp.	Gold coral	Not harvested
Calyptrophora sp.	Gold coral	Not harvested
Lepidisis olapa [1]	Bamboo coral	Not harvested
Acanella sp.	Bamboo coral	Not harvested
Antipathes dichotoma	Black coral	Harvested
Antipathes grandis	Black coral	Harvested
Antipathes ulex	Black coral	Harvested

[1] Previously known as *Keratoisis nuda*.

The only information available on deeper water precious corals comes from reports by fishermen. Pink coral has been reported off Cape Taputapu, but there are no data on quantity, quality and depth (Ian Swan, personal communication). Unidentified precious corals have also been reported off Fanuatapu Island at a depth of 90 m (possibly bamboo coral) and on the sides of an uncharted seamount three-fourths of a mile off the northwest tip of Faleulupo at a depth of about 300 meters (Bill Travis, personal communication).

Guam and the Commonwealth of the Northern Marianas—No commercially important quantities of precious coral have been found on U.S. surveys in the Northern Marianas (Grigg and Eldredge 1975). However, Japanese fishermen (personal communication) claim to have taken some *Corallium* off Rota, Saipan and north of Pagan Island.

Other U.S. island possessions—Japanese fishermen report that in 1975 alone, a harve

*Pending amendment of the Fishery Conservation and Management Act, the Western Pacific Fishery Management Council has no statutory authority to prescribe management measures for fisheries in the Fishery Conservation Zone off the Northern Marianas or minor United States Pacific island possessions. References to management measures for precious coral fishing in those areas in this Plan are in the nature of recommendations which may be implemented by the Secretary of Commerce by actions pursuant to Sec. 201(g) or Sec. 304(c) of the Act.

of 100 metric tons of red corals (*Corallium* spp.) was taken from grounds within 200 miles of Midway. Wake. Yap and Saipan (EIS PMP Precious Corals. DOC. 1977). However. the magnitude of this estimate (approximately the world production in 1970) has come under some doubt on its validity. On the other hand. none of the deep precious coral beds off Wake or Yap have been surveyed by U.S. scientists and only the most preliminary U.S. data are available for the Saipan and Midway areas.

Hawaii.—Beds of pink. gold and/or bamboo coral have been found at six locations off the Hawaiian Archipelago (Grigg 1974) (Figures 1 & 2). These are as follows:

Description	Lat. N	Long. W.	Area in square kilometer
1. Off Ke-ahole Point. Hawaii	19°46.0'	156°08.0'	0.24
2. Off Makapuu. Oahu (Fig. 5)	21°18.0'	157°35.5'	3.60
3. Off Kaena Point. Oahu	21°35.4'	158°22.9'	0.24
4. WesPac Bed. between Nihoa and Necker Islands	23°18'	162°35'	0.8
5. Brooks Bank	24°06.0'	166°48.0'	1.6
6. 180 Fathom Bank north of Kure Is.	28°50.2'	178°53.4'	0.8

With the exception of the Makapuu Bed and those beds (if any) harvested by foreign fishermen. all other precious coral beds within the U.S. fishery conservation zone are believed to be in an unexploited or "virgin" state. The Makapuu Bed has been harvested off and on since 1966 (see Table II. page 10). The area and the pre-fishery standing crop of pink coral in the bed are estimated to be 4.5 km² and 43.500 kg. respectively. Over a 10-year period only about 16% of the original standing crop of pink coral has been harvested: this averages 1.6% per year. and is below estimates of MSY (see section III–F). However. in three of four years the estimate of MSY has been exceeded (see Table II). Of the other five areas. WesPac Bed. Brooks Bank and 180 Fathom Bank are considered to hold the most promise for domestic harvesters. There are undoubtedly many other undiscovered beds. especially off the Northwestern Hawaiian Islands. where few surveys have been conducted. The large yields (see following section) reported to have been taken by foreign fishermen from the Milwaukee Banks (Lat. 32.5°N. Long. 173.0°E). which are outside the U.S. Fishery Conservation Zone. are indications of the potential in the Northwestern Hawaiian Islands. Because of the sessile habit of precious corals and the large distances which separate the known beds. it is a reasonable assumption to treat each bed as a separate management unit. even though nothing is known of the relationship between stock and recruitment. particularly with respect to the possibility of recruitment to one bed arising from reproduction on a different bed.

There are no known Indian treaty. native Hawaiian or other indigenous traditional uses. claims or rights associated with precious corals. If any rights or ceremonial values are identified. this plan will be amended as necessary.

B. History of Exploitation

Although a precious coral fishery has existed in the Mediterranean Sea since about 3000 B.C.. precious coral was not discovered in the Pacific until the early 19th century off Japan. Historically. the primary method of fishing in both the Mediterranean Sea and off Japan has been dredging. Initially little fishing occurred off Japan until 1868. the year of the Meiji Reform. Prior to 1868. coral was confiscated from fishermen by the Shoguns. therefore little incentive existed for commercial fishing. After 1868. however. this custom was abolished and the fishermen were allowed to market coral products freely. Shortly after 1868. about 100 boats began harvesting coral. soon exhausting local grounds near Japan. Subsequent catch and effort depended on the discovery of new grounds and has been extremely variable up to the present time. The pattern of the coral fishery in Japan has been one of exploration. discovery. exploitation and depletion. In spite of the obvious need to control fishing effort. there has been no effective management of the fishery.

Catch and effort data collected in Taiwan for the years 1924–1940 (Anon.. 1956). shown in Figures 6 and 7. show substantial variation over time. However. catch per effort was much less variable except for a very large increase at the end of the period (which may reflect the discovery of new fishing grounds). The data correspond reasonably well to the assumptions of the surplus production model and suggest that MSY/OY could have been achieved with 50–60 boats. which. in fact. is the level at about which the fishery apparently stabilized.

Until recent years. the precious coral fishery in the Pacific was centered off Japan. Okinawa and Taiwan (Grigg. 1971). Depletion of the beds in these areas. however. led to wide ranging exploratory efforts primarily on the part of Japanese fishermen. In 1965. Japanese coral fishermen discovered a very large bed of pink coral contiguous with the Hawaiian Archipelago on the Milwaukee Banks about 500 miles northwest of Midway Island. Milwaukee Banks. including Kinmei Seamount. have an area slightly greater than 300 km². Few data are available concerning the amount of pink coral Japanese fishermen harvested from Milwaukee Banks. However. in 1969 alone. they reportedly took about 113.000 kg (H. Ozawa*. personal communication. 1970).

Prompted by the discovery of pink coral on the Milwaukee Banks. U.S. scientists in 1966 discovered a commercial bed of *Corallium secundum* between 350 and 450 m depth in the Molokai Channel off Makapuu. Oahu. Shortly thereafter. a small group of fishermen began dredging this Makapuu bed on a limited scale. This activity continued on and off for about 3 years until high costs of operation and bad weather led to its discontinuation. About 1.800 kg (4.000 lb) were harvested during this period. After an abortive attempt in 1969 at harvesting with a remote T.V. camera assembly by a Seattle firm (Jacobsen Brothers). research at the University of Hawaii by the Sea Grant Program led to the development of a selective harvesting system utilizing a submersible. Maui Divers of Hawaii. Ltd. adopted this system and began harvesting the Makapuu Bed in 1973. Total annual landings of pink and gold coral from the Makapuu Bed between 1966 and 1977 are given in Table II.

*H. Ozawa was the Managing Director of the All Nippon Coral Fishery Union in 1970.

Table II.—*Annual Harvest of Pink and Gold Coral From the Makapuu Bed*[1]

[Harvest in kilograms]

	Gear	Pink	Gold	Knockdown[2]
Year:				
1966–69	Dredge	1.800	0	2.700
1970–72	(3)	(3)	(3)	
1973	Submersible	538	0	
1974	do	2.209	734	
1975	do	1.385	621	
1976	do	400	383	
1977	do	1.421	329	
1978 (January to June)	do	474	50	

[1] In 1977. 2.7 kg of pink coral and 108 kg of gold coral were harvested from the Ke-ahole Point Bed off the island of Hawaii.

[2] During 1966 to 1969 when dredges were used in the Makapuu Bed the amount of coral dislodged from the bottom and not recovered must also be considered. Simulated harvesting trials in shallow water indicate that tangle dredges are about 40% efficient for one drag. Therefore for every kilogram harvested. 1.5 kg is assumed to have been knocked down and lost.

[3] No harvesting

In the past. there has been no *documented* foreign harvest of precious coral within the U.S. conservation zone. However. in 1973 Japanese vessels reportedly harvested about 100 MT of precious corals within 200 miles of Midway. Wake. Yap and Saipan Islands (EIS/PMP Precious Corals. DOC. 1977). However. because the *world* landings in 1970 were only about 85 MT (H. Ozawa. personal communication). this report is somewhat doubtful. In 1976 and 1977. Taiwanese dredgers were reportedly operating on the Milwaukee Banks and may also have harvested precious corals within the U.S. Fishery Conservation Zone. On June 8. 1977. the U.S. Coast Guard reported entry of a Taiwanese coral fishing vessel. *C/B Hai Tien No. 2.* to Midway Island. which informed the Coast Guard that about 30 other vessels would soon be dredging in the Milwaukee Banks area. The Milwaukee Banks are approximately 280 miles northwest of the U.S. 200 mile limit. Japanese and Taiwanese vessels are presently allowed to fish on seamounts west of 180° longitude and north of 28° latitude in the FCZ for pelagic armorheads and alfonsins. Some incidental catch of precious corals may result from this activity. but retention of the incidentally caught coral is prohibited. Catches must reported.

C. Vessels and Gear

1. Historically. both in the Mediterranean Sea and in the far western Pacific. the primary method used to harvest precious coral has been dredging with tangle nets. Over the long history of the fishery. gear design has varied. but it has always centered around the basic idea of a dredge (weighted tangles) (Figure 8). The weights serve to keep the dredge on the bottom as well as dislodge the coral while the nets entangle it.

Off Hawaii the first attempt to selectively harvest precious coral was by the Jacobsen Brothers in 1969 using a remotely controlled manipulator guided by a television camera. This technology proved to be uneconomical. but was the first step which led to the development of a successful system of selective harvest utilizing a manned submersible. Remotely controlled vehicles for the harvest of precious coral are currently being developed by separate companies in Hawaii and Taiwan.

The vessels utilized in the coral fishery differ largely as a function of the method of collection. Foreign dredging vessels range between 40 and 100 feet in length and employ crews which vary between 3 and 20 men. Typically. the dredges are lowered and raised by line haulers which are located amidships and operated over the side of the vessel. Dredging usually is accomplished without power. The ship is simply allowed to drift positioned at right angles to the current. Japanese fishermen usually deploy from 4 to 8 dredges simultaneously. Some larger vessels are able to handle up to 16 lines at once. Given good weather Japanese coral fishermen continue dredging 24 hours a day. rotating the crew. The same grounds are often redredged.

In 1975. about Japanese vessels (of which 28 were specialized) were engaged in harvesting precious corals off Midway. Wake. Yap and Saipan (Akira Matsura*. personal communication). Most likely the entire Japanese coral fleet is considerabaly larger. In Taiwan. about 30 coral dredgers operate seasonally (summer) out of the Peng-hu (Pescadores) Islands.

The vessels employed by the domestic fishery off Hawaii include a two-man submersible. a towing barge (the LRT) and a 70-foot surface support and towing vessel.

The submersible. *Star II.* is launched and recovered from the LRT below the surface at a depth of about 60 feet. Three SCUBA divers are required for this operation. The coral harvesting gear on *Star II* consists of a coral cutter. wire basket and hydraulic claw (Figure 9). Coral which is harvested selectively is packed in the basket. Maximum payload is about 200 pounds. but the average per dive is about 60 pounds.

2. Evaluation of Gear Performance and Efficiency. Off Hawaii in 1972. experimental trials using dredging and selective harvesting methods were conducted on the Makapuu Bed. The dredge consisted of a concrete-filled cylinder (80 lbs.) with 6-foot hanks of nylon netting attached to eyebolts (Figure 8). the selective method was the use of the submersible. *Star II.* Data were compared in order to evaluate the ecological and economic efficiency of both techniques (Grigg. Bartko and Brancart. 1973). The results favor the selective method. However. this was in part due to the method of dredging employed. Only one dredge was used in the test whereas Japanese fishermen may drag up to 16 dredges simultaneously.

The size frequency distribution of coral collected with the submersible was characterized by larger pieces of higher quality than fragments collected by dredging (Figure 10). On the average. one day of effort with the submersible produced a catch about 10 times the value of an equal day's effort dredging with one coral net. However. if 10 nets were deployed simultaneously. the value of the coral produced should be about the same. Hence. the major advantage of utilizing a submersible was not gross production but rather selectivity.

The advantages and disadvantages of the two methods are outlined in Table III.

There are several advantages of a submersible over a dredge. First. the use of a submersible permits selective harvest: immature colonies can be avoided and other benthic species are not disturbed. Second the capacity for selectivity allows the use of a size limit as a management tool. The advantage of this is that the maximum sustained yield at an optimum size is theoretically about twice what it is if no size limit is imposed (dredging) (see Section III–F) This is because dredging leads to growth-overfishing. that is young colonies are harvested before reaching their maximum potential for growth. Thirdly. with a submersible. nearly all the coral dislodged from the botton is brought to the surface. Dredges. on the other hand. only recover about 40% of what is initially "knocked down."[1] Dredges. of course. can be dragged repeatedly over the same area. Hence overall recovery with a dredge could be significantly greater than 40% For example. three replicate hauls should theoretically collect 78% of the coral. four hauls. 87% recovery. Catch per unit effort. of course. would be progressively less and at some point. depending on costs. the operation would cease to be profitable. Exactly where this point lies no doubt varies with the quality and quantity of coral in each bed. A forth advantage of a submersible over dredging is that a larger percentage of high quality coral may be collected.

*Japanese Fishery Agency.

[1] The estimate of efficiency for tangle nets is based on simulated trails in shallow waters in Kaneohe Bay. Hawaii. Recovery of planted coral on the bottom for the five trails was 35. 39. 44. 40. 42. percent producing an average recovery rate of 40%.

TABLE III.—*Advantages and Disadvantages of Two Coral-Harvesting Systems*

Submersible	Dredging
Advantages	
Permits selective harvesting, i.e. little or no damage to other components of the ecosystem.	Relatively inexpensive, low capital and operating costs.
Permits the use of a size limit as an aid to conservation, however breakage makes enforcement difficult.	May be more productive per 24-hour day, if multiple dredges employed.
Permits a yield per recruit twice that obtainable by non-selective fishing. Maximizing yield per recruit will also maximize total yield, when recruitment is constant or independent of stock size.	
Practically no waste	Able to harvest continuously
Larger percentage of high quality coral	Major equipment readily adaptable for other uses.
Disadvantages	
High capital and operating costs	Nonselective harvesting, immature colonies unprotected.
Requires preparation, maintenance and repairs of expensive, specialized equipment.	Ecologically more destructive, other species and habitats disturbed.
Need for support vessels	More wasteful, some coral dislodged from the bottom may not be recovered.
Shutdown idles high capital investment	Larger percentage of lower values-coral.
May have limited depth capability and not fully utilize the resource.	

Advantages of dredging over a submersible include the following. First. dredging is considerably less costly than operating a submersible. In some cases. dredging may also be actually more economical since more than one dredge can be employed and because the operation may be continuous on a 24 hour basis. The equipment is also readily adaptable to other fishing technologies. which may have economic advantages in areas where diversified fishing is profitable. A submersible requires several support vessels and service and maintenance. both quite costly. A major breakdown of a submersible system or a closed season would both result in idling a significant amount of capital investment. Also. dredges have no depth limits *per se* while submersibles do. In Hawaii. *Star II* has an operational depth limit of 1200 feet (365 m) which curtails full utilization of precious corals (see Table IV). Finally. in the event that distant or deeper coral beds are discovered. selective harvesting may be economically prohibitive or simply not possible. in which case dredging may be the only feasible alternative. Exploration for beds might also be best accomplished by dredging techniques.

Depending on desired goals and varying circumstances. such as the abundance of the resource. either system might be a more "efficient" or desirable alternative. It may be more profitable for industry to utilize a submersible so as to more fully utilize the resource. or if quotas are not overly restrictive. dredging may offer clearcut economic advantages. Hence. the benefits of slective harvest vis-a-vis dredging must be considered on a case by case basis. Clearly there are economic and social tradeoffs which may not be the same for all locations in the Pacific.

D. *Global Economics of the Precious Coral Industry*

1 Worldwide. the precious coral jewelry industry is valued at about $500 Million/year (retail sales). This arises from a world production of raw coral worth between $5–$10 million (H. Ozawa. personal communication). In 1976. about 95 percent of the world's production was harvested from the Pacific Ocean. Most of this coral is sold to international buyers through a system of closed auctions in Japan that are operated by coral fishing associations. World jewelry production today is dominated by Japaneses and Italian manufacturers.

In Hawaii most precious coral sold in the market place is purchased in the Orient. These stones are mounted in Hawaii in order to save import taxes on finished jewelry. A survey in 1971 showed at least 15 manufacturers producing jewelry and 150 to 200 retail outlets (Poh. 1971). Since then. there has been little or no increase in the number of major manufacturers. However. the number of retail outlets has increased by a factor of about two or three.

Retail sales in 1978 in Hawaii for both imported and locally produced coral jewelry were about $20 million (Clifford Slater. personal communication). This total represents a sevenfold increase since 1969 (see Tompson. 1975). This is based on pink. black and gold coral sales. Of the pink coral. about 80% is imported from the Orient in a polished but uncut state. Almost 100% of the black and gold coral sales are of locally harvested coral

2. *Domestic Commercial Harvest.* The domestic fishery for pink and gold coral in Hawaii is carried out by one submersible. two support craft. and about 12 people. The annual harvest capacity of the fishery is at least 3000 kg of pink and gold coral combined. The actual annual harvest in the 1974–77 period averaged less than 2000 kg (Table II).

Estimates of the ex-vessel value of raw pink and gold coral are given in Table IV. Also. for purposes of management analysis. an estimate of the ex-vessel price may be determined from: the price of imported polished—unset coral. the retail price differential between pink and gold coral jewelry. the relative value of the coral gem in a jewelry setting. and the costs of production at the harvesting and processing stages. The total ex-vessel value of pink and gold coral for 1977 was $262.000 (Table IV).

Table IV.—*Estimated Ex-vessel Value of Pink and Gold Raw Precious Coral Harvested in Hawaii, by Year, 1975–77*

Year	Pink	Per kilogram	Gold	Per kilogram	Total
1975	$180,000	$137	$71.000	$114	$261.000
1976	94.000	136	42.000	114	136.000
1977 [1]	215.000	150	47.000	147	262.000

[1] Projection based on the actual value in the first three quarters of the year.

The value of raw coral is determined by color. size. and condition (living or dead and solid or wormy). For pink coral. the most valuable pieces are light pink or "angelskin." Lighter pink or darker red shades are lower priced. For gold coral. the most valuable shades are dark golden-brown. No dollar value can be estimated for bamboo coral at this time.

3. *Domestic Commercial Processing.* The processed commercial product relevant to the Fishery Management Plan is polished-unset precious coral. The primary supply of this product is imports to Hawaii. The domestic harvest of precious coral from the Makapuu Bed and other potential exploitable beds provides the domestic industry with the raw material to produce an alternate source of polished-unset precious coral. About 35 jobs are directly related to processing raw coral harvested locally.

Value added at the processing stage of producing polished-unset coral from landed raw coral is approximately 100%. That is. $100 of value is added to every $100 of raw coral processed to produce $200 worth of polished-unset precious coral. These estimates are based on the cost of imported polished-unset coral and average costs of different stages of production reported confidentially from industry sources.

The estimated value of pink and gold polished-unset coral produced in 1976 was about $423.000. This included some raw coral from previous years' inventories. In the same year the coral jewelry manufacturers imported polished-unset coral at a cost of about $1.538.000 (see Table V).

Table V.—*Value of Polished-Unset Precious Coral Imports to Hawaii: Percent of Total Coral Imports, by Country of Origin and Year, 1973–76*

Country	1973		1974		1975		1976	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
Hong Kong	59.192	11 3	66.770	13.2	17.833	3 3	64.226	4 2
Japan	241.862	46 4	226.109	44.7	153.929	28 4	277.582	18.1
Philippines	0	...	0	...	73.450	13.6	42.005	2 7
Taiwan	220.496	42.3	203.354	40.8	247.167	45.7	1.130.382	73 5
Others	264	0 05	7.020	1 4	49.025	9 1	23.442	1 5
Total	521.814	100.0	506.253	100.0	541.204	100.0	1.537.737	100.0

Source: Hawaii Custom District, Report Number IA-253. 1973–76.

E. Employment

While the number of people directly employed in the harvesting (12) and processing (35) of locally produced precious coral in Hawaii is not great. about 800 persons are engaged to some extent in the precious coral business there. Most jobs are in wholesale and retail sales.

F. State and Federal Tax Revenues and Multiplier Effects

Considering the excise tax on all retail precious coral products sold in Hawaii. revenues to the State (4%) amounted to about $800.000 in 1978 (Clifford Slater. personal communication). About 20% of this can be attributed to local production of pink and

gold coral in 1978. If wholesale taxes. State and Federal income taxes and operational taxes associated with the entire industry are taken into account. State and Federal tax revenues combined are about 2.5 million annually. About $500.000 of this is based on local production.

If a multiplier effect of two (Anderson et al.. 1975) is used to show the impact of the total retail sales of the industry based on local production ($4 million) on the economy of the State. a figure of about $8 million annually is produced. Eight million dollars is about one tenth of one percent of the Gross State Product of $6.6 billion (Bank of Hawaii. 1976). If the total industry is considered with the same multiplier. the value is 40 million or 0.6 percent of the Gross State Product in 1976.

The relevance of economic data for the total precious coral trade of Hawaii to the management of the domestic pink coral fishery has been questioned. in view of the small contribution of domestically harvested coral to the overall business. Some persons in the business believe that the existence of even this small fishery tends to enhance the acceptance of all precious coral products in the market by lending a background of local color to the jewelry. particularly when it is offered as souvenir items for visitors. This contention is. of course. difficult to evaluate or. if valid. to quantify the effect. It is deemed. however. sufficient reason to include some data on the larger trade within which the domestic coral business operates.

G. Jurisdiction

Federal jurisdiction over natural resources on the Continental Shelf outside of 3 miles was established in 1953 by the passage of the Outer Continental Shelf Lands Act. This Act delegated to the Secretary of Interior the responsibility for managing natural resources of the seabed and subsoil of the outer shelf. In the 1958 Convention on the Continental Shelf. natural resources were defined as "mineral and other non-mineral resources of the seabed and subsoil together with living organisms belonging to sedentary species". Had there been a need to manage precious coral fisheries in 1958. this definition would have probably been used to establish jurisdiction within the Department of Interior.

In 1964. legislation was passed which prohibited foreign fishermen from harvesting Continental Shelf fishery resources within the contiguous zone of the United States (12 miles) except as provided by international treaty or Federal permit. Known as the Bartlett Act (Pub. L 88–308). this legislation was amended in 1971 to specifically include six species of precious coral. which thereby defined them as creatures of the Continental Shelf. Since the Bartlett Act referred to all creatures of the Continental shelf. other species of precious coral which are sedentary and occur on the shelf. even though not specifically listed in the Act by name. were covered by the legislation. The Bartlett Act reserved harvesting rights to U.S. nationals but did not contain any provisions for management. On March 1. 1977. the Bartlett Act was replaced by Pub. L 94–265. the FCMA. In 1977. policies for foreign harvest of precious corals within the Fishery Conservation Zone were established by the Secretary of Commerce and are contained in a draft Preliminary Management Plan (PMP) for precious corals and a PMP for seamount fisheries. These policies would prohibit all foreign harvest everywhere in the Central and Western Pacific FCZ except incidental to trawling on seamounts west of 180° longitude and north of 28°N latitude. Such incidental catches of precious coral must be recorded and returned to the sea. The PMP for precious corals has not been implemented. as it provided a zero TALFF. and no foreign fishing applications were received. The seamount fishery. however. is controlled by a PMP with prohibition on retention of corals taken by trawl.

With regard to domestic fisheries. most functions within the Department of Interior having to do with marine species were transferred to the Department of Commerce (DOC) in 1970 under Reorganization Plan No. 4 prepared by President Richard M. Nixon. However. the Department of Interior (DOI) retained authority to manage natural resources. including coral communities. of the Outer Continental Shelf. After the Secretary of Interior (Secretarial Order 2978. 40 FR 42039) placed a moratorium on the taking of any viable corals in Federal waters on September 10. 1975. the Department of Interior developed a set of regulations which presently allow U.S. commercial coral harvesters to operate in Federal waters under permits issued by the Outer Continental Shelf offices of the Bureau of Land Management of the DOI (**Federal Register** Document–76–27063; **Federal Register**. Vol. 41. No. 181. September 16. 1976). See Section IV–I and Appendix III for details on provisions of the DOI permits. Present DOI regulations concerning fishing for corals in the FCZ will be replaced by the provisions in this plan on the date that implementing regulations for this plan take effect. Furthermore. a recent court decision (*United States* v. *Alexander* (U.S.C.A.. 5th Cir.). 1979) casts serious doubt on the Secretary of Interior's authority under the Outer Continental Shelf Lands Act to require permits of coral harvesters except as may relate to mineral leases.

In Hawaii. the State also exercises some authority under S306 of the FCMA over the harvesting of precious corals outside of 3 miles. The State adopted Regulation 41 of the Division of Fish and Game. Department of Land and Natural Resources. in July. 1977. This Regulation establishes a quota and/or permit system for the management of pink and gold coral in the Makapuu Bed. which lies about 6 miles off the island of Oahu. The quota applies only to pink coral. The State of Hawaii's jurisdiction over the Makapuu bed. as well as other interisland waters. remains an unsettled issue between the State of Hawaii and the Federal Government. but the management approach in this plan is consistent in most respects with the State of Hawaii regulations.

III. Biology

A. Life History

Precious corals are characterized by great longevity. slow growth. and relatively low rates of mortality and recruitment (Grigg. 1976). As a result. unfinished coral populations should be relatively stable from year to year. and moderate changes in vital rates should have comparatively small effects on total abundance. Not unexpectedly. precious coral populations recover very slowly from overharvesting. and must be exploited with caution. Evidence that precious corals do recover comes from the history of the fishery in the Mediterranean Sea. where in the 19th century fishing on beds was rotated every 9 years (Tescione. 1065). Japanese fishermen claim that more than 50 years are required for recovery in the Pacific (Japanese fishermen. personal communication).

Pink. gold. and bamboo corals and other corals covered by this plan all have larval planktonic and sessile adult stages. Larvae settle on solid substrata. where they form colonial branching colonies. The length of the larval stage for all deep species is unknown. In the species of primary commercial importance. *Corallium secundum*. the sexes are separate and the reproductive cycle are annual with spawning occuring during summer months in Hawaii (Grigg. 1976). Very little is known about predator-prey and other ecological relationships between the sessile stages of precious corals and other plants and animals. The sparse research that has been done suggests that microzooplankton and particulate organic matter are important in the diet of gorgonians (Grigg. 1970). There are no known predators on precious corals.

A large number of commensals are known generally (Hyman. 1940) to be associated with anthozoans. Many other species of gorgonian corals as well as invertebrates and fish are known to occur within the habitat of pink. gold and bamboo corals in the Hawaiian Islands. At least 37 species in the Order Gorgonacea alone have been described from the Makapuu Bed (Grigg and Bayer. 1976). Ten species of black coral (Order Antipatharia) are also known to occur in the depth zone of precious corals (300–475 m) in the Hawaiian Islands Grigg and Opresko. 1977). None of these black corals are of commercial importance. Species of possible commercial importance. although they are rarely observed in the Makapuu Bed. include the shrimp *Heterocarpus ensifer* and the fisheries. *Seriola dumerilii*. (kahala) and *Etelis carbunculus* (onaga). No species of either threatened or endangered wildlife are known to occur at depths where precious corals are found in the Western Pacific (see Appendix IV).

At least two species are known to be epizoic commensals of *Corallium secundum*. These are an anemone *Palythoa* sp. and a polychaete worm. *Palynoe* sp. the anemone attaches to the skeleton but causes no injury to the coral tissue or skelton: rarely more than 2 or 3 anemones occur on the same colony. The polychaete worms live in burrows or worm runs of their own making in the coral tissue or coenenchym. They cause no injury to the skeleton or the living tissue.

B. Distribution. Abundance and Habitat

The distribution of precious coral beds in the Hawaiian Archipelago, American Samoa. Guam the Commonwealth of the Northern Marianas and other U.S. Pacific island possessions is described in Section II.A. of this report. The vertical or depth zonation of

precious corals in Hawaiian waters is given in Table VI.

Table VI.—*Vertical Zonation of Species of Precious Corals in Hawaii*

Common name	Scientific name	Depth range (m)
Black coral	*Antipathes dichotoma*	30–100[1]
Black coral	*Antipathes grandis*	40–100[1]
Pink coral	*Corallium secundum*	350–475[2]
Gold coral	*Gerardia* sp	300–400[2]
Bamboo coral	*Lepidisis olapa*	330–475[2]

[1] Based on observations from a submersible
[2] Based on observations from a submersible and data collected with a remotely operated television camera.

In the Hawaiian Archipelago, stocks of precious corals may be more abundant in the northwestern end of the island chain, where large areas of potential habitat exist on seamounts and banks near 400 m depth. The combined area of the Milwaukee Banks and Kinmei Seamount (400–500 miles northwest of Midway Island), for example, is over 300 km². In contrast, the area of the major bed off Oahu (Makapuu) is estimated to be 3.6 km². The dimensions of the Makapuu Bed actually cover about 4.5 km² (Figure 5). However, observations from the submersible *Star II* have shown that about 20% of this area includes barren patches and irregular lenses of thin sand deposits. Therefore the area used for the purpose of extrapolating density is taken as 80% of 4.5 km² or 3.6 km².

Annual harvest of *Corallium* in 1969 by the Japanese on the Milwaukee Banks was reported to be 113.000 kg (H. Ozawa, personal communications). This compares to a range of annual harvest of *Corallium* of Makapuu of 438 to 2209 kg in the years 1966 to 1976. If the highest yields for both areas are expressed on a per km² basis (Milwaukee = 376 kg/km², Makapuu = 611 kg/km²), Makapuu actually has a higher yield area. However, since comparative data on fishing effort are lacking, interpretation of these figures is difficult. Nevertheless, the habitat area and total yields at the Milwaukee Banks are far greater in absolute terms than off the high islands at the southeastern end of the Archipelago.

In the high islands, beds of precious corals have been found only within island channels and off promontories such as Ke-ahole Point on the Big Island of Hawaii. Precious corals are only found on solid substrata, which in deep water invariably occurs only where bottom currents are frequently strong (>25 cm/sec).

The only bed that has been accurately surveyed in the Hawaiian chain is off Makapuu, Oahu. In 1971, densities in commercial species were determined in an unexploited section of the bed and the size frequency distribution of pink coral was determined (Grigg, 1976). The average density of pink coral in the Makapuu Bed is 0.022 colonies/m². Extrapolation of this figure to the entire bed (3.6 million m²) gives a standing crop of 79.200 colonies. The 95% confidence limits of the standing crop are 47.200 to 111.700 colonies. Conversion of standing crop of colonies to biomass produced an estimate of 43.500 kg for *C. secundum* in the Makapuu Bed.

The estimates of density for gold coral (*Gerardia* sp.) and bamboo coral (*Lepidistis olapa*) in the Makapuu Bed are 0.003 colonies/m², and 0.01 colonies/m², respectively (Grigg, 1974). However, the distributional patterns of both of these species are very patchy, much more so than *Corallium secundum*, and the area where they occur is only about half that for pink coral or 1.8 km². The corresponding estimates of unfished abundance for gold and bamboo coral are 5.400 and 18.000 colonies, respectively. Data for the mean weight of colonies in the populations of gold and bamboo coral in the makapuu Bed are lacking, but rough estimates are 2.2 kg for gold coral and 0.6 kg for bamboo coral. Multiplying mean weights by densities led to rough estimates of standing corp of about 11.880 kg for *Gerardia* sp. and 10.800 kg for *Lepidisis* sp.

C. Growth and Mortality Rates

An analysis of growth rings in the cross sections of pink coral branches suggested that colony height increases about 0.9 cm/yr. at least to an age of about 30 years (Grigg, 1976). The equation for the regression of height on time is as follows:

$H = \alpha + \beta T$

where:

H = height (cm)
T = Time (yr)
$\alpha = 2.63$
$\beta = 0.89$

A similar relation for weight [1] as a function of height is given by the equation:

$W = aH^b$

where:

W = weight (gm) (landed weight)
a = 0.8
b = 2.27

The largest colonies of pink coral found at Makapuu are rarely more than 60 cm in height. Gold coral colonies may reach a height of 250 cm, while *Lepidisis olapa* grows to about 300 cm.

The natural mortality rate for pink coral was calculated by first converting the size-frequency distribution of the unfished stock to an age frequency distribution and then determining the rate of diminution in progressively older age classes (Grigg, 1976). The best estimate of the annual instantaneous natural mortality rate of *C. secundum* in the Makapuu Bed turned out to be 0.066. This is equivalent to an annual survival rate of about 93% in the absence of fishing. Mortality rates for gold and bamboo coral are not available because their growth rates and age structures are unknown.

D. Reproduction and Recruitment

Pink corals reach sexual maturity at a height of about 12 cm (13 years), however, the data are not very precise (Grigg, 1976). The reproductive cycle is annual with spawning taking place during June and July.

The relationship between parent stock and recruitment in pink coral is unknown. However, because pink coral is long lived, and the population is composed of many year-classes, the standing stock should be relatively stable even with moderate year-to-year fluctuations in recruitment.

[1] Landed weights appropriately 24 hours air dry.

An estimate of steady state recruitment of the unexploited Makapuu stock was obtained by multiplying the virgin stock size (79,200 colonies) by the best estimate of annual instantaneous natural mortality (0.066). Under steady state, the instantaneous rate of recruitment should equal the instantaneous rate of natural mortality. This gives an estimate of annual recruitment to the Makapuu Bed of 5.277 colonies.

E. Biomass per recruit

Biomass per recruit as a function of age was calculated in the absence of fishing using a cohort (=all colonies produced in the same year) production model (Wetherall and Yong 1977). In the model, the cohort gains weight until an age is reached where growth gains are overtaken by natural mortality losses.

This is the "critical age" at which the cohort reaches its maximum biomass in the absence of fishing. The formula for critical age is:

$T = (b/M - \alpha/\beta)$

where:

b = exponential coefficient in the weight-height relationship (p. 30)
M = instantaneous natural mortality rate
α = intercept of linear growth in height equation (p. 30)
β = slope of linear growth in height equation (p. 30)

The numerical result for pink coral is T = 31.4 years.

The corresponding maximum biomass per recruit is given by the formula:

$MBPR = e - (b - \alpha M)/\beta a(\beta^b)^b/(M)$

where the new symbols are:

e = base of natural logarithms = 2.71828
a = coefficient in weight-height relationship (p. 30)

For pink coral the maximum biomass per recruit, attained by a cohort at age 31.4 years, is MBPR = 237 gm. This is shown as the peak in the top curve of Figure 11. Other curves in Figure 11 show the relationship between biomass per recruit and age when fishing takes place at constant rates (F>0) and there is no minimum age limit for harvested coral. Corresponding biomass per recruit curves for the case of a 25-year minimum harvest age are shown in Figure 12.

F. Yield Per Recruit

When fishing is done in such a way that all colonies of a cohort are removed at once, then the yield per recruit is identical to the biomass per recruit at the harvest age. Therefore the maximum yield per recruit is achieved by harvesting all survivors in a cohort of pink coral exactly at the critical age of 31.4 years, and in this case the maximum yield per recruit (MYPR) is = 237 gm. In practice this would require applying an infinite instantaneous fishing mortality rate exactly at age 31.4 years. Since this is not feasible, the 237 gm/recruit is a theoretical upper limit to the harvest that may actually be obtained.

More realistic figures of yield per recruit are obtained by considering a fishery which applies a steady finite fishing mortality rate to all ages in the cohort above a specified minimum harvest age. The results in this case are displayed in Figure 13. The effect of an

age limit of maximum yield per recruit is easily seen. For example. with a minimum harvest age of 30 years the maximum yield per recruit is essentially equal to the upper limit of 237 gm. whereas with a minimum harvest age of zero years the greatest yield per recruit possible is only 119 gm. Hence. if non-selective methods of harvest (e.g.. dredging) are employed. the highest yield per recruit that can be expected is only half of the maximum yield per recruit theoretically possible under selective harvesting.

G. Sustainable Yield and MSY

The analysis above reflects a biological management approach in which the main consideration is achieving the highest possible efficiency in utilizing biological production for a cohort. As long as recruitment is constant or independent of stock size. a fishing policy which maximizes the yield per recruit will also maximize the total yield on a sustained basis. i.e.. it will also produce the maximum sustainable yield (MSY). However. in many fisheries the level of recruitment may be strongly affected by the abundance of reproductive individuals in the stock. which is in turn determined partly by the fishing policy (such as minimum harvest age and fishing mortality rate).

Even though no specific information is available on the actual stock-recruitment relationship in pink coral. it is important to see how various hypothetical relationships would alter the analysis of best fishing policy. If recruitment is not constant. but is instead some decreasing function of spawning stock. then MSY will be reduced accordingly. Several hypothetical stock-recruitment curves are diagrammed in Figure 14. The diagonal line (curve 1) shows a proportional decline in recruitment as a direct function of spawning stock. The curves above the diagonal also show recruitment declining as a function of spawning stock. but at lesser rates. such that when the spawning stock (S) is 50% of its original level (SMAX). recruitment (R) is either 60% (curve 2). 70% (curve 3). 80% (curve 4). or 90% (curve 5) of its maximum level (RMAX). Curve 6 shows the model of constant recruitment.

Possible combinations of sustainable yield and minimum harvest age are shown in Figure 15. as computed in Wetherall and Yong (1977). The outer boundary (curve 6) gives the combination of sustainable yield and minimum harvest age for the constant recruitment case. assuming a steady recruitment of 5.000 colonies per year.

The maximum sustainable yield under this constant recruitment rate is

$$MSY = MYPR \times R$$
$$= 237 \text{ gm/recruit} \times 5{,}000 \text{ recruits/yr}$$
$$= 1185 \text{ kg/yr}$$

This assumes a minimum harvest age of about 30 years and a very high instantaneous fishing mortality rate. When selective harvesting is not possible. then the maximum possible sustainable yield is less than 600 kg/yr.

The other curves (5. 4. 3. and 2) show the outer limits of the policy space (combinations of annual sustainable yield and minimum harvest age) corresponding to the other stock-recruitment models. As the stock-recruitment curves get steeper (i.e.. progressively lower rate of recruitment for a give spawning stock). the minimum age limit necessary to maintain a specified sustainable yield increases. Further. the MSY is significantly less than 1185 kg/yr when recruitment is not constant. This analysis suggests a range of conservative alternative policies which might be adopted in the absence of any understanding of the true stock-recruitment relationship.

Maximum sustainable yield for the constant recruitment case was computed above analytically using the expression

$$MSY = A \cdot D \cdot M \cdot e^{[illegible]}$$
$$= R \cdot MYPR$$

Where the new symbols are:

A = area of Makapuu bed

D = average density of pink coral colonies on the bed before exploitation

M = instantaneous natural mortality rate

R = A × D × M

A rougher but quicker approach to estimating MSY is the approximation of Gulland (1970). viz.

$MSY^1 = 0.4\ M\ B_o$

Where

$B_o = A \times D \times W$ = total biomass of unfished stock and

W = weighted average weight of a colony in the unexploited stock.

In the case of pink coral on the Makapuu bed:

$MSY^1 = (0.4)\ (.066)\ (43.500) = 1148$ kg/yr

The Gulland method is useful especially for gold and bamboo coral where details of population dynamics are relatively unknown. Using the best guesses of unfished biomass (B_o) and substituting the pink coral natural mortality rate (m = 0.066) in place of the unknown values. rough estimates of MSY for gold and bamboo coral were computed to be 313 kg/yr and 285 kg/yr. All estimates of MSY are summarized in Table VII. MSY cannot be estimated for other corals at this time.

[1] Landed dry weight.

Table VII. *Estimates of MSY of Precious Corals in the Makapuu Bed*

Species	Common name	Kilograms per year: MSY [1]	Kilograms per year: Rounded downward	Method of calculation
Corallium secundum	Pink coral	1.185	1.000	Cohort production model
Do	do	1.148	1.000	Gulland
Gerardia sp.	Gold coral	313	300	Do
Lepidisis olapa	Bamboo coral	285	250	Do

[1] Landed dry weight

IV. Management

A. History of Research and Management

The precious coral fishery can be traced back to the Sumerian and Minoan cultures around 3000 B.C. in the Mediterranean Sea. Through this long history. occasional efforts to manage the fishery have been made. Periods of prohibition have been attempted more than once in several places. but invariably they were unsuccessful. The pattern of fishing usually was one of exploration. discovery. exploitation and depletion. When recovery occurred. it usually was brought about unintentionally by interruption of fishing by war. Between 1879 and 1890. off the Barbary Coast in Africa. fishing grounds were rotated (closed) for 9 or 10 year periods. However. lack of enforcement eventually led to severe depletion of the beds. The selection of a 9-10-year period for recovery was based on observations of fishermen and the early research of Lacaze-Duthier (1864). who first investigated the life history of *Corallium rubrum* in the Mediterranean Sea.

Until 1970. research on precious coral in the Pacific was limited to the early work of Kishinouye (1901) on reproductive behavior and studies by Kitahara (1904). who described the coral fishery in Japan in the late 19th century. Before 1868. coral fishing in Japan was inadvertently managed by virtue of the societal customs of the Shoguns. who confiscated coral thereby eliminating incentive for a commercial fishery. After 1868. no management of the stocks was attempted in Japan. probably because fishing activity ranged far beyond local waters.

In 1963. rich beds of *Corallium* were discovered about 100 miles south of Okinawa. and the Government in Okinawa attempted to regulate the harvest by requiring permits and limiting entry into the fishery. Unfortunately. too many permits were issued and the beds were rapidly depleted.

Furthermore. enforcement was lacking to prevent unlicensed fishermen from entering the fishery and this accelerated the decline.

In 1970. a Sea Grant research program was started at the University of Hawaii to investigate the ecology of precious coral and determine the economic feasibility of developing a fishery in Hawaii. This research led to the development of a selective harvesting system which is currently in use in Hawaii (the *Star II* submersible and support craft). This research also generated data concerning distribution. abundance. growth. natural mortality. recruitment. and maximum sustained yield of precious corals in Hawaii and is the basis of the analysis presented in this report. A detailed account can be found in a Sea Grant Technical Report entitled "Fishery Management of Precious and Stony Corals of Hawaii" (Grigg. 1976).

The Makapuu Bed has been exploited periodically since 1966. Estimates of the harvest of pink and gold coral during this period are given in Table I. The first attempt to manage the precious coral fishery in Hawaii was by the State Division of Fish and Game. In 1977. the Division of Fish and Game passed Regulation 41. which contains provisions concerning permits. annual quotas and size limits (see Appendix II). The history of efforts to manage precious coral resources by the Federal government is given in Section II.G on Jurisdiction. The regulations of the Department of Interior are described in Section IV.I and Appendix III.

B. Management Objectives and Philosophy

1. The major objectives of this management plan are to obtain optimum yields of precious corals in the U.S. 200-mile fishery conservation zone. and to maximize the benefits of the resource to the nation. Optimum Yield is defined in the Act as the "amount of fish" which will provide the greatest overall benefit to the nation and is prescribed on the basis of MSY as modified by socio-economic and ecological factors. Given this definition. estimates of MSY have been calculated for pink. gold and bamboo corals in the Makapuu Bed and modified according to the definition given above.

In order to obtain maximum sustained yields of precious corals. several of their biological properties must be considered. Precious coral populations are relatively stable in nature because many year classes are usually present. Annual differences in recruitment and age-specific mortality rates therefore tend to be offsetting. This pattern of life history has two important consequences with respect to exploitation. First. the response of the population to exploitation or changes in the exploitation rate is drawn out over many years (see Figs. 16 & 17). The date presented in Figures 16 and 17 were produced by simulating the past history and future condition of a fishery for *C. secundum* in the Makapuu bed between 1964 and 2014 (50 years). In 1978. six different rates of exploitation were applied to a model of population for one year after which it was assumed that the fishery was closed and monitored for 37 years. In the model. recruitment was assumed to be constant until a level of two-thirds the spawning biomass was reached. after which recruitment was calculated as a direct function of spawning biomass. Examination of Figures 16 and 17 reveals that about 25 years are required before the population biomass and the spawning biomass recover within 95% of original values. Thus. age structure may be in a transitional state for many years.

The second important consequence of great longevity. and the associated slow rates of turnover in the populations. is that if a stock has been overexploited for several years. a long period of reduced fishing effort is required to restore the ability of the stock to produce a maximum sustained yield (Figures 16 and 17). Because of the long recovery time of precious corals. the most prudent policy for the management of newly discovered beds would be to permit commercial exploitation in Exploratory Areas only after assessments of the virgin stocks are made. The assessment should at least include total area of the bed and estimates of density of various species present. The most economical method of obtaining this information would be fishermen operating under exploratory fishing permits with detailed reporting requirements.

2. *Specific Management Objectives.* The specific objectives to be achieved by management measures adopted under this fishery management plan are as follows:

(1) to allow a fishery for precious coral in the fishery conservation zone in the western Pacific. but to limit the fishery so as to achieve the Optimum Yield on a continuing basis

(2) to prevent overfishing and wastage of the resource

(3) to encourage the use of selective harvesting methods

(4) to minimize the harvest of colonies of coral which are immature

(5) to minimize the harvest of colonies of coral which have not reached their full potential for growth

(6) to preserve an opportunity for low-investment equipment in the fishery (dredges)

(7) to encourage the discovery and exploration of new beds

(8) to provide for the establishment of refugia. i.e.. beds completely protected from exploitation

(9) to encourage the development of new information concerning the distribution. abundance and ecology of precious corals.

C. Optimum Yield

A stated purpose of the Fishery Conservation and Management Act of 1976 is to provide for preparation and implementation. in accordance with national standards. of Fishery Management Plans which will achieve and maintain. on a continuing basis. the Optimum Yield (OY) from each fishery. Calculation of OY in this management plan involves several steps. First. MSY is estimated. OY is then derived by adjusting MSY lower or higher for ecological reasons: for example. to rebuild overfished stocks. OY may also be adjusted upward or downward depending on socio-economic considerations or information received via the public hearing process.

In the case of pink coral in the Makapuu Bed. the (downward rounded) estimate of MSY is 1.000 kg. On the basis of past harvest records. the Makapuu Bed does not appear to be in an overfished condition. Therefore. it is reasonable to base OY on MSY. with appropriate modification to include economic and social factors. See Appendix I for an economic analysis of various management options.

This anslysis shows that pulse fishing is more economically efficient than fishing continuously. if there are alternative uses for the fixed factors of production. Otherwise. continuous fishing is more efficient at annual quotas of about 1.000 kg for pink coral and 300 kg for gold coral for the single firm now harvesting the Makapuu bed.

The most likely situation is that the firm now harvesting coral with a submersible in the Makapuu bed will find alternative uses for the submersible and its support vessels during zero harvest years of a pulse fishing strategy. Without adequate information on the world coral market. projections of coral prices are not available. Projections on production cost changes are not available eithes. Therefore. assuming *prices and costs change at the same rate* and the fixed costs are defrayed during zero production years by alternative employment. pluse fishing is deemed the most efficient policy.

If the Optimum Yield is to be based on pulse fishing. the *biological* implications of different catch levels must also be examined. Although setting a 2-year quota of 2.000 kg would concentrate fishing effort in the first year and slightly reduce MSY over the long term. the decrease in negligible (Figure 18) When pulse fishing is simulated for 3- and 4-year periods (again with the entire catch in the first year). the biomass of the exploited population gradually decreases. The biological consequences of harvesting more than an average of 1.000 kg in one year are described in Section IV.F.1.B. Eight such options were tested. and in all cases the rates were not sustainable. Thus. a strategy of 2-year pulse fishing appears to be the best combination in terms of minimizing the biological risks and maximizing economic benefits. For this reason. Optimum Yields for precious corals in the Makapuu Bed have been set on the basis of 2-year quotas. Applying this criterion to pink. gold and bamboo coral gives (downward rounded) Optimum Yields of 2.000 kg. 600 kg. and 500 kg respectively for 2 years for the Makapuu Bed.

Optimum Yields are established for the Conditional Beds by assuming the same densities and population dynamics as for the Makapuu Bed. taking into account the areas of the beds relative to that of the Makapuu Bed. and reducing the resulting figure by 80%. if harvesting is to be by non-selective coral dredges. Thus. the annual quotas on each of these beds will be fractions or multiples of 200 kg of pink coral. 60 kg of gold coral and 50 kg of bamboo coral proportional to the area of the bed. If fishing on a bed is by nonselective methods. the bed will be closed when the quota is filled for any one of the three species. to prevent over-harvesting.

Because of the potential vulnerability of precious corals to over exploitation. a prudent policy for newly discovered and unsurveyed beds would be to fix Optimum Yields only after a careful assessment of their production potential. However. an

assessment of abundance and productivity can be accomplished only after a bed has been located, and as a practical matter, neither Federal nor State agencies are likely to receive funding to search the FCZ to locate coral beds. It must be left to private interests to conduct this exploratory fishing. This in turn poses a serious management problem: there must be a limit to the amount of corals allowed to be taken from an Exploratory Area to reduce the risk of overfishing, but the limit must be large enough to provide the economic incentive to engage in exploratory fishing.

There is no statistical basis for determining this limit; rather, the limit must be a judgmental decision. With respect to abundance, it is believed that there are coral beds scattered throughout the FCZ. Reports of past foreign operations and the detection of illegal foreign operations in 1978 provide evidence of foreign interest in (and perhaps knowledge of) coral resources in the FCZ. With respect to economic incentive, precious coral ex-vessel prices were about $150/kg. in Hawaii in 1977 (see Tables II and IV). Little is known, however, about the costs of operation for a submersible or for dredging, thus, break-even harvests for exploratory fishing cannot be estimated.

The Council's judgement is that an optimum yield of 1000 kg per year per Exploratory Area should provide sufficient incentive for both domestic and/or foreign exploratory fishing while posing little risk of overfishing. For this purpose, there are considered to be five Exploratory Areas, comprising the FCZ off American Samoa, Guam, the Northern Marianas, and the minor U.S. island possessions in the central and western Pacific Ocean, and those portions of the FCZ off the Hawaiian Islands that are not included in Established and Conditional Beds, as defined in this Plan. A quota of 1,000 kg/yr. of all species combined for each Exploratory Area is considered conservative. In Hawaii, this figure represents about one-third of the estimated MSY for these species in all Established and Conditional Beds. However, it is large enough to offer an economic incentive for exploration.

D. Domestic Fishing Capacity, Expected Harvest Level, and TALFF

1. *Established and Conditional Beds.* Domestic harvest from the Makapuu bed of all corals in 1974 was nearly 3,000 kg. (see Table II). The industry was operational on a continuous basis that year. Harvests then declined for two years, but increased again in 1977. The reasons for this pattern of harvests are not known, but it appears that the popularity of coral jewelry may be increasing such that demand and prices for corals (see Table V) justify more intensive fishing.

It has been pointed out that the maximum payload of the submersible in the corals fishery is about 200 pounds, or 90 kg. (Sec. II.C.2). If it is assumed that the average haul on a dive is approximately 60 lbs. (27 kg.), the submersible would have had to make about 110 dives to achieve the 3,000 kg. harvest made in 1974. This number of dives can be accomplished in about 37 weeks. Thus the 3,000 kg. harvest would seem to be a minimal measure of domestic capacity. It seems reasonable to estimate that domestic capacity would be at least one-third higher (i.e. 4,000 kg.) given the right conditions of price, harvest costs, and resource abundance.

Estimating expected domestic harvest is more difficult given the limited data available. Domestically harvested corals constitute only a small portion of the entire corals industry, and it appears that a large volume of low-priced imports could easily drive down the price and make the domestic product less competitive. On the other hand, coral jewelry is a popular item in the tourist markets, and producers may be willing to pay a premium or engage in long-term contracts to insure a stable supply of domestically harvested corals. It also would seem reasonable to conclude that domestic producers have learned how to use the submersible more effectively since 1974, and that the same number of dives would produce more coral per dive than in 1974, assuming sufficient availability of corals for harvest. Considering all these factors, the expected annual harvest is estimated to be 3,300 kg. per year (assuming management measures permit). This represents a 10% increase over the 1974 (peak year) harvest.

The OY for the Makapuu Bed is established to be 3,100 kg. (all species combined) over a two year period. This is the most fished and best studied bed in the FCZ and is quite close to the dominant processing and retailing center of Hawaii. It also is reserved for selective fishing techniques. It appears reasonable to expect that the OY for Makapuu will be harvested in the first year of the two year period so the submersible can be employed during the second year in alternative areas or uses. Thus, there would be more than 3,000 kg/year of "idle" selective capacity available to harvest the OY from the four Conditional Beds from which corals may be harvested (the fifth Conditional Bed is to be a refugium). If selective gear is used, OY for Conditional Beds (in aggregate) would be not more than 1,250 kg. per year, or 2,500 kg. over a two year period (all species combined). If non-selective gear is used, OY would be less. Therefore, it appears reasonable to conclude that domestic vessels can and will harvest the OY from Established and Conditional Beds. Therefore, the TALFF for these beds is zero.

2. *Exploratory Areas.* There is no evidence to indicate that owners of U.S. vessels have either the intention or the desire to conduct exploratory fishing in the FCZ, especially seaward of Guam and American Samoa. Conditions may be somewhat more favorable off Hawaii, given the proximity of the dominant market and the possibility that a vessel fishing a Conditional Bed with dredging gear could conduct some exploratory fishing with little additional cost. Domestic interests, however, are unlikely to make any investments in vessels and gear without some assurance that corals will be available.

Determination of OY and appropriate conservation and management measures for Exploratory Areas presents a unique problem, for the following reasons:

1. Lack of information. By definition, Exploratory Areas comprise all portions of the FCZ excluding the Established and Conditional Beds. There is general information on ocean depths and oceanic circulation patterns in the FCZ, and it is virtually certain that there are beds of precious corals in addition to known beds. There is, however, no information on which to base estimates of abundance and yield potentials except in gross terms. The appropriate level of harvest from each Exploratory Area will reflect a judgment as to acceptable risk of overfishing.

2. Need for exploratory fishing. It is unlikely that governmental or non-profit organizations will receive funds for exploratory surveys to identify and assess coral stocks in the FCZ. Therefore, exploratory commercial fishing must be relied on to generate data on location and yield potential of beds in Exploratory Areas. The level of harvest which will be sufficiently large to generate exploratory fishing can only be estimated.

3. Potential for foreign fishing. The FCMA provides that domestic interests must be given a preferential opportunity to harvest the OY from the fishery. If domestic fishing will not harvest the OY, the unharvested portion must be made available for foreign fishing. This may be especially appropriate for the Exploratory Areas because data from exploratory fishing are so critically needed.

4. Uncertainty. It is unknown whether domestic fishing will occur or, if it occurs, whether coral beds will be located. If a bed is located, harvest could occur quickly or slowly, depending on the bed's size, the density of corals on the bed, the gear used, and other factors. The absence of historic harvest or of evidence of domestic interest at this time does not mean that domestic harvest will not occur in the near future. There should be provision for unexpected domestic entry before making allowance for foreign fishing.

Considering the above, the Council proposes that a "reserve" approach be adopted, as follows:

The MSY per Exploratory Areas is estimated to be at least 1,000 kg. per year, all species combined.

Optimum Yield is 1,000 kg. per Exploratory Areas per year, all species combined.

Expected Domestic Harvest (DAH) in the first year is zero (0) kg., although domestic harvest potential is unknown; DAH will be determined each future year as set forth below.

The entire OY for the first year is to be held in reserve for the first six months.

As soon as practicable after the end of the first six months, the Director, NMFS, Southwest Region, will determine the amount to be released from the reserve. The release shall be equal to 1,000 kg. minus two times the domestic harvest in the first six months; that is, total allowable level of foreign fishing (TALFF) for the second six months (less time for determination of domestic harvest in the first six months) will be calculated by determining the domestic harvest in the first six months, multiplying that amount by two (2), and subtracting the product from 1,000 kg. If domestic harvest in the first six months is 500 kg. or more, there will be zero (0) TALFF for the second six months.

In each succeeding year, DAH will equal the previous year's harvest and the reserve

will equal 1.000 kg. minus the estimated DAH. for each Exploratory Area. TALFF will be determined in the same manner as in the first year. The following hypothetical examples show how the "reserve" system will work:

Year 1

DAH = 0
Domestic Reserve = 1.000 kg.
Domestic catch at end of 6 months = 300 kg.
TALFF = 1.000 − 2 (300) = 400 kg.
Domestic catch at end of year = 600 kg.

Year 2

DAH = 600 kg.
Domesitc Reserve = 400 kg.
Domestic catch at end of 6 months = 350 kg.
TALFF = 1.000 − 1 (350) = 300 kg.
Domestic catch at end of year = 700 kg.

Year 3

DAH = 700 kg.
Domestic Reserve = 300 kg.
Domestic catch at end of 6 months = 200 kg.
TALFF = 1.000 − 2 (200) = 600 kg.
Domestic catch at end of year = 400 kg.

Year 4

DAH = 400 kg.
Domestic Reserve = 600 kg.
Domestic catch at end of six months = 500 kg.
TALFF = 1.000 − 2 (500) = 0 kg.
Domestic catch at end of year = 1.000 kg.

Year 5

DAH = 1.000 kg.
Domestic Reserve = 0
Domestic catch at end of 6 months = 500 kg.
TALFF = 1.000 − 2 (500) = 0
Domestic catch at end of year = 1.000 kg.

The Council recognizes that this approach may be less than optimal for timely planning of foreign fishing effort in the FCA. As a partial offset. the Council recommends that NMFS notify foreign interests that they should submit foreign fishing permit applications in advance of the second six month period to expedite entry to the fishery if a TALFF is determined to exist for that period. This notification would not be a commitment to foreign interests but would signal an intent to cooperate so that if domestic fishing does not occur. foreign fishing can begin as soon as the reserve is released.

This conservation and management strategy will protect against overfishing by limiting harvesting to 1.000 kg. per Exploratory Area per year: will provide a preferential opportunity for domestic fishing by placing all or part of the OY in "reserve" for the first six months of each year. thus allowing time for start up and exploratory domestic fishing before any foreign fishing is permitted: will allow foreign fishing if domestic harvest does not occur: and will establish a system for determining the DAH. the reserve. and the TALFF during each of several years without need to amend the FMP each year.

E. Domestic Processing Capacity and Expected Processing Level

The largest annual domestic harvest since the submersible entered the fishery has been about 2.940 kg. (1974). There are no indications that domestic processing capacity was insufficient to process this level of harvest. The size of the market for polished-unset coral (Table V) suggests that domestic processing would expand rapidly with increased domestic harvest. The Council believes that domestic processing capacity and expected processing levels will equal the domestic harvest for the future. There is no known or suspected interest in joint ventures involving foreign vessel processing of U.S. harvested corals.

F. Management Measures—Options. Recommendations and Rationale

1. In developing a management plan for precious corals in the western Pacific. a number of options were considered for each management provision. All options for each provision are listed below. The policies recommended by the Western Pacific Council and the rationale for these decisions are also described. Where appropriate. reference is made to previous sections of the plan which contain more complete documentation and support for the recommendations of the Council. A draft set of suggested conservation and management measures which implement the recommendations is presented in Section IV.F.2. of the plan.

A. *Gear.* With regard to gear restrictions. six options were considered by the Council. They are as follows:

(1) To prohibit all forms of non-selective harvesting (dredging) in the FCZ.

(2) To allow unconditional non-selective harvesting everywhere in the FCZ.

(3) To allow conditional non-selective harvesting everywhere in the FCZ.

(4) To allow conditional non-selective harvesting in some areas where selective methods are not in current use.

(5) To allow unconditional selective harvest everywhere in the FCZ.

(6) To allow conditional selective harvest everywhere in the FCZ.

Policies 4) and 6) are recommended: to allow conditional non-selective harvesting in Exploratory Areas and on some Conditional Beds. excluding the FCZ seaward of the main Hawaiian Islands. i.e. south and east of a line midway between Niihau and Nihoa Islands: and to allow conditional selective harvest everywhere [1] in the FCA. This would prohibit non-selective harvesting in the areas such as Makapuu. where selective harvesting methods are established and capable of taking the Optimum Yield: or Ke-ahole Point or Kaena Point. which are such small beds that non-selective harvesting poses too great a risk of damage in view of the low economic return.

A discussion of the advantages and disadvantages of selective and non-selective (dredging) technologies is presented in Section II.C of the plan. Where allowed. non-selective harvesting would be subject to reduced quotas relative to quotas for selective methods (see below). This is because young colonies are not protected from exploitation during the period when their growth exceeds losses from natural mortality. Hence. with non-selective harvesting some growth-overfishing occurs. Also. with non-selective harvesting full recovery of pieces knocked down does not occur (Section II.C.2). The reason an allowance for non-selective harvesting is provided at all is the impracticality of utilizing selective methods in certain remote areas. Restricting harvest to selective methods could in practice close off large areas. This would be wasteful of the resource and would not produce new information concerning distribution and abundance. Both non-selective and selective harvest are subject to further conditions which are outlined below.

Both options recommended are consistent with the objectives of the plan (see Section IV.B.2) and the national standards of P.L. 94-265.

B. *Weight Quotas.* Two options were considered: to require or not require weight quotas on a per bed basis. The Council proposes to establish weight quotas for both non-selective and selective harvesting methods. For non-selective harvesting. the weight quota would be set equal to 20% of the quota that would apply if selective methods were in use. The rationale for this restriction is the finding that the MSY for pink coral with no size limit is approximately half what it is at optimum size of first capture (Section III.F).

Taking into account the efficiency of the dredges (40%) results in a further reduction of the quota to 20% (40% of 50%). For selective methods. the weight quotas are based on estimates of MSY (Section III.G). In the Makapuu Bed. eleven weight quotas for pink coral were considered. They are as follows: 1.000 kg/yr. 1.200 kg/yr. 2.000 kg/yr. 3.000 kg/yr. 4.000 kg/yr. 5.000 kg/yr. 6.000 kg/yr. 7.000 kg/yr. 8.000 kg/yr. 2.000 kg/2 yr. and 3.000 kg/3 yr. The option recommended is the tenth: 2.000 kg/2 yr. This option is selected because it is the most efficient quota considering all biological. economic and social factors (Section IV.D). Multiple year quotas in which fishing effort is concentrated in the first year also favor exploration in "off-years" when the equipment might otherwise not be in use. The 2-year quota is based on an estimate of MSY for pink coral. simply being double the amount for twice the time. The same formula was used to develop optimum yields for gold and bamboo coral.

For all harvest levels greater than 1.000 kg for one year. the harvest (even up to 8.000 kg) can be sustained only for several years. after which the population and catch severely decline. Two levels of harvest. 2.000 kg/yr and 4.000 kg/yr. were simulated using a computer model over a 37-year period to show the effects of these policies on both the parent population (Figure 18) and the catch (Figure 19). In the model. recruitment is assumed to be constant until a level of two-thirds the spawning biomass was reached after which it was set as a linear function of spawning biomass. In the case of continuous harvest at the 2.000 kg/yr level. the population is able to produce this yield for only 14 years after which significant reduction occurs. The 4.000 kg/yr option leads to collapse of this level of harvest in just 5 years. In the Makapuu Bed both the 2.000 kg/yr and the 4.000 kg/yr are wasteful in the long term and are inconsistent with the national standards of FCMA.

For Conditional Beds for which there are not good estimates of MSY but for which estimates of area are available. the quota. for

[1] Except Refugia.

each species of precious coral. initially could be set according to the ratio of the area of a bed to the area of the Makapuu Bed. i.e.

$$\frac{\text{Area of Bed}}{\text{Area of Makapuu Bed}} \times \text{MSY for Makapuu Bed}$$

Such beds are defined as Conditional Beds. For Conditional Beds on which non-selective harvesting is allowed the quota would be reduced by 80%.

For areas outside the Makapuu Bed. and the FCZ seaward of the main Hawaiian Islands Conditional Beds. it is proposed to allow either non-selective or selective methods. subject to a limit of 1.000 kg. per Exploratory Area per year. The quota for Exploratory Areas is suggested on the basis of providing a minimum economic incentive for exploration (See p. 44). Of the 1.000 kg. per Exploratory Area per year. 1.000 would be established as a reserve for domestic fishermen for the first six months of the first year at the end of which period a TALFF would be established on the basis of TALFF = 1.000 kg. − 2 x domestic catch. In subsequent years the DAH would equal the previous year's domestic catch and the domestic reserve = 1.000 − DAH. At the end of six months TALFF would be established to equal 1.000 kg. minus two times any domestic catch. A 1.000 kg. quota is judged to be of sufficient value as to provide an economic incentive for exploratory fishing. For this reason the absolute amount of the quota is the same regardless of the type gear employed (selective or non-selective).

The plan envisions that a new bed identified in a Exploratory Area will be designated a Conditional Bed. with a quota based on its estimated area. once and area estimate has been made. Fishing in Exploratory Areas will be controlled by permits to be granted by the Regional Director. NMFS for a one-year term. with provision for a one-year renewal.

All weight quotas recommended in the plan are consistent with the objectives of the plan (Section IV.B) and the national standards of P.L. 94–265. With respect to the Makapuu Bed. the quota recommended for pink coral is also consistent with State law (Appendix III). except that the quota is based on dry weight of live coral only.

C. *Size Limits.* The options for a size limit apply only to selective harvesting methods in the Makapuu Bed and the Conditional Beds off Ke-ahole Point. Hawaii and Kaena Point. Oahu. Since dredging is allowed everywhere else (except in the FCZ seaward of the main Hawaiian Islands). the size limit at this time can apply only to these beds. The alternatives considered were whether or not to require a size limit and if so. what it should be and whether it should be voluntary or compulsory. For pink coral. four size limits were considered: 8. 9. 10 or 11 inches in height measured from the base to the greatest vertical extremity of the colony.

For pink coral a compulsory size limit of 10 inches is proposed for beds on which only select harvesting techniques may be used. Size limits for gold and bamboo corals are not recommended at this time because of inadequate information. The rationale for selecting a 10-inch limit is based on several arguments. First. the size limit which corresponds to MSY is actually 11 inches (Section III.F). However. a slightly smaller size is favored because catch-per-unit effort would be greater than it is with an 11-inch limit while the effect on yield would be negligible (Figures 11 and 13). MSY is adjusted downward to account for a 10-inch size limit (Section III.G). Second. a 10-inch limit is consistent with current practice. Industry claims that harvesting colonies less than 10 inches is not economically practical. because the return does not justify the time spent harvesting. Third. a 10-inch size limit is equivalent to an age of 28 years. and this is approximately 15 years after colonies reach reproductive maturity. Hence. an adequate reproductive cushion (Grigg. 1976) would appear to be provided by a 10-inch size limit.

Because a size limit of 10 inches almost doubles the MSY that would be obtained with no size limit (Section III.G and Figure 13). it promotes efficiency in the utilization of the resource. which is consistent with the national standards of P.L. 94–265. Hawaii State Division of Fish and Game Regulation 41 (Appendix III) and the objectives of this plan (Section IV.B).

Unfortunately much of the pink coral is unavoidably broken during collection. making enforcement of any size limit difficult. Breakage varies depending on handling which itself is a variable due to weather. size of the load and chance. One method that might work would be to calculate an average weight and stem diameter for colonies 10 inches in height. The weight of the load could then be divided by the average weight of a 10-inch colony. This division would produce a number that would equal the minimum number of pieces equal to or larger than the stem diameter equivalent to 10 inches in height. For example. if the stem diameter equivalent to 10 inches in height is one inch and the average weight of a 10-inch colony of pink coral is 2 pounds and if a particular day's load is 50 pounds. then at least 25 pieces in the load should measure at least one inch in maximum diameter.

The calculations for the example are as follows:

$$\frac{50 \text{ lbs (catch)}}{2 \text{ lbs (weight average for colony of 10 in.)}} = 25 \text{ pieces} \geq 1 \text{ inch stem diameter}$$

The Council will reconsider this size limit as a managerment measure if it is found that enforcement is inordinately difficult or expensive.

D. *Royalties.* The options considered for this provision were whether or not to impose royalty fees on the basis of the weight or value of precious coral harvested. Royalties are a feature of management regime for coral fisheries established by BLM. DOI. The recommendation is against the impostition of royalties because the FCMA states that regulations promulgated to implement fishery management plans may not require fees for domestic fishermen beyond the cost of administering the permit system. Presumably royalties would exceed the cost of administration. Also the Council sees no merit in proposing royalties for corals when no other FMP has proposed royalties. The Council considers the employment and taxes generated by the industry to be adequate compensation to the public for use of a common property resource.

E. *Incidental Catch.* The options considered were whether or not to allow incidental catch of corals by vessels fishing for other species of fish and if so under what conditions. The recommendation is to allow incidental catch of all precious corals in the FCZ for both domestic and foreign fishermen. however. subject to certain conditions. It is recommended that domestic and foreign fishermen be allowed to incidentally harvest precious coral. but that they be required to submit detailed monthly reports of such catches to the NMFS. It is further recommended that non-retention apply for both domestic and foreign fishermen. It is also proposed that should the amount of incidental harvest of precious coral be significant (more than 50 kg per vessel per year). the Secretary of Commerce should be so notified so that more restrictive measures can be imposed on an emergency basis.

This policy seeks to encourage the development of fisheries which may take coral incidentally. such as trawling for finfish; gaining new information on coral resources from such incidental taking; and discouraging uncontrolled coral harvesting under the guise of incidental catches.

F. *Refugia.* With respect to Refugia or preserves. that is. beds which would be closed for some period of time to exploitation. the options considered were whether provision should be made for such preserves. and if so. which areas. if any. should be so designated at this time. It is recommended that one Refugium be established immediately. The reasons for establishing Refugia are: (1) to preserve coral beds as natural areas for purposes of research; (2) to establish control areas that could be used in the future to measure environmental impacts of coral harvesting; and (3) to establish possible reproductive reserves for enhancement of recruitment into adjacent areas. WesPac Bed. between Nihoa and Necker Islands (Lat 23°18.0'N. Long. 162°35.0'W). is recommended for designation as the first such Refugium because of its central location within the Hawaiian Archipelago. which favors recruitment into adjacent areas. No commercial or exploratory harvest of precious coral is permitted in Refugia. However. other types of fishing will be allowed subject to restrictions on incidental catch of corals (Section IV.F.1.E.)

G. *Season.* Seasons were also considered. The recommendation is against setting any seasonal restrictions. This decision rests on the observation that there is little biological

basis for establishing a closed season. other than to reduce fishing effort. Natural mortality rates are relatively low for pink corals and are probably also low for gold and bamboo coral as judged by their longevity. Therefore it matters little in terms of the reproductive potential of a colony whether it is harvested before. during or after the reproductive season. The reproductive season for pink coral in Hawaii is June and July (Grigg. 1976). Because reproduction is iteroparous (year after year). the impact of removing a colony in June of any given year is essentially the same as removing that colony in any other month. Hence if summer months were closed to the fishery. and the annual harvest did not change. the benefit would be insignificant. By contrast. and adverse effect could occur if the safest and most accessible months (due to weather) were not open. Summer closure could pose a hardship on the industry and discourage exploration.

H. *Limited Entry.* Limited entry was considered but is not recommended. There is no sign at the present time that the fishery is being overfished due to excess capital investment or to the open access nature of the resource. In the precious coral fishery in the western Pacific. the need to increase information concerning the resource would favor non-restricted entry (increased effrort).

I. *Permits and Conditions.* A requirement for permits. and the conditions under which required. were considered. The Council is in favor of permits. to include all conditions covered in provisions A–H as well as extensive reporting requirements.

Information is to be documented in daily log books and be provided to the appropriate representative of the Secretary of Commerce.

Permits are to be *area specific* with reference to Established Beds. Conditional Beds or Exploratory Areas (see next section for definitions). The duration of the permits is also area specific.

Further details concerning permits and other management measures are contained in the next section of the plan.

2. *Proposed Specific Conservation and Management Measures.*

The following are recommended management measures under which permits to harvest and possess precious corals and associated nonprecious corals for domestic fishermen are to be granted:

Limittion of Permit

Not more than one permit shall be issued to any one person. No permit shall be valid on more than one vessel. Permits shall not be assigned or transferred from person to person nor from vessel to vessel.

Duration of Permit

Permits shall be effective from July 1st* through June 30th* or. if issued after the beginning of such term. for the remainder thereof.

Permit Areas

A permit will be required for the harvest of precious corals. including the species *Corrolium secundum. Gerardia sp.* and *Lepidisis olapa.* and for nonprecious corals taken with precious corals. in any or all Western Pacific Regional Fishery Management Council (FCZ) permit areas described below.

For the purposes of this plan there are three designated permit area categories. These are:

I. *Established Beds* (E–B) shall include only coral beds having a history of harvest and those sufficiently documented to the extent that an optium yield quota consistent with the provisions of the FCMA of 1976 has been established. *Makapuu (Oahu)* E–B–1 *Permit Area* shall include the waters enclosed by the lined area delineated in Figure 5.

II. *Conditional Beds* (C–B) shall include known coral beds for which optimum yield quotas are derived through size relationships to the Makapuu Bed. Estimates of areas of Conditional Beds are based on data accumulated from over 200 dredge haul stations and 33 submersible dives in Star II throughout the Hawaiian Islands.

Ke-ahole Point (Hawaii). C–B–1 *Permit Area.* shall include the waters within a 0.24 km^2 are around a midpoint of Lat. 19°46.0'N. Long. 156°06.0'W.

Kaena Point (Oahu). C–B–2 *Permit Area* shall include the waters within a 0.24 km^2 area around a midpoint of Lat. 21°35.4'N. Long. 158°22.9'W.

Brooks Banks. C–B–3 *Permit Area.* shall include the waters within a 1.6 km^2 area around a midpoint of Lat. 24°06.0'N. Long. 166°48.0'W.

180 Fathom Bank (northwest of Kure). C–B–4 *Permit area.* shall include the waters within a 0.8 km^2 area around a midpoint of Lat. 28°50.2'N. Long. 178°53.4'W.

III. Refugia *Wespac Bed.* R–1 *Permit Area* shall include the waters within a 0.8 km^2 area around a midpoint of Lat. 23°18.0'N. Long 162°35.0–'W.

IV. *Exploratory Permit* Areas (X–P) Area shall include all beds. other than Established and Conditional Beds and Refugia in each of five areas: Hawaii. American Samoa and Guam. the Northern Marianas and the combined FCZ's around all other U.S. Islands in the Central and western Pacific. These may be designated X–P–H. X–P–AS. X–P–G. X–P–NM and X–P–I. A new bed located by exploratory fishing will become a Conditional Bed when sufficient data have been collected to estimate size and yield from the bed.

Season and Quotas

(1) The coral harvesting season shall open July 1 in all permit areas.

(2) *Closing Date Makapuu.* E–B–1. *Permit Area* The coral harvesting season in Makapuu E–B Permit Area will be a 2-year period extending from July 1 of the first year through June 30 of the second year. The season shall be closed prior to June 30 of the second year by the Regional Director. NMFS if it is estimated that the season catch in Permit Areas in E–B–1 will have reached 2.000 kg of pink coral. 600 kg of gold coral. and 500 kg of bamboo coral prior to June 30. All live coral harvested will be retained by the permittee and shall be counted against the Quota.

(3) *Closing date C–B–1–4 Permit Areas* Coral harvesting in Permit Areas C–B–1 through 4. shall be for one-year periods extending from July 1 through June 30. The season shall be closed prior to June 30 by the Regional Director if it is estimated that the season catch for C–B–1–4 Permit Areas will have filled the one-year quota prior to June 30. One-year quotas for non-selective harvesting can be computed on the basis of the following formulas.

$$\text{(i)}\quad \frac{\text{Area of C–B–1–4 Beds}}{\text{Area of Makapuu Bed}} \times 200\ \text{kg} = \text{1-year conditional quota for pink coral}$$

$$\text{(ii)}\quad \frac{\text{Area of C–B–1–4 Beds}}{\text{Area of Makapuu Bed}} \times 60\ \text{kg} = \text{1-year conditional quota for gold coral}$$

$$\text{(iii)}\quad \frac{\text{Area of C–B–1–4 Beds}}{\text{Area of Makapuu Bed}} \times 50\ \text{kg} = \text{1-year conditional quota for bamboo coral}$$

Permit Areas C–B–1–4 shall be closed to further non-selective harvesting of all species of coral whenever the OY of one species has been attained. This measure is to prevent overharvesting of the first species that could occur by way of non-selective harvest of other species.

(4) *Closing date Exploratory Permit (XP) Areas.* Exploratory Permit (XP) Area season shall be a one-year period extending from July 1 through June 30. Announcement of closing dates by the Regional Director in each permit area will be made not less than forty-eight (48) hours in advance of a closing date. except that if the closing date is to be June 30 there need be no announcement. Each Exploratory Permit Area will be closed to domestic fishing when the *total* harvest of pink. gold and bamboo coral in the Area reaches 1.000 kg and to foreign fishing when

*The selection of July 1 date for the beginning of the term for permits was made in order that the terms for Federal permits coincide with State permits.

the *total* foreign harvest of the three species reaches the TALFF.

Gear Limitations

The use of selective harvesting methods shall be encouraged in all permit areas.

(1) In all permit areas where selective harvesting is current practice and an optimum yield has been determined, non-selective harvesting techniques are prohibited.

(2) Non-selective coral harvesting is prohibited in all portions of the FCZ seaward of the main Hawaiian Islands, i.e. south and east of a line midway between Niihau and Nichoa Islands.

(3) Non-selective coral harvesting will be allowed in all other permit areas under specified conditions. If coral tangle dredges are to be employed, on Established and Conditional Beds, the weight quota is to be 20 percent of that allowed using selective methods.

Identification of Vessel

Each vessel operating under the provisions of this plan shall carry on an exposed part of the superstructure of the vessel the number of the owner's permit in fourteen-inch (14-in.) black numbers on a white background. The permittee shall keep the number clearly legible in good repair, and insure that no part of the vessel, its rigging or its fishing gear obstructs the view of the number from an enforcement vessel or aircraft.

Records

Each permittee shall keep an accurate record of his coral harvesting operations in a log book furnished by NMFS. All information requested shall be given completely and accurately.

The permittee shall within 72 hours of landing mail to Regional Director, NMFS, a copy of the NMFS log with complete harvest information for the corals including:

(1) area fished

(2) depth of water

(3) weight or coral harvested by species (landed weight, air dried for at least 24 hours)

(4) fishing effort (days or hours) and dates of harvest

(5) method of harvest

(6) observations about the habitat (current, bottom type, bottom topography, bottom slope, proximity to land, etc.)

(7) sales of precious coral including the amount by species, value, date of sale and name(s) of buyer(s), and

(8) other data as specified in the permit or regulations.

Size Limitation

Makapuu Bed (E–B–1), Ke-ahole Point (C–B–1) and Kaena Point (C–B–2) Permit Areas. Any pink coral harvested from these Beds shall be from colonies of at least 10 inches in height.

All other Permit Areas. There are no size limits established.

Incidental Harvest

All domestic and foreign fishermen shall keep accurate records of all precious coral harvested incidentally. Records shall include but not be limited to: gear type and size, species harvested, weight, location and depth. Records shall be submitted to the NMFS on a basis specified by NMFS. Non-retention (that is, all precious coral harvested incidentally must be immediately returned to the sea) will apply for both domestic and foreign fishermen.

Observers

A permittee may be required to carry a NMFS observer, particularly for fishing in exploratory areas.

Permit Cancellation

Permits shall be subject to suspension or revocation as specified by regulation.

G. Enforcement

Enforcement activities will include aircraft and surface patrols and dockside inspections, and observers may be placed on foreign and domestic vessels. The NMFS estimate of requirements to achieve 95 percent compliance and 100 percent off-load inspection levels include over 1100 hours per year of aerial patrols (multi-purpose, including seamount fishery and billfish fishery) and 200 days per year of surface patrols (also multi-purpose) for the FCZ seaward of the Hawaiian Islands; 168 hours of aerial and 96 days of surface patrols off Guam and the Northern Mariana Islands; 144 hours of aerial and 48 days of surface patrols around American Samoa; and aerial and surface patrols as resources permit off U.S. Possessions. Total fishery enforcement requirements, of which an unspecified percentage would be attributable to corals, are estimated at ten (10) agents and $275,000 for NMFS. To the extent possible, NMFS and the Coast Guard will corrdinate with State enforcement authorities to prevent duplication of effort.

H. Administrative Costs

It is not possible to predict with any certainty the cost of observer coverage. Foreign vessels pay the cost of U.S. observer placements, thus, there is no net cost to the U.S. Government, although NMFS would pay the immediate costs. There has been no expression of foreign interest in fishing for corals in the FCZ; however, for the purposes of considering management costs, it is estimated that observer placement entails an estimated $2,000 per observer per month, whether on a domestic or foreign vessel.

Data collection would involve little cost, given the low level of participation in the fishery. Preparation and distribution of logbooks would cost not more than $1000, and compilation and analysis of the data probably would not cost more than $1000, per year, per area. The "cost" of recording and submitting data would be negligible. The permit system also would be easy to administer since participation is so limited. The cost would not be large enough to warrant an administrative fee. Total administrative costs are estimated to be not more than $25,000 per year as the fishery is now constituted.

I. Relationship To Existing Laws

Implementation of this FMP replaces the Department of Interior's (Bureau of Land Management) regulations regarding the areas covered in this FMP, to the extent that they were, in fact, applicable.

The State of Hawaii has promulgated regulations for the management of pink and gold coral, which are given in Appendix II. As written, the regulations apply generally t "waters subject to the jurisdiction of the State," but they include provisions, includin a catch quota for pink coral, specifically applying to the Makapuu Bed. Questions relating to State jurisdiction over that bed a beyond the scope of this Fishery Manageme Plan. The pink coral quota for the Makapuu Bed in the State regulations, 4,400 pounds fo 2 years, is consistent with the quota defined in this Plan, except that the State specifies that this is to be wet weight of live and deac coral. The State's minimum size limit of 10 inches in colony height is also consistent wi that of this FMP, except that observance of the State's limit is made voluntary. Potential conflicts between the State's regulations and the measures prescribed in this Plan will depend largely on how the extent of the State's jurisdiction may be interpreted in the future.

Local jurisdictions in the other areas covered by this Plan do not have any laws o regulations specifically for the management of coral resources or coral fisheries of the species covered by this Plan.

A determination of consistency of this pla with the CZM plan for the State of Hawaii is given in Section V.B.

There are no known Indian treaty, native Hawaiian or other indigenous traditional uses, claims or rights associated with the precious coral resources that will be managed in accordance with this FMP.

J. Council Review and Amendment of the Plan

A review by the Council is to be conducte annually or more frequently if information is brought to the attention of the Council whicl indicates that emergency actions are needec to protect the resource.

As additional information on number, location, and sizes of coral beds becomes available, and as data on other species of precious coral becomes available, the Coun will amend the plan as necessary.

K. Future Research Needs

The Council recognizes, and this plan emphasizes, the critical need for research. The most important needs for future researc on precious corals in the Pacific Ocean are stock assessment and the collection of economic data. Until the extent and magnitude of the resource are defined, the development of U.S. precious coral fisheries will be hampered. Moreover, stock assessment is the first step in defining Conditional Beds and developing a strategy of management. More specifically, better information on the size of Conditional Beds and rates of growth and mortality of their precious coral populations are needed in order to make more accurate and precise estimates of MSY so that the beds can be upgraded to Established Beds.

Other important biological research is needed to assess the impact of management decisions on the status of the resources. For example, it will be important to know the

impact of harvesting precious coral on recruitment as well as on adult stocks. Records of catch and effort can be used in part to determine if overfishing has occurred. Research is also needed before the impacts of fishing resulting in incidental catches by domestic and foreign fishermen can be assessed. Records of incidental catch coupled with television or submersible surveys would be necessary for this. Another important subject for biological research is the impact of harvesting precious corals on other benthic species which occupy the same habitat.

In terms of gear. further research is needed in two areas. First. to better evaluate the efficiency of dredges and secondly to improve methods of selective harvest using submersibles and remote vehicles. For dredges. it is important to know their efficiency so improvements in design can be made and to attain a better idea of the degree to which precious coral is knocked down but not retrieved.

In the area of economics. better data are needed in Hawaii on cost of harvest. ex-vessel value of precious coral. costs of imported corals. costs of production. total sales of precious coral jewelry produced from local production. and total sales of precious coral jewelry produced from imported coral. In regions of the FCZ other than Hawaii. market studies are needed to assess the potential of precious coral industry considering both local sources of supply and imports.

V. Environmental Impacts

A. *Relation to National Standards*

The management measures proposed herein are fully consistent with the national standards as outlined in P.L. 94–265. In brief. the management plan is designed to achieve optimum yields from each fishery; the plan is based on the best scientific information available: stocks are managed on the basis of a unit (individual beds); the plan does not discriminate between residents of different States: the plan promotes efficient utilization of the resource: the plan accounts for variation in the resource: and it is designed to minimize management costs.

B. *Relationship of the Proposed Action to OCS and CZM*

With regard to the OCS. manganese crusts and precious corals are known to co-occur at depths of 1.200 to 2.000 feet in some areas in the Hawaiian Archipelago such as the Wahoo Shelf off Oahu and the bank immediately to the southeast of French Frigate Shoals. Mining of manganese crusts could directly damage precious corals by the effects of silt and sediments. The potential of such specific impacts have not been determined. although an assessment of the environmental impact of mining for manganese nodules in the Pacific. in general. has been completed by the Environmental Research Laboratory of NOAA (Hirota. unpublished manuscript).

The Coastal Zone Management Act (CZMA) of 1972 encourages states to establish policies and programs for the conservation of coastal resources balanced by the needs of economic development. Conservation and the rational use of living resources in the offshore coastal zone (territorial sea) are among the objectives of the National CZMA. Promotion of domestic fisheries. the development of unutilized or underutilized fishery stocks. and fisheries management according to sound conservation principles are the major objectives of the FCMA. While the geographic area of management authority and application differs under each statute. the CZMA and the FCMA embody unanimity of objectives with regard to transboundary fishery resources.

An approved CZM program has been in effect in Hawaii since 1978. State CZM policies directly relating and pertaining to the proposed action are contained in the coastal ecosystems and economic use resources categories of the Hawaii CZM statute (Act 188 of 1977. Chapter 205A. HRS. as amended). They are as follows: (1) improve the technical basis for natural resource management. (2) preserve valuable coastal (offshore) ecosystems of significant biological or economic importance. and (3) minimize adverse environmental effects from economic uses of coastal zone resources. These CZM policies are fully consistent with the objectives of this Plan and with the selected management measures for precious corals which are: (1) to allow harvesting of precious corals in known beds and to encourage the exploration and discovery of new beds. but subject to limitations to prevent overfishing: (2) to encourage the use of selective harvesting methods. but also to prevent the wastage of resources by allowing dredging in those areas where large distances would make selective harvesting economically infeasible. (3) to minimize the harvest of immature colonies that have not reached their full potential for growth. (4) to provide for the establishment of Refugia. and (5) to encourage the development of new information on the distribution. abundance. and ecology of precious corals so as to improve the technical basis for management. As with the Hawaii CZM program which has been established to balance the needs of economic development with the long-term conservation of coastal resources. the proposed action provides a combination of measures designed to maximize opportunities from the harvest of precious corals while minimizing the biological risks involved. The relationship of the proposed action to coastal zone management planning in Guam. American Samoa. and the Northern Mariana Islands cannot be determined at this time because CZM plans have not been completed and approved for these areas.

The Hawaii offshore CZM Program area extends from the shoreline to the seaward limit of the State's jurisdiction. While the offshore coastal zone is defined for National CZM Program purposes as not extending beyond the territorial sea of the United States. the State of Hawaii does not relinquish or in any way waive its rights. authority. or claims. present and future. over those waters within the State's jurisdiction that exist outside the conventional 3-mile seaward boundary of the territorial sea.*

*U.S. DOC. Office of Coastal Zone Management. *State of Hawaii Coastal Zone Management Program and Final Environmental Impact State.* 1978.

Section 6 of Article IX of the State of Hawaii Constitution expressly provides: "The State shall have the power to manage and control the marine. seabed and other resources located within the boundaries of the State *including the archipelagic waters* of the State. and reserves to itself all such rights outside state boundaries not specifically limited by federal or international law" (emphasis supplied). As such. the degree of State sovereignty over the management of precious corals of the Hawaiian Archipelago is dependent on a legal determination on the actual geographic extent of the State's offshore boundaries including archipelagic waters. Jurisdiction over the intersland waters and resources remains an unsettled question between the State of Hawaii and the Federal Government. The resolution of this issue is beyond the scope of this Fishery Management Plan.

Other coastal zone plans for other areas covered by this plan have not been completed at this date (July 1979).

C. *Biological Impacts of Domestic Fishing*

The management plan is based on the national standards and should not result in unacceptable biological impacts to populations of precious coral. The recommended management measures result in only about 2 percent removal of precious coral populations in any harvesting period. However. the proposed regulations are based on an analysis in which natural mortality. recruitment and growth are assumed to be constant. To the extent that these parameters vary from year to year. it may be necessary to revise management measures. Also caution should be exercised because of the sampling errors inherent in the data on which the analysis is based. If significant changes in the population dynamics of any species of precious coral considered here were to occur in the future. management plans should be revised accordingly.

Biological impacts of harvesting precious corals on *other* species which occupy the same habitat can be expected to be similar to or less than the biological impacts of harvesting precious corals themselves. Even if a two year quota of pink coral were taken in one year. only about 4 percent of the standing crop of pink coral would be affected. For species which live on. in or around pink corals a similar impact would be expected. Similarly. other benthic species that may be damaged by non-selective methods should not suffer a proportionately greater impact than target species of precious coral. Indeed. many species of gorgonian corals have flexible skeletons and do not break as easily as pink or bamboo coral (both have calcareous skeletons) and therefore should be impacted proportionately less than calcareous precious corals. While many species of fish. occur on or near the bottom in the depth zone of precious corals. none are known to depend directly or indirectly on precious corals for food or habitat space.

It is noted that there is risk in extrapolating pink coral characteristics to other species. but this appears to be minimal and the error can be in either direction. There also is a risk of overfishing by allowing non-selective harvesting. The quotas however appear to be sufficiently low that this risk is low.

Consideration has been given to the possibility of any impact of the precious coral fisheries covered by this Plan and the recommended management measures on marine mammals or endangered species. It is concluded that because of the characteristics of the precious coral habitat and the fishing techniques used to harvest precious corals there is little or no possibility of any such impact. A biological opinion from NMFS confirms this conclusion (Appendix 4). Access to the Hawaiian Islands National Wildlife Refuge is restricted and this plan should have minimal effect on those islands.

D. Impacts to Industry

If the Hawaii precious coral industry is to survive and prosper, it should have access to a reliable and controllable supply of raw material. The Makapuu Bed is a small fraction of the total area thought to be potentially commercially productive in the Hawaiian Archipelago. Thus an increased supply appears to be locally available which may decrease the need for some imports. With rising tourist expenditures and growth in personal income of the residents of Hawaii, expansion in the local market can be expected (Poh, 1971). In addition there is the potential of developing a larger mainland market. The potential for growth in these markets may not be realized unless imports combined with local supplies keep pace with demand. Hence, it is important for the industry to establish new sources of supply in U.S. waters to ensure a steady and reliable domestic supply of raw material.

The proposed action may slightly reduce the past annual harvesting rates for pink and gold coral. This is an unavoidable constraint imposed by the limited nature of the resource. Management measures have been proposed which take into account the economics of the industry and are designed to increase benefits to the nation. The proposed action should cause no loss in jobs, and while total production may be slightly reduced, this is considered to be favorable to the long term interest of producers and consumers.

E. Alternatives to the Proposed Plan

For each management measure recommended, several options were considered. These have been thoroughly discussed in Sections IV.F.1 and IV.F.2.

Other conceivable alternatives listed below were not given serious consideration for the following reasons:

1. To rely on the Preliminary Management Plan indefinitely—As noted earlier, the draft PMP for precious corals has not been implemented. Even if it were, it would provide no control over domestic fishing, nor would it provide any opportunity for foreign fishermen to develop new exploratory beds and thereby furnish much needed information on coral resources of the FCZ, as it would establish a zero TALFF. Also, failure to implement an FMP would be contrary to the intent of the FCMA.

2. To leave management of precious coral resources in the region to the State of Hawaii, which has a management regulation in place, and the Territorial Governments—The legal basis for the local governments to regulate coral fisheries which are carried on in the FCZ, if the coral is not landed in the State, is questionable, especially with regard to foreign fishermen, and the states appear to lack the capability to enforce any regulations with respect to coral beds at any distance from their shores.

3. To allow the Bureau of Land Management to continue to regulate coral fishing on the Outer Continental Shelf—The BLM regulations (see Appendix III) do not constitute a fishery management regime which would meet the requirements of the FCMA, which gives priority to the Department of Commerce in this field, if, in fact, the BLM regulations are valid in the present context.

F. Impacts on Foreign Fishing

The proposed action may partially displace foreign precious coral harvesters from areas near Midway, Wake, Guam and the Commonwealth of the Northern Mariana Islands. The proposed plan allows foreign vessels to harvest under permit up to 1,000 kg of pink, gold, bamboo and other precious corals combined per exploratory area in Hawaii, American Samoa, Guam, the Northern Marianas and U.S. possessions depending upon the amount of domestic catch and to incidentally harvest but not to retain precious corals incidentally harvested in other fishery operations in the United States FCZ. It therefore provides for reasonable foreign use of U.S. fish stocks having a harvestable surplus as long as such use does not conflict unduly with the development of the U.S. precious coral industry and with long-term conservation requirements.

G. Adverse Impacts of Foreign Fishing

Certain kinds of foreign fishing, such as bottom trawling, will kill or harvest precious corals incidentally in certain areas. To the extent that such fishing operations are permitted and take place, a small reduction in the amount of precious coral available to U.S. harvesters will occur. Further, because most trawling operations are not efficient in capturing or recovering colonies dislodged from the bottom, there will be some wastage of the resource. Recovery of previously damaged beds may be delayed. However, the policies set by the PMP for the Seamount Groundfish Fisheries limit trawling by foreign vessels to only a small portion of the FCZ where precious corals may occur, and damage (if any) would be restricted to a very small area.

H. Relationship Between Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed action provides for full commercial harvest of precious coral stocks only after they have been assessed and optimum yields have been estimated. Limited harvest is allowed so new beds may be located, and once located, may be studied to determine area of bed, abundance of corals and other critical factors. Thus precious corals are protected from negligent, wasteful over-exploitation which might lead to short-term economic gains for domestic fishermen but to long-term shortages and economic losses for U.S. industry.

I. Irreversible and Irretrievable Commitments of Resources Involved in the Proposed Action Should It Be Implemented

If the resource is inadvertently overexploited, commercial harvest would almost certainly cease for economic reasons before any coral species approached biological extinction. The major change in the population dynamics of precious corals that can be expected to occur as a result of harvesting is a non-irreversible shift in age structure toward younger age classes. Mean age would be somewhat reduced, but natural mortality might decrease as a consequence of pre-emption by fishing mortality, and growth and recruitment might increase in response to reduced competition.

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VII Glossary

BLM-DOI—Bureau of Land Management, U.S. Department of Interior
DAH—An estimate of the amount of coral that will be taken on an annual basis by domestic harvesters
Cohort—All the individual organisms of the same species produced (spawned) within the same year
CZM—Coastal Zone Management
DFG—Division of Fish and Game, State of Hawaii
DOC—U.S. Department of Commerce
Domestic Fishing Capacity—Annual production capacity of domestic fishing firms
Domestic Processing Capacity—Annual production capacity of domestic processing firms
EIS—Environmental Impact Statement
Expected Harvest level—Anticipated annual harvest by domestic fishing firms
Expected Processing Level—Anticipated annual production of domestic harvesting firms
FCMA—Fishery Conservation and Management Act
FCZ—Fishery Conservation Zone
Fixed capital costs—Cost of depreciable equipment
FMP—Fishery management plan
MSY—Maximum sustained yield
Net present value—Future net income stream discounted to the present
NMFS—National Marine Fishery Service
OCS—Outer continental shelf
OY—Optimum yield
PMP—Preliminary fishery management plan
TALFF—Total allowable level of foreign fishing
WPRFMC—Western Pacific Regional Fisheries Management Council

Appendix I—Economic Analysis of Harvest Quotas and Optimum Yield

Bioeconomic models are developed to evaluate the economic efficiency of several harvest quotas under different assumptions of price changes and alternative uses for fixed factors of production. The net value[1] under each quota is estimated for four different models. The results indicate that the net present value of pink and gold coral in the Makapuu Bed is greatest when pulse-fished, if there exist alternative uses for the fixed factors of production. If, during the "off-years", the fixed factors cannot be used in other operations, then it makes little difference if the bed is fished continuously or periodically. Different assumptions about price changes alter the results slightly.

The important assumptions of the models are: prices are determined exogenously (due to import supplies); marginal cost is constant for different levels of production; the change in average variable cost is inversely proportional to the change in the exploitable biomass from one year to the next, i.e. if the exploitable biomass declines so does catch/effort; pink and gold coral are multiple products harvested in fixed proportions; and the full quota is harvested during the year (the first year in the case of the multiple-year quotas) unless the exploitable biomass falls below the quota.

Four models are evaluated over a 37-year time horizon begininng with 1978. (Shorter time horizons were considered by the qualitative results are almost identical). In the first model, the imputed values, or estimated prices of pink and gold raw coral, are a constant over the 37-year production period and the firms incur fixed costs during periods of zero production. In the second model, prices increase at a constant rate. In the third and fourth models, prices are constant and increase, respectively, but the firms do not incur fixed costs during years of zero production In the last two models, it is assumed that there are alternative uses for the fixed factors of production. The alternative used may include exploration and harvest of other coral beds or activities unrelated to a coral fishery.

In each model, five alternative harvest quotas for pink coral are evaluated: (1) 1.000 kg/year, (2) 2.000 kg/year, (3) 3.000 kg/year, (4) 2.000 kg/2 years, (5) 3.000 kg/3 years. Due to the assumption of fixed proportions output, a quota on pink coral implies a quota for gold coral. The quotas for gold coral are: (1) 370 kg/year, (2) 740 kg/year, (3) 1.100 kg/year, (4) 740 kg/2 years, (5) 1.100 kg/3 years. The first values tested for both pink and gold coral (1.000 kg/year and 370 kg/year) correspond to estimates of MSY for each. Subsequent values are various multiples of these values.

The differentials of the discounted revenues and discounted costs (net revenues) are summed over all production years to obtain the net present value of the quota alternatives for each model. The absolute amount of the net present values is not the prime concern in this analysis. Rather, the relative outcome of the values allows some conclusions to be drawn about the economic efficiency of different quota proposals—the economic efficiency of a quota proposal being greater if the new present value is greater.

In all the models in which the quotas exceed a mean annual harvest of 1.000 kg. for pink coral the outcome is economically inefficient. This results in the long run because the harvest is not sustainable. In the short run, when the harvest is sustainable, the above outcome is due primarily to accelerating costs caused by a rapid decline in the exploitable biomass.

For the other pink coral quota alternatives (1.000 kg/year, 2.000 kg/2 years, 3.000 kg/3 years) economic efficiency varies due to changes in price and the ability to defray fixed costs. When price inceases 6 percent annually relative to costs, a quota of 3.000 kg/3 years is more efficient whether fixed costs can be defrayed or not. In the case of incurring fixed costs during zero-harvest years, the annual rate increase in prices shifts the most efficient quota from 1.000 kg year to 3.000 kg/3 years. When costs can be defrayed, the most efficient quota shifts from 2.000 kg/2 years to 3.000 kg/3 years due to the price increases. These shifts can be explained by the exponential increase in the prices and the assumption that a 2.000 kg or 3.000 kg quota is harvested in the first year of the 2 or 3 year quota period. When the harvest in some years can be taken one or two years earlier the entire flow of net revenues is shifted closer to the present and, therefore becomes more valuable due to a positive rate of time preference. This impact of pulse fishing only results in the models when prices increase each year.

The impact of defraying the fixed cost when pulse fishing is negligible for the two models with increasing prices. The most efficient allocation is 3.000 kg/3 years whether or not there exist alternative uses for the fixed factors of production. When prices are held constant, the ability of firms to explore and harvest other coral beds shifts the most efficient quota from 1.000 kg/year to

[1] Net present value (NPV) $= \sum_{i=0}^{n} \frac{(R_i - C_i)}{(1+D)^i}$

where: R_i = total revenue during i^{th} period

C_i = total cost during i^{th} period

D = discount rate

[2] These values do not correspond exactly to MSY or multiples of MSY for gold coral because in this analysis figures were rounded upward instead of downward as was done for MSY.

2.000 kg/2 years. This results in the models when the average total cost of harvesting coral at the Makapuu Bed decreases by employing the fixed factors of production elsewhere and defraying the cost of those factors.

Considering the characteristics of the coral harvesting firms in Hawaii and the history of the world coral market. pulse fishing the Makapuu Bed is more efficient for the existing firms. Whether or not pulse fishing at 3.000 kg/3 years is overall more efficient than 2.000 kg/2 years. as indicated in the models. must depend on the existence of other firms wanting to enter the fishery.

Appendix II—State of Hawaii. Department of Land and Natural Resources. Honolulu. Division of Fish and Game

The Board of Land and Natural Resources in conformity with Chapters 187 through 190. Hawaii Revised Statutes and every other law hereunto enabling does hereby adopt the following regulation relating to the management of pink coral and gold coral.

Regulation 41. Relating to the Management of Pink Coral and Gold Coral

Section 1. *Definitions* (as used herein).

a. *Pink coral* means all species of coral belonging to the genus *Corallium* in their raw state.

b. *Gold coral* means all species of coral belonging to the genus *Parazoanthus* in their raw state (=*Gerardia*).

Section 2. *Prohibition.* It shall be unlawful to take or destroy pink coral or gold coral in waters subject to the jurisdiction of the State of Hawaii. or to possess. sell or offer to sell such corals within the State of Hawaii. , except as provided in this regulation.

Section 3. *Permits.* It shall be lawful with a permit issued by the Board of Land and Natural Resources under such terms and conditions as it deems necessary to:

a. take or possess pink coral or gold coral for scientific or educational purposes.

b. take or possess pink coral or gold coral for commercial or domestic purposes from the Makapuu Bed provided that the taking of pink coral (*Corallium secundum*) shall be subject to the provisions stipulated in Section 5. relating to the management of the Makapuu Bed pink coral resources. and provided further that such taking for commercial purposes shall be subject to the commercial fishing license requirement of Section 189–2. Hawaii Revised Statutes.

Section 4. *Cancellation of Permits.* The Board of Land and Natural Resources may cancel any permit issued pursuant to this regulation for any infraction of the terms and conditions of the permit as determined by the Board.

Section 5. *Management of the Makapuu Bed (located approximately 6 miles East of Makapuu Point. Oahu) Pink Coral (Corallium secudum) resources.* A two-year quota of 4.400 pounds dry weight is hereby established for the taking of live and dead *Corallium secundum* at the Makapuu Bed beginning July 1. 1977. provided that the quota shall be for the combined harvest of all permittees. and provided further that harvesters shall make every effort to collect only mature colonies ten (10) inches or larger in height.

Section 6. *Prohibited Methods of Coral Harvesting.* It shall be unlawful to use nets. dredges. trawls. mops. explosives or any other destructive or non-selective means to take pink coral or gold coral within waters subject to the jurisdiction of the State of Hawaii.

Section 7. *Landing of Pink Coral and Gold Coral.* All pink coral and gold coral taken:

a. in waters subject to the jurisdiction of the State of Hawaii for any purpose shall be landed in the State.

b. in waters outside of the jurisdiction of the State of Hawaii and landed in the State shall be subject to this regulation and all other applicable State laws and regulations.

Section 8. *Possession and Sale of Pink Coral and Gold Coral Legally Obtained.* Nothing in this regulation shall be construed as making it unlawful for any person to possess or sell pink coral or gold coral obtained prior to the effective date of this regulation.

Section 9. *Authority to Suspend the Taking of Pink Coral and/or Gold Coral.* The Division of Fish and Game shall have the authority to order an immediate suspension on the taking of all pink coral and/or gold coral from the Makapuu Bed when deemed necessary for the management of these coral resources on a sustainable yield basis.

Section 10. *Penalty.* Any person who violates any of the provisions of this regulation or whoever violates the terms and conditions of any permit issued as provided for in this regulation shall be fined not more than $500.00.

Section 11. *Severability.* Should any section. subsection. sentence. clause. or phrase of this regulation be for any reason held by a court of competent jurisdiction to be invalid. such decision shall not affect the validity of the remaining portions of this regulation.

Adopted this *27th* day of *May.* 1977 by the Board of Land and Natural Resources.

Moses W. Kealoha.

Member. Board of Land and Natural Resources.

Shinichi Nakagawa.

Member. Board of Land and Natural Resources.

Approved this 13th day of September. 1977.

George R. Ariyoshi.

Governor of Hawaii.

Approved as to form:

Susan Y. M. Chock.

Deputy Attorney General.

Date: June 23. 1977.

Publication of Notice of Public Hearing—Honolulu Star Bulletin/Advertiser—January 16. 1977

Certificate

I hereby certify that the foregoing copy of Regulation 41. Division of Fish and Game. Department of Land and Natural Resources. is a full. true. and correct copy of the original which is on file in the office of the Division of Fish and Game of the Department of Land and Natural Resources.

William Y. Thompson.

Chairman and Member. Board of Land and Natural Resources.

Appendix III—Regulations of the Department of Interior for the Taking of Precious Coral in Federal Waters

Permits: Requirement for a permit

No person shall engage in any operation which directly causes damage or injury to a viable coral community that is located on the Outer Continental Shelf without having obtained a permit for said operations

Application for a Permit

(a) Application for a permit shall be filed in the proper office of the Bureau.

(b) No specific form is required.

(c) Each application shall include.

1. The name. legal mailing address and telephone number of each person intending to participate in the operations covered by the application.

2. A description of the proposed area of the operations.

3. A map or maps. such as a National Ocean Survey Map. with a scale of not less than 1:30.000 delineating the proposed area of operations.

4. Information in detail describing the nature of the proposed operations and how the operation will be conducted.

5. If coral specimens are to be taken. the purpose of such taking. the method of taking. the currents and their velocity in the area of taking. the depth of taking. the size. estimated dry weight. and type of coral to be taken. and the estimated fair market value of the coral to be taken.

6. The approximate dates of commencement and termination of the operation.

7. An affirmative statement that the operation will use methods that are designed to do minimum harm and disturbance to the viable coral community covered by a permit and those viable coral communities adjacent thereto. Also. an explanation of the procedures that will be taken to assure protection of said viable coral communities during said operation.

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Appendix IV

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

October 4, 1978 FSW1/JJN

TO: Wilvan G. Van Campen, Executive Director, Western Pacific Regional Fishery Management Council

FROM: Doyle E. Gates, Administrator, WPPO, NMFS

SUBJECT: Endangered species consultation concerning the fishery management plan for precious corals in the Western Pacific

This is in reference to your memorandum of September 12. 1978 concerning formal consultation between the Council and NMFS during development of FMP's. If a Federal Agency (in this case the Council) determines that an action may affect endangered or threatened marine species, it should request consultation with NMFS providing the species in question fall under the responsibility of NMFS. Upon receipt of a request for consultation, NMFS will conduct a threshold examination which usually results in a biological opinion as to whether the proposed action is likely to jeopardize the species or destroy or adversely modify its critical habitat.

We realize that you are in the process of finalizing the FMP for precious corals in the Western Pacific. Therefore, utilizing your memorandum of September 12, 1978 as a request for consultation, we offer the following biological opinion on the implication of the precious coral fishery on endangered and threatened marine species.

Endangered marine mammals (humpback whale, sperm whale, and the Hawaiian monk seal) and endangered and threatened sea turtles (leatherback and green turtle) are known for or suspected of inhabiting waters overlaying precious coral beds in the central and western Pacific. However, considering the methods utilized for harvesting precious corals, it is our opinion that this fishery does not constitute a threat to these endangered and threatened species or will it destroy or adversely modify their critical habitat.

cc: G. V. Howard

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Washington, D.C. 20235

JAN 16 1979

F6/TRL

Mr. Edwin K. Lee
Administrative Officer
Western Pacific Regional
Fishery Management Council
1164 Bishop Street
Room 1506
Honolulu, Hawaii 96813

Dear Mr. Lee:

This letter is to inform you that I concur with the October 4, 1978, memo (enclosure) to Mr. Wilvan G. Van Campen, Executive Director, from Mr. Doyle Gates, Administrator, Western Pacific Program Office, National Marine Fisheries Service, transmitting the Section 7 consultation regarding the fishery management plan for precious corals in the Western Pacific. The consultation concluded that the coral fishery does not constitute a threat to endangered or threatened species or their habitat.

Please contact my office if you require further clarification.

Sincerely,

for Terry L. Leitzell
Assistant Administrator
for Fisheries

Enclosure

BILLING CODE 3510-22-C

Figure 1. The southeastern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of major known beds of precious coral.
Figure 2. The northwestern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of precious coral beds.
Figure 3. The fishery conservation zone for Guam.
Figure 4. The fishery conservation zone for the islands of American Samoa.
Figure 5. The precious coral bed off Makapuu, Oahu.
Figure 6. Catch of precious coral at Taiwan, 1924–1940 (Anon. 1956).
Figure 7. Effort of coral fishing in Taiwan, 1924–1940 (Anon. 1956).
Figure 8. Photo of a coral dredge.
Figure 9. The coral harvesting system on the submersible Star II consists of a wire basket, cutter and hydraulic claw (manipulator).
Figure 10. Size-frequency distribution of precious coral collected with tangle nets (A) and the submersible (B).
Figure 11. Biomass per recruit curves of *C. Secundum* using a constant rate of natural mortality (M = 0.066) and progressively increasing rates of fishing mortality (F) applied over all year classes. The age of entry into the fishery is zero, i.e. no age limit is applied.
Figure 12. Biomass per recruit curves for a cohort of *C. secundum* using a constant rate of natural mortality (M = 0.066) and progressively increasing rates of fishing mortality (F) applied after a minimum age of 25 years.
Figure 13. Yield per recruit isopleths for *C. secundum* in the Makapuu Bed, given a constant rate of natural mortality of 0.066. Contour units are in grams per recruit.
Figure 14. Various spawning stock recruitment functions. S_{max} = original spawning stock S = spawning stock after fishing R_{max} = original recruitment R = recruitment after fishing
Figure 15. MSY of pink coral as a function of recruitment and age at first capture under various stock-recruitment models.
Figure 16. Population biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given six different exploitation rates in 1978 followed by a complete closure of the bed.
Figure 17. Spawning biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given six different exploitation rates in 1978 followed by a complete closure of the bed.
Figure 18. Population biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given different rates of exploitation.
Figure 19. Yields of *C. secundum* in the Makapuu Bed between 1964 and 1977 after which different rates of harvest are simulated.

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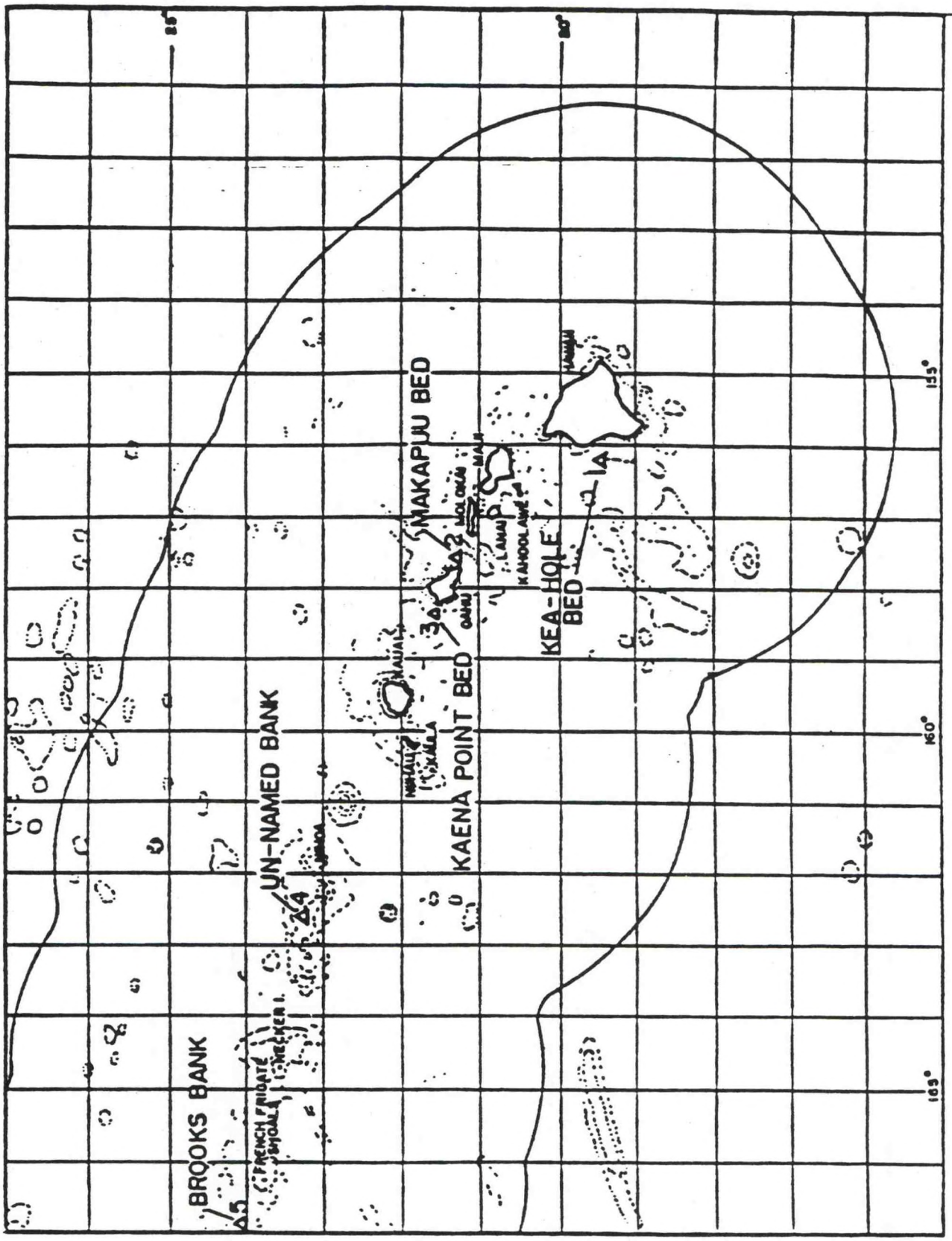

Figure 1. The southeastern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of major known beds of precious coral.

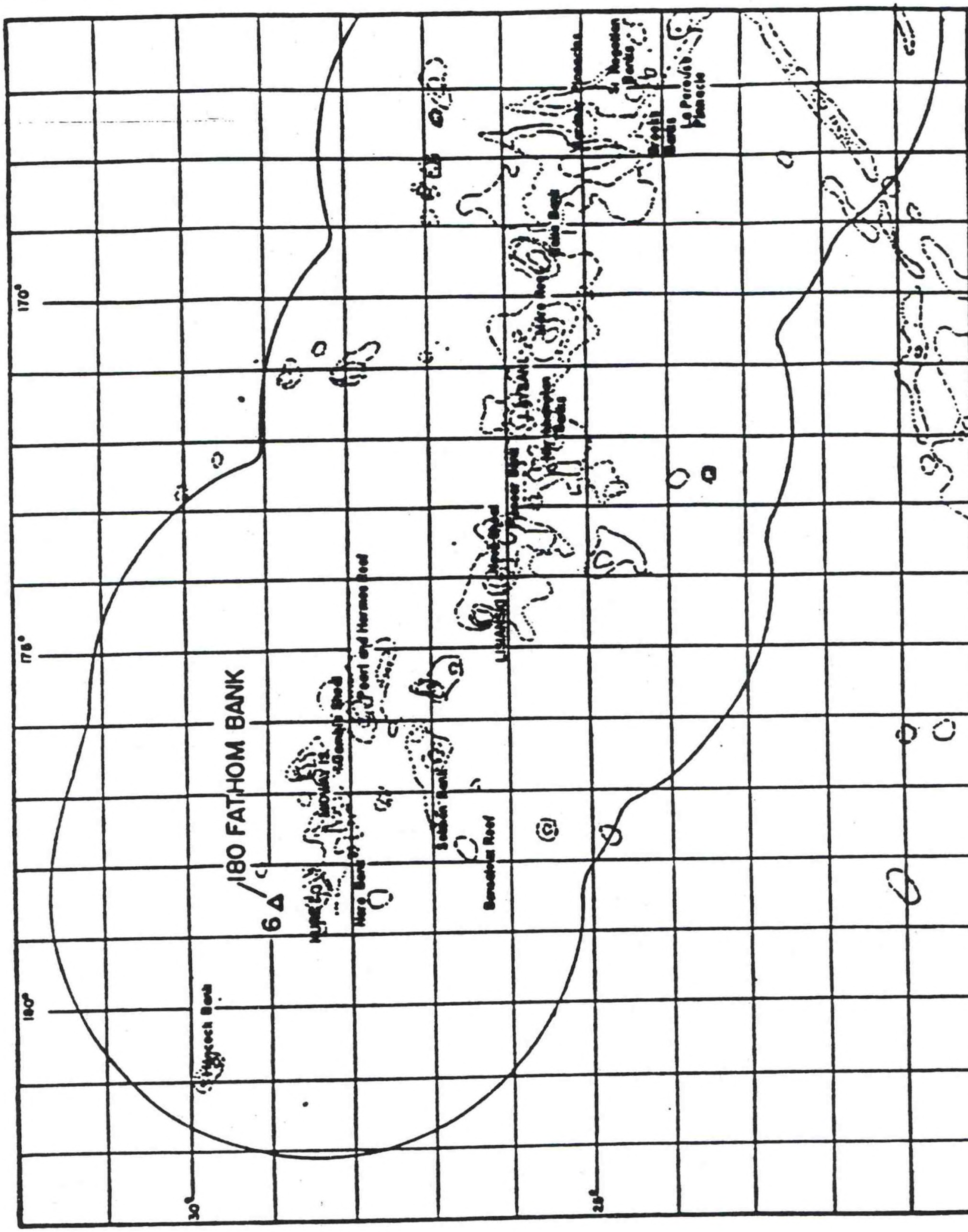

Figure 2. The northwestern half of the Hawaiian Archipelago showing the extent of the fishery conservation zone and the location of precious coral beds.

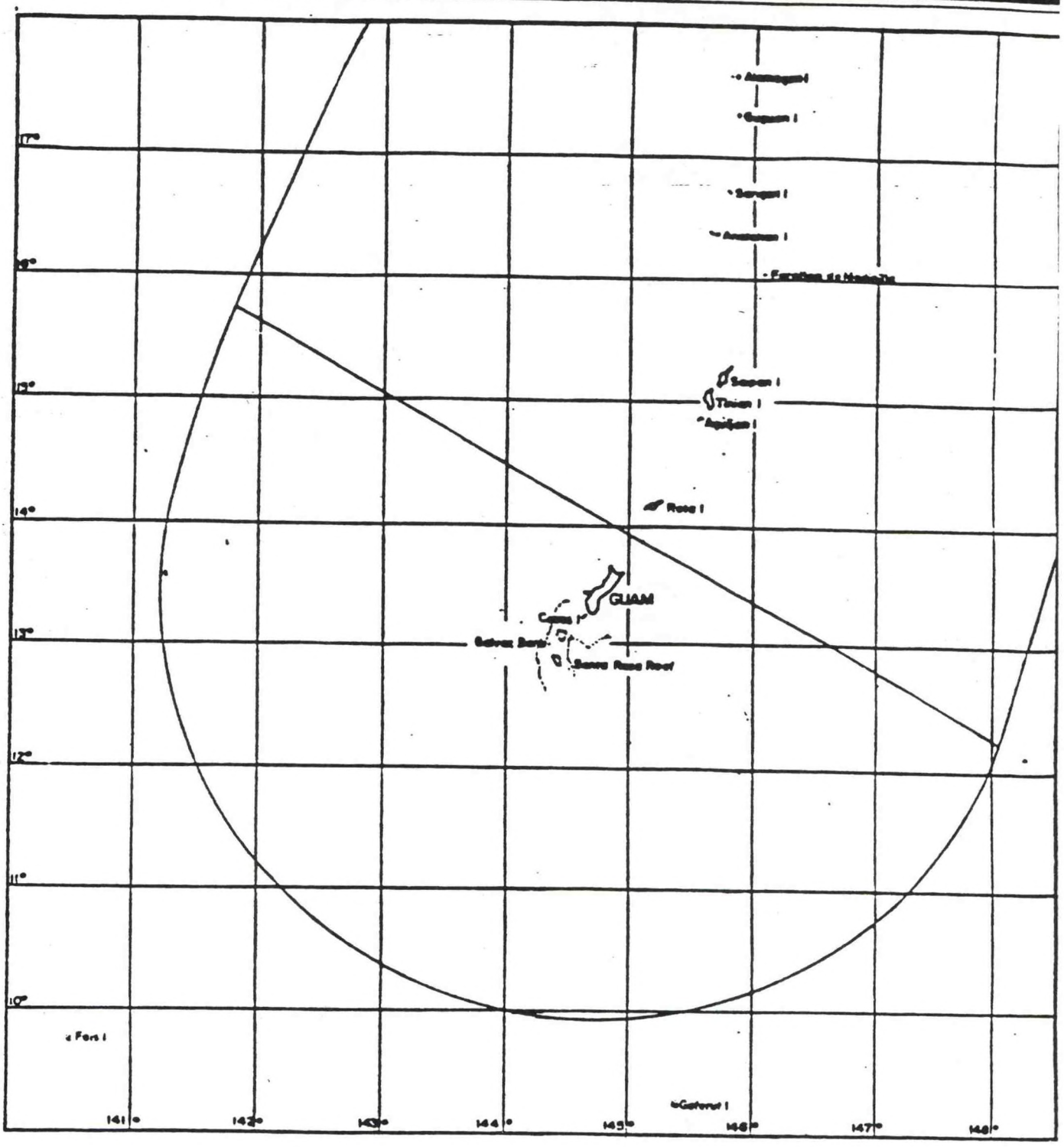

Figure 3. The fishery conservation zone for Guam.

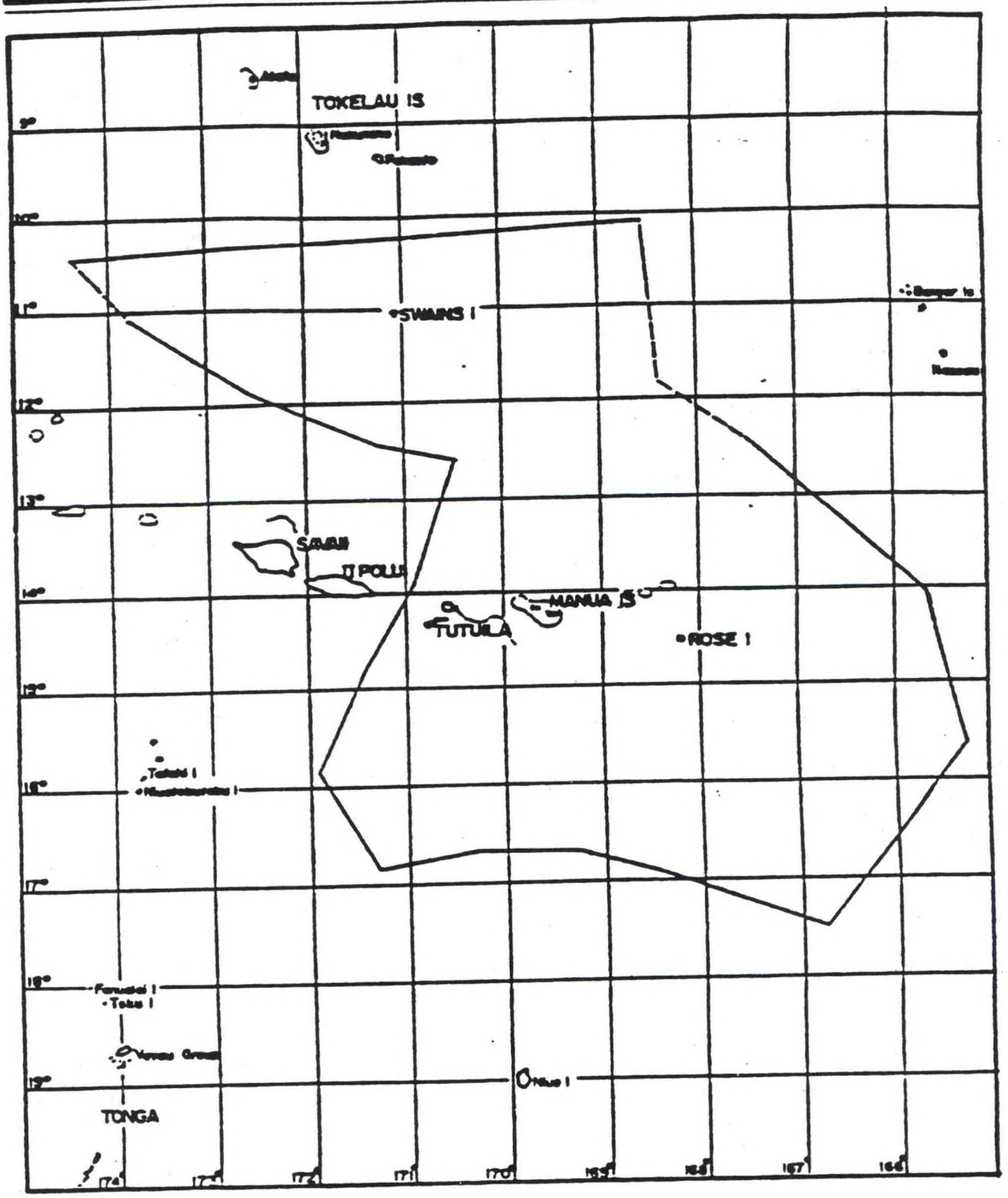

Figure 4. The fishery conservation zone for the islands of American Samoa. (U.S. fishery enforcement line around Swains Island is not yet defined pending negotiations.)

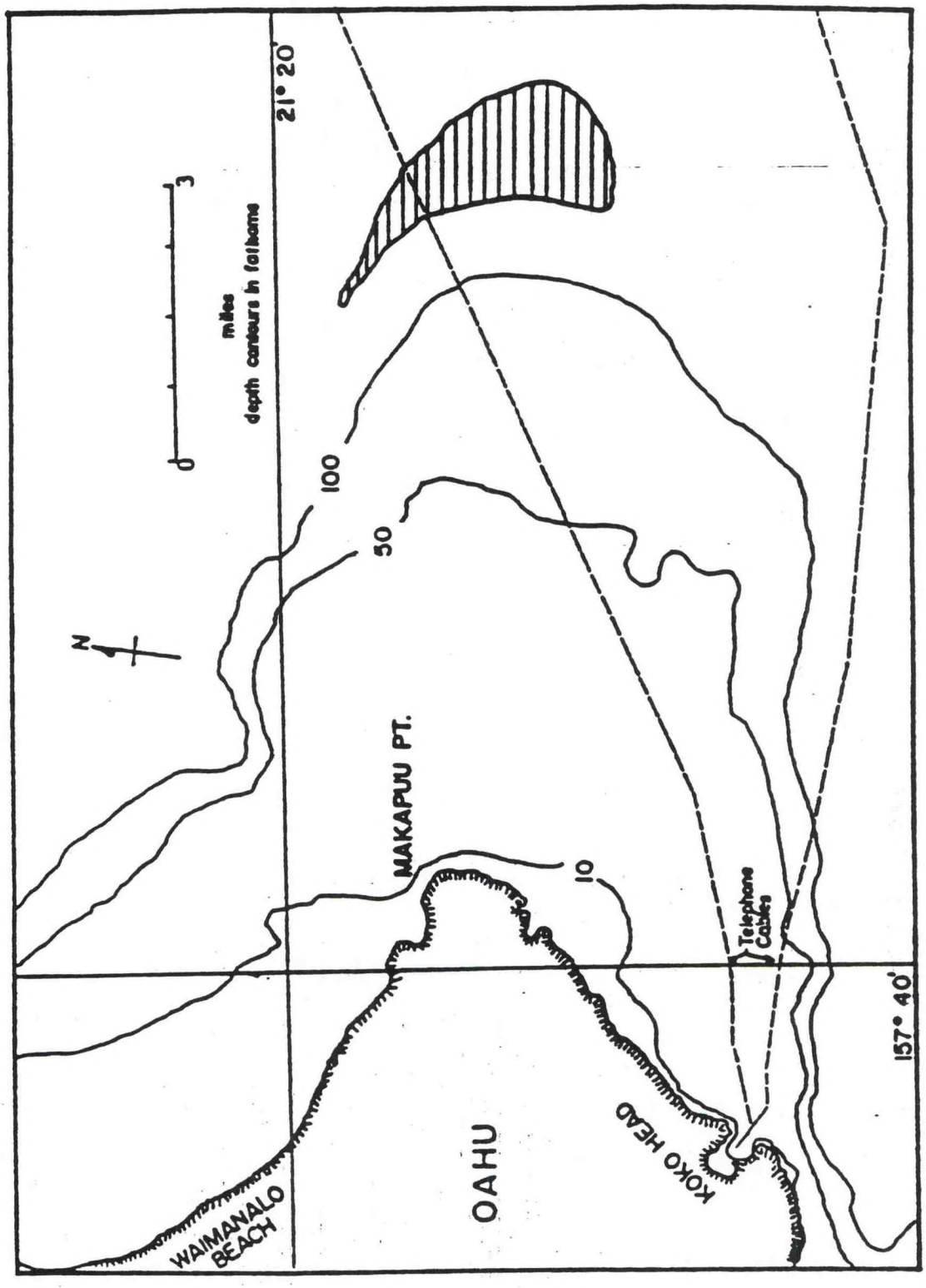

Figure 5. The precious coral bed off Makapuu, Oahu.

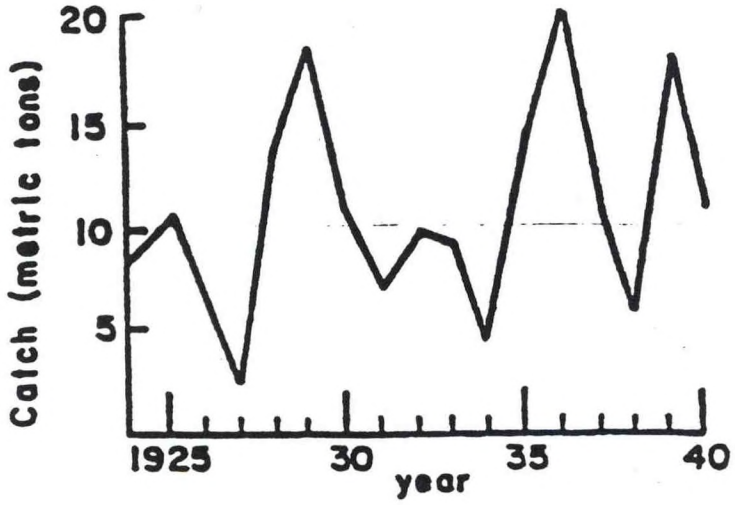

Figure 6. Catch of precious coral at Taiwan, 1924-1940 (Anon, 1956).

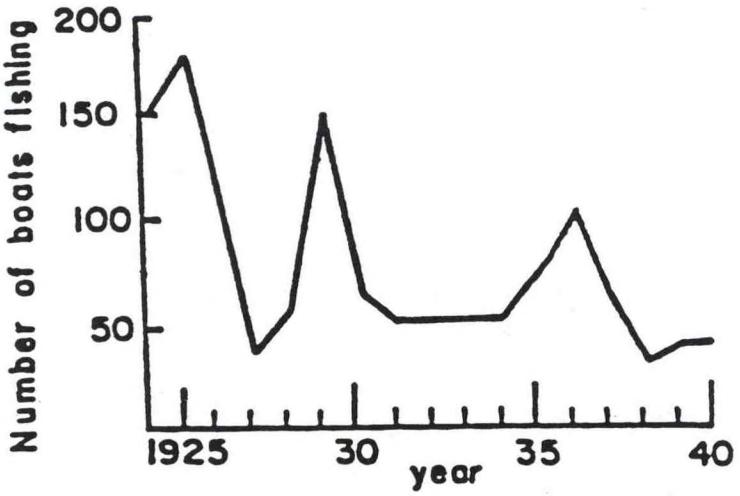

Figure 7. Effort of coral fishing in Taiwan, 1924-1940 (Anon, 1956).

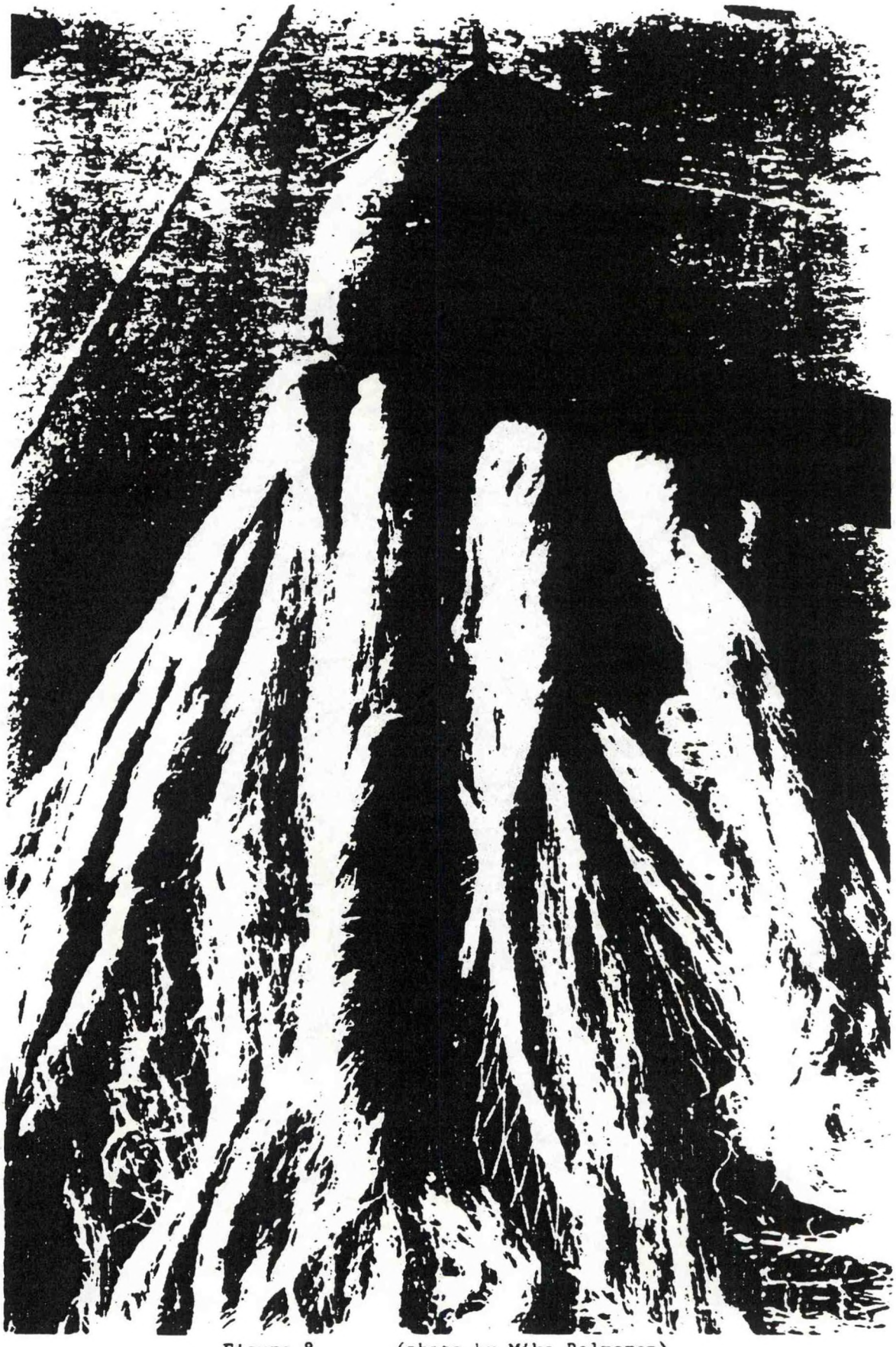

Figure 8 (photo by Mike Palmgren)
Photo of a coral dredge

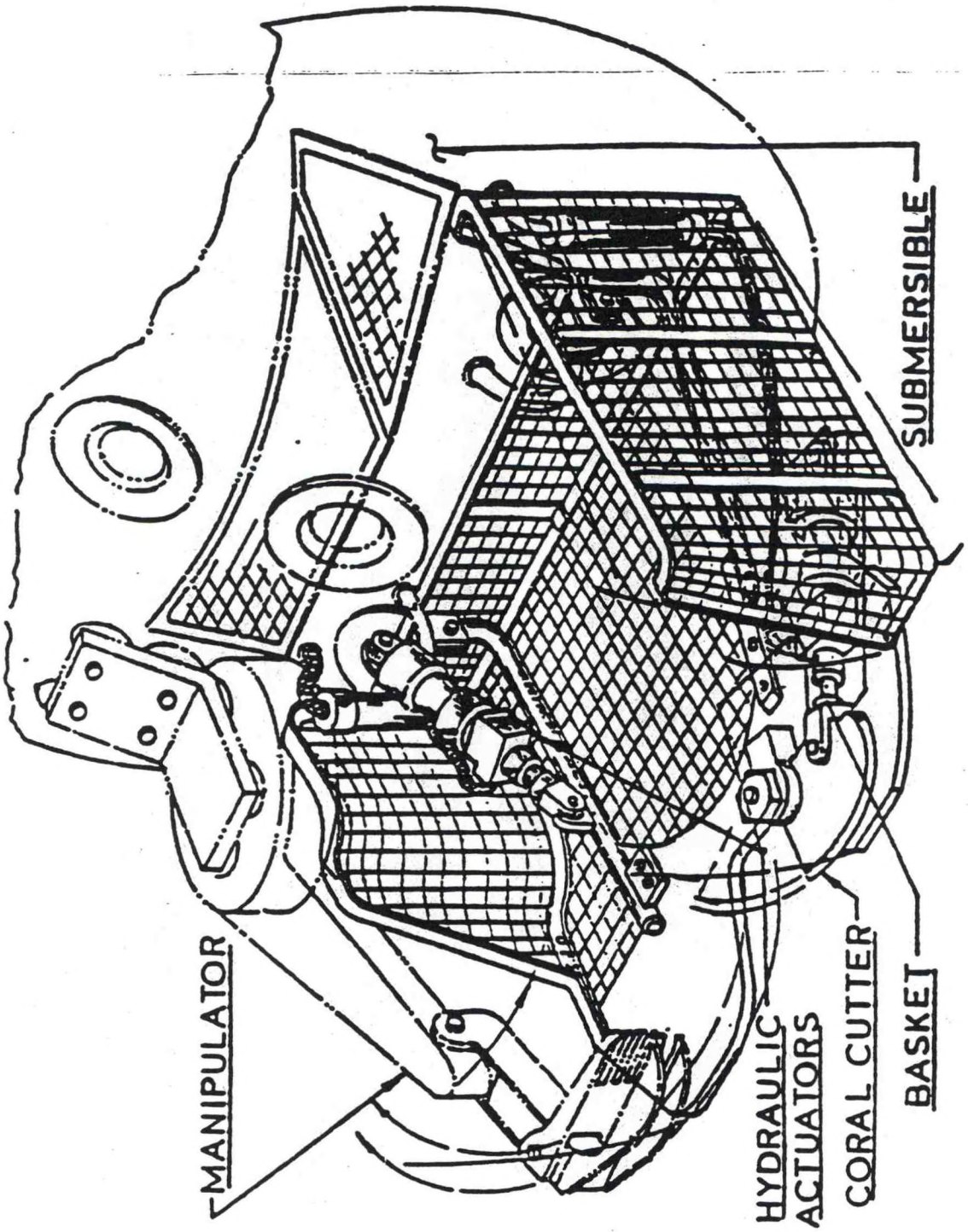

Figure 9. The coral harvesting system on the submersible Star II consists of a wire basket, cutter and hydraulic claw (manipulator).

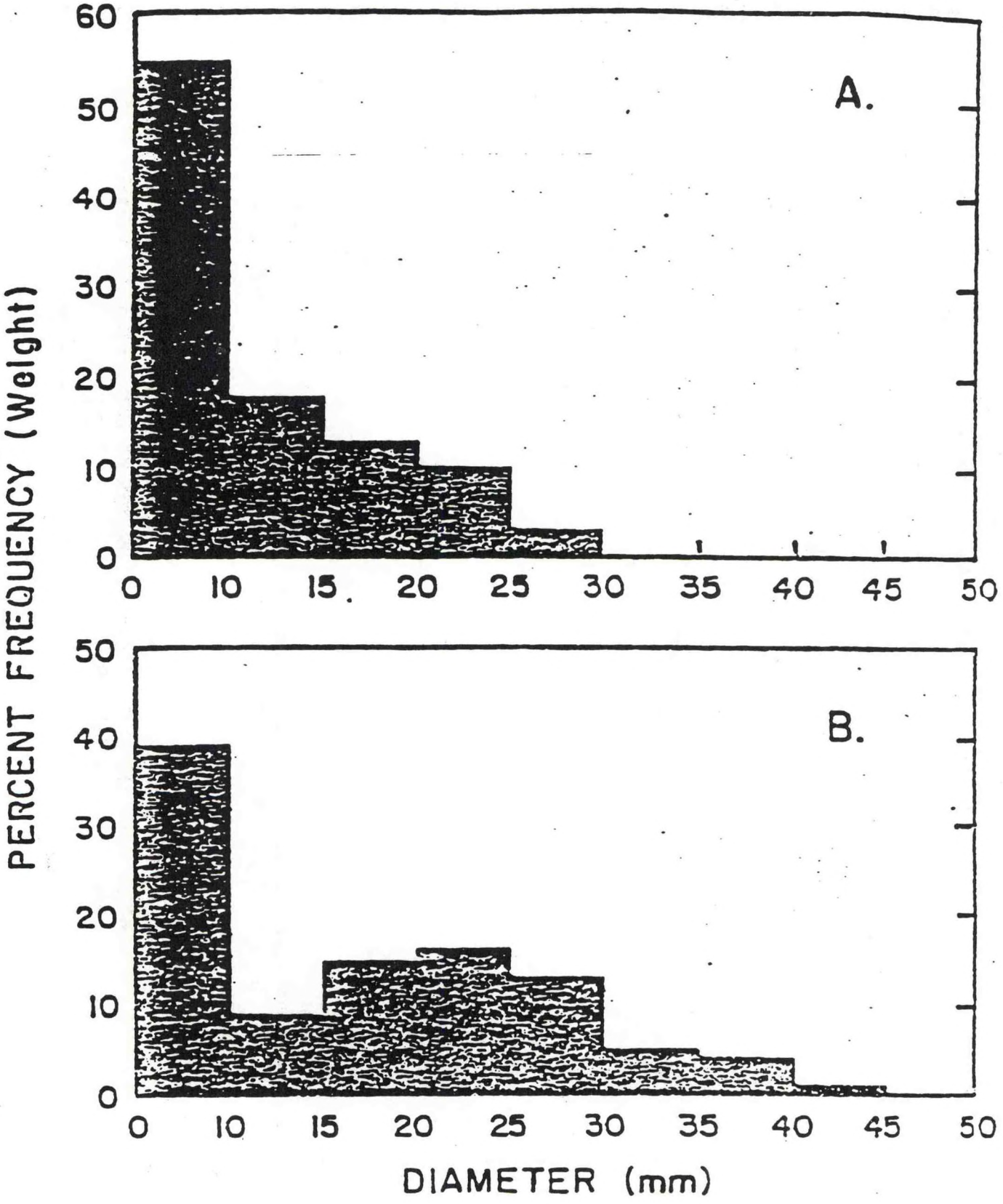

Figure 10. Size-frequency distribution of precious coral collected with tangle nets (A) and the submersible (B).

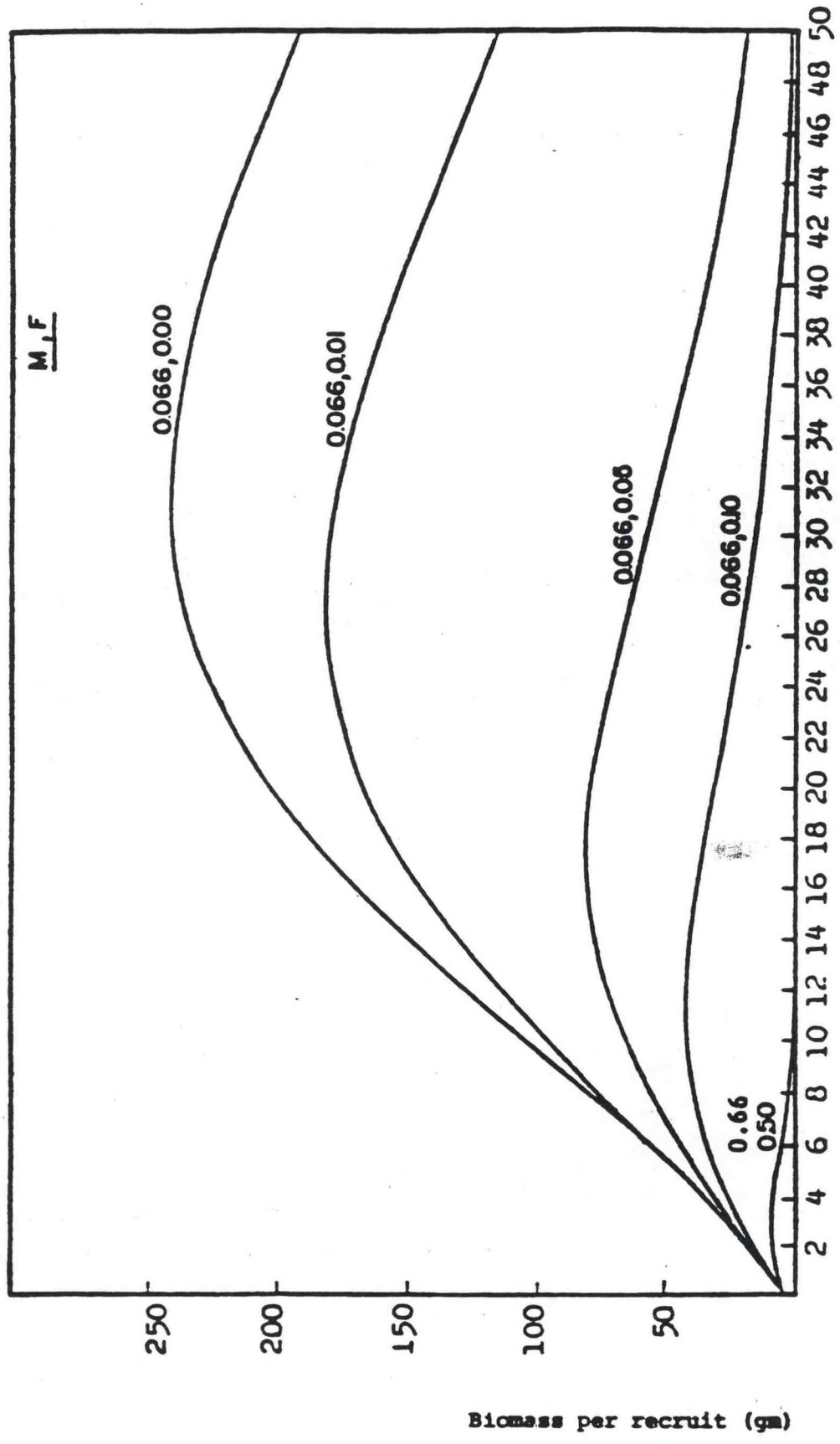

Figure 11. Biomass per recruit curves of *C. acuminatus* using a constant rate of natural mortality (M=0.066) and progressively increasing rates of fishing mortality (F) applied over all year classes. The age of entry into the fishery is zero, i.e. no age limit is applied.

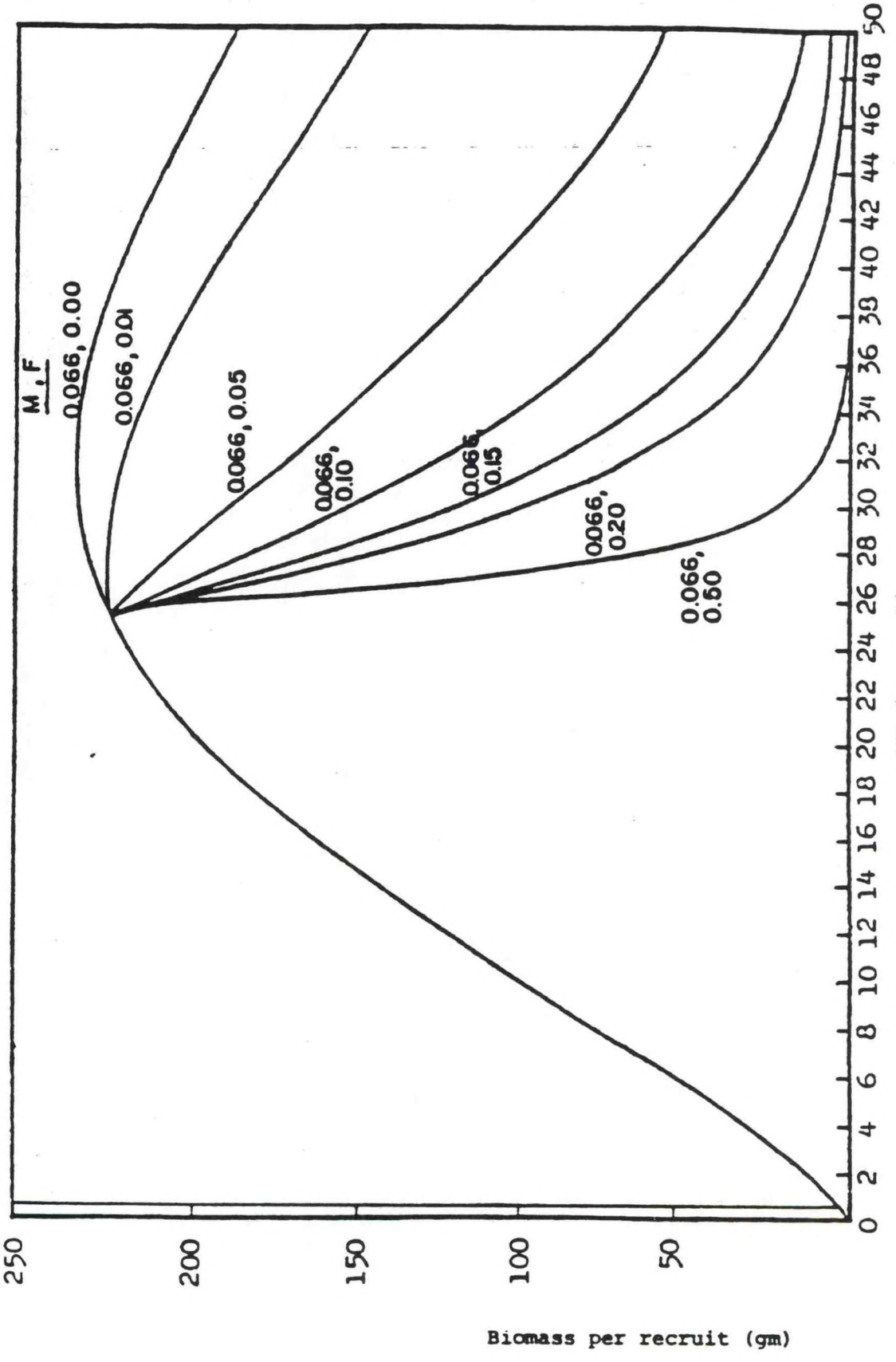

Figure 12. Biomass per recruit curves for a cohort of *C. aquadulcis* using a constant rate of natural mortality (M=0.066) and progressively increasing rates of fishing mortality (F) applied after a minimum age of 25 years.

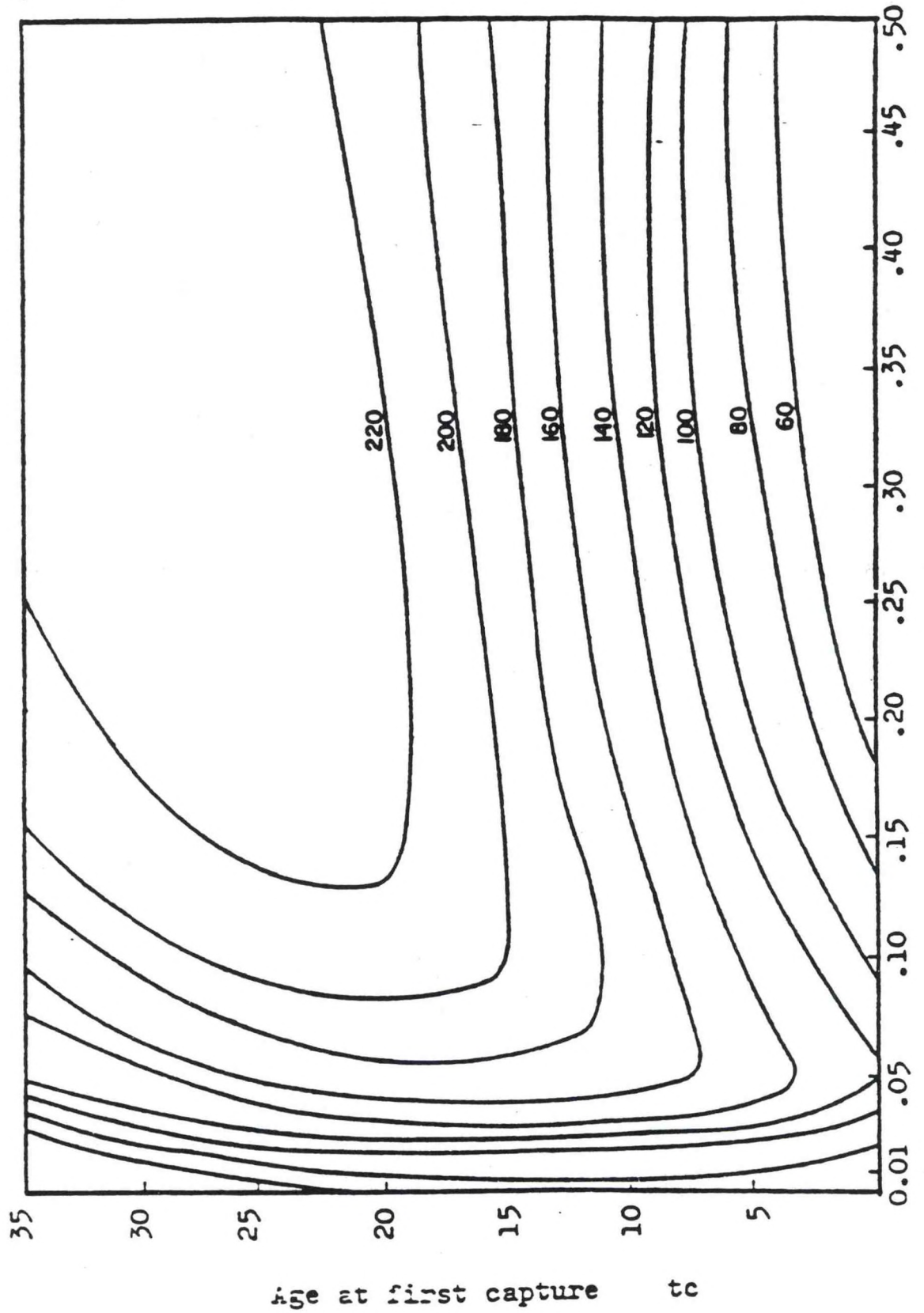

Figure 13. Yield per recruit isopleths for *C. acuminatum* in the Makapuu Bed, given a constant rate of natural mortality of 0.066. Contour units are in grams per recruit.

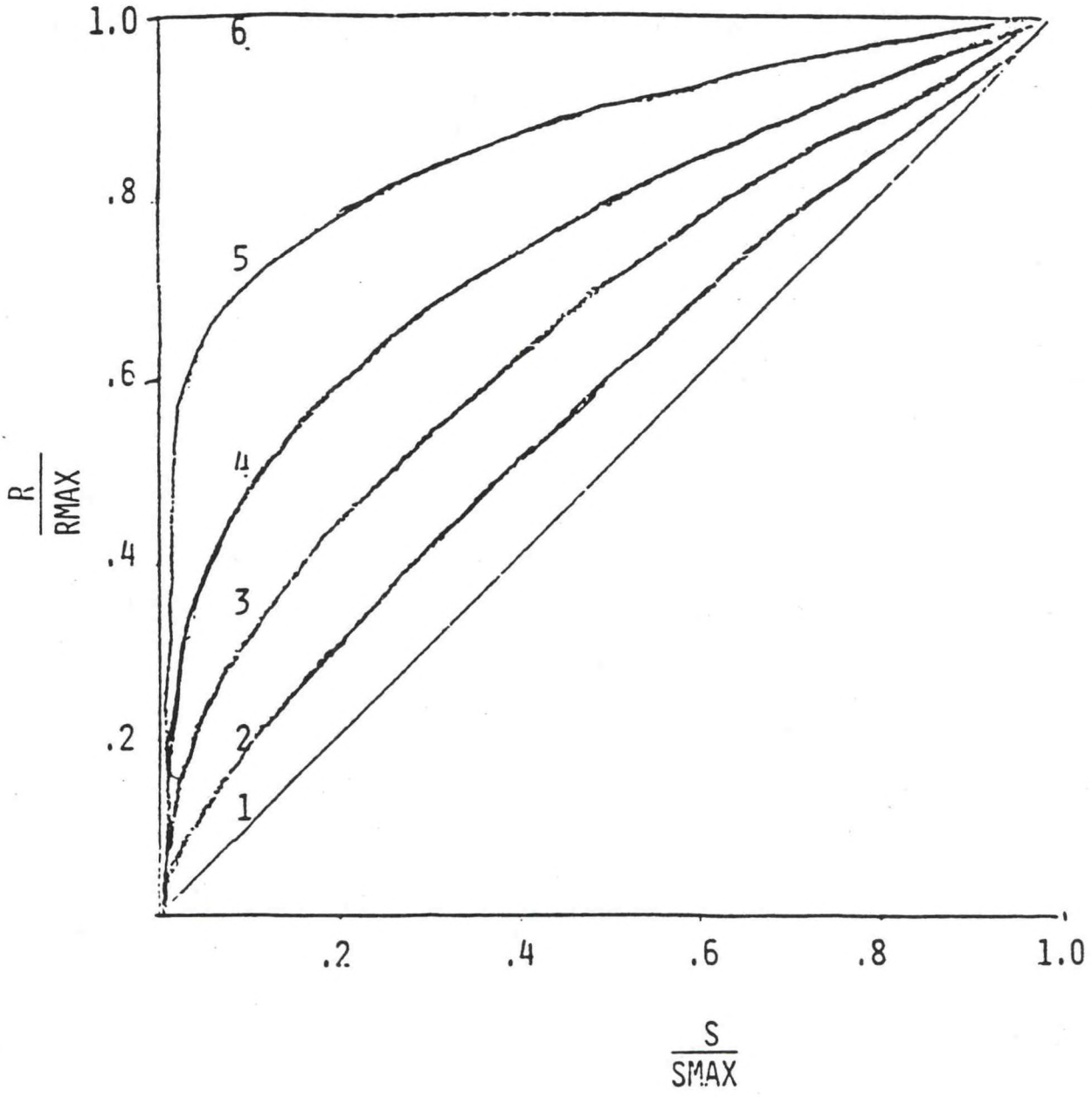

Figure 14. Various spawning stock recruitment functions.

Smax = original spawning stock
S = spawning stock after fishing
Rmax = original recruitment
R = recruitment after fishing

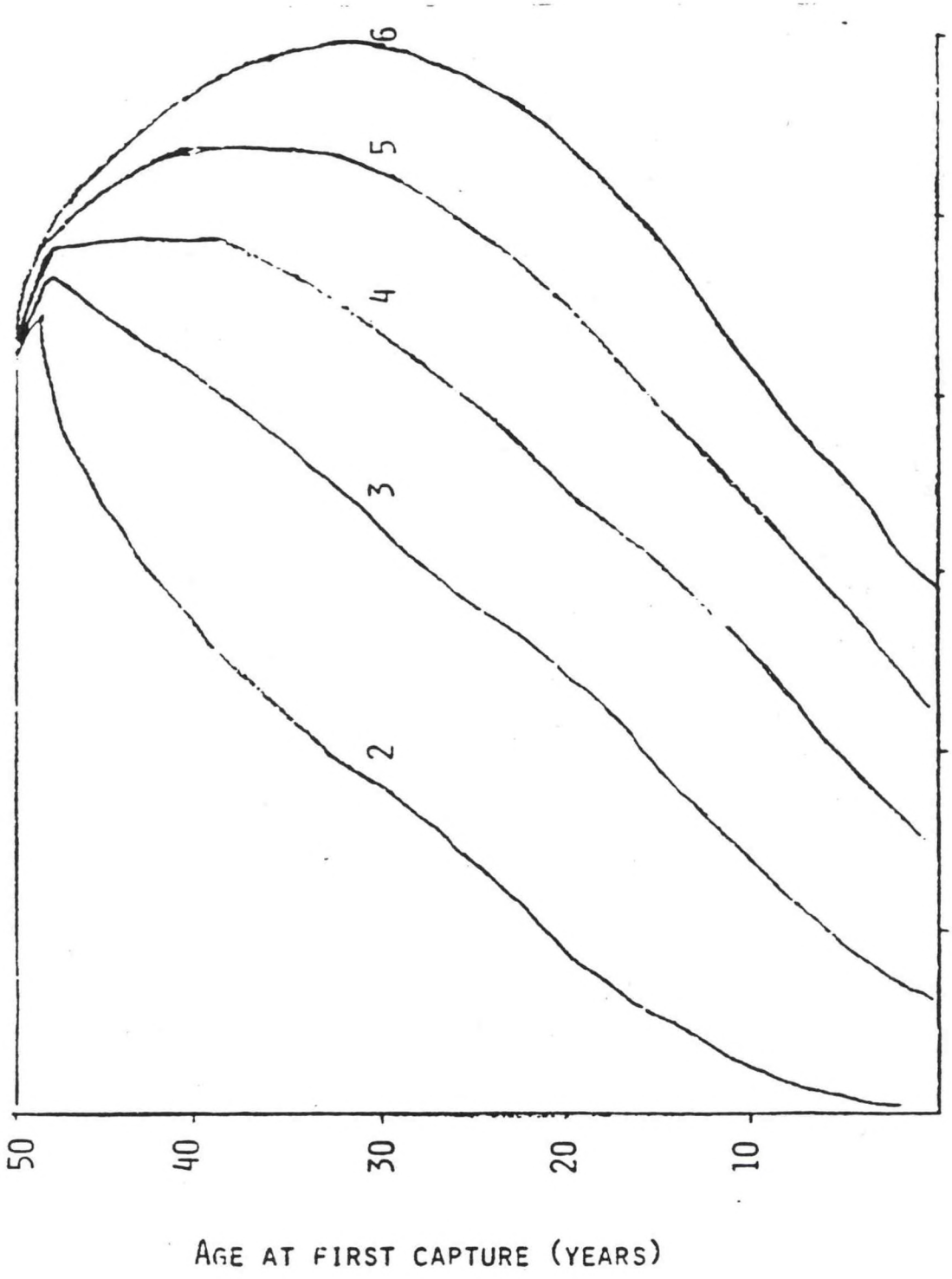

Figure 15. MSY of pink coral as a function of recruitment and age at first capture under various stock-recruitment models. Areas to the left of each curve show biologically feasible combinations of age at first capture and sustainable yield. The MSY curves (2 through 6) correspond to stock-recruitment options shown in Fig. 14.

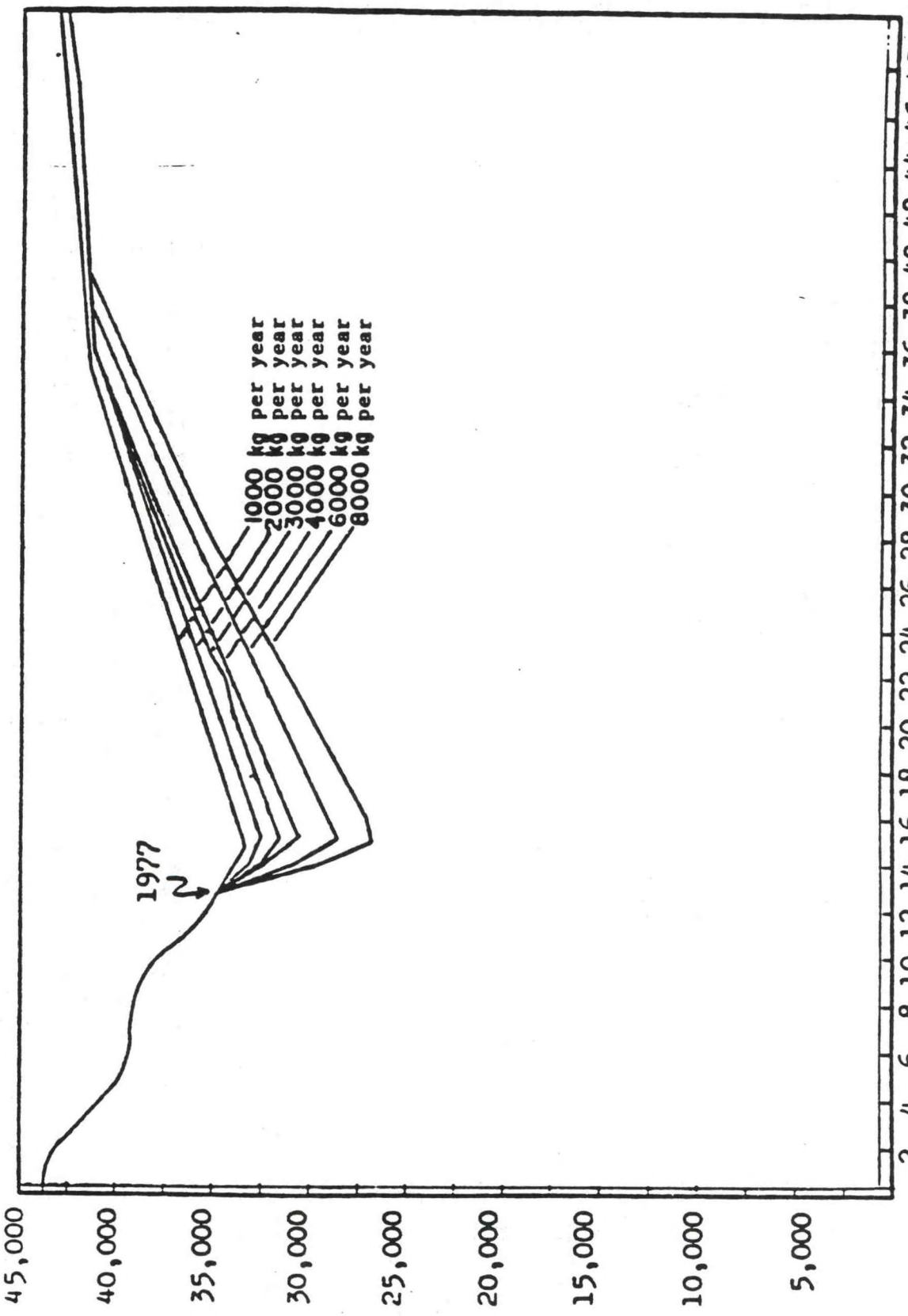

Figure 16. Population biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given six different exploitation rates in 1978 followed by a complete closure of the bed.

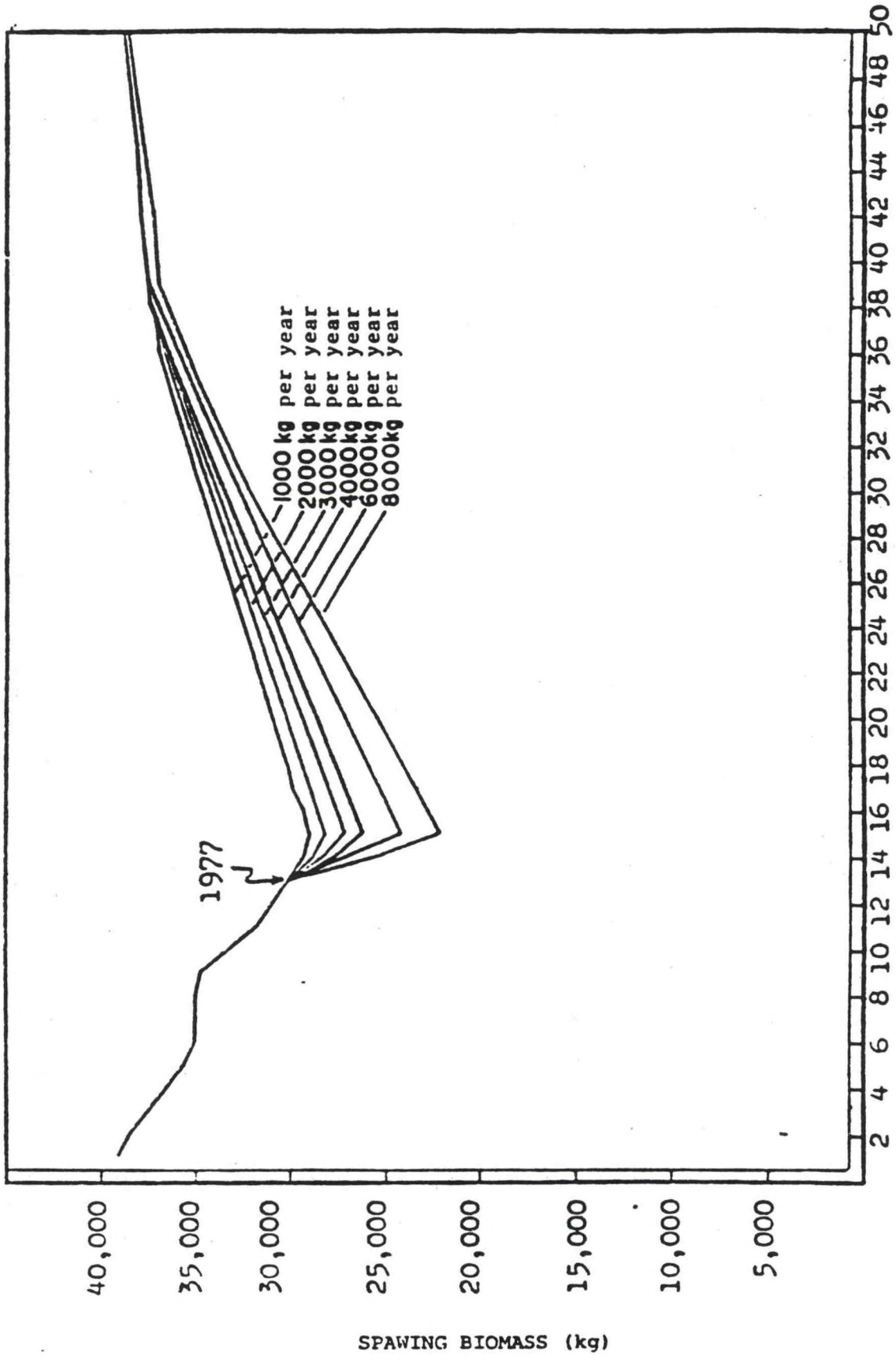

Figure 17. Spawning biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given six different exploitation rates in 1978 followed by a complete closure of the bed.

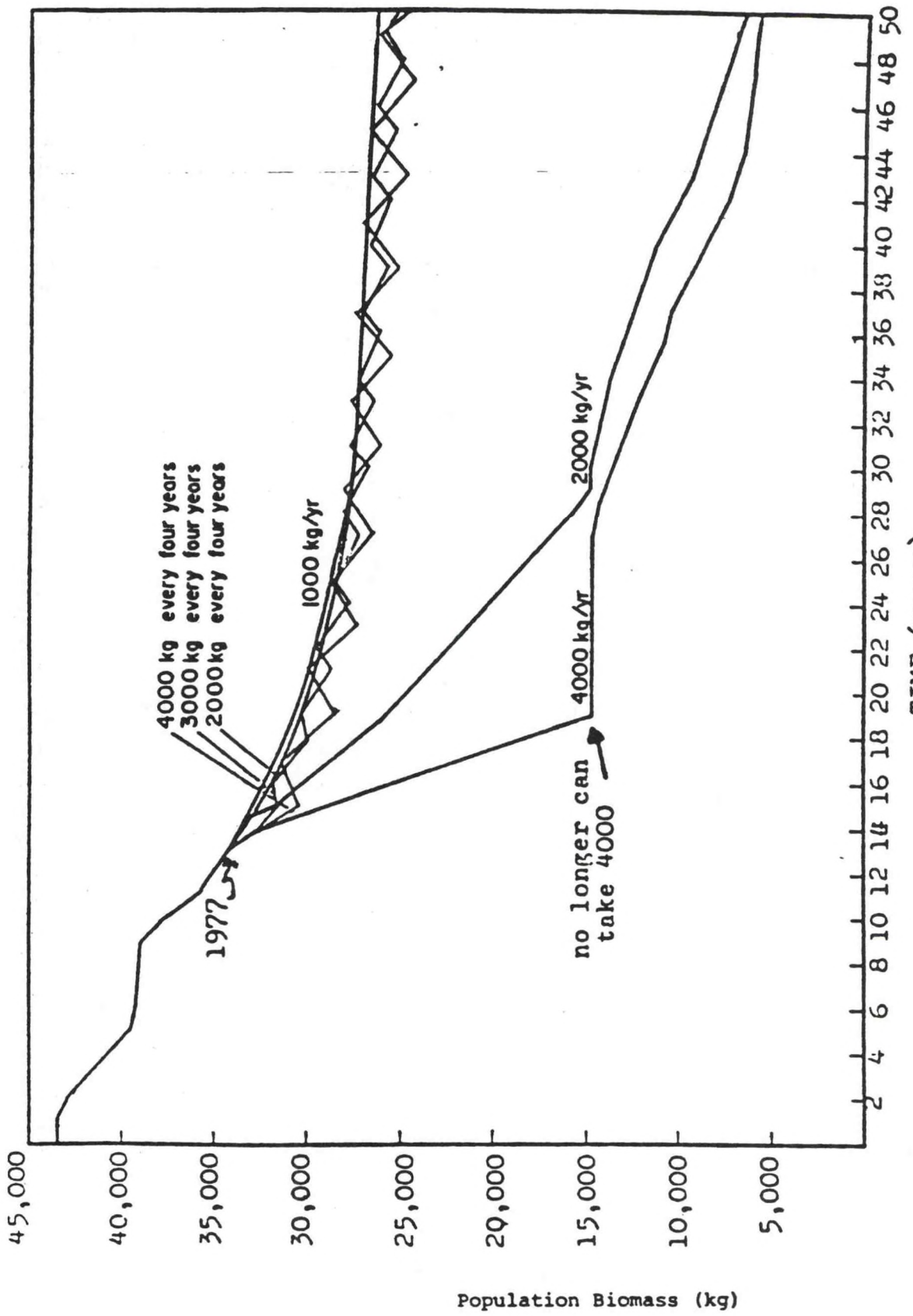

Figure 18. Population biomass of *C. secundum* in the Makapuu Bed between 1964 and 1977 and after 1977 given different rates of exploitation.

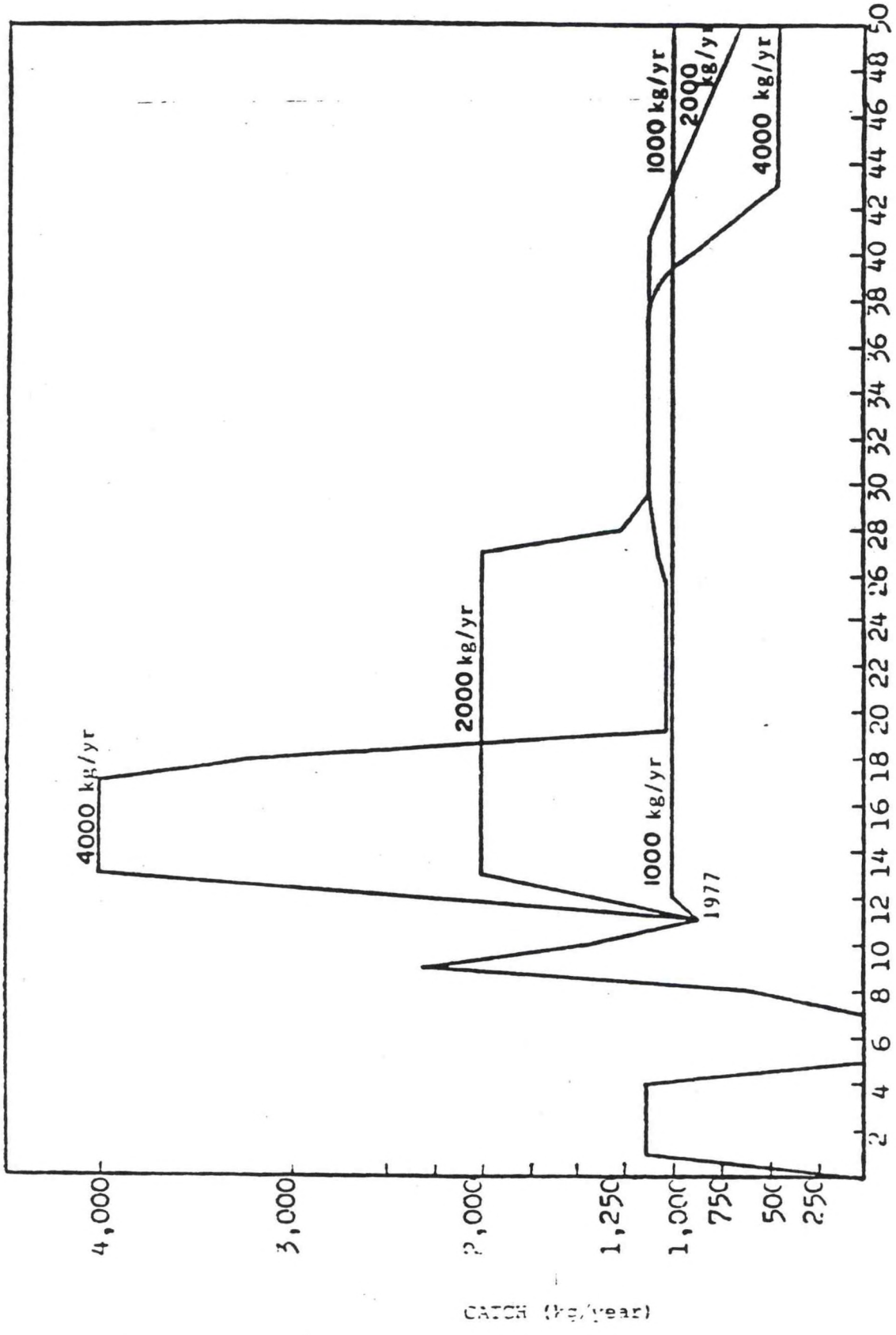

Figure 19. Yields of *C. secundum* in the Makapuu Bed between 1964 and 1977 after which different rates of harvest are simulated. See text for further explanation.

AMENDMENT 1 AND ENVIRONMENTAL ASSESSMENT

FOR THE FISHERY MANAGEMENT PLAN

FOR THE

PRECIOUS CORALS FISHERIES

OF THE

WESTERN PACIFIC REGION

MARCH 1988

Prepared By

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1.0 PREFACE

1.1 Responsible Agencies

The Western Pacific Regional Fishery Management Council (the Council) was established by the Magnuson Fishery Conservation and Management Act (MFCMA), as amended, to develop Fishery Management Plans (FMPs) for fisheries in the U.S. Exclusive Economic Zone (EEZ) around Hawaii, the territories (American Samoa, Guam), and possessions of the United States in the Pacific (Figure 1). Once an FMP is approved by the Secretary of Commerce, it is implemented by Federal regulations and enforced by the National Marine Fisheries Service (NMFS) and the U.S. Coast Guard in cooperation with state and territorial agencies.

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1.2 Public Review and Comment

The Regional Council involves fishermen and other parties interested in developing FMPs and amendments. This ensures that those who can be affected have the opportunity to submit their views on the proposed action and alternatives to the Council.

The rule changes proposed by this amendment have been considered by the Council for several years. During that time period they have been discussed at meetings of the Council's Scientific and Statistical Committee, the Council's Precious Coral Plan Development Team, and the industry Advisory Panel.

On February 5, 1988, a draft summary of this document was distributed to fishermen interested in harvesting precious corals and to all fishermen presently engaged in commercial fisheries in the Northwestern Hawaiian Islands (NWHI). In addition, this amendment was presented and discussed at two public hearings held in Honolulu, Hawaii; one on May 19, 1987, and the other on February 16, 1988. Verbal and written comments were solicited at each public hearing. The closing date for written comments from the most recent hearing is March 1, 1988.

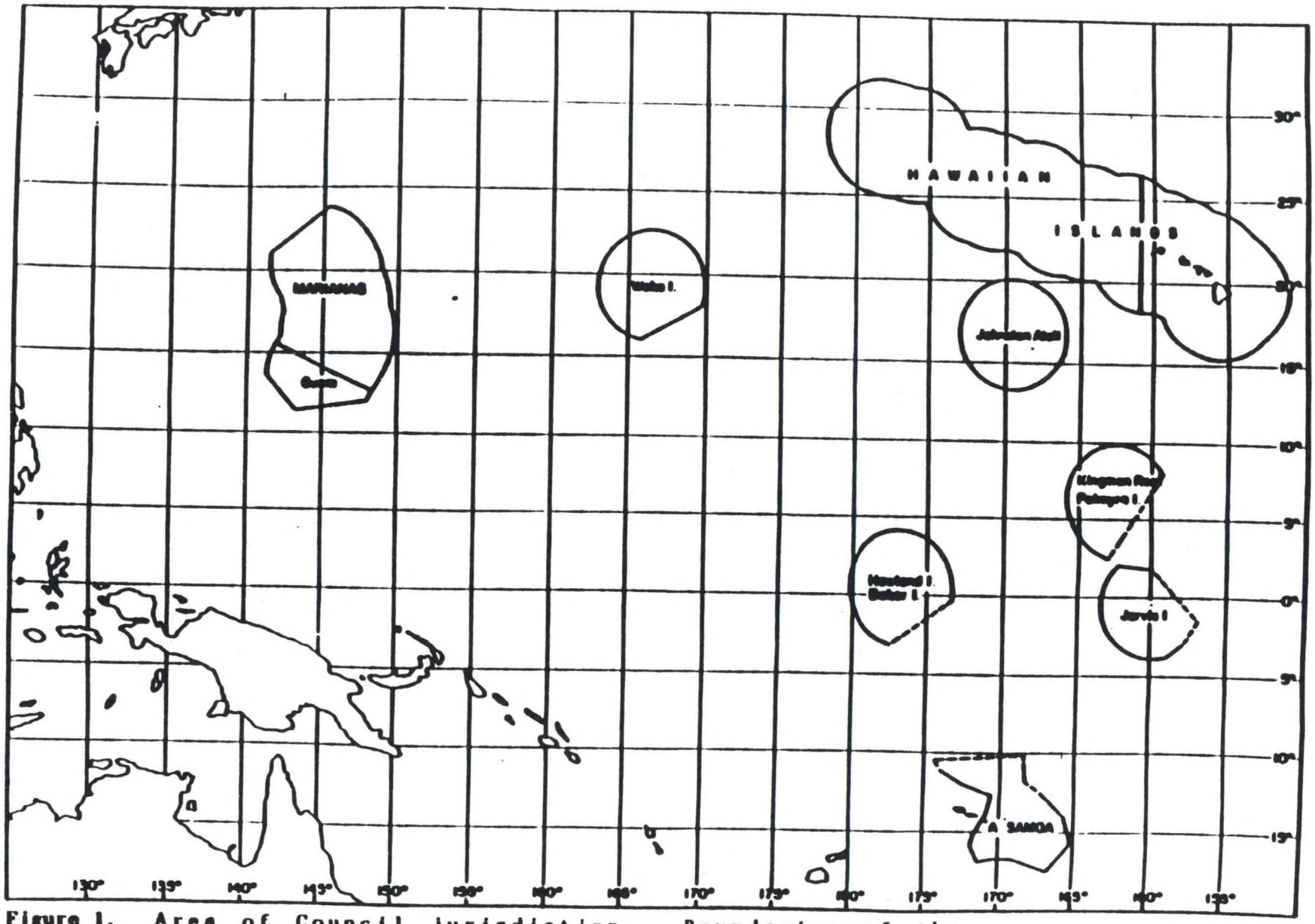

Figure 1. Area of Council jurisdiction. Boundaries of the Exclusive Economic Zone around Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, and the U.S. Possessions.

1.3 Relationship to Applicable Laws and Policies

This first amendment to the FMP for the Precious Corals attempts to correct a major inadequacy of the FMP: that is, the fishery has not developed as the FMP intended. Information and analysis in support of the proposed action are presented in a manner intended to satisfy MFCMA requirements as well as requirements of other applicable laws and policies.

The FMP for the Precious Coral Fisheries for which the Amendment is being prepared satisfies the information and procedural requirements of the National Environmental Policy Act of 1969, the Regulatory Flexibility Act, Executive Order 12291, and other laws and directives. The FMP also served as an environmental impact statement (EIS). Similarly, this amendment is intended to serve as an Environmental Assessment. The amendment assesses the economic and administrative/enforcement impacts of the proposed regulatory changes, and will satisfy the requirement for a Regulatory Impact Analysis. This document contains all the information necessary under the several statutes and directives applicable to the planning process. A copy of the original FMP and companion regulations may be obtained from the Council.

In addition, this amendment provides information regarding habitat and vessel safety concerns, as required by the 1986 amendments to the MFCMA.

1.4 List of Preparers

This FMP Amendment was prepared by:

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with considerable input from the following members of the Precious Coral Fishery Plan Monitoring Team and Advisory Panel

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1.5 Acknowledgements

The Council wishes to acknowledge the input and cooperation of the members of the industry and the fishing community. Individuals from those groups have graciously made private information available, explained features of their operations, and patiently assisted the Council in the formulation of this amendment.

The Council also wishes to extend a special acknowledgement to Dr. Rick Grigg for his substantial contributions to understanding the biology, life histories, and world fisheries of precious corals.

2.0 BACKGROUND

2.1 Species of Concern and Their Biological Characteristics

Harvesting of deep-water precious corals is subject to the regulations of the FMP which became effective on September 29, 1983. The FMP covers domestic and foreign fishing for pink, gold, and bamboo corals in the U.S. EEZ of the Western Pacific Region. These species of precious corals are found in deep water (350-450 m and 1,000-1,500 m) on solid substrate where bottom currents are strong. Precious corals are slow-growing and are characterized by low rates of mortality and recruitment. Natural populations are relatively stable, and a wide range of age classes are generally present. This life history pattern (longevity and many year classes) has two important consequences with respect to exploitation. First, the response of the population to exploitation is drawn out over many years. Second, because of the great longevity of individuals, and the associated slow rates of turnover in the populations, a long period of reduced fishing effort is required to restore the ability of the stock to produce at Maximum Sustained Yield (MSY) if a stock has been overexploited for several years.

2.2 Distribution in the EEZ

The FMP identifies the problem of managing a resource of unknown dimensions characterized by slow growth, low rates of mortality, and low rates of recruitment. Precious corals are known to exist in the EEZ around Hawaii and very likely exist in the EEZ around American Samoa, Guam, the Commonwealth of the Northern Marianas, and U.S. possessions in the Pacific, but virtually nothing is known of their distribution and abundance in these areas. So far, beds of pink, gold and/or bamboo coral have been found at six locations, all in the EEZ around the Hawaiian Archipelago. The annual sustainable harvest from these six beds is estimated at approximately 3,000 kg per year for all species of precious corals combined. Very small beds of deepwater precious corals have recently been discovered on a bank east of French Frigate Shoals and on the Cross Seamount southwest of the island of Hawaii, but these beds are too small for commercial harvests.

Until recently, all of the known beds of deep-water precious corals in the EEZ of the Western Pacific Region were in the Hawaiian Islands Archipelago. In 1987, a research vessel discovered precious corals in the EEZ around Palmyra. The extent of the Palmyra discovery is not presently known. Beds of precious corals are almost certain to exist within the EEZ around other island areas. Of the known beds in the Hawaiian Island

chain only the Makapu'u bed off Oahu has been accurately surveyed for commercial densities.

2.3 Existing Management Measures

The FMP considers precious coral beds as separate management units because known beds are patchily distributed and widely separated from each other. The beds are classified as Established, Conditional, or Exploratory. Established beds are ones for which estimates of maximum sustainable yields are reasonably precise. So far only Makapu'u bed has been studied adequately enough to be classified as Established. Conditional beds are beds for which an estimate of MSY exists. MSYs for Conditional beds are figured by comparing the size of the beds to that of the Makapu'u Bed and then multiplying that ratio by the yield from the Makapu'u Bed. It is assumed that ecological conditions at the Makapu'u bed are representative of conditions at all other beds. Five beds of precious corals are classified as Conditional, all of them off the Hawaiian Islands (Figure 2). Exploratory Permit Areas are the unexplored portions of the EEZ in which precious coral beds are almost certain to exist, but no beds have yet been located. There are three such areas: the EEZ seaward of the State of Hawaii, and the EEZ seaward of both American Samoa and Guam. The FMP provides allowance for domestic or foreign fishing in Exploratory Permit Areas, up to a maximum of 1,000 kg, all species combined, per area, per year.

The regulations prescribe methods of harvest for each class of coral bed and harvest quotas for individual beds. Only selective gear is permitted in the EEZ around the main Hawaiian Islands, i.e., south and east of a line midway between Niihau and Nihoa Islands. Use of both selective and nonselective gear is permitted on the NWHI Conditional beds of Brooks Bank and the 180° Fathom Bank and throughout the Exploratory Area of the NWHI. Quotas have been established for pink, gold, and bamboo coral populations in the Makapu'u bed and in the Conditional beds. If tangle net dredges are employed on Conditional beds, the weight quota is only twenty percent of that allowed for selective harvesters. In addition to regulating harvesting methods and harvest amounts, the FMP establishes a procedure for upgrading coral beds from Exploratory to Conditional and from Conditional to Established as new beds are located and more catch/effort data become available which will allow more precise determinations of sustainable yields.

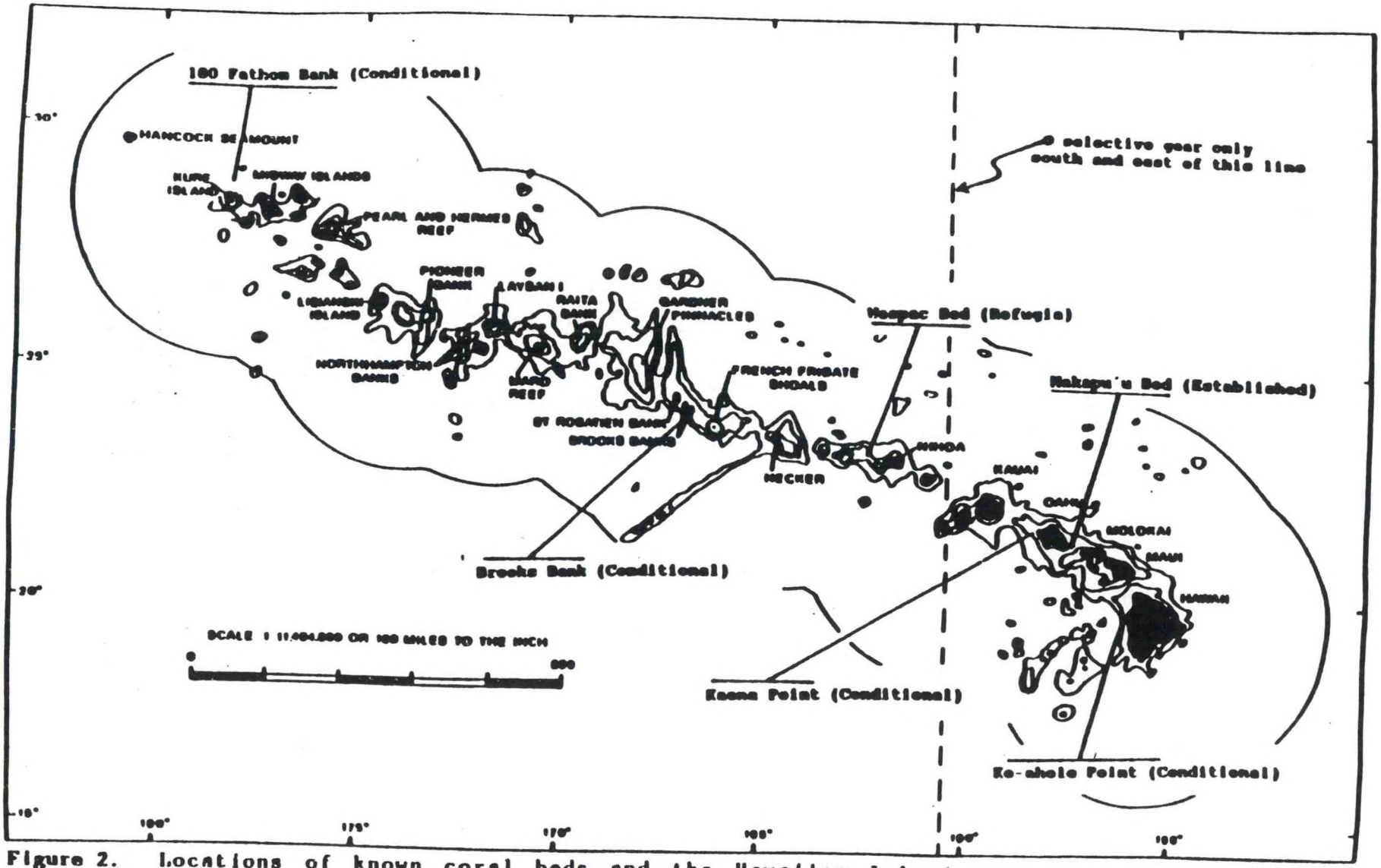

Figure 2. Locations of known coral beds and the Hawaiian Islands Exploratory Permit Area. Bed type is in parentheses.

3.0 Proposed Actions

3.1 List of Proposed Actions

The actions of Amendment 1 to the Precious Corals FMP of the Western Pacific Region are to:

1. Include the U.S. Possessions under the FMP as a combined single Exploratory Area (X-P-PI) with a 1000 kg annual harvest quota for all species of precious corals combined;

2. Place all species of Corallium (Corallium spp.) harvested or likely to be harvested by the fishery within the Management Unit Species (MUS) of the FMP;

3. Create a method for issuing Experimental Fishing Permits (EFPs) for fishing within Exploratory Areas.

In addition, the amendment provides information on habitat and reviews safety concerns, as required by 1986 amendments to the MFCMA.

3.2 Location of the Proposed Actions

The first proposed action specifically applies to the U.S. EEZ surrounding Wake Island, Johnston Atoll, Kingman Reef and Palmyra Island, Jarvis Island, and Howland and Baker Islands. Proposed action 1 will consolidate the portions of the EEZ which surrounds those islands into a single Exploratory Area (Figure 1).

The second and third proposed actions apply to all Exploratory Permit Areas of the EEZ under jurisdiction of the Council (Figure 1).

4.0 Need for Amendment 1

4.1 Include the U.S. Possessions under the FMP as a combined single Exploratory Area (X-P-PI) with a 1000 kg annual harvest quota for all species of precious corals combined

There are no regulations in place that govern the harvest of precious corals in the federal waters surrounding the U.S. Pacific Island Possessions. When the Precious Corals FMP was approved by the Assistant Administrator of Fisheries in September of 1980, Federal waters around the U.S. Pacific Island Possessions were not within Council jurisdiction. In 1983, Congress passed Public Law 97-453, which amended the MFCMA. That law extended Council jurisdiction to the EEZ around U.S. Pacific Island Possessions. In anticipation of P.L. 97-453, the FMP document contained specific language regarding fishing for precious corals in those areas. Those passages are footnoted to highlight the fact that those management measures were recommendations to the Secretary of Commerce until such time that fisheries management authority for the Pacific Island Possessions transferred to the Council.

The management measures described for federal waters around island possessions are consistent with the regulations in place for the other Exploratory Areas defined in the FMP. Exploratory Areas are the unexplored portions of the EEZ in which coral beds are almost certain to exist but where no beds have yet been located. The Island Possessions would be incorporated into a single Exploratory Permit Area designated as X-P-PI, with a 1000 kg annual harvest quota for all species of precious corals combined.

The first proposed action of this amendment will formally incorporate those areas into the Fishery Management Plan for Precious Corals.

This action would prevent unregulated domestic fishing for precious corals in the EEZ around Palmyra where precious corals were recently discovered.

4.2 Place all species of <u>Corallium</u> (<u>Corallium</u> spp.) harvested by the fishery within the Management Unit Species of the FMP

The definition of precious corals contained in the regulations of the FMP is restrictive. It does not adequately recognize the present taxonomic uncertainties that exist (Midway Deep-sea coral), or the probability for discovery of new species of precious corals. That approach saddles management with the all too familiar role of catch-up rather than one of prudent anticipation.

Through history, precious coral fisheries have followed the pattern of exploration, discovery, exploitation, and depletion (Grigg 1976). The FMP points out that given what is known regarding life histories and population dynamics of precious corals the role of catch-up is particularly risky as a management strategy. Precious corals are particularly long lived, and beds, or populations, are characterized by low rates of recruitment and natural mortality which produce extremely slow turnover rates. That combination of qualities means that precious coral beds recover very slowly from overharvesting.

The most precious of the precious corals are in the genus Corallium (Grigg 1984). Seven varieties of precious pink and red corals are recognized in the Pacific, six of which are considered distinct species of Corallium (Grigg 1981). There may be other species of pink coral not yet taxonomically classified. Expanding the MUS from the three species of Corallium listed in the regulations to the entire genus (Corallium spp.) is in keeping with the intent of the FMP. Additionally, there is sufficient evidence to predict that domestic coral fishermen will harvest species of Corallium not currently listed in the FMP regulations definition of precious corals.

In 1980-81, Japanese vessels made a big coral strike when fishermen discovered Midway Deep-sea, a still undescribed (and therefore unnamed) species of Corallium, northwest of Midway Island, on the Emperor Seamounts at depths between 1,000 and 1,500 m. The Milwaukee Banks are only 280 miles from the northwest portion of the Hawaiian Islands Exploratory Area. Table 1 includes approximate volumes of Deep-sea Midway that were harvested by foreign draggers in the years following its discovery. These harvest figures indicate the potential of the coral fishery in the Northwestern Hawaiian Islands.

Table 1. Estimated landings and value of precious corals harvested in the Pacific: 1979-1983. (Grigg 1983; Grigg 1984).

Year	Area	Traditional Grounds		Midway		Total	
	Production / Country	Volume kg	Value $/kg	Volume kg	Value $/kg	Volume kg	Value $/kg
1979	Taiwan	13,000[b]	-	110,000[b]	-	123,000[b]	99[b]
	Japan	14,516[a]	400	76,988[a]	90	91,504[a]	139[a]
	Totals	27,516		186,988		214,504	116
1980	Taiwan	16,000[c]	-	138,000[c]	80-100[d]	154,000[c]	-
	Japan	10,227	530	74,228[a]	82	84,455[d]	137[a]
	Totals	26,227		212,228		238,455	-
1981	Taiwan	14,000[c]	-	240,000[b]	25-150[b-d]	254, 00	-
	Japan	9,786[a]	541	44,471[a]	72	54,257[a]	156[a]
	Totals	23,786		284,471		308,257	-
1982	Taiwan	13,200[d]	-	52-60,000[d]	69[d]	~69,200	-
	Japan	~8,000[d]	-	28,000[d]	48-74	36,000	-
	Totals	~21,200	-	~84,000	-	105,200	-
1983	Taiwan	6,500	490	90,000	69	96,500	-
	Japan	1,781	532	49,313	62	51,094	-
	Totals	8,281		139,313		147,594	-

Exchange rate of 40 NT/$1 U.S.
" " " 270 ¥/$1 U.S.

Sources: 1. For landings in Japan: a) All Japan Coral Fishing Association. 2. For landings in Taiwan b) Fung Mei Coral Co., c) Grigg, 1982; d) Based on 1982 interviews.

Due to the close proximity of banks in U.S. waters to the Milwaukee Banks of the Emperor Seamount Group, and the common geomorphology of all the islands and banks along the Hawaiian Ridge, it can be predicted that at least Midway Deep-sea (Corallium sp. nov.) will be harvested by domestic fishermen.

The area of habitat suitable for precious corals in the Exploratory Areas is vast and spans a wide range of latitude (Tables 2 and 3). Species of Corallium other than those listed may be discovered once activity in the fishery commences and expands to those less known regions.

Table 2. Range and area of EEZ in the Western Pacific Region.

Exploratory Area	Latitude Range	Area of EEZ (nmi²)
Hawaii	35°N - 18°N	648,000
American Samoa	≈10°N - 17°30′S	75,000
Guam	≈15°40′N - 11°N	60,000
CNMI*	≈23°40′N - 12°20′N	251,000
Pac. Is. Poss.	(see Figure 1)	
	Howland and Baker	83,000
	Jarvis	125,000
	Johnston Atoll	83,000
	Kingman Reef & Palmyra	60,000
	Wake Island	125,000
		476,000
TOTAL EEZ AREA		1,511,000

* No language in this amendment refers to the Commonwealth of the Northern Mariana Islands because of differences of legal opinion between the CNMI and the U.S. Government over fisheries jurisdiction.

Table 3. Estimated areas of deep water (Midway Deep-Sea) and shallow water precious corals (Corallium secundum) in the EEZ around the Hawaiian Islands. (Council files).

Type of Precious Coral	Depth Range	Btm Area (nmi^2)
Corallium secundum	350 - 450 m	1702
Midway Deep-Sea (Corallium sp. nov.)	1000 - 1500 m	5876

4.3 Create a method for issuing Experimental Fishing Permits (EFPs) for fishing in Exploratory Areas

The primary intent of the FMP was to achieve the optimum yield of precious corals from the EEZ within the Western Pacific Region. The FMP attempted to strike a balance between protection of coral resources while creating enough incentive to stimulate development of a domestic fishery. In turn it was hoped that the newly developed domestic fishery would discover coral beds in the Exploratory Areas. The catch data provided by commercial vessels would be used to assess the resources and refine the management of the fishery. Once sufficient data were accumulated, beds in Exploratory Areas would be elevated to Conditional and then Established bed status. MSYs for each bed would be calculated, and discreet quotas would be assigned.

In view of the apparent ease with which the resource could be overfished, the Council set an initial quota of 1000 kg in each of the three Exploratory Areas defined in the FMP regulations. At that time the Council and its advisory bodies believed that 1000 kg quotas provided enough incentive to stimulate exploration and discovery of new beds, particularly by vessels that employed low cost traditional dredge and tangle-net technology.

Time has proved that expectation to be incorrect. No fishermen, domestic or foreign, have legally fished for precious corals within the EEZ of the Western Pacific Region since 1979. From 1973-79 Maui Divers, a domestic firm, harvested precious corals from the Makapu'u Bed with a manned submersible. Prohibitively high insurance costs forced a curtailment of their fishing operation in 1979. Over the years since, the Council office has fielded numerous inquiries from a wide range of interested parties, but still no legal fishing has taken place in any Exploratory Area. Only two potential operators have obtained permits under the FMP, but neither has fished. Potential operators have persistently complained that the 1000 kg quota for Exploratory Areas is too low. None of them feels that the capital investment needed to enter the fishery can be justified,

not even by the relatively lower cost dredging operations. Potential operators have suggested a wide range of larger quotas for Exploratory Areas, from 4,000 - 15,000 kg annually.

The quota amounts suggested were inextricably linked to the intended method of harvest. Dredging - that is "stones" with tangle nets or mops attached - is the most common method worldwide. It's technologically unsophisticated and requires relatively low capital investment. The other fishing alternative is highly sophisticated and costly. It employs a manned or unmanned submersible. The widely different start-up costs are used to justify substantially different quota requests which are geared toward securing financing and a reasonable probability of making a profit.

The Council and its advisory bodies endorse the concept of higher quotas in principle, but hesitate to make changes because sufficient information on the precious coral resources within the Exploratory Areas does not exist. Any present change in area quotas must rely heavily on operational economics and conjecture rather than on hard biological data. The Council does not think it prudent management to increase quotas indefinitely under the FMP for a resource that can be easily depleted before enough direct evidence exists to support such changes.

It's not likely that State or Federal agencies will fund and pursue assessment programs for precious corals in the Exploratory Areas. The Council must depend on industry to provide accurate data on the extent and abundance of precious corals so that quotas can be thoughtfully and cautiously revised. However, the present quotas have created a dilemma; they are too low to stimulate fishing activity. Therefore no new data, which would be used to bring quotas in line with resource abundance, are being gathered.

An Experimental Fishing Permit for Exploratory Areas would assist to 1) stimulate development of the precious coral fishery, 2) encourage domestic involvement in the fishery, and 3) generate much needed information for accurate assessment of the resource. The EFP would be issued by the Regional Director, Southwest Region, NMFS, following review and consideration of advice from the Council, the Coast Guard, the State(s) adjacent to the area to be fished, and the public. Receipt of, and decisions on EFP applications will be noticed in the Federal Register. Additionally, the Council will develop and distribute guidelines that it will use for evaluating and making recommendations on EFP applications for the Regional Director to consider during his review of EFP applications. Conditions could be imposed on the permit holder to limit risk to precious coral stocks or other marine resources. Among the possible limits could be time or area constraints, harvest limits, gear controls, and observer requirements. Harvest quotas assigned to each EFP will be more

directly related to individual operational economics than existing Exploratory Area OYs (Section 8.3). Precious corals harvested in accordance with EFPs are not intended to affect Exploratory Area quotas available to vessels that fish under the existing permit system. The FMP stipulates that vessels can only hold one valid permit. Permitees must surrender one permit prior to being issued a permit to fish in another Exploratory Area. This provision prevents fishermen from simultaneously holding an Exploratory Area Permit and an EFP.

4.4 Habitat and Safety Issues

Amendments to the MFCMA in 1986 require that new FMPs or the next amendment to any FMP already in place 1) include readily available information on the condition and importance of the habitat for the management unit species, and 2) review any access provisions in the FMP to determine if adjustments are needed for safety reasons. The information on habitat is presented in Section 6.1. The information on safety is contained in Section 10.6.

5.0 Description of the Fishery

Precious corals are important deep-water resources frequently found on seamounts. The fishery extends worldwide, but the richest beds exist on seamounts in the western Northwest Pacific Ocean and the western Mediterranean Sea.

5.1 In International Waters

Although precious corals fisheries have existed in the Mediterranean Sea since ancient times, beds of precious corals of commercial densities were not discovered in the Pacific until the early 19th century, off Japan. Until recent years, the precious corals fisheries were centered off Japan, Okinawa, and Taiwan in the far western Pacific. In 1966, about 95% of the world's production of precious corals was dredged from these areas by Japanese and Taiwanese fishermen. Depletion of coral beds in these areas, however, led to wide-ranging exploratory efforts. In 1965, Japanese coral dredgers discovered a very large bed of precious corals on the Milwaukee Banks which lie on the junction of the Emperor Seamounts and the Hawaii Ridge system. Since that time, the center of the world's precious corals harvests has shifted from the traditional grounds in the far western Pacific to the newly discovered grounds in the Emperor Seamounts, around 500 miles west of Midway Island. Because Midway Island is the nearest island to the Emperor Seamounts fishing grounds, coral dredged from this area has been labeled in the trade as "Midway" corals. In 1980, the Midway area accounted for 90% of the world's production of precious corals. In 1983, vessels from Taiwan and Japan dredged up about 140,000 kg of pink coral from the Midway area, which amounted to about three-quarters of the world's production for that year.

For the past five years, more than half of the world's landings have come from the region of the Emperor-Hawaiian Ridge Seamounts, but only about 10% of the "Midway" grounds lie in the U.S. EEZ near the Hancock Seamount area in the northwest edge of the EEZ. The fishery is unregulated, for the most part, because most beds of precious corals are found outside of territorial limits in international waters. Ex-vessel revenues from the fishery are substantial (Table 4), however ex-vessel revenues in a strict sense fail to provide an accurate barometer of the value of the industry (Section 5.4). Worldwide, the current annual ex-vessel revenue from the fishery is estimated at near $50 million (Grigg pers. comm.).

Table 4. Estimates of ex-vessel revenues from precious coral landings in Japan and Taiwan, 1979 -1983. (Derived from figures in Grigg 1982; 1982a; 1983).

Year	Landings (kg)	Ave Price $/kg	Ex-vessel Revenue (US$ millions)
1979	214,504 (87)*	116	24.9
1980	238,455 (89)	106	25.4
1981	308,257 (92)	121	37.4
1982	105,200 (80)	158	16.6
1983	197,594 (91)	149	29.4

* Number in parentheses lists percent of coral from Midway grounds in annual landings.

5.2 Domestic Fishing in the EEZ

Domestic participation in harvesting precious corals began in 1966, when U.S. scientists discovered a commercial bed of pink coral off Makapu'u Point, Oahu in the Molokai Channel. Shortly thereafter, a small group of fishermen began dredging this bed on a small scale. Research at the University of Hawaii by the Sea Grant Program led to the development of a selective harvesting system utilizing a manned submersible. Adopting this system, Maui Divers of Hawaii, Ltd., began harvesting the Makapu'u Bed in 1973. High operating costs led to the discontinuation of this operation in 1979. Since then no domestic fishing for deep-water precious corals has taken place, although there has been renewed interest from time to time among domestic fishermen, including Maui Divers, to enter the fishery.

5.3 Foreign Poaching

The large yields reported to have been taken by foreign fishermen from the Milwaukee Banks of the Emperor Seamounts in recent years are indications of harvest potentials for precious corals in the EEZ. Even though most precious coral resources are outside the U.S. EEZ in international waters, foreign interest in U.S. precious coral has been keen. In 1980, and again in 1981, about 10,000 kg of pink coral was harvested by Taiwanese fishermen in the U.S. EEZ surrounding the NWHI (R. Grigg pers comm.). In 1981 alone, there were 21 documented violations of illegal fishing by Taiwanese and Japanese vessels inside the EEZ in the Hancock Seamount area. No violations of the EEZ were observed by the U.S. Coast Guard in 1982 and 1983, although a source who has ties with Taiwanese fishermen reported

that some illegal fishing did occur in the Hancock Seamount area. The record of violations continued in April 1984 when the Coast Guard seized a coral dragger for fishing in the Hancock Seamount area without a permit. It has been reported that about 20 Taiwanese coral draggers poached about 100 tons of precious corals from seamounts inside the EEZ north of Gardner Pinnacles and Laysan Island during 1985. This much coral has an ex-vessel value of around $10 million. Reports of past foreign operations and the continued detection of illegal operations by foreign draggers in the EEZ of the NWHI provide indirect evidence that there are more coral beds scattered throughout the EEZ waiting to be discovered by domestic fishermen, but only if there is sufficient incentive to induce exploratory fishing.

5.4 Value of the Precious Corals Fishery/Industry

The economic potential of a domestic precious coral fishery cannot be appreciated without examining the related industry. Precious corals are used to produce value-added products. Through the sale of both unprocessed and processed coral, the value of the product is increased by about 33 percent (Grigg 1982). In 1980, for Taiwan and Japan combined the precious coral industry was worth approximately $50 million (Table 5).

The present value of the precious coral industry in Hawaii through retail sales of souvenirs and jewelry is estimated to be between $17 and $25 million (Grigg and Slater pers. comm.). That value is for imported precious coral. If the coral were domestically produced, the authentic nature of a Hawaiian product could increase the existing value-added component.

Table 5. Estimated value of the precious coral industry in Taiwan and Japan: 1980. (Reproduced from Grigg 1982).

A. Landings of Midway coral in Taiwan in 1980	**138,000 kg**
1. 10% is exported unprocessed at US$100 per kg.	US$ 1,380,000
2. 10% processed in Taiwan factories where the value added is 1.3 x to US$130 per kg; coral is sold at the retail level at a markup of 3 x.	US$ 5,382,000
3. 80% is processed for export by trading companies at US$100 per kg with 1.3 x value added.	US$14,352,000
Total A	**US$21,114,000**
B. Landings of far western Pacific coral in Taiwan in 1980	**16,000 kg**
1. 50% is exported unprocessed to Italy and Japan at an average of US$600 per kg (highest quality material is not exported, hence the average price is less than US$1000 per kg).	US$ 4,800,000
2. 10% processed in Taiwan factories where the value added is 1.3 x to US$1000 per kg; coral is sold at a retail level at a markup of 3 x.	US$ 6,240,000
3. 40% is processed for export by trading companies at US$1,000 per kg with 1.3 x value added.	US$ 8,320,000
Total B	**US$19,360,000**
Total A + B	**US$40,474,000**
C. Value estimate of precious coral products from Japan for 1980.	
Total C	**US$13,000,000**
Total Value: A + B + C	**US$53,474,000**

6.0. Condition of Precious Coral Stocks in the U.S. EEZ Surrounding the Hawaiian Islands

In the FMP, precious corals beds are treated as distinct management units because of their widely separated patchy distribution, and the sessile nature of individual colonies, even though recruitment may be dependent on reproduction at other coral beds. There are six known precious coral beds, all in the EEZ of the Hawaiian Islands, for which harvest yields have been established. Five of these beds are quite small and have never been commercially exploited. The only domestic commercial fishery for precious corals existed in the Makapu'u bed for six years from 1974 through 1979. During this period about 17,500 kg of pink coral was collected from the bed (Grigg in press). This represents about 40% (by weight) of the estimated standing crop of pink coral in the entire bed.

Transect surveys of the Makapu'u bed were conducted with a manned submersible in 1971, early 1983, and late 1985. The 1971 survey was conducted before any commercial harvesting had taken place. The 1983 and 1985 surveys were completed about three and six years, respectively, after harvesting had ceased. One of the most significant findings of the surveys was that harvesting had no apparent effect on the rate of recruitment which showed no change between 1971, 1983 and 1985. The combined mean density for all megafaunal species of precious coral in the Makapu'u bed did not change significantly between 1971 and 1985 and is approximately 0.1 colonies per square meter (Grigg in press). The low densities indicate that space is not a limiting factor for megafaunal populations in the Makapu'u bed. Furthermore, there is little indication of age-specific differences in natural mortality.

The age frequency distributions observed in the 1983 and 1985 surveys, when compared to the age frequency distribution of the virgin population in 1971, provide a measure of impact caused by harvesting as well as a measure of the potential of precious coral resources to recover. By comparing the 1985 and 1971 age frequency distributions of pink coral it is predicted that full recovery of the Makapu'u bed to the virgin state will require at least 15, but more nearly 25 years. Apparently recovery is a simple function of slow growth gradually in-filling year classes that were removed by harvesting. Recruitment appears unaffected by harvesting and is independent of the density of the standing stock. In short, recruitment in the Makapu'u bed may be wholly dependent on outside sources. The Makapu'u bed appears to be healthy enough to once again sustain a small domestic harvest quota.

Nothing is known about the status of the precious coral resources in the Exploratory Areas. The U.S. does not even know the precise location where foreign draggers have reportedly

poached surprisingly large quantities of precious corals in the EEZ of the NWHI. About 10,000 kg was reportedly poached by foreign fishermen in 1980 and again in 1981 inside the EEZ in the area of the Hancock Seamounts. This is nearly three times the amount of coral allowed to be harvested from the Makapu'u bed and the five Conditional beds in the Hawaiian Archipelago combined. It's ten times greater than the existing harvest quotas for entire Exploratory Areas. If the 90,000 kg reported figure for poaching is accurate, then in 1985, foreign draggers poached about thirty times the amount of coral lawfully allowed by the FMP. The magnitude of this estimate (a large share of the world's production) casts some doubt on its validity. Nonetheless, it underscores the fact that the amount of illegally harvested coral is substantial.

With the exception of the Makapu'u bed and those beds harvested by foreign fishermen, all other precious coral beds within the U.S. EEZ are believed to be in an unexploited or "virgin" state.

6.1 Habitat of Precious Corals

Although precious corals inhabit distinct non-overlapping vertical zones, habitat requirements are strikingly similar. Precious corals are only found on solid substrate in areas where bottom currents are frequently strong (Grigg 1974). Currents work on the substrate to prevent sediment build up, which would keep new larvae from settling and smother young colonies. Living colonies orient themselves perpendicular to the prevailing current pattern, and although currents carry food to corals, the full importance of currents to living colonies is not clear. Precious corals have been recorded growing on a variety of substrate types, however, experienced Japanese fishermen have reported that coral catches are largest on limestone or shell-sandstone bottoms (Grigg 1971). Basaltic and metamorphic bottoms which support precious coral beds are often veneered with a thin crust of limestone.

In Federal waters, precious corals occur in two principal depth zones; 350-450 m and 1000-1500 m. In the Hawaiian Island chain these zones encompass 1700 nmi.^{2} and 5900 nmi.^{2} of potential habitat, respectively, and range from 18 to 35 degrees N. latitude (Wespac files).

A variety of other animals are known to co-occur with precious corals; both invertebrates and fish. Species of possible commercial importance recorded within precious coral beds are <u>Etelis coruscans</u> (onaga), <u>Seriola dumerilii</u> (kahala), and the shrimp <u>Heterocarpus ensifer</u>. However, no species of either threatened or endangered wildlife is known to occur at depths where precious corals are found in the western Pacific.

The habitat sustaining precious corals is generally in a pristine condition. There are no known areas which have sustained damage due to resource exploitation, notwithstanding the alledged heavy fishing for corals in the Hancock Seamounts area. Although it presently appears unlikely, if future development projects are planned in the proximity of precious coral beds, care should be taken to prevent destruction of or damage to the beds. Projects of particular concern would be ones that will generate sediments or substantially modify sediment deposition or water movement patterns.

The Council has established a standing committee on Ecosystem and Habitat. That committee will advise the Council on potential threats to precious corals habitat from other resource uses and will recommend steps to prevent or mitigate adverse impacts on the coral resources.

7.0 List of Proposed Actions and Alternatives

7.1 Possessions

a. Include the U.S. Possessions under the FMP as a combined single Exploratory Area with a 1000 kg annual harvest quota

b. No action

7.2 Species in the Fishery Management Unit

a. Place all species of Corallium (Corallium spp.) harvested by the fishery within the Management Unit Species (MUS) of the FMP

b. Only place Midway Deep-sea (Corallium species novum) in the Management Unit Species (MUS)

c. No action

7.3 Experimental Fishing Permit (EFP) System

a. Create a provision for an Experimental Fishing Permit (EFP) for fishing within Exploratory Areas

b. Increase annual harvest quotas for Exploratory Areas

1. Establish a single increased quota

2. Establish two distinct quotas; one for selective gear and one for nonselective gear

c. No action

8.0 Impacts of Alternatives

8.1 Possessions

A. Impact of the Preferred Alternative

1. Include the U.S. Possessions under the FMP as a combined single Exploratory Area (X-P-PI) with a 1000 kg annual harvest quota for all species combined.

This alternative would apply the provisions of the FMP to the federal waters that surround the U.S. Pacific Island Possessions. This would preclude any necessity by the Secretary of Commerce to formulate a Plan or action with respect to Section 304 (c) of the MFCMA.

The Council anticipated P.L. 97-453 when the Precious Corals FMP was being researched and developed. The FMP addressed the EEZ of those island areas with regard to precious corals. When the plan was implemented those management measures were recommendations to the Secretary of Commerce. This proposed action would simply remove the recommendation aspect from the management measures already proposed in the plan.

The amendment would place the Pacific Island Possessions within a single Exploratory Area (X-P-PI) with a 1000 kg annual harvest quota for all species of precious corals combined. This would establish consistent management measures and regulations for all Exploratory Areas. The Council recognizes the shortcomings of the 1000 kg annual harvest quota, particularly the fact that it is not related to the actual abundance of precious corals. However, there is not sufficient evidence to recommend an alternative value at the present time.

This action should be considered in the context of proposed action 3, i.e., establishing an Experimental Fishing Permit system. This action would place the U.S. Pacific Possessions under the Precious Corals FMP in the most efficient fashion possible. The EFP action would authorize issuance of Experimental Fishing Permits, frameworked to encourage fishing while gathering the scientific data necessary to make adjustments in Exploratory Area quotas (Sec. 8.3).

The language regarding the Magnuson Determinations, i.e., Optimum Yield (OY), Domestic Annual Harvest (DAH), Domestic Annual Processing (DAP), Total Allowable Level of Foreign Fishing (TALFF), for a Pacific Island Exploratory Area (X-P-PI) is already contained within the FMP. As written, those values are the same for all Exploratory Areas. The difficulties associated with the initial determination of those values are enumerated and

discussed in the FMP. Primarily because no fishing has taken place under the FMP, those difficulties remain, and insufficient data/information is available at the present time for recommending changes.

B. Impact of the Rejected Alternative

1. No action

As stated earlier, this proposed action is simply a housekeeping measure. It brings the FMP in line with the FCMA as amended by Public Law 97-453, which extended the Council's management authority to the EEZ surrounding the Pacific Island Possessions. As the situation now stands, there is no provision for control over domestic fishing for precious corals in those waters, and any regulations regarding the fishery must be promulgated by the Secretary of Commerce. That situation would continue under the no action alternative.

8.2 Species in the Fishery Management Unit (FMU)

A. Impact of the Preferred Alternative

1. Place all species of Corallium (Corallium spp.) harvested by the fishery within the Management Unit Species (MUS) of the FMP.

Through history precious coral fisheries are characterized by four distinct stages: exploration, discovery, exploitation, and depletion. Precious corals are long-lived, sessile animals. Populations are characterized by low rates of recruitment and natural mortality, so populations turn over very slowly. This life history makes precious coral resources particularly susceptible to overfishing. The FMP established management principles founded on those principles. The FMP was written before the discovery of Midway Deep-sea coral. That is the only reason that Midway Deep-sea is not included in the definition of the MUS.

This alternative would facilitate the following:

1. It would make the regulations of the fishery reflect the management intent of the FMP;

2. It would specifically convey management to Midway Deep-sea coral (Corallium sp. nov.) which will almost certainly be harvested by domestic fishermen;

3. It circumvents taxonomic uncertainties in the genus Corallium;

4. It anticipates discovery and conveys management to other valuable commercially abundant species of Corallium.

This action is intended to convey the intent of the FMP to the harvest realities of the fishery. Therefore, although the action will expand the MUS, no distinct Magnuson determinations are appropriate. Harvests of any species included within the MUS by this action will contribute to the OY quotas already determined for Exploratory Areas.

B. Impact of the Rejected Alternatives

1. Only place Midway Deep-sea (Corallium species novum) in the Management Unit Species

This alternative is not technically possible. Common names are not recognized as valid within the international community. Scientific names based on species taxonomy are the only ones appropriate. Long intervals often transpire before the phylogenetic relationships of a species are accurately described or conjectured. Those investigations precede the assignment of a species name. To date, Midway Deep-sea coral remains undescribed scientifically. It has been placed in the genus Corallium however, and in the literature is referred to as Corallium species novum, or new species. In order to place Midway Deep-sea coral into the definition of precious corals in the Management Unit Species it must be included at the genus level. Its description and taxonomy beyond that are still uncertain. That precludes extending management only to Midway Deep-sea coral.

2. No action

This proposed action is a housekeeping measure designed to make the regulations for the fishery more accurately reflect the management intent of the FMP.

The FMP was written with a keen awareness of historical patterns of coral fishing, and it clearly recognizes the ease with which precious coral resources can be overharvested. The FMP concomitantly acknowledges the paucity of information that exists for coral resources within Exploratory Permit Areas, both in terms of species and abundance. These facts were instrumental in shaping the FMP regulations and objectives. One of the primary objectives of the FMP is to allow a fishery for precious corals but to also limit the fishery in order to achieve the Optimum Yield on a sustainable basis. Actual discovery of a new species of Corallium (Midway Deep-sea) and the coral strike that followed underscored the possibility of other discoveries within the vast expanses of the U.S. EEZ in the western Pacific. The definition of precious corals contained in the regulations does

not convey the intent of the FMP in light of both actual and potential discoveries.

The Midway grounds are the first likely location where domestic fishermen will focus fishing effort. The area of the Emperor Seamounts produced over 50 percent of the world's supply of precious corals between 1979-83. In 1983, the coral harvested from the Midway grounds totaled 140,000 kg, which represented 70 percent of the world's production (Grigg 1984). Numerous citations have been issued to Taiwanese and Japanese vessels caught fishing illegally for precious corals on the "Midway grounds" within the northwest reaches of the Hawaiian Islands Exploratory Area (Section 5.3) (Table 1).

Domestic operations will almost certainly concentrate initial fishing efforts in known coral regions, specifically the northwest portion of the Hawaiian Islands Exploratory Area. Harvests will almost certainly contain Midway Deep-sea coral (Corallium sp. nov.).

Midway Deep-sea coral is not listed in the definition of precious corals contained in the regulations of the FMP. **No action will nullify the management philosophy which is the foundation of the FMP.** As worded, the regulations do not govern the amount of Midway Deep-sea coral that can be harvested by domestic fishermen, although foreign harvest cannot be permitted.

The discovery of Midway Deep-sea coral also illustrates the taxonomic uncertainties which can be expected to accompany discoveries of new species. The taxonomy of Midway Deep-sea coral, although it was discovered in 1980, remains uncertain. It is simply listed as Corallium species novum (new species). Changing the definition of precious corals to Corallium spp., would render the taxonomic uncertainties within the genus a non-problem. Fishing and economic realities will ensure that this change only affects corals sufficiently abundant to be of commercial value. **Under No action the risk of overharvesting Midway Deep-sea coral and any other commercially valuable, yet taxonomically unclassified species of Corallium will remain.**

8.3 Experimental Fishing Permit (EFP) System

A. Impact of the Preferred Alternative

1. Create a provision for an Experimental Fishing Permit (EFP) for fishing within Exploratory Areas.

In view of the uncertainties that surround precious coral resources in Exploratory Areas, an EFP is the most favorable alternative. An EFP would provide positive impacts beyond ones which would result from increased quotas. An EFP offers greater

flexibility and shorter response times to detectable changes in the fishery. The first quotas attached to EFPs would be primarily based on operational economics. But with EFPs, quotas could be quickly brought in line with the resources based on the information collected by the fishery. Quota revisions would not take amendment form before they could be justified, at least in part, with biological/ scientific information. This approach is not only more flexible, but also considerably less costly than a series of quota revisions by amendment. The first amendment, to stimulate domestic fishing, would increase quotas without the benefit of stock assessment information. Later on, once the fishery collected enough data on the stocks, a second amendment would be submitted so quotas will reflect resource abundance. The amendment process is quite slow and costly for both the Council and the NMFS.

B. Impact of the Rejected Alternatives

1. Increase annual harvest quotas for Exploratory Areas

a. Establish a single increased quota

b. Establish two distinct quotas; one for selective gear and one for nonselective gear

These options can be jointly considered. Adoption of either, given sufficiently high quotas, would promote development of a domestic fishery for precious corals, one of the primary objectives of the FMP. The two differ in that option b recognizes operational differences between the two types of fishing and figures them into quota assignments. As outlined above, three components that would prominently figure into that process would be cost of operations, harvest efficiency, and catch value. However, these two options, and indeed any option which mandates new quotas, are severely hampered because assessment data on precious coral resources within Exploratory Areas of the western Pacific region do not presently exist (Precious Corals FMP). Resource potential can only be speculated, and only for the northwest portion of the Hawaiian Islands Exploratory Area, based on information solicited from Japanese and Taiwanese commercial fishing ventures which have concentrated fishing activities on the Emperor Seamounts (Table 1).

If quotas were set sufficiently high, either option is likely to stimulate domestic participation in the fishery. In turn, fishing activity would generate data on the distribution and abundance of precious corals within Exploratory Areas. That information could be used to assess stocks and manage the fishery. It could also serve to pinpoint locations for scientific research to target. Research funds would be saved due to

the early role played by private industry. However, if domestic fishing failed to materialize for some reason, despite the increased quotas, that amount of coral would have to be made available to foreign fishing.

Regardless of what quota was selected, it would not be based on scientific data regarding resource abundance. Quotas must necessarily be selected on the basis of operational economics, and some understanding of the way natural populations respond to harvesting over time (Grigg in press). An amendment that would increase or remove quotas not based on any form of stock assessment data is a risky proposition. The consequences of increasing quotas to levels necessary to stimulate the domestic fishery must be weighed against the risk of overharvesting and the potential for legal fishing by foreign vessels. Once fishing generates reliable resource data, it's almost certain that the FMP will require additional amendments to bring quotas in line with the amount of resources that actually exist. Such a sequence of amendments is a long and expensive process.

2. No action

If No action is taken, the existing condition will persist, specifically, no domestic precious corals fishery will develop. That lack of domestic involvement revolves around the present 1000 kg annual harvest quotas for Exploratory Areas. No legal foreign fishing has taken place since the FMP was implemented either. Foreign fishing is allowed if domestic fishermen have not harvested one half of the established quota by the midpoint of the fishing year.

Potential entrants have indicated that Exploratory Area quotas are too small to provide the economic incentive necessary to induce domestic participation. Knowledge of how the value of precious coral is determined and certain operational characteristics of both harvest methods aids evaluation of that claim.

The value of precious corals is dependent on color, size, abundance, and condition. Condition is judged by whether the coral was harvested dead or alive, the amount of encrusting, and the extent of boring by marine invertebrates. The two species commercially harvested in significant quantities within the Hawaiian islands chain are the shallow water species, Corallium secundum, and the undescribed species of Corallium referred to as Midway Deep-sea. Market value of C. secundum ranges between $100 -$120 per kilo. Midway Deep-sea is slightly less valuable, between $60 - $80 per kilo (Grigg 1984).

A best-case scenario under the present regulations illustrates why no domestic involvement would be predicted under the no action alternative. The most profitable situation poss-

ible would be where a single vessel successfully landed the entire 1000 kg quota from an Exploratory Area, and only coral with the highest value was harvested. Gross revenue would total $120,000 for an entire Exploratory Area. Significant risk and uncertainty surround one, the discovery of precious coral beds in Exploratory Areas and two, successfully harvesting the resource. This combination of risk factors overshadows the relatively meager total gross revenues available. The years of no activity under the FMP have confirmed this impression.

Therefore, even though domestic interest in the fishery has recently been rekindled, the present Exploratory Area quotas hamper active participation. This is particularly true for selective harvester operations (unmanned submersibles). Cliff Slater, the president of Maui Divers Incorporated, which is the only selective harvest operation with a past history and a present interest in the fishery, estimated that a capital investment of $750,000 would be necessary to initiate a selective harvest operation. The current quotas render that type of operation economically unfeasible.

Slater also cautioned that the costs associated with coral draggers are not as simple as they first appear. Despite comparatively low start-up costs, relatively high operational costs are associated with dredging. Those operational costs are linked to such factors as 1) harvest efficiency and 2) catch value. Harvest efficiency of tangle net dredges is about 40 percent. That is, dredges tangle about 40 percent of the coral that is knocked down per pass over an area of bottom. By repeatedly dragging an area, although each pass yields less coral, draggers may be capable of harvest efficiencies between 70-80 percent. Whether or not vessels will drag an area enough to reach this efficiency level depends on the particular circumstances at the time. Draggers also generally experience lower catch values than selective harvesters. As mentioned above, the value of coral is fundamentally linked to the size, color and condition of the piece. Large, completely intact trees of coral have the greatest value. Draggers land pieces of broken corals knocked down by the dredge stone and then tangled in the nets as the dredge was pulled along the bottom. Breakage may reduce a coral's value as much as 80 percent. Draggers can offset lower catch values to some degree by hauling multiple dredges to increase total harvest tonnage. In contrast, selective harvesters take coral so that it retains its highest value.

Therefore, although costs are partitioned differently for each type of operation, the present quotas offer insufficient economic incentives for both draggers and selective harvesters.

Table 6. Comparison of the impacts of Experimental Fishing Permits and alternatives.

	Alternatives Considered		
Impacts	No Action	Larger Quotas	EFP
Initiate Domestic Fishing	no	yes	yes
Provide Info. on Resources	no	yes	yes
Increase Chances for Foreign Fish. (TALFF)	no	yes	no
Ease of Enforcement	0	yes	yes
Flexibility for Management	no	no	yes
Flexibility in terms of Conservation	no	no	yes

9.0 Choice of Alternatives Based on the Objectives of the FMP / Enforceability

The preferred alternatives for each of the proposed actions were selected on the basis of how closely they were aligned with the related objectives of the FMP.

9.1 Specific Management Objectives

The objectives of the FMP that the proposed actions of this amendment will directly promote are:

1. to **allow a fishery for precious corals** in the Exclusive Economic Zone of the western Pacific, but to limit the fishery so as to achieve the optimum yield on a continuing basis;

2. to encourage the discovery and exploration of new beds;

3. to encourage the development of new information concerning the distribution, abundance and ecology of precious corals.

This amendment recognizes that the FMP fell short of its intention to promote a domestic fishery for precious corals. The stance of the FMP turned out to be particularly conservative because of the historical evidence which underscored the apparent ease with which resources could be overfished and depleted. All three actions proposed in this amendment work in concert toward responsible development of the domestic precious corals fishery. By formally placing the Pacific Island Possessions under the FMP, unregulated harvesting by domestic fishermen is prevented. Expanding the MUS not only extends FMP coverage to known species (specifically, Midway Deep-sea) almost certain to be harvested by the fishery, but also anticipates discovery of new species. EFPs facilitate domestic involvement in the fishery by recognizing operational economics. In turn, fishing under EFPs will assist in refining existing harvest quotas by collecting badly needed data on resource abundance and distribution.

9.2 MFCMA Determinations

The FMP as approved made the required determinations of MSY, OY, DAH, DAP, and TALFF. Those are not changed by this amendment.

The FMP did not specify joint venture processing (JVP). That specification was not required under the MFCMA in 1980.

There is sufficient domestic processing capacity to accomodate increased harvests. The FMP indicates that the U.S. imports semi-processed coral for finishing into jewelry. Domestic production would replace imports, if the FMP has the ultimate desired effects. The Council concludes that there is no excess harvest capacity to warrant joint venture processing, and no precious coral is available for joint ventures.

10.0 Relationship of Amendment 1 to Other Applicable Laws and Policies

10.1 Coastal Zone Consistency

Section 307 (c) (1) of the Federal Coastal Zone Management Act of 1972 (CZMA) require that all Federal activities which directly affect the coastal zone be consistent with approved State coastal zone management programs to the maximum extent practicable.

The State CZM policies directly relating to the actions proposed in this amendment are contained in the coastal ecosystems and economic use resources categories of the Hawaii CZM statute (Act 188 of 1977, Chapter 205A, HRS, as amended). Those policies are to 1) improve the technical basis for natural resource management, 2) preserve valuable coastal (offshore) ecosystems of significant biological importance, and 3) minimize adverse environmental effects from economic uses of coastal zone resources. The actions of this amendment are fully consistent with these objectives.

Two existing situations could potentially impact the way that a) expanding the MUS, and b) establishing EFPs affect consistency between State and Federal regulations. First, the State of Hawaii exercises some authority under S306 of the MFCMA over the harvesting of precious corals outside of three miles. Under Regulation 41 of the Division of Aquatic Resources, the State has adopted a quota and/or permit system for the management of pink and gold corals in the Makapu'u Bed which lies about 6 miles off the island of Oahu. Second, the State of Hawaii claims management and conservation jurisdiction over all resources enclosed within archipelagic baselines. State jurisdiction over the Makapu'u Bed as well as other interisland waters remains an unsettled issue between the State and the Federal government. Still, the proposed management and conservation actions within this amendment are in agreement with State of Hawaii CZM policy.

The Council has reviewed the Coastal Zone Management Programs of American Samoa, Guam and the Commonwealth of the Northern Mariana Islands and found the actions of this amendment consistent with policies set forth on fisheries and living marine

resources. The Council has requested reviews of this amendment from agencies responsible for CZM policy within each government.

10.2 Marine Mammal Protection Act / Endangered Species Act

The management measures of the FMP document were judged not to have any significant impact on marine mammals or endangered species. Those conclusions were based on the characteristics of precious corals habitat and the fishing techniques used to harvest precious corals. The NMFS rendered a biological opinion that confirmed that conclusion (Appendix 4, Precious Corals FMP). The actions proposed in this amendment are passive with regard to habitat and conventional fishing practices. The measures of Amendment 1 will not impose any new or increased risks to marine mammals or endangered species.

10.3 National Environmental Policy Act - Environmental Assessment

The need for this amendment, the proposed actions, and their impacts are discussed in Sections 4, 7, and 8.

The proposed amendment is not a major action, and it will not have significant impacts on the marine or human environment of the EEZ within the Council's jurisdiction. Amendment 1 does not alter the management and conservation policies set forth in the FMP. The actions are two housekeeping measures which enhance the conservation features of the FMP, while the third action, a provision for EFPs, simply facilitates the fishery development intent of the original document. The proposed actions will not result in impacts significantly different in context or intensity from those described in the Environmental Impact Statement (EIS) published in February of 1980. Therefore, an EIS for this amendment is not required under the Categorical Exclusion criteria set forth in NOAA Directive 02-10 Section 5c(3)(f).

Mitigating Measures Related to the Proposed Actions:
None

Unavoidable Adverse Effects:
None

Relationship Between Local Short-term uses of the Resources and Enhancement of Long-term Productivity:
The actions of this amendment should promote the long term use of precious coral resources. Presently resources are not utilized at all. This amendment is designed to promote development of a domestic fishery. The data gained from fishing under EFPs will add significantly to the scant

existing information on resource abundance and distribution. In turn, these data will promote refinement of management and conservation measures to ensure long-term productivity of precious coral resources.

Irreversible and Irretrievable Commitment of Resources:
None

Notwithstanding the above, the Regional Director and the Council will consider and document any environmental concerns associated with particular EFP proposals and may propose control measures necessary to ensure prevention of any likely adverse environmental impacts.

10.4 Determination of Impacts Under Executive Order 12291 and the Regulatory Flexibility Act

The actions proposed in this amendment are not viewed as major. None of the actions, or all of them together, will produce an annual effect on the economy greater than or equal to $100 million. In 1980, the estimated value of the entire industry in the world's largest producing nations of Taiwan and Japan was only half that, or $50 million. That value was the combined production of some 300 vessels (Grigg 1982), of which about 120 were 100 ton vessels involved in the distant water fishery for precious corals. Existing regulations only permit 1000 kg harvests for individual Exploratory Areas. Even after EFPs are issued, and somewhat greater harvests are permitted, the direct impact of the actions of this amendment would not reach the level of $100 million.

These proposed changes are likely to have a positive impact on local small business entities. Precious coral jewelry is a popular item in the local tourist trade. The authenticity of jewelry manufactured from corals harvested from nearby waters is likely to enhance product value. The Hawaii precious corals jewelry industry has been estimated to be between $17 - $25 million (Grigg 1982, Slater pers. comm.).

The specific economic and social impacts of the EFP process cannot be determined at this time. The Regional Director and the Council will consider economic and social aspects in reviewing and taking action on specific EFP proposals. This consideration will be documented as part of the approval/disapproval process for EFP applications.

10.5 Applicability of the Paperwork Reduction Act

Two of the actions proposed in this amendment are not likely to create any additional paperwork burden because permit forms and catch report forms already exist. Creation of the Pacific

Island Possessions Exploratory Area (X-P-PI) and expanding the MUS will not require additional forms. The present fishing logbook regulation requires reporting harvests of precious corals by area, by species, by weight. Similarly, existing permit forms already include a block for designating permit area.

Creation of an EFP will produce an added, unavoidable, paperwork burden. Information in addition to what's presently required will be necessary. Applicants will be requested to submit enough operational information to justify individual quota and operating period requests (see Sections 4.3 and 8.3). Guidelines developed by the Council for use in evaluating EFP applications will outline the sort of information considered necessary. Pertinent information may include start-up costs, estimated trip costs, and costs associated with any shoreside handling and processing that might be required. Information requirements will be set by regulations implementing this amendment.

10.6 Consideration of Vessel Safety Issues

None of the actions proposed in this amendment imposes any regulations or restrictions on vessels that can be used in the fishery. Therefore, vessel safety will not be affected in any way. Nonetheless, this amendment has been sent to the U.S. Coast Guard for evaluation regarding vessel safety. Similarly, the Coast Guard will be asked to review and advise the NMFS regarding safety and enforcement matters with respect to specific EFP proposals.

11.0 Indigenous Fishing Rights

There are no formal agreements between the Federal government and the native Hawaiians, Samoans, or Chamorros that allocate special fishing entitlements to indigenous peoples. However, the legal possibility of granting such rights is presently being investigated. The research specifically pertains to the bottomfish fishery of the Northwestern Hawaiian Islands. If that research concludes that indigenous peoples should be awarded special considerations in the NWHI bottomfishery, and that finding holds for other fisheries as well, then FMPs and amendments may require revision. However, under the prevailing circumstances, it does not appear that this amendment will affect any native Hawaiian, Samoan, or Chamorro cultural or religious practices.

12.0 References

Grigg, R. W. 1971. Status of the precious coral industry in Japan, Taiwan, and Okinawa: 1970. Sea Grant Advisory Report. UNIHI-SEAGRANT-ADV-RPT-71-02. 12 pp.

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Grigg, R. W. 1976. Fishery management of precious and stony corals in Hawaii. Sea Grant Technical Report. UNIHI-SEAGRANT-TR-77-03. 48 pp.

Grigg, R. W. 1981. Status of the precious coral industry in the Pacific: 1981. Western Pacific Regional Fishery Management Council Contract Report No. WPC - 00181. 15 pp.

Grigg, R. W. 1982. Economics and future development of the precious coral fishery in the Pacific. Infofish Marketing Digest, 2:8-11.

Grigg, R. W. 1982a. Status of the precious coral industry in 1982. Western Pacific Regional Fishery Management Council Contract Report No. WPC - 0483. 13 pp.

Grigg, R. W. 1983. Review of the precious corals fishery-1983. Western Pacific Regional Fishery Management Council Report. 7 pp.

Grigg, R. W. 1984. Resource management of precious corals: a review and application to shallow water reef building corals. Marine Ecology, 5(1):57-74.

Grigg, R. W. in press. Recruitment limitation of a deep benthic hard-bottom coral population in the Hawaiian Islands. 17pp.

Western Pacific Regional Fishery Management Council. 1980. Fishery management plan and proposed regulations for the precious coral fishery of the Western Pacific region. U.S. Federal Register, 45(180):60957-61002.

13.0 Appendix I

National Oceanic and Atmospheric Administration

50 CFR Part 680

[Docket No.

Western Pacific Precious Coral Fisheries

Agency: National Marine Fisheries Service (NMFS), NOAA, Commerce

Action: Proposed rule

Summary: NOAA issues a proposed rule to implement Amendment 1 to the Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region (FMP), adopted by the Western Pacific Regional Fisheries Management Council (Council) at its 61st meeting in Honolulu, Hawaii on February 25-26, 1988. Amendment 1 would (1) include the E.E.Z. around the U.S. Pacific possessions in the FMP management area, (2) expand the management unit species to include all precious coral in the genus Corallium, and (3) establish an experimental fishing permit (EFP) under the FMP. The intent of the amendment is to establish Council management authority over the full range of precious coral resources in the EEZ and encourage domestic exploratory fishing for precious coral under controlled conditions.

Date: Written comments must be submitted on or before _____.

Address: Send comments to E.C. Fullerton, Director, Southwest Region, National Marine Fisheries Service, 300 South Ferry Street, Terminal Island, CA 90731. A copy of the amendment may be obtained by contacting the Western Pacific Regional Fishery Management Council (Council), 1164 Bishop Street, Suite 1406, Honolulu, Hawaii 96813, 808/523-1368.

For Further Information Contact: Doyle E. Gates, Administrator, Western Pacific Program Office, 2570 Dole St., Room 106, Honolulu, Hawaii, 96822-2396, 808/955-8831.

SUPPLEMENTARY INFORMATION

The domestic and foreign fisheries for precious coral in the exclusive economic zone (EEZ) adjacent to the State of Hawaii and the territories of Guam and American Samoa are managed under the Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region (FMP). The FMP was developed by the Western Pacific Regional Fishery Management Council (Council) under the Magnuson Fishery Conservation and Management Act

(Magnuson Act), approved by the Secretary of Commerce on May 20, 1980, and implemented September 29, 1983 (48 FR 39229; August 30, 1983).

U.S. Possessions

When the FMP was first approved in 1980, the jurisdiction of the Council, as defined by the Magnuson Act, did not extend to the EEZ around the U.S. possessions in the western Pacific. As such the Precious Coral FMP management area included the EEZ around Hawaii, Guam and American Samoa only. With the passage of Public Law 99-453 in 1983, the Magnuson Act was amended to extend Council jurisdiction to the EEZ around the U.S. Pacific possessions.

Amendment 1 would formally incorporate the EEZ around the U.S. possessions in the FMP management area and create a new combined single exploratory area (X-P-PI) for the U.S. possessions. The new exploratory area would have a 1000 kg annual harvest quota for all species of precious corals combined. The areas affected by this action include the EEZ around Wake Island, Johnston Atoll, Kingman Reef and Palmyra Island, Jarvis Island and Howland and Baker Islands. The management measures proposed for the possessions are consistent with the regulations currently in place for the other exploratory areas defined in the FMP.

Redefine the Management Unit Species

Amendment 1 proposes to expand the definition of precious coral covered under the FMP to include all species of the genus Corallium. The management unit species as defined in the regulations cover twelve species of coral, three of which are pink (or red) coral in the genus Corallium. The Council determined that this definition is unnecessarily restrictive in that it fails to recognize present taxonomic uncertainties that surround the recently discovered Midway Deepsea coral (Corallium sp. nov.), and does not provide automatic FMP management authority in the event new species of Corallium precious corals are discovered in the EEZ. In order to circumvent these taxonomic problems, the Council proposes to expand the definition of precious coral to include all species of coral in the genus Corallium. Harvest quotas established for the exploratory areas remain unchanged. However, harvests of any new species of Corallium will count toward the established quotas.

Experimental Fishing Permit (EFP)

The original goal of the FMP was to obtain optimum yield from the precious coral fishery in the EEZ by striking a balance among several objectives. These objectives included, among others, (1) encouraging development of a domestic fishery for precious coral, (2) generating new information needed for resource

management, and (3) preventing overfishing and wastage of the resource. That goal has not been achieved.

The original FMP established a harvest quota of 1000 kg of precious coral for each of the three exploratory areas defined in the FMP. It was believed that a 1000 kg quota would provide sufficient incentive to stimulate exploration and discovery of new coral beds.

Rather than stimulate exploratory fishing for precious coral, the 1000 kg quota has proven to be too low to justify the financial investments required by domestic fishermen to explore for and harvest precious coral. As such, there has been no legal fishing for precious coral by domestic or foreign fishermen since the FMP first went into effect. Furthermore, the absence of domestic or foreign fishing has prevented the Council and NMFS from obtaining any new information on precious coral resources which could be used to refine the current management program. Neither State nor Federal fishery research budgets currently are able to finance a new research initiative focused on precious coral.

In order to address these problems, the Council has proposed the establishment of an experimental fishing permit (EFP). An EFP would allow fishermen to harvest precious coral in exploratory areas above current quota levels under tightly controlled conditions. Harvest quotas would be assigned on a case-by-case basis to each vessel fishing under an EFP at a level that would be more directly related to the cost of undertaking an exploratory fishing venture for precious coral and that would produce the type of scientific information needed to better manage the resource. An EFP application and review process is established which defines the application requirements, review criteria, and operating conditions which may be attached to an EFP in order to protect precious coral beds. An opportunity for public comment on EFP applications is provided. In addition, the Council will develop guidelines for its use in evaluating EFP applications and making recommendations to the Regional Director.

The Council recognizes the need to increase harvest quotas in order to stimulate domestic fishing and generate information needed for accurate resource assessment. However, because of limited information available on the size and reproductive condition of precious coral beds, the Council was reluctant to propose and unable to justify a permanent increase in harvest quotas. Controlled fishing under an EFP was the preferred alternative to accomplish these objectives. Information generated by vessels fishing under an EFP will allow the Council to develop future harvest quotas which are more in line with resource abundance.

Classification

Section 304(a)(1)(D)(ii) of the Magnuson Act, as amended by Public Law 99-659, required the Secretary of Commerce (Secretary) to publish regulations proposed by a Council within 15 days of receipt of any amendment to an FMP. At this time the Secretary has not determined that the FMP amendment that these rules would implement is consistent with the national standards, other provisions of the Magnuson Act, and the other applicable law. The Secretary, in making that determination, will take into account the data, views, and comments received during the comment period.

The Council prepared an environmental assessment as a part of the FMP and concluded that there will be no significant impact on the environment as a result of this rule.

The Administrator of NOAA determined that this proposed rule is not a "major rule" requiring a regulatory impact analysis under Executive Order 12291. The present action will not have a cumulative effect on the economy of $100 million or more nor will it result in a major increase in costs to consumers, industries, government agencies, or geographical regions. No significant adverse effects on competition, employment, investments, productivity, innovation, or competitiveness of U.S. based enterprises are anticipated.

The Council prepared a regulatory impact review which concludes that this rule will have a positive impact on small business entities. Current FMP regulations and harvest quotas have effectively prevented any domestic fishing for precious coral, particularly in the Hawaii exploratory area. The proposed rule is expected to provide new harvesting opportunities for domestic fishermen.

This proposed rule is exempt from the review procedures of E.O. 12291 under section 8(a)(2) of that order. Deadlines imposed under the Magnuson Act, as amended by Public Law 99-659, require the Secretary to publish this proposed rule 15 days after its receipt. The proposed rule is being reported to the Director, Office of Management and Budget, with an explanation of why it is not possible to follow procedures of the order.

The General Counsel of the Department of Commerce certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, will not have a significant economic impact on a substantial number of small businesses because there are no domestic vessels currently operating in the fishery. Any impact on small businesses as a result of this rule is expected to be positive. As a result a regulatory flexibility analysis was not prepared.

This rule contains a collection of information requirement subject to the Paperwork Reduction Act. Information will be collected from interested persons applying for experimental fishing permits as required by the FMP. The collection of information requirements contained in this rule have been submitted to OMB for review under Section 3504(h) of the Act. Comments on the proposed information collections should be sent to the Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for NOAA.

The Council has determined that the measures established in Amendment 1 are consistent to the maximum extent practicable with the approved coastal zone management programs of American Samoa, Guam, and Hawaii. Letters requesting concurrence with this finding have been forwarded to the responsible agency within each government.

List of Subjects in 50CFR Part 680

Fisheries, Reporting and recordkeeping requirements.

Dated:

Proposed Regulations

PART 680 - [AMENDED]

1. The authority citation for 50 CFR Part 680 continues to read as follows:

Authority: 16 USC 1801 et seq.

2. In Subpart A of Part 680, §680.1, paragraph (b) is revised to read as follows:

§680.1 Purpose and Scope

* * * * *

(b) These regulations govern fishing for precious coral by fishing vessels of the United States within the exclusive economic zone seaward of Hawaii, Guam, American Samoa and the U.S. possessions in the western Pacific.

* * * * *

3. In §680.2, the definition for Fishery conservation zone (FCZ) is removed and a new definition for Exclusive economic zone (EEZ) is added in alphabetical order; and the definitions of Management area, Permit area, and Precious coral are revised to read as follows:

§680.2 Definitions

* * * * *

Exclusive economic zone (EEZ) means the zone established by Presidential Proclamation 5030, dated March 10, 1983, and is that area adjacent to the United States which, except where modified to accommodate international boundaries, encompasses all waters from the seaward boundary of each of the coastal States to a line on which each point is 200 nautical miles from the baseline from which the territorial sea of the United States is measured.

Management area means the EEZ of the United States seaward of the State of Hawaii; the Territory of Guam; the Territory of American Samoa and the U.S. possessions in the western Pacific.

Permit area is used to describe each precious coral bed in the management area. Each bed is designated by a permit area code and assigned to one of the following four categories:

* * * * *

(d) * * *

(1) * * *

(2) * * *

(3) * * *

(4) Permit Area X-P-PI includes all coral beds, other than established beds, conditional beds, or refugia, in the EEZ seaward of the U.S. possessions in the western Pacific.

Precious coral means any coral of the genus Corallium in addition to the following species of corals:

* * * * *

4. In Subpart A of Part 680, a new section §680.10 Experimental fishing permits (EFP) is added as follows:

§680.10 Experimental fishing permits (EFP)

(a) General. The Secretary may authorize the direct or incidental harvest of precious coral managed by the FMP which would otherwise be prohibited by this part. No experimental fishing may be conducted unless authorized by an experimental fishing permit (EFP) issued by the Secretary in accordance with

the criteria and procedures specified in this section. EFP's will be issued without charge.

(b) Application. An applicant for an EFP shall submit to the Regional Director at least 60 days before the desired effective date of the EFP a written application including, but not limited to, the following information:

(1) The date of the application;

(2) The applicant's name, mailing address, and telephone number;

(3) A statement of the purposes and goals of the experiment for which an EFP is needed, including a general description of the arrangements for disposition of all species harvested under the EFP;

(4) A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals;

(5) For each vessel to be covered by the EFP:

(i) Vessel name;

(ii) Name, address, and telephone number of owner and master;

(iii) U.S. Coast Guard documentation, State license, or registration number;

(iv) Home port;

(v) Length of vessel;

(vi) Net tonnage;

(vii) Gross tonnage;

(viii) Radio call sign;

(ix) Engine horsepower; and

(x) Approximate fish hold capacity.

(6) A description of the species (directed and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment;

(7) For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used; and

(8) The signature of the applicant.

The Secretary may request from an applicant additional information necessary to make the determinations required under this section. An applicant will be notified of an incomplete application within 10 working days of receipt of the application. An incomplete application will not be considered until corrected in writing.

(c) Issuance

(1) If an application contains all of the required information, the Secretary will publish a notice of receipt of the application in the FEDERAL REGISTER with a brief description of the proposal, and will give interested persons an opportunity to comment. The Secretary will also forward copies of the application to the Western Pacific Fishery Management Council, the U.S. Coast Guard, and the fishery management agency of the affected State.

(2) At a Western Pacific Fishery Management Council meeting following receipt of a complete application, the Secretary will consult with the Council, the U.S. Coast Guard, and the Director of the affected State fishery management agency concerning the permit application. The applicant will be notified in advance of the meeting at which the application will be considered, and invited to appear in support of the application if the applicant desires.

(3) Within 5 working days after the consultation in paragraph (c) (2) of this section, or as soon as practicable thereafter, the Secretary shall notify the applicant in writing of the decision to grant or deny the EFP, and, if denied, the reasons for the denial. Grounds for denial of an EFP include, but are not limited to, the following:

(i) The applicant has failed to disclose material information required, or has made false statements as to any material fact, in connection with his or her application; or

(ii) According to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect any species of fish in a significant way; or

(iii) Issuance of the EFP would inequitably allocate fishing privileges among domestic fishermen or would have economic allocation as its sole purpose; or

(iv) Activities to be conducted under the EFP would be inconsistent with the intent of this section or the management objectives of the FMP; or

(v) The applicant has failed to demonstrate a valid justification for the permit; or

(vi) The activity proposed under the EFP would create a significant enforcement problem.

(4) The Secretary will publish a notice in the FEDERAL REGISTER announcing the decision to grant or deny an EFP. If the permit is granted, the FEDERAL REGISTER notice will describe the experimental fishing to be conducted under the EFP. The Secretary may attach terms and conditions to the EFP consistent with the purpose of the experiment including, but not limited to:

(i) The maximum amount of each species which can be harvested and landed during the term of the EFP, including trip limits, where appropriate;

(ii) The number, sizes, names, and identification numbers of the vessels authorized to conduct fishing activities under the EFP;

(iii) The time(s) and place(s) where experimental fishing may be conducted;

(iv) The type, size, and amount of gear which may be used by each vessel operated under the EFP;

(v) The condition that observers be carried aboard vessels operated under an EFP;

(vi) Data reporting requirements; and

(vii) Such other conditions as may be necessary to assure compliance with the purposes of the EFP consistent with the objectives of the FMP.

(d) Duration. The effective period of the permit will be specified by the Secretary in the terms of the EFP. An EFP may be renewed by following the application procedures in this section.

(e) Alteration. Any permit that has been altered, erased, or mutilated is invalid.

(f) Transfer. EFPs issued under this part are not transferable or assignable. An EFP is valid only for the vessel(s) for which it is issued.

(g) Inspection. Any EFP issued under this part must be carried aboard the vessel(s) for which it was issued. The EFP must be presented for inspection upon request of any authorized officer.

(h) Surrender. Upon issuance of an EFP the applicant must surrender to the Regional Director any permit to fish for precious coral that was issued under section 680.4 of this part.

(i) Sanctions. Failure of the holder of an EFP to comply with the terms and conditions of an EFP, the provisions of Subpart B of this part, any other applicable provision of this part, the Magnuson Act, or any other regulation promulgated thereunder, shall be grounds for revocation, suspension, or modification of the EFP with respect to all persons and vessels conducting activities under the EFP. Any action taken to revoke, suspend, or modify an EFP for enforcement reasons will be governed by 15 CFR Part 904 Subpart D.

(j) Permit modification. Where circumstances have changed such that a permittee desires to modify any term or condition of an EFP, the permittee must submit to the Regional Director, a written request which provides full justification and supporting information for the proposed modification. Such applications for modification are subject to the same issuance criteria as are original applications, as provided in paragraph(c) of this section. Modifications to an EFP which are of a technical nature only and do not affect the substance of the fishing activity authorized by the EFP may be approved by the Regional Director without the notice and consultation provided for in paragraphs(c)(1) and (2) of this section.

(k) Appeals of administrative action.

(1) Except as provided in Subpart D of 15 CFR 904, an applicant for a permit or a permit holder may appeal the denial or conditioning of a permit under $ 680.10 to the Assistant Administrator for Fisheries, NOAA. In order to be considered by the Assistant Administrator, such appeal must be in writing, must state the action(s) appealed, and the reasons therefore, and must be submitted within 30 days of the action(s) by the Regional Director. The appellant may request an informal hearing on the appeal.

(2) Upon receipt of an appeal authorized by this section, the Assistant Administrator may request such additional information and in such form as will allow action upon the appeal. Upon receipt of sufficient information, the Assistant

Administrator will decide the appeal in accordance with the criteria set out in § 680 and the amendment to the Precious Coral FMP, as appropriate, based upon information relative to the application on file at the NMFS and the Western Pacific Fishery Management Council and any additional information, the summary record kept of any hearing and the hearing officer's recommended decision, if any, as provided in paragraph k (3) of this section, and such other considerations as deemed appropriate. The Assistant Administrator will notify all interested persons of the decision, and the reason(s) therefore, in writing, normally within 30 days of the receipt of sufficient information, unless additional time is needed for a hearing.

(3) If a hearing is requested or if the Assistant Administrator determines that one is appropriate, the Assistant Administrator may grant an informal hearing before a hearing officer designated for that purpose after first giving notice of the time, place and subject matter of the hearing in the FEDERAL REGISTER. Such hearing shall normally be held no later than 30 days following publication of the notice in the FEDERAL REGISTER unless the hearing officer extends the time for reasons deemed equitable. The appellant and, at the discretion of the hearing officer, other interested persons, may appear personally or by counsel at the hearing and submit such material and present such arguments as determined appropriate by the hearing officer. Within 30 days of the last day of the hearing, the hearing officer shall recommend in writing a decision to the Assistant Administrator.

(4) The Assistant Administrator may adopt the hearing officer's recommended decision, in whole or in part, or may reject or modify it. In any event, the Assistant Administrator will notify interested persons of the decision, and the reason(s) therefore, in writing within 30 days of receipt of the hearing officer's recommended decision. The Assistant Administrator's action shall constitute final action for the agency for the purposes of the Administrative Procedures Act.

(5) Any time limit prescribed in this section may be extended for a period not to exceed 30 days by the Assistant Administrator for good cause, either upon his or her own motion or upon written request from the appellant stating the reason(s) therefore.

(l) Protected species. Vessels fishing under an EFP are required to report any incidental take of fisheries interaction with protected species on a form provided for that purpose. Reports must be submitted to the Regional Director within 3 days of arriving in port.

5. In §680.21, Table 1, the coral bed named "Hawaii, American Samoa, Guam" is revised to read as "Hawaii, American Samoa, Guam, U.S. possessions."

§680.2, 680.4, 680.7, 680.21, and 680.25 [Amended]

6. In addition to the amendments set forth above, the initials "FCZ" are removed and the initials "EEZ" are added in their place in the following places: §§680.2, definition for Permit area; 680.4(k); 680.7(a); 680.21(a) Table 1, footnote(c); and 680.25.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
300 South Ferry Street
Terminal Island, California 90731-7415

F/SWR1:ETN

Ms. Kitty Simonds
Executive Director
Western Pacific Regional Fishery
Management Council
1164 Bishop Street, Suite 1405
Honolulu, HI 96813

Dear Kitty:

This acknowledges your request to initiate Section 7 consultation for Amendment 1 to the Fishery Management Plan (FMP) for the Precious Corals Fisheries of the Western Pacific Region. We have reviewed the three proposed actions of the amendment and concur with the assessment that these actions are not likely to add any new risks or increase risks to listed species. Since the original Biological Opinion for this FMP concluded that the fishery did not constitute a threat to threatened or endangered species or their habitat, and the proposed actions are passive with regard to habitat and conventional fishing practices, we find that the implementation of Amendment 1 will not likely adversely affect listed species under the jurisdiction of the National Marine Fisheries Service. Accordingly, formal consultation will not be required for this action. However, we will continue to monitor the development and implementation process of the Amendment informally.

Sincerely yours,

Chas

E.C. Fullerton
Regional Director

cc: F/SWR1

U.S. Department of Transportation
United States Coast Guard

Commander (ole)
Fourteenth Coast Guard District

Prince Kalanianaole
Federal Building
300 Ala Moana Blvd
Honolulu, Hawaii 96850
Phone: (808) 541-2300

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Ser 34075
09 Mar 88

Mr. Paul Gates
Western Pacific Fishery
Management Council
1164 Bishop St. - Room 1405
Honolulu, Hawaii 96613

Dear Mr. Gates:

You have requested Coast Guard input on Amendment #1 to the Precious Corals Fishery Management Plan for the Western Pacific Region. Specifically, you have requested a written evaluation on the effects on safety of Amendment #1.

Section 303(a) of the Magnuson Fishery Management and Conservation Act (MFCMA), as amended on 14 November 1986, provides, among other things,

> ... any fishery management plan which is prepared by any Council...with respect to any fishery shall...consider, and may provide for, temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safety of the vessels.....16 U.S.C. 1853(a) (as amended by Pub. L. No. 99-659, Sec 105(a)(1)(c)).

Amendment #1 does not call for temporary adjustments, such as altering a closure schedule, to accommodate fishing vessels prevented from harvesting by weather or other ocean conditions affecting vessel safety. Consequently, there is no issue in this amendment to be addressed by the Coast Guard within the statutory guidelines of the MFCMA.

Please feel free to contact me concerning any additional inquiries you may have.

Sincerely,

M. J. Williams, Jr.

M. J. WILLIAMS, JR.
Commander, U. S. Coast Guard
Chief, Law Enforcement Branch
By direction of the District Commander

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR
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DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

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Ref. No. P-8173

March 11, 1988

Ms. Kitty Simonds
Executive Director
Western Pacific Regional Fishery
Management Council
1164 Bishop Street, Room 1405
Honolulu, Hawaii 96813

Dear Ms. Simonds:

Subject: Federal Consistency Determination for Amendment #1 to the Fishery Management Plan for the Precious Coral Fisheries (File No. FC/88-013)

This is to inform you that we have reviewed your assessment of the subject activity's consistency with Hawaii's Coastal Zone Management Program (CZM) and concur with your finding that the activity is consistent. By copy of this letter, we are informing the Federal permit issuing agency that CZM consistency review requirements have been met.

Sincerely,

Roger A. Ulveling

cc: National Marine Fisheries Service
Western Pacific Program

Amendment 2

and Environmental Assessment

Fishery Management Plan for the

Precious Corals Fisheries of the Western Pacific Region

October 12, 1990

Western Pacific Regional Fishery Management Council
1164 Bishop Street #1405
Honolulu, Hawaii 96813
Telephone: (808) 523-1368
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1.0 PREFACE

1.1 Responsible Agencies

The Western Pacific Regional Fishery Management Council (WPRFMC or Council) was established by the Magnuson Fishery Conservation and Management Act (MFCMA) to develop Fishery Management Plans (FMPs) for fisheries in the US Exclusive Economic Zone (EEZ) around American Samoa, Hawaii (including the Northwestern Hawaiian Islands), Guam, the Northern Mariana Islands, and other United States possessions in the Pacific[1]. Once an FMP is approved by the Secretary of Commerce, it is implemented by federal regulations which, in turn, are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, along with state and territorial agencies.

For further information, contact:

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Executive Director
WPRFMC
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Honolulu, HI 96813
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Fax: (808) 526-0824

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Resource Management Specialist
NMFS Pacific Area Office
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Honolulu, HI 96822
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Fax: (808) 949-7400

1.2 Public Review and Comment

The Council elicits the help of commercial and recreational fishing interests, as well as other interested parties. This ensures that those who might be affected by new management measures have an opportunity to submit ideas and suggestions for potential actions by the Council. Therefore, those affected by the FMPs are involved in the decision-making process.

The action proposed by this amendment was developed by the Precious Corals Plan Team, and was reviewed by the Scientific and Statistical Committee and the industry Advisory Panel. A draft of this amendment was distributed for comments to fishermen and other interested parties in August 1990. The final document is responsive to comments received, and the Council considered these comments at its September 1990 public meeting. The comments were

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[1] *Howland and Baker Islands, Jarvis Island, Johnston Atoll, Kingman Reef and Palmyra Island, and Wake Island.*

incorporated into the draft amendment, which will be submitted to the Secretary of Commerce and released for public review.

1.3 Relationship to Applicable Laws and Policies

This second amendment to the FMP for the Precious Corals complies with the Secretary of Commerce's revised guidelines for the national standards of the MFCMA. Information and analysis in support of the proposed action are presented in a manner intended to satisfy MFCMA requirements, as well as the requirements of other applicable laws and policies. The FMP for the Precious Coral Fisheries for which the amendment is being prepared satisfies the information and procedural requirements of the National Environmental Policy Act, the Regulatory Flexibility Act, Executive Order 12291, and other laws and directives. The FMP also served as an Environmental Impact Statement (EIS). Similarly, this amendment is intended to serve as an Environmental Assessment. The amendment assesses the economic and administrative/enforcement impacts of the proposed actions, and will satisfy the requirement for a Regulatory Impact Review. This document contains all the information necessary under the several statutes and directives applicable to the planning process. A copy of the original FMP, its amendment, and companion regulations may be obtained from the Council. In addition, this amendment provides information regarding habitat and vessel safety concerns as required by the 1986 changes to the MFCMA.

1.4 List of Preparers

Amendment 2 for the Precious Corals FMP was prepared by the WPRFMC Precious Corals Plan Team:

Mr. Fini Aitaoto, Statistics Program Manager
American Samoa Department of Marine and Wildlife Resources

Dr. Edward DeMartini, Fisheries Biologist
NMFS Honolulu Laboratory

Dr. Terry Donaldson, Fishery Biologist
Northern Mariana Islands Division of Fish and Wildlife

Dr. Richard Grigg, Marine Biologist (Plan Team Chairman)
University of Hawaii Department of Oceanography

Mr. Paul Kawamoto, Environmental Protection Program Manager
Hawaii Division of Aquatic Resources

Mr. Kevin Kelly, Remotely Operated Vehicle Manager
Hawaii Undersea Research Laboratory

Dr. Samuel Pooley, Industry Economist
NMFS Honolulu Laboratory

Dr. Richard Randall, Associate Professor of Biology
University of Guam Marine Laboratory

and:

Mr. Robert Harman, Staff Biologist
Western Pacific Regional Fishery Management Council

Mr. Alvin Katekaru, Resource Management Specialist
NMFS Southwest Region Pacific Area Office

2.0 BACKGROUND

Harvesting of deep-water precious corals is subject to the regulations of the FMP (effective date: September 29, 1983), which covers domestic and foreign fishing for several species of precious pink, gold and bamboo corals[2] inhabiting the US EEZ of the Western Pacific Region (WPRFMC 1980, as amended).

The goal of the FMP is to obtain optimum yield from the fishery through several objectives:

1) prevent overfishing and waste of the resource;
2) minimize harvest of immature colonies;
3) minimize harvest of colonies that have not reached full growth;
4) preserve opportunities for low-cost equipment in the fishery (e.g., tangle-net dredges);
5) encourage discovery and exploration of new coral beds;
6) encourage development of new information on the ecology of precious corals.

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[2] *Pink corals (Corallium secundum, C. regale, C. laauense, C. spp.); gold corals (Gerardia spp., Callogorgia gilberti, Narella spp., Calyptrophora sp.); bamboo corals (Lepidisis olapa, Acanella spp.); the FMP also discusses, but does not manage, black corals (Antipathes dichotoma, A. grandis, A. ulex).*

2.1 Biological Characteristics

These coral species are slow-growing and display low mortality and recruitment rates. Natural populations are relatively stable, and a wide range of age classes is generally present in the beds. This life-history pattern (longevity and multiple year classes) has two important consequences with respect to exploitation: (1) the response of the population to exploitation extends over many years, and (2) if a stock has been overexploited for several years, a long period of reduced fishing effort is required to restore the ability of the stock to provide coral at Maximum Sustainable Yield (MSY), because of the great longevity of individuals, and the associated slow rates of turnover in the populations.

2.2 Habitat

This section supports and is consistent with the NMFS Habitat Conservation Policy. The precious corals covered by the FMP live in deep water on solid substrate where bottom currents are frequently strong (Grigg 1974). Different species of precious corals inhabit distinct non-overlapping depth zones, but their habitat requirements are strikingly similar. Strong currents prevent the accumulation of sediments, which would keep new larvae from settling and smother young colonies. Currents also carry food to (and waste from) corals, but the full importance of strong currents to living colonies is unclear. Precious corals have been recorded growing on a variety of substrate types, but coral harvests tend to be highest on bottoms of limestone, shell-sandstone, and basaltic or metamorphic rock with a limestone veneer.

In federal waters, precious corals occur in two principal depth zones; 350-450 m and 1000-1500 m. In the Hawaiian Archipelago, these zones encompass 1700 nm^2 and 5900 nm^2 of potential habitat, respectively, and range from 18°N to 35°N. A variety of other invertebrates and fish are known to occur with precious corals. Species of possible commercial importance include a snapper (onaga, Etelis coruscans), the yellowtail (kahala, Seriola dumerilii), and the shrimp Heterocarpus ensifer. These species do not appear to depend on the coral for shelter or food. No threatened or endangered species is known to occur with precious corals in the western Pacific.

The habitat sustaining precious corals is generally in a pristine condition. There are no known areas that have sustained damage due to resource exploitation, notwithstanding the alleged heavy foreign fishing for corals in the Hancock Seamounts area. Although unlikely, if future development projects are planned in the proximity of precious coral beds, care should be taken to prevent damage to the beds. Projects of particular concern would be those that suspend

sediments or modify water-movement patterns. The Council has a standing committee on Ecosystems and Habitat that will advise the Council on potential threats to precious corals habitat, and will recommend steps to prevent or mitigate adverse impacts on the resource.

2.3 Distribution in the US EEZ

To date, beds of pink, gold or bamboo corals have been found at several locations in and around the Hawaiian Archipelago. Precious corals have been discovered in the EEZ around Palmyra, but the extent of this bed is not known. Very small beds of deep-water precious corals have recently been discovered on Cross Seamount (southwest of the island of Hawaii) and a bank east of French Frigate Shoals (in the middle of the Hawaiian Archipelago) but these beds appear too small for commercial harvests. Precious corals almost certainly occur within the EEZ around the territories of American Samoa and Guam, the Commonwealth of the Northern Mariana Islands (CNMI), and other US possessions in the Pacific, but virtually nothing is known of their distribution and abundance in these areas. Of the known beds in the Western Pacific Region, only the bed off Makapuu Pt., Oahu, Hawaii, has been reliably surveyed for commercial densities. The annual sustainable harvest from the six Hawaiian beds[5] is estimated at approximately 3000 kg yr^{-1} for all species combined.

2.4 Description of Fishery

Precious corals are important deep-water resources frequently found on offshore banks and seamounts. The resource and its fishery is global, but the richest beds are found on seamounts in the western Mediterranean Sea and the western North Pacific Ocean.

A. US EEZ

Domestic participation in precious corals harvesting began in 1966, when US scientists discovered a commercial bed of pink coral off Makapuu Point in the Molokai Channel. Shortly thereafter, a small group of fishermen began dredging this bed on a small scale. Research at the University of Hawaii led to the development of a selective harvesting system using a manned submersible. A Hawaii-based company adopted this system and began fishing the Makapuu Bed in 1973, but high operating costs ended the operation in 1979. In 1988 and 1989, one coral-dredging vessel operated out of Hawaii but limited success, including

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[5] *180-Fathom Bank, Brooks Bank, Kaena Pt., Keahole Pt., Makapuu and WesPac.*

unsuccessful catches at and near Hancock Seamounts, forced it to leave the fishery.

B. International Waters

Precious corals fisheries have existed in the Mediterranean Sea since ancient times, but commercial beds of precious corals were not discovered in the Pacific until the early 1800s, off Japan. Until recent years, the Pacific precious corals fisheries were centered off Japan, Okinawa and Taiwan. The focus of the world harvest has shifted from those traditional grounds in the far western Pacific to the newly discovered grounds in the Emperor Seamounts. Because Midway is the nearest island to the Emperor Seamounts fishing grounds, corals dredged from this area have been labeled in the trade as "Midway" coral, and this coral has accounted for as much as 90% of the annual world production. Only about 10% of the "Midway" grounds lie within the US EEZ (near the Hancock Seamounts at the northwest limit of the EEZ), however, so most of the fishery is unregulated.

C. Foreign Harvest

The large harvests reported by foreign fishermen from the Milwaukee Banks of the Emperor Seamounts in the early 1980s are indicative of the harvest potential for precious corals in the US EEZ. Even though most precious coral resources are in international waters, foreign interest exists in US coral resources. Allegations of illegal foreign operations in the EEZ of the NWHI provide indirect evidence that additional productive beds exist. Foreign activity in the region has declined in recent years, however, which suggests that some of the once-productive beds are now over-exploited.

2.5 Vessel Safety Considerations

Vessel safety is not affected in this fishery because none of the actions proposed in the FMP or in this amendment impose any restrictions on vessel operations. Nonetheless, this amendment will be reviewed by the US Coast Guard for evaluation regarding vessel safety.

2.6 Condition of Stocks in the US EEZ around the Hawaiian Islands

The only regular, domestic commercial fishery for precious corals existed in the Makapuu Bed for six years during the 1970s. During this period about 17,500 kg of pink coral was collected (Grigg 1988). This represents about 40% (by weight) of the estimated standing crop of pink coral in the entire bed.

Transect surveys of the Makapuu Bed were conducted with a manned submersible in 1971, early 1983 and late 1985. The first survey was conducted before any commercial harvesting had taken place. The other two surveys were completed about three and six years after harvesting had ceased. The surveys indicated that harvesting had no apparent effect on coral recruitment rates. The combined mean density for all megafaunal species of precious coral in the Makapuu Bed did not change significantly between 1971 and 1985, and is approximately 0.1 colonies per square meter (Grigg 1988). The low densities indicate that space is not a limiting factor for megafaunal populations in the Makapuu Bed. Furthermore, there is little indication of age-specific differences in natural mortality.

The age-frequency distributions observed in the 1983 and 1985 surveys, when compared to the age-frequency distribution of the virgin population in 1971, provide a measure of impact caused by harvesting, as well as a measure of the ability for precious coral resources to recover from fishing pressure. By comparing the 1985 and 1971 age-frequency distributions of pink coral it is predicted that full recovery of the Makapuu Bed to the virgin state may require up to 25 years. Recovery is apparently a simple function of slow growth gradually in-filling year classes that were removed by harvesting. At the Makapuu Bed, recruitment appears unaffected by harvesting and is independent of the density of the standing stock. In short, recruitment in the Makapuu Bed may be wholly dependent on outside sources. The Makapuu Bed appears to be healthy enough to once again sustain a small domestic harvest quota.

Nothing is known about the status of the precious coral resources in the Exploratory Areas or the precise location where foreign draggers have allegedly poached large quantities of precious corals in the EEZ of the NWHI. With the exception of the Makapuu Bed and those beds harvested illegally by foreign fishermen, all other precious coral beds within the US EEZ are believed to be in an unexploited or "virgin" state.

3.0 EXISTING MANAGEMENT MEASURES

In the FMP, precious corals beds are treated as distinct management units because of their widely-separated patchy distribution and the sessile nature of individual colonies, even though recruitment may be dependent on reproduction at other coral beds. The four categories are Established Bed, Conditional Bed, Refugia Bed and Exploratory Permit Area.

A. Established Beds are ones for which appraisals of maximum sustainable yields are reasonably precise. To date, only the Makapuu Bed has been studied well enough to be classified as

Established. Both the State of Hawaii and the WPRFMC have management measures in place at the Makapuu Bed.

B. Conditional Beds are beds for which only an estimate of MSY exists, based on the approximate size of the bed rather than on survey or fishery performance data. The ecological conditions at the Makapuu Bed are assumed to be representative of conditions at the Conditional Beds. MSY estimates for Conditional Beds are then calculated by assigning the Makapuu Bed MSY, factored by the relative size of the Conditional Bed to the Makapuu Bed. Four beds of precious corals are classified as Conditional (180-Fathom Bank, Brooks Bank, Kaena Pt., Keahole Pt.), all of them around the Hawaiian Islands.

C. Refugia Beds are areas set aside for baseline studies and possible reproductive reserves. No harvesting of any type is allowed in these areas. To date, the only refuge is the Wespac Bed (between Nihoa and Necker Islands in the Hawaiian Archipelago).

D. Exploratory Permit Areas are the unexplored portions of the EEZ. There are four such areas: around American Samoa, Guam, Hawaii and US island possessions.

The regulations prescribe methods of harvest for each class of coral bed and harvest quotas for individual beds. Only selective gear is permitted in the EEZ around the main Hawaiian Islands, i.e., east of a north-south imaginary line midway between Niihau and Nihoa Islands. The use of selective and non-selective gear is permitted at the NWHI Conditional Beds of Brooks Bank and the 180-Fathom Bank, and throughout the Exploratory Permit Area of the NWHI. Quotas have been established for pink, gold and bamboo coral populations in the Makapuu Bed and Conditional Beds. If tangle-net dredges are employed on Conditional Beds, the weight quota is only 20% of that allowed for selective harvesters because tangle-net dredges kill up to an additional 150% of the colonies that would have been harvested selectively (Grigg 1989). Domestic or foreign fishing in each Exploratory Permit Areas may harvest up to 1000 kg of all species combined per area per year. In addition to regulating harvesting methods and harvest amounts, the FMP establishes a procedure for upgrading coral beds from Exploratory to Conditional to Established as new beds are located and more catch/effort data become available that allow more accurate determinations of sustainable yields.

Amendment 1 to the FMP: (1) conferred the management measures of the FMP to all US island possessions in the Pacific by incorporating them into a single Exploratory Permit Area, (2) expanded the managed species to include the

Midway Deep-sea coral, Corallium sp. nov., and (3) outlined provisions for Experimental Fishing Permits that were designed to stimulate the domestic fishery and gather information on unexplored beds by approving quotas for Exploratory Permit Areas that are larger than the normal 1000-kg limit.

4.0 NEED FOR AMENDMENT 2

The MFCMA does not define overfishing, nor does the precious corals FMP. In addition, biological data necessary to determine overfishing are limited, so management decisions might be made without sufficient regard to the long-term health of the resource or industry. To ensure that long-term viability is a basic consideration, the Secretary's revised guidelines (Federal Register: 54 FR 30826) stipulate that:

A. each FMP specify an objective and measurable definition of overfishing for each stock or stock complex, with an analysis of how the definition was developed and how it relates to biological potential, and

B. a Stock Assessment and Fishery Evaluation (SAFE) report, or its equivalent, be prepared and updated as necessary. The report would summarize the best biological, economic, social and ecological information about the stocks being managed.

5.0 MANAGEMENT OBJECTIVES OF AMENDMENT 2

The management objectives of Amendment 2 are to:

A. help ensure the long-term health of the precious corals resources by specifying what portion of the spawning stock biomass must be protected in order to maintain the productive capacity of the species being managed under the FMP.

B. help ensure the timely detection of changes and initiation of appropriate management action by the Council through periodic monitoring and assessment of the coral stocks and coral fishing in the EEZ.

6.0 PROPOSED ACTIONS

6.1 List of Proposed Actions

The actions of Amendment 2 to the Precious Corals FMP are to:

A. Define overfishing as follows:

"An Established coral bed shall be deemed overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20% of its unfished condition."

This definition applies to all species of precious corals, and is based on cohort analyses of the pink coral, Corallium secundum. It takes into account the mean survivorship, yield, age at maturity, reproductive potential and MSY of the coral populations (see Table 1). It is also based on conservative estimates of harvest yields necessary to protect the spawning stock biomass of precious corals, and is consistent with language already in the FMP.

Table 1. Survivorship, growth and yield of the precious pink coral, Corallium secundum.

Age Group (yr) (a)	Mean Survivorship (b)	Mean Weight (g) (c)	Mean Yield (g) (b X c)	% Spawning Stock Biomass
Sublegal Size:				
0-5*	.87	6.4	5.6	
5-10*	.64	77.5	49.6	
10-15*	.48	247.2	118.6	
15-20	.35	530.6	185.7	
20-25	.26	938.7	243.8	20%
********** OVERFISHING **********				
25-30	.19	1480	281.2	30%
********** MSY **********				
Legal Size:				
30-35	.14	2163	302.8	
35-40	.11	2993	329.2	
40-45	.08	3976	318.1	70%
45-50	.06	5118	307.0	
50-55	.04	6428	256.0	
55-60	.03	7898	236.0	

* sexually-immature colonies

The model shows that 71.1% of the sexually-mature colonies are made up of legal-sized colonies, as defined in the FMP. That is, approximately 70% of the spawning stock biomass is older than 30 years, which is the age at which MSY is achieved. This is the level at which current management efforts such as minimum size limits, quotas, etc., are focused. Additional or different management measures would be mandatory if the spawning stock were reduced an additional 10%; this level would constitute overfishing.

Sustainable yield was assessed by modeling the pink coral resource using empirically-derived estimates of age-class structure, growth, and mortality along with hypothesized stock recruitment relationships. MSY was found to equal about 1200 kg at an age of first harvest of 30 yr for a constant recruitment model. Estimated MSY drops, however, to about 1000 kg for more realistic stock recruitment models where recruitment falls off gradually with declining stock until low stock levels where it declines precipitously. Hence, the Council selected a more realistic estimate of 1000 kg at age 30 (Figure 15 in the FMP) as its definition of MSY. Pulse fishing is allowed under the FMP to harvest the resource down to the age at first entry into the fishery that would result in MSY. From Table 1, this harvesting strategy can be seen to result in a ~~spawning potential~~ [ratio ~~(SPR)~~ spawning stock biomass$_{fished}$ / spawning stock biomass$_{unfished}$] equal to approximately 30% (or the removal of 70% of the spawning stock biomass). Surveys of the Makapuu Bed conducted toward the end of the pulse fishing period and after approximately 10 years of unfished recovery, indicated that recruitment into the fishable portion of the stock had occurred as expected based on the growth model. However, sufficient time had not elapsed to verify whether recruitment due to settlement as opposed to recruitment due to growth of previous settlement had been effected by the MSY-pulse harvesting rate.

If pulse fishing were to harvest down through age 25, ~~SPR~~ would equal 17% and protect 10 out of 45 age-classes of spawning animals. Since managing at MSY with pulse fishing is estimated to result in protecting 30% of the spawning stock biomass for this resource, the Precious Corals Plan Team concluded that protecting 20% (or 12-13 age-classes) is a reasonably prudent threshold for preventing overfishing. Availability of research funds to conduct surveys to verify settlement and subsequent recruitment by growth into the fishable portion of the stock will make it possible to verify the adequacy of the model and the efficacy of the management strategy chosen.

It should be pointed out that, according to the model, harvesting down through age 20 results in a ~~SPR~~ of only 8% and protects only 5 out of the original 45 mature age-classes. Maximum yield per recruit (Y/R, Fig. 13 in the FMP) is obtained at about age 20 for age of first harvest. While managing at Y/R is generally regarded as less conservative than managing at MSY, the Plan Team, SSC and Council concluded that it would not be prudent to set the overfishing threshold at this level because too few mature size classes are protected given the uncertainty involving the stock-recruitment relationship.

The biological parameters used in the cohort analysis for C. secundum will be applied to other precious coral species. The overfishing definition will be applied to other species, at least until adequate basic information is gained about the other species.

B. Require an annual report which summarizes the best scientific information available on the biological condition of established precious coral beds within the US EEZ of the Western Pacific Region, and on the fisheries being managed under the FMP.

The Council staff and the Precious Corals Plan Team (Team) will have lead responsibility for preparing an annual report on the previous year's harvest levels of precious corals, significant trends in the fishery, and the effectiveness of the plan in meeting its objectives. The Council staff and Team will work closely with the NMFS, Coast Guard, and state and territory officials to ensure that data submission requirements and data collection programs are generating the information necessary for effectively monitoring the fishery and determining whether different or alternative management measures are necessary. As conditions in the fishery dictate, the NMFS Honolulu Laboratory will provide timely data analyses and research results on the precious corals fishery for use by the Council staff and Team.

The Team will prepare for the Council an annual report on the fishery, relative to the prevention of overfishing as defined in the FMP, by March 31 each year. The report will contain an overview of the status of precious coral stocks and any significant trends in the fishery. Information for the previous year will be compared with prior years, to the extent data are available for each area of the EEZ and adjacent waters of the Region. The report should contain at least the following information, if such information is new or has changed since the previous year's report:

1) Stock Assessment
   a. Estimates of total biomass and spawning biomass for each established coral bed;
   b. Comparison of those estimates to the biomass estimates from previous years;
   c. Explanation of how those estimates were calculated and their reliability;
   d. If a bed is overfished, estimated time necessary for the spawning stock biomass to recover to a level at which the

stock's reproductive capacity is maintained (and fishing can resume).

2) Fishery Performance Data
   a. Estimated amount of precious coral harvested by species, size, gear type and area;
   b. Approximate ex-vessel revenue of harvested coral by species;
   c. Estimated amount and volume of the processed product derived from harvested raw material;
   d. Number of vessels by gear type, number of trips, days fished, landings per trip, and other indicators of performance.
3) Summary of Recent Research and Survey Results
4) Habitat Conditions and Recent Alterations
5) Enforcement Activities and Problems
6) Administrative Actions (e.g., data collection, reporting, permits)
7) State and Territory Management Actions
8) Assessment of Need for Council Action:
   a. Biological conditions and trends
   b. Economic conditions and trends
   c. Social conditions and trends
   d. Enforcement issues
   e. Administrative issues
   f. State/federal consistency
9) Recommendations for Council Action
10) Estimated Impacts of Recommended Action

6.2 Impacts of Proposed Actions

A. The overfishing definition would provide an objective and measurable definition of overfishing for the Western Pacific Region's precious corals stocks in areas where enough data exist (i.e., Established Beds). There would be no impact on other classes of beds; other beds would need to be studied sufficiently to upgrade them to Established Beds before the overfishing definition could be applied. Ultimately, all precious corals beds will be classified as Established, so all beds will be protected from overfishing.

B. The annual report would help ensure the timely detection of changes in the corals fishery by periodic monitoring and assessment of the fishery in the EEZ, thus satisfying any requirement for a SAFE document.

6.3 Location of Proposed Actions

The proposed actions apply to all areas of the EEZ under jurisdiction of the Council (except the CNMI), i.e., American Samoa, Guam, Hawaii (including the Northwestern Hawaiian Islands), and other US possessions in the Pacific.

6.4 Monitoring of Proposed Actions and Possible Council Responses

The FMP already contains provisions for scientific observers and mandatory catch reporting. These provisions allow constant monitoring, and provide the vehicle for classifying newly-discovered beds, as well as monitoring Established Beds.

The new requirement for an annual report will explicitly identify any established bed which has been overfished as defined in this amendment. If a bed is found to be overfished, the report will evaluate potential corrective measures for Council adoption, including such potential measures as immediate bed closure(s), lower quotas to achieve rebuilding, a change in size limits, or other actions.

The Council will then review the analysis and determine which specific measures should be implemented to ensure rebuilding of coral stocks on an overfished bed to at least the threshold level within 15 years. The Council's proposed measures will be presented to the Regional Director within 30 days of the meeting at which the decision is made. If the Regional Director approves, the proposed measures will be implemented through a change in the regulations implementing the FMP.

7.0 REJECTED ALTERNATIVES

7.1 List of Rejected Alternatives and Reason for Rejection

A. No action.

A no action alternative maintains the status quo in which an overfishing definition is not specified in the FMP and a periodic report assessing the condition of the stock (or stock complex) or condition of the fisheries is not required. This alternative is not in accord with the revised national standards guidelines, so it was rejected.

B. Alternative definition of overfishing:

"An Established coral bed shall be deemed overfished when the spawning stock biomass has been reduced to 30% of its virgin state."

This alternative definition of overfishing for Established beds was developed to correspond with the MSY level of 30% of spawning stock biomass, which is the level at which the Council currently manages the fishery. The SSC and Council felt that if overfishing was defined at this level, it might be forced to impose overly strict management measures (i.e., closures) when, in actuality, the fishery was operating at a level of fishing effort which could be sustained.

8.0 RELATIONSHIP OF AMENDMENT 2 TO OTHER APPLICABLE LAWS AND POLICIES

8.1 Coastal Zone Consistency

Section 307(c)(1) of the federal Coastal Zone Management Act (CZMA) requires that all federal activities which directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. The State of Hawaii CZM policies directly relating to the actions proposed in this amendment are contained in the coastal ecosystems and economic use resources categories of the Hawaii CZM statute (Act 188, Chapter 205A, HRS). Those policies are to: 1) improve the technical basis for natural resource management, 2) preserve valuable coastal (offshore) ecosystems of significant biological importance, and 3) minimize adverse environmental effects from economic uses of coastal zone resources. The actions of this amendment are fully consistent with these objectives. State jurisdiction over the Makapuu Bed as well as other archipelagic waters remains an unsettled issue between state and the federal governments. Still, the proposed management and conservation actions within this amendment are in agreement with Hawaii CZM policy.

The Council has reviewed the Coastal Zone Management Programs of American Samoa and Guam, and found the actions of this amendment consistent with policies set forth on fisheries and living marine resources. The Council has requested reviews of this amendment from agencies responsible for CZM policy within each government.

8.2 Marine Mammal Protection Act and Endangered Species Act

The management measures of the FMP document were judged not to have any significant impact on marine mammals or endangered species. Those conclusions were based on the characteristics of precious corals habitat and the fishing techniques used to harvest precious corals. The NMFS rendered a biological opinion that confirmed that conclusion. The actions proposed in this amendment are passive with regard to habitat and conventional fishing practices.

The measures of Amendment 2 will not impose any new or increased risks to marine mammals or endangered species.

8.3 National Environmental Policy Act - Environmental Assessment

A. Purpose and Need for Action

This Environmental Asessment has been prepared in accordance with the requirements of the National Environmental Policy Act to assess the potential for environmental impacts (including the human environment) that may result from Amendment 2 to the Precious Corals FMP. The proposed actions are consistent with the goals and objectives of the FMP, National Standards of the MFCMA, and revised guidelines for the national standards (50 CFR Part 602). The proposed actions are deemed to be the preferred alternative.

B. Analysis of Impacts of the Preferred Alternative

1) The preferred alternative is intended to ensure the long-term productivity of the resource by preventing recruitment overfishing.

2) The preferred alternative provides a safeguard against significant and irreversible damage to the ocean and coastal habitats. Although non-selective harvest methods such as tangle nets may be used in the fishery, they are confined to designated exploratory areas and tightly controlled under an established experimental fishing permit (EFP) system[4]. All fishing operations conducted under an EFP are subjected to stringent terms and conditions, including but not limited to harvest limitations, scientific observers, reporting requirements, and the immediate cessation of harvest activities if such activities pose any risk of substantial and permanent damage to the coral stocks or their habitat. The habitat of established corals beds is also afforded full protection under the preferred alternative.

3) The preferred alternative is not expected to have any adverse impact upon public health or safety since there is no known dependency of any particular fishery or human activity in the areas where precious corals are known to occur.

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[4] *Code of Federal Regulations: 50 CFR 680.10*

4) The preferred alternative will not impact protected (endangered or threatened) species or marine mammals. Protected animals are not known to occur at depths where precious corals are known to occur.

5) Cumulative effects of the preferred alternative are expected to be beneficial to the coral stocks and fishery. An annual assessment of the precious corals stocks under the preferred alternative will provide a better understanding of the magnitude and dynamics of the fishery. This would enable the Council and NMFS to effectively manage, conserve and develop the precious coral resources.

6) The preferred alternative is not expected to generate controversy or have adverse socio-economic effects. However, it is acknowledged that the overfishing definitions proposed for inclusion in the FMP are based upon limited scientific data. There are uncertainties regarding the present condition of the coral stocks, so the validity of the definitions may be challenged. Nonetheless, the Council intends to exercise the best informed judgement in applying this definition and preventing any precious coral bed from closely approaching or reaching an overfished state.

7) The preferred alternative will not have any effect upon flood plains and wetlands, or trails and rivers listed, or eligible for listing, on the National Trails and Nationwide Inventory of Rivers.

C. Agencies and Persons Consulted

The Coastal Zone Management offices and Natural Resources offices of American Samoa, Guam, Hawaii and the Northern Mariana Islands were sent this draft amendment for review, as were the US Coast Guard and Fish and Wildlife Service, and people interested in harvesting precious corals.

D. Finding of No Significant Impact

Based on the information contained in the environmental assessment, it is concluded that the actions proposed by the FMP amendment will not have a significant effect on the human environment. Therefore, the preparation of an environmental impact statement is not required.

8.4 Executive Order 12291 and Regulatory Flexibility Act

The actions proposed by this amendment do not, at this time, require the issuance of new rules, review of existing rules, or development of legislative proposals concerning regulations. A regulatory impact review and flexibility analysis will be performed when regulatory review and/or amendment become necessary.

8.5 Paperwork Reduction Act

No additional rule for establishing record-keeping and reporting requirements, for the purpose of collecting information from the public, are proposed under Amendment 2.

8.6 Indigenous Peoples' Fishing Rights

There is no formal agreement between the US government and the indigenous peoples of the region (i.e., native Chamorros, Hawaiians and Samoans) that allocate preferential fishing rights to native peoples. The necessity and legal possibility of granting such rights, however, are being investigated. If it is concluded that indigenous peoples should be awarded special considerations, then the Precious Corals FMP might require revision. At present, Amendment 2 does not appear to affect any native Chamorro, Hawaiian or Samoan cultural or religious practices.

9.0 LITERATURE CITED

Grigg, R.W. 1974. Distribution and abundance of precious corals in Hawaii. In: Second Int. Symp. on Coral Reefs, Great Barrier Reef, Australia, 1973, Proc. 2: 235-240.

Grigg, R.W. 1988. Recruitment limitation of a deep benthic hard-bottom octocoral population in the Hawaiian Islands. Mar. Ecol. 45: 121-126.

Grigg, R.W. 1989. Precious corals fisheries of the Pacific and Mediterranean. In: J.F. Caddy (ed.) Marine invertebrate fisheries: their assessment and management. J. Wiley and Sons. New York. p. 637-645.

Western Pacific Regional Fishery Management Council. 1980, as amended. Fishery management plan and proposed regulations for the precious coral fishery of the Western Pacific region. Var. pag.

action must be taken to control fishing mortality.

For the crustacean fisheries in the Western Pacific, the Council defined overfishing of crustacean stocks of slipper and spiny lobster as the point where the spawning potential ratio (SPR) of each stock equals 0.2 or below. The SPR is a measure of the relative reproductive potential of the stock and is calculated as the ratio of the spawning stock biomass per recruit (SSBR) of a fished population to the SSBR of the unfished population. Thus, spiny lobster or slipper lobster would be overfished if the respective SPR were equal to or less than 0.2. The analysis in Amendment 6 demonstrates that the size limits and other measures governing the fishery were selected to ensure that the SPR will remain well above the 0.2 threshold level.

The FMP includes a requirement for an annual report that summarizes the best scientific information available on the biological condition of crustacean resources. The report will contain an overview of the status of crustacean stocks relative to the overfishing threshold and any significant trends in the fishery that may increase the risk of overfishing. It is the Council's intent to manage the fishery to prevent reaching an overfished condition.

No comments on the amendment were received.

The definition of overfishing, and the measures to implement the definition, have been determined to meet the approvability criteria of the national standard guidelines.

Classification

The Director, Southwest Region, NMFS, determined that Amendment 6 is necessary for the conservation and management of the precious corals fishery and is consistent with the Magnuson Act and other applicable law.

The Council included an environmental assessment (EA) in Amendment 6. The Assistant Administrator for Fisheries, NOAA, concluded that there will be no significant impact on the human environment resulting from this amendment.

Because this amendment requires no implementing regulations, 5 U.S.C. section 553 of the Administrative Procedure Act, E.O. 12291, and the Regulatory Flexibility Act do not apply to this notice of approval. There will be no impact on marine mammals or endangered species.

This amendment does not contain collection-of-information requirements subject to the Paperwork Reduction Act.

The Council has determined that the proposed amendment is consistent to the maximum extent practicable with the coastal zone programs of the governments of Hawaii, American Samoa, and Guam and has asked for concurrence with this determination. The governments did not respond; therefore, concurrence is inferred.

Amendment 6 does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: January 22, 1991.

Michael F. Tillman,

Acting Assistant Administrator for Fisheries, National Marine Fisheries Service.

[FR Doc. 91-1889 Filed 1-25-91; 8:45 am]

BILLING CODE 3510-22-M

Western Pacific Precious Corals Fisheries

AGENCY: National Marine Fisheries Service (NMFS), NOAA, Commerce.

ACTION: Notice of approval of amendment 2 to the fishery management plan for precious corals.

SUMMARY: NOAA issues this notice that amendment 2 to the Fishery Management Plan for the Precious Corals Fisheries of the Western Pacific Region (FMP) has been approved. Amendment 2, which defines overfishing in compliance with national standards 1 and 2 of the Magnuson Act, was submitted by the Western Pacific Fishery Management Council (Council) for Secretarial review on October 16, 1990. No rulemaking is involved in this action.

DATES: January 22, 1991.

FOR FURTHER INFORMATION CONTACT: Svein Fougner, NMFS, Southwest Region, (213) 514-6660, or Alvin Katekaru, NMFS, Pacific Area Office, Honolulu, Hawaii, (808) 955-8831.

SUPPLEMENTARY INFORMATION: A notice of availability of Amendment 2 was published in the **Federal Register** on November 2, 1990 (55 FR 46236), and comments were invited until December 20, 1990.

The guidelines to the national standards attendant to the Magnuson Act (50 CFR part 602) were revised in 1989 (54 FR 30711 *et seq.*) to require the Councils to amend all fishery management plans to include definitions of overfishing for their respective fisheries.

With regard to precious corals in the western Pacific, the Council defined overfishing of an established coral bed as the point where the total spawning biomass (all species combined) has been reduced to 20 percent of its unfished condition, illustrated by the use of a spawning potential ratio (SPR), which is the ratio of the spawning stock biomass of a fished resource to the spawning stock biomass of an unfished resource.

The amendment also implements the requirement of an annual report that summarizes the best scientific information available on the biological condition of established precious coral beds. The report will contain an overview of the status of precious coral stocks and any significant trends in the fishery.

Three comments on the amendment were received. One individual suggested that the category "size of crew" be included in the annual report so that fishery employment in the fishery can be adequately represented. That suggestion has been adopted.

One individual asked for a clarification of Table 1 in the amendment, and another asked for an explanation of why SPR, which in the past has referred to spawning stock biomass per recruit, is used to refer to spawning stock biomass in the case of coral management. These comments have been referred to the Council for its attention.

Classification

The Director, Southwest Region, NMFS, determined that the Amendment, as approved, is necessary for the conservation and management of the precious corals fishery and is consistent with the Magnuson Act and other applicable law.

The Council included an environmental assessment (EA) in Amendment 2, and the Assistant Administrator for Fisheries, NOAA, concluded that there will be no significant impact on the human environment resulting from this amendment.

Because the amendment requires no implementing regulations, 5 U.S.C. 533 of the Administrative Procedure Act, E.O. 12291, and the Regulatory Flexibility Act do not apply to this notice of approval. There will be no impact on marine mammals or endangers species.

This amendment does not contain collection-of-information requirements subject to the Paperwork Reduction Act.

The Council has determined that the proposed amendment is consistent to the maximum extent practicable with the coastal zone programs of the governments of Hawaii, American Samoa, and Guam and has asked for concurrence with this determination.

the term of the current tribal member expires.

(5) The Secretary shall rotate the appointment among the tribes taking into consideration:

(i) The qualifications of the individuals on the list referred to in paragraph (b)(1) of this section.

(ii) The various rights of the Indian tribes involved and judicial cases that set out how those rights are to be exercised.

(iii) The geographic area in which the tribe of the representative is located.

(iv) No tribal representative shall serve more than three consecutive terms in the Indian tribal seat.

(6) Any vacancy occurring prior to the expiration of any term shall be filled in the same manner as described above except that the Secretary may use the list referred to in paragraph (b)(1) of this section from which the vacating member was chosen.

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[FR Doc. 97-23940 Filed 9-5-97; 10:40 am]

BILLING CODE 3510-22-F

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket Number; 970903221-7221-01; I.D. 081297C]

RIN 0648-XX89

Fisheries off West Coast States and in the Western Pacific; Precious Corals Fisheries; Technical Amendment

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Correcting amendment.

SUMMARY: This document contains a correction to the regulations implementing the Fishery Management Plan for Precious Corals Fisheries of the Western Pacific Region (FMP) which were published in the **Federal Register** on July 2, 1996. This amendment corrects the coordinates for the location of the Makapuu bed of precious corals appearing under the category of "Established beds" in the definition of "Precious coral permit area".

DATES: Effective September 10, 1997.

FOR FURTHER INFORMATION CONTACT: Svein Fougner, 562-980-4034; or Alvin Katekaru, 808-973-2985.

SUPPLEMENTARY INFORMATION: In the original FMP the coordinates for the center of the Makapuu bed contained a typographical error. Instead of the longitude being listed as 157° 32.5' W. it was incorrectly listed as 157° 35.5' W. longitude. This error placed the location of the bed approximately three miles away from its actual location.

There has been almost no fishing under the FMP since its implementation, and this error was only recently discovered. This technical amendment corrects the regulations implementing the FMP (August 30, 1983, 48 FR 3923; consolidated by July 2, 1996, 61 FR 34570) to list the coordinates for the center of the Makapuu bed.

Classification

The Assistant Administrator for Fisheries, NOAA (AA), under 5 U.S.C. 553(b)(B) finds that providing prior notice and an opportunity for public comment on this rule is unnecessary, because the rule merely corrects coordinates for the location of a resource, and such notice and opportunity for comment would serve no useful purpose. Similarly, the AA, under 5 U.S.C. 553 (d)(3) finds that delaying the effective date of the correction for 30 days is unnecessary because the location of the bed is fixed.

Because prior notice and opportunity for public comment are not required for this rule by 5 U.S.C. 553, or by any other law, the analytical requirements of the Regulatory Flexibility Act, 5 U.S.C. 601 *et seq.*, are inapplicable. This rule is exempt from review under E.O. 12866.

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, Indians, Reporting and recordkeeping requirements, Administrative practice and procedure, American Samoa, Guam, Hawaiian Natives, Northern Mariana Islands.

Dated: September 4, 1997.

David L. Evans,

Deputy Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR Part 660 is amended as follows:

PART 660—FISHERIES OFF WEST COAST STATES AND THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. In § 660.12, the category for" *Established beds* "under the definition of "*Precious coral permit area*" is corrected by revising the coordinates of the point specified therein to read "21° 18.0' N. lat, 157° 32.5' W. long."

[FR Doc. 97-23941 Filed 9-9-97; 8:45 am]

BILLING CODE 3510-22-F

WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

Amendment 3

to the

Fishery Management Plan for the Precious Corals Fisheries of the Western Pacific Region

---

(includes Environmental Assessment and Regulatory Impact Review)

March 1998

Western Pacific Regional Fishery Management Council
1164 Bishop St., Suite 1400
Honolulu, Hawaii 96813

Telephone (808) 522-8220
Fax (808) 522-8226

WESTERN
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2.0 SUMMARY

The Western Pacific Fishery Management Council is operating in an environment of great uncertainty with regard to the distribution and abundance of precious coral resources, especially with regard to those in Exploratory Areas. Given this situation, the Council includes in the FMP (through this amendment) framework procedures which would provide for adjustments of certain management measures as more information on the fisheries and the status of the stocks becomes available. A framework process offers greater flexibility and shorter response times to detectable changes in the fishery.

3.0 TABLE OF CONTENTS

4.0 INTRODUCTION

4.1 Responsible Agencies

The Western Pacific Regional Fishery Management Council (Council or WPRFMC) was established by the Magnuson Fishery Conservation and Management Act (Magnuson Act) to develop fishery management plans (FMPs) for fisheries operating in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands and US possessions in the Pacific. Once an FMP is approved by the Secretary of Commerce (Secretary), it is implemented by federal regulations which are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, in cooperation with state agencies.

For further information, contact:

Ms. Kitty M. Simonds
Executive Director
WPRFMC
1164 Bishop St., Suite 1400
Honolulu, HI 96813
Telephone: (808) 541-1974
Fax: (808) 526-0824

Dr. William T. Hogarth
Regional Administrator
NMFS Southwest Region
501 W. Ocean Boulevard, #4200
Long Beach, CA 90802-4213
Telephone: (310) 980-4001
Fax: (310) 980-4018

4.2 Public Review Process and Schedule

A summary of draft preliminary Amendment 3 was presented at meetings of the Council's Precious Coral Plan Team and Scientific and Statistical Committee. A public hearing was held on Oahu at the November 1997 Council meeting. The preliminary draft amendment package was available upon request to any interested people. The Council took action in November 1997 and directed staff to complete Amendment 3 for public review.

4.3 List of Preparers

Amendment 3 was prepared by (listed alphabetically):

Alvin Z. Katekaru, Fishery Management Specialist
Pacific Area Office, NMFS, Southwest Region, Pacific Islands Area Office, Honolulu, HI

Donald M. Schug, Staff Economist
Western Pacific Regional Fishery Management Council, Honolulu, HI

5.0 BACKGROUND

5.1 Species of Concern and Their Biological Characteristics

Harvesting of deep-water precious corals is subject to the regulations of the FMP which became effective on September 29, 1983. The FMP covers domestic and foreign fishing for precious corals in the US EEZ of the Western Pacific Region. Precious coral includes the following coral species:

Pink coral (also known as red coral), *Corallium secundum*
Pink coral (also known as red coral), *Corallium regale*
Pink coral (also known as red coral), *Corallium laauense*
Gold coral, *Gerardia* spp.
Gold coral, *Narella* spp.
Gold coral, *Calyptrophora* spp.
Bamboo coral, *Lepidisis olapa*
Bamboo coral, *Acanella* spp.
Black coral, *Antipathes dichotoma*
Black coral, *Antipathes grandis*
Black coral, *Antipathes ulex*

These species of precious corals are found in deep water (350-450 m and 1000-1500 m) on solid substrate where bottom currents are strong. Precious corals are slow growing and are characterized by low rates of mortality and recruitment. Natural populations are relatively stable, and a wide range of age classes are generally present. This life history pattern (longevity and many year classes) has two important consequences with respect to exploitation. First, the response of the population to exploitation is drawn out over many years. Second, because of the great longevity of individuals, and the associated slow rates of turnover in the populations, a long period of reduced fishing effort is required to restore the ability of the stock to produce at maximum sustainable yield (MSY) if a stock has been overexploited for several years.

5.2 Distribution in the EEZ

The FMP identifies the problem of managing a resource of unknown dimensions characterized by slow growth, low rates of mortality and low rates of recruitment. Precious corals are known to exist in the EEZ around Hawaii and very likely exist in the EEZ around American Samoa, Guam, the Commonwealth of the Northern Marianas and the US possessions, but virtually nothing is known of their distribution and abundance in these areas. So far, beds of pink,

gold and/or bamboo coral have been found at six locations, all in the EEZ around Hawaii. The annual sustainable harvest from these six beds is estimated at approximately 3000 kg per year for all species of precious coral combined. Of the known beds in the Hawaiian Island chain only the Makapu'u bed off Oahu has been accurately surveyed for commercial harvesting.

6.0 EXISTING MANAGEMENT MEASURES

The Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region was developed by the Council, and its regulations were published by the National Marine Fisheries Service at 48 FR 39231, 30 August 1983. In the FMP, precious coral beds are treated as distinct management units because of their widely-separated patchy distribution and the sessile nature of individual colonies. The beds are classified as Established, Conditional, Refugia or Exploratory. Established Beds are ones for which appraisals of MSY are reasonably precise. To date, only Makapu'u bed has been studied adequately enough to be classified as Established. Conditional Beds are ones for which estimates of MSY have been calculated by comparing the size of the beds to that of the Makapu'u bed and then multiplying the ratio by the yield from the Makapu'u bed. It is assumed that ecological conditions at the Makapu'u bed are representative of conditions at all other beds. Five beds of precious corals are classified as Conditional, all of them located in the EEZ around Hawaii. Refugia Beds are areas set aside for baseline studies and possible reproductive reserves. No harvesting of any type is allowed in those areas. The single Refugia Bed that has been designated - the Westpac bed - is also located in the EEZ surrounding Hawaii. Exploratory Areas are the unexplored portions of the EEZ. Separate Exploratory Permit Areas are established for Hawaii, American Samoa and Guam.

The regulations prescribe methods of harvest for each category of coral bed and harvest quotas for individual beds. Only selective gear is permitted in the EEZ around the main Hawaiian Islands, i.e., south and east of a line midway between Niihau and Nihoa Islands. Use of both selective and nonselective gear is permitted on the Conditional Beds of Brooks Bank and the 180 Degree Fathom Bank and throughout the Exploratory Area of the Northwestern Hawaiian Islands. Quotas have been established for pink, gold and bamboo coral populations in the Makapu'u bed and in the Conditional Beds. There are no quotas for the harvest of black corals. Pink coral harvested from the Makapu'u bed, the Keahole Point bed and the Kaena Point bed must have attained a minimum height of ten inches.

If tangle net dredges are employed on Conditional Beds, the weight quota is only 20% of that allowed for selective harvesting. In addition to regulating harvesting methods and harvest amounts, the FMP establishes a procedure for redesignating coral beds from Exploratory to Conditional and from Conditional to Established as new beds are located and more catch/effort data become available which will allow more precise determinations of sustainable yields.

The FMP has been amended twice. The first amendment, implemented by rules published at 53 FR 24660 on 29 June 1988, applied the management measures of the FMP to all US Pacific Insular Areas other than Guam, American Samoa and the Northern Mariana Islands by incorporating them into a single Exploratory Permit Area; expanded the managed species to include Midway Deep-sea coral; and outlined provisions for experimental fishing permits designed

to stimulate the domestic fishery.

Amendment 2, implemented by rules published at 53 FR 27521 on 21 July 1988, defined overfishing with respect to Established Beds as follows: An Established Bed shall be deemed overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20% of its unfished condition. This definition applies to all species of precious corals, and is based on cohort analysis of the pink coral, *Corallium secundum*.

7.0 NEED FOR ACTION

7.1 Description of Fishery

No significant domestic precious corals fishery has developed since the FMP was implemented. The lack of domestic involvement is due, at least in part, to the present 1000 kg annual harvest quotas for Exploratory Areas. Some potential entrants have indicated that the quotas are too small to provide the economic incentive necessary to induce exploration. No legal foreign fishing has taken place possibly for the same reason.

Amendment 1 to the FMP established an "experimental fishing permit" (EFP) system, under which a US interest could potentially fish with higher quotas or innovative gear under tightly monitored conditions. It was hoped that this approach would stimulate the domestic fishery. However, only one party fished under an EFP in the EEZ around Hawaii, making three trips with virtually no success. There has been no fishing since 1990.

7.2 Status of Coral Beds

The cumulative harvest of *Corallium* from the Makapu'u bed between 1966 and 1978 was about 32% of the standing stock. The average annual harvest was 685 kg, somewhat less than the estimated MSY of 1000 kg. Surveys of the Makapu'u bed in 1983 and 1985 showed substantial recovery at rates in close agreement with model predictions in the FMP. The Makapu'u bed appears to be healthy enough to once again sustain a small domestic harvest quota. The most recent survey of the bed showed it to be at least 15 percent larger than indicated by previous surveys.[1] The survey also showed that the recovery of pink coral has increased from 74% of the virgin biomass in 1978 to 90% in 1997. However, the assessment indicated that the recruitment of gold coral at the Makapu'u bed may be very low.

Nothing is known about the status of the precious coral resources in the Exploratory Areas. Foreign poaching has been a serious problem in the past. During the 1980s Japanese and Taiwanese coral vessels violated the EEZ frequently near the Hancock Seamounts. In 1985, Taiwanese coral draggers reportedly poached about 100 tons of *Corallium* from seamounts within the EEZ north of Gardner Pinnacles and Laysan Island. Absence of poaching since that

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[1]Richard W. Grigg. Resurvey of the Makapu'u Precious Coral Bed: August 21 - 22, 1997. Report to the 94th meeting of the Western Pacific Council held in November 1997.

me could indicate that the resources in these areas have been economically exhausted. With the xception of the Makapu'u bed and those beds harvested by foreign fishermen, most other precious coral beds within the EEZ are believed to be in an unexploited or "virgin" state.

7.3 Need for Action

The Council is operating in an environment of great uncertainty with regard to the distribution and abundance of precious coral resources, especially with regard to those in Exploratory Areas. Given this situation, the Council includes in the FMP (through this amendment) framework procedures which would provide for adjustments of certain management measures as more information on the fisheries and the status of the stocks becomes available. A framework process offers greater flexibility and shorter response times to detectable changes in the fishery. For example, quotas could be quickly brought in line with the abundance and distribution of the resource as information is collected by the fishery. In the case of the harvest of black corals, a quota or other regulations could be readily imposed, if necessary. With the framework procedures, quota revisions would not require amending the FMP, which can be quite slow and costly for both the Council and NMFS.

8.0 PREFERRED ACTIONS

The following framework process allows for modifying the regulatory measures that overn the precious corals fishery if the information supports such changes.

8.1.1 Regulatory Procedure 1: Modification of Established Measures

Established measures are those that are, or have been, in place for the fishery, including: fishing seasons, classification of coral beds, harvest quotas for all management unit species, size restrictions, area restrictions, gear restrictions, incidental catches, and permit conditions. The estimated and potential impacts of these measures have been evaluated in the FMP. Changes in established measures would be made under the following procedure:

1. The Council would identify problems that may warrant action through the annual report or a separate report from the Plan Team, SSC, permit holders, enforcement officials, NMFS, or other sources.

2. At a Council meeting following completion or receipt of a report identifying a problem, the Council would discuss whether changes to established conservation and management measures would resolve the problem. Notice to the public and news media preceding the meeting would indicate that the Council intends to discuss and possibly recommend regulatory adjustments through the framework process for established measures to address the issue or problem. The notice must summarize the issue(s) and the basis for recommending the measures being reviewed and would refer interested parties to the document(s) pertaining to the issue.

3. Based on discussions at the meeting, which include participation by the Plan Team, SSC, or other Council organizations, the Council would decide whether to recommend action by the

Regional Administrator.

4. The Regional Administrator would be asked to indicate any special concerns or objections to the possible actions being considered under the framework process and, if there are any concerns or objections, would be asked for ways to resolve them.

5. If the Council decides to proceed, a document would be prepared describing the problem and the proposed regulatory adjustment to resolve it. The document would demonstrate how the adjustment is consistent with the purposes of the established measure and that the impacts had been addressed in the document supporting the original imposition of the measure. The document would be submitted to the Regional Administrator with a recommendation for action. The Council may indicate its intent that the recommendations are to be approved or disapproved as a single action.

6. If the Regional Administrator approves part or all of the Council's recommendation, the Secretary, in accordance with the Administrative Procedure Act, may implement the approved change in an established measure by publishing a final rule, waiving advance notice and comment. This does not preclude the Secretary from deciding to provide additional opportunity for advance notice and comment, but contemplates that the Council process will satisfy the requirements of the Magnuson Act and Administrative Procedure Act regarding prior notice and comment. Established measures are measures that have been evaluated and applied in the past, and adjustments under this framework must be consistent with the original intent of the measure and within the scope of analysis in previous documents supporting the existing measure.

8.1.2 Regulatory Procedure 2: Establishment of New Measures

New measures are those that have not been used before in managing the precious corals fishery. New measures may have been previously considered but rejected in a past FMP amendment or document, but the specific impacts on the beds and on permit holders have not been evaluated in the context of current conditions. Potential new measures include, but are not limited to, a limited access system or individual transferable quotas. The procedure for establishing new measures is as follows:

1. A Plan Team report (annual or in-season), or input from advisors, NMFS, or other agencies will first bring attention to a problem or issue that needs to be addressed at the next Council meeting. In its notice announcing the meeting, the Council would summarize the concern or issue raised, the party that has raised the problem, and the extent to which it is a new problem or a problem that may require new management measures. The Council would seek to identify all interested persons and organizations and solicit their involvement in discussion and resolution of this problem through the Council process, and the Council meeting notice in the *Federal Register* would emphasize that this problem will be discussed and that proposed actions may result.

2. The document presenting the problem to the attention of the Council would be distributed to all advisory bodies of the Council who have not yet received it, with a request for comments. The document also would be distributed to the Council's mailing list associated with the FMP to

[redacted]t comments and to indicate the Council would take up action at the following meeting. The [redacted]ncil's chairperson may request the Council's Precious Corals Standing Committee to discuss the issue and review the comments, if any, of the Plan Team, Advisory Panel, or SSC, and develop recommendations for Council action.

4. At the meeting, the Council would consider the recommendations of its Precious Corals Standing Committee, if any, and other Council organizations and would take comments from the public concerning the possible course of action. If the Council agrees to proceed with further action under the framework process, the issue would be placed on the agenda for the following meeting. A document describing the issue, alternative ways to resolve the issue, the preferred action, and the anticipated impacts of the preferred action, would be prepared and distributed to the public with a request for comments. A notice would be published in the *Federal Register* summarizing the Council's deliberations and preferred action and indicating the time and place for the Council meeting to take final action.

5. In its notice for the following meeting, the Council would indicate that it may take final action on the possible adjustment to regulations under this section. At the meeting, the Council would consider the comments received as a result of its solicitation of comments and take public comments during the meeting on the issue or problem. The Council would consider any new information presented or collected and analyzed during the comment period. The Regional Administrator would be asked to indicate any objections or concerns about any or all components [redacted]e measures being considered. The Council would then decide whether to recommend the [redacted]lishment of new management measures.

6. If the Council decides to proceed, it would submit its proposal to the Regional Administrator for consideration, with supporting rationale and an analysis of the estimated biological, economic, and social impacts of the proposed action. The Council may indicate its intent that all components of its recommendations be approved or disapproved as a single action.

7. If the Regional Administrator concurs in whole or in part, the Secretary, in accordance with the Administrative Procedure Act, may implement the approved new measures by publishing a final rule, waiving advance notice and comment. Nothing in this procedure is intended to preclude the Secretary from deciding to provide additional opportunity for advance notice and comment in the *Federal Register*, but contemplates that the Council process (which includes two Council meetings with opportunity for public comment at each) would satisfy that requirement.

8. If a new action is approved and implemented, future adjustments may be made under the procedure for established measures (see Regulatory Procedure 1, above).

9.0 IMPACT ASSESSMENT

9.1 Establish Framework Procedures for Regulatory Changes

9.1.1 Impact of the Preferred Alternative

Adoption of the framework processes will not in itself result in any biological, economic or social impacts. Each action taken under the framework processes will entail documentation of the analysis of impacts of that action. To the extent appropriate, the Council will need to prepare regulations, regulatory analyses, environmental assessments, or other documents depending on the scope of the action, which framework process (if any) is being used, and the types and magnitude of impacts involved.

By facilitating the refinement of existing harvest quotas as new data becomes available a framework process would promote domestic involvement without endangering the long-term productivity of the coral beds. In addition, it may be necessary to impose a quota or other regulations on the harvest of black corals, if a fishery for those corals develops. Adoption of a framework process should simplify the adjustment of conservation and management measures, and reduce the costs of those adjustments to the Federal government. Once the process is in place, many future adjustments could be made with a single notice in the *Federal Register* rather than through full FMP amendment procedures. The notice process is faster and entails less cost for *Federal Register* publications.

This alternative recognizes that the FMP has fallen short of its intention to promote a domestic fishery for precious corals. The FMP adopted a precautionary approach because historical evidence indicated the ease with which the resource could be overfished and depleted. Using framework procedures, the Council may be able to better reconcile the objectives of developing a sustainable domestic fishery without going through a formal FMP amendment, which can be slow and costly.

9.1.2 Impact of the Rejected Alternative

9.1.2.1 No action

Among the objectives of the fishery management plan are to encourage the discovery and exploration of new beds. The lack of domestic involvement revolves around the present 1000 kg annual harvest quotas for Exploratory Areas. Potential entrants have indicated that Exploratory Area quotas are too small to provide the economic incentive necessary to encourage domestic participation.

If new scientific data becomes available that would support making an adjustment in the quota for an Exploratory Area, the establishment of a quota level, or other changes in the FMP, could be accomplished by preparing full FMP amendments. However, this alternative would entail relatively slow response times and high administrative costs.

9.2 Evaluation of impacts relative to National Standards for Fishery Conservation and Management

National Standard 1 -- The amendment should tend to increase the net benefits of the fishery to the nation while preventing overfishing of the fishery resources.

National Standard 2 -- Adoption of a framework process would provide for adjustments of certain management measures as more information on the fisheries and the status of the stocks becomes available.

National Standard 3 -- The amendment may encourage the exploration of new precious coral beds, while providing for timely adjustment of management measures as new beds are discovered.

National Standard 4 -- The amendment will not discriminate between residents of different states.

National Standard 5 -- By facilitating the refinement of existing harvest quotas as new data becomes available a framework process could potentially improve the profitability of harvest operations without endangering the long-term productivity of the coral beds.

National Standard 6 -- The amendment will improve the ability to take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches.

National Standard 7 -- Adoption of a framework process should simplify the adjustment of conservation and management measures, and reduce the costs of those adjustments to the Federal government.

National Standard 8 -- A framework process could potentially improve the economic viability of harvest operations.

National Standard 9 -- Current precious coral harvesting technology (utilizing manned or unmanned submersibles) is highly selective and minimizes bycatch.

National Standard 10 -- The amendment will have a neutral effect on safety at sea.

10.0 RELATIONSHIP OF AMENDMENT 3 TO OTHER APPLICABLE LAWS AND POLICIES

10.1 Coastal Zone Management Act (CZMA)

The CZMA requires a determination that a FMP or amendment has no effect on the land or water uses or natural resources of the coast zone, or is consistent to the maximum extent practicable with an affected State's approved coastal zone management program. A copy of the proposed amendment will be submitted to the Office of State Planning, State of Hawaii for review and concurrence with a determination made by the Council that the amendment is consistent, to the maximum extent practicable, with their coastal zone management programs.

10.2 Endangered Species Act (ESA)

The Council has concluded that Amendment 3 is not likely to have any effect on any listed

endangered or threatened species, or habitat of those species.

10.3 Marine Mammal Protection Act (MMPA)

All fisheries, including the precious coral fishery, in the Western Pacific region are designated as Category 3, meaning that fishermen must report interactions with marine mammals, but they are not required to obtain exemption certificates in order to fish. This amendment does not require redesignation of MMPA category for the western Pacific precious coral fishery.

10.4 Paperwork Reduction Act (PRA)

The PRA requires federal agencies to minimize paperwork and reporting burdens whenever collecting information form the public. No additional record-keeping and reporting requirements are necessary to implement Amendment 3.

10.5 Regulatory Flexibility Act (RFA)

The RFA establishes the principle that federal regulations should be tailored to the capacity of regulated entities to bear the regulatory burden. This amendment will not have a significant economic impact on a substantial number of fishermen. Also, the actions proposed by this amendment do not, at this time, require the issuance of new rules, review of existing rules, or development of legislative proposals concerning regulations. A regulatory impact review and flexibility analysis will be performed when a regulatory review becomes necessary.

10.6 Indigenous Peoples' Fishing Rights

No management measures in this amendment will adversely affect any native Carolinian, Chamorro, Hawaiian or Samoan traditional indigenous fishing practices.

Section 305(i) of the Magnuson-Stevens Fishery Conservation and Management Act provides for the establishment of a Western Pacific Community Development Program. This provision was added to the Magnuson Act in 1996 to allow communities consisting of descendants of indigenous peoples in the Council's area to better share in the benefits from the area's fisheries. The Council and the Secretary, respectively, have discretion to develop and to approve programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council. The range of acceptable content of these programs will be determined by the Council and the Secretary working together through the FMP process. Measures to improve access to the precious corals fishery may include setting aside a percentage of specific quotas and area closures. Joint venture agreements for the harvesting and processing of precious corals may also be employed.

10.7 Vessel Safety Considerations

The US Coast Guard has been asked to review this amendment from the standpoint of vessel safety. No vessel safety issues were identified.

10.8 Environmental Assessment (and Finding Of No Significant Environmental Impact)

This section has been prepared in accordance with the requirements of the NEPA (see Section 10.5) to asess the potential for environmental impacts (including the human environment) that may result from Amendment 3 to the Precious Corals Fisheries FMP. The actions described in Sections 8.0 and 9.0 pose no unavoidable, adverse impacts on protected species, wetlands, or the marine environment. The preferred actions of this FMP amendment would establish framework procedures for regulatory changes.

The following addresses the ten points to be considered in determining whether or not impacts of the preferred actions, including alternatives, are significant (Section 1508.27 of the CEQ Regulations):

1. Beneficial and Adverse Impacts. There would be beneficial (preferred actions) and potential adverse impacts (status quo alternative) from actions considered in this document. These impacts are described in Section 9.0.

2. Public Health or Safety. No impact on public health or safety is expected from the actions.

3. Unique Characteristics. None of the actions would be expected to have any significant adverse impact on unique characteristics of the Western Pacific region such as historic or cultural resources, park lands, wetlands, or ecologically critical areas.

4. Controversial Effects. No significant controversial issues for the public are expected.

5. Uncertainty or Unique/Unknown Risks. The preferred actions are not expected to have any significant effects on the human environment that are highly uncertain or involve unique or unknown risks.

6. Precedent/Principle Setting. The preferred actions are not expected to have any significant effects in establishing a precedent and do not represent a decision in principle about future precious corals management.

7. Relationship/Cumulative Impact. The preferred actions are not expected to have any significant cumulative impacts that could have a substantial adverse effect on the precious coral resources or any related resource. The cumulative impacts are expected to be beneficial.

8. Historical/Cultural Impacts. No significant effects from any actions considered in this amendment would be expected on historical sites listed in the National Register of Historic Places and will not result in any significant impacts on scientific, cultural, or historic resources.

9. Endangered/Threatened Impacts. The actions are not likely to have any impact on any listed endangered or threatened species, or the habitat of those species.

10. Interaction with Existing Laws for Habitat Protection. No interaction which might threaten a violation of Federal, state, or local law or requirements imposed for the protection of the environment are expected from any of the action considered in this FMP amendment.

Finding of No Significant Impact: Based on the information contained in this combined Amendment 3 and EA, it is concluded that the preferred actions and alterative actions will not have a significant effect on the human environment. Therefore, the preparation of an environmental impact statement is not required.

In response to the Sustainable Fisheries Act, the Council intends to prepare a comprehensive amendment for all of its FMP's, including the Precious Corals FMP, to implement SFA provisions to identify and minimize adverse effects on essential fish habitat. As part of this initiative, which must comply with NEPA requirements, an EA will be prepared for the Precious Corals FMP. The date for submitting that FMP amendment is October 1998.

11.0 APPENDICES

11.1 Draft Proposed Regulations

PART 660 – Fisheries off West Coast and Western Pacific States

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C 1801 et. seq.

2. A new §660.89 is added to Subpart F to read as follows:

§660.89 Framework procedures.
(a) Introduction. New management measures may be added through rulemaking if new information demonstrates that there are biological, social, or economic concerns in precious coral permit area. The following framework process authorizes the implementation of measures that may affect the operation of the fisheries, gear, quotas, season, or changes in catch and/or effort.

(b) Annual report. By June 30 of each year, the Council-appointed Precious Coral Team will prepare an annual report on the fisheries in the management area. The report shall contain among other things, recommendations for Council action and an assessment of the urgency and effects of such action(s).

(c) Procedure for established measures.
(1) Established measures are management measures that, at some time, have been included in regulations implementing the FMP, and for which the impacts have been evaluated in Council/NMFS documents in the context of current conditions.

(2) Following the framework procedures of Amendment 3 to the FMP, the Council may recommend to the Regional Administrator that established measures be modified, removed, or re-instituted. Such recommendation shall include supporting rationale and analysis, and shall be made after advance public notice, public discussion, and consideration of public comment. NMFS may implement the Council's recommendation by rulemaking if approved by the Regional Administrator.

(d) Procedure for new measures.
(1) New measures that have not been included in regulations implementing the FMP, or for which the impacts have not been evaluated in Council/NMFS documents in the context of current conditions.

(2) Following the framework procedures of Amendment 3 to the FMP, the Council will publicize, including by a Federal Register document, and solicit public comment on, any proposed new management measure. After a Council meeting at which the measure is discussed, the Council will consider recommendations and prepare a

Federal Register document summarizing the Council's deliberations, rationale, and analysis for the preferred action, and the time and place for any subsequent Council meeting(s) to consider the new measure. At subsequent public meeting(s), the Council will consider public comments and other information received to make a recommendation to the Regional Administrator about any new measure. NMFS may implement the Council's recommendation by rulemaking if approved by the Regional Administrator.

coordinates for Channel 269C at Azle, Texas, are 33–23–20 and 97–43–03. The reference coordinates for Channel 267C1 at Lawton, Oklahoma, are 34–32–31 and 98–31–40. With this action, the proceeding is terminated. A filing window for Channel 282C2 at Olney, Texas, will not be opened at this time. Instead the issue of opening a filing window for this channel will be addressed by the Commission in a subsequent order.

EFFECTIVE DATE: November 17, 1998.

FOR FURTHER INFORMATION CONTACT: Robert Hayne, Mass Media Bureau, (202) 418–2177.

SUPPLEMENTARY INFORMATION: This is a synopsis of the Commission's Report and Order adopted September 23, 1998, and released October 2, 1998. The full text of this decision is available for inspection and copying during normal business hours in the FCC Reference Center (Room 239), 1919 M Street, NW, Washington, D.C. The complete text of this decision may also be purchased from the Commission's copy contractor, International Transcription Service, Inc., (202) 857–3805, 1231 M Street, NW, Washington, DC 20036.

List of Subjects in 47 CFR Part 73

Radio broadcasting.

Part 73 of Title 47 of the Code of Federal Regulations is amended as follows:

PART 73—[AMENDED]

1. The authority citation for Part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334, 336.

§ 73.202 [Amended]

2. Section 73.202(b), the Table of FM Allotments under Oklahoma, is amended by removing Channel 268C1 and adding Channel 267C1 at Lawton.

3. Section 73.202(b), the Table of FM Allotments under Texas, is amended by removing Channel 269C1 at Denison-Sherman, and adding Azle, Channel 269C.

4. Section 73.202(b), the Table of FM Allotments under Texas, is amended by adding Channel 282C2 at Olney.

5. Section 73.202(b), the Table of FM Allotments under Texas, is amended by removing Channel 248C2 at Olney and adding Archer City, Channel 248C2.

Federal Communications Commission.

John A. Karousos,

Chief, Allocations Branch, Policy and Rules Division, Mass Media Bureau.

[FR Doc. 98–27939 Filed 10–16–98; 8:45 am]

BILLING CODE 6712–01–U

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 73

[MM Docket No. 97–67, RM–8996, RM–9079]

Radio Broadcasting Services; Freeport and Cedarville, IL

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document allots Channel 295A to Freeport, Illinois, and Channel 258A to Cedarville, Illinois. See 62 FR 7984, February 21, 1997; The reference coordinates for Channel 295A at Freeport, Illinois, are 42–19–28 and 89–35–13. The reference coordinates for Channel 258A at Cedarville, Illinois, are 42–21–50 and 89–40–59. With this action, the proceeding is terminated.

EFFECTIVE DATE: November 17, 1998.

FOR FURTHER INFORMATION CONTACT: Robert Hayne, Mass Media Bureau, (202) 418–2177.

SUPPLEMENTARY INFORMATION: This is a synopsis of the Commission's Report and Order in MM Docket No. 97–67, adopted September 23, 1998, and released October 2, 1998. The full text of this decision is available for inspection and copying during normal business hours in the FCC Reference Center (Room 239), 1919 M Street, NW, Washington, D.C. The complete text of this decision may also be purchased from the Commission's copy contractor, International Transcription Service, Inc., (202) 857–3805, 1231 M Street, NW, Washington, DC 20036.

List of Subjects in 47 CFR Part 73

Radio Broadcasting.

Part 73 of Title 47 of the Code of Federal Regulations is amended as follows:

PART 73—[AMENDED]

1. The authority citation for Part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334, 336.

§ 73.202 [Amended]

2. Section 73.202(b), the Table of FM Allotments under Illinois, is amended by adding Channel 295A at Freeport.

3. Section 73.202(b), the Table of FM Allotments under Illinois, is amended by adding Cedarville, Channel 258A.

Federal Communications Commission.

John A. Karousos,

Chief, Allocations Branch, Policy and Rules Division, Mass Media Bureau.

[FR Doc. 98–27938 Filed 10–16–98; 8:45 am]

BILLING CODE 6712–01–U

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 980714174–8250–02; I.D. 061898B]

RIN 0648–AK60

Fisheries Off West Coast States and in the Western Pacific; Western Pacific Precious Coral Fisheries; Amendment 3

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce

ACTION: Final rule.

SUMMARY: NMFS issues this final rule to implement Amendment 3 to the Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region (FMP). This rule establishes framework procedures enabling management measures to be established and/or changed via rulemaking rather than through FMP amendment. This action will allow the Western Pacific Fishery Management Council (Council) to respond quickly to rapid changes in the Western Pacific precious corals fisheries.

DATES: Effective November 18, 1998.

ADDRESSES: Copies of Amendment 3 may be obtained from Kitty Simonds, Executive Director, Western Pacific Fishery Management Council, 1164 Bishop St., Suite 1400, Honolulu, HI 96813.

FOR FURTHER INFORMATION CONTACT: Alvin Katekaru, Fishery Management Specialist, Pacific Islands Area Office, NMFS at (808) 973–2985 or Kitty Simonds at (808) 522–8220.

SUPPLEMENTARY INFORMATION: The FMP was approved in 1980 and governs the harvest of precious corals in the U.S. exclusive economic zone of the western Pacific region. This rule, which implements Amendment 3, establishes framework procedures enabling the Council and NMFS to change elements of the management regime governing the Western Pacific precious coral fisheries through rulemaking rather than by FMP amendment. The procedures specify how certain new management measures may be established through rulemaking if new information demonstrates that there are biological, social, or economic concerns in the precious coral permit areas. Also, the framework includes somewhat more streamlined procedures allowing adjustments to established management measures. Under the

framework, the Southwest Regional Administrator, NMFS, with the concurrence of the Council, could initiate rulemaking. Before taking an action under the framework process, the impacts of that action would be analyzed. Advance public notice, public discussion, and consideration of public comment on each framework action are required.

Amendment 3 describes the framework procedure in more detail than the regulatory text of this rule. The history of the development of Amendment 3 is summarized in the preamble to the proposed rule (63 FR 39064, July 21, 1998) and is not repeated here.

Comments

No comments were received from the public on the proposed rule.

Changes to the Proposed Rule

NMFS simplified the last sentence in section 660.89(d)(2) to read "If approved by the Regional Administrator, NMFS may implement the Council's recommendation by rulemaking." In the proposed rule the sentence ended with " ...and final rulemaking. In some instances, or if circumstances warrant, by proposed and final rulemaking." The word "rulemaking" alone should indicate NMFS will adhere to the Administrative Procedure Act, which generally requires a **Federal Register** notice giving advance notice and soliciting public comment before an agency issues a final rule.

Classification

The Administrator, Southwest Region, NMFS, determined that Amendment 3 is necessary for the conservation and management of the precious coral fisheries and that it is consistent with the Magnuson-Stevens Fishery Conservation and Management Act and other applicable laws.

This final rule has been determined to be not significant for purposes of E.O. 12866.

The Assistant General Counsel for Legislation and Regulation of the Department of Commerce certified to the Chief Counsel for Advocacy of the Small Business Administration when the rule was proposed, that it would not have a significant economic impact on a substantial number of small entities. No comments were received regarding this certification. Since the basis for this certification has not changed, a regulatory flexibility analysis was not prepared.

List of Subjects in 50 CFR Part 660

Administrative practice and procedure, American Samoa, Fisheries, Fishing, Guam, Hawaiian Natives, Indians, Northern Mariana Islands, Reporting and recordkeeping requirements.

Dated: October 13, 1998.

Rolland A. Schmitten,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 660 is amended as follows:

PART 660 — FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.*

2. A new § 660.89 is added to subpart F to read as follows:

§ 660.89 Framework procedures.

(a) *Introduction.* Established management measures may be revised and new management measures may be established and/or revised through rulemaking if new information demonstrates that there are biological, social, or economic concerns in a precious coral permit area. The following framework process authorizes the implementation of measures that may affect the operation of the fisheries, gear, quotas, season, or levels of catch and/or in effort.

(b) *Annual report.* By June 30 of each year, the Council-appointed Precious Coral Team will prepare an annual report on the fisheries in the management area. The report will contain, among other things, recommendations for Council action and an assessment of the urgency and effects of such action(s).

(c) *Procedure for established measures.* (1) Established measures are management measures that, at some time, have been included in regulations implementing the FMP, and for which the impacts have been evaluated in Council/NMFS documents in the context of current conditions.

(2) According to the framework procedures of Amendment 3 to the FMP, the Council may recommend to the Regional Administrator that established measures be modified, removed, or re-instituted. Such recommendation will include supporting rationale and analysis and will be made after advance public notice, public discussion, and consideration of public comment. NMFS may implement the Council's recommendation by rulemaking if approved by the Regional Administrator.

(d) *Procedure for new measures.* (1) New measures are management measures that have not been included in regulations implementing the FMP, or for which the impacts have not been evaluated in Council/NMFS documents in the context of current conditions.

(2) Following the framework procedures of Amendment 3 to the FMP, the Council will publicize, including by a **Federal Register** document, and solicit public comment on, any proposed new management measure. After a Council meeting at which the measure is discussed, the Council will consider recommendations and prepare a **Federal Register** document summarizing the Council's deliberations, rationale, and analysis for the preferred action and the time and place for any subsequent Council meeting(s) to consider the new measure. At a subsequent public meeting, the Council will consider public comments and other information received before making a recommendation to the Regional Administrator about any new measure. If approved by the Regional Administrator, NMFS may implement the Council's recommendation by rulemaking.

[FR Doc. 98–27972 Filed 10–16–98; 8:45 am]

BILLING CODE 3510–22–F

WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

A Framework Adjustment to Measures in the Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region

Regarding Harvest Quotas, Definitions, Size Limits, Gear Restrictions, and Bed Classifications

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Including an Environmental Assessment and
Regulatory Impact Review/Final Regulatory Flexibility Analysis

March 15, 2001

Western Pacific Regional Fishery Management Council
1164 Bishop St., Suite 1400
Honolulu, Hawaii 96813

Telephone (808) 522-8220
Fax (808) 522-8226

2.0 Summary

The domestic fishery for pink, gold and bamboo precious corals in the EEZ of the Western Pacific region has been nearly dormant for two decades. However, a number of firms have recently expressed interest in participating in the precious coral fishery in the EEZ around Hawaii using selective gear. In addition, recent research and surveys have provided new information on precious corals in the waters around the Hawaiian Islands, including information on the size and condition of certain classified precious coral beds, potential increases in fishing pressure on black corals, the presence of a new precious coral bed near French Frigate Shoals and the possible importance of precious coral beds as foraging areas for the endangered Hawaiian monk seal (*Monachus schauinslandi*). Based on these recent research and survey findings and the prospect of a renewal of the fishery, the Council recommends the following adjustments to the regulations governing the precious coral fisheries in the EEZ of the Western Pacific region:

1) Suspend the harvest quota for gold coral at the Makapu'u Bed until additional information is available on the impact of harvesting on subsequent recruitment of gold coral at the Makapu'u Bed.

2) Redefine live precious coral as precious coral that has live coral polyps or tissue. Redefine dead precious coral as precious coral that no longer has any live coral polyps or tissue.

3) Apply size limits to live coral only.

4) Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch, measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony. Persons who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule would qualify for an exemption which allows the hand harvest of black coral that has attained a minimum base diameter of 3/4 inches, measured on the widest portion of the skeleton at a location just above the holdfast.

5) Allow only selective gear to harvest precious corals from all permit areas.

6) Apply the current size limit for pink coral to all permit areas.

7) Revise the boundaries of Brooks Bank, Permit Area C-B-3, to include the area within a radius of 2.5 nautical miles of a point at 23° 58.8' N and 166° 42' W. At Brooks Bank change the harvest quota for pink coral to 200 kg and suspend the harvest quota for gold coral until additional scientific information becomes available on the impact of harvesting gold coral on monk seal foraging habitat.

8) Classify the newly-discovered FFS-Gold Pinnacles Bed as a conditional bed, Permit Area C-B-5, which includes the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W. At the FFS-Gold Pinnacles Bed set the annual harvest quota for all types of

precious coral at zero until additional information becomes available on the impact of harvesting gold coral on monk seal foraging habitat.

In addition to the above regulatory measures, the Council recommends that 1) all managed species of precious corals be listed on the NMFS Daily Precious Coral Harvest Log and Precious Coral Sales Trip Report; and 2) the NMFS Daily Precious Coral Harvest Log include the following fishing information: (i) Beginning and ending time, and date, of all dives, including the dives when no harvest is made; (ii) Beginning and ending position in degrees latitude and longitude of each dive and distance traveled; (iii) Maximum and minimum depth of each dive; (iv) Number of live and dead colonies harvested on each dive by species; (v) Weight of harvested coral on each dive by species, to the nearest tenth of a kilogram (landed weight air dried for at least 24 hours); (vi) Number of live and dead colonies damaged but not harvested on each dive by species. Any video tapes made during harvest operations shall be made available to NMFS upon request. The video recording should continuously display date and time. This is a non-regulatory change as the current regulations already require harvesters to fill out logs as supplied by NMFS.

During the preparation of this document, President Clinton issued Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001), which together establish conservation measures for the newly formed Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Under these orders, commercial fishing effort and take in the reserve are capped at each permittee's take in the year preceding December 4, 2000. Since there were no Federal precious coral permits issued for any harvestable Northwestern Hawaiian Islands (NWHI) beds (Brooks Banks and 180 Fathom Beds), the Executive Orders place a permanent zero harvest cap on these beds (despite their existent harvest quotas). The effect of this cap on the single Hawaii exploratory area (permit area X-P-H which includes waters around both the NWHI and the main Hawaiian Islands) is less clear as, although there was some harvest of precious corals from the main Hawaiian Islands portion of this area in 2000, there was no harvest from the NWHI portion. How this historical take will now be allocated within the Hawaii exploratory area remains unresolved. The Precious Corals Fishery Management Plan will be revised to reflect these measures as they are clarified by the Reserve Operating Plan which is now being developed by the National Ocean Service. This Operating Plan is anticipated to contain implementing regulations as well as a complete analysis of the impacts of those regulations on the human environment.

3.0 Table of Contents

3.1 Tables and Figures

4.0 Introduction

4.1 Responsible agencies

The Western Pacific Regional Fishery Management Council (Council or WPRFMC) was established by the Magnuson Fishery Conservation and Management Act to develop fishery management plans (FMPs) for fisheries operating in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands and the remote US Pacific Island possessions.[1] Once an FMP is approved by the Secretary of Commerce (Secretary), it is implemented by Federal regulations which are enforced by the National Marine Fisheries Service (NMFS) and the US Coast Guard, in cooperation with state agencies.

For further information, contact:

Kitty M. Simonds
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WPRFMC
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Honolulu, HI 96813
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NMFS Pacific Islands Area Office
1601 Kapiolani Blvd., #1110
Honolulu, HI 96814-0047
Telephone: (808) 973-2937
Fax: (808) 973-2941

4.2 Public review process and schedule

Prior to the 16-18 June 1999 Council meeting an information document was circulated to all interested parties. This document outlined the nature of the problem and alternative solutions. At the Council meeting in June the Council considered recommendations made by the Precious Corals Standing Committee and other advisory groups such as the Precious Coral Fishery Plan Team and Scientific and Statistical Committee. The Council agreed to proceed with further action under the framework process, and the issue was placed on the agenda for the 18-22 October 1999 Council meeting. A document describing the issue, alternative ways to resolve the issue, the preferred action and the anticipated impacts of the management alternatives was prepared and distributed to the public with a request for comments. A notice was published in the Federal Register summarizing the Council's deliberations and preferred action and indicating the time and place for the Council meeting to take final action. The Council took final action at the Council meeting on October 18-20, 1999. A proposed rule was published in the Federal Register on September 5, 2000, with a 30 day public comment period.

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[1] Howland Island, Baker Island, Jarvis Island, Johnston Atoll, Midway Island, Kingman Reef, Palmyra Atoll, and Wake Island.

4.3 List of preparers

This document was prepared by:

Donald Schug, Staff Economist
Western Pacific Regional Fishery Management Council

Marcia Hamilton, Fishery Program Specialist
National Marine Fisheries Service, Pacific Islands Area Office

and the following members of the WPRFMC Precious Coral Fishery Plan Team and Advisory Panel:

Richard Grigg, Marine Biologist (Plan Team Chair)
University of Hawaii, Department of Oceanography, Honolulu, Hawaii

Isaac Harp, Fisherman
Lahaina, Hawaii

David Jolley, Consultant (Advisory Panel Chair)
American Deepwater Engineering, Ltd., Honolulu, Hawaii

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Samuel Pooley, Industry Economist
NMFS, Southwest Region, Honolulu Laboratory

Frank Parrish, Fishery Biologist
NMFS, Southwest Region, Honolulu Laboratory

Clifford Slater, President, and Carl Marsh, Senior Vice President
Maui Divers of Hawaii, Ltd., Honolulu, Hawaii

5.0 Purpose and Need for Action

The domestic fishery for deep water (pink, gold and bamboo) precious corals in the EEZ of the Western Pacific region has been nearly dormant for two decades, with limited harvest of black corals taken from EEZ waters. During the late 1980s, non-selective tangle nets harvested about 450 kg of pink coral in the waters off the NWHI, but most of the colonies harvested were dead and of poor quality (Grigg 1993). However, a number of firms have recently expressed interest in participating in the precious coral fishery in the EEZ around Hawaii using selective gear. One of these firms has received a NMFS permit to harvest precious corals at the Makapu'u Bed and completed an exploratory survey of the bed. In addition, recent research and surveys have provided new information on precious corals in the waters around Hawaii, including information on the size and condition of certain classified precious coral beds, potential increases in fishing pressure on black corals, the presence of a new precious coral bed near French Frigate Shoals and the possible importance of precious coral beds as foraging areas for the endangered Hawaiian monk seal (*Monachus schauinslandi*). As a result of discussions of these research and survey findings and the prospects of a renewed fishery, the Council identified a number of problems for resolution. These can be grouped into eight areas as follows: potential overfishing of gold coral at the Makapu'u Bed; concerns that some gold coral stands may provide foraging habitat for the endangered Hawaiian monk seal; a possibility that the current definitions of live and dead coral may be inappropriate; a need to update the MSY and resultant harvest quota for pink coral at the Brooks Bank Bed; concerns for minimum size limits for black and pink corals; a possible need to limit all harvesters to selective gear types only; classification of a new bed discovered in the NWHI; and a need for greater details on the harvesting activities of fishery participants.

6.0 Existing Management Measures

6.1 Overview

The FMP for precious corals in the Western Pacific region was approved by the US Secretary of Commerce on May 20, 1980. The FMP covers domestic and foreign fishing for precious corals in the US EEZ of the Western Pacific region. Precious coral means any coral of the genus *Corallium,* including the following coral species:

Pink coral (also known as red coral), *Corallium secundum*
Pink coral (also known as red coral), *Corallium regale*
Pink coral (also known as red coral), *Corallium laauense*
Gold coral, *Gerardia* spp.
Gold coral, *Narella* spp.
Gold coral, *Calyptrophora* spp.
Bamboo coral, *Lepidisis olapa*
Bamboo coral, *Acanella* spp.
Black coral, *Antipathes dichotoma*
Black coral, *Antipathes grandis*
Black coral, *Antipathes ulex*

The FMP for precious corals in the Western Pacific region identifies the problem of managing a resource of unknown dimensions characterized by slow growth, low rates of mortality and low rates of recruitment.

Precious corals are known to exist in the EEZ around Hawaii and very likely exist in the EEZ around American Samoa, Guam, the Northern Mariana Islands and the remote US Pacific Island possessions, but virtually nothing is known of their distribution and abundance in those areas. To date, beds of pink, gold and/or bamboo coral have been found at seven locations in the Council's jurisdiction, all in the EEZ around Hawaii. This number includes a recently discovered bed near French Frigate Shoals in the Northwestern Hawaiian Islands (NWHI). There are also two known major beds of black coral in the Council's area, as well as several minor beds (Grigg 1998a). Most of these are located in Hawaii's state waters, however the largest (the Au'au Channel Bed) extends into the EEZ.

6.2 Definition of Beds

The plan treats separate precious coral beds as distinct management units because of their widely-separated patchy distribution and the sessile nature of individual colonies. There are two known major black coral beds in Hawaii's EEZ, these are not identified by regulation and to date have not been actively managed by this FMP. There are currently six identified deep water (pink, gold, bamboo) precious coral beds which are classified as established, conditional, refugia or exploratory. Established beds are ones for which appraisals of the MSY are reasonably precise. To date, only the Makapu'u Bed has been studied adequately enough to be classified as established. Lacking other data, the FMP assumes that ecological conditions at the Makapu'u Bed are representative of conditions at all other beds.

Conditional beds are ones for which optimum yields are estimated on the basis of bed characteristics relative to established beds. Four beds of precious corals are classified as conditional. Refugia beds are areas set aside for baseline studies and possible reproductive reserves. No harvesting of any type is allowed in those areas. The single refugium bed that has been designated - the Westpac Bed - is also located in the EEZ surrounding Hawaii. Exploratory areas are the unexplored portions of the EEZ. Separate exploratory permit areas are established for Hawaii, American Samoa, Guam and the remote US Pacific Island possessions. The classification and bounds of each bed are described in the FMP as follows in Table 1.

6.3 Gear Restrictions

Only selective gear is permitted in the EEZ around the main Hawaiian Islands, i.e., south and east of a line midway between Niihau and Nihoa Islands. Selective gear is defined in the FMP as gear used for harvesting precious corals that can discriminate or differentiate between types, size, quality or characteristics of living or dead corals. Use of both selective and non-selective gear is permitted on the conditional beds of Brooks Bank and the 180 Degree Fathom Bank and throughout the exploratory area around the NWHI.

6.4 Harvest Quotas and Rationale

The FMP contains an estimate of maximum sustainable yield (MSY) for pink coral at the Makapu'u Bed of 1,185 kg per year. This estimate is derived using an approximation of Gulland (1970) based on the assumption of a stable annual recruitment of 5,277 colonies, the observed density of colonies per unit of area, the known area of the bed, an estimated annual instantaneous mortality rate of 0.066, and an estimated maximum yield per recruit of 237 gm at an age of 31.4 years. This level of yield can be sustained only if a minimum limit for harvestable colony size is enforced at a size approximating that at which yield per recruit is greatest, which is possible only when selective harvesting methods are used. For pink coral, the minimum size limit is set at a colony height of 10 inches.

Table 1. Classification and bounds of precious coral beds identified in the FMP.

Bed	Location And Bounds	Area in km^2
Makapu'u (established)	Main Hawaiian Islands - the area within a radius of 2.0 nautical miles (nm) of a point at 21° 18.0 N lat., 157°32.5 W. long.	3.60
Keahole Point (conditional)	Main Hawaiian Islands - the area within a radius of 0.5 nm of a point at 19° 46.0 N. lat, 156° 06.0W. long.	0.24
Kaena Point (conditional)	Main Hawaiian Islands - the area within a radius of 0.5 nm of a point at 21° 35.4 N lat, 155° 22.9 W. long.	0.24
Brooks Bank (conditional)	Northwestern Hawaiian Islands - the area within a radius of 2.0 nm of a point at 24° 06.0N lat, 166° 48.0W. long.	1.6
180 Fathom Bank (conditional)	Northwestern Hawaiian Islands - the area within a radius of 2.0 nm of a point at 28° 50.2N. lat, 178° 53.4W.long	0.8
Westpac Bed (refugium)	Northwestern Hawaiian Islands - the area within a radius of 2.0 nm of a point at 28° 50.2N lat, 162° 35.0W long	0.8
Exploratory permit area X-P-H	Hawaii - all coral beds, other than established beds, conditional beds, or refugia, in the EEZ seaward of the State of Hawaii.	unknown
Exploratory permit area X-P-AS	American Samoa - all coral beds, other than established beds, conditional beds, or refugia, in the EEZ seaward of American Samoa.	unknown
Exploratory permit area X-P-G	Guam - all coral beds, other than established beds, conditional beds, or refugia, in the EEZ seaward of Guam.	unknown
Exploratory permit area X-P-PI	Pacific Island Possessions - all coral beds, other than established beds, conditional beds, or refugia, in the EEZ seaward of the U.S. Pacific Island Possessions	unknown

The optimum yield prescribed for the pink coral fishery on the Makapu'u Bed represents a modification of the MSY by reference to economic considerations affecting the coral harvesting industry. The 10 inch minimum colony height limit is approximately 1 inch shorter than the minimum size which would produce the theoretically highest yield per recruit. The departure from the ideal size limit is made to accommodate current practice in the fishery, where it is considered that a colony height of about 10 inches is the minimum below which harvest of the small, lower valued colonies is not an economically efficient use of the harvesting equipment. The lowered size limit is believed to slightly improve catch rates and the analyses presented in the FMP indicate that the effect on the MSY is negligible. To compensate for this relaxation of the theoretically most productive limit, and to provide a conservative buffer against the possibility of errors of over-estimation in the production analyses, the optimum yield is obtained by rounding the MSY figure downward to 1,000 kg per year.

The major difference between the MSY of 1,000 kg of pink coral per annum and the optimum yield is that the latter is established as 2,000 kg to be taken during any part of a 2-year period rather than 1,000 kg to be harvested each year. The reason for this biennial quota rule is that it is, according to industry sources, economically infeasible to tie up the expensive, specialized equipment required for selective harvesting of precious coral for only a part of each year on one coral bed, whereas the more flexible biennial schedule permits productive employment of the submersible craft for a greater part of the available time making it easier to deploy it in other areas after the quota for the Makapu'u Bed is taken. The analyses presented in the FMP indicate that any lowering of the long-term MSY by strategy would be negligible. Optimum yields for Makapu'u gold coral, based on an MSY of 300 kg per year, and Makapu'u bamboo coral, based on an MSY of 250 kg per year, have been determined by analogy with the case of pink coral and on the same rationale.

Optimum yields of pink, gold, and bamboo stocks on beds other than Makapu'u, for which there is no information available beyond the approximate gross area of the bed, are calculated by considering them to bear the same relation to the optimum yields of the Makapu'u stocks that the areas of the beds bear to the area of the Makapu'u Bed as follows:

$$\frac{\text{MSY for Makapu'u Bed}}{\text{Area of Makapu'u Bed}} = \frac{\text{MSY for Conditional Bed}}{\text{Area of Conditional Bed}}$$

Based on the discussion above, the FMP prescribes methods of harvest for each category of coral bed and harvest quotas for individual beds (Table 2). There are no quotas or size limits for the harvest of black corals. If non-selective gear is employed on conditional beds, the harvest quota is 20 percent of that allowed for selective harvesting because of the loss of potential growth of the undersized colonies that are harvested and failure of the gear to recover all of the coral colonies that it knocks down. The FMP defines non-selective gear as any gear used for harvesting corals that cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals

Table 2. Harvest quotas for precious coral beds.

Name of Bed	Type of Bed	Harvest Quota	Number of Years	Gear Restriction
Makapuu Bed	Established	Pink --- 2,000 kg Gold --- 600 kg Bamboo --- 600 kg	2	Selective only
Ke-ahole Point	Conditional	Pink --- 67 kg Gold --- 20 kg Bamboo --- 17 kg	1	Selective only
Kaena Point	Conditional	Pink --- 67 kg Gold --- 20 kg Bamboo --- 17 kg	1	Selective only
Brooks Bank	Conditional	Pink --- 444 kg (see Note 1 below) Gold --- 133 kg Bamboo -- 111 kg	1	Selective or Non-Selective (see Note 2 below)
180 Fathom Bank	Conditional	Pink --- 222 kg Gold --- 67 kg Bamboo --- 56 kg	1	Selective or Non-Selective (see Note 2 below)
Westpac Bed	Refugium	Zero (0 kg)	N/A	N/A
Hawaii, American Samoa, Guam, US Pacific Island possessions	Exploratory	1,000 kg per area, all species combined (except black corals)	1	Selective or Non-Selective (see Notes 2 and 3 below)

Note 1: The final rule implementing the FMP published on 20 August 1983 lists the harvest quota for pink coral at Brooks Bank as 17 kg. This is a typographical error. The correct harvest quota is 444 kg.
Note 2: Only 1/5 of the indicated quota amount is allowed if non-selective gear is used; that is, the non-selective harvest will be multiplied by 5 and counted against the quota. If both selective and non-selective methods are used, the bed will be closed when $S + 5N = Q$, where S = selective harvest amount, N = non-selective harvest amount and Q = total harvest quota, for any single species on that bed.
Note 3: Only selective gear may be used to harvest coral from the EEZ seaward of the main Hawaiian Islands.

During the preparation of this document, President Clinton issued Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001), which together establish conservation measures for the newly formed Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Under these orders, commercial fishing effort and take in the reserve are capped at each permittee's take in the year preceding December 4, 2000. Since there were no Federal precious coral permits issued for any harvestable Northwestern Hawaiian Islands (NWHI) beds (Brooks Banks and 180 Fathom Beds), the Executive Orders place a permanent zero harvest cap on these

beds (despite their existent harvest quotas). The effect of this cap on the single Hawaii exploratory area (permit area X-P-H which includes waters around both the NWHI and the main Hawaiian Islands) is less clear as, although there was some harvest of precious corals from the main Hawaiian Islands portion of this area in 2000, there was no harvest from the NWHI portion. How this historical take will now be allocated within the Hawaii exploratory area remains unresolved. The Precious Corals Fishery Management Plan will be revised to reflect these measures as they are clarified by the Reserve Operating Plan which is now being developed by the National Ocean Service. This Operating Plan is anticipated to contain implementing regulations as well as a complete analysis of the impacts of those regulations on the human environment.

6.5 Other Regulations

Related to the issue of gear restriction is the application of the current size limit for pink coral. A minimum size limit of 10 inches (tree height) was implemented in order to help ensure that the estimated MSY for these precious coral species is not exceeded. However, this size limit can only be applied to pink coral at beds where the use of non-selective gear is prohibited because this gear by definition is non-selective for colony size. At present the size limit only applies to pink coral harvested from the Makapu'u, Keahole Point, and Kaena Point Beds. There are no size limits for pink coral at other beds since the use of non-selective gear is allowed everywhere else, except the EEZ around the Main Hawaiian Islands. This size limit applies to both live and dead pink coral.

The FMP defines dead coral as any precious coral that contains holes from borers or is discolored or encrusted at the time of removal from the seabed. According to this definition, coral that is only slightly bored or encrusted and still partially covered with live coral polyps or tissue is regarded as dead. The harvest quotas apply only to live coral, which is defined as any precious coral that is free of holes from borers, and has no discoloration or encrustation on the skeleton at the time of removal from the seabed.

Recordkeeping and reporting requirements in the FMP require that operators of vessels fishing for precious corals provide only the following fishing information: 1) date of harvest; 2) fishing effort in hours; 3) method of harvest; 4) area fished; 5) depth of water; 6) weight of coral harvested by species; and 7) observations that may be made about the habitat. Amendment 1 to the FMP placed all species *Corallium* harvested by the fishery within the management unit. However, only three species of *Corallium* are listed in the NMFS Daily Precious Coral Harvest Log and Precious Coral Sales Trip Report. In addition, the NMFS Daily Precious Coral Harvest Log and Precious Coral Sales Trip Report do not list the three managed species of black coral.

The FMP also includes a procedure for re-classifying coral beds from exploratory to conditional and from conditional to established as new beds are located and more catch and effort data become available which will allow more precise determinations of sustainable yields.

6.6 Amendments to the FMP

The FMP has been amended four times. The first amendment, implemented by a rule published at 50 FR 27519 on 21 July 1988, applied the management measures of the FMP to US Pacific Insular Areas other than Guam, American Samoa and the Northern Mariana Islands by incorporating them into a single exploratory permit area; expanded the managed species to include any coral of the genus *Corallium*; and outlined provisions for experimental fishing permits designed to stimulate the domestic fishery.

Amendment 2, implemented by a rule published at 56 FR 3072 on 28 January 1991, defined overfishing with respect to established beds as follows: an established bed shall be deemed overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20 percent of its unfished condition. This definition applies to all species of precious corals, and is based on cohort analysis of the pink coral, *Corallium secundum*.

Amendment 3, implemented by a rule published at 63 FR 55809 on 19 October 1998, established a framework procedure for adjustment of management measures. Established measures that are in place via rule-making procedures for the fishery include fishing seasons, classification of coral beds, harvest quotas for all managed species, size restrictions, area restrictions, gear restrictions, incidental catches and permit conditions.

Amendment 4, implemented by rules published at 50 FR part 660 on 19 April 1998, identifies and describes essential fish habitat for managed species of precious corals, discusses measures to minimize bycatch and bycatch mortality in the precious coral fishery and provides criteria for identifying when overfishing has occurred in the fishery. Amendment 4 designated the established bed of Makapu'u as a habitat area of particular concern[2] for the precious coral fishery because of the ecological function it provides, the rarity of the habitat type and its sensitivity to human-induced environmental degradation. Amendment 4 designated the Au'au Channel as a second habitat area of particular concern for the precious coral fishery because of the ecological function it provides, the rarity of the habitat type and its sensitivity to human-induced environmental degradation. Its commercial importance was also considered.

7.0 Management Objectives

The recommended adjustments to management measures in the FMP would help achieve the following objectives:

1) Allow a fishery for precious coral in the EEZ in the western Pacific but limit the fishery so as to achieve the Optimum Yield on a continuing basis;

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[2] Habitat areas of particular concern are areas of fish habitat that are particularly important to the long-term productivity of populations of one or more managed species, or are particularly vulnerable to degradation.

2) Prevent overfishing and wastage of resources;

3) Encourage the use of selective harvesting methods;

4) Minimize the harvest of colonies of coral which are immature;

5) Minimize the harvest of colonies of coral which have not reached their full potential for growth; and

6) Encourage the acquisition and analysis of new information concerning the distribution, abundance and ecology of precious corals.

8.0 Description of Alternatives

Eight management measures are proposed to address the new developments and potential problems presented above. These are discussed by issue below, and each includes a preferred alternative as well as several rejected alternatives.

Issue 1 - Conservation of gold coral
Alternative 1: No action
Alternative 2 (Preferred): Suspend the harvest quota for gold coral at the Makapu'u Bed until additional information is available on the impact of harvesting on subsequent recruitment of gold coral at this bed.
Alternative 3: Suspend the harvest quota for gold coral at all established and conditional beds.
Alternative 4: Implement a minimum size limit for gold coral.

Issue 2 - Definitions of live and dead coral
Alternative 1: No action.
Alternative 2 (Preferred): Redefine live precious coral as precious coral that has live coral polyps or tissue. Redefine dead precious coral as precious coral that no longer has any live coral polyps or tissue.
Alternative 3: Redefine live precious coral as precious coral that is standing upright. Redefine dead precious coral as precious coral that is no longer standing upright.

Issue 3 - Application of size limits
Alternative 1: No action
Alternative 2(Preferred): Apply size limits to live coral only.

Issue 4 - Conservation of black coral
Alternative 1: No action.
Alternative 2(Preferred): Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch, measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony. Persons who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule would qualify for an exemption which

allows the hand harvest of black coral that has attained a minimum base diameter of 3/4 inches, measured on the widest portion of the skeleton at a location just above the holdfast.
Alternative 3: Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch, measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony.
Alternative 4: Prohibit the harvest of black coral unless it has attained a minimum base diameter of 3/4 inches.

Issue 5 - Gear restrictions
Alternative 1: No action.
Alternative 2(Preferred): Only selective gear may be used to harvest precious corals from all permit areas.
Alternative 3: Only selective gear may be used to harvest precious corals from established and conditional beds.

Issue 6 - Application of size limit for pink coral
Alternative 1: No action.
Alternative 2(Preferred): Apply the current size limit for pink coral to all permit areas.
Alternative 3: Apply the current size limit for pink coral to all established and conditional beds.

Issue 7 - Adjusting Brooks Bank boundaries and harvest quotas
Alternative 1: No action.
Alternative 2 (Preferred): Revise the boundaries of Brooks Bank, Permit Area C-B-3, to include the area within a radius of 2.5 nautical miles of a point at 23° 58.8' N and 166° 42' W. At Brooks Bank change the harvest quota for pink coral to 200 kg and suspend the harvest quota for gold coral until additional scientific information becomes available on the impact of harvesting gold coral on monk seal foraging habitat.
Alternative 3: Increase the boundaries and reclassify the bed as a refugium.

Issue 8 - Classification of newly discovered French Frigate Shoals-Gold Pinnacles Bed
Alternative 1: No action.
Alternative 2.(Preferred): Classify the newly-discovered FFS-Gold Pinnacles Bed as a conditional bed, Permit Area C-B-5, which includes the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W. At the FFS-Gold Pinnacles Bed set the annual harvest quota for all types of precious coral at zero until additional information becomes available on the impact of harvesting gold coral on monk seal foraging habitat.
Alternative 3: Classify the bed as a refugium
Alternative 4: Classify the bed as a conditional bed and set the annual harvest quota for gold coral at 80 kg.

In addition to the above regulatory measures, the Council recommends that 1) all managed species of precious corals be listed on the NMFS Daily Precious Coral Harvest Log and Precious Coral Sales Trip Report; and 2) the NMFS Daily Precious Coral Harvest Log include the following fishing information: (i) Beginning and ending time, and date, of all dives, including

the dives when no harvest is made; (ii) Beginning and ending position in degrees latitude and longitude of each dive and distance traveled; (iii) Maximum and minimum depth of each dive; (iv) Number of live and dead colonies harvested on each dive by species; (v) Weight of harvested coral on each dive by species, to the nearest tenth of a kilogram (landed weight air dried for at least 24 hours); (vi) Number of live and dead colonies damaged but not harvested on each dive by species. Any video tapes made during harvest operations shall be made available to NMFS upon request. The video recording should continuously display date and time.

9.0 Affected Environment

9.1 Ecology

Adult pink, gold and bamboo coral are found in deep water (350-1500 m) on solid substrate where bottom currents are strong, while black coral also typically occurs on solid substrate but generally at depths less than 100 m. Precious coral polyps form colonies resembling small trees, and these colonies form aggregations called beds. Asexual reproduction (by fragmentation and reattachment) appears rare.

All precious corals are slow growing and are characterized by low rates of mortality and recruitment. Natural populations are relatively stable, and a wide range of age classes are generally present. This life history pattern (longevity and many year classes) has two important consequences with respect to exploitation. First, the response of the population to exploitation is drawn out over many years. Second, because of the great longevity of individuals, and the associated slow rates of turnover in the populations, a long period of reduced fishing effort is required to restore the ability of the stock to produce at the maximum sustainable yield (MSY) if a stock has been overexploited for several years.

In general western Pacific precious corals share several ecological characteristics: they lack symbiotic algae in tissues (they are ahermatypic) and most are found in deep water below the euphotic zone; they are filter feeders, and many are fan shaped to maximize contact surfaces with particles or microplankton in water column. Most species are uni-sexual or dioecious (sexes are separate) and the age at reproductive maturity is 12-13 years for *secundum* and *dichotoma*, with fertilization appearing to take place in the water column. Western Pacific precious coral larvae are more affected by light and temperature than are adults, with larvae of both *Anipathes* in Hawaii are known to be negatively phototactic which is why they are not found at depths less than 30 meters. The duration of the larval stage is unknown for most species, but Mediterranean studies of *Corallium rubrum* suggest that their larvae remain competent for several weeks. Species of *corallium* exist below the euphotic zone at depths between 350 and 1500 meters where temperature varies between 14 and 3 C. These larvae may avoid settling deeper where lower temperatures may prevent reproduction. Similarly, the lower limit of the *dichotoma* and *grandis* black corals coincides with top of thermocline in the high Hawaii islands (Grigg, 1993).

Little information is available on the ecological associations of the precious corals or their significance to the lives of other organisms. Microzooplankton and particulate organic matter are important in the diets of related *gorgonians*, and like other anthozoan species they are associated

with numerous kinds of commensal invertebrates. They are also associated with many species of other anthozoans. They have not been observed to be consistently associated with any kind of finfish or free-swimming invertebrate. Eucidarid sea urchins are known to prey upon precious corals.

Because of the great depths at which they live, the precious corals would be expected to be insulated from some short-term drastic changes in the physical environment. For the same reason, it is difficult to imagine circumstances in which man-made pollution would affect their environment, except in the unlikely event that large quantities of heavy material, such as waste from manganese nodule refining, were dumped directly on a bed. Nothing in known of the long-term effects of changes in environmental conditions, such as water temperature or current velocity, on the reproduction, growth, or other life activities of the precious corals. The oldest corals observed at Makapu'u are thought to be 75 years old, and it is believed that black corals may live even longer. Hawaii populations of *Corallium secundum* and *A.dichotoma* appear relatively stable implying a balance between recruitment and mortality.

9.2 Distribution

Precious corals are known to exist in the EEZ around Hawaii and very likely exist in the EEZ around American Samoa, Guam, the Northern Mariana Islands and the remote US Pacific Island possessions, but virtually nothing is known of their distribution and abundance in these areas. To date, beds of pink, gold and/or bamboo coral have been found only at seven locations in the Council's jurisdiction, all in the EEZ around Hawaii. This number includes a recently discovered bed near French Frigate Shoals in the Northwestern Hawaiian Islands (NWHI). There are also two known major beds of black coral in the Council's area, as well as several minor beds (Grigg 1998a). Most of these are located in Hawaii's state waters, however the largest (the Au'au Channel Bed) extends into the EEZ. The approximate areas of the seven identified beds of precious corals have been determined. These beds are small; only two of them have an area greater than 1 square kilometer, and the largest is 3.6 square kilometers in size. There are undocumented and unconfirmed reports that precious corals have been observed or exploited in widely scattered locations in the Western Pacific region: off American Samoa, Guam, the Northern Mariana Islands, and Wake Island, but no details are available. In some cases attempts at scientific surveys in areas referred to in such reports have failed to turn up any evidence of precious corals. Undocumented reports of large past commercial production by Japanese vessels on the Milwaukee Banks, some 500 miles beyond the northwestern extreme of the Leeward Hawaiian Islands, and the large physical area of those banks lead to conjecture that precious corals may at some locations occur in much larger aggregations than have as yet been demonstrated by scientific surveys. Asian coral fishers, who have roamed the western and central Pacific for decades, undoubtedly have undocumented and unorganized information on precious coral beds that is unavailable to U.S. researchers and administrators. It must be said that in general the available information on precious coral occurrence and distribution is fragmentary and very incomplete, and there is a high probability that further surveying and prospecting will reveal significant additional precious coral resources in areas under U.S. jurisdiction.

9.2.1 Makapu'u Bed

This bed has experienced the greatest exploitation and thus is the source of much of the available information about the region's precious corals. Estimates of the densities of occurrence of precious coral colonies in their habitat based on in site observations made at the Makapuu Bed, indicated a sparse, widely separated habit of growth. Surveys of this bed were made in the 1970s, and again in 1997.

In 1971 densities of commercial species were determined in an unexploited section of the bed and the size frequency distribution of pink coral was determined (Grigg, 1976). The average density of pink coral in the Makapu'u Bed was 0.022 colonies per square meter. Extrapolation of this figure to the entire bed (3.6 million square meters) results in a standing crop of 79,200 colonies. The 95% confidence limits of the standing crop are 47,200 to 111,700 colonies. Conversion of standing crop colonies to biomass produced an estimate of 43,500 kg for *C. secundum* in the Makapu'u Bed. The estimates of density for gold coral (*Gerardia* sp.) and bamboo coral (*Lepidisis olapa*) in the Makapu'u Bed were 0.003 colonies/m^2 and 0.01 colonies/m^2 respectively. However, the distributional patterns of both of these species were found to be very patchy, much more so than *C. secundum*, and the area where they occurred was only about half that for pink coral, or 1.8 m^2 .

The corresponding estimates of unfished abundance for gold and bamboo colonies were 5,400 and 18,000 colonies respectively. Data for the mean weight of colonies in the populations of gold and bamboo coral in the Makapu'u Bed were lacking, but rough estimates were 2.2 kg for gold coral and 0.6 kg for bamboo coral. Multiplying mean weights by densities led to rough estimates of standing crop of about 11,800 kg for *Gerardia* sp. and 10,800 for *Lepidisis* sp.

An analysis of growth rings in the cross sections of pink coral branches suggests that colony height increases about 0.9 cm/year, at least to an age of about 30 years (Grigg, 1976). The largest colonies of pink gold found at Makapu'u were rarely more than 60 cm in height. Gold coral colonies were seen to reach a height of about 250 cm, while *Lepidisis olapa* was observed at about 300 cm.

The natural mortality rate for pink coral was calculated by first converting the size-frequency distribution of the unfished stock to an age-frequency distribution and then determining the rate of diminution in progressively older age classes (Grigg, 1976). The best estimate of the annual instantaneous mortality rate of *C. secundum* in the Makapu'u Bed is 0.66. This is equivalent to an annual survival rate of about 93% in the absence of fishing. Mortality rates for gold and bamboo coral were not available because their growth rates and age structures were unknown.

Pink corals reach sexual maturity at a height of about 12 cm (13 years), however, the data are not very precise (Grigg, 1976). The reproductive cycle is annual with spawning taking place during June and July. The relationship between parent stock and recruitment in pink coral is unknown. However, because pink coral is long lived, and the population is composed of many year-classes, the standing stock should be relatively stable even with moderate year-to-year

fluctuations in recruitment. An estimate of steady state recruitment of the unexploited Makapu'u stock was obtained by multiplying the virgin stock size (79,200 colonies) by the best estimate of instantaneous mortality (0.066). Given steady state, the instantaneous rate of recruitment should equal the instantaneous rate of natural mortality. This gives an estimate of recruitment to the Makapu'u Bed of 5,277 colonies.

Biomass per recruit as a function of age was calculated in the absence of fishing using a cohort production model (Wetherall and Yong, 1977). In this model, the cohort gains weight until an age is reached where growth gains are overtaken by natural mortality losses. This is the "critical age" at which the cohort reaches its maximum biomass in the absence of fishing. For pink coral the maximum biomass per recruit, attained by a cohort at age 31.4 years is 237 gm.

Under the FMP, the MSYs for precious corals are calculated using a Beverton and Holt (Beverton and Holt, 1957) cohort production model where data is available for *Corallium secundum*, and the Gulland Model (MSY = 0.4 M Bo, where m=natural mortality and Bo is virgin biomass) for *Gerardia* and *Lepidisis*. According to the FMP, the estimated MSY for pink coral at Makapu'u Bed is 1,000 kg/yr, the estimated area of Makapu'u Bed is 3.6 km^2

When fishing is done in such a way that all colonies of a cohort are removed at once, then the yield per recruit is identical to the biomass per recruit at the harvest age. Therefore the maximum yield per recruit is achieved by harvesting all survivors in a cohort of pink coral exactly at the critical age of 31.4 years, and in this case the maximum yield per recruit is 237 gm. In practice this would require an infinite instantaneous fishing mortality rate exactly at 31.4 years. Since this is not feasible, the 237 gm/recruit is a theoretical upper limit to the harvest that may actually be obtained. More realistic figures of yield per recruit are obtained by considering a fishery which applies a steady finite fishing mortality rate to all ages in a cohort above a specified minimum harvest age. With a minimum harvest age of 30 years the maximum yield per recruit is essentially equal to the upper limit of 237 gm, whereas with a minimum harvest age of zero years the greatest yield per recruit possible is only 119 gm. Hence, if non-selective measures are employed, the highest yield per recruit that can be expected is only half the maximum yield per recruit theoretically possible under selective harvesting. As long as recruitment is constant or independent of stock size, a fishing policy which maximizes the yield per recruit will also maximize the total yield on a sustained basis, i.e. it will also produce the maximum sustainable yield.

Amendment 4 to the FMP designated the established bed of Makapu'u as a habitat area of particular concern[3] for the precious coral fishery because of the ecological function it provides, the rarity of the habitat type and its sensitivity to human-induced environmental degradation. The potential commercial importance of the Makapu'u Bed and the amount of scientific information that has been collected at the bed during the past three decades were also considered. Between 1973 and 1978, a manned submersible was used to harvest 5,953 kg of pink coral and 2,097 kg of gold coral from the Makapu'u Bed.

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[3] Habitat areas of particular concern are areas of fish habitat that are particularly important to the long-term productivity of populations of one or more managed species, or are particularly vulnerable to degradation.

In August 1997, the Hawaii Underwater Research Laboratory, NOAA used a manned submersible to assess the extent to which the precious corals at the Makapu'u Bed have recovered since the bed was last harvested over 20 years ago (Grigg 1997). During this survey, the number of transects of the Makapu'u Bed made were limited, and only a small area of the bed was surveyed. However, based on the limited data obtained it was concluded that this bed may be at least 15% larger than was indicated by previous data. The survey also showed that the recovery of pink coral has increased from 74% of the virgin biomass in 1978, to 90% in 1997. This finding supports the supposition that recruitment of pink coral is unaffected by harvesting and independent of the density of the standing stock. However, the assessment found that gold coral stocks at the Makapu'u Bed may have experienced little or no recruitment. During the 1997 survey only two or three colonies of gold coral were observed. The number of transects of the Makapu'u Bed made during this assessment were too limited to determine if the stock of gold coral was in an overfished condition, but the data collected suggest that the level of recruitment of gold coral at the Makapu'u Bed has been low. However, it is uncertain if the current scarcity of gold coral colonies at the bed was caused by the 1973-1978 harvests.

9.2.2 Brooks Bank Bed

The current harvest quota listed in the FMP for pink coral at Brooks Bank is 444 kg/yr.[4] This figure was calculated using the following formula provided in the FMP for setting the quota for conditional beds for which site specific data is unavailable.

$$\frac{\text{MSY for Makapu'u Bed}}{\text{Area of Makapu'u Bed}} = \frac{\text{MSY for Conditional Bed}}{\text{Area of Conditional Bed}}$$

According to the FMP, the estimated MSY for pink coral at Makapu'u Bed is 1,000 kg/yr, the estimated area of Makapu'u Bed is 3.6 km^2 and the estimated area of Brooks Bank is 1.6 km^2.

The only survey of this bed was done in September of 1998. Transects on this survey were 2.1 kilometers in length, and conducted at a depth of 350-505 meters. Red coral (*C. regale*) was observed to be very abundant with thousands of colonies present. Colonies occurred in patches from one to five square meters in size, and were located in waters between 430-517 meters deep. These colonies were up to 50 cm in height and averaged 1 cm in diameter. Extrapolation of this data suggests that a conservative standing crop of 8,000 kg of *C. regale* exists at this bed (Grigg 1998b). If it is assumed that this species of precious coral has the same natural mortality rate as *C. secundum* at the Makapu'u Bed (6.6%), an estimate of the MSY can be derived from the formula provided by Gulland (1970): MSY = 0.4MB, where M is the natural mortality rate and B is the standing crop biomass. Rounding down, it is estimated that 200 kg of *C. regale* could be harvested annually on a sustainable basis based on these data and

[4] The final rule implementing the FMP published on 20 August 1983 lists the harvest quota for pink coral at Brooks Bank as 17 kg. This is a typographical error.

assumptions. Pink coral (C. secundum) was observed to be moderately abundant on the east side of the bank at depths of 363-427 meters, but were generally small (less than 20 cm in height). Gold coral was abundant with 250 large colonies found between 392-467 meters. It was estimated that there was a standing stock of 2,000 kg of live gold coral, with an equal amount observed dead. Observations of finfish in the area were rare, and there was no evidence of predation by sea urchins at this bed.

9.2.3 Wespac Bed

This bed was also surveyed in 1998. Transects of 3.2 km were made between depths of 360-500 meters. No red coral was observed, however pink coral was abundant, with thousands of colonies in patches ranging from 0.3 to 1.0 square meters in size. Gold coral was rare, with only 2 colonies observed. Finfish (mostly Polymixia) were abundant, and there was high predation by Eucidarid sea urchins, with 50% of colonies showing signs of predation.

9.2.4 French Frigate Shoals-Gold Pinnacles Bed

Using monk seal telemetry, the1998 survey also located a previously unknown bed near French Frigate Shoals which has been named the FFS-Gold Pinnacles Bed. Transects 2.9 km in length at a depth of 360-575 meters found no red coral (*C. regale)*, and a low abundance of pink coral (*C. secundum*.) The pink coral which was observed was generally small, averaging less than 12 cm in height (Grigg 1998b). Both live and dead gold coral were found in abundance, and 300 colonies were observed in scattered patches at depths of 365-406 meters. Extrapolation of the transect data suggests that a standing crop of 3,000 kg of gold coral exists at the FFS-Gold Pinnacles Bed. If it is assumed that this species of precious coral has the same natural mortality rate as *C. secundum* at the Makapu'u Bed (6.6%), an estimate of the MSY can be derived from the formula provided by Gulland (1970): MSY = 0.4MB, where M is the natural mortality rate and B is the standing crop biomass. Rounding down, it is estimated that 80 kg of gold coral could be harvested annually on a sustainable basis based on these data and assumptions. Few finfish were observed at this bed, no arrowtooth eels were seen.

9.2.5 Black coral beds

Oishi (1990) and Grigg (1998a) summarized available information on Hawaii's black coral resources as follows[5]: Grigg and Opresko (1977) reported 14 species of black coral known to occur in Hawaiian waters. Historically however commercial fishermen have harvested only three species, *Anthipathes dichotoma* (almost 90% of commercial harvest), *A. grandis* (10%), and *A. ulex* (1%). The two major species (*A. dichotoma* and *A. grandis*) are found in coastal waters from Hawaii to Niihau and may extend up to the Northwestern Hawaiian Islands. *A. dichotoma* exists at depths from 30 to 110 meters while A. grandis exists at depths from 45 to 110 meters. Within their depth ranges, both species can be found highly aggregated on, or under, vertical dropoffs, terraces, or undercut notches. The growth rates for *A. dichotoma* and *A. grandis* have been estimated to be 6.42 cm per year and 6.12 cm per year respectively. Plotting gonad

[5] Much of this information is drawn from Grigg, 1976.

diameter versus colony height, Grigg (1976) estimated the size of reproductively mature *A. dichotoma* colonies to range from 64 to 80 cm. This implies an age at reproduction of 10 to 12.5 years.

There are two known major beds of black coral in the Council's area (the Au'au Channel Bed and the Kauai Bed), as well as several minor beds. Most of these are located in Hawaii's state waters, however the largest (the Au'au Channel Bed) extends into the EEZ and thus Hawaii shares jurisdiction of this bed.

The commercial harvest of black coral has occurred in the waters around Hawaii for more than three decades. Significant commercial harvest of black coral has occurred in the Au'au Channel Bed in the Kauai Bed. By 1976, Grigg had determined the areal coverage of these beds to be 1.7 km^2 and 0.4 km^2 respectively and maximum sustainable yields (calculated using a Beverton and Holt yield production model) for the two beds were estimated to be 6,174 kg/yr and 1,480 kg/yr. (Grigg, 1976).

These values were adjusted downwards by about 20% to recommended MSYs of 5,000 kg/yr and 1,250 kg/year respectively. These values correspond to a minimum size limit of 1.2 m (48 inches) for both species and thus allow smaller but fewer colonies to be harvested which is consistent with economic considerations (optimum yield) and traditional fishing practices (Grigg 1998a).

Since 1980, virtually all of the black coral harvested around the Hawaiian Islands has been taken from the bed located in the Au'au Channel. Most of this harvest has been confined to State waters. Although a substantial portion of this bed is located in the EEZ, the Hawaii Department of Land and Natural Resources estimates that about 85% of the black coral harvested is collected within three miles of the shoreline (Hawaii DLNR 1979), perhaps because gear constraints have restricted divers for black coral to relatively shallow waters (75 m or less) (Grigg 1998a). Amendment 4 to the FMP designated the Au'au Channel as a habitat area of particular concern for the precious coral fishery because of the ecological function it provides, the rarity of the habitat type and its sensitivity to human-induced environmental degradation. Its commercial importance was also considered.

A recent assessment of the biological condition of the black coral in the Au'au Channel was conducted in July 1998 (Grigg 1998a). The age frequency distributions of sample populations in 1975 and 1998 are very similar, suggesting that harvesting during the intervening years has had no significant effect on recruitment. However, the black coral resources in other areas of State waters (for example, "Stonewall" off Lahaina, Maui) which are easily accessible with conventional scuba gear were intensely harvested in the 1970s and have not recovered significantly under the relatively light fishing pressure they are now experiencing.

While the condition of the Au'au Channel Bed is generally good, there are a number of potential factors that could result in greater harvesting pressure on black coral resources in the near future. The first is the possible introduction of new coral harvesting technology (Grigg 1998a). To date, black coral in Hawaii has been hand harvested by a small group of divers using conventional scuba gear with compressed air. As noted above, the maximum depth to which

divers using this gear can safely descend is less than 75 m. However, the introduction of mixed-gas diving methods and re-breathers would enable scuba divers to dive to the maximum depth (about 110 m) at which colonies of black coral are known to occur. The segment of the population between 80 m and 110 m, which currently may represent a reservoir for recruitment, would be exposed to fishermen. These new diving methods also allow harvesters to extend the length of time which they can safely spend underwater. The cost of this equipment has declined in recent years, making it financially feasible for many divers to purchase the gear. For example, the price of a re-breather is about $20,000, not including the training expenses that use of this diving equipment may entail. Although this new diving gear is not yet being used to harvest black coral in Hawaii, some harvesters are experimenting with towed underwater camera systems and other new technology that could increase the output from old harvest areas and lead to the discovery of new beds.

An even greater increase in the level of black coral harvested is likely if vessels equipped with manned submersibles and remotely operated vehicles enter the fishery. These gear types are far more efficient than the hand harvest techniques described above in terms of locating and harvesting black coral beds. In recent years, the capital and operating costs of manned submersibles and remotely operated vehicles have become more affordable. A number of firms in Hawaii are currently examining the feasibility of harvesting precious corals using these gear types, and these firms may decide to target black coral as well as other precious corals. Although the ex-vessel price of black coral is low compared to that of other precious corals, the cost of harvesting black coral is also lower because of the relatively shallow depths at which black coral occurs.

An increase in the demand for black coral could also result in greater harvesting pressure on black coral resources. In the past, the market for colonies of black coral small enough to fit inside the typical curio display case or household aquarium was small in comparison to the market for larger trees that are processed for jewelry (Oishi 1990). However, according to the Hawaii Division of Aquatic Resources, the demand in Hawaii for small, immature black coral colonies may increase in the near future as the popularity of marine aquaria grows. The demand for coral harvested in the waters around Hawaii could also increase significantly if out-of-state markets for raw black coral are aggressively pursued by Hawaii coral processors or if current imports of cut and polished black coral from Taiwan into Hawaii decrease (Grigg 1998a).

9.3 History of the precious corals fishery

The FMP for precious corals in the Western Pacific region was approved by the US Secretary of Commerce on May 20, 1980. The FMP covers domestic and foreign fishing for precious corals in the US EEZ of the Western Pacific region. Most of the information in this section pertains only to the precious corals fishery occurring around the Hawaiian Archipelago. No precious coral harvester has received a federal permit to fish in the EEZ surrounding American Samoa or Guam since the implementation of the FMP in 1980.

There exits two distinct and separate precious coral fisheries in Hawaii. One fishery focuses on the harvest of deepwater (400 to 1,500 m) pink, gold and bamboo corals using tangle net dredges or manned and unmanned submersibles. The other fishery involves the hand harvest

of black coral by SCUBA divers at depths of 30 to 100 m.

9.3.1 Deep water precious corals

In 1965, Japanese coral fishermen discovered a large bed of pink coral (*Corallium* spp.) on the Milwaukee Banks in the Emperor Seamount Chain near the northwestern end of the Hawaiian Archipelago (Grigg 1993). Intermittently, over the next two decades dozens of foreign vessels employed tangle-net dredges to harvest precious corals in the waters around the NWHI. During the 1980s, Japanese and Taiwanese coral vessels frequently fished illegally in the EEZ near the Hancock Seamounts (Grigg 1993). In 1985, Taiwanese vessels reportedly poached about 100 tons of pink coral from north of Gardner Pinnacles and Laysan Island (Grigg 1993). The discontinuation of poaching in the late 1980s probably indicated that the resources in those areas were reduced to the point that the fishery was no longer economically viable. (Carleton 1987).

In 1966 researchers at the University of Hawaii located a small bed of pink coral off Makapu'u, Oahu. Over the next three years, a small group of fishermen harvested this bed using tangle net dredges. By 1969, the precious coral industry in Hawaii was producing about $2 million in retail sales. Part of these sales consisted of pink coral jewelry imported from Taiwan and Japan. Further research on precious corals conducted by the University of Hawaii led to the development of a selective harvesting system using a manned submersible. Starting in 1973, Maui Divers of Hawaii, Inc., the leading manufacturer and retailer of precious coral jewelry in Hawaii, adopted this system for the commercial harvest of pink, gold and bamboo coral at the Makapu'u Bed. However, harvest operations were discontinued in 1978 because of high operating costs.

In 1988, the domestic vessel *Kilauea* used a tangle net dredge to harvest beds at Hancock Seamount. The owners of the *Kilauea* received a federal Experimental Fishing Permit that allowed them to collect an amount of precious coral in excess of the harvest quotas that had been established by the WPRFMC in 1980. However, their catch consisted mostly of dead or low quality pink coral, and the operation was soon discontinued (Grigg 1993). One company in Hawaii has recently been experimenting with manned submersibles and remotely operated vehicles (ROVs). These technologically advanced devices are equipped with spotlights, cameras and a variety of maneuverable tools. It is possible to harvest individual colonies, place the cut material in collecting cages and bring them to the surface in a highly controlled and efficient manner (Carleton 1987). While this fishing gear is still very expensive, innovations in submersible technology within the petroleum and defense industries during the past two decades have significantly reduced the capital and operating costs. In particular, the expense of operating manned submersibles has declined, one reason being that the submersibles are smaller and, consequently, the tender vessels can be smaller. In addition, it is likely that participants in the deep-water precious coral fishery will attempt to defray the costs of using selective gear by finding other lucrative uses for the gear, such as salvage and research.

Recently, the firm of American Deepwater Engineering, a division of the Hawaii-based American Marine Services Group, received a federal permit to gather precious corals in the waters around Hawaii. The firm is using two one-person submersibles capable of diving as deep as 2,000 ft. Harvests of precious corals have been made at the Makapu'u Bed and in the

exploratory area of the EEZ. The harvest levels of this operation can not be reported here because of NOAA confidentiality restrictions. Other firms have expressed an interest in harvesting deep-water precious corals in Hawaii using selective gear, but have delayed entry into the fishery because of uncertainty about the fishery's profitability. It is too early to determine if this fishery will be profitable. The ex-vessel value of precious coral varies widely according to color and size. It is uncertain whether the coral harvested by the current firm will be of sufficient quality to receive the high prices required to offset the high fishing costs.

The worldwide glut of *Corallium* produced during the boom years of the early 1980s caused the market value of pink coral to fall even below breakeven prices for Taiwanese and Japanese coral fishermen (Grigg 1993). Consequently, many fishermen dropped out of the fishery and the worldwide supply of deep-water precious corals has dwindled. For the past 20 years Hawaii businesses engaged in the manufacture of deep-water precious coral jewelry have relied on local stockpiles of gold coral and imports of pink coral from foreign suppliers. Prices for precious corals gradually increased, and specimens of the highest quality pink coral currently sell for $5,000/lb in international auctions. However, changes in the jewelry industry during the past decade may have diminished the demand for precious corals. Products such as black pearls have captured a substantial share of the market formerly held by precious corals (C. Marsh, Maui Divers of Hawaii, Inc., pers. comm.). In 1993 Hawaii's precious coral jewelry industry was valued at about $25 million at the retail level (Grigg 1993).

9.3.2 Harvest of black corals

Before European explorers first visited the Hawaiian Islands the indigenous people of the islands used *ekaha ku moana* (black coral) medicinally to treat various respiratory and childhood diseases and may have collected the coral with hook and line (Iversen et al. 1990). The commercial harvest of black coral did not begin until the late-1950s when sport divers discovered beds of *Antipathes dicomata* and *A. gradis* about 4.8 km west of Lahaina, Maui at an area now known as "Stonewall" (Grigg 1993). A cottage industry producing curios and black coral jewelry soon developed in Lahaina.

The collection of black coral has continued in Hawaii since the inception of the fishery although harvest levels have fluctuated with changes in demand. In the 1960s and early 70s, as much as 10,000 kg were harvested annually from black coral beds off Kauai and Maui. During the 1970s, the State drafted a regulation requiring a minimum size limit (height) of 48 inches, which corresponded to the recommended MSY levels. This regulation was never codified, however divers and jewelry makers have voluntarily complied with it. A recent (1998) survey of the Au'au Channel Bed reexamined five areas first studied in 1975. In summary, there was no difference between the two time periods in the age structure of colonies less than 19 years old, which represents the recommended size limit of 48 inches. This indicates excellent compliance by the divers with this management guideline. The study also found that the population had almost completely replaced itself since 1975. In fact, 97% of the colonies surveyed in 1998 were less than 23 years old. This means that the regeneration time of the bed is equivalent to the age of its oldest colonies and that the bed is experiencing undiminished recruitment (Grigg 1998a).

Between 1990 and 1997, the annual harvest of black coral in Hawaii varied from a low of

864 lbs to a high of 6,017 lbs, with a yearly average of 3,084 lbs. As noted above, the harvest of black coral has occurred mainly in State of Hawaii waters. Since 1980, virtually all of the black coral harvested around the Hawaiian Islands has been taken from the bed located in the Au'au Channel. Most of the Au'au Channel harvest has occurred in State of Hawaii waters, and no black coral diver has ever received a federal permit to harvest precious coral. However, a substantial portion of the black coral bed in the Au'au Channel is located in the EEZ. The annual

harvests have consistently been well below the recommended MSY for this bed of 5,000 kg/yr (11,000 lb/year).

Table 3. Volume and value of black coral landings in Hawaii.

Year	Harvested (lbs.)	Sold (lbs.)	Value ($)
1990	2,349	2,169	31,575
1991	2,305	2,250	35,080
1992	2,398	2,328	46,560
1993	864	769	15,380
1994	4,354	4,209	84,180
1995	6,017	5,912	122,765
1996	4,865	1,703	41,325
1997	1,520	415	10,394

Source: Hawaii Division of Aquatic Resources

Variations between pounds harvested and pounds sold are primarily due to stockpiling by both divers and jewelry makers.

To date, black coral in Hawaii has been hand harvested by a small group of divers using conventional scuba gear with compressed air. The maximum depth to which divers using this gear can safely descend is less than 75 m. However, it likely that in the new future black coral divers in Hawaii will be using mixed-gas diving methods or re-breathers that enable divers to increase the depth at which they can safely dive as well as their bottom time. Already, some harvesters are experimenting with towed underwater camera systems and other devices that may increase the output from old harvest areas and lead to the discovery of new beds.

Since the inception of the black coral fishery in Hawaii in the late 1950s, generally fewer than ten individuals have been active in the fishery at any one time. Participation has probably been limited by the relatively small market for black coral in Hawaii and the extreme physical danger of harvesting operations. Currently, there are probably less than five active commercial black coral harvesters in Hawaii.

Today, considerably less black coral is required by the industry because the jewelry items produced are smaller and of higher quality and because modern cutting procedures have become much more efficient (Carleton 1987). Recently, the demand for small, immature black coral colonies has increased with the growing popularity of household marine aquaria.

In 1999, despite the voluntary compliance with the 48 inch minimum size limit, concern about the potential for greater harvesting pressure on black coral resources led the State of Hawaii to prohibit the harvest of black coral with a base diameter of less than 3/4 inches from state waters.

9.4 Relationship with protected species

Concerns about the harvest of gold coral have been also raised by an array of recent studies on foraging and feeding behavior of the endangered Hawaiian monk seal (Parrish 1998). The studies have focused on the monk seal population at French Frigate Shoals in the NWHI where the species' largest breeding colony resides. In 1998, a total of 410 seals were identified at French Frigate Shoals (Johanos and Baker 1998). This breeding colony has experienced a high juvenile mortality during the past several years which could place the future of the Hawaiian monk seal in grave jeopardy (Laurs 1999). A significant decline in prey availability might explain the observed changes in condition and survival of immature seals (Johanos and Baker 1998).

Until recently, no species of either threatened or endangered wildlife was known to occur at depths where deep-water precious corals are found in the Western Pacific region. However, a multi-year/season study of the movements of the Hawaiian monk seal population at French Frigate Shoals using satellite tags found seals (34 males and females) to range between Gardner Pinnacles and Necker Bank (Abernathy and Siniff 1998). Depth-of-dive records from the study show that a small percentage of the diving by seals occurred at depths (350-500 m) where precious corals are found. The time spent by seals at these depths ranged from occasional visits to as much as half the seals' sea-going effort. Based on this sample of deep-foraging seals, it is estimated that 25 seals in the French Frigate Shoals population dive to these depths.

A study of the diving behavior of the monk seal population at French Frigate Shoals using video cameras harnessed to 24 adult male seals found that these seals preferred to forage outside the atoll (Parrish et al., 2000). Three seals carrying video cameras dove below 350 m. The seals were heard to make feeding sounds at these depths, and one seal was observed ascending with a deep-water bottomfish in its mouth. The video camera data indicate that the foraging male seals prefer to exploit habitats which afford improved prey density or accessibility. Studies of the diet of Hawaiian monk seals show that deep-water bottomfish and eels may be a significant component (Goodman-Lowe 1998). In summary, the data collected by these various studies suggest that some monk seals from the resident population on French Frigate Shoals do a significant amount of concentrated foraging at the depths where precious corals occur.

In September 1998, submersibles were used by NMFS to survey the ocean floor at two sites around French Frigate Shoals where previous studies showed monk seals focused their deep

dive activity. The survey found an abundance of live and dead colonies of gold coral at both sites, one of which was located at the southeast portion of Brooks Bank and the other on the east ridge of French Frigate Shoals. The latter was a previously unknown bed of precious corals and has been named the FFS-Gold Pinnacles Bed. Submarine surveys of nearby sites, where there were no records of monk seal foraging activity, found no precious corals indicating that monk seals may specifically target precious coral beds.

Many of the gold coral colonies observed at Brooks Bank and the FFS-Gold Pinnacles Bed were greater than 40 inches in height. These coral trees may provide enough vertical relief and structure that they constitute an important element of fish habitat/cover. The shelter afforded by these beds of precious corals may aggregate monk seal prey and improve the seals' foraging success. Amendment 4 to the FMP designated Brooks Bank as a habitat area of particular concern for the precious coral fishery because of the ecological function it provides, the rarity of the habitat type and its possible importance as a foraging habitat for the Hawaiian monk seal. If the gold coral were harvested from these beds, the fish habitat and monk seal foraging area on these beds may be lost or significantly diminished for several decades. It is unlikely that pink coral at Brooks Bank or the FFS-Gold Pinnacles Bed provide habitat for monk seal prey items, as most of the pink coral colonies at these beds are small in height (less than 19 inches). Nor is there any evidence that monk seals residing in other areas of the Hawaiian Islands are using precious coral beds as foraging habitat.

Observations of monk seal foraging behavior near French Frigate Shoals suggest that live precious coral would be more important foraging habitat for monk seals that are diving to depths at which precious corals occur. Monk seal prey, such as eels, have not been observed congregating around fallen or standing coral that is devoid of live coral polyps or tissue. It is speculated that the presence of galatheid shrimps that are commensal on living gold coral colonies is what attracts the eels. In addition, a dead coral colony is rarely standing. Dead precious coral is found mainly as rubble lying on the seabed and generally does not provide sufficient vertical relief to attract significant numbers of fish. This information suggests that the harvest of dead coral may not have a significant adverse effect on monk seal foraging habitat.

However, the definition of dead coral in the FMP is any precious coral that contains holes from borers or is discolored or encrusted at the time of removal from the seabed. According to this definition, coral that is only slightly bored or encrusted and still partially covered with live coral polyps or tissue is regarded as dead. The harvest quota only applies to live coral, which is defined as any precious coral that is free of holes from borers, and has no discoloration or encrustation on the skeleton at the time of removal from the seabed. With no restriction on the quantity of dead coral that can be harvested, the current definition of dead coral could result in the unrestricted harvest of coral that is standing upright and partially covered with living tissue as long as it contains holes from borers or is discolored or encrusted. It is possible that colonies of such coral near French Frigate Shoals may provide foraging habitat for monk seals.

9.5 Cultural and socio-economic environment

The precious corals do not, in the living state, form an overt part of the human environment in the region, in part because of the great depths which they inhabit and the isolated

locations of most of the known beds. They are not within the range of observation of recreational or commercial free divers, and are seen in vivo only by the operators of the submersible vessel employed to harvest them in Hawaii, and occasionally by research scientists. It should be noted however, that precious corals, like any species of wildlife, have scientific values apart from socio-economic considerations.

The handling and processing of the product, which is a small volume of an inert mineral skeletal material, does not obtrude itself on the public notice as the analogous operations in other fisheries often do, through cannery odors or localized pollution of harbor waters. Probably the majority of the inhabitants of the Hawaiian Islands and elsewhere in the region are unaware that there are precious coral resources in the surrounding waters, except as that fact is brought to their attention by the advertisement and display of coral jewelry on the local market.

Precious corals are rarely, if ever, harvested accidentally by any type of domestic commercial or recreational fishery practiced in the region nor has their been indication that any group of fishermen in the region consider the precious corals in any way related to the success of their fishing operations. It is probably that foreign fishers, who from time to time carry on deep trawling for finfish in some areas of the fishery conservation zone, occasionally encounter incidentally harvested precious corals in their trawls.

The element of the human population of the region which is aware of and concerned about the precious corals resources, aside from a few scientists and administrators, primarily comprises the persons employed in the precious corals fishery and the associated processing industry, and members of environmental groups. The largest firm in the precious corals industry employs about 308 persons, including 35 involved directly in fishing and/or processing of locally harvested coral. It is reported that there are about 15 other firms in Hawaii engaged in making jewelry from imported coral and is estimated that as many as 500 retail outlets the State handle coral jewelry, among other types, of which an unknown portion is made of locally harvested coral. In total, around 800 to 1000 persons, from fishermen to retail sales clerks are employed in the coral industry in Hawaii. In other island groups, of the region, the involvement of the local population is much less, although most curio shops and airport terminal duty-free shops sell coral jewelry.

In considering the human environment of the precious coral fishery in the Western Pacific Region, attention must be paid to the possibility that people of other islands than those of Hawaii may become involved in the future in precious coral harvesting and perhaps in the processing of precious coral into jewelry. There is no such involvement at present, although a basis for its development may exist in that small quantities of black corals (Anitipathes spp.) are reported to be collected by local divers at some of the islands from time to time. It is generally agreed that the people of American Samoa, Guam and the Northern Mariana Islands need the development of a variety of new economic activities in order to become self-supporting, and they must look to ocean resources for the basis for such development because of the general paucity of land and terrestrial natural resources. Coral harvesting by simple methods such as dredging would be relatively easy for the island people to take up, if organized surveys by government agencies or private prospecting should reveal the existence of significant beds of coral in locations accessible to them. On the other hand, dredging as practiced on the Makapuu Bed in Hawaii in the 1960s

was apparently not efficient enough to be profitable, and there is some question whether it could be made to pay in American Samoa, Guam or the Marianas.

From the inception of the black coral fishery in Hawaii in the late 1950s, generally fewer than five individuals have been active in the fishery during any one year. Between 1990 and 1997, the annual harvest of black coral in Hawaii varied from a low of 864 lbs to a high of 6,017 lbs, with a yearly average of 3,084 lbs (Table 2). This average harvest level is substantially lower than the MSY for the Au'au Channel black coral population, which is estimated to be about 11,000 lbs/yr (Grigg 1976). The 415 lbs of black coral sold in 1997 had a dockside value of about $10,394, assuming a price of $25/lb.

10.0 Analysis of Beneficial and Adverse Impacts of Management Alternatives

The Council identified various management options to address the problems described in Section 5.0 and achieve the objectives listed in Section 7.0. This section provides an analysis of the relative ecological, economic and social impacts of the alternative management measures considered by the Council. The generally poor understanding of the status of deep-water precious coral stocks and biology and population dynamics of most precious coral species, together with uncertainty about the level of private sector interest in renewing the fishery, preclude a detailed quantification of the impacts of alternative management measures. However, the analysis presented provides an adequate basis for making management decisions.

Table 4 summarizes the management alternatives and their impacts on fisheries for precious corals in the Western Pacific. These alternatives and analyses of their impacts are discussed in greater detail in Sections 10.1-10.9.

During the preparation of this document, President Clinton issued Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001), which together establish conservation measures for the newly formed Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Under these orders, commercial fishing effort and take in the reserve are capped at each permittee's take in the year preceding December 4, 2000. Since there were no Federal precious coral permits issued for any harvestable Northwestern Hawaiian Islands (NWHI) beds (Brooks Banks and 180 Fathom Beds), the Executive Orders place a permanent zero harvest cap on these beds (despite their existent harvest quotas). The effect of this cap on the single Hawaii exploratory area (permit area X-P-H which includes waters around both the NWHI and the main Hawaiian Islands) is less clear as, although there was some harvest of precious corals from the main Hawaiian Islands portion of this area in 2000, there was no harvest from the NWHI portion. How this historical take will now be allocated within the Hawaii exploratory area remains unresolved. The Precious Corals Fishery Management Plan will be revised to reflect these measures as they are clarified by the Reserve Operating Plan which is now being developed by the National Ocean Service. This Operating Plan is anticipated to contain implementing regulations as well as a complete analysis of the impacts of those regulations on the human environment.

Table 4. Summary of management alternatives and their impacts.

Alternative	Ecological Impacts	Economic and Social Impacts
	Conservation of gold coral	
No action	May delay or prevent recovery of the gold coral stock at the Makapu'u Bed.	Minimal impact in the short term because the stock of gold coral at the Makapu'u Bed is low. Long-term negative impacts on harvest levels and gross revenues are potentially large if overfishing occurs.
Suspend the harvest quota at Makapu'u Bed **(Preferred Alternative)**	May increase the probability that a recovery in the gold coral stock at the Makapu'u Bed occurs.	Minimal economic impact because the stock of gold coral at the Makapu'u Bed is low.
Suspend the harvest quota for gold coral at all established and conditional beds	Minimizes the possibility that overfishing of the gold coral stock could occur.	Could result in between $158,400 to $356,400 in foregone potential gross revenues every two years.
Implement a minimum size limit for gold coral	Could be negative if the lack of reliable biological information results in the establishment of a size limit that is too small to prevent overfishing.	Uncertain, but there may be some cost if any coral is avoided or discarded because of the size limit.
	Definitions of live and dead coral	
No action	Unrestricted harvest of dead coral may result in a decrease in Hawaiian monk seal foraging habitat in the NWHI. Impact is expected to be small, as most dead coral colonies do not attract seal prey items.	The negative impacts could be substantial if NMFS implements measures to mitigate interactions with protected species.
Redefine live precious coral as precious coral that has live coral polyps or tissue. Redefine dead precious coral as precious coral that no longer has any live coral polyps or tissue **(Preferred Alternative)**	Would reduce the risk of harvesting coral which could be providing foraging habitat for the Hawaiian monk seal.	Some adverse impacts are possible, but unlikely. Could facilitate monitoring and enforcement of harvest quotas by more clearly differentiating live coral from dead coral.
Redefine live precious coral as precious coral that is standing upright. Redefine dead precious coral as precious coral that is no longer standing upright	The impacts would be similar to those of above alternative.	Could increase the difficulty of monitoring and enforcing harvest quotas if harvesters intentionally "knock down" coral colonies.

Application of size limits		
No action	May reduce incentive to collect dead coral since it is less valuable than live coral. From the standpoint of conservation, it is more desirable to harvest dead coral than live coral.	Would have a negative impact because it prohibits the harvest of dead coral colonies that are below the minimum size.
Apply size limits to live coral only **(Preferred Alternative)**	No impact is expected, as dead coral generally decays from erosion and chemical weathering.	Impact is likely to be positive, as dead coral of any size would be allowed to be harvested.
Conservation of black coral		
No action	Overfishing of stocks could result if fishing pressure increases.	Minimal impact in the short term, but long-term negative impacts on harvest levels and gross revenues are potentially large if overfishing occurs.
Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch, measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony. Persons who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule would qualify for an exemption which allows the hand harvest of black coral that has attained a minimum base diameter of 3/4 inches, measured on the widest portion of the skeleton at a location just above the holdfast **(Preferred Alternative)**	Would prevent the harvest of colonies which are immature and have not reached their full potential for growth, thereby contributing towards maintenance of black coral stocks at OY levels.	The impact on harvesters could be significant, as only about half of the colonies currently being harvested are larger than this size limit. Could have a negative impact on human safety by inducing harvesters to dive deeper and stay submerged longer in search of coral colonies that are of a legal size. Would be difficult to enforce since the size limit is inconsistent with State regulations. Recommended exemption is intended to reduce the negative economic impacts on current black coral harvesters, mitigate the negative impacts on the safety of human life at sea and facilitate enforcement.
Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch, measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony.	Impacts would be similar to those of above alternative.	Impacts would be similar to those of Alternative 2, except no exemption is provided that would reduce the negative economic impacts on current black coral harvesters, mitigate the negative impacts on the safety of human life at sea and facilitate enforcement.
Prohibit the harvest of black coral unless it has attained a minimum base diameter of 3/4 inches	May result in overfishing if fishing pressure increases.	Minimal impact in the short term, but long-term negative impacts on harvest levels and gross revenues are potentially large if overfishing occurs.

Establish a weight quota for black coral	May not be as effective as a size limit in avoiding overfishing, as information is limited on the standing stock and sustainable yield.	May be more difficult to enforce than size limits.
Gear restrictions		
No action	May result in damage to other sessile organisms, waste of coral colonies that are "knocked down," but not harvested and a decrease in Hawaiian monk seal foraging habitat.	Would minimize the costs of harvesting deep-water precious corals and may encourage the discovery and exploration of new beds. The negative impacts could be substantial if NMFS implements measures to mitigate interactions with protected species.
Only selective gear may be used to harvest precious corals from all permit areas **(Preferred Alternative)**	Would help prevent overfishing and wastage of resources by minimizing bycatch.	The estimated dockside value of the precious coral that would no longer be available for annual harvest by non-selective gear from established and conditional beds is $62,618.
Only selective gear may be used to harvest precious corals from established and conditional beds	The impacts would be similar to the no action alternative, except the potential adverse impacts of using non-selective gear to harvest precious corals at established and conditional beds would be eliminated.	The impacts would be similar to the no action alternative, except up to 200 kg of precious coral would continue to be available for annual harvest by non-selective gear from each of the exploratory beds.
Application of size limit for pink coral		
No action	Increased risk that the estimated MSY for pink coral will be exceeded at those conditional beds (i.e., Brooks Bank, 180 Fathom Bank and newly discovered FFS-Gold Pinnacles Bed) and exploratory areas where there is no size limit.	Minimal impact in the short term, but long-term negative impacts on harvest levels and gross revenues are potentially large if overfishing occurs.
Apply the current size limit for pink coral to all permit areas **(Preferred Alternative)**	Would prevent the harvest of colonies which are immature and have not reached their full potential for growth, thereby reducing the potential for overfishing to occur.	Minimal impact because the financial return from harvesting colonies of pink coral that are less than size limit is low.
Apply the current size limit for pink coral to all established and conditional beds	Impacts would be similar to those of above alternative, except beds of pink coral occurring in exploratory areas would not receive the protection from overfishing provided by a minimum size limit.	Impacts would be similar to those of above alternative.

Adjusting Brooks Bank boundaries and harvest quotas		
No action	Maintaining the current harvest quota for pink coral could result in the overfishing of these species. Harvest of live gold coral may result in a decrease in Hawaiian monk seal foraging habitat in the NWHI.	Positive impact in the short term, but long-term negative impacts on harvest levels and gross revenues are potentially large if overfishing occurs. The negative impacts could also be substantial if NMFS implements measures to mitigate interactions with protected species.
Increase the boundaries; change the harvest quota for pink coral to 200 kg; and suspend the harvest quota for gold coral **(Preferred Alternative)**	Would protect pink coral stock from overfishing by setting harvest quota at the estimated MSY. Would reduce the risk of harvesting coral which could be providing foraging habitat for the Hawaiian monk seal.	Potential gross revenues from the harvest of pink and gold coral would be reduced by $190,200. However, the impact over the long term would be positive, as the productivity of the bed would be maintained and the conservation goals of the FMP achieved.
Increase the boundaries and re-classify the bed as a refugium	Would eliminate the risk of overfishing and interactions with Hawaiian monk seals. However, the positive impact is likely to be minimal.	Potential gross revenues from the sustainable harvest of pink, bamboo and gold coral would be reduced by $190,200. This figure may underestimate the potential economic loss, as the harvest of dead coral would also be prohibited.
Classification of newly discovered FFS-Gold Pinnacles Bed		
No action	Harvest of live gold coral may result in a decrease in Hawaiian monk seal foraging habitat in the NWHI. In the absence of a harvest quota, precious coral stocks could be harvested at a level that exceeds the estimated MSY.	Positive impact in the short term, but long-term negative impacts on harvest levels and gross revenues are potentially large if overfishing occurs. The negative impacts could also be substantial if NMFS implements measures to mitigate interactions with protected species.
Classify bed as a conditional bed and set the annual harvest quota for all types of precious coral at zero **(Preferred Alternative)**	Would protect stock of pink coral from overfishing and reduce risk of interactions with protected species.	Potential gross revenues from the harvest of gold coral would be reduced by $26,400.
Classify bed as a refugium	Would eliminate the risk of overfishing and interactions with protected species. However, the positive impact is likely to be minimal.	Potential gross revenues from the harvest of gold coral would be reduced by $26,400. This figure may underestimate the potential economic loss, as the harvest of dead coral would also be prohibited.
Classify bed as a conditional bed and set the annual harvest quota for gold coral at 80 kg.	Would protect stock of gold coral from overfishing, but may result in a decrease in Hawaiian monk seal foraging habitat in the NWHI.	The negative impacts could be substantial if NMFS implements measures to mitigate interactions with protected species

10.1 Conservation of gold coral

10.1.1 Alternative 1: No action

Ecological Impacts

A recent assessment of the recovery and current status of precious corals at the Makapu'u Bed found that the recruitment of gold coral at that bed is very low even though it has been over 20 years since gold coral was harvested at this bed (Section 9.2.1). The current biennial harvest quota of 600 kg of gold coral at the Makapu'u Bed was based on the best scientific information available. However, at the time the quota was set only a limited amount of information was available on the impact of harvesting on subsequent recruitment of gold coral at the Makapu'u Bed. At present, there is still insufficient information on the biology of gold coral to quantify the impacts of management alternatives on the recruitment of these coral species, including the alternative of taking no action. Nevertheless, given the low standing stock of gold coral indicated by the most recent survey, it is likely that maintaining the harvest quota for gold coral at Makapu'u Bed would increase the risk that the recovery of the gold coral stock at Makapu'u Bed is delayed or prevented. It is likely that the Makapu'u Bed will be harvested for commercial purposes in the near future. A number of firms have recently expressed interest in participating in the precious coral fishery in the EEZ around Hawaii using selective gear. One of these firms has received a NMFS permit to harvest precious corals at the Makapu'u Bed and completed an exploratory survey of the bed.

Economic and Social Impacts

According to Maui Divers, Ltd., the principal processor of precious corals in Hawaii, the ex-vessel price of gold coral is $330/kg ($150/lb). Maintaining the current biennial harvest quota of 600 kg for gold coral at Makapu'u Bed would continue to make available to prospective harvesters a quantity of gold coral worth $198,000 if the actual stock is of sufficient size to support such a harvest. However, a recent survey of the Makapu'u Bed revealed that the current standing stock of gold coral is low and, in fact, might be so low that there is actually less gold coral in the bed than the harvest quota of 600 kg. In addition, the adverse economic impacts over the long term would be significant if further harvesting diminishes the number of colonies to the point that no recovery is possible.

10.1.2 Alternative 2 (Preferred Alternative): Suspend the harvest quota for gold coral at the Makapu'u Bed until additional information is available on the impact of harvesting on subsequent recruitment of gold coral at this bed

Ecological Impacts

The benefits of this alternative cannot be quantified due to the poor understanding of the biology and population dynamics of gold coral. However, suspending the quota for gold coral at Makapu'u Bed until additional scientific information is available on the reasons for the low recruitment of gold coral at this bed would be a precautionary measure expected to increase the probability that a recovery in the number of gold coral colonies at the Makapu'u Bed eventually

occurs. Amendment 4 to the FMP designated the Makapu'u Bed as a habitat area of particular concern for the precious coral fishery because of the ecological function it provides, the rarity of the habitat type and its sensitivity to human-induced environmental degradation. The potential commercial importance of the Makapu'u Bed and the amount of scientific information that has been collected at the bed during the past three decades were also considered.

Economic and Social Impacts

A suspension of the quota would likely have a minimal adverse economic impact on prospective harvesters, as the density of gold coral at the Makapu'u Bed is currently very low. Should harvest effort at the Makapu'u Bed occur, it is likely that it will be directed mainly toward pink coral because this coral is relatively abundant at the bed and has a higher market value than gold coral ($440/kg for pink coral (*C. secundum*) vs. $330/kg for gold coral according to Maui Divers of Hawaii, Ltd.).

A suspension of the quota is not expected to have an adverse economic impact on processors of precious corals in Hawaii. The fishery in the EEZ around Hawaii for deep-water species of precious coral, including pink, gold and bamboo coral, has been dormant for nearly two decades. Consequently, the processors of these corals in Hawaii have relied exclusively on imported material.

10.1.3 Alternative 3: Suspend the harvest quota for gold coral at all established and conditional beds until additional information is available on the impact of harvesting on subsequent recruitment of gold coral

Ecological Impacts

Suspending the quota for gold coral at all established and conditional beds would be a precautionary measure that would minimize the possibility that overfishing of known gold coral stocks could occur. Because it is highly uncertain whether harvesters will be able to find new beds to exploit, it is important to ensure that existing established and conditional beds are able to rebuild after being harvested. However, it is uncertain if the low recovery rate of gold coral at Makapu'u Bed would also occur at other established or conditional beds. Recruitment rates are dependent on the specific biological and physical conditions of each precious corals bed. It likely that information on the recruitment of gold coral and other species of precious coral at various beds will only be obtained by allowing commercial harvesting of these beds subject to harvest restrictions and monitoring coral recovery rates. Suspending all harvest quotas for gold coral

would eliminate this important source of information on the population dynamics of these coral species.

Economic and Social Impacts

The adverse economic impacts could be significant. The current total harvest quota for gold coral at all established and conditional beds is 1,080 kg every two years, with an estimated dockside value of $356,400. However, the gold coral quota at the Makapu'u Bed accounts for more than half of this total. As noted in Section 10.1.1, the current standing stock of gold coral at the Makapu'u

Bed may not yield the current biennial harvest quota of 600 kg. If no gold coral is harvested from the Makapu'u Bed the amount of potential gross revenues foregone by suspending the harvest quota at all established and conditional beds would be about $158,400 every two years

10.1.4 Alternative 4: Implement a minimum size limit for gold coral at Makapu'u Bed

Ecological, Economic and Social Impacts

Estimates of growth rates, mortality rates and size at reproductive maturity are necessary before a size limit can be reliably set. These data are lacking for gold coral. Without this information the size limit established may be too low, thereby insufficiently protecting the coral from overfishing, or be too high, thereby resulting in an overly conservative size limit that reduces the potential economic return from the fishery. There will be some cost if any coral is actually avoided or discarded because of the size limit.

10.2 Definitions of live and dead coral

10.2.1 Alternative 1: No action

Ecological Impacts

The harvest quotas in the FMP do not apply to dead coral, which is defined in the FMP as any precious coral that contains holes from borers or is discolored or encrusted at the time of removal from the seabed. With no restriction on the quantity of dead coral that can be harvested, the current definition of dead coral allows the unrestricted harvest of coral that is standing upright and partially covered with living tissue as long as it contains holes from borers or is discolored or encrusted. It is possible that colonies of such coral near French Frigate Shoals in the NWHI may provide foraging habitat for the endangered Hawaiian monk seal (Section 9.4). The possible reduction in foraging habitat that may result from the harvest of dead standing coral partially covered with living tissue could intensify the problems related to food-stress which the monk seal population at French Frigate Shoals is experiencing. However, the negative impact on monk seal foraging habitat is likely to be small, as most coral colonies that contain holes from borers or are discolored or encrusted also no longer have any living polyps or tissue.

Economic and Social Impacts

If the Council does not develop management measures to ensure the protection of monk seal foraging habitat or does not develop measures that are considered adequate by NMFS, NMFS would likely initiate an Endangered Species Act section 7 consultation on the precious coral fishery. Management measures that could be imposed include emergency closures of specific sites or alteration of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

10.2.2 Alternative 2 (Preferred Alternative): Redefine live precious coral as precious coral that has live coral polyps or tissue. Redefine dead precious coral as precious coral that no longer has any live coral polyps or tissue

Ecological Impacts

This alternative would reduce the risk of harvesting coral in the waters around the Northwestern Hawaiian Islands which could be providing foraging habitat for the Hawaiian monk seal. However, the added protection to monk seal foraging habitat may be small, as most coral colonies that contain holes from borers or are discolored or encrusted also no longer have any living polyps or tissue.

Economic and Social Impacts

This alternative may have some adverse economic impacts. Only live coral is counted toward the quotas limiting the amount of precious coral that may be taken in any permit area during the fishing year. It is possible that some of the coral at a given bed that was regarded as dead under the current definition would be regarded as live under the alternative definition, and therefore be subject to the harvest quota for that bed. However, the amount of additional coral that would be subject to the quota is likely to be small, as coral colonies that contain holes from borers or are discolored or encrusted generally no longer have any living polyps or tissue.

This alternative would facilitate monitoring and enforcement of harvest quotas by more clearly distinguishing between live coral and dead coral. Members of the Precious Coral Fishery Plan Team state that the presence or absence of live tissue or polyps on coral colonies is easier to detect and less ambiguous than the presence or absence of holes from borers or discoloration or encrustation. Further, the definitions of live and dead coral proposed by this alternative are the same as the definitions of live and dead coral adopted by the Hawaii Department of Land and Natural Resources. Consistent definitions would assist the enforcement of State and Federal precious coral fishery regulations.

10.2.3 Alternative 3: Redefine live precious coral as precious coral that is standing upright. Redefine dead precious coral as precious coral that is no longer standing upright

Ecological Impacts

This alternative would reduce the risk of harvesting coral in the waters around the Northwestern Hawaiian Islands which could be providing foraging habitat for the Hawaiian monk seal. However, the added protection to monk seal foraging habitat is likely to be small, as most coral colonies that contain holes from borers or are discolored or encrusted also are no longer standing upright.

Economic and Social Impacts

This alternative may have some adverse economic impacts. Only live coral is counted

toward the quotas limiting the amount of precious coral that may be taken in any permit area during the fishing year. It is possible that some of the coral at a given bed that was regarded as dead under the current definition would be regarded as live under the alternative definition, and therefore be subject to the harvest quota for that bed. However, the amount of additional coral that would be subject to the quota is likely to be small, as coral colonies that contain holes from borers or are discolored or encrusted are often no longer standing upright.

This alternative could increase the difficulty of enforcing harvest quotas, as there would an incentive for fishery participants to intentionally "knock down" standing coral colonies during harvesting operations, thereby changing some "live coral" to "dead coral" and decreasing the quantity of harvested coral that is counted toward the quota.

10.3 Application of size limits

10.3.1 Alternative 1: No action

Ecological Impacts

As noted in Section 5, the current minimum size limit for pink coral applies to dead coral as well as live coral. Applying a minimum size to dead coral is inconsistent with the model for developing an appropriate minimum size limit, which is based on an estimated growth rate, mortality rate and size at reproductive maturity for live coral. Further, the application of a minimum size limit to dead coral may remove any incentive for harvesters to collect dead coral since it is less valuable than live coral. From the standpoint of conservation, it is more desirable to harvest dead coral than live coral.

Economic and Social Impacts

This alternative has a negative economic impact because it prohibits the harvest of dead pink coral colonies that are below the minimum size. There is insufficient information on the quantity of dead pink coral at different beds to evaluate the economic impact.

Applying size limits to both live and dead coral would facilitate enforcement of size limits by eliminating the need for enforcement officers to distinguish between live and dead coral.

10.3.2 Alternative 2 (Preferred Alternative): Apply size limits to live coral only

Ecological Impacts

The taking of dead pink coral of any size is not likely to have any adverse ecological effects. Fallen dead coral generally decays from erosion and chemical weathering in about 50 years. It is unlikely that the harvest of dead pink coral at Brooks Bank or the newly discovered FFS-Gold Pinnacles Bed would have an adverse effect on the monk seal population at French Frigate Shoals, as most of the pink coral trees at these beds are of insufficient size to provide habitat for monk seal prey items (Section 9.4).

Economic and Social Impacts

The economic impacts of this alternative are likely to be positive, as dead pink coral of any size would be allowed to be harvested. As noted in Section 10.3.1, there is insufficient information on the quantity of dead pink coral at different beds to evaluate the economic impact.

10.4 Conservation of black coral

10.4.1 Alternative 1: No action

Ecological Impacts

The present status of the major black coral bed in Hawaii that is currently being commercially harvested can be described as good, particularly with regard to levels of recruitment and a rate of harvest that has not exceeded the estimated MSY (Section 9.2.3). However, emerging harvesting technologies that render black coral occurring at greater depths more accessible to harvesters and improve the efficiency of harvesting operations may intensify the fishing pressure on black coral resources. Black coral harvesters in Hawaii are currently experimenting with towed underwater camera systems and other new technology that could increase the output from old harvest areas and lead to the discovery of new beds. Furthermore, firms in Hawaii that are examining the feasibility of harvesting precious corals using manned and unmanned submersibles may decide to target black corals. Market factors could also lead to depletion of black coral resources. For example, in Hawaii the demand for small, immature black coral colonies is likely to increase in the near future as the popularity of household marine aquaria grows. In summary, in the absence of restrictions on the harvest of black coral, increased fishing pressure and the harvest of immature colonies could lead to the overfishing of black coral resources at targeted beds.

In July 1999, recognition of the potential for greater harvesting pressure on black coral resources led the State of Hawaii to prohibit the harvest of black coral with a base diameter of less than 3/4 inches from State marine waters. A black coral colony with a basal stem diameter of 3/4 inches corresponds to an age of about 15 years, which is approximately 5 to 2.5 years after which colonies reach sexual maturity. A reproductive cushion of 5 to 2.5 years may be too short a period to sustain the recruitment of black coral species if fishing pressure on the resource increases.

Economic and Social Impacts

Over the short run maintaining the status quo would have a positive economic impact, as the harvesting of black coral colonies could proceed without restriction. However, if fishing pressure increases to the point at which black coral resources become overfished, the fishery could become economically unviable. As noted above, some current black coral divers in Hawaii are experimenting with new technology that will increase the efficiency of harvesting operations and intensify the fishing pressure on black coral beds with the highest commercial importance, including those in the Au'au Channel.

10.4.2 Alternative 2 (Preferred Alternative): Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch,

measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony. Persons who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule would qualify for an exemption which allows the hand harvest of black coral that has attained a minimum base diameter of 3/4 inches, measuredon the widest portion of the skeleton at a location just above the holdfast

Ecological Impacts

This alternative would prevent the harvest of colonies which are immature and have not reached their full potential for growth, thereby reducing the potential for overfishing to occur. Black coral colonies reach sexual maturity at 10 to 12.5 years of age, corresponding to a tree height of 25 to 31 inches (Grigg 1976). A coral colony that has attained a height of 48 inches or basal stem diameter of 1 inch corresponds to an age of about 20 years, which is approximately 8 to 10 years after black coral colonies reach sexual maturity. Hence, this alternative provides an adequate reproductive cushion (the difference between age at reproductive maturity and the age at first capture) for recruitment and reduces the risk of overfishing black coral resources. Data on the estimated MSY and growth rates indicate that 48 inches is the minimum acceptable harvesting size limit for sustaining maximum yield (Grigg 1998a).

A coral colony with a 3/4 inch base diameter is estimated to be about 15 years old, which is approximately 5 to 2.5 years after which black coral colonies reach sexual maturity. Allowing individuals who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule tend to promote conservation of the resource. While the reproductive cushion provided by a size limit of 3/4 inches is significantly smaller than that provided by a 1 inch base diameter/48 inch tree height size limit, the expected harvest level of the divers who potentially could qualify for an exemption is substantially lower than the MSY for the Au'au Channel bed, which is estimated to be about 11,000 lbs/yr (Section 9.2.3). Between 1990 and 1997, the annual harvest of black coral in Hawaii varied from a low of 864 lbs to a high of 6,017 lbs, with a yearly average of 3,084 lbs. An assessment of the biological condition of the black coral bed in the Au'au Channel conducted in July 1998 showed that the age frequency distributions of sample populations in 1975 and 1998 are very similar, suggesting that harvesting during the intervening years has had no significant effect on recruitment.

Economic and Social Impacts

The "either/or" provision provides flexibility for harvesters by allowing the taking of stunted colonies less than 48 inches in height but having a 1 inch or greater basal stem diameter, and slender colonies less than 1 inch in diameter but 48 inches or more in height. However, the estimated economic impact of this size limit on current black coral harvesters in Hawaii could be significant if divers extend their harvesting operations into the EEZ. The State of Hawaii Division of Aquatic Resources estimates that only about 50 percent of the black coral colonies currently being harvested are either at least 48 inches in height or have a base diameter of 1 inch or greater.

This alternative takes into account present participation in the fishery; historical fishing practices in, and dependence on, the fishery; and the economics of the fishery. It would mitigate the negative economic impacts of a minimum size limit on those black coral divers who currently have the greatest economic dependence on the fishery by allowing them to continue to harvest coral with a 3/4 inch or larger base diameter. Persons who reported a landing of lack coral to the State of Hawaii within 5 years before the effective date of the final rule would qualify for the exemption. The negative economic impacts of a size limit of 3/4 inches are likely to be small, as most of the black coral that is currently being harvested is larger than this minimum size. The State of Hawaii Division of Aquatic Resources estimates that nearly 83 percent of the black coral harvested has a base diameter of 3/4 inches or greater. According to Maui Divers of Hawaii, Ltd., processors of precious coral prefer to purchase black coral colonies which are at least 1 inch in diameter near the base because these colonies are the most suitable size and weight for the manufacture of black coral jewelry. However, black coral processors will purchase smaller colonies in order to ensure adequate supplies of raw material.

This alternative takes into account the cultural and social framework relevant to the fishery and any affected fishing communities. The commercial harvest of black coral using hand harvest methods has occurred in the waters around Hawaii for more than three decades (Grigg 1993). By allowing active participants in the fishery to continue to harvest coral with a 3/4 inch or larger base diameter the exemption is expected to mitigate the negative impacts of a size limit for black coral on enjoyment of the fishery and social or cultural activity in the fishery. This alternative is not expected to adversely affect the capability of fishing vessels used in the fishery to engage in other fisheries.

This alternative is not expected to provide any particular individual, corporation or other entity with an excessive share of fishing privileges. It is estimated that 3 to 5 individuals in Hawaii would qualify for the exemption. From the inception of the black coral fishery in Hawaii in the late 1950s, generally fewer than 5 individuals have been active in the fishery during any one year.

A minimum size limit could induce harvesters to dive deeper and stay submerged longer in search of coral colonies that are of a legal size. Diving to great depths for extended periods of time exposes harvesters of black coral to nitrogen narcosis and decompression sickness, both of which can result in injury or death. Over the years, many black coral harvesters in Hawaii have died or become permanently disabled from diving accidents. To the extent that a 1 inch base diameter/48 inch tree height size limit creates pressures on harvesters to dive to depths that they would otherwise avoid, this alternative could have a negative impact on the safety of human life at sea. However, the exemption included in this alternative would mitigate these negative impacts on human safety by allowing qualifying harvesters to collect coral with a base diameter of 3/4 inches.

To the extent that only individuals who receive an exemption participate in the black coral fishery, this alternative would facilitate enforcement by applying Federal regulations for the harvest of black coral that are consistent with those of the State of Hawaii. As noted in Section 9.2.3, the Hawaii Department of Land and Natural Resources recently implemented a minimum size limit of 3/4 inches for black coral. However, if harvesters who don't qualify for an exemption enter the fishery State and Federal enforcement office would be faced with the difficulty of enforcing conflicting regulations. An inconsistency between State and Federal regulations may be particularly problematic if harvesters collect black coral from beds which lie in areas over which both the State

and Federal governments claim jurisdiction. Specifically, the State claims the authority to manage and control the marine, seabed and other resources within "archipelagic waters." In some areas, including the Au'au Channel, these archipelagic waters extend into the EEZ.[6] It is not possible to predict how the conflicting claims to jurisdiction will be reconciled.

10.4.3 Alternative 3: Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1", measured no less than 1" from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony

Ecological Impacts

The ecological impacts are expected to be similar to those of Alternative 2.

Economic and Social Impacts

The economic and social impacts would be similar to those of Alternative 2, except no exemption is provided that would reduce the negative economic impacts on current black coral harvesters, mitigate the negative impacts on the safety of human life at sea and facilitate enforcement of Federal and State of Hawaii black coral regulations.

10.4.4 Alternative 4: Prohibit the harvest of black coral unless it has attained a minimum base diameter of 3/4 inches

Ecological Impacts

A coral colony with a basal stem diameter of 3/4 inches corresponds to an age of about 15 years, which is approximately 5 to 2.5 years after which black coral colonies reach sexual maturity. A reproductive cushion of 5 to 2.5 years may be too short a period to sustain the recruitment of black coral species if fishing pressure on the resource increases.

Economic and Social Impacts

The adverse economic impacts would be small in the short run, as most of the black coral that is currently being harvested has a base diameter larger than 3/4 inches. The State of Hawaii Division of Aquatic Resources estimates that nearly 83 percent of the black coral harvested has a base diameter of 3/4 inches or greater. However, if a minimum size of 3/4 inches inadequately protects black coral resources from overfishing if fishing pressure increases, the fishery may be unsustainable and economically unviable over the long term.

By implementing a smaller minimum size limit this alternative would be expected to have

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[6] An October 24, 1997 memorandum from NOAA/GCSW to the WPRFMC Chairman states that, despite any contentions by the State of Hawaii to the contrary, for purposes of Federal fishery management State waters do not extend beyond three miles from the coast.

less of a negative impact on human safety in terms of inducing harvesters to dive deeper and stay submerged longer in search of coral colonies that are of a legal size. On the other hand, if the size limit inadequately protects stocks from overfishing, the gradual depletion of the resource would also encourage divers to take more risks in order to maintain harvest levels.

This alternative would facilitate enforcement by establishing Federal regulations that are consistent with State of Hawaii regulations for black coral.

10.4.5 Alternative 5: Establish a weight quota for black coral

Ecological, Economic and Social Impacts

A weight quota may not be as effective as a size limit in avoiding overfishing of the resource. Information is limited on the standing stock and sustainable yield of managed species of black coral. The use of minimum size limits based on knowledge of the reproductive biology of precious corals is the preferred basis for management of the fishery when selective harvesting is expected to be economically feasible. In addition, weight quotas may be more difficult to enforce than size limits (Grigg 1998a).

10.5 Gear restrictions

10.5.1 Alternative 1: No action

Ecological Impacts

To the extent that the use of non-selective gear is destructive to essential fish habitat, allowing the continued use of this gear is inconsistent with Magnuson-Stevens Act obligations to minimize to the extent practicable adverse effects on such habitat caused by fishing. The FMP states that it is probable that the use of non-selective gear such as dredges (pieces of netting dragged across the ocean floor at slow speed) may damage other sessile organisms on the bed, especially those which, like the precious corals, form colonies which rise some distance off the bottom. The benthic animals that occur at these depths tend to be long-lived with slow re-colonization and growth rates. Consequently, it will take an extended period of time for populations of these animals to recover from any damage that the use of non-selective gear may cause.

A variety of invertebrates and fish are known to utilize the same habitat as precious corals including onaga (*Etelis coruscans*), kahala (*Seriola dumerallii*) and deep-water pandalid shrimp (*Heterocarpus ensifer*). There is no evidence that these species depend on the coral for shelter or food, but the functional significance for the ecosystem and fisheries of these deep-water communities is poorly understood.

The use of non-selective gear may also be wasteful, as some coral dislodged from the bottom may not be recovered. The FMP indicates that dredges only recover about 40 percent of the precious coral that is "knocked down." Much of the remainder slowly dies, becomes prone to attack from parasites and encrusting organisms and quickly deteriorates (Carleton 1987).

The damage to precious coral beds and associated benthic communities caused by the use of non-selective gear may have an indirect adverse impact on Hawaiian monk seals. As noted in Section 9.2.4, precious coral beds in the vicinity of French Frigate Shoals in the NWHI may constitute important foraging habitat for monk seals. The foraging success of monk seals may be adversely affected if the use of non-selective gear damages these beds. However, the point at which the use of non-selective gear might have an adverse effect on monk seals is uncertain.

Economic and Social Impacts

This alternative minimizes the capital and operating costs of harvesting deep-water precious corals. However, non-selective gear has not been used to harvest precious corals in the EEZ since 1989 when a coral-dredging operation in Hawaii made at least three trips to areas around the NWHI. Most of the coral harvested was dead and of poor quality, and the revenue generated during these trips was insufficient to cover vessel operating costs. As a result of large financial losses the firm ceased operations.

The use of non-selective gear to harvest precious corals may not be an efficient use of fishery resources. The value of precious coral colonies is dependent on its size, color and condition. Large, completely intact trees of color have the greatest value. Non-selective gear such as dredges land pieces of broken coral knocked down by the dredge stone and entangled in the nets as the dredge is pulled along the sea floor. Breakage may reduce a coral's value by as much as 80 percent.

Allowing the continued use of non-selective gear in exploratory areas may encourage the discovery and exploration of new beds. However, the use of this gear is unlikely to provide sufficient data to develop reliable estimates of the standing stock and MSY for newly discovered beds because this gear cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals.

If the Council does not develop management measures to ensure the protection of monk seal foraging habitat or does not develop measures that are considered adequate by NMFS, NMFS would likely initiate an Endangered Species Act section 7 consultation on the precious coral fishery. Management measures that could be imposed include emergency closures of specific sites, including Brooks Bank, or alteration of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

10.5.2 Alternative 2 (Preferred Alternative): Only selective gear may be used to harvest precious corals from all permit areas.

Ecological Impacts

Allowing only selective gear for the harvest of precious corals would help prevent overfishing and wastage of resources by minimizing bycatch. By employing selective gear, harvest quotas and size limits could be more strictly adhered to, thereby minimizing the possibility of adversely impacting the long-term health of these precious coral beds. The use of selective gear would also minimize adverse impacts on habitat and other living organisms.

Because non-selective gear by definition is non-selective for colony size, the imposition of a size limit for managed precious corals is precluded in those permit areas where the use of non-selective is allowed. Prohibiting the use of non-selective gear would allow the current size limit for pink coral to be applied to all permit areas. A broader application of the size limit would help ensure the conservation of pink coral.

The Council's Precious Coral Fishery Plan Team noted that even the use of non-selective gear for scientific research activity could result in ecological damage, although the damage is likely to be relatively slight because the amount of precious corals taken and the portion of a precious coral bed that would be adversely affected during such activity is generally small. The Plan Team stated that the use of non-selective gear is unnecessary to assess the abundance and distribution of precious corals at established beds. By definition established beds are those which are sufficiently documented that optimum yields have already been established on the basis of biological stock assessment techniques. On the other hand, the Plan Team also noted that allowing the use of non-selective gear for scientific research activity may have a beneficial ecological impact to the extent that it increases the incentive to collect scientific data on precious corals at conditional beds and in exploratory areas which are needed for effective implementation of the FMP. For example, non-selective gear can be used to collect data on precious corals taxonomy, genetic composition and zoogeography. At present, the level of Federal and State funds for such scientific studies is low because of the lack of activity in the precious coral fishery. Permitting the use of non-selective gear provides a relatively inexpensive method of conducting research on precious corals. However, the type of scientific information that can be collected with non-selective gear is limited because this gear by definition cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals.

Economic and Social Impacts

The estimated dockside value of the precious coral that would no longer be available for annual harvest by non-selective gear from established and conditional beds is $62,618 (Table 5). This figure is based on a harvest quota that is 20 percent of the quota allowed for selective harvesting (Table 1). According to Maui Divers of Hawaii, Ltd., the largest processor of precious coral jewelry in Hawaii, the ex-vessel price of all species of gold coral, *C. secundum*, *C. regale* and both species of bamboo coral is $330/kg ($150/lb), $440/kg ($200/lb), $600/kg ($270/lb) and $18/kg ($8/lb), respectively.

In addition, up to 200 kg of precious coral would no longer be available for annual harvest by non-selective gear from each of the exploratory beds around Hawaii, American Samoa, Guam and the remote US Pacific Island possessions.

Prohibiting the use of non-selective gear may inhibit the development of the precious coral fishery by making it uneconomical for some firms to enter the fishery. However, as noted in Section 10.5.1, the most recent venture attempting to harvest precious corals with non-selective gear in the EEZ around the Hawaiian Islands proved to be economically unviable.

Table 5. Estimated quantity and value of precious coral available for harvest by non-selective gear under current regulations.

Name of Bed	Harvest Quota	Total Value
Brooks Bank	Pink 40.0 kg (see Note 1 below) Gold 26.6 kg Bamboo 22.2 kg	$33,178
180 Fathom Bank	Pink 44.4 kg (see Note 2 below) Gold 13.4 kg Bamboo 11.2 kg	$24,160
FFS-Gold Pinnacles (note 3)	Gold 16.0 kg	$5,280
		$62,618

Note 1: Pink coral assumed to be *C. regale.* Based on revised harvest quota (Section 9.2.2).
Note 2: Pink coral assumed to be *C. secundum.*
Note 3: Newly discovered bed (Section 9.2.4).

According to industry representatives, technological innovations during the last decade have significantly reduced the costs of purchasing and operating selective gear. In particular, the costs of operating manned submersibles have declined over the years. One reason that costs have declined is that the size of these submersibles has decreased substantially and, consequently, tender vessels are smaller. The capital cost of a manned submersible has also decreased as much as 50 percent since the 1970s. The cost of purchasing an unmanned submersible (i.e., remotely operated vehicle) has also declined significantly. The price may be as low as $50,000, which is approximately equal to the capital investment in gear required to initiate a non-selective harvest operation using tangle nets.

Although the capital and operating costs of manned submersibles are still high in comparison to those of non-selective gear, they are not economically prohibitive, as is evidenced by the recent interest of two firms in using this type of selective gear to harvest precious corals in the waters around Hawaii. In addition, it is likely that some harvesters of precious coral will be able to defray the costs of using selective gear by finding other lucrative uses for the gear, such as salvage and research.

As noted in Section 10.5.1, the use of non-selective gear to harvest precious corals may be an inefficient use of fishery resources. Non-selective gear tends to damage the precious coral trees as it harvests them, thereby greatly reducing the value of the coral. In contrast, selective gear harvests coral so that it retains its highest value.

10.5.3 Alternative 3: Only selective gear may be used to harvest precious corals from established and conditional beds

Ecological Impacts

The ecological impacts would be similar to those of Alternative 1, except the potential adverse impacts of using non-selective gear to harvest precious corals at established and conditional beds would be eliminated. Allowing the continued use of this relatively inexpensive gear in exploratory areas may encourage the discovery and exploration of new beds. However, as noted in Section 10.5.1, the use of non-selective gear is unlikely to provide sufficient data to develop reliable estimates of the standing stock and MSY for newly discovered beds because this gear cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals.

Economic and Social Impacts

The economic impacts would be similar to those of Alternative 1, except up to 200 kg of precious coral would continue to be available for annual harvest by non-selective gear from each of the exploratory beds around Hawaii, American Samoa, Guam and the remote US Pacific Island possessions.

10.6 Application of size limit for pink coral

10.6.1 Alternative 1: No action

Ecological Impacts

A minimum colony height size limit of 10 inches for pink coral was implemented in order to help ensure that the estimated MSY for these species of precious corals is not exceeded (Section 10.5). However, the size limit for pink coral applies only to the Makapu'u Bed, Keahole Point Bed and Kaena Point Bed because the use of non-selective gear is allowed everywhere else (except in the EEZ seaward of the main Hawaiian Islands). Under the no action alternative there is increased risk that the estimated MSY for pink coral will be exceeded at those conditional beds (i.e., Brooks Bank, 180 Fathom Bank and newly discovered FFS-Gold Pinnacles Bed) and exploratory areas where there is no size limit.

Economic and Social Impacts

The impact in the short term is minimal. However, long-term negative impacts on harvest levels and gross revenues could be potentially large if the MSY is exceeded. Given the life-history characteristics of pink coral, such as slow growth and long generation time, overfishing of these species could degrade the productivity of precious coral beds for many years. On the other hand, the deep-water precious coral fishery in Hawaii has been dormant for several years, and the interest of industry in harvesting the corals at those beds where there is no size limit is uncertain.

10.6.2 Alternative 2 (Preferred Alternative): Apply the current size limit for pink coral to all permit areas

Ecological, Economic and Social Impacts

The feasibility of this alternative is contingent on a prohibition on the use of non-selective gear to harvest precious corals for commercial purposes in all permit areas (Section 10.5.2). The alternative would prevent the harvest of colonies which are immature and have not reached their full potential for growth, thereby reducing the potential for overfishing to occur.

Applying the size limit for pink coral to additional permit areas is unlikely to have a significant negative economic impact because the financial return from harvesting colonies of pink coral that are less than 10 inches in height is low. According to Maui Divers of Hawaii, Ltd., harvesting colonies less than 10 inches is not economically practical, because the return does not justify the time spent harvesting.

Enforcement of any size limit for pink coral is difficult because much of the pink coral is unavoidably broken during collection. Breakage varies depending on handling which itself is a variable due to weather, size of the load and chance. The FMP states that this difficulty may be reduced by calculating an average weight and stem diameter for colonies 10 inches in height. The weight of the load could be divided by the average weight of a 10-inch colony. This division

would produce a number that would equal the minimum number of pieces equal to or larger than the stem diameter equivalent to 10 inches in height.

10.6.3 Alternative 3: Apply the current size limit for pink coral to all established and conditional beds

Ecological, Economic and Social Impacts

The ecological impacts would be similar to those of Alternative 2, except beds of pink coral occurring in exploratory areas would not receive the protection from overfishing provided by the preferred alternative.

The economic and social impacts would be similar to those of Alternative 2.

10.7 Adjusting Brooks Bank boundaries and harvest quotas

10.7.1 Alternative 1: No action

Ecological Impacts

A September 1998 survey of precious coral beds around the Northwestern Hawaiian Islands revealed that the size of Brooks Bank is larger than previously specified. However, maintaining the current harvest quota of 444 kg for pink coral could result in the overfishing of these species of precious coral at Brooks Bank. Recent estimates of the standing crop of precious coral at Brooks Bank suggests that 200 kg of pink coral can be harvested annually from this bed on a sustainable basis (Section 9.2.2).

It is unlikely that the harvest of the current quota for pink coral at Brooks Bank would have an adverse effect on the Hawaiian monk seal population at French Frigate Shoals, as most of the pink coral trees at this bed are of insufficient size to provide habitat for monk seal prey items (Section 9.2.2).

The harvest of the existing quota of 133 kg for gold coral at Brooks Bank could have an adverse impact on the Hawaiian monk seal population at French Frigate Shoals by reducing the function of the precious coral beds to aggregate monk seal prey species and thereby reducing the seals' foraging success. One reason that Brooks Bank is designated as a habitat area of particular concern for the precious coral fishery is its possible importance as a foraging habitat for the monk seal. However, the point at which harvesting of gold coral at Brooks Bank might have an diverse effect on monk seals is uncertain.

The effect of harvesting the current precious coral quotas at Brooks Bank is unlikely to have an adverse impact on habitat and related marine organisms. A variety of invertebrates and fish are known to utilize the same habitat as precious corals. These species of fish include onaga (*Etelis coruscans*), kahala (*Seriola dumerallii*) and the shrimp (*Heterocarpus ensifer*). However, there is no evidence that these species depend on the coral for shelter or food.

Economic and Social Impacts

Maintaining the current harvest quota for pink coral at Brooks Bank would have a positive economic impact over the short term. According to Maui Divers of Hawaii, Ltd., the ex-vessel price of *C. regale* is $600/kg. Hence, the potential gross revenues obtained from harvesting the current quota of 444 kg for pink coral is about $266,400. However, the long-term economic effects may be negative if the stock of pink coral at Brooks Bank is overfished. Given the life-history characteristics of precious corals, such as slow growth and long generation time, overfishing could degrade the productivity of the bed for many years. On the other hand, the deep-water precious coral fishery in Hawaii has been dormant for several years, and the interest of industry in harvesting the corals at Brooks Bank or any other bed in the waters around the Northwestern Hawaiian Islands is uncertain.

Maintaining the current quota for gold coral at Brooks Bank harvest is likely have a positive economic impact over the short term. According to Maui Divers of Hawaii, Ltd., the ex-vessel price of gold coral is $330/kg. Hence, the potential gross revenues obtained from harvesting the current quota of 133 kg for gold coral is about $43,890. However, if the Council does not develop management measures to ensure the protection of monk seal foraging habitat or does not develop measures that are considered adequate by NMFS, NMFS would likely initiate an Endangered Species Act section 7 consultation on the precious coral fishery. Management measures that could be imposed include emergency closures of specific sites, including Brooks Bank, or alteration of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

10.7.2 Alternative 2 (Preferred Alternative): Revise the boundaries of Brooks Bank, Permit Area C-B-3, to include the area within a radius of 2.5 nautical miles of a point at 23° 58.8' N and 166° 42' W. At Brooks Bank

change the harvest quota for pink coral to 200 kg and suspend the harvest quota for gold coral until additional scientific information becomes available on the impact of harvesting gold coral on monk seal foraging habitat.

Ecological Impacts

The proposed revision in the boundaries of Brooks Bank simply reflects new information on the size of the bed collected during a survey of selected precious coral beds around the Northwestern Hawaiian Islands conducted by NMFS in September 1998. The adjustment in the coordinates of the bed is not expected to have any ecological impacts.

The ecological impacts of adjusting the harvest quota for pink coral at Brooks Bank are expected to be positive, as a harvest quota of 200 kg is the estimated MSY for pink coral at this bed based on the best scientific information available.

By suspending the harvest of gold coral this alternative eliminates the possible adverse effects that the harvest of this coral could have on the Hawaiian monk seal population at French Frigate Shoals. The potential benefits to monk seals cannot be quantified because of the generally poor understanding of the dietary importance to monk seals of fish and other organisms inhabiting beds of gold coral and the effects of gold coral harvesting at Brooks Bank on monk seal prey resources. For example, deep-water bottomfish and eels are known components of monk seal diets, but their relative importance is uncertain. In the absence of data, a precautionary approach would be to suspend the harvest quota of gold coral.

It is unlikely that the harvest of the revised quota for pink coral at Brooks Bank would have an adverse effect on the Hawaiian monk seal population at French Frigate Shoals, as most of the pink coral trees at this bed are of insufficient size to provide habitat for monk seal prey items (Section 7.1.2).

Economic and Social Impacts

The short-term economic impacts are likely to be negative, as the harvest quota for pink coral at Brooks Bank would be reduced by 244 kg. Assuming an ex-vessel price for *C. regale* of $600/kg, this reduction in the harvest quota would decrease potential gross revenues by about $146,400. However, this alternative is likely to have a positive economic benefit over the long term if the revised harvest quota protects the productivity of the bed from degradation through overfishing.

The potential adverse economic impacts of suspending the harvest of gold coral are significant. As noted in Section 10.7.1, the quantity of gold coral that could be harvested from Brooks Bank on a sustainable basis is worth about $43,890. On the other hand, the deep-water precious coral fishery in Hawaii has been dormant for several years, and the interest of industry in harvesting the corals at Brooks Bank or any other bed in the waters around the Northwestern Hawaiian Islands is uncertain.

Under this alternative the harvest of dead gold coral would continue to be allowed. The September 1998 survey of Brooks Bank found an abundance of dead gold coral at the bed (Section 9.2.4).

10.7.3 Alternative 3: Revise the boundaries of Brooks Bank to include the area within a radius of 2.5 nautical miles of a point 23° 58.8' N and 166° 42' W. Re-classify the bed as a refugium

Ecological Impacts

The risk of adversely impacting the foraging habitat of the monk seal by harvesting precious corals is eliminated. However, it is unlikely that prohibiting the harvest of pink coral at Brooks Bank would have a beneficial effect on the Hawaiian monk seal population at French Frigate Shoals, as most of the pink coral trees at this bed are of insufficient size to provide habitat for monk seal prey items (Section 9.2.4). Furthermore, it is unlikely that prohibiting the harvest of dead precious coral of any species would have a beneficial effect on monk seals. Observations of monk seal foraging behavior near French Frigate Shoals indicate that it is live precious coral that constitutes the most important foraging habitat for monk seals that are diving to depths at which precious corals occur (Section 9.4). Monk seal prey, such as eels, have not been observed congregating around dead coral.

Another refugium would provide an additional reserve for possible reproductive replenishment of other beds. However, the deep-water precious coral fishery in Hawaii has been dormant for nearly two decades. Although some firms have expressed interest in renewing the fishery, the number of fishery participants is likely to remain low because of the high capital and operating expenses. Therefore, there does not appear to be a need for a second reproductive reserve for enhancement of recruitment into adjacent areas at this time.

Economic and Social Impacts

This alternative is likely to have a pronounced adverse negative economic effect, as 200 kg of pink coral, 133 kg of gold coral and 111 kg of bamboo coral which could be harvested on a sustainable basis would be foregone. Assuming the ex-vessel price of all species of gold coral is $330/kg ($150/lb), price of *C. regale* is $600/kg ($270/lb) and price of both species of bamboo coral is $18/kg ($8/lb), the total dockside value of this coral is about $166,000. This figure underestimates the potential economic loss, as the harvest of dead coral would also be prohibited. A September 1998 survey of the precious corals bed at Brooks Bank recorded an abundance of dead gold coral colonies (Section 9.2.4).

10.8 Classification of newly discovered FFS-Gold Pinnacles Bed

10.8.1 Alternative 1: No action

Ecological Impacts

The newly discovered FFS-Gold Pinnacles Bed is currently classified as part of the

exploratory permit area X-P-H. The only harvest quota which applies to this bed is the 1,000 kg annual quota which may be taken from the entire X-P-H area. The 1998 survey of the FFS-Gold Pinnacles Bed revealed that colonies of pink or bamboo coral were sparse or absent (Section 9.2.4). It is uncertain if the stocks of these corals at the FFS-Gold Pinnacles Bed are capable of supporting any level of harvest on a sustainable basis. Harvesting of the few pink or bamboo colonies that occur at the bed could have a significant adverse ecological impact on the stocks of these species.

The 1998 survey of the FFS-Gold Pinnacles Bed recorded an abundance of live and dead gold coral colonies in scattered patches (Section 9.2.4). Based on survey data it estimated that the MSY for gold coral at this bed is 80 kg/yr. In the absence of a harvest quota, the stock of gold coral at the FFS-Gold Pinnacles Bed could be harvested at a level that exceeds the estimated MSY. The negative impacts on the stock could be especially significant if a harvest operation used the entire 1,000 kg quota for the exploratory area around the State of Hawaii (Permit Area X-P-H) to harvest the gold coral at the FFS-Gold Pinnacles Bed.

The harvest of live gold coral may have an adverse impact on the Hawaiian monk seal population at French Frigate Shoals by reducing the availability of monk seal prey species. The point at which precious corals harvesting at the FFS-Gold Pinnacles Bed might have an adverse effect on monk seals is uncertain.

The effect of harvesting gold coral from the FFS-Gold Pinnacles Bed is unlikely to have an adverse impact on habitat and related marine organisms. A variety of invertebrates and fish are known to utilize the same habitat as precious corals. These species of fish include onaga (*Etelis coruscans*), kahala (*Seriola dumerallii*) and the shrimp (*Heterocarpus ensifer*). However, there is no evidence that these species depend on the coral for shelter or food.

Economic and Social Impacts

Allowing the entire 1,000 kg quota for the exploratory area around the State of Hawaii (Permit Area X-P-H) to be used to harvest the precious coral at the FFS-Gold Pinnacles Bed could have a positive economic impact over the short term. Given that only gold coral is abundant at the FFS-Gold Pinnacles Bed, the value of a 1,000 kg harvest at this bed is more than $300,000, assuming the ex-vessel price of gold coral is $330/kg ($150/lb). However, a harvest of 1,000 kg would exceed the estimated MSY for gold coral at the FFS-Gold Pinnacles Bed by 920 kg and would likely deplete the gold coral stock at this bed such that it would be unable to support any further harvest for many years.

In addition, if the Council does not develop management measures to ensure the protection of monk seal foraging habitat or does not develop measures that are considered adequate by NMFS, NMFS would likely initiate an Endangered Species Act section 7 consultation on the precious coral fishery. Management measures that could be imposed include emergency closures of specific sites or alteration of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

10.8.2 Alternative 2 (Preferred Alternative): Classify the newly-discovered FFS-Gold Pinnacles Bed as a conditional bed, Permit Area C-B-5, which

includes the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W. At the FFS-Gold Pinnacles Bed set the annual harvest quota for all types of precious coral at zero until additional information becomes available on the impact of harvesting gold coral on monk seal foraging habitat.

Ecological Impacts

As noted in Section 10.8.1, colonies of pink or bamboo coral are sparse or absent at the FFS-Gold Pinnacles Bed, and it is uncertain if the stocks of these corals are capable of supporting any level of harvest on a sustainable basis. Setting the conditional harvest quota for pink and bamboo coral at zero would protect the stocks of these species from possible overfishing, should the precious corals fishery off the NWHI recommence.

Setting the conditional harvest quota for gold coral at zero until additional scientific information becomes available on the impact of harvesting this coral on Hawaiian monk seal foraging habitat reduces the likelihood that a resumption of the precious corals fishery off the NWHI would have an adverse impact on the monk seal population at French Frigate Shoals. The importance to monk seal foraging habitat of colonies of gold coral is uncertain. In the absence of data, a precautionary approach would be to set the harvest quota of gold coral at zero. Setting the conditional harvest quota for gold coral at zero would also protect the stock of this species from overfishing.

Economic and Social Impacts

The adverse economic impacts of setting the conditional harvest quota for gold coral at zero are likely to be significant. It is estimated that about 80 kg of gold coral could be annually harvested from the FFS-Gold Pinnacles Bed on a sustainable basis. Assuming an ex-vessel price of $330/kg ($150/lb) for gold coral, about $26,400 in potential gross revenues would be foregone. However, fishing ventures would be allowed to harvest dead gold coral, which, according to existing survey data (Section 9.0), is abundant at this bed.

10.8.3 Alternative 3: Classify newly discovered FFS-Gold Pinnacles Bed as a refugium, Permit Area R-2, which includes the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W.

Ecological Impacts

Prohibiting the harvest of any live or dead coral minimizes the possibility of interactions between Hawaiian monk seals and the precious coral fishery. However, prohibiting the harvest of pink coral at this bed is expected to have little beneficial effect on monk seals, as most of the pink coral trees at this bed are of insufficient size to provide habitat for monk seal prey items (Section 9.4). Nor is a prohibition on the harvest of dead coral of any species expected to have a significant beneficial effect on monk seals. Observations of monk seal foraging behavior near French Frigate Shoals indicate that it is live precious coral that constitutes the most important foraging habitat for

monk seals that are diving to depths at which precious corals occur (Section 9.4). Monk seal prey, such as eels, have not been observed congregating around dead coral.

Another refugium would provide an additional reserve for possible reproductive replenishment of other beds. However, the deep-water precious coral fishery in Hawaii has been dormant for nearly two decades. Although a small number of firms have expressed interest in renewing the fishery, the number of fishery participants is always likely to be low because of the high capital and operating expenses. Therefore, there is no need for a second reproductive reserve for enhancement of recruitment into adjacent areas at this time.

Economic and Social Impacts

The adverse economic impacts of prohibiting the harvest of live or dead coral are likely to be significant. As noted in Section 10.8.2, it is estimated that a quantity of live gold coral worth about $26,400 could be annually harvested from the FFS-Gold Pinnacles Bed on a sustainable basis. This figure underestimates the potential economic loss, as the harvest of dead coral would also be prohibited if the bed is classified as a refugium. Existing survey data indicates that dead colonies of gold coral are abundant at this bed (Section 9.2.4).

10.8.4 Alternative 4: Classify newly discovered FFS-Gold Pinnacles Bed as a conditional bed, Permit Area C-B-5, which includes the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W. Set the annual harvest quota for gold coral at 80 kg.

Ecological Impacts

This alternative would have a positive ecological impact on precious coral resources, as the amount of precious corals that may be taken would be set at a level that equals the estimated MSY for the FFS-Gold Pinnacles Bed (Section 9.2.4).

However, the harvest of live gold coral at the FFS-Gold Pinnacles Bed may have an adverse impact on the Hawaiian monk seal population at French Frigate Shoals by reducing the availability of monk seal prey species. There is insufficient information available to determine the point at which the harvest of gold coral at the FFS-Gold Pinnacles Bed might have an adverse effect on monk seal survival. The potential impact of harvesting gold coral on monk seals if a harvest quota for gold coral is established is likely to be less than the impact if no quota is set (no action).

Economic and Social Impacts

This alternative would impose a cost on harvesters over the short term, as it restricts the amount of precious coral that is allowed to be harvested. However, 80 kg of gold coral worth about $26,400 would be allowed to be harvested annually. Further, a quota would help ensure that harvest activity at the FFS-Gold Pinnacles Bed is sustainable and economically viable over the long term.

As noted above, the harvest of live gold coral at the FFS-Gold Pinnacles Bed may have an adverse impact on the Hawaiian monk seal population at French Frigate Shoals by reducing the availability of prey species. If the Council does not develop management measures to ensure the protection of monk seal foraging habitat or does not develop measures that are considered adequate by NMFS, NMFS would likely initiate an Endangered Species Act section 7 consultation on the precious coral fishery. Management measures that could be imposed include emergency closures of specific sites or alteration of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

10.9 Recommended changes to recordkeeping and reporting requirements

Current recordkeeping and reporting requirements provide the Council and NMFS with important information about the precious corals fishery (Section 6.0). However, the data may be insufficient to accurately assess the recovery and current status of known precious coral beds and determine the location and productive potential of new beds.

The recommended changes to the current recordkeeping and reporting requirements are expected to have significant beneficial impacts. Given the high costs of conducting biological surveys of precious coral resources, it is likely that the Council and NMFS will depend on fishermen to be the principle collectors of data on these resources. The additional data which will be collected under these recommended changes will enable the Council and NMFS to identify the most cost-effective way to ensure the long-term productivity of precious coral beds, maintain an economically viable fishery and minimize fishery interactions with protected species in the NWHI or adverse impacts on essential fish habitat. Furthermore, additional information on the distribution, abundance and potential yields of precious coral could provide an impetus for growth of the domestic precious corals industry.

11.0 Consistency with 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 recommended measures help reduce the risk of overfishing in the precious coral fishery by 1) suspending the harvest of gold coral at the Makapu'u Bed until additional information is available on the impact of harvesting on subsequent recruitment of this species (Section 10.1.2); 2) establishing a minimum size limit for black coral that reduces the risk of overfishing (Section 10.4.2); 3) prohibiting the use of non-selective gear in the harvest of precious coral in all permit areas (Section 10.5.2); 4) applying the current size limit for pink coral to all permit areas (Section 10.6.2); 5) modifying the estimated MSY for pink coral at Brooks Bank based on new information (Section 10.7.2); and 6) estimating the MSY for precious coral at the newly discovered FFS-Gold Pinnacles Bed (Section 10.8.2).

National Standard 2 states that conservation and management measures shall be based upon the best scientific information available. The Council recommends revised reporting and recordkeeping requirements that would expand the information base for assessing the recovery and current status of known precious coral beds and determining the location and productive potential of

new beds (Section 10.9.2).

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 FMP for precious corals treats separate precious coral beds as distinct management units because of their widely-separated patchy distribution and the sessile nature of individual colonies.

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 proposed measures will not discriminate between residents of different States. The recommended allocation of fishing privileges with respect to the harvest of black coral is consistent with this standard (Section 10.4.2).

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 purpose. The recommended prohibition on the use of non-selective gear takes into account the efficient utilization of precious coral resources. Technological advances have reduced the costs of using remotely operated vehicles to harvest precious corals to a level comparable to the costs of using non-selective gear. Although the capital and operating costs of a manned submersible are still high in comparison to those for non-selective gear, they are not economically prohibitive, as is evidenced by the recent interest expressed by two firms in entering the fishery using this type of selective gear (Section 10.5.2).

National Standard 6 states that conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches. The recommended measures take into account uncertainties in precious coral resources. Suspending the quota for gold coral at Makapu'u Bed until additional scientific information is available on the reasons for the low recruitment of gold coral at this bed would be a precautionary measure expected to increase the probability that a recovery in the number of gold coral colonies at the Makapu'u Bed eventually occurs (Section 10.1.2).

National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication. The establishment of a minimum size limit for black coral that is inconsistent with the State of Hawaii size limit may increase the difficulty of enforcing both Federal and State regulations. However, the best scientific information available suggests that the recommended minimum size is required to prevent overfishing, should harvest levels increase (Section 10.4.2). Furthermore, the recommended exemption which would allow qualifying persons to harvest black coral that has attained a 3/4 inch base diameter is expected to facilitate enforcement (Section 10.4.2). The recommended reporting and recordkeeping requirements are not expected to impose a significant economic burden on participants in the precious coral fishery (Section 10.9.2).

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. There have been no harvesters of deep-water species of precious coral, including pink, gold and bamboo coral, in the EEZ around Hawaii for nearly two decades. Current processors of these corals in Hawaii rely on imported material. Consequently, the recommended measures pertaining to these deep-sea corals are not expected to have a negative impact on processors. The recommended minimum size limit for black coral is also not expected to have a significant economic or social impact on precious coral processors in Hawaii. Nor is it expected to have a negative impact on the three to five individuals in Hawaii currently participating in the fishery for black coral in terms of employment, enjoyment of the fishery, social or cultural activity in the fishery or other social factors. The recommended exemption which would allow qualifying persons to harvest black coral that has attained a 3/4 inch base diameter is expected to reduce the negative economic impacts of establishing a size limit (Section 10.4.2).

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. By prohibiting the use of non-selective gear in the commercial harvest of precious corals, the proposed management measures would minimize damage to other sessile organisms on the bed and minimize the amount of coral which is dislodged from the bottom during harvesting operations and not recovered (Section 10.5.2). The Council recommends that the NMFS Daily Precious Coral Harvest Log be revised to include the number of live and dead colonies damaged but not harvested on each dive by species (Section 10.9).

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. Establishing a minimum size limit for black coral could induce harvesters using scuba gear to dive deeper and stay submerged longer in search of coral colonies that are of a legal size. On the other hand, depletion of the resource as a result of overfishing would also encourage divers to take more risks in order to maintain harvest levels. Furthermore, the recommended exemption which would allow qualifying persons to harvest black coral that has attained a 3/4 inch base diameter is expected to mitigate the negative impacts on human safety that result from establishing a size limit (Section 10.4.2).

12.0 Relationship to Other Applicable Laws and Provisions of the Magnuson-Stevens Act

12.1 National Environmental Policy Act (NEPA)

This document has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 to assess the impacts on the human environment that may result from the proposed action. The Environmental Assessment (EA) provided in this document presents a brief analysis of the environmental impacts of the proposed action and its alternatives. NEPA requires preparation of an Environmental Impact Statement if the EA does not support a finding of no significant impact.

The purpose and need for action is described in Section 5.0 of this document. A discussion of the proposed action and alternatives and their impacts is presented in Section 10.0. A description of the affected environment is provided in Section 9.0. Updated information on the essential fish habitat and habitat areas of particular concern for the precious corals fishery is provided in Amendment 4 to the FMP.

12.1.1 Conclusions and determination

a. The proposed action is not expected to jeopardize the sustainability of any target species that may be affected by the action. The recommended measures help reduce the risk of overfishing in the precious coral fishery by 1) suspending the harvest of gold coral at the Makapu'u Bed until additional information is available on the impact of harvesting on subsequent recruitment of this species (Section 10.1.2); 2) establishing a minimum size limit for black coral that reduces the risk of overfishing (Section 10.4.2); 3) prohibiting the use of non-selective gear in the commercial harvest precious coral in all permit areas (Section 10.5.2); 4) applying the current size limit for pink coral to all permit areas (Section 10.6.2); 5) modifying the estimated MSY for pink coral at Brooks Bank based on new information (Section 10.7.2); and 6) estimating the MSY for precious coral at the newly discovered FFS-Gold Pinnacles Bed (Section 10.8.2).

b. The proposed action is not expected to jeopardize the sustainability of any non-target species that may be affected by the action. By prohibiting the use of non-selective gear in the commercial harvest of precious corals, the proposed management measures would minimize damage to other sessile organisms on the bed and minimize the amount of non-target coral which is dislodged from the bottom during harvesting operations and not recovered (Section 10.5.2).

c. The proposed action is not expected to cause substantial damage to the ocean or coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs. By prohibiting the use of non-selective gear in the commercial harvest of precious corals, the proposed management measures would minimize damage to other sessile organisms on the bed and minimize the amount of coral which is dislodged from the bottom during harvesting operations and not recovered (Section 10.5.2).

d. The proposed action is not expected to have a substantial adverse impact on public health or safety. Establishing a minimum size limit for black coral could induce harvesters using scuba gear to dive deeper and stay submerged longer in search of coral colonies that are of a legal size. On the other hand, depletion of the resource as a result of overfishing would also encourage divers to take more risks in order to maintain harvest levels (Section 10.4.2). Furthermore, the recommended exemption which would allow qualifying persons to harvest black coral that has attained a 3/4 inch base diameter is expected to mitigate the negative impacts on human safety that result from establishing a size limit (Section 10.4.2).

e. The proposed action is not expect to adversely affect endangered or threatened species, marine mammals, or the critical habitat of these species. The likelihood that the harvest of precious corals would have an adverse impact on monk seal foraging habitat is expected to

be negligible because the recommended measures suspend the harvest quota for gold coral at Brooks Bank and set the harvest quota for gold coral at the FFS-Gold Pinnacles Bed at zero (Section 10.7.2).

f. The proposed action is not expected to have cumulative adverse impacts that could have a substantial effect on the target species or non-target species. The recommended measures help reduce the risk of overfishing in the precious coral fishery by 1) suspending the harvest of gold coral at the Makapu'u Bed until additional information is available on the impact of harvesting on subsequent recruitment of this species (Section 10.1.2); 2) establishing a minimum size limit for black coral that reduces the risk of overfishing (Section 10.4.2); 3) prohibiting the use of non-selective gear in the harvest of precious coral in all permit areas (Section 10.5.2); 4) applying the current size limit for pink coral to all permit areas (Section 10.6.2); 5) modifying the estimated MSY for pink coral at Brooks Bank based on new information (Section 10.7.2); and 6) estimating the MSY for precious coral at the newly discovered FFS-Gold Pinnacles Bed (Section 10.8.2) . The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area (e.g. benthic productivity, predator-prey relationships etc.)

g. The proposed action is not expected to have significant social or economic impacts which are interrelated with adverse natural or physical environmental effects.

h. The proposed action is non-controversial.

Based on the information contained in this document, I have determined that the proposed action to: suspend the harvest of gold coral at the Makapu'u Bed; redefine live precious coral as any precious coral which has live coral polyps or tissue; apply size limits to live coral only; set minimum sizes for black coral; prohibit the use of non-selective gear to harvest precious corals; apply the current size limit for pink coals to all permit areas; adjust the boundaries and harvest quotas for the Brooks Bank Bed; and classify the newly discovered French Frigate Shoals-Gold Pinnacles Bed as a conditional bed with all harvest quotas set at zero, is consistent with existing national policies and objectives set forth in sections 101 (a) and 101 (b) of the National Environmental Policy Act and will not have a significant on the quality of the human environment. As described in section 5.03c of NOAA Administrative Order 216-6, a Finding of No Significant Impact is supported and appropriate for the proposed action. Therefore, preparation of an environmental impact statement is not required by Section 101 (2) (C) of the National Environmental Policy Act or its implementing regulations.

_____ _____

William Hogarth Date

NOAA Acting Assistant Administrator for Fisheries

12.2 Executive Order 12866 and Regulatory Flexibility Act

In order to meet the requirements of Executive Order 12866, the National Marine Fisheries Service requires that a Regulatory Impact Review (RIR) be prepared for all regulatory actions that are of public interest. This analysis provides an overview of the problem, policy objectives, and anticipated impacts of the regulatory 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 addition, 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 organizations through the preparation of a Regulatory Flexibility Analysis. These analyses are presented in full in the Appendix to this document. In summary, the analyses concluded that the preferred management measures of 1) suspending the harvest of gold coral at the Makapu'u Bed; 2) applying the existing size limit for pink corals to all permit areas; 3) reducing the harvest of pink coral and suspending the harvest of gold coral from Brooks Bank; 4) and restricting the harvest of all precious corals from the FFS-Gold Pinnacles Bed would most likely have negative impacts on potential fishery revenues. However, these proposed measures are expected to result in positive long-term net benefits to the nation through improved resource management. Further, due to the low level of participation in the precious coral fishery (estimated to be three to five harvesters of black coral at any one time during the past 20 years), aggregate economic impacts resulting from implementation of the proposed measures will be minimal unless there is a significant increase in the number of harvesters of precious coral resources in the EEZ.

Estimated revenues forgone from suspending the quota for gold coral at the Makapu'u Bed, total $198,000 every two years if the entire biennial harvest quota of 600 kg could be harvested. However, this estimated economic impact is a worst case scenario because the current standing stock of gold coral at the Makapu'u Bed may not yield this harvest level.

Revising the definitions of live and dead coral is not expected to have a significant negative economic impact, as the amount of additional coral that would be subject to the harvest quota as a result of changes in the definitions is likely to be small. Applying size limits to only live coral is expected to have a positive economic impact by allowing greater utilization of dead coral resources and thus increasing potential income to harvesters.

Implementing a size limit for black coral could have a negative economic impact on fishery revenues. However, given that the preferred measure would allow current participants in the fishery who employ hand harvest methods to continue to collect black corals with a base diameter of 3/4 inches or greater, the negative economic impact is expected to be small. Future participants would be prohibited from harvesting black coral unless it has attained either a minimum stem diameter of 1 inch or a minimum height of 48 inches. Additional data on the size composition of black coral resources in the EEZ is needed to accurately estimate the potential impact of this measure on future harvests. It is estimated that 50 percent of the black coral currently harvested meets or exceeds this size limit.

Prohibiting the use of non-selective gear in all permit areas could impose an additional cost on future participants. However, the firms that have recently expressed interest in harvesting pink, gold and bamboo coral in the waters around Hawaii indicate that they intend to use only selective gear. Hand harvesters of black coral would be unaffected by this measure. The additional cost of using selective is not known. However, it is expected to be small, as a remotely operated vehicle can reportedly be purchased at the same cost as a set of tangle nets. Further, the use of selective gear could increase gross revenues by reducing the breakage of precious coral colonies during harvesting. Breakage may reduce a coral's value by as much as 80 percent.

Immediate revenues forgone from applying the size limit for pink coral to all permit areas, are difficult to predict since there are little size composition data on existing coral resources in the EEZ. Nevertheless, it is believed that a minimum size would have positive benefits to potential fishery participants through the long-term maintenance of maximum sustainable yields.

Setting the harvest quota for gold coral at Brooks Bank and the FFS-Gold Pinnacles Bed at zero is considered important to the protection of the foraging habitat of the endangered Hawaiian monk seal. Suspending the harvest quota for gold coral at Brooks Bank would result in up to $44,000 in forgone revenues, while restrictions on the harvest of all precious corals from the FFS-Gold Pinnacles Bed are projected to result in a short run annual loss of $26,000, primarily from forgone harvests of gold coral. Reducing the harvest of pink coral at Brooks Bank is expected to result in forgone annual revenues of up to $146,000 over the short run. However, positive long-term benefits are expected through the long-term maintenance of maximum sustainable yield for the pink coral stock at Brooks Bank.

12.3 Coastal Zone Management Act (CZMA)

The CZMA requires a determination that a FMP or amendment has no effect on the land or water uses or natural resources of the coast zone, or is consistent to the maximum extent practicable with an affected state's approved coastal zone management program. A copy of the proposed amendment was submitted to the appropriate state agencies in Hawaii, American Samoa and Guam for review and concurrence with a determination made by the Council that the amendment is consistent, to the maximum extent practicable, with the states' coastal zone management programs. An affirmative response was received from Hawaii, the lack of response from American Samoa and Guam within 45 days is taken as indication of their concurrence as well.

12.4 Endangered Species Act (ESA)

A Biological Opinion was prepared by NMFS in 1983 under an ESA section 7 consultation for the precious coral fishery, and it was determined at that time that the fishery did not constitute a threat to endangered or threatened species. The fishery has been nearly dormant since the implementation of the FMP in 1983, with the exception of a limited harvest of black corals primarily from State waters around the main Hawaiian Islands. During the development of these regulatory adjustments, an informal ESA Section 7 consultation was conducted by NMFS to evaluate the potential impacts of the proposed regulatory measures on threatened and endangered

species known to occur in waters around Hawaii and the likelihood there will be an adverse effect on monk seals or any other threatened or endangered species. This consultation found that the proposed action is not expected to adversely affect any endangered or threatened resources. Section 12.5 of this document discusses the impact of these proposed measures on Hawaiian monk seals. Expected effects on other threatened or endangered species should be negligible as precious coral colonies are not believed to provide important foraging habitat or resources for other marine mammals, turtles or seabirds. The measures in this document are designed to protect precious corals from overfishing or degradation and should thus be protective of any unpredicted relationships between precious corals and endangered or threatened marine species.

12.5 Marine Mammal Protection Act (MMPA)

Although other marine mammals are regularly sighted in the NWHI, research has found that the Hawaiian monk seal is the only species known to potentially be affected by this fishery (Section 9.0) This research was the basis for several regulatory measures in this document specifically intended to protect monk seals through prohibition on the harvest of coral colonies believed to provide foraging habitat for some monk seals in the NWHI. These measures are: (1) suspend harvest of gold coral at the NWHI Brooks Bank Bed; (2) set the harvest quota for gold coral at the FFS-Gold Pinnacles Bed at zero; and (3) redefine dead precious coral as that coral which no longer has any living coral polyps or tissue. The remaining measures in this document (minimum size limits for harvest of pink and black corals, prohibitions on the use of non-selective gear, revised boundaries and new bed classification, and new reporting requirements) are not considered to have any negative impact on Hawaiian monk seals or other marine mammals.

All fisheries in the western Pacific region, which includes the precious coral fishery in the NWHI, are designated as Category 3. Under this category, fishermen are not required to obtain exemption certificates in order to fish. However, they must report all interactions with marine mammals. The proposed measures will not change the MMPA designation of the precious coral fishery.

12.6 Executive Order 13089

Executive Order 13089 on Coral Reef Protection directs Federal agencies to use their authorities to protect coral reef ecosystems and, to the extent permitted by law, prohibits them from authorizing, funding or carrying out any action that will degrade these ecosystems. The regulatory measures in this document are consistent with the objectives and recommendations of this Executive Order.

12.7 Executive Orders 13178 and 13196

During the preparation of this document, President Clinton issued Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001), which together establish conservation measures for the newly formed Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Under these orders, commercial fishing effort and take in the reserve are capped at each permittee's take in the year preceding December 4, 2000. Since there were no Federal precious coral permits issued for any

harvestable Northwestern Hawaiian Islands (NWHI) beds (Brooks Banks and 180 Fathom Beds), the Executive Orders place a permanent zero harvest cap on these beds (despite their existent harvest quotas). The effect of this cap on the single Hawaii exploratory area (permit area X-P-H which includes waters around both the NWHI and the main Hawaiian Islands) is less clear as, although there was some harvest of precious corals from the main Hawaiian Islands portion of this area in 2000, there was no harvest from the NWHI portion. How this historical take will now be allocated within the Hawaii exploratory area remains unresolved. The Precious Corals Fishery Management Plan will be revised to reflect these measures as they are clarified by the Reserve Operating Plan which is now being developed by the National Ocean Service. This Operating Plan is anticipated to contain implementing regulations as well as a complete analysis of the impacts of those regulations on the human environment.

12.8 Paperwork Reduction Act (PRA)

The operator of a fishing vessel that participates in the precious corals fishery under the FMP is currently required to maintain and complete harvest and sales trip reports, which must be submitted to NMFS within 72 hours following the landing and offloading of precious corals.

The fisherman must record the date of harvest, harvest method, area fished, number of hours fished, depth of water (harvest site), weight of coral harvested (within nearest tenth of a kilogram) by species, and observations/comments about the habitat (current, bottom type, bottom topography, bottom slope, etc.). Also, the required sales information includes the date of landing, port of landing, name of buyer, address of buyer, amount sold (pounds or kilograms), sale price, and date of sale. The amount of time required to compile and record harvest and sales information is estimated to vary from five minutes to two hours per report, with an average of 35 minutes.

The reporting forms used for the precious coral information collections are approved under OMB No. 0648-214, Southwest Region Logbook Family of Forms.

The Council has recommended that NMFS modify its precious coral daily logbook form to enable the collection of the following additional information on the fishery (see Sections 8.0 and 10.9): (1) start and end time of all dives, including the dives when no harvest is made; (2) start and end position in degrees latitude and longitude of each dive and distance traveled; (3) depth of each dive, including the minimum and maximum depth of the harvest locations; (4) number of live and dead colonies harvested on each dive by species; (5) weight of harvested coral on each dive by species (landed weight air dried for at least 24 hours); and (6) by species, the number of unharvested live coral colonies damaged from harvesting operations and unharvested dead coral colonies. Furthermore, the Council recommends that any video tape made during the harvest operations be made available to NMFS upon request.

Although additional information may need to be collected on the sale of precious corals in the future, no change to the trip sales report is recommended at this time.

12.9 Traditional indigenous fishing practices

The Magnuson-Stevens Act requires the Western Pacific Council to take into account traditional fishing practices in preparing any FMP or amendment. No management measures proposed in this document will adversely affect traditional indigenous fishing practices in the western Pacific. Iversen et al. (1990) report that Native Hawaiians traditionally used black coral medicinally to treat various respiratory and childhood diseases and they may have collected the coral with hook and line. Studies of traditional fishing rights and practices in American Samoa (Severance and Franco, 1989), Guam (Amesbury and Hunter-Anderson, 1989) and the Northern Mariana Islands (Amesbury et al., 1989) do not describe any traditional indigenous fishing practices in these island areas related to the precious corals fishery.

Section 305(i) of the Magnuson-Stevens Fishery Conservation and Management Act provides for the establishment of a Western Pacific Community Development Program for any fishery under the authority of the Council. This provision results from concern that communities consisting of descendants of indigenous peoples in the Council's area have not been appropriately sharing in the benefits from the area's fisheries. The Council and the Secretary, respectively, have discretion to develop and to approve programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council. The range of acceptable content of these programs will be determined by the Council and the Secretary working together through the FMP process. If a Western Pacific Community Development Program is established for the precious corals fishery, measures to improve access to the fishery may include setting aside a percentage of specific quotas and area closures. Joint venture agreements for the harvesting and processing of precious corals may also be employed.

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14.0 Proposed Regulations

PART 660 - FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. Section 660.12 is amended by revising the definitions of "dead coral", "live coral" to read as follows:

§ 660.12 Definitions.

* * * * *

Dead coral means any precious coral that no longer has any live coral polyps or tissue.

* * * * *

Live coral means any precious coral that has live coral polyps or tissue.

* * * * *

3. In § 660.12 paragraph (2)(iii) of the definition of "precious corals permit area" is revised to read as follows:

§ 660.12 Definitions.

* * * * *

(2) * * *

(iii) Brooks Bank Bed, Permit Area C-B-3, includes the area within a radius of 2.5 nm of a point 23°58.8' N. lat., 166°42.0' W. long.

* * * * *

4. A new paragraph (2)(v) is added to the definition of "precious corals permit area" to read as follows:

§ 660.12 Definitions.

* * * * *

(2) * * *

(v) FFS-Gold Pinnacles Bed, Permit Area C-B-5, includes the area within a radius of 0.25 nm of a point at 23°55.0' N. lat., 165°23.11' W. long.

* * * * *

5. In § 660.12 paragraph (3) of the definition of "precious corals permit area" is revised to read as follows:

§ 660.12 Definitions.

* * * * *

(3) Refugia. Westpac Bed, Permit Area R-1, includes the area within a radius of 2.0 nm of a point at 23°18' N. lat., 162°35' W. long.

* * * * *

6. In § 660.82 paragraph (c) is revised to read as follows:

§ 660.82 Prohibitions.

* * * * *

(c) Take and retain, possess, or land any live pink coral or live black coral from any precious coral permit area that is less than the minimum height specified in §660.86 unless:

* * * * *

7. Section 660.86 is revised to read as follows:

§ 660.86 Size restrictions.

The height of a live coral specimen shall be determined by a straight line measurement taken from its base to its most distal extremity. The stem diameter of a living coral specimen shall be determined by measuring the greatest diameter of the stem at a point no less than one inch (2.54 cm) from the top surface of the living holdfast.

(a) Live pink coral harvested from any precious coral permit area must have attained a minimum height of 10 inches (25.4 cm).

(b) Live black coral harvested from any precious coral permit area must have attained either a minimum stem diameter of 1 inch (2.54 cm), or a minimum height of 48 inches (122 cm).

(1) An exemption permitting a person to hand harvest black coral from any precious coral permit area which has attained a minimum base diameter of 3/4 inches (1.91 cm), measured on the widest portion of the skeleton at a location just above the holdfast, will be issued to a person who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule.

(2) A person seeking an exemption under this section must submit a letter requesting an exemption to the NMFS Pacific Islands Area Office.

8. Section 660.88 is amended by removing and reserving paragraph (b) and revising paragraph (a) to read as follows:

§ 660.88 Gear restrictions.

(a) Only selective gear may be used to harvest coral from any precious coral permit area.

* * * * *

6. Table 1 to Part 660. is revised to read as follows:

TABLE 1 TO PART 660.--QUOTAS FOR PRECIOUS CORALS PERMIT AREAS

Name of coral bed	Type of bed	Harvest quota	Number of years
Makapuu	Established	P--2,000 kg G--Zero (0 kg) B--500 kg	2 2
Ke-ahole Point	Conditional	P--67 kg G--20 kg B--17 kg	1 1 1
Kaena Pint	Conditional	P--67 kg G--20 kg B--17 kg	1 1 1
Brooks Bank	Conditional	P--200 kg G--Zero (0 kg) B--111 kg	1 1
180 Fathom Bank	Conditional	P--222 kg G–67 kg B--56 kg	1 1 1

FFS-Gold Pinnacles Bed	Conditional	P--Zero (0 kg) G--Zero (0 kg) B--Zero (0 kg)	
Westpac Bed	Refugium	Zero (0 kg)	
Hawaii, American Samoa, Guam, U.S. Pacific Island possessions.	Exploratory	X-1,000 kg (all species combined except black corals) per area	1

Notes:
1. Types of corals: P=Pink G=Gold B=Bamboo

2. No authorized fishing for coral in refugia.

APPENDIX
Regulatory Impact Review/Final Regulatory Flexibility Analysis

March 1, 2002

A Framework Adjustment to Measures in the
Precious Corals Fishery Management Plan for the Western Pacific
Regarding Harvest Quotas, Definitions, Size Limits,
Gear Restrictions, and Bed Classifications

INTRODUCTION

In order to meet the requirements of Executive Order 12866 (E.O. 12866) the National Marine Fisheries Service requires that a Regulatory Impact Review (RIR) be prepared for all regulatory actions that are of public interest. This review provides an overview of the problem, policy objectives, and anticipated impacts of the court-ordered regulatory 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 $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. In addition, 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 organizations via the preparation of Regulatory Flexibility Analyses. A summary of an Initial Regulatory Flexibility Analysis for this action was published with the relevant proposed rule in the Federal Register on September 5, 2000. No comments were received on that Initial Regulatory Flexibility Analysis and no new data has been received since the preparation of that document, thus the discussion of that analysis is unchanged.

PROBLEM STATEMENT AND NEED FOR ACTION

The domestic fishery for pink, gold and bamboo precious corals in the exclusive economic zone (EEZ) of the Western Pacific region has been nearly dormant for two decades. However, two firms have recently expressed interest in using selective gear to harvest these precious corals in the EEZ around Hawaii. One of these firms has received a NMFS permit to harvest the Makapu'u Bed. In addition, recent research and surveys have provided new information on precious corals in the waters around Hawaii, including information on the size and condition of certain classified precious coral beds, presence of a new precious coral bed near French Frigate Shoals (FFS) and the possible importance of precious coral beds as foraging areas for the endangered Hawaiian monk seal. Over the last two decades

black coral has been hand harvested in relatively shallow waters around the main Hawaiian islands by a three to five divers using conventional scuba gear. There is concern that if new types of fishing gear are introduced into the fishery that allow harvesters to dive deeper and for a longer period of time, the harvest pressure on black coral resource could significantly increase. In addition, the demand in Hawaii for small, immature black coral colonies may increase in the near future as the popularity of household marine aquaria grows.

The preferred alternatives within this regulatory action would 1) set the quota for gold coral at zero for the Makapu'u Bed; 2) redefine dead precious coral as having no living coral polyps or tissue, and live coral as having living polyps or tissue; 3) apply size restrictions to live corals only; 4) establish a size limit for black coral; 5) prohibit the use of non-selective gear in all permit areas; 6) apply the existing size limit for pink coral size to all permit areas; 7) enlarge the boundaries of the Brooks Bank Bed and reduce the harvest quotas for pink coral and gold coral at this bed; and 8) classify the newly discovered bed near (FFS) in the Northwestern Hawaiian Islands (NWHI) as a conditional bed and set the harvest quotas at zero for all managed species of precious coral at this bed. NMFS intends to disapprove preferred alternatives number 7 and number 8, which apply only in the NWHI because these are unnecessary in light of Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001) [see discussion below] and appear to contemplate active fisheries in the NWHI in contravention of those executive orders. Therefore, the proposed action does not include alternatives number 7 and 8 above.

During the preparation of the IRFA, President Clinton issued Executive Orders 13178 (December 4, 2000) and 13196 (January 18, 2001), which together establish conservation measures for the newly formed Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Under these orders, commercial fishing effort and take in the reserve are capped at each permittee's take in the year preceding December 4, 2000. Since there were no Federal precious coral permits issued for any harvestable NWHI beds (Brooks Banks and 180 Fathom Beds), the Executive Orders place a permanent zero harvest cap on these beds (despite their existent harvest quotas). The effect of this cap on the single Hawaii exploratory area (permit area X-P-H which includes waters around both the NWHI and the main Hawaiian Islands) is less clear as, although there was some harvest of precious corals from the main Hawaiian Islands portion of this area in 2000, there was no harvest from the NWHI portion. How this historical take will now be allocated within the Hawaii exploratory area remains unresolved. The Fishery Management Plan for the Precious Corals Fisheries of the Western Pacific Region (FMP) will be revised to reflect these measures when they are clarified by the Reserve Operating Plan which is now being developed by the National Ocean Service. This Operating Plan is anticipated to contain implementing regulations as well as a complete analysis of the impacts of those regulations on the human environment. The following analysis examines only those regulatory measures contained in this document, it does not attempt to address the impacts of the NWHI harvest caps imposed by Executive Orders 13178 and 13196.

CURRENT MANAGEMENT MEASURES

The FMP for the precious coral fisheries of the Western Pacific was approved on May 20, 1980, and has been amended four times. The FMP treats separate precious coral beds as distinct management units

because of their widely-separated patchy distribution and the sessile nature of individual colonies. The beds are classified as established, conditional, refugia or exploratory. Established beds are ones for which appraisals of maximum sustainable yield (MSY) are reasonably precise. To date, only the Makapu'u Bed has been studied adequately enough to be classified as established. Conditional beds are ones for which optimum yields are estimated on the basis of bed characteristics relative to established beds. It is assumed that ecological conditions at the Makapu'u Bed are representative of conditions at all other beds. Four beds of precious corals are classified as conditional, all of them located in the EEZ around Hawaii. These are Keahole Point Bed, Kaena Point Bed, Brooks Bank Bed, and the 180 Fathom Bank Bed. Refugia beds are areas set aside for baseline studies and possible reproductive reserves. No harvesting of any type is allowed in those areas. The single refugium bed that has been designated - the WestPac Bed - is also located in the EEZ surrounding Hawaii. Exploratory areas are the unexplored portions of the EEZ. Separate exploratory permit areas are established for Hawaii, American Samoa, Guam and the remote US Pacific Insular Areas.

The regulations prescribe methods of harvest for each category of coral bed and harvest quotas for individual beds. Quotas have been established for pink, gold and bamboo coral populations in the Makapu'u Bed and conditional beds. Pink coral may not be harvested from the Makapu'u Bed, Keahole Point Bed or Kaena Point Bed unless it has attained a size limit of ten inches. There are no quotas or size limits for the harvest of black corals. Only selective gear is permitted in the EEZ around the main Hawaiian Islands, i.e., south and east of a line midway between Niihau and Nihoa Islands. Use of both selective and non-selective gear is permitted on the conditional beds of Brooks Bank and the 180 Degree Fathom Bank and throughout the exploratory area around the NWHIs. If non-selective gear is employed on conditional beds, the weight quota is 20 percent of that allowed for selective harvesting. Reporting requirements include a daily harvest log and a sales trip report. In addition to regulating harvesting methods and harvest amounts, the FMP establishes a procedure for re-classifying coral beds from exploratory to conditional and from conditional to established as new beds are located and more catch/effort data become available which will allow more precise determinations of sustainable yields.

MANAGEMENT OBJECTIVES

The proposed adjustments to management measures in the FMP would help achieve the following FMP objectives:

1) Allow a fishery for precious coral in the EEZ in the western Pacific but limit the fishery so as to achieve the Optimum Yield on a continuing basis;

2) Prevent overfishing and wastage of resources;

3) Encourage the use of selective harvesting methods;

4) Minimize the harvest of colonies of coral which are immature;

5) Minimize the harvest of colonies of coral which have not reached their full potential for growth; and

6) Encourage the development of new information concerning the distribution, abundance and ecology of precious corals.

PROPOSED MANAGEMENT MEASURES

Eight management measures are proposed under this regulatory action. Each is described below, along with its alternatives and their estimated economic impacts. The economic analysis compares the estimated costs and returns under the proposed management measure to the costs and returns under the "no action" alternative. Because the fishery for pink, gold and bamboo precious coral in the EEZ of the Western Pacific has been nearly dormant during the past 20 years, much of the economic analysis is qualitative.

Management Objective 1: Reduce the potential for overfishing of gold coral at the Makapu'u Bed.

Rationale: A 1997 survey and assessment of the Makapu'u Bed indicated that recruitment of gold coral there may be low. The renewed harvest of gold coral in this area may prevent or delay its recovery. Suspending the harvest of gold coral until additional scientific information on the recruitment rate of gold coral at the Makapu'u Bed is available is a precautionary measure that will ensure that no further decline in the number of colonies at this bed occurs.

Alternatives:
Alternative1 (No Action) - Maintain the biennial gold coral quota of 600 kg at the Makapu'u Bed.
Alternative 2 (Preferred) - Suspend the harvest quota for gold coral at the Makapu'u Bed until further information on the impact of harvesting on subsequent recruitment of gold coral is available.
Alternative 3 - Suspend the harvest quota for gold coral at all established and conditional beds until additional information is available on the impact of harvesting on subsequent recruitment of gold coral.
Alternative 4 - Implement a minimum size limit for gold coral at the Makapu'u Bed.

Economic Impacts:

Alternative 1 - According to Maui Divers, Ltd., the principal processor of precious corals in Hawaii, the ex-vessel price of gold coral is $330/kg ($150/lb). Maintaining the current biennial harvest quota of 600 kg for gold coral at Makapu'u Bed would continue to make available to prospective harvesters a quantity of gold coral worth $198,000 every two years ($99,000 annually) if the actual stock is of sufficient size to support such a harvest. However, a recent survey of the bed revealed that the current standing stock of gold coral is low and may not yield the current harvest quota. In addition, the adverse economic impacts over the long term would be significant if further harvesting diminishes the number of colonies to the point that no recovery is possible.
Alternative 2 - A gold coral quota of zero would likely have some adverse economic impact on potential harvesters. However, the density of gold coral at the Makapu'u Bed is already very low. Should harvest effort at the Makapu'u Bed occur, it is likely that it will be directed mainly toward pink coral

because this coral is relatively abundant at the bed and has a higher market value than gold coral ($440/kg for pink coral (*C. secundum*) vs. $330/kg for gold coral according to Maui Divers of Hawaii, Ltd.). A suspension of the quota is not expected to have an adverse economic impact on processors of precious corals in Hawaii. The fishery in the EEZ around Hawaii for deep-water species of precious coral, including pink, gold and bamboo coral, has been nearly dormant for two decades. Consequently, the processors of these corals in Hawaii have relied exclusively on imported material.

Alternative 3 - The adverse economic impacts could be significant. The current total harvest quota for gold coral at all established and conditional beds is 1,080 kg every two years, with an estimated dockside value of $356,400. However, the gold coral quota at the Makapu'u Bed accounts for more than half of this total. As noted above, the current standing stock of gold coral at the Makapu'u Bed may not yield the current biennial harvest quota of 600 kg. If no gold coral is harvested from the Makapu'u Bed the amount of potential gross revenues foregone by suspending the harvest quota at all established and conditional beds is estimated to be about $158,400 every two years.

Alternative 4 - The calculation of an appropriate minimum size requires estimates of growth rates, mortality rates and size at reproductive maturity before a size limit can be reliably set. These data are lacking for gold coral. Without this information the size limit established may be too low, thereby insufficiently protecting the coral from overfishing and eventually leading to reduced economic returns, or be too high, thereby resulting in an overly conservative size limit that unnecessarily reduces potential economic returns.

Management Objective 2: Reduce the potential for harvest of coral which has live coral polyps or tissue.

Rationale: The harvest quotas presently in the FMP do not apply to dead coral, which is currently defined as any precious coral that contains holes from borers or is discolored or encrusted at the time of removal from the seabed (whether live polyps or tissue are present or not). With no restriction on the quantity of dead coral that can be harvested, the current definition of dead coral allows the unrestricted harvest of coral that is standing upright and partially covered with living tissue as long as it contains holes from borers or is discolored or encrusted. It is possible that colonies of such upright coral near FFS in the NWHI may provide foraging habitat for the endangered Hawaiian monk seal. The possible reduction in foraging habitat that may result from the harvest of dead standing coral partially covered with living tissue could intensify the problems related to food-stress which the monk seal population at FFS is experiencing.

Alternatives:

Alternative 1 (No Action) - Maintain the current definition of dead precious coral as any precious coral that contains holes from borers or is discolored or encrusted at the time of removal from the seabed.

Alternative 2 (Preferred) - Define dead precious coral as precious coral that no longer has any live coral polyps or tissue, and define live precious coral as precious coral that has live polyps or tissue.

Alternative 3 - Define dead precious coral as precious coral that is no longer standing upright, and define live precious coral as precious coral that is standing upright.

Economic Impacts:
Alternative 1 - Allowing the harvest of coral which may provide foraging habitat to the endangered Hawaiian monk seal may lead to an Endangered Species Act section 7 consultation on the precious coral fishery, which may in turn result in emergency closures of specific sites or alterations of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.
Alternative 2 - This alternative may have some adverse economic impacts. Only live coral is counted toward the quotas limiting the amount of precious coral that may be taken in any permit area during the fishing year. It is possible that some of the coral at a given bed that was regarded as dead under the current definition would be regarded as live under the alternative definition, and therefore be subject to the harvest quota for that bed. However, the amount of additional coral that would be subject to the quota is likely to be small, as coral colonies that contain holes from borers or are discolored or encrusted generally no longer have any living polyps or tissue. There is insufficient information on the amount of coral meeting this definition at different beds to quantify this economic impact.
Alternative 3 - This alternative may have some adverse economic impacts. Only live coral is counted toward the quotas limiting the amount of precious coral that may be taken in any permit area during the fishing year. It is possible that some of the coral at a given bed that was regarded as dead under the current definition would be regarded as live under the alternative definition, and therefore be subject to the harvest quota for that bed. However, the amount of additional coral that would be subject to the quota is likely to be small, as coral colonies that contain holes from borers or are discolored or encrusted are often no longer standing upright. There is insufficient information on the amount of coral meeting this definition at different beds to quantify this economic impact.

Management Objective 3: Allow greater utilization of dead coral resources.

Rationale: The current minimum size limit for pink coral applies to dead coral as well as live coral. Applying a minimum size to dead coral is inconsistent with the model for developing an appropriate minimum size limit, which is based on an estimated growth rate, mortality rate and size at reproductive maturity for live coral. The application of a minimum size limit to dead coral reduces potential income to harvesters without providing any additional conservation benefits.

Alternatives:
Alternative 1 (No Action) - Maintain the application of minimum size limits to both live and dead coral.
Alternative 2 (Preferred) - Apply size limits to live coral only.

Economic Impacts:
Alternative 1 - This alternative has a negative economic impact because it prohibits the harvest of dead coral that is below the minimum size. There is insufficient information on the quantity of dead coral at different beds to quantify this economic impact.
Alternative 2 - This alternative would allow greater utilization of dead coral resources and thus increase potential income to harvesters. There is insufficient information on the quantity of dead coral at different beds to quantify this economic impact.

Management Objective 4: Regulate the harvest of black coral.

Rationale: The present status of the major black coral beds in Hawaii that are currently being commercially harvested can be described as good, particularly with regard to levels of recruitment and a rate of harvest that has not exceeded the estimated MSY. However, emerging harvesting technologies that render black coral occurring at greater depths more accessible to harvesters and improve the efficiency of harvesting operations may intensify the fishing pressure on black coral resources. Some black coral harvesters in Hawaii have already begun to experiment with towed underwater camera systems and other new technology that could increase output from old harvest areas and lead to the discovery of new beds. In addition, the demand in Hawaii for small, immature black coral colonies may increase in the near future as the popularity of household marine aquaria grows. In the absence of restrictions on the harvest of black coral, increased fishing pressure and the harvest of immature colonies could lead to the overfishing of black coral resources at targeted beds.

Alternatives:
Alternative 1 (No Action) - Maintain the current situation of no restrictions on the harvest of black coral.
Alternative 2 (Preferred) - Prohibit the harvest of black coral unless it has attained either a minimum stem diameter of 1 inch, measured no less than 1 inch from the top of the living holdfast, or a minimum height of 48 inches, measured from the base to the greatest distal extremity of the colony. Persons who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule may apply for an exemption which allows the hand harvest of black coral that has attained a 3/4 inch base diameter, measured on the widest portion of the skeleton at a location just above the holdfast.
Alternative 3 - Prohibit the harvest of black coral unless it has attained a minimum base diameter of 3/4 inch.
Alternative 4 - Establish a weight quota for black coral.

Economic Impacts:
Alternative 1 - Over the short run maintaining the status quo would have a positive economic impact, as the harvesting of black coral colonies could proceed without restriction. However, if fishing pressure increases to the point at which black coral resources become overfished, the fishery could become economically unviable.
Alternative 2 - The economic impact on future black coral harvesters or buyers could be substantial. The "either/or" provision provides flexibility for harvesters by allowing the taking of stunted colonies less than 48 inches in height but having a 1 inch or greater basal stem diameter, and slender colonies greater than 48 inches in height but having a less than 1 inch basal stem diameter. In addition, this alternative would exempt current participants in the fishery from this size limit and allow them to continue to harvest coral with a 3/4 inch or larger base diameter. However, future participants would be prohibited from harvesting black coral unless it has attained either a minimum stem diameter of 1 inch or a minimum height of 48 inches. It is estimated that only 50 percent of black coral currently harvested in the waters around Hawaii meets this size limit. Additional data on the size composition of black coral resources in the EEZ is needed to accurately determine the potential impact of this measure on future harvests and revenues.
Alternative 3 - The adverse economic impacts are expected to be small in the short run, as most of the

black coral that has been harvested in the past has been larger than this size. The State of Hawaii Division of Aquatic Resources estimates that 83 percent of the black coral harvested has a base diameter of 3/4 inch or greater. However, if a minimum size of 3/4 inch inadequately protects black coral resources from overfishing as fishing pressure increases, the fishery may be unsustainable and economically unviable over the long term.
Alternative 4 - A weight quota may not be as effective as a size limit in avoiding overfishing of the resource. Information on the standing stock and sustainable yield of managed species of black coral is limited. The use of minimum size limits based on knowledge of the reproductive biology of precious corals is the preferred basis for management of the fishery when selective harvesting is expected to be economically feasible.

Management Objective 5: Protect precious coral resources and essential fish habitat from the effects of ecologically destructive and wasteful harvest gear.

Rationale: Current regulations allow the use of non-selective gear on the conditional beds at Brooks Bank and the 180 Fathom Bank, as well as throughout the exploratory permit area around the NWHI. Selective gear must be in used in all other areas. The FMP defines non-selective gear as any gear used for harvesting corals that cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals. The disadvantage of non-selective gear is that it may be ecologically destructive, as habitat and other species may be disturbed as the gear is pulled across the sea floor. The damage to precious coral beds and associated benthic communities could have an adverse impact on Hawaiian monk seal foraging habitat. Non-selective gear may also be wasteful, as some coral dislodged from the bottom may not be recovered. Historically, the principal disadvantage of selective gear has been the high capital and operating costs. However, recent innovations in manned and unmanned submersibles have significantly reduced the capital and operating expenses of utilizing selective gear in the harvest of precious corals.

Alternatives:
Alternative 1 (No Action) - Maintain the current regulations requiring selective gear only at the Makapu'u, Keahole Point, and Kaena Point Beds.
Alternative 2 (Preferred) - Require that selective gear be used to harvest precious corals from all permit areas.
Alternative 3 - Require that selective gear be used to harvest precious corals from all established and conditional beds.

Economic Impacts:
Alternative 1 - This alternative minimizes the capital and operating costs of harvesting deep-water precious corals. However, the use of non-selective gear to harvest precious corals may not be an efficient use of fishery resources. The value of precious coral colonies is dependent on its size, color and condition. Large, completely intact trees of color have the greatest value. Non-selective gear such as dredges harvest pieces of broken coral knocked down by the dredge stone and entangled in the nets as the dredge is pulled along the sea floor. Breakage may reduce a coral's value by as much as 80 percent. Allowing the continued use of this relatively inexpensive gear in exploratory areas may

encourage the discovery and exploration of new beds. However, the use of non-selective gear is unlikely to provide sufficient data to develop reliable estimates of the standing stock and MSY for newly discovered beds because this gear cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals. Further, if the Council does not develop management measures to ensure the protection of monk seal foraging habitat, NMFS would likely initiate an Endangered Species Act (ESA) section 7 consultation on the precious coral fishery. Management measures that could be imposed include emergency closures of specific sites, including Brooks Bank, or alteration of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

Alternative 2 - The cost of purchasing an unmanned submersible (i.e., remotely operated vehicle) may be as low as $50,000, which is roughly equal to the capital investment in gear required to initiate a non-selective harvest operation using tangle nets. Although the capital and operating costs of manned submersibles may be high, they are not economically prohibitive, as is evidenced by the recent interest of two firms in using this type of selective gear to harvest precious corals in the waters around Hawaii. In addition, it is likely that some harvesters of precious coral will be able to defray the costs of using selective gear by finding other lucrative uses for the gear, such as salvage and research. The use of non-selective gear to harvest precious corals is an inefficient use of fishery resources. Non-selective gear tends to damage the precious coral trees as it harvests them, thereby greatly reducing the value of the coral. In contrast, selective gear harvests coral so that it retains its highest value.

Alternative 3 - The economic impacts would be similar to those of Alternative 1, except up to 200 kg of precious coral would continue to be available for annual harvest by non-selective gear from each of the exploratory beds around Hawaii, American Samoa, Guam and the remote US Pacific Island possessions.

Management Objective 6: Reduce the potential for overfishing of pink coral at conditional beds and in exploratory areas.

Rationale: The size limit for pink coral applies only to the Makapu'u Bed, Keahole Point Bed and Kaena Point Bed because the use of non-selective gear is allowed everywhere else (except in the EEZ seaward of the main Hawaiian Islands). There is increased risk that the estimated MSY for pink coral will be exceeded at those conditional beds (i.e., Brooks Bank, 180 Fathom Bank and newly discovered FFS-Gold Pinnacles Bed) and exploratory areas where there is no size limit.

Alternatives:

Alternative 1 (No Action) - Maintain the application of the 10 inch size limit for pink coral at the established Makapu'u, Keahole Point, and Kaena Point Beds only.

Alternative 2 (Preferred) - Apply the current 10 inch size limit for pink coral to all established beds, conditional beds and exploratory areas.

Alternative 3 - Apply the current 10 inch size limit for pink coral to all established and conditional beds.

Economic Impacts:

Alternative 1 - The impact in the short term is minimal. However, long term negative impacts on harvest levels and gross revenues could be potentially large if the resources are overfished. Given the life-

history characteristics of pink coral, such as slow growth and long generation time, overfishing could degrade the productivity of affected precious coral beds for many years.
Alternative 2 - The feasibility of this alternative is contingent on a prohibition on the use of non-selective gear to harvest precious corals for commercial purposes in all permit areas. Applying the size limit for pink coral to all permit areas is unlikely to have a significant negative economic impact because the potential financial return from harvesting colonies of pink coral that are less than 10 inches in height is low. According to Maui Divers of Hawaii, Ltd., harvesting colonies less than 10 inches is not economically practical, because the return does not justify the time spent harvesting.
Alternative 3 - The economic impacts would be similar to those of Alternative 2.

Management Objective 7: Revise boundaries and harvest quotas for Brooks Bank based on new information.

Rationale: A September 1998 survey of precious coral beds around the NWHI revealed that the size of Brooks Bank is larger than previously specified. However, maintaining the current harvest quota of 444 kg for pink coral could result in the overfishing of these species of precious coral at Brooks Bank. Recent estimates of the standing crop of precious coral at Brooks Bank suggests that 200 kg of pink coral can be harvested annually from this bed on a sustainable basis (Section 7.1.4). In addition, the harvest of the existing quota of 133 kg for gold coral at Brooks Bank could have an adverse impact on the Hawaiian monk seal population at FFS by reducing the function of the precious coral bed to aggregate monk seal prey species, thereby reducing the seals' foraging success.

Alternatives:
Alternative 1 (No Action, Current proposed action) - Take no additional action to manage the precious coral fishery at Brooks Bank.
Alternative 2 (Original preferred action) - Enlarge the boundaries of Brooks Bank to include the area within a radius of 2.5 nautical miles of a point at 23° 58.8' N and 166° 42' W. Change the harvest quota for pink coral to 200 kg and suspend the harvest quota for gold coral.
Alternative 3 - Enlarge the boundaries of Brooks Bank to include the area within a radius of 2.5 nautical miles of a point 23° 58.8' N and 166° 42' W. Re-classify the bed as a refugium, thereby prohibiting the harvest of all live and dead coral.

Economic Impacts:
Alternative 1 - Not altering the current regulations for Brooks Bank precious coral bed has no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve. The decision to take no action clarifies that NMFS no longer intends to manage the NWHI as an active precious corals fishery under the Reserve.
Alternative 2 - This alternative would also have no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve.
Alternative 3 - This alternative would also have no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve.

Management Objective 8: Protect the newly discovered bed near FFS from overfishing and loss of monk seal foraging habitat.

Rationale: The FFS-Gold Pinnacles Bed is currently categorized as part of the exploratory permit area X-P-H. As such, the harvest quota which applies is the 1,000 kg for the entire exploratory area. The 1998 survey of the FFS-Gold Pinnacles Bed revealed that colonies of pink or bamboo coral were sparse or absent. It is uncertain if the stocks of these corals are capable of supporting any level of harvest on a sustainable basis. Harvesting of the few pink or bamboo colonies that occur at the bed could have a significant adverse ecological impact on the stocks of these species. The 1998 survey also recorded an abundance of live and dead gold coral colonies in scattered patches. Based on survey data it estimated that the MSY for gold coral at this bed is 80 kg/yr. In the absence of a harvest quota, the stock of gold coral could be harvested at a level that exceeds the estimated MSY. The negative impacts on the stock could be especially significant if a harvest operation used the entire 1,000 kg quota for the exploratory permit area to harvest the gold coral at the FFS-Gold Pinnacles Bed. The harvest of live gold coral may also have an adverse impact on the Hawaiian monk seal population at FFS by reducing the availability of monk seal prey species which rely on gold coral for habitat.

Alternatives:

Alternative 1 (No Action, Current proposed action) - Maintain the status of the FFS-Gold Pinnacles Bed as a part of exploratory permit area X-P-H.

Alternative 2 (Original preferred action) - Classify the FFS-Gold Pinnacles Bed as a conditional bed with boundaries set as the perimeter of the area within a radius of 0.25 nautical miles of the point at 23° 55' N and 165° 23.11' W. Set the annual harvest quota for all types of precious coral at zero.

Alternative 3 - Classify the FFS-Gold Pinnacles Bed as a refugium, thereby prohibiting the harvest of all live and dead coral, with boundaries set as the perimeter of the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W.

Alternative 4 - Classify the FFS-Gold Pinnacles Bed as a conditional bed with boundaries set as the perimeter of the area within a radius of 0.25 nautical miles of a point at 23° 55' N and 165° 23.11' W. Set the annual harvest for gold coral at 80 kg and set annual harvest quotas of zero for all other species.

Economic Impacts:

Alternative 1 - Not altering the current regulations to designate a new permit area has no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve. The decision to take no action clarifies that NMFS no longer intends to manage the NWHI as an active precious corals fishery under the Reserve.

Alternative 2 - This alternative would also have no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve.

Alternative 3 - This alternative would also have no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve.

Alternative 4 - This alternative would also have no impact because no precious coral harvest is allowed in the NWHI Coral Reef Ecosystem Reserve.

DESCRIPTION OF SMALL BUSINESSES TO WHICH THE RULE WOULD APPLY

The proposed management measures could potentially affect five to seven small businesses. There are three to five small-boat fishermen who harvest black coral using scuba gear in beds overlapping State of Hawaii and Federal waters. Between 1990 and 1997, the total annual harvest of black coral in Hawaii varied from a low of 864 lbs to a high of 6,017 lbs, with a yearly average of 3,084 lbs. The 415 lbs of black coral sold in 1997 had a dockside value of about $10,394, assuming a price of $25/lb. Current data does not discriminate whether this coral was harvested from State or Federal waters. However, as Figure 1 illustrates, the majority of black coral resources lie inside State waters (state water boundaries are indicated by solid lines around each island). Table 1 presents a summary of total reported black coral landings and gross revenues from 1990 through 1997.

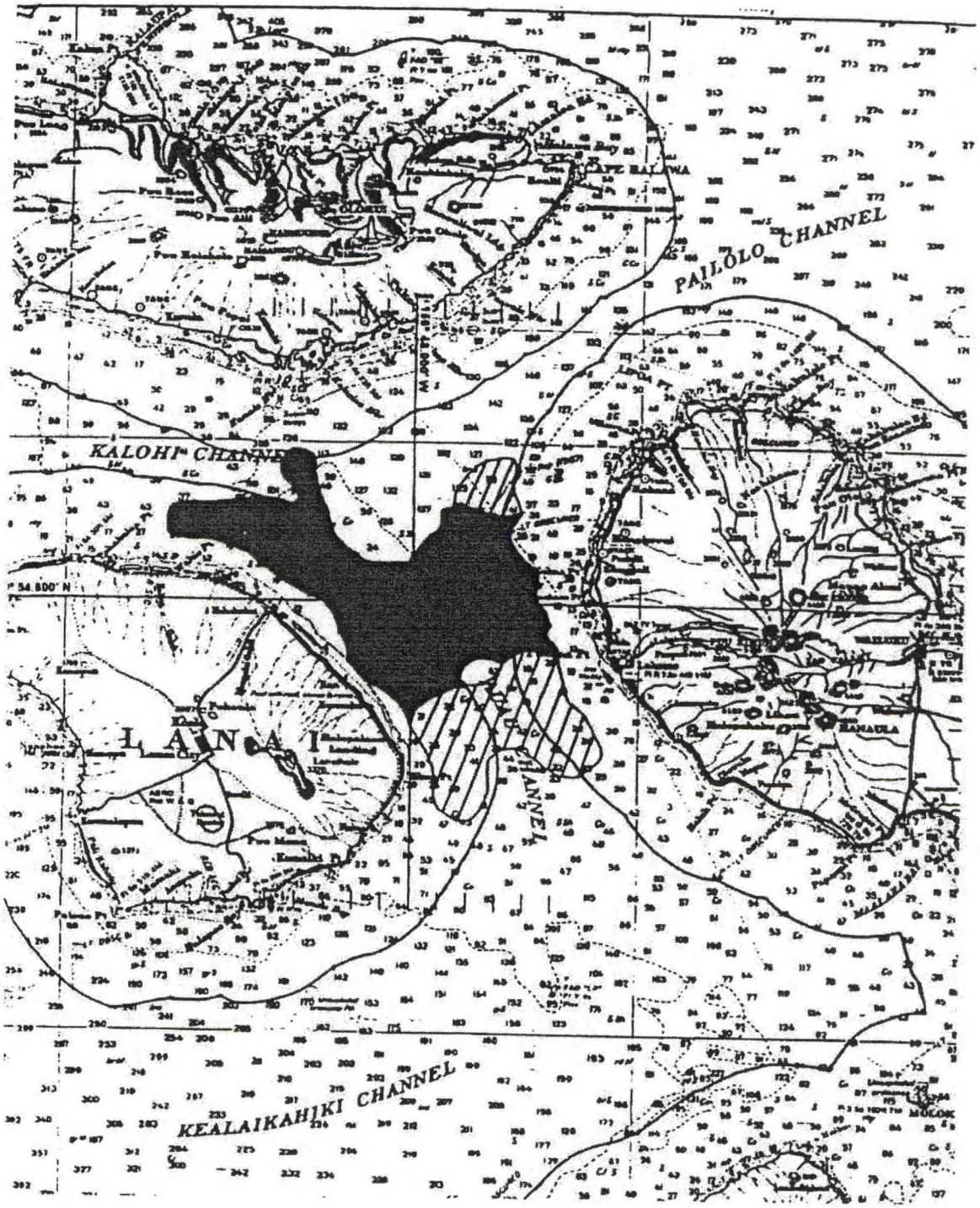
Table 1. Volume and value of black coral landings in Hawaii.

Year	Harvested (lbs.)	Sold (lbs.)	Value ($)
1990	2,349	2,169	31,575
1991	2,305	2,250	35,080
1992	2,398	2,328	46,560
1993	864	769	15,380
1994	4,354	4,209	84,180
1995	6,017	5,912	122,765
1996	4,865	1,703	41,325
1997	1,520	415	10,394

Source: Hawaii Division of Aquatic Resources

The proposed management measures also potentially affect two companies who have expressed interest in harvesting pink, gold and bamboo precious coral in the EEZ around Hawaii EEZ using manned submersibles or remotely operated vehicles.

Figure 1. Location of major black coral beds around the Hawaiian Islands.



MEASURES TAKEN TO MINIMIZE ECONOMIC IMPACTS ON SMALL BUSINESSES

Impacts to small businesses were identified in an Initial Regulatory Flexibility Analysis and summarized in a Federal Register notice published on September 5, 2000. NMFS believes that the proposed management measures offer the most cost-effective means for meeting the goals and objectives of the precious corals fishery management plan. In addition, the proposed measures are superior to those rejected in terms of minimizing impacts on small businesses.

CHANGES TO REPORTING REQUIREMENTS ARISING FROM THE PROPOSED MEASURES

The proposed measures would not impose any additional reporting requirements on fishery participants or associated entities.

COST/BENEFIT ANALYSIS OF ALTERNATIVES

Considering the low level of fishing activity in this fishery over the past twenty years, the proposed actions may be viewed as precautionary in terms of protecting coral resources. Due to a lack of information on the long term effects of alternative management measures on coral stocks, harvest effort or catch rates, a detailed quantitative analysis of the costs and benefits of alternative management measures is not possible.

Although long term data are unavailable, analysis of this fishery is ongoing, and may lead tc simulation models capable of predicting the biological (and economic) effects of each alternative. From a conceptual point of view, the precious corals fishery represents a difficult economic analysis. Although standard bioeconomic theory suggests that the harvest rate should be no more than the growth rate of the coral population at its maximum sustainable yield (accounting for economic production cost relationships and the discount rate), the growth rate of coral is so slow that a mining approach might be considered preferable, i.e., that the resource might be allowed to be over-fished in the short-term, and then harvesting prohibited for the many years which would be required for it to be fully restored. Because National Standard 1 does not allow biological over-fishing, this strategy is precluded from operational possibility. However, it is anticipated that by allowing the coral populations to maintain their long-term sustainability, there will be larger standing stock of corals which will optimize harvest rates and reduce the relative costs of harvesting (due to increased density). By limiting the harvest rates to those allowed by maximum sustainable yield, the likelihood that long-term benefits exceed their costs is increased. In addition, these restrictions may preclude excessive entry into the fishery, therefore improving social benefits (i.e., avoiding over-capacity). To the extent that these initial explorations are successful in identifying additional coral resources for harvesting, and as new economic information is acquired, a re-evaluation of the relative benefits and costs of these management measures would be warranted.

With regard to the proposed measures intended to minimize the risk of fishery interactions with the Hawaiian monk seal, current public policy suggests that the preservation of this endangered species provides a significant benefit to the nation. Government expenditures related to the protection and recovery of monk seals amount to several million dollars annually. The implication is that the economic value of providing the Hawaiian monk seal with additional protection by mitigating fishery interactions with this species outweighs the costs.

None of the alternatives considered is expected to have significant social impacts on fishery participants or Hawaii fishing communities in terms of employment, enjoyment of the fishery, vessel and crew safety, social or cultural activity in the fishery or other social factors.

affect the communities of Indian tribal governments when analyzed under the principles and criteria contained in Executive Order 13175 ("Consultation and Coordination with Indian Tribal Governments"). Therefore, the funding and consultation requirements of this Executive Order would not apply.

Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires us to consider whether our proposals will have a significant economic impact on a substantial number of small entities. "Small entities" include independently owned and operated small businesses that are not dominant in their field and that otherwise qualify as "small business concerns" under section 3 of the Small Business Act (15 U.S.C. 632). This rulemaking may reasonably be expected to affect small businesses or entities that currently own documented fishing vessels, fish processing vessels, or fish tender vessels, that have financed such vessels, or that are engaging in the fisheries of the United States with such vessels. The Small Business Administration defines businesses within the fishing industry that have annual receipts of $3 million or less as small businesses, 13 CFR 121.201. We believe that any cost to small business entities to comply with this final rule will be minimal, if any, because this final rule allows waiver of procedural (i.e., administrative) requirements that may cause a vessel owner to lose its fishery endorsement. Therefore, MARAD certifies that this rule will not have a significant economic impact on a substantial number of small entities.

Environmental Impact Statement

We have analyzed this rule for purposes of compliance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and have concluded that under the categorical exclusions provision in section 4.05 of Maritime Administrative Order 600–1, "Procedures for Considering Environmental Impacts," 50 FR 11606 (March 22, 1985), the preparation of an Environmental Assessment, and an Environmental Impact Statement, or a Finding of No Significant Impact for this rulemaking is not required. This rulemaking involves administrative and procedural regulations that clearly have no environmental impact.

Paperwork Reduction Act

This rulemaking does not establish any new requirement for the collection of information.

Unfunded Mandates Reform Act of 1995

This final rule will not impose an unfunded mandate under the Unfunded Mandates Reform Act of 1995. It will not result in costs of $100 million or more, in the aggregate, to any of the following: State, local, or Native American tribal governments, or the private sector. This final rule is the least burdensome alternative that achieves the objective of the rule.

Regulation Identifier Number

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN number contained in the heading of this document can be used to cross reference this action with the Unified Agenda.

List of Subjects in 46 CFR Part 356

Citizenship and naturalization, Fishery endorsement, Fishing vessels, Mortgages, Mortgage trustee, Penalties, Preferred mortgages, Reporting and recordkeeping requirements, Vessels.

For the reasons discussed in the preamble, MARAD amends 46 CFR part 356 as follows:

PART 356—REQUIREMENTS FOR VESSELS OF 100 FEET OR GREATER IN REGISTERED LENGTH TO OBTAIN A FISHERY ENDORSEMENT TO THE VESSEL'S DOCUMENTATION

1. The authority citation for 46 CFR part 356 is revised to read as follows:

Authority: 46 App. U.S.C. 12102; Public Law 105–277, Division C, Title II, Subtitle I, section 203 (46 App. U.S.C. 12102 note), section 210(e), and section 213(g), 112 Stat. 2681; 49 CFR 1.66.

2. For the convenience of the reader, 3356.2 is republished to read as follows:

§ 356.2 Waivers.

In special circumstances and for good cause shown, we may waive the procedures prescribed in this part, provided the waiver is consistent with the requirements of the AFA and with the intent of this part.

Dated: March 11, 2002.

By Order of the Maritime Administrator.

Joel C. Richard,

Secretary, Maritime Administration.

[FR Doc. 02–6304 Filed 3–15–02; 8:45 am]

BILLING CODE 4910–81–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 000816233–1154–02; I.D. 050200A]

RIN 0648–AK23

Fisheries off West Coast States and in the Western Pacific; Precious Corals Fisheries; Harvest Quotas, Definitions, Size Limits, Gear Restrictions, and Bed Classification

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS has partially approved a regulatory amendment under the Fishery Management Plan for Precious Coral Fisheries of the Western Pacific Region (FMP) submitted by the Western Pacific Fishery Management Council (Council) and is issuing a final rule that will implement gear restrictions, size limits, and definitions governing the harvest of precious coral resources managed under the FMP. Precious coral management measures that were published in the proposed rule that apply only to the Northwestern Hawaiian Islands (NWHI) are not being implemented by NMFS because they were determined to be inconsistent with certain provisions of Executive Order 13178 and Executive Order 13196, which together establish the NWHI Coral Reef Ecosystem Reserve (Reserve).

DATES: Effective April 17, 2002.

ADDRESSES: Copies of the background documents, including an environmental assessment/initial regulatory flexibility analysis/regulatory impact review (EA/IRFA/RIR) (March 2001) and an RIR/final regulatory flexibility analysis (FRFA), (March 2002) are available from Dr. Charles Karnella, Administrator, NMFS, Pacific Islands Area Office (PIAO), 1601 Kapiolani Blvd., Suite 1110, Honolulu, HI 96814.

FOR FURTHER INFORMATION CONTACT: Alvin Katekaru, PIAO, 808–973–2937.

SUPPLEMENTARY INFORMATION: On September 5, 2000, NMFS published a proposed rule (65 FR 53692) on regulatory adjustments governing the harvest of precious coral resources managed under the FMP. The rule contained eight measures intended to conserve and reduce the risk of overfishing the precious coral resource; promote optimal utilization of the resource and minimize waste; and

protect the precious coral beds in the NWHI that provide foraging habitat for the endangered Hawaiian monk seal. In December 2000, and January 2001, President Clinton issued Executive Order 13178 and Executive Order 13196, respectively, which together established the Reserve. NMFS has determined that two of the proposed precious coral measures that apply only to precious coral beds around the NWHI are inconsistent with Executive Order 13178 and Executive Order 13196.

This final rule implements the following six measures: (1) Suspends the harvest of gold coral at Makapu'u Bed off the Island of Oahu; (2) redefines "dead precious coral" as coral that has no live coral polyps or tissue, and redefines "live precious coral" accordingly; (3) applies minimum size restrictions only to live precious corals; (4) prohibits the harvest of black coral unless it has attained a minimum stem diameter of 1 inch (2.54 cm) or a minimum height of 48 inches (122 cm), except in certain cases; (5) prohibits the use of non-selective fishing gear to harvest precious corals; and (6) applies the current minimum size restriction for pink coral to all permit areas.

Comment and Response

One letter was received commenting on the proposed rule.

Comment: The measures to define live coral as coral harboring living polyps and to apply size and quota restrictions to live coral only, mean that the harvest of dead gold coral will be unregulated. Unrestricted takes of dead gold coral may have negative impacts on live gold coral as there is some evidence from the NWHI that dead coral may be the preferred substrate for resettlement (i.e., seeding) of new gold coral colonies.

Response: NMFS shares this concern. The amount of information on the relationship between dead gold coral and the seeding of new colonies is limited at this time. NMFS however believes the concern is mitigated by restrictions imposed on commercial harvesting of precious corals, under Executive Order 13178 and Executive Order 13196 establishing the Reserve.

NMFS is not implementing two precious coral measures that would have (a) revised the boundaries of the Brooks Banks Bed, NWHI, reduced this bed's harvest quota for pink coral, and suspended the harvest quota (i.e., reduced to zero) for gold coral; and (b) established a NWHI precious coral permit area, French Frigate Shoals (FFS) Gold Pinnacles Bed, and classified this bed as a "conditional" bed with a zero harvest quota for all species of precious corals. The final rule is changed from the proposed rule because continued management of precious coral fisheries around the NWHI is inconsistent with Executive Order 13178 and Executive Order 13196. Specifically, the measures establishing pink and gold coral harvest quotas at NWHI Brooks Banks Bed are inconsistent with section 7(b)(5) of the Executive Order 13178 and Executive Order 13196. In this section, the Executive Order establishes zero harvest in the Reserve where the Brooks Banks Bed is located. Establishment of a quota for pink coral at Brooks Banks Bed also conflicts with the Executive Order 13178 and Executive Order 13196 since they generally prohibit the harvest of living and nonliving resources throughout the Reserve. Although creation of a new FFS Gold Pinnacles Bed and its classification as a "conditional" bed are not literally contrary to the E.O.s, a zero harvest quota duplicates restrictions in the E.O.s, and therefore is unnecessary.

Another change between the final rule and proposed rule is that § 660.86 (b)(2) has been revised to allow for expedient issuance of exemptions from black coral harvest size requirements. This change allows NMFS to streamline the exemption process by relying on a State of Hawaii precious corals database to determine eligible harvesters.

The final rule contains a technical correction to the location of the Wespac Bed, Permit Area R-1, by redefining the current position of 28°50.2′ N. lat. to 23°18′ N. lat.

Classification

This final rule has been determined to be not significant for purposes of Executive Order 12866.

NMFS prepared a FRFA describing the impact of the action on small entities. The IRFA was summarized in the proposed rule published on September 5, 2000(65 FR 53692). None of the comments received on the proposed rule directly or indirectly addressed the results of the IRFA, which also provided analysis on the proposed measures that are not included in the final rule. The following is a summary of the FRFA (March 1, 2002).

The Council considered eight adjustments to management measures in the FMP. Six of those management measures are discussed below. The remaining two management measures, that involve the Reserve, were not approved by NMFS for the reasons stated above. This partial disapproval is not expected to have any economic impact because no commercial precious coral harvest is currently occurring in the Reserve.

Under Management Objective 1, (reduce the potential for overfishing of gold coral at the Makapu'u Bed), four alternatives were considered including the preferred alternative. Under the preferred alternative, the harvest quota for gold coral at the Makapu'u Bed will be suspended until further information on the impact of harvesting on subsequent recruitment of gold coral is available. A gold coral quota of zero would likely have some adverse economic impact on potential harvesters. However, the density of gold coral at the Makapu'u Bed is already very low. It is likely that any harvest effort occurring at Makapu'u bed will be directed mainly toward pink coral because this coral is relatively abundant at the bed and has a higher market value than gold coral ($440/kg for pink coral (C. secundum) vs. $330/kg for gold coral according to Maui Divers of Hawaii, Ltd.). A suspension of the quota is not expected to have an adverse economic impact on processors of precious corals in Hawaii. The fishery in the EEZ around Hawaii for deep-water species of precious coral, including pink, gold and bamboo coral, has been nearly dormant for two decades. Consequently, the processors of these corals in Hawaii have relied almost exclusively on imported material.

Three alternatives were considered and rejected for the first management objective. The first rejected alternative would have maintained the biennial gold coral quota of 600 kg (132 lb) at Makapu'u Bed. Maintaining the current biennial harvest quota of 600 kg (132 lb) for gold coral at Makapu'u Bed would continue to make available to prospective harvesters a quantity of gold coral worth $198,000 every two years ($99,000 annually) if the actual stock is of sufficient size to support such a harvest. However, a recent survey of the bed revealed that the current standing stock of gold coral is low and may not yield the current harvest quota. In addition, the adverse economic impacts over the long term would be significant if further harvesting diminishes the number of colonies to the point that no recovery is possible.

The second rejected alternative would have suspended the harvest quota for gold coral at all established and conditional beds until additional information is available on the impact of harvesting on subsequent recruitment of gold coral. The total harvest quota for gold coral at all established and conditional beds is 1,080 kg (238 lb) every two years, with an estimated dockside value of $356,400. However, the gold coral quota at the Makapu'u Bed accounts for more than half of this

total. As noted above, the current standing stock of gold coral at the Makapu'u Bed may not yield the current biennial harvest quota of 600 kg (132 lb). If no gold coral is harvested from the Makapu'u Bed the amount of potential gross revenues foregone by suspending the harvest quota at all established and conditional beds is estimated to be about $158,400 every two years.

The third rejected alternative would have implemented a minimum size limit for gold coral at the Makapu'u Bed. This alternative was rejected because the calculation of an appropriate minimum size requires estimates of growth rates, mortality rates and size at reproductive maturity. These data estimates are lacking for gold coral. Without this information the size limit established may be too low, thereby insufficiently protecting the coral from overfishing and eventually leading to reduced economic returns, or may be too high, thereby resulting in an overly conservative size limit that unnecessarily reduces potential economic returns.

Under Management Objective 2 (reduce the potential for harvest of coral which has live coral polyps or tissue), three alternatives were considered including the preferred alternative. Under the preferred alternative, dead precious coral will be defined as precious coral that no longer has any live coral polyps or tissue, and live precious coral will be defined as precious coral that has live polyps or tissue. Only live coral will be counted toward the quotas limiting the amount of precious coral that may be taken in any permit area during the fishing year. It is possible that some of the coral at a given bed that was regarded as dead under the current definition would be regarded as live under the alternative definition, and therefore be subject to the harvest quota for that bed. However, the amount of additional coral that would be subject to the quota is likely to be small, as coral colonies that contain holes from borers or are discolored or encrusted generally no longer have any living polyps or tissue. There is insufficient information on the amount of coral meeting this definition at different beds to quantify this economic impact.

Two alternatives were considered and rejected for the second management objective. The first rejected alternative would have maintained the current definition of dead precious coral as any precious coral that contains holes from borers or is discolored or encrusted at the time of removal from the seabed. This alternative was rejected because allowing the harvest of coral that is currently defined as dead and is believed to provide foraging habitat to the endangered Hawaiian monk seal may lead to emergency closures of specific sites or alterations of fishing operations. The economic impact of closures or other measures would depend on the length of time that these measures are in effect.

The second rejected alternative would have defined dead precious coral as precious coral that is no longer standing upright, and define live precious coral as precious coral that is standing upright. However, the amount of additional coral that would be subject to the quota is likely to be small, as coral colonies that contain holes from borers or are discolored or encrusted are often no longer standing upright. There is insufficient information on the amount of coral meeting this definition at different beds to quantify this economic impact.

Under Management Objective 3, (allow greater utilization of dead coral resources), two alternatives were considered including the preferred alternative. Under the preferred alternative, size limits will be applied only to live coral. This alternative will allow greater utilization of dead coral resources and thus increase potential income to harvesters. There is insufficient information on the quantity of dead coral at different beds to quantify this economic impact.

The rejected alternative would have maintained the application of minimum size limits to both live and dead coral. This alternative was rejected because it prohibits the harvest of dead coral that is below the minimum size limit despite the fact that the harvest of dead coral is not considered to be detrimental. There is insufficient information on the quantity of dead coral at different beds to quantify the economic impact.

Under Management Objective 4 (regulate the harvest of black coral), four alternatives were considered including the preferred alternative. Under the preferred alternative, the harvest of black coral will be prohibited unless it has attained either a minimum stem diameter of 1 inch (2.54 cm), measured no less than 1 inch (2.54 cm) from the top of the living holdfast, or a minimum height of 48 inches (122 cm), measured from the base to the greatest distal extremity of the colony. Persons who reported a landing of black coral to the State of Hawaii within 5 years before the effective date of the final rule may apply for an exemption which allows the hand harvest of black coral that has attained a 3/4 inch (1.905 cm) base diameter, measured on the widest portion of the skeleton at a location just above the holdfast.

Three alternatives were considered and rejected for this management objective. The first rejected alternative would have maintained the current situation of no restrictions on the harvest of black coral. This alternative was rejected because it would allow fishing pressure to increase in an uncontrolled manner and could lead to overfishing of black coral.

The second rejected alternative would have prohibited the harvest of black coral unless it has attained a minimum base diameter of 3/4 inch (1.905 cm), which is believed to inadequately protect black coral resources from overfishing.

The third rejected alternative would have established a weight quota for black coral and was rejected because a weight quota may not be as effective as a size limit in avoiding overfishing of the resource. Information on the standing stock and sustainable yield of managed species of black coral is limited. The use of minimum size limits based on knowledge of the reproductive biology of precious corals is the preferred basis for management of the fishery when selective harvesting is expected to be economically feasible as information on the standing stock and its sustainable yield in terms of weight is limited.

Under Management Objective 5 (protect precious coral resources and essential fish habitat (EFH) from the effects of ecologically destructive and wasteful harvest gear), three alternatives were considered including the preferred alternative. The preferred alternative will require that selective gear be used to harvest precious corals from all permit areas. The cost of purchasing an unmanned submersible (i.e., remotely operated vehicle) may be as low as $50,000, which is roughly equal to the capital investment in gear required to initiate a non-selective harvest operation using tangle nets. Although the capital and operating costs of manned submersibles may be high, they are not economically prohibitive, as is evidenced by the recent interest of two firms in using this type of selective gear to harvest precious corals in the waters around Hawaii. In addition, it is likely that some harvesters of precious coral will be able to defray the costs of using selective gear by finding other lucrative uses for the gear, such as salvage and research. The use of non-selective gear to harvest precious corals is an inefficient use of fishery resources. Non-selective gear tends to damage the precious coral trees as it harvests them, thereby greatly reducing the value of the

coral. In contrast, selective gear harvests coral so that it retains its highest value.

Two alternatives were considered and rejected for the fifth management objective to protect precious coral resources and EFH from the effects of ecologically destructive and wasteful harvest gear.

The first rejected alternative would have maintained the current regulations requiring selective gear only at the Makapu'u, Keahole Point, and Kaena Point Beds. This alternative was rejected because the use of non-selective gear to harvest precious corals is not an efficient use of fishery resources. The value of precious coral colonies is dependent on its size, color and condition. Large, completely intact trees of coral have the greatest value. Non-selective gear such as dredges harvest pieces of broken coral knocked down by the dredge stone and entangled in the nets as the dredge is pulled along the sea floor. Breakage may reduce a coral's value by as much as 80 percent.

Allowing the continued use of this relatively inexpensive gear in exploratory areas may encourage the discovery and exploration of new beds. However, the use of non-selective gear is unlikely to provide sufficient data to develop reliable estimates of the standing stock and maximum sustained yield (MSY) for newly discovered beds because this gear cannot discriminate or differentiate between types, size, quality or characteristics of living or dead corals. Further, the degradation of precious coral beds may reduce monk seal foraging habitat. The economic impact of such adverse modifications would be likely to include emergency closures of specific sites, including Brooks Bank, or alteration of fishing operations. The specific cost of closures or other measures would depend on the length of time that these measures are in effect.

The second rejected alternative would have required that selective gear be used to harvest precious corals from all established and conditional beds. This alternative was rejected as it would fail to protect those precious coral resources located outside of these beds.

Under Management Objective 6 (reduce the potential for overfishing of pink coral at conditional beds and exploratory areas), three alternatives were considered including the preferred alternative. Under the preferred alternative, the current 10 inch size limit for pink coral will be applied to all established beds, conditional beds, and exploratory areas. The feasibility of this alternative is contingent on a prohibition on the use of non-selective gear to harvest precious corals for commercial purposes in all permit areas. Applying the size limit for pink coral to all permit areas is unlikely to have a significant negative economic impact because the potential financial return from harvesting colonies of pink coral that are less than 10 inches (25.4 cm) in height is low. According to Maui Divers of Hawaii, Ltd., harvesting colonies less than 10 inches (25.4 cm) is not economically practical, because the return does not justify the time spent harvesting.

Two alternatives were considered and rejected for the sixth management objective. The first rejected alternative would have maintained the application of the 10-inch (25.4 cm) size limit for pink coral at the established Makapu'u, Keahole Point, and Kaena Point Beds only, and was rejected because long-term negative impacts on harvest levels and gross revenues could be potentially large if the resources are overfished. Given the life-history characteristics of pink coral, such as slow growth and long generation time, overfishing could degrade the productivity of affected precious coral beds for many years.

The second rejected alternative would have applied the current 10–inch (25.4 cm) size limit for pink coral only to established and conditional beds. This alternative would have had economic impacts similar to the preferred alternative. However, it was rejected because it would not provide protection for the minimum sizes to pink corals located in exploratory areas.

This final rule could affect five to seven small businesses. There are three to five small-boat fishermen who harvest black coral using scuba gear in beds overlapping State of Hawaii and Federal waters, as well as two historical or potential operations targeting other precious corals. Between 1990 and 1997, the total annual harvest of black coral in Hawaii varied from a low of 864 lbs (391 kg) to a high of 6,017 lbs (272 kg), with a yearly average of 3,084 lbs (139 kg). The 415 lbs (188 kg) of black coral sold in 1997 had a dockside value of about $10,394, assuming a price of $25/lb. NMFS cannot determine the proportions of the harvest of black coral made in State and Federal waters based on the available information. Details on the harvest of other precious corals cannot be released due to confidentiality requirements as there have been less than three operations active in the past decade.

Due to the low level of participation in the western Pacific precious coral fishery, aggregate economic impacts resulting from the final rule will be minimal. The analysis, however, shows that prohibiting the harvest of gold coral at Makapu'u Bed could result in the loss of potential revenues of approximately $100,000 annually in the short term, if the actual stock is of sufficient size to support the current harvest quota. Establishment of a universal minimum harvest size for all pink coral management unit species could result in a positive economic impact in the form of long-term maintenance of MSYs. On the other hand, imposing a minimum harvest size for black corals could have a negative economic impact on fishery revenues, except for five harvesters expected to be exempt from the minimum harvest size requirement. A prohibition on the use of non-selective gear to harvest precious corals could result in additional costs for future participants. Hand-harvesters for black corals would be unaffected by this prohibition. The exact costs of selective gear technologies are unknown, although a remotely operated submersible coral harvester can now be obtained for $50,000, which may be approximately equal to the cost of setting up a non-selective harvest operation using tangle nets. The effective yield is higher for selective harvesting of precious corals using submersibles compared to the wasteful practice of harvesting precious corals using non-selective gear.

Due to a lack of information on the long term effects of alternative management measures on coral stocks, harvest effort or catch rates, a detailed quantitative analysis of the costs and benefits of alternative management measures is not possible at this time.

Although long-term data are unavailable, analysis of this fishery is ongoing, and may lead to simulation models capable of predicting the biological (and economic) effects of each alternative. From a conceptual point of view, the precious corals fishery represents a difficult economic analysis. Although standard bioeconomic theory suggests that the harvest rate should be no more than the growth rate of the coral population at its MSY (accounting for economic production cost relationships and the discount rate), the growth rate of coral is so slow that a mining approach might be considered preferable, i.e., that the resource might be allowed to be over-fished in the short-term, and then harvesting prohibited for the many years which would be required for it to be fully restored. However, this approach was rejected because it would be inconsistent, with National Standard 1 of the Magnuson-Stevens Act which prohibits overfishing. It is anticipated by NMFS that by allowing the coral populations to maintain their long-term

sustainability, there will be a larger standing stock of corals which will optimize harvest rates and reduce the relative costs of harvesting (due to increased density). By limiting the harvest rates to those allowed by MSY, the likelihood that long-term benefits will exceed costs is increased. In addition, these restrictions may preclude new entry into the fishery, therefore improving social benefits (i.e., avoiding over-capacity). To the extent that these initial explorations are successful in identifying additional coral resources for harvesting, and as new economic information is acquired, a re-evaluation of the relative benefits and costs of these management measures would be warranted.

None of the alternatives considered is expected to have significant social impacts on fishery participants or Hawaii fishing communities in terms of employment, enjoyment of the fishery, vessel and crew safety, social or cultural activity in the fishery, or other social factors.

To minimize impact, this final rule removes size limits for dead corals. However, this revision could cause some risk to certain corals, such as gold corals, that may use dead corals for resettlement of new colonies.

This final rule does not contain any reporting or record- keeping requirements.

An informal consultation under the Endangered Species Act was conducted to determine whether this regulatory amendment was likely to affect any endangered or threatened species, including Hawaiian monk seals. This consultation was completed on December 20, 2000, and concluded that this regulatory amendment is not likely to adversely affect any endangered or threatened resources. The disapproval of the two NWHI measures does not affect that determination.

This final rule is consistent with Executive Order 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.

List of Subjects in 50 CFR Part 660

Administrative practice and procedure, American Samoa, Fisheries, Fishing, Guam, Hawaiian Natives, Indians, Northern Mariana Islands, Reporting and recordkeeping requirements.

Dated: March 12, 2002.

Rebecca Lent,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 660 is amended as follows:

PART 660—FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.*

2. In § 660.12, the definitions of "Dead coral" and "Live coral" are revised, and under the definition of "Precious coral permit area", paragraph (3) is revised to read as follows:

§ 660.12 Definitions.

* * * * *

Dead coral means any precious coral that no longer has any live coral polyps or tissue.

* * * * *

Live coral means any precious coral that has live coral polyps or tissue.

* * * * *

Precious coral permit area * **

* * * * *

(3) *Refugia.* Westpac Bed, Permit Area R-1, includes the area within a radius of 2.0 nm of a point at 23°18′ N. lat., 162°35′ W. long.

* * * * *

3. In § 660.82, paragraph (c) introductory text is revised to read as follows:

§ 660.82 Prohibitions.

* * * * *

(c) Take and retain, possess, or land any live pink coral or live black coral from any precious coral permit area that is less than the minimum height specified in § 660.86 unless:

* * * * *

4. Section 660.86 is revised to read as follows:

§ 660.86 Size restrictions.

The height of a live coral specimen shall be determined by a straight line measurement taken from its base to its most distal extremity. The stem diameter of a living coral specimen shall be determined by measuring the greatest diameter of the stem at a point no less than 1 inch (2.54 cm) from the top surface of the living holdfast.

(a) Live pink coral harvested from any precious coral permit area must have attained a minimum height of 10 inches (25.4 cm).

(b) *Black coral.* (1) Except as provided in paragraph (b)(2) of this section, live black coral harvested from any precious coral permit area must have attained either a minimum stem diameter of 1 inch (2.54 cm), or a minimum height of 48 inches (122 cm).

(2) The NMFS Pacific Islands Area Office will issue an exemption permitting hand-harvesting of live black coral that has attained a minimum base diameter of 3/4 inches (1.91 cm), measured on the widest portion of the skeleton at a location just above the holdfast, to any person who reported a landing of black coral to the State of Hawaii within 5 years before April 17, 2002.

5. Section 660.88 is revised to read as follows:

§ 660.88 Gear restrictions.

Only selective gear may be used to harvest coral from any precious coral permit area.

6. Table 1 to Part 660 is revised to read as follows:

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

July, 2003

Amendment 4 to the Precious Corals Fishery Management Plan is contained in the Council's Magnuson-Stevens Act Definitions and Required Provisions, as required under the Sustainable Fisheries Act. This amendment would implement new definitions for Hawaii fishing communities. For a complete background description and analysis of Amendment 4, please see the Magnuson-Stevens Act Definitions and Required Provisions.

Vermont Avenue, NW., Washington, DC 20590.

SUPPLEMENTARY INFORMATION: Section 5 of the Department of Transportation Act (49 U.S.C. 1654 *et seq.*) establishes a program of federal grants to states to fund local rail freight assistance projects. The regulations implementing section 5 of the Act are contained in 49 CFR part 266. The Local Rail Service Reauthorizing Act, Public Law No. 101–213 (Dec. 11, 1989) ("Reauthorizing Act") amended section 5 of the Act in several ways. The proposed amendment of part 266 was to reflect those amendments enacted by the Reauthorizing Act. However, the Administration has not requested, and the Congress has not provided, any appropriations for that program since 1995. As a result no new funding has been made available to recipients since that time and none is anticipated. Since no further funding is anticipated for the program, the proposed amendments to part 266 are no longer necessary.

Conclusion: Based on the foregoing, FRA is withdrawing the NPRM.

Issued in Washington, DC on March 31, 2003.

Allan Rutter,

Administrator.

[FR Doc. 03–8283 Filed 4–4–03; 8:45 am]

BILLING CODE 4910–06–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[I.D. 032703B]

RIN 0648–AN79, 0648–AP54, 0648–AP55

Fisheries Off West Coast States and in the Western Pacific; Precious Coral Fisheries, Fishery Management Plan (FMP) Amendment 4; Bottomfish and Seamount Groundfish Fisheries, FMP Amendment 6; Pelagic Fisheries, FMP Amendment 8; Crustacean Fisheries, FMP Amendment 10

AGENCY: National Marine Fisheries Service (NOAA), Commerce.

ACTION: Notice of availability of supplemental FMP amendments; request for comments.

SUMMARY: NMFS announces that the Western Pacific Fishery Management Council (Council) has prepared supplements to FMP Amendment 4 to the Fishery Management Plan for the Precious Coral Fisheries of the Western Pacific Region (Amendment 4) fisheries, FMP Amendment 6 to the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region (Amendment 6), fisheries FMP Amendment 8 to the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region (Amendment 8) for fisheriesand FMP Amendment 10 to the Fishery Management Plan for Crustaceans Fisheries of the Western Pacific Region (Amendment 10) of the Western Pacific Region. The supplemental amendments, which have been submitted to NMFS for Secretarial review, are intended to implement certain revisions made by the provisions of the Sustainable Fisheries Act (SFA) revisions to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Included in the supplemental amendments are bycatch provisions for the bottomfish and seamount groundfish and pelagic FMPs fisheries; overfishing definitions and control rules for the bottomfish and seamount groundfish, pelagics, and crustacean FMPs fisheries; and definitions of "fishing communities" in Hawaii for the bottomfish and seamount groundfish, pelagics, crustaceans, and precious corals FMPs fisheries.

DATES: Written comments on the supplemental FMP amendments must be received on or before June 6, 2003.

ADDRESSES: Written comments on any of the supplemental FMP amendments should be sent to Dr. Charles Karnella, Administrator, Pacific Islands Area Office, NMFS, 1601 Kapiolani Boulevard, Suite 1110, Honolulu, HI 96814, or faxed to 808–973–2941. Comments will not be accepted via e-mail or the internet.

Copies of the amendment documents are available from Kitty Simonds, Executive Director, Western Pacific Fishery Management Council, 1164 Bishop St., Suite 1400, Honolulu, HI 96813. The documents are also available on the following website: *http://www.wpcouncil.org.*

FOR FURTHER INFORMATION CONTACT: Kitty Simonds, phone: (808) 522–8220; fax: (808) 522–8226.

SUPPLEMENTARY INFORMATION: The Magnuson-Stevens Act requires each Regional Fishery Management Council to submit fishery management plans or plan amendments to NMFS for review and approval, disapproval, or partial approval. The Magnuson-Stevens Act also requires NMFS, immediately upon receiving a fishery management plan or amendment, to publish notification in the **Federal Register** that the fishery management plan or plan amendment is available for public review and comment. NMFS will consider the public comments received during the comment period described above in determining whether to approve, disapprove, or partially disapprove the fishery management plan or plan amendment.

The Council has prepared supplements to Amendment 4, Amendment 6, Amendment 8, and Amendment 10 that address bycatch issues; establish overfishing definitions and describe control rules; and designate define fishing communities in the State of Hawaii, consistent with the certain SFA amendments made by the 1996 SFA to the Magnuson-Stevens Act. Then on February 3, 1999, NMFS approved portions of the Council's FMP amendments pertaining to essential fish habitat provisions, identification of commercial, recreational and charter fishing sectors; overfishing definition for precious corals; bycatch provisions for crustaceans and precious coral fisheries; and designation definition of fishing communities for American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands.

The supplemental amendments provide new specifications of overfishing criteria. Maximum sustainable yield-based control rules and overfishing thresholds are defined for the Northwestern Hawaiian Islands (NWHI) lobster stock and multi-species complexes of bottomfish and seamount groundfish and western Pacific pelagic management unit species. Stock status determination criteria, including maximum fishing mortality thresholds and minimum stock size thresholds, are defined for the lobster stock, bottomfish, and pelagic stock complexes. The bottomfish and seamount groundfish FMP already contains measures to prevent overfishing and to rebuild overfished stocks. These include a moratorium on the harvest of armorhead to rebuild this stock in the seamount groundfish fishery, a prohibition on the use of destructive bottomfish fishing methods, area closures around the main Hawaiian Islands, and limited access programs in the implementation of bottomfish NWHI to limit fishing effort. Additional measures to prevent overfishing or to rebuild overfished stocks that may be considered by the Council in the future include additional area closures, seasonal closures, reduction in the number of available limited access permits, establishment of limited access programs in areas other than the NWHI, limits on catch per trip, limits on effort per trip, and fleet-wide limits on catch and effort.

The pelagics FMP already includes measures to prevent local overfishing

and to keep stocks from becoming locally overfished through a limited access program for the Hawaii-based longline fishery, prohibition on the use of drift gill nets, and various longline area closures in Federal waters around American Samoa, Guam, and Hawaii. Additional measures that may be considered by the Council in the event of overfishing include reductions in the number of limited access longline permits, size restrictions, etc.

The crustaceans FMP contains measures to prevent overfishing and keep NWHI stocks from becoming overfished including gear restrictions, trap specifications (to allow juvenile lobsters to escape), a limited access permit program for the NWHI commercial lobster fishery, a limit on the number of lobster traps allowed per vessel, seasonal and area closures, and annual bank-specific harvest guidelines. Additional measures that may be considered by the Council, if needed, include adjustments to the NWHI seasonal closure, temporary fishery closures, and size or species harvest restrictions.

Supplemental FMP amendments pertaining to bycatch issues describe bycatch levels and patterns in the bottomfish and seamount groundfish and pelagic fisheries. Management measures currently require all primary and relief operators (captains) in the NWHI limited access fisheries to complete one-time protected species workshop. The supplemental amendments describe recent improvements in bycatch reduction and bycatch reporting, as well as non-regulatory management initiatives to further minimize bycatch and reduce bycatch mortality, and improve the measurement of bycatch and analyses thereof in these fisheries. These initiatives include fishery outreach programs that foster awareness of bycatch issues, research into fishing methods and gear modification to reduce bycatch and bycatch mortality, development of markets for low value fish that would otherwise be discarded by fishermen, and improvements to information collection for bycatch.

The supplemental amendments for the bottomfish and seamount groundfish, pelagics, crustaceans, and precious corals FMPs define each of the major inhabited main Hawaiian islands as a fishing community. This island-by-island designation definition of fishing communities is based on analyses indicating that the social and economic cohesion of fishery participants is strongest at the island level. Fishing, support services, and fishery infrastructure are critically important to all of Hawaii's populated areas. As such fishing communities in Hawaii are not distinguished according to a particular fishery or gear type. The supplemental amendments define Hawaii's fishing communities as the islands of Niihau, Kauai, Oahu, Molokai, Maui, Lanai, and Hawaii.

Public comments on any or all of the supplemental FMP amendments must be received by June 6, 2003, to be considered by NMFS in the decision whether to approve, disapprove, or partially approve the amendments.

The supplemental amendments contain no implementing regulations.

Authority: 16 U.S.C. 1801 *et. seq.*

Dated: April 2, 2003.

Richard W. Surdi,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 03–8398 Filed 4–4–03; 8:45 am]

BILLING CODE 3510–22–S

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

July, 2003

Amendment 5 to the Precious Corals Fishery Management Plan is contained in the Council's Coral Reef Ecosystems (CRE) Fishery Management Plan. This amendment would prohibit fishing for Precious Corals Management Unit Species in the CRE Plan's no-take areas. For a complete background description and analysis of Amendment 5, please see the Coral Reef Ecosystems Fishery Management Plan.

It is prohibited to harvest the precious corals management unit species listed in Table 5.4, and all future additions to the precious corals MUS list, in no-take marine protected areas designated in the Coral Reef Ecosystem FMP, and in any marine protected areas that may be designated by amendment to the Coral Reef Ecosystem FMP. The locations of the no-take MPAs are:

(1) federal waters shallower than 10 fathoms in the Northwestern Hawaiian Islands; and,

(2) federal waters shallower than 50 fathoms around Jarvis Island (0°23' S, 160°01' W), Howland Island (0°48' N, 176° 38' W), Baker Island (0° 13' N, 176°38' W), Kingman Reef (6°23' N, 162°24' W), Laysan Island (25° 45' N, 171°45' W), French Frigate Shoals (23° 45' N, 166°15' W), the Northern half of Midway Atoll (28° 14' N, 177° 22' W), and Rose Atoll (14° 33' S, 168° 09' W).

Table 5.4: Precious Corals management unit species list.

Scientific Name	English Common Name	Scientific Name	English Common Name
Corallium secundum	Pink coral (also known as red coral)	*Lepidisis olapa*	Bamboo coral
Corallium regale	Pink coral (also known as red coral)	*Acanella* spp.	Bamboo coral
Corallium laauense	Pink coral (also known as red coral)	*Antipathes dichotoma*	Black coral
Gerardia spp.	Gold coral	*Antipathes grandis*	Black coral
Narella spp.	Gold coral	*Antipathes ulex*	Black coral
Calyptrophora spp.	Gold coral		

extension of the comment period for the proposed designations and non-designations of critical habitat for plant species on the island of Hawaii. We will accept public comments on the proposal for the island of Hawaii until November 30, 2002. The extension of the comment period gives all interested parties the opportunity to comment on the proposal. Comments already submitted on the proposed designations and non-designations of critical habitat for plant species from the island of Hawaii need not be resubmitted as they will be fully considered in the final determinations. Extension of the comment period will enable us to respond to the requests for a public hearing on the proposed action. Written comments should be submitted to the Service office listed in the **ADDRESSES** section. The comment period now closes on November 30, 2002.

Author

The primary author of this notice is Christa Russell (*see* **ADDRESSES** section).

Authority: The authority for this action is the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*).

Dated: September 16, 2002.

Craig Manson,

Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 02–24248 Filed 9–23–02; 8:45 am]

BILLING CODE 4310–55–M

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 020508114–2114–01; I. D. 030702C]

RIN 0648–AM97

Fisheries of West Coast States and in the Western Pacific; Coral Reef Ecosystems Fishery Management Plan for the Western Pacific

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS issues a proposed rule that would implement those parts of the Fishery Management Plan for Coral Reef Ecosystems of the Western Pacific Region (CREFMP)that have been approved by NMFS. Coral reef ecosystem fisheries in federally managed waters of the western Pacific U.S. exclusive economic zone (U.S. EEZ) are currently unregulated under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The CREFMP, which was developed by the Western Pacific Fishery Management Council (Council), would apply ecosystem principles to fisheries management to conserve and protect coral reef fisheries, their ecosystems, and associated habitats in the U.S. EEZ around American Samoa, Guam, Hawaii (main Hawaiian Islands), the Commonwealth of the Northern Mariana Islands (CNMI), and the U.S. Pacific remote island areas (PRIA): Howland Island, Baker Island, Jarvis Island, Wake Island, Kingman Reef, Palmyra Atoll, and Johnston Atoll.

DATES: Comments must be submitted in writing by October 24, 2002.

ADDRESSES: Written comments should be sent to Dr. Charles Karnella, Pacific Islands Area Office (PIAO), NMFS, 1601 Kapiolani Blvd, Suite 1110, Honolulu, HI 96814. Comments will not be accepted if submitted via e-mail or the internet. Copies of the CREFMP, environmental impact statement (EIS), regulatory impact review (RIR), and initial regulatory flexibility analysis (IRFA) are available at the Council website, *www. wpcouncil. org.* Requests for a CD or paper copy of these documents can be made by contacting *Jarad. Makaiau@noaa. gov.* A copy of the Record of Decision issued by NMFS for the partially approved CREFMP is available at the PIAO website, *http//swr. nmfs. noaa. gov/piao.* Send comments regarding the reporting burden estimate or any other aspect of the collection-of-information requirements in this proposed rule to the NMFS address and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), Washington, DC00503 (Attn: NOAA Desk Officer).

FOR FURTHER INFORMATION CONTACT: Kitty Simonds, Executive Director, Western Pacific Fishery Management Council, at (808) 522–8220 or Dr. Charles Karnella, Administrator, PIAO, at (808) 973–2937.

SUPPLEMENTARY INFORMATION: The Council began development of the CREFMP in 1996, with the preparation of an assessment of the coral reef ecosystem resources. Initial scoping hearings were conducted by the Council in June 1999 to obtain public input on a new fishery management plan for these resources. A notice of availability soliciting public comment on the CREFMP's draft environmental impact statement (DEIS) was published in the **Federal Register** on January 12, 2001 (66 FR 1945). Although the comment period ended on February 26, 2001, additional comments were accepted during the month following the closing date.

Four major agency reviews were conducted to ensure completeness, accuracy, and compliance of the draft CREFMP with applicable laws. The Council also conducted 59 public meetings and hearings to receive comments on the draft document. These comments were incorporated into the text of the final CREFMP. The Council adopted the final CREFMP on June 20, 2001, and transmitted it to NMFS on March 8, 2002. A notice of availability was published in the **Federal Register** on March 18, 2002, 67 FR 11971. On June 14, 2002, NMFS partially approved the CREFMP and parallel amendments to the Council's management plans for bottomfish and seamount groundfish fisheries (Bottomfish FMP), pelagic fisheries (Pelagics FMP), precious coral fisheries, and crustacean fisheries of the western Pacific region. The CREFMP was approved, except for that portion of the CREFMP that governs fishing in waters of the U.S. EEZ around the Northwestern Hawaiian Islands (NWHI) west of 160°50′ W. long. NMFS disapproved a portion of the plan because it would be inconsistent with, or duplicate, certain provisions of Executive Order 13178 and 13196s, which together establish the NWHI Coral Reef Ecosystem Reserve (Reserve), as authorized by section 6(g) of Public Law 106–513. The Reserve encompasses a portion of the U.S. EEZ around the NWHI from the seaward boundary of the State of Hawaii, out to a distance of 50 nautical miles (nm). Specifically, section 7(b)(5) of Executive Order 13178, one of two executive orders that established the Reserve, prohibits the harvest of almost all living and non-living resources throughout the Reserve, while the CREFMP would actively manage the same species within the same geographical area. The bottomfish fishery in the NWHI will continue to be managed under existing management measures for the Bottomfish FMP, as authorized by the Magnuson-Stevens Act, while the process to designate a national marine sanctuary in the NWHI as directed by section 6(g) of Public Law 106–513, is ongoing. Coral reefs are highly complex, integrated ecosystems. The vast majority of the total area covered by coral reefs under U.S. jurisdiction is located in the western Pacific region and would be managed either by this new fishery management plan or by the NWHI Reserve management regime. The CREFMP

adopts aprecautionary approach by addressing the potential for problems before they occur, and by establishing management measures that can be adapted rapidly in response to changes in the fishery. Although state and territorial regulations control most impacts from coral reef ecosystem fisheries in near-shore areas, the CREFMP would complement those regulations by implementing measures to manage coral reef ecosystems in adjacent Federal waters of the U.S. EEZ. In general, these areas have been minimally exploited, but potential fisheries, including those for live fish markets in Southeast Asia, coral and "live rock" for the U.S. aquarium trade, and marine bioprospecting for pharmaceutical uses, may develop and are addressed within the CREFMP.

The CREFMP has eight objectives: (1) Foster sustainable use of coral reef ecosystem resources in an ecologically and culturally sensitive manner; (2) provide a flexible and responsive management program for coral reef ecosystem resources that allows for rapid adjustments to management measures in response to changes in resource abundance, new scientific information, or changes in fishing patterns; (3) establish integrated resource data collection and permitting systems, including a research and monitoring program to collect fishery and other ecological information necessary to make informed management decisions about coral reef ecosystems in the U.S. EEZ; (4) minimize adverse human impacts on coral reef ecosystem resources by establishing new and improving existing marine protected areas (MPAs), managing fishing pressure, controlling wasteful harvest practices, reducing other anthropogenic stressors directly affecting coral reef ecosystem resources (through the conservation and protection of essential fish habitat (EFH) and allowing the recovery of naturally balanced reef ecosystems); (5) improve public and government awareness and understanding of coral reef ecosystems, their vulnerability and resource potential so as to reduce adverse human impacts and foster support for science-based management; (6) facilitate collaborative effort among agencies and organizations concerned with the conservation of coral reef ecosystems in order to share in decision-making, data, and resources needed to effectively monitor the vast and complex coral reef ecosystems managed under the CREFMP; (7) encourageand promote surveillance and enforcement in support of CREFMP management measures; and (8) provide for sustainable participation by fishing communities in coral reef ecosystem fisheries and, to the extent practicable, minimize adverse economic impacts on such communities.

Relation to Other Laws

In order to ensure consistency between the management regimes of different Federal agencies, NMFS is adding language to the proposed rule that states that unless specifically authorized by the U.S. Fish and Wildlife Service (USFWS), fishing authorized under Subpart J—Western Pacific Coral Reef Ecosystem Fisheries is not allowed within the boundary of a wildlife refuge regardless of whether that refuge was established by action of the President or the Secretary of the Interior. Contact the USFWS at 808–541–1291 for more information and boundary details.

Amendments to Existing FMPS

To ensure consistency with the proposed regulations of the CREFMP, the Council would amend its existing fishery management plans for bottomfish and seamount groundfish fisheries, crustacean fisheries, pelagic fisheries, and precious coral fisheries. Fishing for management unit species (MUS) included in these existing plans would be prohibited in the CREFMP no-take MPAs. The Council initially proposed an insurance requirement for all vessels managed under these fishery management plans while operating in or transiting through the coral reef ecosystem MPAs. This measure was intended to provide the means for mitigating reef damage in the event of a vessel grounding or an oil spill in the coral reef ecosystems, including the possibility for wreck removal and reef recovery activities. The FMP did not set forth the details of this complex and novel issue. As a result, the insurance requirement is not included in this proposed rule; however, the Council will continue to address appropriate means to provide for reef protection. Finally, the MUS list for the Pelagics FMP would be amended to include only the following species of pelagic sharks: *Alopias pelagicus* (pelagic thresher shark), *Alopias superciliousus* (bigeye thresher shark), *Alopias vulpinus* (common thresher shark), *Carcharhinus falciformis* (silky shark), *Carcharhinus longimanus* (oceanic whitetip shark), *Prionace glauca* (blue shark), *Isurus oxyrinchus* (shortfin mako shark), *Isurus paucus* (longfin mako shark), and *Lamna ditropis* (salmon shark). The remaining coastal sharks currently listed as MUS in the Pelagics FMP would become CREFMP MUS. Dogtooth tuna would also change from a Pelagics FMP MUS to a CREFMP MUS. This revision to the Pelagics FMP MUS would closely reflect the species associated with the respective ecosystems for each plan and provide for more accurate data gathering without affecting fisheries operations.

Management Area

The coral reef ecosystem management area consists of the U.S. EEZ around American Samoa, Guam, Hawaii, PRIA, and the Commonwealth of the Northern Mariana Islands (CNMI). For American Samoa, Guam, and Hawaii, the management area would generally occur between 3 nm and 200 nm from shore; in some areas, the outer boundary of the U.S. EEZ is truncated by adjacent international maritime boundaries. Management measures are proposed only for the "offshore zone", which consists of those waters from 3 to 200 nm. The management area for the PRIA (Kingman Reef, Johnston and Palmyra Atolls, and Jarvis, Howland, Baker, and Wake Islands) begins at the shoreline and extends offshore 200 nm (seaward boundary of the U.S. EEZ). Kingman Reef, Johnston and Palmyra Atolls, and Jarvis, Howland, and Baker Islands are National Wildlife Refuges managed by the USFWS. Fisheries management responsibilities in the PRIA and Rose Atoll will be shared by the Council, NMFS and the USFWS. Because the CNMI EEZ includes all waters from the shoreline to 200 nm, this would comprise the management area. For the purposes of this rule, those waters for which management measures are proposed are collectively termed the "coral reef ecosystem regulatory area", which includes the U.S. EEZ waters of the western Pacific region, with the exception of EEZ waters within 3 miles of the shoreline of the CNMI and the EEZ around the NWHI west of 160°50′ W. long.

Coral Reef Ecosystem MUS

CRE-MUS are defined as those taxa listed in Table 1. 2 and 1. 3 of the CRE-FMP that spend the majority of their non-pelagic (post-settlement) life stages within waters less than or equal to 50 fathoms in total depth. These MUS are separated into two lists: "Currently harvested coral reef taxa" (CHCRT) and "potentially harvested coral reef taxa" (PHCRT). CHCRT consists of coral reef associated species, families, or subfamilies, as described in Table 1. 2 to the CREFMP, that have annual landings greater than 454. 54 kg (1,000 lb) as reported on individual state, commonwealth, or territory catch reports or through creel surveys. Fisheries and research data for many of these species have been analyzed by

regional management agencies. PHCRT consists of coral reef associated species, families, or subfamilies, as described in Table 1. 3 to the CREFMP, for which little or no information is available beyond general taxonomic and distribution descriptions. These species have either not been caught in the past or have been harvested annually in amounts less than 454. 54 kg (1,000 lb). Species that occur in the coral reef ecosystem that are not managed, i. e., not listed as management unit species under the Council's other fishery management plans, would be similarly categorized. NMFS is specifically soliciting public comments on these MUS definitions.

Principal Management Measures

The proposed rule contains four types of management measures, (MPAs, permits and monitoring, fishing gear methods, and other management measures) which, unless otherwise specified, would apply throughout the regulatory area.

MPAs

Based on their natural resource values, human use and historic values, impacts of human activities, and management concerns, this rule would establish MPAs within the U.S. EEZ waters around the PRIA and Rose Atoll in American Samoa. Ecologically sensitive areas would be designated as no-take MPAs, in which all harvesting activities would be prohibited. These no-take MPAs would be located in waters of the U.S. EEZ seaward from the shoreline to the 50–fathom (fm) (91.5–m) curve (isobath) at Jarvis, Howland, and Baker Islands, Kingman Reef and Rose Atoll. Low-use MPAs would be located in waters of the U.S. EEZ between the shoreline and the 50–fm (91.5–m) curve around Johnston Atoll, Palmyra Atoll, and Wake Island.

In low-use MPAs, most existing fishing activities, primarily recreational fishing by residents on Palmyra, could be permitted under special permits. The CREFMP does not abolish or amend prohibitions or restrictions on fishing imposed under other Federal laws, such as the National Wildlife Refuge System Administration Act. In other words, no special permits issued under these regulations would allow fishing within the boundary of a national wildlife refuge unless such fishery is also authorized by the USFWS. Fisheries governed under the Council's other fishery management plans and operating in low-use MPAs would continue to abide by the permit and reporting requirements established under those plans. Minimum insurance coverage against vessel groundings and oil spills is not included in this proposed rule at this time for reasons explained earlier; however, the Council will continue to explore options to help mitigate adverse impacts resulting from potential vessel groundings in the coral reef ecosystems in the U.S. EEZ. Although not an MPA in the sense of having fishing or permitting restrictions, Guam's Southern Banks is designated as a no-anchoring zone.

Permits and Monitoring

In general, any person who harvests coral reef ecosytem MUS in low-use MPAs would be required to have a Federal special permit issued by NMFS. Issuance of special permits would be on a case-by-case basis and based upon several factors including the potential for bycatch, the sensitivity of the area to the type of fishing proposed, and the level of fishing occurring in relation to the level considered sustainable in a low-use MPA. A person permitted and targeting non-CRE MUS under other fishery management plans would not be required to obtain a special permit to fish in low-use MPAs. In addition to the permit requirement for low-use MPAs, special permits would be required for any directed fisheries on PHCRT within the regulatory area. The harvest of live rock and living corals would be prohibited throughout the federally managed U.S. EEZ waters of the region (except 0–3 miles around CNMI); however, under special permits with conditions specified by NMFS following consultation with the Council, indigenous people could be allowed to harvest live rock or coral for traditional uses, and aquaculture operations could be permitted to harvest seed stock. The proposed rule would implement a Federal reporting system for all fishing under special permits. Resource monitoring systems administered by state, territorial, and commonwealth agencies would continue to collect fishery data on the existing coral reef fisheries that do not require special permits.

Fishing Gears and Methods

Fishing gear has the potential to adversely impact coral reef ecosystems. The CREFMP lists both allowable fishing gear types and fishing methods for targeting MUS. The listing of allowable gear types and methods is based on: (1) Impact on habitat; (2) potential for bycatch; and (3) degree to which fish may find refuge from capture. The proposed list of allowable gear types is: (1) Hand harvest; (2) spear; (3) slurp gun; (4) hand/dip net; (5) hoop net for Kona crab; (6) throw net; (7) barrier net; (8) surround/purse net that is attended at all times; (9) hook-and-line (powered and unpowered handlines, rod and reel, and trolling); (10) crab and fish traps with vessel ID number affixed; and (11) remote operating vehicles/submersibles. New fishing gears that are not included in the allowable gear list may be allowed under the special permit provision. The proposed rule would prohibit SCUBA-assisted spearfishing at night within U.S. EEZ waters around the PRIA.

Other Management Measures

Adaptive Management

A framework process, providing for an administratively simplified procedure to facilitate adjustments to management measures previously analyzed in the CREFMP, is an important component of the CREFMP. These potential framework measures include designating "no-anchoring" zones and establishing mooring buoys, requiring vessel monitoring systems on board fishing vessels, designating areas for the sole use of indigenous peoples, and including species not specifically listed as PHCRT under the "special permit" regime as warranted. A general fishing permit program could also be established for all U.S. EEZ coral reef ecosystem fisheries under the framework process of the CREFMP.

Other Actions

The CREFMP also contains non-regulatory measures consistent with CREFMP objectives that would be undertaken by the Council outside of the regulatory regime. These include a process and criteria for EFH consultations; formal plan team coordination to identify and to address coral reef ecosystem impacts from existing FMPs fisheries; a system to facilitate consistent state and territorial level management; and research and education efforts.

Classification

With the exception of provisions of the CREFMP that have been disapproved, NMFS has determined that the CREFMP and the parallel amendments to the bottomfish and seamount groundfish fisheries, pelagic fisheries, crustacean fisheries, and precious coral fisheries fishery management plans that this rule would implement are consistent with the national standards of the Magnuson-Stevens Act and other applicable laws.

The Council prepared an Final Environmental Impact Statement (EIS) for the CREFMP; a notice of availability was published on May 10, 2002 (67 FR

31801). On June 14, 2002, in partially approving the CREFMP, NMFS issued a Record of Decision identifying the selected alternative, a variation of the preferred alternative in the EIS. The intent of the partially approved CREFMP and its proposed implementing rule (i. e., selected alternative) is to prevent harmful activities and adverse impacts to the environment before they occur. This proposed rule is expected to maintain the sustainability of target and non-target species; safeguard against substantial damage to the ocean and coastal habitats and/or EFH;protect endangered or threatened species, marine mammals, and critical habitat; help ensure public health and safety; prevent the occurrence of cumulative adverse effects that could have a substantial effect on the target species or non-target species; promote biodiversity and ecosystem function within the affected area; and minimize, if not eliminate, negative social or economic impacts.

This proposed rule has been determined to be significant for purposes of Executive Order 12866.

The Council prepared an IRFA that describes the economic impact this proposed rule, if adopted, would have on small entities. The IRFA is available from the Council (see ADDRESSES). A summary of the IRFA follows.

The need for and objectives of this proposed rule are stated in the **SUMMARY** and **SUPPLEMENTARY INFORMATION** sections of this document and are not repeated here. This action is taken under authority of the Magnuson-Stevens Act and regulations at 50 CFR part 660.

All commercial fishing operations affected by this proposed rule are considered to be small entities under guidelines issued by the Small Business Administration because they are independently owned and operated, and have annual receipts not in excess of $3. 5 million. Based on information provided in the IRFA, this proposed rule would potentially affect 24 to 63 entities, including commercial harvesters of food fish, ornamental fish collectors, charter sportsfishing operations, and research entities. It is difficult to predict how many entities would alter their planned operations by fishing in state waters or moving to other target species to avoid applying for special permits and complying with increased reporting requirements under this proposed rule. However, NMFS believes that initially approximately five special permit applications will be received each year.

It is estimated that the costs to these small entities will primarily consist of a special permit application fee of between $50 and $100 per application. It is not anticipated that many additional entities (beyond those holding special permits) will be affected by this measure, as the proposed MPAs are located far from inhabited areas and the majority of other fisheries operate outside of proposed MPA waters utilizing gears that would continue to be allowed under this proposed rule. However, small entities using fish or crab traps to target CRE MUS throughout the regulatory area will be required to affix identification markers to each trap on board a vessel or deployed in the water. Based on similar requirements in other fisheries, the cost of this requirement is anticipated to be minimal, as identification markings may be inexpensively made using permanent ink, paint, or dye. Other, non-quantifiable, potential costs include revenue impacts resulting from the implementation of no-take MPAs. This action has information collection requirements that are addressed elsewhere in this classification section.

Several alternatives to these proposed measures are examined in the IRFA. Please note that the impacts of the proposed measures (selected alternative) will be less than the preferred alternative because the NWHI commercial bottomfish fishery will not be affected under the partially approved CREFMP (see Record of Decision). The first alternative is the no action alternative, which would not impose any economic costs on small entities. This alternative was rejected on the basis that it could lead to unsustainable levels of fishing effort and eventual degradation of coral reef ecosystems and their component resources. The second alternative examined is similar to the selected alternative with the following exceptions. It would not designate any no-take MPAs (low-use MPAs would be designated). It would not implement any prohibitions on nighttime fishing for coral reef ecosystem MUS with SCUBA/hookah gear, and it would not prohibit the take of live rock or coral throughout the regulatory area. This alternative was also rejected on the basis that it would not provide sufficient protection to coral reef ecosystems or their component resources. Finally, the third alternative examined would designate no-take MPAs out to 100 fathoms around all western Pacific islands and atolls (no low-use MPAs would be designated); require general permits for harvest of all CHCRT and special permits for harvest of all PHCRT throughout the western Pacific U.S. EEZ; prohibit all spearfishing with SCUBA/hookah throughout the U.S. EEZ; and prohibit the take of live rock or coral throughout the U.S. EEZ. This alternative was rejected on the basis that it would unnecessarily impede the sustainable use of coral reef ecosystem resources, as the selected alternative would provide adequate conservation and protection for these resources.

A copy of this analysis is available from the Council for public review and comment.

This proposed rule contains collection-of-information requirements subject to review and approval by OMB under the Paperwork Reduction Act (PRA). These requirements have been submitted to OMB for approval. Public reporting burden for these collections of information is estimated to average 2 hours per response for a permit application, 3 hours for a permit appeal, 30 minutes per day for a fishing record, 15 minutes per day for a transshipment log, 3 minutes for an at-sea notification prior to landing, and 2 minutes per trap to mark fishing gear. These estimates include the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Public comment is sought regarding whether this proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information has practical utility; the accuracy of the burden estimate; ways to enhance the quality, utility, and clarity of the information to be collected; and ways to minimize the burden of the collection of information, including through the use of automated collection techniques or other forms of information technology. Send comments on these and any other aspects of the collection regarding these burden estimates or any other aspect of the collection of information to PIAO at the **ADDRESSES** above, and to the OMB at the Office of Information and Regulatory Affairs, OMB, Washington, DC20503 (Attention:NOAA Desk Officer).

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of informationsubject to the requirements of the PRA, unless the collection of information displays a currently valid OMB Control Number.

On March 7, 2002, an informal Endangered Species Act section 7 consultation was completed by NMFS' Southwest Region, Office of Sustainable Fisheries, and concluded by NMFS'

Southwest Region, Office of Protected Resources regarding the CREFMP. It was determined that the proposed action is not likely to adversely affect any endangered or threatened resources or critical habitat under NMFS's jurisdiction. On May 22, 2002, the USFWS concurred with the determination of NMFS that the activities proposed in the CREFMP are not likely to adversely affect listed species (i. e., seabirds and terrestrial plants) and listed species shared with NMFS (i. e., sea turtles under its jurisdiction).

This proposed rule is consistent with Executive Order 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.

List of Subjects in 50 CFR Part 660

Administrative practice and procedure, American Samoa, Fisheries, Fishing, Guam, Hawaiian Natives, Indians, Northern Mariana Islands, and Reporting and recordkeeping requirements.

Dated: September 13, 2002.

Wlliam T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 660 is proposed to be amended as follows:

PART 660 FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.*

2. In § 660.11, paragraph (b) is revised, and a new paragraph (c) is added to read as follows:

§ 660.11 Purpose and scope.

* * * * *

(b) Regulations specific to individual fisheries are included in subparts C, D, E, F, and J of this part.

(c) Nothing in subparts C, D, E, F, and J of this part is intended to supercede any valid state or Federal regulations that are more restrictive than those published here.

3. Section 660.12 is amended by revising the introductory text and the definition for "Pacific pelagic management unit species"; and adding definitions for the "Commonwealth of the Northern Mariana Islands (CNMI)", "CNMI offshore area", "Coral reef ecosystem management area", "Coral reef ecosystem management unit species", "Coral reef ecosystem regulatory area", "Hookah breather", "Live rock", "Low use marine protected area", "No-take marine protected area", and "Special permit", alphabetically to § 660.12 to read as follows:

§ 660.12 Definitions.

In addition to the definitions in the Magnuson-Stevens Act, and in § 600. 10, the terms used in subparts B through F and subpart J of this part have the following meanings:

* * * * *

Commonwealth of the Northern Mariana Islands (CNMI) means Northern Mariana Islands.

CNMI offshore area means the portion of the U.S. EEZ around the CNMI extending seaward from

(1) a line drawn 3 nautical miles from the baseline around the CNMI from which the territorial sea is measured, to

(2) the outer boundary of the U.S. EEZ, which to the south means those points which are equidistant between Guam and the island of Rota in the CNMI.

* * * * *

Coral Reef ecosystem management area means the U.S. EEZ waters surrounding American Samoa, Guam, Hawaii, CNMI and the U.S. Pacific remote island areas (PRIA).

Coral reef ecosystem management unit species (MUS) means all of the taxa listed in Table 1. 2 and 1. 3 of the Coral Reef Ecosystems Fishery Management Plan (CREFMP) that spend the majority of their non-pelagic (post-settlement) life stages within waters less than or equal to 50 fathoms in total depth. Table 1. 2 contains a listing of Currently Harvested Coral Reef Ecosystem MUS, and Table 1. 3 contains a listing of Potentially Harvested Coral Reef Ecosystem MUS.

Coral reef ecosystem regulatory area means the U.S. EEZ waters around American Samoa, Guam, Hawaii, CNMI and the PRIA except for the portion of EEZ waters 0–3 miles around the CNMI, and EEZ waters around the NWHI.

* * * * *

Hookah breather means a tethered underwater breathing device that pumps air from the surface through one or more hoses to divers at depth.

* * * * *

Live rock means any natural, hard substrate, including dead coral or rock, to which is attached, or which supports, any living marine life-form associated with coral reefs.

* * * * *

Low use marine protected area (MPA) means an area of the U.S. EEZ where fishing operations have specific restrictions in order to protect the coral reef ecosystem, as specified under area restrictions.

* * * * *

No-take Marine Protected Area (MPA) means an area of the U.S. EEZ that is closed to fishing for or harvesting of MUS from every Western Pacific Council Fishery Management Plan.

* * * * *

Pacific Pelagic Management Unit Species means the following fish:

Common Name	Scientific Name
Mahimahi (dolphinfish)	*Coryphaena spp.*
Indo-Pacific blue marlin	*Makaira mazara*
Black marlin	*M. indica*
Striped marlin	*Tetrapturus audax*
Shortbill spearfish	*T. angustirostris*
Swordfish	*Xiphias gladius*
Sailfish	*Istiophorus platypterus*
Pelagic thresher shark	*Alapiaspelagicus*
Bigeye thresher shark	*Alopias*
Common thresher shark	*Alopias vulpinus*
Silky shark	*Carcharhinus falciformis*
Oceanic whitetip shark	*Carcharhinus longimanus*
Blue shark	*Prionace glauca*
Shortfin mako shark	*Isurus oxyrinchus*
Longfin mako shark	*Isurus paucus*

Common Name	Scientific Name
salmon shark	*Lamna ditropis*
Albacore	*Thunnus alalunga*
Bigeye tuna	*T. obesus*
Yellowfin tuna	*T. albacore*
Northern bluefin tuna	*T. thynnus*
Skipjack tuna	*Katsuwonus pelamis*
Kawakawa	*Euthynnus affinis*
Wahoo	*Acanthocybium solandri*
Moonfish	*Lampris spp.*
Oilfish family	*Gempylidae*
Pomfret	family Bramidae
Other tuna relatives	*Auxis spp., Scomber spp.; Allothunus spp.*

* * * * *

Special permit means a permit issued to allow fishing for coral reef ecosystem resources in low-use MPAs or to fish for any potentially harvested coral reef taxa.

* * * * *

4. In § 660.13, paragraph (a), the first sentence of paragraph (c)(1), the first and second sentences of paragraph (c)(2), and paragraphs (e), (f)(2), and (g)(1) are revised to read as follows:

§ 660.13 Permits and fees.

* * * * *

(a)*Applicability.* The requirements for permits for specific Western Pacific fisheries are set forth in subparts C, D, E, F and J of this part.

* * * * *

(c) *Application.* (1) A Southwest Regional Federal fisheries permit application form may be obtained from the Pacific Islands Area Office (PIAO) to apply for a permit or permits to operate in any of the fisheries regulated under subparts C, D, E, F, and J of this part.

* * *

(2) A minimum of 15 days should be allowed for processing a permit application for fisheries under subparts C, D, E, and F of this part. A minimum of 60 days should be allowed for processing a permit application for fisheries under subpart J of this part.* * *

* * * * *

(e) *Issuance.* (1) After receiving a complete application, the Regional Administrator will issue a permit to an applicant who is eligible under §§ 660.21, 660.41, 660.61, and 660.81.

(2) After receiving a complete application, the PIAO Administrator may issue a special permit in accordance with § 660.601(d)(3).

(f) *Fees.** * *

(2) PIAO will charge a fee for each application for a Hawaii longline limited access permit, a Mau zone limited access permit, and a coral reef ecosystem special permit (including permit transfers and permit renewals). The amount of the fee is calculated in accordance with the procedures of the NOAA Finance Handbook, for determining the administrative costs of each special product or service. The fee may not exceed such costs and is specified with each application form. The appropriate fee must accompany each application. Failure to pay the fee will preclude issuance of any of the permits listed in this section.

(g) *Expiration.* (1) Permits issued under subparts C, D, E, F, and J of this part are valid for the period specified on the permit unless transferred, revoked, suspended, or modified under 15 CFR part 904.

* * * * *

5. In § 660.14, paragraphs (a), (b), and (g) are revised and paragraph (f)(4) is added to read as follows:

§ 660.14 Reporting and recordkeeping.

(a) *Fishing record forms.* The operator of any fishing vessel subject to the requirements of §§ 660.21, 660.41, 660.81, or 660.601 must maintain on board the vessel an accurate and complete record of catch, effort and other data on report forms provided by the PIAO Administrator. All information specified on the forms must be recorded on the forms within 24 hours after completion of each fishing day. Each form must be signed and dated by the fishing vessel operator. For the fisheries managed under §§ 660.21, 660.41, and 660.81, the original logbook form for each day of the fishing trip must be submitted to the PIAO Administrator within 72 hours of each landing of MUS. For the fisheries managed under § 660.601, the original logbook form for each day of the fishing trip must be submitted to the PIAO Administrator within 30 days of each landing of MUS.

(b) *Transshipment logbooks.* Any person subject to the requirements of § 660.21(c) or 660.601(a)(2) must maintain on board the vessel an accurate and complete NMFS transshipment logbook containing report forms provided by the PIAO Administrator. All information specified on the forms must be recorded on the forms within 24 hours after the day of transshipment. Each form must be signed and dated by the receiving vessel operator. The original logbook for each day of transshipment activity must be submitted to the PIAO Administrator within 72 hours of each landing of Pacific pelagic management unit species. The original logbook for each day of transshipment activity must be submitted to the PIAO Administrator within 7 days of each landing of coral reef ecosystem MUS.

* * * * *

(f) * * *

(4) *Coral Reef Ecosystem MUS.* Any person who has a special permit and who is required by state laws and regulations to maintain and submit records of catch and effort, landings and sales for coral reef ecosystem MUS by this subpart and subpart J of this part must make those records immediately available for Federal inspection and copying upon request by an authorized officer as defined in § 600. 10.

(g) *State reporting.* Any person who has a permit under § 660.21, 660.61, or 660.601 of this chapter and who is regulated by state laws and regulations to maintain and submit records of catch and effort, landings and sales for vessels regulated by subparts C, E and J of this part must maintain and submit those records in the exact manner required by state laws and regulations.

6. In § 660.15, paragraphs (f) and (k) are revised and a new paragraph (l) is added to read as follows:

§ 660.15 Prohibitions.

* * * * *

(f) Fail to affix or maintain vessel or gear markings, as required by §§ 660.16, 660.24, 660.47, and 660.605.

* * * * *

(k) Fail to notify officials as required in §§ 660.23, 660.28, 660.43, 660.63, and 660.603.

(l) Fish for, take or retain within a no-take MPA. defined in § 660.18, any Bottomfish MUS, Coral reef ecosytem

MUS, Crustacean MUS, Pelagic MUS, Precious coral MUS or Seamount groundfish.

* * * * *

7. In subpart B, § 660.18 is added to read as follows:

§ 660.18 Area restrictions.

(a) Fishing is prohibited in all no-take MPAs designated in this section.

(b) Anchoring by all fishing vessels over 50 ft (15.25 m) LOA is prohibited in the U.S. EEZ seaward of the Territory of Guam west of 144 °30′ E. long. except in the event of an emergency caused by ocean conditions or by a vessel malfunction that can be documented.

(c) *MPAs.*—(1) *No-take MPAs.*The following U.S. EEZ waters in the Western Pacific Region are no-take MPAs:

(i) Landward of the 50–fathom (fm) (91.5–m) curve at Jarvis, Howland, and Baker Islands, and Kingman Reef; as depicted on National Ocean Survey Chart Numbers 83116 and 83153;

(ii) Landward of the 50–fm (91.5–m) curve around Rose Atoll, as depicted on National Ocean Survey Chart Number 83484.

(2) *Low-use MPAs.* The following U.S. EEZ waters in the Western Pacific Region are low-use MPAs:

(i) All waters between the shoreline and the 50–fm (91.5–m) curve around Johnston Atoll, Palmyra Atoll, and Wake Island. as depicted on National Ocean Survey Chart Numbers 83637, 83157 and 81664.

(ii) [Reserved]

8. A new subpart J is added to read as follows:

Subpart J—Western Pacific Coral Reef Ecosystem Fisheries

Sec.

Subpart J—Western Pacific Coral Reef Ecosystem Fisheries

§ 660.601 Relation to other laws.

To ensure consistency between management regimes of different Federal agencies with shared management responsibilities of fishery resources within the Coral reef ecosystem management area, fishing authorized under this subpart will not be allowed within the boundary of a national wildlife refuge regardless of whether that refuge was established by action of the President or the Secretary of Commerce.

§ 660.602 Permits and fees.

(a) *Applicability.* Unless otherwise specified in this subpart, § 660.13 applies to coral reef ecosystem permits.

(1) *Special Permit.* Any person of the United States fishing for, taking or retaining coral reef ecosystem MUS must have a special permit if they, or a vessel which they operate, is used to fish for any:

(i) Coral reef ecosystem MUS in low-use MPAs as defined in § 660.18;

(ii) Potentially harvested coral reef ecosystem MUS in the regulatory area; or

(iii) Coral reef ecosystem MUS in the regulatory area with any gear not specifically allowed in this subpart.

(2) *Transshipment permit.* A receiving vessel must be registered for use with a transshipment permit if that vessel is used in the regulatory area to land or tranship potentially harvested coral reef ecosystem MUS species, or any coral reef ecosystem MUS harvested within low-use MPAs.

(3) *Exceptions.* The following persons are not required to have a permit under this section:

(i) Any person incidentally harvesting coral reef ecosystem MUS while targeting MUS listed under a separate FMP. It will be considered a rebuttable presumption that such a person is targeting coral reef ecosystem MUS if the total weight or number of pieces of landed coral reef ecosystem MUS comprise more than 20 percent of the total landed weight or number of pieces respectively, on any one trip;

(ii) Any person targeting currently harvested coral reef ecosystem species outside of an MPA, who does not retain any incidentally caught potentially harvested coral reef ecosystem MUS; and

(iii) Any person collecting marine organisms for scientific research as described in § 600. 745 of this chapter.

(b) *Validity.* Each permit will be valid for fishing only in the fishery management subarea specified on the permit.

(c) *General requirements.* General requirements governing application information, issuance, fees, expiration, replacement, transfer, alteration, display, sanctions, and appeals for permits are contained in § 660.13.

(d) *Low use MPAs special permit.* No direct harvest of coral reef ecosystem MUS species may be conducted in low use MPAs unless authorized by a special permit issued by the PIAO Administrator in accordance with the criteria and procedures specified in this section.

(1) *Application.* An applicant for a special or transshipment permit issued under this section must complete and submit to the PIAO Administrator, a Special Coral Reef Ecosystem Fishing Permit Application Form issued by NMFS. Information in the application form must include, but is not limited to a statement describing the objectives of the fishing activity for which a special permit is needed, including a general description of the expected disposition of the resources harvested under the permit (i. e., stored live, fresh, frozen, preserved; sold for food, ornamental, research, or other use, and a description of the planned fishing operation, including location of fishing and gear operation, amount and species (directed and incidental) expected to be harvested and estimated habitat and protected species impacts).

(2) *Incomplete applications.* The PIAO Administrator may request from an applicant additional information necessary to make the determinations required under this section. An applicant will be notified of an incomplete application within 10 working days of receipt of the application. An incomplete application will not be considered until corrected in writing.

(3) *Issuance.* (i) If an application contains all of the required information, the PIAO Administrator will forward copies of the application within 30 days to the Council, the U.S. Coast Guard, the fishery management agency of the affected state, and other interested parties who have identified themselves to the Council, and the USFWS.

(ii) Within 60 days following receipt of a complete application, the PIAO Administrator will consult with the Council through the Executive Director, USFWS, and the Director of the affected state fishery management agency concerning the permit application and will receive their recommendations for approval or disapproval of the application based on:

(A) Information provided by the applicant,

(B) The current domestic annual harvesting and processing capacity of the directed and incidental species for which a special permit is being requested,

(C) The current status of resources to be harvested in relation to the overfishing definition in the FMP,

(D) Estimated ecosystem, habitat, and protected species impacts of the proposed activity, and

(E) Other biological and ecological information relevant to the proposal. The applicant will be provided with an opportunity to appear in support of the application.

(iii) Following a review of the Council's recommendation and supporting rationale, the PIAO Administrator may:

(A) Concur with the Council's recommendation and, after finding that it is consistent with the goals and objectives of the FMP, the national standards, the Endangered Species Act, and other applicable laws, approve or deny a special permit; or

(B) Reject the Council's recommendation, in which case, written reasons will be provided by the PIAO Administrator to the Council for the rejection.

(iv) If the PIAO Administrator does not receive a recommendation from the Council within 60 days of Council receipt of the permit application, the PIAO Administrator can make a determination of approval or denial independently.

(v) Within 30 working days after the consultation in paragraph (a)(3)(ii) of this section, or as soon as practicable thereafter, NMFS will notify the applicant in writing of the decision to grant or deny the special permit and, if denied, the reasons for the denial. Grounds for denial of a special permit include the following:

(A) The applicant has failed to disclose material information required, or has made false statements as to any material fact, in connection with his or her application.

(B) According to the best scientific information available, the directed or incidental catch in the season or location specified under the permit would detrimentally affect any coral reef resource or coral reef ecosystem in a significant way, including, but not limited to issues related to, spawning grounds or seasons, protected species interactions, EFH, and habitat areas of particular concern (HAPC).

(C) Issuance of the special permit would inequitably allocate fishing privileges among domestic fishermen or would have economic allocation as its sole purpose.

(D) The method or amount of harvest in the season and/or location stated on the permit is considered inappropriate based on previous human or natural impacts in the given area.

(E) NMFS has determined that the maximum number of permits for a given area in a given season has been reached and allocating additional permits in the same area would be detrimental to the resource.

(F) The activity proposed under the special permit would create a significant enforcement problem.

(vi) The PIAO Administrator may attach conditions to the special permit, if it is granted, consistent with the management objectives of the FMP, including but not limited to:

(A) The maximum amount of each resource that can be harvested and landed during the term of the special permit, including trip limits, where appropriate.

(B) The times and places where fishing may be conducted.

(C) The type, size, and amount of gear which may be used by each vessel operated under the special permit.

(D) Data reporting requirements.

(E) Such other conditions as may be necessary to ensure compliance with the purposes of the special permit consistent with the objectives of the FMP.

(4) *Appeals of permit actions.* (i) Except as provided in subpart D of 15 CFR part 904, any applicant for a permit or a permit holder may appeal the granting, denial, conditioning, or suspension of their permit or a permit affecting their interests to the Regional Administrator. In order to be considered by the Regional Administrator, such appeal must be in writing, must state the action(s) appealed, and the reasons therefore, and must be submitted within 30 days of the original action(s) by the Regional Administrator. The appellant may request an informal hearing on the appeal.

(ii) Upon receipt of an appeal authorized by this section, the Regional Administrator will notify the permit applicant, or permit holder as appropriate, and will request such additional information and in such form as will allow action upon the appeal. Upon receipt of sufficient information, the Regional Administrator will rule on the appeal in accordance with the permit eligibility criteria set forth in this section and the FMP, as appropriate, based upon information relative to the application on file at NMFS and the Council and any additional information, the summary record kept of any hearing and the hearing officer's recommended decision, if any, and such other considerations as deemed appropriate. The Regional Administrator will notify all interested persons of the decision, and the reasons therefor, in writing, normally within 30 days of the receipt of sufficient information, unless additional time is needed for a hearing.

(iii) If a hearing is requested, or if the Regional Administrator determines that one is appropriate, the Regional Administrator may grant an informal hearing before a hearing officer designated for that purpose after first giving notice of the time, place, and subject matter of the hearing in the **Federal Register**. Such a hearing shall normally be held no later than 30 days following publication of the notice in the **Federal Register**, unless the hearing officer extends the time for reasons deemed equitable. The appellant, the applicant (if different), and, at the discretion of the hearing officer, other interested parties, may appear personally or be represented by counsel at the hearing and submit information and present arguments as determined appropriate by the hearing officer. Within 30 days of the last day of the hearing, the hearing officer shall recommend in writing a decision to the Regional Administrator.

(iv) The Regional Administrator may adopt the hearing officer's recommended decision, in whole or in part, or may reject or modify it. In any event, the Regional Administrator will notify interested persons of the decision, and the reason(s) therefore, in writing, within 30 days of receipt of the hearing officer's recommended decision. The Regional Administrator's action constitutes final action for the agency for the purposes of the Administrative Procedure Act.

(5) Any time limit prescribed in this section may be extended for good cause, for a period not to exceed 30 days by the Regional Administrator, either upon his or her own motion or upon written request from the Council, appellant or applicant stating the reason(s) therefore.

§ 660.603 Prohibitions.

In addition to the general prohibitions specified in § 600. 725 of this chapter and § 660.15 of this part, it is unlawful for any person to do any of the following:

(a) Fish for, take, retain, possess or land any coral reef ecosystem MUS in any low-use MPA as defined in § 660.18(c)(1) and (c)(2) unless:

(1) A valid permit has been issued for the hand harvester or the fishing vessel operator that specifies the applicable area of harvest;

(2) A permit is not required, as outlined in the permit section of these regulations;

(3) The coral reef ecosystem MUS possessed on board the vessel originated outside the regulatory area and this can be demonstrated through receipts of purchase, invoices, fishing logbooks or other documentation.

(b) Fish for, take, or retain any coral reef ecosystem MUS species:

(1) That is determined overfished with subsequent rulemaking by the PIAO Administrator.

(2) By means of gear or methods prohibited under § 660.604.

(3) In a low-use MPA without a valid special permit.

(4) In violation of any permit issued under § 660.13 or § 660.601.

(c) Fish for, take, or retain any wild live rock or live hard coral except under a valid special permit for scientific research, aquaculture seed stock collection or traditional and ceremonial purposes by indigenous people.

§ 660.604 Notifications.

Any special permit holder subject to the requirements of this subpart must contact the appropriate NMFS enforcement agent in American Samoa, Guam, or Hawaii at least 24 hours before landing any coral reef ecosystem MUS unit species harvested under a special permit, and report the port and the approximate date and time at which the catch will be landed.

§ 660.605 Allowable gear and gear restrictions.

(a) Coral reef ecosystem MUS may be taken only with the following allowable gear and methods:

(1) Hand harvest;

(2) Spear;

(3) Slurp gun;

(4) Hand net/dip net;

(5) Hoop net for Kona crab;

(6) Throw net;

(7) Barrier net;

(8) Surround/purse net that is attended at all times;

(9) Hook-and-line (includes handline (powered or not)), rod-and-reel, and trolling);

(10) Crab and fish traps with vessel ID number affixed; and

(11) Remote-operating vehicles/submersibles.

(b) Coral reef ecosystem MUS may not be taken by means of poisons, explosives, or intoxicating substances. Possession or use of these materials by any permit holder under this subpartwho is established to be fishing for coral reef ecosystem MUS in the regulatory area is prohibited.

(c) Coral reef ecosystem MUS may not be taken by means of spearfishing with scuba at night (from 6 p. m. to 6 a. m.) in the U.S. EEZ waters around Howland Island, Baker Island, Jarvis Island, Wake Island, Kingman Reef, Johnston Atoll and Palmyra Atoll.

(d) Existing FMP fisheries shall follow the allowable gear and methods outlined in their respective plans.

(e) Any person who intends to fish with new gear not included in § 660.604 must describe the new gear and its method of deployment in the special permit application. A decision on the permissibility of this gear type will be made by the PIAO Administrator after consultation with the Council and the director of the affected state fishery management agency.

§ 660.606 Gear identification.

(a) The vessel number must be affixed to all fish and crab traps on board the vessel or deployed in the water by any vessel or person holding a permit under § 660.13 or § 660.601 or that is otherwise established to be fishing for coral reef ecosystem MUS in the regulatory area.

(b) *Enforcement action.* (1) Traps not marked in compliance with paragraph (a) of this section and found deployed in the regulatory area will be considered unclaimed or abandoned property, and may be disposed of in any manner considered appropriate by NMFS or an authorized officer;

(2) Unattended surround nets or bait seine nets found deployed in the regulatory area will be considered unclaimed or abandoned property, and may be disposed of in any manner considered appropriate by NMFS or an authorized officer.

§ 660.607 Framework for regulatory adjustments.

(a) *Procedure for established measures.* (1) Established measures are management measures that, at some time, have been included in regulations implementing the FMP, or for which the impacts have been evaluated in Council/NMFS documents in the context of current conditions;

(2) Following framework procedures of the CREFMP, the Council may recommend to the Regional Administrator that established measures be modified, removed, or re-instituted. Such recommendation shall include supporting rationale and analysis, and shall be made after advance public notice, public discussion and consideration of public comment. NMFS may implement the Council's recommendation by rulemaking if approved by the Regional Administrator.

(b) *Procedure for new measures.* (1) New measures are management measures that have not been included in regulations implementing the FMP, or for which the impacts have not been evaluated in Council/NMFS documents in the context of current conditions. New measures include but are not limited to catch limits, resource size limits, closures, effort limitations, reporting and recordkeeping requirements;

(2) Following the framework procedures of the FMP, the Regional Administrator will publicize, including by **Federal Register** document, and solicit public comment on, any proposed new management measure. After a Council meeting at which the measure is discussed, the Council will consider recommendations and prepare a document summarizing the Council's deliberations, rationale, and analysis for the preferred action, and the time and place for any subsequent Council meeting(s) to consider the new measure. At subsequent public meeting(s), the Council will consider public comments and other information received to make a recommendation to the Regional Administrator about any new measure. NMFS may implement the Council's recommendation by rule making if approved by the Regional Administrator.

(i) The Regional Administrator will consider the Council's recommendation and supporting rationale and analysis, and, if the Regional Administrator concurs with the Council's recommendation, will propose regulations to carry out the action. If the Regional Administrator rejects the Council's proposed action, the Regional Administrator will provide a written explanation for the denial within 2 weeks of the decision.

(ii) The Council may appeal denial by writing to the Assistant Administrator, who must respond in writing within 30 days.

(iii) The Regional Administrator and the Assistant Administrator will make their decisions in accordance with the Magnuson-Stevens Act, other applicable laws, and the CREFMP.

(iv) To minimize conflicts between the Federal and state/territorial/commonwealth management systems, the Council will use the procedures in paragraph (a)(2) in this section to respond to state/territorial/commonwealth management actions. Council consideration of action would normally begin with a representative of the state, territorial or commonwealth government bringing a potential or actual management conflict or need to the Council's attention.

§ 660.608 Regulatory area.

(a) The regulations in this subpart govern fishing for coral reef ecosystem management unit species by vessels of the United States or persons who operate or are based inside the outer boundary of the U.S. EEZ off:

(1) The Hawaiian Islands Archipelago lying to the east of 160°50′ W. long.

(2) Guam.
(3) American Samoa.
(4) Offshore area of the CNMI or that portion of the U.S. EEZ around the CNMI between three nautical miles offshore and the outer boundary of the U.S. EEZ.
(5) Baker Island, Howland Island, Jarvis Island, Wake Island, Johnston Atoll, Palmyra Atoll and Kingman Reef.

(b) The inner boundary of the regulatory area is as follows:

(1) The shoreline of Baker Island, Howland Island, Jarvis Island, Wake Island, Johnston Atoll, Palmyra Atoll and Kingman Reef.

(2) The seaward boundaries of the State of Hawaii, the Territory of Guam, the Territory of American Samoa; and

(3) A line three nautical miles seaward from the shoreline of the CNMI.

(c) The outer boundary of the regulatory area is the outer boundary of the U.S. EEZ or adjacent international maritime boundaries. The CNMI and Guam regulatory area is divided by a line intersecting these two points: 148° E. long., 12° N. lat., and 142° E.

§ 660.609 Annual reports.

(a) *Annual reports.* By July 31 of each year, a Council-appointed coral reef ecosystem plan team will prepare an annual report on the fisheries in the management area. The report will contain, among other things, fishery performance data, summaries of new information and assessments of need for Council action.

(b) *Recommendation for Council action.*

(1) The Council will evaluate the annual report and advisory body recommendations and may recommend management action by either the state/territorial/commonwealth governments or by Federal regulation;

(2) If the Council believes that management action should be considered, it will make specific recommendations to the PIAO Administrator after considering the views of its advisory bodies.

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WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

July, 2003

Amendment 6 to the Precious Corals Fishery Management Plan would include the EEZ waters around the Commonwealth of the Northern Mariana Islands in the FMP. This amendment is currently being updated for review and approval by the National Marine Fisheries Service.

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

July, 2003

A framework adjustment to the Precious Corals Fishery Management Plan that would implement measures regarding harvest quotas and harvesting restrictions for exploratory areas of the Western Pacific Region is currently undergoing revisions due to recent changes in this fishery.