AMENDMENT #3 AND ENVIRONMENTAL ASSESSMENT

FOR THE

FISHERY MANAGEMENT PLAN

FOR

LOBSTER FISHERIES

OF THE

WESTERN PACIFIC REGION

OCTOBER 1985

(REVISED)

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1.0 PREFACE

1.1 Responsible Agencies

The Western Pacific Regional Fishery Management Council (the Council) was established under the Magnuson Fishery Conservation and Management Act (MFCMA) to develop fishery management plans (FMPs) for fisheries in the U.S. Fishery Conservation Zone (FCZ) around Hawaii, the territories (American Samoa, Guam) and possessions of the United States in the Pacific Ocean. After a FMP is approved by the Secretary of Commerce, it is implemented by Federal regulations and is 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 MFCMA requires the Regional Councils to involve fishermen and other interested parties in developing FMPs and amendments. This is to insure that those who can be affected will have an opportunity to give the Councils their views about a proposed action and alternatives and to provide information to the Councils. The rule changes proposed by this Amendment are not new or recent. They have been subjects before the Council for over a year, and they have been discussed at length during the past four Council meetings. Fishermen, processors, marketing people, scientists, enforcement officers and other interested parties were given opportunities to express their views on the subjects addressed in this Amendment.

This document has been distributed to all fishermen who are engaged in the commercial fisheries of the NWHI, to all relevant government agencies, and other interested parties. All individuals and organizations are invited to comment on this proposal. The Council will address all comments received and make changes as necessary. All who comment will be sent a reply addressing their concerns.

1.3 Relationship to Other Laws and Policies

The Spiny Lobster FMP for which this amendment is being prepared complies with 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 original draft and final FMPs also served as draft and final environmental impact statements (EISs). Similarly, this amendment is intended to also serve as the Environmental Assessment. The amendment also assesses the administrative/enforcement impacts of the proposed regulatory changes and therefore 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 its companion Source Document (containing scientific reports and appendixes) and amendments to the FMP may be obtained from the Council.

1.4 List of Preparers

This FMP amendment was prepared by Council staff, with input from the Council's Lobster Plan Development Team, and the NMFS staff of the Southwest Region.

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2.0 BACKGROUND

The Fishery Management Plan (FMP) for the Spiny Lobster fisheries of the Western Pacific Region became effective on March 9, 1983. The FMP has been amended two times since then, and the fishery for lobsters operating in the Northwestern Hawaiian Islands (NWHI) is presently governed by a temporary moratorium on new entrants into the fishery which was established by emergency regulations which became effective on October 1, 1985.

The FMP is principally directed at the conservation of NWHI spiny lobster stocks because these are the only known stocks of spiny lobster of significant commercial potential in the Pacific island areas under the Council's jurisdiction. The FMP controls the spiny lobster fishery in Federal waters of the NWHI through a set of regulations which include: (a) prohibition against commercial lobster fishing within 20 miles of Laysan Islands, within waters shallower than 10 fathoms and within lagoon waters of the NWHI; (b) commercial fishing is restricted to use of traps of specified dimensions as the only gear type allowed; (c) spiny lobster smaller than 7.7 cm in carapace length or 5.0 cm in tail width cannot be retained except for a 15% allowance for undersized lobsters if the tail width measurement is used; and (d) egg-bearing ("berried") lobsters cannot be retained. The FMP requires a lobster fishing permit for Federal waters and lobster catch reports from fishermen.

Amendment #1 became effective on December 20, 1983. The amendment simply adopted State of Hawaii regulations which govern fishing for spiny lobsters in State waters around the main Hawaiian islands to also govern fishing for spiny lobsters in the U.S. Fishery Conservation Zone (FCZ) around the main Hawaiian islands. The amendment essentially made Federal and State regulations regarding fishing for spiny lobster around the main Hawaiian islands consistent with each other. Without the amendment, the State would have difficulty demonstrating the guilt of any fishermen, holding a Federal lobster fishing permit for the FCZ, who lands undersized lobsters according to State regulations and claims this catch was made in the FCZ, rather than in State waters. Prior to this amendment there were no restrictions for fishing for lobster in the FCZ around the main Hawaiian islands other than reporting of catches.

Amendment #2 became effective on January 9, 1984. This amendment changed the specifications of entryway openings of traps used in the NWHI lobster fishery. Commercial fishing was restricted to the use of traps having an entryway opening at the smaller end of the entryway (funnel) of no greater than 6.5 inches in the greatest diagonal of the opening. This was done to allow a wider variety of trap designs to be used in the fishery while still preventing endangered Hawaiian monk seals from getting their heads stuck in lobster trap openings. Virtually, all vessels now use black plastic traps of the general type used in the California Dungeness crab fisheries.

The first set of emergency regulations became effective on April 25, 1985. These emergency regulations: (a) eliminated the use of the 7.7 cm carapace length to define a legal-sized spiny lobster and substituted a 4.8 cm minimum tail width instead; (b) eliminated any allowance for retaining of undersized lobster tails; and (c) defined a new location on a spiny lobster tail where measurement is to be made to determine legal size. Emergency regulations can stay in effect for only 2 consecutive 90-day periods, and these changes to the FMP expired on October 22, 1985. Enforcement of minimum size regulations has reverted back to the original regulations of the FMP.

The second set of emergency regulations became effective on October 1, 1985. These regulations place a moratorium on the further issuance of new Federal permits for the lobster fishery in the FCZ of the NWHI and restrict the number of traps fished by each present permit holder to the number shown on his permit application. The Council requested the Secretary of Commerce to establish a moratorium through emergency regulations to help control and stabilize fishing pressure in the fishery while the Council deliberates additional changes in the regulations of the FMP needed to prevent overfishing of NWHI lobster stocks and to reduce economic waste in the fishery through lowering redundant fishing effort. The moratorium on new permits and on the number of traps will expire around April 1, 1986.

3.0 PROPOSED ACTION

Amendment #3 to the FMP for spiny lobster fisheries of the Western Pacific Region is intended to:

1. Permanently eliminate the use of carapace length to define legal-sized spiny lobsters, and instead substitute a tail width measurement to define minimum legal size;

2. Permanently eliminate the 15% allowance for undersized lobsters and rely on a singular minimum tail width;

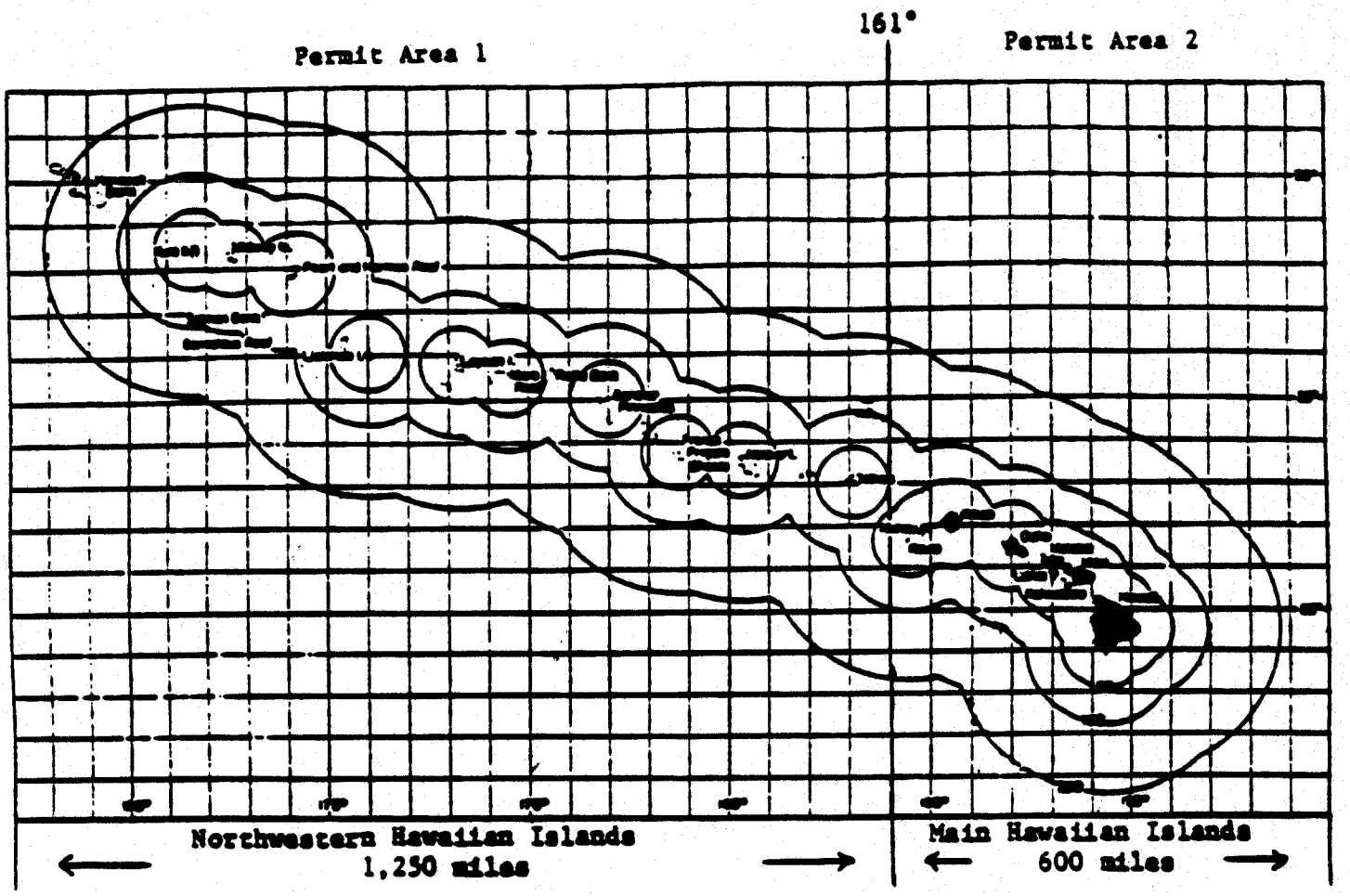
3. Permanently codify the new location on a spiny lobster tail as presently defined in the expired emergency regulations where measurement is to be made to determine minimum size; and

4. Establish a 4.8 cm minimum tail width for a one-year trial period starting with the effective date of this amendment.

This amendment would only apply to the FCZ around the NWHI referred to as Permit Area 1 in the regulations (Figure 1). The FCZ consists of the waters from the edge of the territorial sea of the State of Hawaii to a distance of 200 nautical miles from the baseline for measuring the territorial sea. Carapace length would continue to be the relevant size regulation for spiny lobsters caught in the waters off the main Hawaiian islands.

A review of the 4.8 cm minimum tail width will be a part of the 1986 Annual Report on the NWHI lobster fishery which will be available to the Council in January 1987. The Council will be in a position to act at that time should the review indicate an evident need to change the 4.8 cm minimum tail width to some other standard.

FIGURE 1 - THE HAWAIIAN ARCHIPELAGO



4.0 NEED FOR AMENDMENT #3

4.1 Eliminate the Use of Carapace Length Measure to Define Legal-Size Lobsters

The FMP established a minimum carapace length limit of 7.7 cm for retaining spiny lobsters taken in the FCZ of the NWHI. When the regulations implementing the FMP went into effect, much of the landings consisted of live lobster. Now, most of the landings are in the form of frozen tails with carapace detached. As such, the carapace length measurement is archaic and no longer is a practical and workable measure by which to regulate harvesting of spiny lobsters in the NWHI. The intent of this rule change is to permanently eliminate the use of carapace length measure to define legal-size spiny lobsters taken from the NWHI and substitute a minimum tail width measurement instead.

4.2 Eliminate the 15% Allowance for Undersized Lobsters

Under the original regulations of the FMP, only spiny lobsters with a carapace length of 7.7 cm or greater may be retained. Since the carapace length cannot be determined by enforcement officers when lobsters are de-tailed at sea, the regulations currently specify that only lobsters with tails at least 5.0 cm wide may be retained, except for an allowance of up to 15% (by number) of the total spiny lobster catch per trip which may have tail widths between 4.5 and 5.0 cm. In accordance with the intent of the regulations of the FMP, fishermen are supposed to measure carapace length to determine whether a lobster is of legal size. Enforcement officers, however, can only make inferences about carapace length based on tail width when sampling landings of tails which have been processed at sea. Under such circumstances, the 15% allowance for undersized lobster tails was derived to protect fishermen from being wrongly prosecuted for taking what would appear to be sublegal lobsters based on carapace length. As with every population of organisms, spiny lobsters exhibit variations in their morphology. The 15% allowance was determined through a statistical technique called "discriminant function analysis". It was found that as much as 15% of spiny lobsters having a carapace length of 7.7 cm or larger can have tail widths smaller than 5.0 cm.

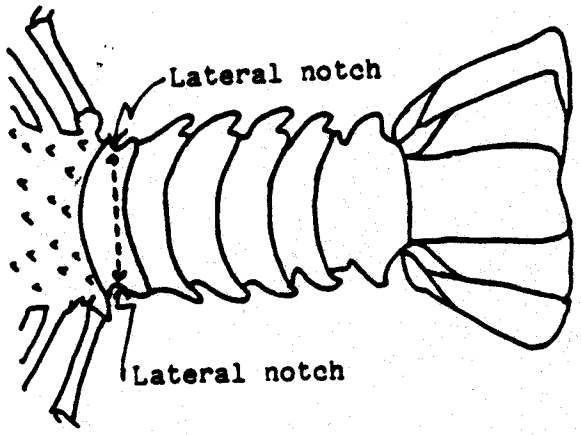
While the 15% allowance is proper in concept and statistically sound, it has proven to be unenforceable. A statistically valid check to determine that the 15% allowance of undersized lobsters in the landings is being adhered to requires the meeting of two conditions: (1) lobster tails must be more or less packed in the holds of vessels without any sorting or aggregation by size; and (2) samples of lobster tails taken from vessel holds must be drawn randomly

to determine the proportion of sublegals to legals. Experience has shown that neither of these conditions can be met. Thus, it is not possible to demonstrate that the 15% allowance has been exceeded. Adopting a minimum tail width as a single determination of a legal size spiny lobster would eliminate both the need for any allowance to take undersized lobsters and the enforcement problem inherent in using two different measures as criteria of legality. While there was some doubt initially when the FMP was being prepared, experience has shown that it is just as easy for fishermen to measure tail width as carapace length. Under a singular minimum tail width measurement, there would be no basis for misinterpretation of what constituted a legal-size lobster thus making effective enforcement of the FMP possible.

4.3 Redefine the Site on a Spiny Lobster Tail Where Measurement is to be Made to Determine Legal Size

Tail width is presently defined in the regulations of the FMP as "the straight line distance between the lateral notches on the first tail segment". (See Figure 2).

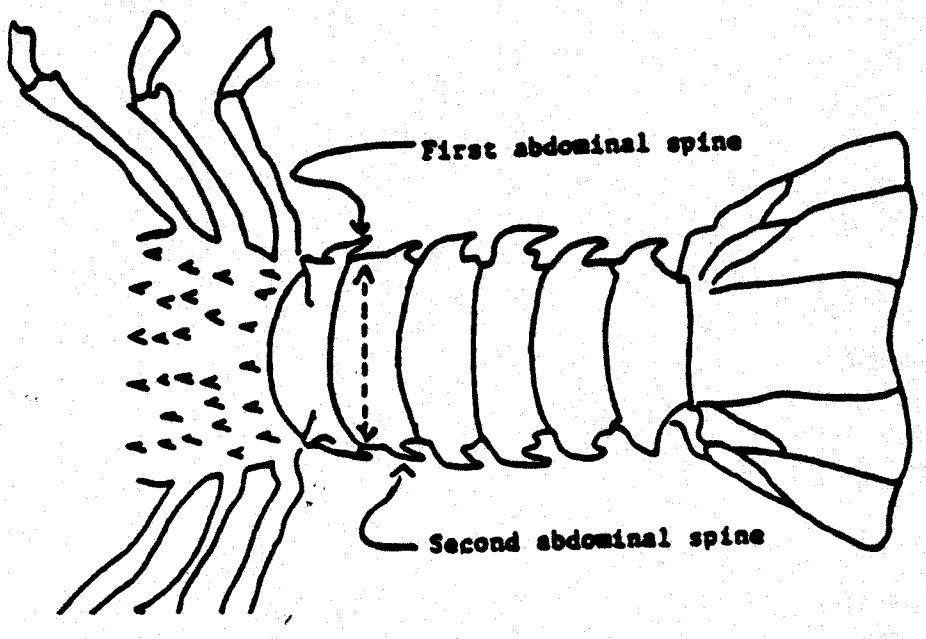
FIGURE 2 - TAIL WIDTH MEASUREMENT SITE UNDER INITIAL REGULATIONS



Enforcement officers have experienced some difficulty in measuring the width of frozen lobster tails at this location because of inadvertent breakage of the lateral notches during de-tailing and packaging operations and ice build ups during freezing. Also, during de-tailing and packaging of lobster tails, the tail meat can curl back over the location where the measurement to determine tail width is made, thus obscuring the measurement location and making a check measurement impossible without thawing out the frozen tails. These measurement problems can be eliminated and minimum tail width size enforcement reliability

greatly increased by choosing a new measurement site on a lobster tail to determine legal size. This new location on a spiny lobster tail is shown in Figure 3. Tail width is defined under the proposed action (as under the expired emergency regulations) as "the straight line distance across the tail measured at the widest spot between the first and second abdominal spines". De-tailing of lobsters and freezing of the tails should not obscure this new location, thus making accurate check measurement by enforcement officers possible.

FIGURE 3 - TAIL WIDTH MEASUREMENT SITE UNDER THE PROPOSED ACTION



4.4 Define the Minimum Tail Width

The FMP established that only spiny lobsters which have a carapace length of 7.7 cm or larger may be retained. This minimum carapace length was initially established by the FMP to protect the reproductive potential of the spiny lobster stocks, and it resulted from consideration of fecundity and proportion of females bearing eggs. Thus, the 7.7 cm minimum carapace length regulation was established on the basis of female size and reproductive biology, and it was applied to both female and male spiny lobsters without consideration of the reproductive biology of male lobsters.

At its meeting on February 22, 1985, the Council heard testimony from lobster fishermen, processors, and NMFS scientists. Based upon the comments received, the Council voted unanimously to define a legal-sized spiny lobster for purposes of the emergency regulations as one with a tail width of 4.8 cm or greater at the new measurement site unless future study by the NMFS indi-

cate that a 4.8 cm minimum tail width is inadequate to protect the resource from overfishing. Several of the fishermen who attended the Council's February meeting felt that the sample of lobsters measured by NMFS scientists from Necker Island and Maro Reef during a 1984 research cruise may not necessarily be representative of spiny lobsters found on the many different banks of the NWHI. It was agreed upon by the Council that additional measurements on carapace length and tail width should be collected on lobster vessels by NMFS observers under commercial fishing conditions. Two of the fishermen who attended the Council's February meeting agreed to take NMFS observers on their fishing trips. Trapping would be done on various banks and the sample would be large enough to capture variations in the morphology of spiny lobsters at different banks.

NMFS observers took measurements of carapace length and tail width at the new measurement site on the tail of 1,354 spiny lobsters taken from Gardner Pinnacles, Raita Bank, Maro Reef, and Pearl and Hermes Reef by two commercial vessels. Functional regression estimates of tail width equivalent to a 7.7 cm carapace length (CL) were derived for female and male lobsters and for both sexes combined. The results of the regression analysis, pooled for all islands, are shown below.

Tail Width Equivalent of a 7.7 cm Carapace Length	r^2	Sample Size (n)
52.5 mm for female lobsters;	0.966	735
49.7 mm for male lobsters; and	0.954	619
51.2 mm for both sexes	0.930	1,354

Spiny lobsters having a carapace length of 7.7 cm would, on the average, have a corresponding tail width of about 5.1 cm when both sexes of animals are considered together. Although the data show that female lobsters tend to have wider tails than male lobsters at a given carapace length, the Planning Team and the Scientific and Statiscal Committee (SSC) had recommended to the Council to adopt a 5.1 cm tail width as the new minimum legal size for retention of spiny lobster tails because fishermen measure lobsters independent of sex. Switching the minimum legal size from a 7.7 cm carapace length to a 5.1 cm tail width would not be expected to have much of an effect on lobster catches or on the reproductive biology of the stocks since the two measures are essentially equivalent of each other.

The Planning Team's and SSC's recommendations were presented at the August 7-8, 1985 meeting of the Council. Fishermen informed the Council that lobsters with tail widths between 4.8 and 5.1 cm are a sizeable component of their current catches of spiny lobsters (see Table 9), and having small tails helps them leverage sales of mixed loads of multi-size spiny and slipper lobster tails.

Some fishermen reported that there is a market preference for small spiny lobster tails compared to larger tails. There was unanimity among fishermen, processors, and market people that adoption of a 5.1 cm minimum tail width would be highly damaging to all sectors of the industry. The Council's Advisory Panel and other industry representatives in attendance at the Council's August 7-8, 1985 meeting urged the Council to stick with the 4.8 cm minimum tail width as defined in the emergency regulations. Fishermen felt that extending the 4.8 cm minimum tail width standard for one year would not result in long-term damage to the stocks. Instead of adopting the Planning Team's and SSC's recommendations, fishermen urged the Council to explore limited access as a possible alternative means of controlling lobster mortality due to fishing pressure. Following an extended discussion, the Council voted unanimously in favor of an amendment to the FMP adopting a 4.8 cm minimum tail width with no percentage allowance for lobsters with undersized tails. The 4.8 cm minimum legal size would be reviewed after one year of the effective date of the amendment. Lobsters with tail widths of 4.8 cm would, on the average, have a carapace length of around 7.1 cm.

Tail weight equivalents for spiny lobster tails for different, given tail widths at the proposed measurement site are shown in Table 1. The average weight of male and female spiny lobster tails (and for both sexes combined) for different tail widths are shown in Table 1. The numbers in Table 1 were derived from a sample of 408 male and 197 female lobsters (605 sets of measurements on lobsters in total) caught at Necker, Maro Reef, and French Frigate Shoals on NMFS Honolulu Laboratory research cruises conducted from October 1976 to November 1978 (Uchida, et. al, 1980). Ignoring the sex of the lobster, a 5.1 cm wide tail (7.7 cm carapace length equivalent) would be expected to weigh 5.0 ounces on the average, while at 4.8 cm tail (7.0 cm carapace length equivalent) would weigh 4.2 ounces on the average. With regard to this sample, a 4 ounce tail is equivalent to a 4.7 cm-wide tail when both sexes of spiny lobsters are combined. It is clearly evident from the data that female spiny lobsters have heavier tails than male spiny lobsters for any given tail width.

TABLE 1

RELATIONSHIP BETWEEN TAIL WIDTH AND TAIL WEIGHT
FOR NWHI SPINY LOBSTERS

Tail Width* (cm)	Tail Weight (ounces)		
	Males	Females	Sexes Combined
4.4	3.1	3.4	3.3
4.5	3.3	3.6	3.5
4.6	3.5	3.9	3.8
4.7	3.7	4.2	4.0
4.8	4.0	4.6	4.2
4.9	4.1	4.8	4.5
5.0	4.3	5.1	4.7
5.1	4.6	5.5	5.0
5.2	4.8	5.8	5.3
5.3	5.1	6.2	5.6
5.4	5.3	6.5	5.9
5.5	5.6	7.0	6.3
5.6	5.8	7.4	6.7
	408 Samples	197 Samples	605 Samples

* At the proposed new measurement site on a spiny lobster tail.

Source: Adopted from Uchida, et. al, 1980. "Biology, Distribution, and Estimates of Apparent Abundance of the Spiny Lobster, Panulirus marginatus in Waters of the Northwestern Hawaiian Islands: Part II. Size Distribution, Legal to Sublegal Ratio, Sex Ratio; Reproductive Cycle, and Morphometric Characteristics". In Proceedings of the Symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands, April 24-25, 1980. Seagrant Miscellaneous Report, UNIHI-SEAGRANT-MR-80-04, August 1980.

5.0 DESCRIPTION OF THE FISHERY

5.1 Description of the Management Unit

The FMP summarizes much of the information presently available on the abundance, distribution, and population dynamics of spiny lobster stocks in the Northwestern Hawaiian Islands. Two species of spiny lobsters, locally known as ula, are of commercial importance in Hawaii. Panulirus marginatus is much more abundant than P. penicillatus in the FCZ of the Northwestern Hawaiian Islands. In addition, the latter species is less catchable in traps and principally inhabits waters shallower than 10 fathoms where commercial fishing for lobsters in the NWHI is prohibited by regulations. Therefore, the NWHI trap fishery for spiny lobsters is directed primarily at P. marginatus.

Prior to 1984, slipper lobsters were a minor component of the catch. However, in 1984, slipper lobsters made up 30% of the total legal lobster catch, and through September of 1985, the catch of slipper lobsters has exceeded that of legal-sized spiny lobsters. Thus, the fishery is now a multi-species fishery for spiny and slipper lobsters with small incidental catches of Kona Crab (family Raninidae). No specific management measures for slipper lobster and Kona Crab have been proposed by the Council, but the need for management of slipper lobsters and design of alternative management measures are being explored. Catches of slipper lobster and Kona Crab must be reported along with spiny lobster catches as called for in the FMP and implementing regulations.

5.2 Management Objectives

The objectives enumerated in the FMP continue to be valid for management of the NWHI spiny lobster fishery:

1. To assure the long-term productivity of spiny lobster stocks and to prevent biological overfishing;

2. To promote an efficient and continuous contribution of the NWHI spiny lobster resources to the United States economy;

3. To collect and analyze biological and economic information about NWHI lobster fisheries in an attempt to improve the basis for management and conservation into the future; and

4. To prevent unfavorable impacts of the fishery on the Hawaiian monk seal and other threatened and endangered species.

5.3 Trends in Descriptors of Fishery Activities

The distant-water trap fishery for spiny lobsters in the NWHI expanded rapidly after a 1975 research cruise by the NMFS demonstrated the commercial potential of the spiny lobster resources around Necker Island and several other areas of the NWHI. The exploratory survey prompted commercial vessels, beginning in 1976, to harvest spiny lobsters for the live lobster market in Hawaii. In 1977, these vessels produced then record landings of 72,000 pounds (whole weight) of spiny lobsters, and fishing operations shifted to at-sea processing and freezing of lobster tails to supply the large national and international market for this commodity. Tails are weighed, size-graded, and packed by processing firms in Hawaii and the U.S. mainland.

In 1980, three large vessels entered the lobster fishery in the NWHI, and landings for that year increased to 328,000 pounds (whole weight). Landings climbed to 780,000 pounds in 1981 when 10 vessels participated in the distant-water trap fishery. In 1982, there were fewer boats in the spiny lobster fishery than in 1981. These boats were smaller, carried fewer traps, and made fishing trips of shorter duration than in 1980 and 1981. All of these factors contributed to reduced landings of approximately 187,000 pounds in 1982. In 1983, there were fewer boats fishing for spiny lobsters in the NWHI compared to 1982, but they made as many fishing trips as in 1982. The total catch for 1983 was approximately 170,000 pounds of spiny lobster. In 1984, a record number of boats secured permits to fish the NWHI for spiny lobsters. The 1984 landings of 640,000 pounds of spiny lobsters are the second largest in the history of the fishery. The number of active boats in the fishery increased from 4 in 1983 to 14 in 1984, the number of fishing trips increased from 19 to 38, the number of days fished increased from 274 in 1983 to 823 in 1984, and the number of trap-days fished increased from about 77,000 in 1983 to nearly 378,000 in 1984. Through September of 1985, there were 46 fishing trips taken in the NWHI by 15 vessels. The number of trap-days fished during the first nine months of 1985 was 675,729, a much larger number than for the comparable period of 1984. The 1985 catch of the fleet through September totaled some 575,000 legal-size spiny lobsters and 880,000 slipper lobsters.

Table 2 summarizes the trends in aggregate landings, number of boats in the fishery and fishing trips taken, as well as gross ex-vessel revenues derived from the fishery. Slipper lobsters became a major component of total lobster landings in 1984. Through September of 1985, the catch of slipper lobsters for the first time has exceeded the catch of spiny lobsters in terms of both total weight and number and in gross ex-vessel revenues.

TABLE 2

TRENDS IN THE NWHI FISHERY FOR LOBSTERS

Year	Number of Boats	Number of Trips	Spiny Lobsters			Slipper Lobsters		
			Landings (lb)	Average Ex-Vessel Price	Total Ex-Vessel Revenue	Landings (lb)	Average Ex-Vessel Price	Total Ex-Vessel Revenue
1977	5	14	72,000	$2.90	$ 208,800		$	$
1978	*	*	*	*	*			
1979	*	*	*	*	*			
1980	3	12	328,000	3.40	1,115,800			
1981	10	25	780,000	3.50	2,730,000			
1982	7	19	187,000	3.60	673,000			
1983	4	19	169,000	2.92	493,000	19,000	2.50	47,500
1984	14	38	640,000	2.65	1,696,000	213,000	2.50	532,000
Through Sept. 1985	15	46	550,000	~ $2.68	~ $1,500,000	662,000	~ $2.50	$ 1,650,000

NOTE: Landings and average ex-vessel prices are given in terms of WHOLE WEIGHT EQUIVALENTS. On the average, a spiny lobster tail constitutes about 35% of the total weight of the animal. Tail weight for slipper lobsters is somewhat less than 35% of the total weight of the animal.

Source: Annual Report of the 1984 Northwestern Hawaiian Islands Spiny Lobster Fishery, and other NMFS monthly catch reports.

* Data not disclosed because fewer than 3 vessels were in the fishery.

5.4 Changes in Catch Per Unit of Effort

Annual fishing effort and catch per unit of effort statistics for 1983, 1984, and through September 1985 are presented in Table 3. These data are derived from the logbooks submitted to the NMFS by fishermen. The catch rate (number of lobsters caught per trap set) for legal and undersized spiny lobsters declined slightly in 1984 compared to 1983 while the catch rate of berried spiny lobsters, and slipper lobsters increased. During the first nine months

of 1985, the catch rate for legal, undersized, and berried spiny lobsters decreased significantly compared to 1984 while the catch rate of slipper lobster continued to increase almost as significantly.

TABLE 3

CATCH PER UNIT OF EFFORT (CATCH RATE) FOR
SPINY LOBSTER, PANULIRUS MARGINATUS AND SLIPPER LOBSTER, SCYLLARIDES SP.
IN THE NWHI FOR 1983, 1984, AND THROUGH SEPTEMBER 1985

Year	Number of Areas (Banks) Fished	Number of Trap-Days	Catch Per Trap-Day*				
			Legal Spiny	Sublegal Spiny	Berried Spiny	Total Spiny	Total Slipper
1983	3	76,857	2.05	0.66	0.13	2.84	0.33
1984	7	377,690	1.77	0.63	0.20	2.59	0.75
Through Sept. 1985	15	675,729	0.85	0.35	0.12	1.32	1.31

Source: Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service. Data derived from FMP-required "Daily Lobster Catch Report per Statistical Area". The above catch rates are averages for all Statistical Areas pooled.

* See Section 6.0 for additional discussion as to the significance of the observed changes in catch rates and the usefullness and validity of industry data for stock assessment purposes.

Catch per unit of effort for legal spiny lobsters has fallen from 1.77 lobsters per trap-day in 1984 to 0.85 lobsters per trap-day in 1985, averaged through September. During the same time, slipper lobster catch rates have risen from 0.75 animals per trap-day in 1984 to 1.31 animals per trap-day in 1985. Explanations for the decrease in the catch rate for spiny lobsters are that the stocks may be at reduced levels because of intensive fishing effort, that the catchability of spiny lobsters has changed with changes in fishing strategy (targeting on slipper lobster), or a combination of both factors. Increases in the catch rate for slipper lobster could be due to changes in fishing strategy, fishing gear, or possibly to reduced competition with spiny lobsters.

Table 4 shows the monthly variability in fishing effort and on catch rates for spiny and slipper lobsters for each month of 1985 for the industry as a whole for all areas of the NWHI combined.

TABLE 4

MONTHLY FISHING EFFORT AND CATCH PER UNIT OF EFFORT
FOR SPINY AND SLIPPER LOBSTERS IN THE NWHI, 1985

Month	Number of Trips	Number of Trap-Days	Catch Per Trap-Day				
			Legal Spiny	Sublegal Spiny	Berried Spiny	Total Spiny	Total Slipper
Jan	4	18,106	0.80	0.23	0.09	1.12	0.31
Feb	5	27,652	0.76	1.02	0.17	1.96	0.65
Mar	4	55,312	0.80	0.55	0.07	1.42	0.87
Apr	8	141,393	0.41	0.12	0.03	0.56	1.41
May	5	51,867	0.59	0.54	0.09	1.23	1.84
Jun	5	119,655	0.74	0.30	0.11	1.16	2.60
Jul	5	111,000	1.23	0.18	0.18	1.59	1.11
Aug	6	98,867	1.08	0.40	0.18	1.66	0.64
Sep	4	51,877	1.48	0.63	0.19	2.29	0.35
TOTAL	46	675,729	0.85	0.35	0.12	1.32	1.31

Source: Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service. Data derived from FMP-required "Daily Lobster Catch Report.

These data are quite revealing. Note that the catch rate for legal-sized spiny lobsters declined most dramatically during April through June, while the catch rate of slipper lobsters reached their highest levels during the same period. The catch rates for spiny lobsters took a strong rebound during July through September while the catch rates for slipper lobster declined during this time compared to their previous peaks in May and June. This suggests that fishermen have developed a capability to target on either spiny or slipper lobsters. While there is much variability in the catch rates for both spiny and slipper lobsters between banks in the NWHI and from month-to-month, overall, the catch rate of spiny lobsters has declined since 1983 and the catch rate of slipper lobster has increased significantly during the same period (Table 3). The fishery has been rapidly transformed from essentially a fishery for a single species of spiny lobster to a multi-species trap fishery for spiny and slipper lobster.

5.5 Economic Characteristics of the Fishery

Whole, frozen spiny lobsters landed in Honolulu curently receive ex-vessel prices averaging about $3.00 per pound, whereas live lobster is sold for prices averaging about $5.50 per pound. Spiny lobster tails processed at sea and landed and sold in Hawaii currently receive ex-vessel prices in the

$6.50 to $9.00 range per pound, depending on local market demand, the quality of the product, and size of tails. Hawaii spiny lobster tails are also sold directly to buyers on the U.S. mainland at wholesale prices averaging about $10.50 per pound. The average ex-vessel price for slipper lobster tails is about $5.50 per pound, or about $1.00 to $3.00 less per pound than for spiny lobster tails. As with spiny lobster tails, market demand, the quality of the product, and size of tails are also the principal determinants of market price for slipper lobster tails.

The economic information that is presently available on the fishery is insufficient for gauging the relative profitability of the vessels operating in the fishery. Information on capital and operating costs is largely of a confidential nature. Nonetheless, some inferences can be drawn on the economic status of the fishery by examining industry revenues. Table 5 shows that gross revenues for the fleet as a whole increased continuously between 1983, 1984, and 1985 as did gross revenues per trip.

TABLE 5

GROSS REVENUES FROM THE NWHI LOBSTER FISHERY, 1983-1985

Year	Gross Revenue ($)			Number of Trips	Number of Trap-days	Gross Revenues ($) Per Trip	Gross Revenues ($) Per Trap-Day
	Spiny Lobster	Slipper Lobster	Total				
1983	493,000	47,500	540,000	19	76,857	$28,400	7.03
1984	1,696,000	532,500	2,228,000	38	377,690	58,600	5.90
Through Sept. 1985	1,500,000	1,650,000	3,150,000	46	675,729	$68,500	4.66

The evident large increases in gross revenues per trip are probably due to the entry of large processor vessels in the fishery and spending more time on the fishing grounds. Some boats carry as many as 1,000 traps, and the increases in gross revenues per trip are a reflection of their fishing power. The measure which is more revealing of the economic condition of the fishery is gross revenues per trap-day. In 1983, the industry averaged about $7.00 in gross revenue per trap-day. The average gross return per trap set dropped below $6.00 in 1984, and the average gross return per trap-day so far for 1985 has fallen to $4.66. Although gross revenues per trap-day have diminished considerably, this alone is not a sufficient indication of the present profitability of the industry. If capital and operating costs have remained constant, then the industry's profitability has increased. However, it is very likely that operating and capital costs have risen since fishermen now use more traps and they are fishing grounds which are very distant from Honolulu.

Although the fishery appears healthy on the revenue side, the economic picture on the cost side remains blurred. It is not known whether costs increases have lagged behind revenue increases, or have accelerated so that fishermen's profits have been significantly reduced. However, there are reasons to suspect that fishing costs per trip are at an all time high due to: (1) increased fuel expenditures as more distant grounds are now being exploited, (2) increased costs for new traps, trap maintenance and replacement, and (3) increased handling costs due to a higher frequency of entrapment of sublegal lobsters. Average costs per trip for the fleet as a whole may also be higher now than in previous years due to the entry of smaller and, perhaps, sub optimally-sized vessels into the fishery. However, there is no data to substantiate this inference.

5.6 Moratorium on Fishing Effort

Upon receiving reports from the NMFS which indicated rather pronounced declines in the catch rate for spiny lobsters for the first four months of 1985 compared to previous years, the Council voted on May 8, 1985, to request the Secretary of Commerce to promulgate emergency regulations to (1) impose a moratorium on issuing new permits for the fishery, and (2) to limit the number of traps fished by those vessels now permitted in this fishery to the number of traps shown on their permit applications. The Council's request for a moratorium was approved by the Department of Commerce, and the moratorium became effective on October 1, 1985. During the period that the moratorium emergency regulations are in effect (180 days), the Council will be considering possible ways to restructure the FMP to deal with the dual problems of developing a management program for slipper lobsters and finding ways to deal with the apparently redundant fishing effort now being applied in the fishery for spiny lobsters.

6.0 STATUS OF STOCKS OF SPINY LOBSTERS IN THE NWHI

Since the implementation of the FMP in March 1983, considerable catch and effort information has become available as a result of fishing trip reporting requirements. However, it remains difficult to make definitive inferences about the status of spiny lobster stocks directly from trends in commercial catch and effort data because of the different types of traps that have been used in the fishery. The fishery started with wire mesh traps. Wooden slat traps were added later. Recently introduced black plastic traps are now the standard traps used in the fishery. The catch rates for lobsters are different for each of these trap types, and certain trap designs are more effective in catching slipper lobster than spiny lobster. The catch and effort trends based on commercial data discussed in previous sections of this report must be interpreted with caution since the numbers themselves could be missleading. A comparison of catch rates, in order to be valid, must be based on an unchanging standard unit of fishing effort.

The Honolulu Laboratory of the NMFS carried out research trapping for spiny lobsters in the NWHI using wire mesh traps in 1977 when there was very little commercial trapping going on. In August 1985, a research cruise re-sampled identical areas at Necker Island, Maro Reef, and Laysan Island using the same type of wire mesh traps. In addition, a comparison of catch rates between the wire mesh trap and the black plastic trap which is currently used by commercial fishermen was performed. The comparisons were made by constructing strings of traps composed of an alternating sequence of the wire and plastic traps. Necker Island and Maro Reef were chosen for sampling because they are major fishing grounds. Necker Island has been most intensively fished since the beginning of the fishery. Lobster grounds near Laysan Island were chosen for re-sampling because they are in a refuge area which is closed to lobster fishing. The impacts on catch rates due to fishing could thus be compared to catch rates where commercial fishing is not allowed. In 1977, the commercial fishery for spiny lobsters was just beginning and fishing effort was low. Thus, the catch rates from the research cruises in 1977, can be considered to be, for all practical purposes, reflective of unexploited standing stocks.

Table 6 shows a comparison of the catch rates for spiny lobster between 1977 and 1985 for the same geographic sites at Necker Island, Maro Reef, and Laysan Island for wire mesh traps used during the research cruises. Table 7 shows the catch rates for slipper lobster for wire mesh traps between 1977 and 1985. In both tables, the catch rate or CPUE is expressed as the number of lobsters caught per trap-day.

TABLE 6

MEAN CATCH RATE FOR SPINY LOBSTER*

Bank	Number of Traps		Catch Rate (CPUE)		RATIO: 1985 CPUE / 1977 CPUE
	1977	1985	1977	1985	
Necker	438	192	6.30	2.52	0.40
Maro	223	379	4.03	2.42	0.60
Laysan	229	376	1.55	1.61	1.04

* Wire mesh traps.

TABLE 7

MEAN CATCH RATE FOR SLIPPER LOBSTER*

Bank	Number of Traps		Catch Rate (CPUE)		RATIO: 1985 CPUE / 1977 CPUE
	1977	1985	1977	1985	
Necker	438	192	0.05	0.17	3.40
Maro	223	379	0.16	0.15	0.94
Laysan	229	376	0.09	0.10	0.90

* Wire mesh traps.

The 1985 average catch rate for spiny lobsters has declined to 40% of its 1977 level at Necker Island. The 1985 catch rate for spiny lobster at Maro Reef has declined to 60% of its 1977 level, and the catch rate essentially has remain unchanged at Laysan Island. If it is assumed that these catch rates are a good indicator of lobster density, then these results imply that the stock of trapable lobsters has been reduced to 40% and 60% of its pre-exploitation level at Necker Island and Maro Reef, respectively. The catch rates for slipper lobsters in wire mesh traps at these same sites are very low compared to spiny lobsters and they essentially remain unchanged, except for Necker Island. The three-fold increase in the catch rate for slipper lobster in wire traps at Necker Island may be a reflection of a higher abundance of slipper lobsters there now but the increase is not statistically significant due to the large variance associated with the denominator of the ratio (Table 7).

Table 8 compares catch rates for spiny lobsters for wire mesh traps for two size classes: (1) lobsters having a carapace length of 7.7 cm or larger, or legal-sized lobsters, and (2) undersized lobsters having a carapace length between 7.0 to 7.7 cm, or sublegals.

TABLE 8

MEAN CATCH RATE FOR LEGAL AND SUBLEGAL SPINY LOBSTERS*

Bank	Catch Rate (CPUE) Legal Size Lobsters 1977	1985	RATIO: 1985 CPUE / 1977 CPUE	Catch Rate (CPUE) Sublegal Lobsters 1977	1985	RATIO: 1985 CPUE / 1977 CPUE
Necker	4.92	1.28	0.26	1.27	0.94	0.74
Maro	3.35	1.90	0.57	0.44	0.39	0.89
Laysan	1.32	1.47	1.11	0.13	0.12	0.92

* Wire mesh traps.

The 1985 catch rate of the harvestable size group of spiny lobsters is 26% of its 1977 level at Necker Island and 57% of its 1977 level at Maro Reef. The 1985 catch rate for the sublegal size group is at 74% of its 1977 level at Necker Island and 89% of its 1977 level at Maro Reef. As expected, the catch rates for both legals and sublegals at Laysan Island did not change very much from their 1977 levels probably due to the absence of fishing at Laysan Island and the absence of natural disturbances.

These catch rates imply that the population of legal-size spiny lobsters at Necker Island has been reduced to about one quarter of its unexploited level, and at Maro Reef the population of legal size spiny lobsters has been reduced to about 60% of its unexploited level. Catch rates for sublegal spiny lobsters have also declined both at Necker Island and Maro Reef but by a much smaller extent. Notably, the sublegal population at Necker Island is at 74% of its unexploited level. The reduction of the sublegal population at Necker Island since 1977 may be due to a number of factors including mortality of sublegals that are caught in traps and released, a decline in recruitment due to heavy and continuous fishing pressure which could reduce the spawning stock, direct mortality on sublegals due to their retention in the catch under the FMP's 15% allowance for undersized lobsters, or a combination of these factors.

An interesting point is that the observed declines in the catch rates of sublegal lobsters between 1977 and 1985 at Necker Island and Maro Reef are not that much different from the changes in the catch rates of sublegal lobsters at Laysan Island where there is no fishing allowed. This observation is supportive of the hypothesis that recruitment is not bank specific and suggests that natural environmental influences and/or fishing activities may have resulted in lower recruitment for the entire NWHI.

The size class makeup of 1354 spiny lobsters measured by NMFS observers earlier this summer on two commercial boats fishing at Gardner Pinnacles, Raita Bank, Maro Reef, and Pearl and Hermes Reef (Section 4.4) is shown in Table 9. Spiny lobsters smaller than 4.5 cm in tail width constituted only 8.6% of the catch of these two commercial boats. The small lobsters are either not very abundant, or more likely, they are not vulnerble to trapping or they can readily escape from traps before the traps are hauled. Almost 16% of the catch was composed of lobsters having tails smaller than the proposed 4.8 cm minimum tail width. Eighty-four percent of the lobsters caught by the two commercial vessels were retained under the 4.8 cm tail width standard. Seventy-four percent of the catch would have been retained had a 5.1 cm minimum tail width standard been in effect, a reduction of 10% in the retainable catch. The reduction in the retainable catch would have been larger had the two commercial vessels also fished at Necker Island where the spiny lobster population is made up of individuals of smaller size compared to spiny lobsters on other banks of the NWHI. Thre does not appear to be any gaps in the size (age) class structure of the sampled spiny lobster stocks at Gardner Pinnacles, Raita Bank, Maro Reef, and Pearl and Hermes Reef. Lobsters greater than 5.5 cm in tail width constituted 57.4% of the catch, and the smaller size classes seem to be well represented.

TABLE 9

SIZE CLASS STRUCTURE OF 1354 SPINY LOBSTERS CAUGHT ON VARIOUS BANKS OF THE NWHI

Tail Width (cm)	Relative Frequency (%)		Cumulative Frequency (%)
<4.5	8.6		8.6
4.5+	2.2	15.9	10.8
4.6+	2.1		12.9
4.7+	3.0		15.9
4.8+	3.0		18.9
4.9+	3.5	10.1	22.4
5.0+	3.6		26.0
5.1+	4.6		30.6
5.2+	3.8		34.4
5.3+	3.9	74.0	38.3
5.4+	4.3		42.6
>5.5+	57.4		100.0
Total	100.0		

N = 1354 spiny lobsters.

Source: Honolulu Laboratory, NMFS.

The relative "catchability success" between wire mesh traps used in the research cruises and black plastic traps now used by commercial fishermen was tested by setting strings of traps composed of an alternating sequence of the wire and plastic traps. Table 10 shows the results of this experiment for both spiny and slipper lobsters. The numbers shown are a ratio of catch rate for wire mesh traps relative to catch rate for plastic traps.

TABLE 10

RATIOS OF 1985 CATCH RATES FOR WIRE MESH TRAPS
RELATIVE TO CATCH RATES FOR PLASTIC TRAPS

	RATIO: CPUE Wire Trap / CPUE Plastic Trap	
Bank	Spiny Lobster	Slipper Lobster
Necker	0.82	0.29
Maro	1.16	0.32
Laysan	0.85	0.03

There does not appear to be much difference between the two types of traps with respect to their catch rates for spiny lobsters, but the plastic traps appear to catch at least 3 times the number of slipper lobsters compared to the wire traps. Moreover, size-frequency counts indicate that plastic traps catch a greater proportion of smaller animals than the wire traps. That is one reason why fishermen want to see a lower minimum size limit established, since almost all fishermen now use black plactic traps. For example, at Necker Island where the average size of spiny lobsters is smaller than at most other banks in the NWHI, about 75% of the spiny lobsters caught in plastic traps during the August 1985 research cruise had a carapace length less than 7.7 cm while only about 50% of the spiny lobsters caught in the wire traps were under 7.7 cm in carapace length.

Based on the catch rate and size-frequency data for spiny lobsters gathered on the research cruises, and on a rather approximate estimate that 50% of spiny lobster females are sexually mature at a 7.0 cm carapace length, it is possible to compute an index of the spawning stock biomass at Necker Island and Maro Reef in both 1977 and 1985. In 1985, the spawning stock biomass (females greater than 7.0 cm in carapace length) at Necker Island was reduced to 25% of its 1977 level, and to 61% of its 1977 level at Maro Reef. These declines in spawning stock biomass are of the same order of magnitude as the declines in the catch rates for legal-size spiny lobsters (Table 8).

Using the Beverton and Holt yield equation, Polovina (October 1985) estimated the relative fishing mortality which would produce the decline of the standing stock of legal-size spiny lobsters observed in 1985 at Necker Island and Maro Reef (Table 8). In order for the standing stock of legal-size spiny lobsters to be reduced to 26% of its unexploited level at Necker Island would require fishing mortality of about 1.5 times natural mortality. At Maro Reef, the standing stock of legal-sized spiny lobsters will be reduced to 57% of its unexploited level when fishing mortality is 50% of natural mortality. Fishing mortality at Necker Island is about three times greater than at Maro Reef. This finding is expected since Necker Island has been fished most intensively from the beginning of the fishery as it is the closest island to Honolulu where the lobster fleet is based.

In summary, the standing stock of legal-size spiny lobsters in 1985 at Necker Island is at 26% of its unexploited level, and 57% of its unexploited level at Maro Reef. The Schaefer surplus production model indicates that maximum sustainable production occurs when the standing stock is maintained at 50% of its unexploited level. Using this general rule as a guide, the standing stock of spiny lobsters at Necker Island is reduced below the level required to provide maximum sustainable yield, while the standing stock of spiny lobsters at Maro Reef is at or near its maximum level of production (for a length of entry of 7.7 cm carapace length). The standing stock of sublegal animals at Necker Island has been reduced to 74% of its unexploited level, while at Maro Reef the standing stock of sublegal spiny lobsters has declined to 89% of its unexploited level. The apparent decline in the standing stock of sublegal spiny lobsters at Necker Island and Maro Reef is of a much lower magnitude compared to the apparent delines in the standing stock of legal size spiny lobsters in these areas (Table 8). However, there is reason for concern regarding the decline in the standing stock of sublegal lobsters at Necker Island because it could be indicative of revenue losses to fishermen in the future for causes which aré not fully known and understood.

7.0 ALTERNATIVES CONSIDERED BUT REJECTED

7.1 No Action

The original regulations of the FMP specify that only spiny lobsters with a carapace length of 7.7 cm or greater may be retained. When lobsters are de-tailed at sea and carapace length cannot be determined directly by enforcement officers, then only spiny lobsters with tails at least 5.0 cm wide may be retained, except for an allowance of up to 15% (by number) of the total spiny lobster catch per trip may have tail widths greater than or equal to 4.5 cm and less than 5.0 cm. Under the no action alternative, the FMP regulations would not be amended and the enforcement of the fishery would stay with the initial regulations of the FMP. Effective enforcement of a minimum size limit would once again be improbable.

7.2 Allow Both Carapace Length and Tail Width to Define a Legal Size Lobster

The fishery for lobsters in the NWHI has been transformed from a fishery initially focusing on live spiny lobsters for the fresh lobster market to one focusing on frozen spiny and slipper lobster tails for export markets. The need for a carapace length measure as the standard of minimum legal size has, thus, disappeared. It is just as easy for fishermen to measure tail width as carapace length so there is no need for a dual measurement of minimum legal size.

7.3 Allow Some Taking of Undersized Lobster Tails at a Level Which is Less Than the Present Allowance of 15% of the Total Catch Per Trip

Enforcement of any allowance for undersized lobsters requires meeting two necessary conditions: (1) capacity to draw a true random sample of lobster tails from the entire vessel's load and statistically determine the portion of the total catch per trip that is composed of lobster tails which are less than the minimum size, or (2) measure each and every lobster tail in the entire load. Attempting to measure each and every lobster tail would effectively shut down many unloading operations when loads can consist of tens of thousands of frozen lobster tails per trip. In most instances, it is not possible for enforcement agents to draw a true random sample of lobster tails in a load because lobster tails are not randomly disributed by size. Instead, they are often segregated by size due to sorting or due to fishing different grounds on a single trip. When this happens, the result is a stratification of lobster

tails in a vessel's hold according to size since different grounds have different sized lobsters. This situation, in turn, would require drawing a stratified random sample, but enforcement agents do not have any prior knowledge of how lobster tails are segregated according to size in the hold of vessels returning from fishing trips. As a result, enforcement agents are incapable of drawing a stratified random sample because they do not have prior knowledge on how the lobster tails are stratified in the holds of vessels. Simply put, any allowance for retention of undersized lobster tails cannot be enforced.

7.4 Adopt a Minimum Tail Width of 5.1 cm

It was indicated in section 4.4 of this report that a 5.1 cm tail width is equivalent to a 7.7 cm carapace length when both sexes of spiny lobsters are considered together. Adopting this standard would better protect lobster stocks in the long run compared to the 4.8 cm standard being proposed and compared to the original minimum size regulations of the FMP. But the 5.1 cm tail width may be over protective of the resource at the a major expense of fishermen presently operating in the fishery as there is no guarantee that release of the sublegal lobsters would eventually contribute to the spawning stock biomass because discarded lobsters are potentially subject to high mortalities. If this is indeed the case, there would be no added benefit to stock conservation through adopting a 5.1 cm minimum tail width or any other minimum tial width. Instead, there could be unnecessary waste of lobsters, and a commensurate loss of sales revenues. A considerble portion of current total catches of spiny lobsters is comprised of lobsters having tail widths between 4.8 and 5.1 cm, (see Table 9).

The Council has concluded that the loss of revenues to fishermen presently operating in the fishery stemming from adoption of a 5.1 cm minimum tail width would result in a great social cost and is not warranted in view of the uncertain benefits to stock conservation. Maintaining the 4.8 cm minimum tail width standard will allow further testing of the stock assessment models presently being used. Subsequent upward revision of the tail width regulation can be undertaken should annual reviews indicate the need to do so.

8.0 IMPACTS OF REJECTED ALTERNATIVES

8.1 No Action

Unless the FMP is amended, the harvest of spiny lobsters in the NWHI will continue to be regulated under existing regulations of the FMP. If existing regulations are not amended, enforcement officers will continue to be unable to determine whether the 15% allowance for undersized lobsters is being adhered to. The biological condition of spiny lobster stocks in the NWHI could be adversely affected without effective enforcement of minimum size regulations. The risk of overfishing spiny lobster stocks in the NWHI would increase if no action is taken. If overfishing were extreme, there might be a negative impact on the endangered Hawaiian monk seal because of reduced stocks of spiny lobster. But this is unlikely since monk seals are opportunistic feeders and they are known to eat spiny lobster along with many other sea creatures. There would not be any impacts expected on other endangered and threatened species or on their habitat.

If overfishing of spiny lobster stocks occurs in the future because of a continuing incapacity for effective enforcement of minimum size regulations, commercial lobster catches, and subsequent income and profit would decline. Employment, processing, and vessel support activities would also diminish. There would be no changes in costs for permits and for required record keeping. Data collection and reporting burdens would be unchanged under the no action alternative. The cost of processing and implementing this amendment would be avoided. The costs of developing this amendment package would be sunk and forgotten.

8.2 Allow Both Carapace Length and Tail Width to Define a Legal Size Lobster

There is a highly significant statistical relationship between carapace length and tail width. Theoretically, either minimum size measure could be used for stock conservation purposes. The condition of spiny lobster stocks in the NWHI would not be affected by this alternative because either measure, if adhered to by fishermen, would be equally effective in protecting the stocks of undersized lobsters. Adopting this alternative would provide a convenience to some fishermen who have preferences for measuring carapace length rather than tail width. However, the seeming worthiness of this alternative loses its appeal in a fishery where about 95% of the landings made in recent years are in a frozen tail form. Data analysis burdens would be increased by this alternative since government data processors and analysts would have to deal with transforming the data to make them compatible with each other. There is too much complexity, uncertainty, and confusion presently involved in the manage-

ment of the fishery. Strides towards simplicity are needed. This alternative was rejected because allowing two measurements of minimum legal size would complicate enforcement and administration of the FMP.

8.3 Allow Some Taking of Undersized Lobster Tails at a Level Which is Less Than the Present Allowance of 15% of the Total Catch Per Trip

The implicit effect of adopting this alternative would be to seemingly provide additional protection for spiny lobster stocks in the NWHI because lesser amounts of undersized lobsters would be landed, at least in theory. But for reasons stated in previous sections, effective enforcement of any allowance of undersized lobsters is impossible or at least not very probable and it cannot be expected. This is the primary reason why this alternative was rejected.

Since spiny lobsters are an item in the diet of the endangered Hawaiian monk seal, it is possible that a reduction in the take of undersized lobsters could increase the food supply of these predators. This might be possible, but it is improbable that the availability of spiny lobsters to monk seals would be increased because any allowance for undersized lobsters cannot be effectively enforced. Moreover, it is conjectural that a larger amount of spiny lobsters would be responsible for increasing the population of monk seals since these animals are opportunistic feeders. There would be no impact on the threatened green sea turtle since there is no evidence of critical interactions between turtles and lobsters in Hawaii. Data collection and reporting burdens would be unchanged if this alternative was adopted. This alternative was rejected because effective enforcement of any percentage allowance for retaining undersized lobster tails is not probable, and the implicit beneficial effects on the population of lobsters and monk seals would probably not be realized.

8.4 Adopt a Minimum Tail Width of 5.1 cm

The effects of this alternative are mixed when weighed against the 4.8 cm minimum tail width standard embodied in the expired emergency regulations and being proposed here. Increasing the minimum size from 4.8 cm to 5.1 cm would tend to give more protection to spiny lobster stocks but it would also certainly reduce fishermen's income in the short-run.

Based on the estimates (Section 6.0) that fishing mortality is half natural mortality at Maro Reef and 1.5 natural mortality at Necker Island and with the assumption that the size at which 50% of the population is sexually mature at both those islands is 7.0 cm carapace length (CL), the Beverton and Holt yield equation was used to estimate the change in the spawning stock biomass which would occur when the minimum tail width is reduced from 5.1 cm (equivalent to 7.7 cm CL) to 4.8 cm (equivalent to 7.0 cm CL). At Necker

Island under the existing level of fishing mortality, a reduction in tail width from 5.1 to 4.8 cm would reduce the spawning stock biomass by 30% of its level under the 5.1 cm tail width minimum size, and if the level of recruitment is not reduced then the yield will increase by 15%. At Maro Reef under the current level of fishing mortality, a reduction of the tail width from 5.1 cm to 4.8 cm would reduce the spawning stock biomass by 14% of its level under a minimum tail width of 5.1 and increase the yield by 7% if the recruitment is not reduced.

In the case of Maro Reef, which appears typical of most of the other islands and banks in the NWHI, under the 5.1 cm minimum tail width regulation the spawning stock biomass is at 61% of its unexploited level, thus a further reduction of it under the 4.8 cm tail width minimum will reduce it to 52% of its unexploited level which is probably still sufficient to prevent recruitment overfishing. Thus it appears that the reduction of the tail width from 5.1 cm to 4.8 cm at Maro Reef, and most other islands and banks, will not be detrimental to the stocks and could increase the yield. The main caution is that as the size of the harvestable population declines from fishing pressure, the proportion of animals below 4.8 cm tail width entering the traps will increase, and if mortality from capture and release of these animals is a factor, the reduction of the spawning stock biomass will be greater than has been projected and could result in recruitment overfishing.

At Necker Island, the problem of forecasting the impact of a reduction of the minimum tail width from 5.1 to 4.8 cm is more complicated because under the current high level of fishing pressure the spawning stock biomass is already at 34% of its unexploited level and the reason or reasons for the observed reduction in the sublegal population is not known. If the reduction in the sublegal population is either due to direct fishing and retention of sublegals or if it is due to mortality due to capture and release, then a reduction of the minimum tail width together with the use of escape gaps may not be detrimental to the stock. However, if the reduction in the sublegal population is due to a reduction in recruitment due to a low level of the spawning stock biomass resulting from the high level of fishing mortality, then a reduction of the minimum tail width from 5.1 to 4.8 cm will only further reduce the spawning stock biomass and hence further reduce recruitment.

While it has proven possible to define the direction of the effects and to quantify their expected physical magnitudes, it is presently not possible to estimate the long-term net effects on fishermen's income under either the 5.1 cm or the 4.8 cm standards. Since the net economic effects of each of these standards of minimum size are unquantifiable at present, comparisons of net benefits must be based on speculation. The 5.1 cm minimum tail width alternative was rejected because it is desirable to give fishermen the benefit of the doubt when faced with much uncertainty rather than reduce their incomes by conservative regulation. Also, the effects of the 4.8 cm minimum tail width under the amendment will be re-assessed after one year when an adjustment in the minimum size regulation can be made if that is determined to be necessary.

The fact that average gross revenues per trap-day (Table 4) for the industry as a whole have fallen from $7.03 in 1983, to $5.90 in 1984 to $4.66 in 1985 indicates that fishermen's concerns regarding their economic future are real. Although, the industry as a whole may still be enjoying profits, albeit at significantly reduced levels especially compared to 1983, it is also likely that there are some vessels in the fishery which are operating at a loss.

9.0 IMPACTS OF THE PREFERRED ALTERNATIVE

This amendment proposes to "institutionalize" the changes in the administration and enforcement of the FMP made by the emergency regulations which expired on October 22, 1985. Specifically, Amendment #3 proposes to eliminate the use of the 7.7 cm minimum carapace length limit for determining legal size and instead use a 4.8 cm minimum tail width limit (7.0 cm carapace length equivalent) for a one year trial period; to remove for good the existing 15% allowance in catches of undersized lobsters; and, to redefine the site on a spiny lobster tail where measurement is made to determine legal size. The 4.8 cm tail width size limit is to be reviewed after one year of the effective date of Amendment #3. This amendment applies only to the NWHI (Permit Area 1). It is proposed that a legal-sized spiny lobster be defined as one with a tail width of 4.8 cm or greater measured across the tail at the widest spot between the first and second abdominal spines. These changes to the regulations of the FMP should insure that fishermen take only legal-sized spiny lobsters.

Polovina's (October 1985) analysis of catch rates indicates that the standing stock of harvestable spiny lobsters at Necker Island is now at 26% of its unexploited level, and at Maro Reef it has been reduced to 57% of its unexploited level. Under the Schaefer Model, Maro reef would be considered to be fished at or near the maximum level of production while the standing stock of spiny lobsters at Necker Island has been reduced below the level which provides maximum fishing yield.. The standing stock of sublegal spiny lobsters has been reduced to 74% of its unexploited level at Necker Island and 89% of its unexploited level at Maro Reef (Table 7).

A major question which arises from Polovina's analysis is what caused the reductions in the sublegal populations of spiny lobsters (especially at Necker Island). These reductions could be due to a number of factors including: (1) a reduction in recruitment caused by intensive and sustained fishing pressure over many years which might have substantially reduced the spawning stock); (2) mortality of sublegals as a result of stress caused by being caught, injuries incurred by handling, and predation upon release; and (3) direct fishing mortality on sublegals due to their retention in the catch. If it was certain that the reduction of the sublegal population at Necker Island is substantially due to recruitment overfishing, then it would not be wise to reduce the size limit to a 4.8 cm tail width since that would only further reduce the spawning stock biomass which would result in further reduction of the sublegal population. Such a scenario might be more likely to occur if the spiny lobster population at Necker Island were genetically isolated from the population(s) of spiny lobsters at the many other banks of the NWHI. Using a technique called electrophoresis, however, Shaklee and Samollow (1980) were unable to detect differences in the genetic make-up of lobsters found on widely scattered banks. This lack of evidence for sub population structure or stock heterogenety suggests that larvae released on one bank may possibly seed other

banks. Such and inference is consistent with a model developed by MacDonald (1983) to explain the seasonal and geographic patterns of spiny lobster larval recruitment in the NWHI. However, larval recruitment may be bank specific since Shaklee and Samollow's results only show no genetic differences at the loci tested. There might be some genetic differences which do not show up with electrophoresis.

If the reduction in the sublegal population of spiny lobsters is due to mortality on the sublegals resulting from their capture and release, then there is no evidence that the spawning stock biomass is too low and it would be reasonable to reduce the minimum tail width to 4.8 cm. Why throw away marketable lobsters if most of them die anyway shortly after release? However, there is a caveat here. The need for escape gaps on lobster traps would be heightened immensely if it were known that capture and surface release of sublegal lobsters were major factors related to mortality. Since about 50% of the spiny lobsters caught in the plastic traps at Necker Island are smaller than 4.8 cm in tail width, the use of escape gaps has appeal. However, the use of escape gaps is problematic considering that the fishery now produces more slipper lobsters than spiny lobsters, and that plastic traps are about 3 times as effective in catching slipper lobsters as spiny lobsters.

The Council chose this alternative for essentially the same reasons that the Council rejected the 5.1 cm minimum legal size alternative. When scientific answers to questions must be qualified because of simplifying assumptions, then the unanimous recommendations of fishermen should be given serious consideration. The effects of the 4.8 cm size standard will be re-evaluated after the one year trial period expires.

While the data collected from the logbooks of commercial vessels provide essential information on the level of catch, effort, catch rate, and areas fished, commercial data alone are not sufficient to understand the status of the resource. At the minimum, annual research cruises are needed to continue to conduct standardized fishing and to systematically collect a time series of size-frequency data and catch rate data. The Honolulu Laboratory of the NMFS is drawing up plans to continue research cruises in future years. In about a year and a half from now, the impacts of the 4.8 cm tail width size standard should become much clearer than they are perceived at present and more real in terms of quantification. If beginnings of lasting stock conservation problems become evident, the problems could be directly arrested. An assessment of the 4.8 cm minimum tail width size limit will be a part of the 1986 Annual Report on the NWHI lobster fishery. This report will be available in January 1977.

10.0 CHOICE OF ALTERNATIVES BASED ON ACHIEVEMENT OF THE OBJECTIVES OF THE FMP

The Preferred Alternative was selected out of all of the alternatives considered based on how well it would contribute to achievement of the four objectives of the FMP (Section 5.2) compared to the other alternatives examined.

10.1 Protect Stock Productivity and Prevent Overfishing

Alternative 6.1 would not help meet this objective. Doing nothing would assure that the 15% allowance for undersized lobster tails would remain unenforceable, thus maintaining an opportunity for exceeding of the 15% allowance for the retention of undersized spiny lobsters. This could adversely affect the long-term productivity of spiny lobster stocks since small lobsters would be removed from the fishery before they had a chance to spawn.

Alternative 6.2 would have no impact on stock productivity since a minimum carapace length or its equivalent tail width would be essentially equally effective in protecting the reproductive potential of the stocks by prohibiting the retention of undersized lobsters.

Alternative 6.3 would reduce the existing 15% allowance for taking of undersized lobster tails while the Preferred Alternative would eliminate the allowance all together. The Preferred Alternative would protect stock productivity and prevent overfishing more effectively than would alternative 6.3 since any allowance for undersized lobsters cannot be enforced.

Alternative 6.4 (minimum tail width of 5.1 cm) would seemingly have more of a beneficial impact on protecting stock productivity of spiny lobsters compared to the Council's preferred alternative of a 4.8 cm minimum tail width. However, for this to be realized, the mortality associated with catch and release of sublegal spiny lobsters would have to be low. If the mortality rate associated with non-retention of sublegal lobsters is high, then adopting a 5.1 cm minimum size standard would have little perceptible effect on protecting stock productivity since most released lobsters would die anyway shortly upon release. Valuable lobsters would be wasted with no evident offsetting gains in stock conservation.

10.2 Maintain or Enhance Economic Contribution

Doing nothing (Alternative 6.1) would enhance the short-term prospects for higher economic gains from the fishery since the opportunity for taking

undersized spiny lobsters would remain because the 15% allowance is not enforceable. Economic gains stemming from the fishery in the long-term, however, would be placed at risk since the productivity of lobster stocks could be seriously diminished.

Alternative 6.2 would not affect this objective at all since fishermen should theoretically catch and retain about the same amount of spiny lobsters under a minimum carapace length rule or an equivalent tail width. The two measures are equivalent. Therefore, alternative 6.2 is largely neutral with respect to meeting this objective.

Reducing, but not eliminating, the 15% allowance for undersized lobsters (alternative 6.3) would have the same effect as doing nothing since any allowance for undersized lobsters cannot be enforced. The Preferred Alternative would help meet this objective better than the other three alternatives examined since the productivity of the stocks would be better protected. Long-term economic contributions from the fishery are predicated on maintaining the productivity of the stocks in perpetuity.

Adopting a 5.1 cm minimum tail width (alternative 6.4) can be expected to have an effect of reducing fishermen's profits in the short-term. If the mortality associated with catch and release of sublegal lobsters is high, then stock conservation gains would be minimum regardless of whether the minimum legal size is established at 5.1 cm or 4.8 cm or anywhere in between. The short-term economic damage to the fishery stemming from a 5.1 cm minimum tail width could be significant, whereas it is unlikely that the 4.8 cm minimum tail width preference will cause long-term irreversible damage to the stocks.

The 4.8 cm minimum size proposal has a principal advantage over the 5.1 cm alternative. There would be less waste of lobsters under the 4.8 cm rule than under the 5.1 cm rule since lobsters having tail widths between 4.8 and 5.1 cm could be retained instead of being discarded.

10.3 Collect Information

Neither the Preferred Alternative or the other alternatives considered would have much of an effect on this objective. The present record keeping and reporting procedures would remain essentially unchanged regardless of the alternative chosen. An exception to this statement is alternative 6.2. Establishing dual standards for minimum size based on carapace length and tail widths, while offering a possible convenience to fishermen who do not process lobster tails, would complicate enforcement, record keeping, analysis of the data collected, and the administration of the FMP.

10.4 Prevent Unfavorable Impacts on Endangered and Threatened Species

Alternatives 6.1, 6.3 and the Preferred Alternative could possibly have a negative impact on this objective because diminished lobster stocks would reduce one item in the food supply of the endangered Hawaiian monk seal. Alternative 6.2 would have no effect on this objective since about the same amount of lobsters would be available to monk seals under a carapace length measurement or an equivalent tail width measurement. The Preferred Alternative would seemingly do more toward achieving this objective compared to the No Action Alternative provided that spiny lobsters are an essential item in the diet of monk seals and not simply a preference. The regulations of the FMP allow a 15% retention of under-sized lobsters down to a 4.5 cm tail width.

When the four objectives of the FMP are considered together as a set, the Preferred Alternative satisfies most of the objectives better than the alternatives considered. Reduction of the minimum size from 7.7 cm carapace length (5.1 cm tail width equivalent) to 4.8 cm tail width could diminish the productivity of stocks but this may not be a problem of consequence if lower loster density results in compensation in either growth or survival (or both) of sublegal lobsters. Moreover, as indicated previously, there is no assurance that release of sublegal lobsters actually contributes to the spawning stock biomass because discarded lobsters are potentially subject to high rates of mortality.

11.0 DETERMINATION OF ENVIRONMENTAL IMPACT

11.1 Endangered and Threatened Species

During the development of the FMP, the Council requested formal consultation under Section 7 of the Endangered Species Act. A National Marine Fisheries Service biological opinion dated February 18, 1981, considered the potential impacts of the lobster fishery in the NWHI on the Hawaiian monk seal, an endangered marine mammal. Many of the regulatory measures in the FMP are intended to protect monk seals. These measures, in addition to the trap opening requirment, are: (1) tangle nets are prohibited in taking lobster; lobsters may only be taken by traps or by hand; (2) observers may be required at the request of the NMFS Regional Director; (3) commercial fishing for lobsters in lagoons and in nearshore waters less than 10 fathoms deep is prohibited, as well as fishing for lobster within 20 miles off Laysan Island, a major breeding area for monk seals; (4) emergency protective measures may be implemented if the Regional Director receives a report of a monk seal death that appears to be related to the fishery; (5) fishermen are subject to specific record keeping and reporting requirments; and (6) vessel logbooks must contain information on observation of monk seals in the fishing area, in the vicinity of fishing gear, and whether monk seals interfere with fishing operations or not.

The biological opinion considered the possibility that monk seals searching for food might be caught in the entryways of lobster traps and drown. The opinion stated that the specified dimension restriction of the inner openings of lobster traps might prevent adult monk seals from becoming entrapped. The opinion concluded that the FMP contained safeguards to reduce adverse impacts on monk seals from the lobster fishery and recommended that the FMP be implemented with provisions for emergency closures in the event that fishery-related mortality of monk seals occurs. Thousands upon thousands of lobster traps have been set in the NWHI and no monk seal interactions have been reported.

The green sea turtle, a threatened species, breeds in the NWHI where the spiny lobster fishery occurs. Green sea turtles are herbivorous and are not likely to interact with spiny lobster, so no environmental effects on the NWHI green sea turtle populations should occur with or without this amendment.

The FMP contains a list of other endangered and threatened species observed in the NWHI. None of these species will be adversely affected by this amendment to the FMP.

11.2 Environmental Impact Statement (EIS) Determination

The proposed amendment is not a major action having significant impact on the quality of the marine or human environment of the Northwestern Hawaiian Islands. The proposed action is an adjustment of the original regulations of the FMP to assure their enforceability. The proposed action should not result in impacts significantly different in context or intensity from those described in the Environmental Impact Statement (EIS) published with the initial regulations implementing the approved FMP. The preparation of a formal EIS is not required for this amendment by section 102(2)(c)(c) of the National Environmental Policy Act or its implementation regulations.

- Mitigating Measures Related to Proposed Action

  Mitigating measures are unnecessary. The effects of the proposed 4.8 cm tail width minimum size will be re-evaluated after one year.

- Unavoidable Adverse Effects

  None are expected. See discussions in Sections 7.4, 8.0, and 10.4.

- Relationship Between Local Short-Term Uses of the Resources and Enchancement of Long-Term Productivity

  The catch of legal-sized spiny lobsters would be improved in the short-term and maintained in the long-run subject to oscillations common in most fisheries.

12.0 DETERMINATION OF IMPACTS UNDER EXECUTIVE ORDER 12291 AND THE REGULATORY FLEXIBILITY ACT

The action proposed in this amendment is essentially a correction or tuning of existing regulations. Section 5.0 describes the NWHI spiny lobster fishery, indicating that the number of participating vessels has ranged from 3 to 15 (Table 1). The economic impact of the proposed amendment would be substantially less than $100 million since the gross revenue generated by the spiny lobster fishery in the NWHI is only about $1.5 million per year (Table 4). For these reasons, the proposed action is not deemed to be "major" under the definition of Executive Order 12291, and it will not have a significant impact on a substantial number of small business entities under the Regulatory Flexibility Act. There are only about 15 vessels active in the fishery, although almost 40 vessels have secured permits prior to the effective date of the moratorium. The impact on the affected vessels will be positive.

13.0 APPLICABILITY OF THE PAPERWORK REDUCTION ACT

The data collection and reporting burdens of the approved FMP would be unchanged by the proposed action, and there is not any new collection of information requirements. Thus the provisions of the Paperwork Reduction Act are not germane to the proposed action.

14.0 COASTAL ZONE CONSISTENCY

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 (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. On June 6, 1983, the State of Hawaii put into effect amended regulations governing lobster fishing in territorial waters around the NWHI, thus, making its regulations consistent with the regulations of the FMP. On December 20, 1983, the Federal government implemented lobster fishing regulations for the FCZ around the main Hawaiian Islands which are the equivalent of existing State regulations. On January 9, 1984, Federal regulations which changed the specifications of entryway openings of lobster traps that are used in the fishery for spiny lobsters in the NWHI became effective. The State of Hawaii in turn amended its regulations on lobster trap entryway openings for the territorial sea surrounding each of the NWHI. These regulations became effective on June 25, 1984.

The changes in the Federal regulations governing commercial fishing for spiny lobsters in the FCZ of the NWHI proposed here will require making parallel changes in existing State of Hawaii regulations covering the taking of spiny lobsters in the 3-mile territorial sea of the State of Hawaii around the NWHI. The State of Hawaii previously adopted the FMP's regulations for the territorial sea to be consistent with Federal regulations governing lobster fishing in the FCZ. The regulation changes proposed by Amendment #3 will eliminate the 15% allowance for undersized lobsters and establish new procedures for determining a legal-sized lobster. These changes, if approved, will necessitate changes in present State of Hawaii regulations covering lobster fishing in the territorial sea surrounding each of the NWHI to make them fully consistent once again with Federal regulations.

While it is the goal of the Council and the State to have complementary management measures, Federal and State administrative procedures vary and amendments are unlikely to be fully instituted at the same time.

Based upon the assessment of this amendment's impacts in previous sections, the Council has concluded that Amendment #3 is a refinement to the Federal management measures for spiny lobster fisheries in the NWHI and is consistent to the maximum extent practicable with Hawaii's approved Coastal Zone Management Program. This amendment will not change the Federal regulations which apply to spiny lobster fisheries in the FCZ around the main Hawaiian islands, American Samoa, and Guam. Therefore, previous coastal zone consistency determinations for Guam and American Samoa continue to apply for the regulations which implement the FMP in these areas.

15.0 NATIVE HAWAIIAN FISHING RIGHTS

Unlike the native Americans in the continental United States, where treaties and agreements have provided formal legal ground for allocation of fishing rights to native Americans, no such treaties were formed in Hawaii. Traditional Hawaiian society was significantly affected in the quarter century prior to annexation of Hawaii by the United States in 1900. Formal agreements between the two governments concerning fishing rights were not incorporated into the Organic Acts relevant to Hawaii's political integration into the United States. However, there is a growing concern about the manner in which Hawaii was annexed and Hawaiian land ceded to the United States government. The relationship between ancient Hawaiian land and water rights and the developing commercial fisheries is presently not known.

It appears that this amendment to the spiny lobster FMP will not affect any native Hawaiian, Samoan, or Chamorran cultural or religious practices so far as can be determined at this time. The Council has requested the Office of Hawaiian Affairs to examine this issue and to provide a legal opinion as to whether the Council is required by treaty or law to make special provisions for indigenous people in fishery management planning in the Northwestern Hawaiian Islands.

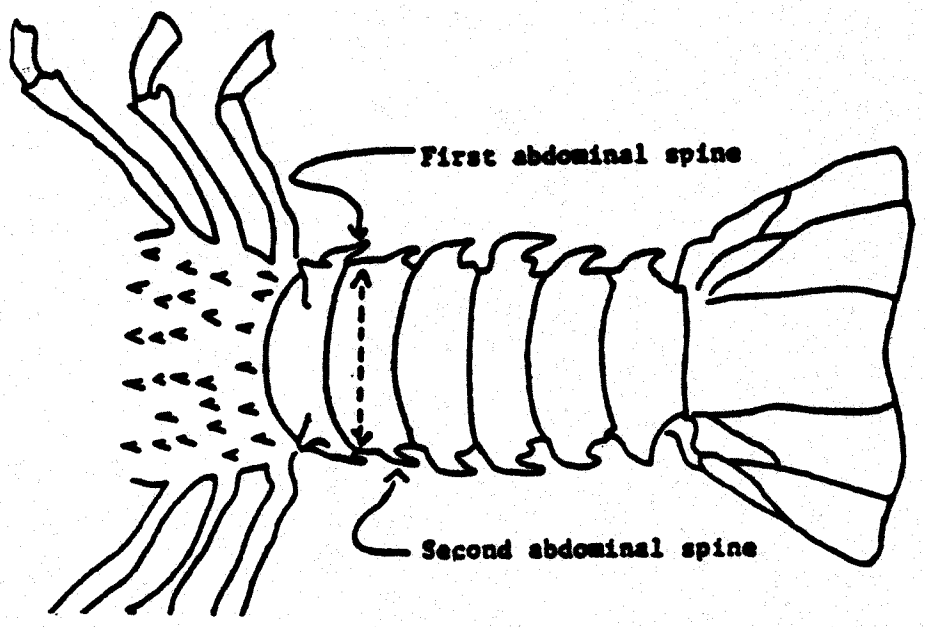
16.0 PROPOSED AMENDMENT OF REGULATIONS

PART 681 - WESTERN PACIFIC SPINY LOBSTER FISHERIES
50 CFR 681 is amended as follows:
The authority citation for Part 681 reads as follows:
Authority: 16 U.S.C. 1801 et. seq.

In Section 681.2 Definitions, the definition of tail width is revised to read as follows:

Tail width means the straight line distance across the tail measured at the widest spot between the first and second abdominal spines.

In Section 681.2 Definitions, Figure 2 Tail Width, is replaced with a new Figure 2, as shown below:



In Subpart B - Management Measure for Permit Area 1 (the Northwestern Hawaiian Islands), Section 681.21 size restriction, paragraph (a) and (b) are revised to read as follows:

Size restrictions - only spiny lobsters with a tail width of 4.8 cm or greater may be retained.

The National Marine Fisheries will publish a Preamble including the above text on the proposed rulemaking.

17.0 KEY REFERENCES

MacDonald, D.D. 1983. "Seasonal and Geographic Patterns of Hawaiian Spiny Lobster Puerulus Recruitment". In Sea Grant Quarterly, Spiny 1983, Volume 5, Number 1. University of Hawaii Sea Grant College Program.

Polovina, J.J. "Status of Stocks of Spiny Lobsters at Necker and Maro Islands 1985", September 1985, Draft Report, Southwest Fisheries Center, Honolulu Laboratory.

Shaklee, J.B., and P.B. Samollow. 1980. "Genetic Aspects of Population Structure of Four Species in the Northwestern Hawaiian Islands". In Proceedings of the Symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands, Honolulu, Hawaii, April 24-25, 1980, ed. R.W. Grigg, and R.T. Pfund, pp 264-277. UNIHI-SEAGRANT-MR-80-04. University of Hawaii Sea Grant College Program, Honolulu, Hawaii.

Uchida, R.N., et. al., 1980. "Biology, Distribution, and Estimates of Apparent Abundance of the Spiny Lobster, Panulirus marginatus, in Waters of the Northwestern Hawaiian Islands: Part II. Size distribution, Legal to Sublegal Ratio, Sex Ratio, Reproductive Cycle, and Morphometric Characteristics". In same as above, pp 131-142.