AMENDMENT NUMBER 1

TO

SPINY LOBSTER

FISHERY MANAGEMENT PLAN

FOR

THE GULF OF MEXICO AND SOUTH ATLANTIC

INCLUDING ENVIRONMENTAL ASSESSMENT,
SUPPLEMENTAL REGULATORY IMPACT REVIEW,
AND
INITIAL REGULATORY FLEXIBILITY ANALYSIS

FEBRUARY 1987

GULF OF MEXICO FISHERY MANAGEMENT COUNCIL
LINCOLN CENTER, SUITE 881
5401 WEST KENNEDY BOULEVARD
TAMPA, FLORIDA 33609
(813)228-2815

AND

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
1 SOUTHPARK CIRCLE
CHARLESTON, SOUTH CAROLINA 29407
(803)571-4366

2.0. TABLE OF CONTENTS

Section	Page
1.0. Title Page	1
2.0. Table of Contents	2
3.0. Summary	5
3.1. Fishery	5
3.2. Management Unit	5
3.3. Maximum Sustainable Yield	5
3.4. Optimum Yield	5
3.5. EDAH and TALFF	5
3.6. Projected Benefits	6
3.7. Issues in the Fishery	6
3.8. Management Objectives	7
3.9. Current Management Measures	7
3.10. Proposed Management Measures	8
3.11. Rejected Management Measures	9
3.12. Recommendations	11
3.12.1. Recommendations to the Secretary of Commerce	11
3.12.2. Recommendations to the States	11
4.0. Introduction	12
4.1. Management Objectives	12
4.2. Problems in the Fishery Requiring Plan Amendment	12
4.3. Achievement of Stated Objectives	14
5.0. Description and Status of the Spiny Lobster Fishery and Stock	16
5.1. Description of Data Available	16
5.2. Description of Fishery and Participants	16

5.3. Trends in the Fishery 17

5.3.1. Landings and Effort 17

5.3.2. Prices and Costs 18

5.4. Status of Spiny Lobster Stock 18

5.4.1. Stock Assessment 18

5.4.2. Assessment of Handling Practices of Undersize Lobsters..... 20

5.5. Status of Spanish Lobster Stock 22

5.6. Description of Related Habitat..... 23

5.6.1. Condition of the Habitat..... 23

5.6.2. Habitat Areas of Particular Concern..... 24

5.6.3. Habitat Protection Programs..... 25

6.0. Supplemental Regulatory Impact Review and Initial Regulatory Flexibility Analysis 41

6.1. Introduction 41

6.2. Methodology 42

6.3. Regulatory Impacts of Proposed and Alternative Management Measures 43

6.3.1. Use of Undersize Lobsters as Attractants..... 43

6.3.2. Commercial Fishing Permit..... 49

6.3.3. Recreational Fishing Permit..... 51

6.3.4. Regular Fishing Season - Recreational Possession Limit..... 53

6.3.5. Recreational Fishing Season - Recreational Possession Limit..... 55

6.3.6. Recreational Fishing Season Duration..... 56

6.3.7. Closed Season Duration..... 58

6.3.8. Closed Season Violations 60

6.3.9. Egg-Bearing Lobsters 62

6.3.10. Minimum Size Limit 64

6.3.11. Tail Separation 65

6.3.12. Slipper (Spanish) Lobster 67

7.0. Recommendations 84

7.1. Special Recommendations to the Secretary 84

7.2. Special Recommendations to the States 84

8.0. Related Federal Laws 85

8.1. Paperwork Reduction Act 85

8.1.1. Proposed Data Collection Program 85

8.1.2. Estimate of Reporting Burden 85

8.2. Endangered Species and Marine Mammal Protection Acts 85

8.3. Coastal Zone Management Act 85

8.4. National Environmental Policy Act 86

9.0. Bibliography 88

3.0. SUMMARY

3.1. Fishery

The spiny lobster fishery consists of the spiny lobster Panulirus argus, including an incidental catch of the spotted spiny lobster, Panulirus guttatus, and smooth tail lobster, Panulirus laevicauda, and the slipper (Spanish) lobster fishery consists of the slipper lobster Scyllarides nodifer, including an incidental catch of Scyllarides aequinoctialis, which inhabit or migrate through the coastal waters and the exclusive economic zone (EEZ) of the Gulf of Mexico and the South Atlantic areas and which are pursued by commercial and recreational fishermen.

3.3. Management Unit

The management unit for which federal regulations will be implemented shall be the spiny lobster Panulirus argus and the slipper lobster Scyllarides nodifer in the EEZ within the areas of authority of the Gulf of Mexico and South Atlantic Councils.

3.3. Maximum Sustainable Yield

Maximum sustainable yield (MSY) for spiny lobster is estimated as 13.7 million pounds annually for the maximum yield per recruit size of 3.5 inches carapace length. Quantitative estimation of MSY for Spanish lobster is not possible at this time due to the lack of population data, therefore it is established as equal to Optimum Yield.

3.4. Optimum Yield

Optimum yield (OY) is specified to be all spiny lobster more than 3.0 inches carapace length or not less than 5.5 inches tail length that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions. Optimum yield is estimated at 9.5 million pounds.

Optimum yield for the slipper lobster is specified to be all non egg-bearing slipper lobster that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions. No quantitative estimate of optimum yield is available at this time due to the absence of population data.

3.5. Expected Domestic Annual Harvest (EDAH) and Total Allowable Level of Foreign Fishing (TALFF)

Spiny lobster

EDAH = 9.5 million pounds.
TALFF = 0.0 pounds.

Slipper lobster

EDAH = Optimum yield.
TALFF = 0.0 pounds.

3.6. Projected Benefits

The following projected benefits, based on the spiny lobster fishery, were adapted from the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic (FMP) but were not achieved due to problems outlined in this amendment. Therefore the projected benefits of the FMP also apply to this amendment and will be achieved with effective industry compliance, enforcement, and government monitoring of the results of management measures implemented by this amendment.

1. An increase in annual yield of up to 1.5 million pounds from the present estimated legal catch of 8.0 million pounds to the EDAH of 9.5 million pounds by 1988 fishing season.

2. An eventual increase in annual yield of 4.0 million pounds from the present estimated legal catch of 8.0 million pounds to the MSY of 13.7 million pounds with effective enforcement throughout the fishery and the development of alternative attractants for use in traps.

3. An increase in annual revenue to the harvesting sector of up to $3.3 million and a total impact on the national economy of up to $7.3 million by 1988 fishing season.

4. An increase in employment opportunities by 371 man-years.

The projected benefits from management of the slipper lobster fishery include continuation of the fishery and associated employment by preventing overfishing of a population sensitive to fishing mortality.

3.7. Issues in the Fishery

1. The number of undersize lobsters taken and sold illegally continues to be significant. Enforcement of size limit regulations will be a major consideration when developing procedures for implementing management measures.

2. Whereas the present practices involving the use of undersize lobsters as attractants is causing significant mortality to undersize lobsters and subsequent loss in yield to the fishery, there is controversy over the methods to reduce the mortality of undersize lobsters used as attractants in traps.

3. There is an increasing number of traps in the fishery.

4. Incompatible Federal and State regulations hinder effective enforcement of the minimum size limit and the prohibition against spearing lobsters.

5. The abandonment of traps during the closed season have created a significant "ghost fishing" mortality that represents a loss in yield to the fishery.

6. The major user groups of the resource are not adequately defined to insure fair and equitable treatment. The existing Florida permit system is not sufficient in identifying major user groups resulting in an inability to properly assess the impacts of alternative management measures on the users of the resource. In addition, data on recreational harvest is nonexistent. Existing data sources will need to be supplemented, especially if future allocation of the resource is to be considered.

3.8. Management Objectives

1. Protect long-run yields and prevent depletion of lobster stocks.

2. Increase yield by weight from the fishery.

3. Reduce user group and gear conflicts in the fishery.

4. Acquire the necessary information to manage the fishery.

5. Promote efficiency in the fishery.

3.9. Current Management Measures

1. A minimum harvestable size limit of more than 3.0 inches carapace length or not less than 5.5 inches tail length shall be established.

2. A closed season from April 1 through July 25 shall be established. During this closed season there shall be a five-day "soak period" from July 21-25 and a five-day grace period for removal of traps from April 1-5.

3. All spiny lobster traps shall have a degradable surface of sufficient size so as to allow escapement of lobsters from lost traps.

4. The taking of spiny lobsters in the EEZ with spears, hooks and similar devices or gear containing such devices shall be prohibited. The possession of speared, pierced or punctured lobsters shall be proof of the taking with prohibited gear while in the EEZ.

5. No person shall willfully molest a trap or buoy or work a trap belonging to another without permission from the owner.

6. To aid enforcement, traps may be worked during daylight hours only.

7. All spiny lobster taken below the legal size limit shall be immediately returned to the water except undersize lobsters which may be carried on the vessel provided they are: for use as lures or attractants in traps and kept in a shaded "bait" box while being transported between traps. No more than three live "shorts" per trap (traps carried on the boat) or 200 live "shorts", whichever is greater, may be carried at anyone time.

8. All lobster traps used in the fishery within the EEZ shall be identified by a number and color code issued through the office of the Regional Director of National Marine Fisheries Service (NMFS) or his designee to each vessel desiring to use lobster traps in the EEZ. Further, each vessel using such traps must be clearly marked with the same color to allow identification from aerial and water patrol craft.

9. A special two-day recreational season shall be established.

10. The retention aboard vessels or possession on land of egg-bearing female spiny lobsters shall be prohibited. Stripping or otherwise molesting female lobsters to remove the eggs shall be prohibited. Egg-bearing female lobsters taken in traps or other gear must be immediately returned to the water alive and unharmed.

11. Use of poisons or explosives to take spiny lobsters shall be prohibited.

3.10. Proposed Management Measures

1. Use of Undersize Lobsters as Attractants.

Up to 100 lobsters shall be allowed on board lobster trap-fishing vessels for use as attractants. All undersize lobsters must be immediately placed and kept in an aerated and shaded "open system" live well suitable to maintain the undersize lobsters alive and in a healthy condition until they are used in a trap as an attractant. The live well shall be large enough to provide at least three-fourths gallon of aerated circulating sea water per attractant lobster held on board the vessel.

2. Commercial Fishing Permit

A permit shall be required for fishing vessels engaged in harvesting lobsters for sale or for the harvest or possession of more than six lobsters per person per day. The permit shall be issued to either the vessel owner or operator and the applicant must have at least ten percent of his earned income from commercial fishing.

3. Recreational Fishing Permit.

Require a permit for all recreational fishermen actively engaged in lobster fishing in the EEZ, with the provision that this measure is not to be implemented until the State of Florida implements a recreational fishing permit requirement for spiny lobster recreational fishermen within state waters.

4. Regular Fishing Season — Recreational Possession Limit

The recreational harvest and possession limit during the regular fishing season (August 5 – March 31) shall be six lobsters per person per day.

5. Recreational Fishing Season – Recreational Possession Limit

The recreational harvest and possession limit during the special two-day recreational fishing season shall be six lobsters per person per day.

6. Recreational Fishing Season Duration.

The two-day recreational nontrap season shall be the first full weekend prior to August 1, beginning with the 1988-89 fishing season.

7. Closed Season Duration.

The closed fishing season shall be from April 1 through August 5 with a preseason soak period beginning August 1.

8. Closed Season Violations.

In addition to the existing five-day post-season grace period of April 1 – 5, for removal of traps, a 10-day extension for trap retrieval shall be allowed, on an individual basis if a documented hardship or emergency prevented trap retrieval prior to the end of the April 1 – 5 grace period.

9. Egg-bearing Lobsters

All captured egg-bearing females shall be released immediately alive to the open water and not be retained in traps as attractants.

10. Minimum Size Limit

The harvesting of Panulirus argus spiny lobsters with a carapace length 3.0 inches or less; or if the carapace and tail are separated, with a tail length of less than 5.5 inches shall be prohibited.

11. Tail Separation

The separation of lobster carapace and tail at sea shall be prohibited except by special permit. To be eligible for a tail separation permit the fishing craft must have been assigned a commercial lobster permit, and must be operated for lobster fishing in the EEZ for two or more days from port. Furthermore, the permit applicant (fishing craft owner or operator) must provide a signed statement that his fishing activity necessitates a tail separation permit.

12. Slipper (Spanish) Lobster

The possession or stripping of egg-bearing females shall be prohibited. All captured egg-bearing females shall be released alive to the open water.

3.11. Rejected Management Measures

1. Use of Undersize Lobsters as Attractants

- No action.

- Permit possession of undersize lobsters for baiting purposes only while the vessel is actively fishing a trap line in the EEZ.

- Prohibit the use of undersize lobsters as attractants.

- Require an escape gap to permit undersize lobster escapement.

- Reduce the number of traps in the fishery to reduce the required number of undersize lobsters needed as attractants.

2. Commercial Fishing Permit

- No action.

- Require a permit for all commercial fishermen actively engaged in lobster fishing in the EEZ.

3. Recreational Fishing Permit

- No action.

– Require a permit to be issued to the owner or operator for recreational fishing craft harvesting lobsters in the EEZ.

4. Regular Fishing Season — Recreational Possession Limit

– No action.

– The recreational harvest and possession limit during the regular season shall be 6 lobsters per person per day or 24 lobsters per day per vessel.

5. Recreational Fishing Season – Recreational Possession Limit

– No action.

6. Recreational Fishing Season Duration

– No action.

– The two–day recreational nontrap season shall be the first full weekend prior to August 1, beginning with the 1987–88 season.

7. Closed Season Duration

– No action.

8. Closed Season Violations.

– No action.

– A performance bond shall be required of all permitted fishermen requiring the removal of all traps at the end of the fishing season, with forfeiture of the bond for failing to remove traps by the end of the post–season grace period of April 1–5.

– Permit individuals to salvage and keep traps left in the water during the closed season.

9. Egg–bearing Lobsters

– No action.

10. Minimum Size Limit

– No action.

11. Tail Separation

– No action.

– Prohibit tail separation completely.

12. Slipper (Spanish) Lobster

– No action.

- Establish a closed season during the reproductive period.

- Establish a minimum size limit.

3.12. Recommendations

3.12.1. Special Recommendations to the Secretary

The Councils have recommended the following areas of needed information.

1. New baits or other fishing practices that offer economically viable substitutes for using undersize lobsters as attractants in traps;

2. Information on unreported landings from all user groups, most particularly the recreational fishery;

3. Better estimates of total mortality including natural as well as fishing mortality;

4. The source of lobster larvae recruited to the south Florida fishery;

5. Information on catch and effort and size composition, by geographic area;

6. The design and implementation of a system that will assist in locating and retrieving of traps and minimize conflicts between users of the resource;

7. The evaluation of the effectiveness of artificial and supplemental habitats in existing sanctuaries for juvenile lobsters.

8. The evaluation of the effectiveness of live wells in reducing undersize lobster mortality associated with their use as attractants.

3.12.3. Special Recommendations to the States

The Councils recommend that the states implement the management measures proposed in this amendment to the FMP within its State waters where applicable. The Councils further encourage the states to assist the Secretary in addressing and supporting the research and other special recommendations.

4.0 INTRODUCTION

The management unit includes the spiny lobster, Panulirus argus, inhabiting that portion of the EEZ within the areas of authority of the Gulf of Mexico and South Atlantic Fishery Management Councils. This amendment proposes to include the slipper (Spanish) lobster, Scyllarides nodifer into the management unit also. The spiny lobster fishery occurs principally in the waters off south Florida with approximately 50 percent of the catch taken from the EEZ. The slipper (Spanish) lobster fishery occurs off west Florida and the Florida panhandle and is conducted almost entirely in the EEZ by shrimp vessels using otter trawls.

The objectives of the FMP implemented in July, 1982, address a number of problems. Foremost among these problems was the need to manage the fishery throughout its range. Florida had been managing the fishery for years, but with its jurisdiction limited to its territorial waters.

The FMP projected an estimated increase in yield of 1.5 million pounds in the first year over the estimated 1982 legal catch of 8.0 million pounds (includes 1.0 - 2.6 million pounds of unrecorded commercial and recreational catches), and an eventual long-term increase in yield of approximately 4.0 million pounds. Projected increases in annual revenue to the commercial fishery paralleled projected yield. The projected yield and revenue increases have not been attained, however, maximum sustainable yield (MSY) is estimated to be 12.7 million pounds for a maximum yield per recruit size of 3.5 inches carapace length. Optimum yield (OY) is estimated to be 9.5 million pounds and specified to be all lobster more than 3.0 inches carapace length that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions. Optimum yield is estimated to be 9.5 million pounds.

4.1. Management Objectives

1. Protect long-run yields and prevent depletion of lobster stocks.

2. Increase yield by weight from the fishery.

3. Reduce user group and gear conflicts in the fishery.

4. Acquire the necessary information to manage the fishery.

5. Promote efficiency in the fishery.

4.2. Problems in the Fishery Requiring Plan Amendment

A number of the FMP's spiny lobster regulations differ from Florida's and have either resulted in a burden to the fishermen or have hindered enforcement efforts. Although the State of Florida was requested to adopt management measures similar to those in the FMP, to date Florida has made no changes to its spiny lobster regulations.

The lack of a spiny lobster fishing permit and recreational daily bag limit of 24 lobsters in the EEZ hampers State enforcement efforts to prevent trap poaching. Without direct observation by a law enforcement official, it is impossible to determine the catch site of a given spiny lobster. Thus, a recreational fisherman could conceivably claim that an illegal catch of spiny lobsters taken from State waters had come from the EEZ. In addition, if the State of Florida elected to revoke a permit for the commercial

harvesting of spiny lobster, the subject of the revocation could transfer his operation to the EEZ, claim to be a recreational fisherman and continue to harvest considerable quantities of spiny lobster. Failure to limit the spiny lobster catch by a recreational bag limit probably also encourages trap poaching.

Failure to prohibit the possession of separated spiny lobster tails at sea in the EEZ effectively defeats the prohibition against the taking of, or possession of, speared spiny lobster because it allows individuals to legally remove and discard the speared carapace thereby destroying evidence of an illegal activity. In addition, the illegal harvest of undersize lobster tails is facilitated by the indiscriminate allowance of the possession of separated tails because a lobster tail is only one-third as large as a whole lobster and consequently, lobster tails are more easily concealed.

The allowance of fishing craft to have 200 undersize lobsters on board while at sea prevents State enforcement officers from enforcing the State prohibition on the possession of undersize lobsters since the most effective enforcement of the State's regulation occurs while the fishing craft is enroute to port.

Landings in the last four years have averaged 5.6 million pounds (1982-1984) and are substantially less than either the preceding seven-year average of 6.3 million pounds (1975-1981) (Table 6.1) or the estimated optimum yield of 9.5 million pounds. The number of traps deployed in the fishery is continuing to increase. In 1984, between 675,000 to 750,000 traps were fished - a record high (see Table 6.1 and Monroe County Planning Department, 1985). The FMP estimated that optimum yield could be harvested with just 200,000 traps. Consequently, annual catch per trap has declined substantially in the last ten years and has been lowest in the past three years than in all previous years. The decline in catch per trap probably reflects both the extent of excessive effort in the fishery and a decrease in the standing stock of lobsters in south Florida. Since there is no limitation on number of traps, fishermen must continually increase their number of traps to remain competitive.

The illegal market in undersize lobsters, on board handling and exposure of undersize lobsters and their confinement in traps as attractants are significant sources of undersize lobster mortality that are preventing the fishery from harvesting optimum yield. Although undersize lobsters are an effective attractant, the mortality associated with there use as attractants, in combination with an increasing number of traps being fished, are contributing to the fishery's inability to achieve optimum yield and the observed decline in annual landings per trap currently being experienced in the fishery. Consequently the benefits of management, as projected in the FMP, were not achieved.

Although sufficient information exists to define the major problems within the fishery, insufficient data are available on the fishery to determine either the dynamics of the lobster population or the dynamics of the fishing fleet; this data deficiency will become more critical in the future as effort limitation or resource allocation problems are considered. The users of the resource are not adequately identified, therefore, it is difficult to assess the potential impacts of management measures under consideration on recreational and commercial fishermen; Florida's permit system does not identify the user groups impacting the resource. Catch and effort data on the commercial fishery is also inadequate to assess the stability of the stock to current fishing pressures. Data on recreational harvest are nonexistent. Although the need for recreational data on the spiny lobster fishery was identified in the FMP, no progress has been made in either identifying the magnitude of recreational harvest or the recreational user group.

4.3. Achievement of Stated Objectives

Objective 1 — Protect Long-Term Yields and Prevent Depletion of Lobster Stocks.

The primary management measures supporting this objective are the restrictions on minimum size, closed season, spearing, taking egg-bearing females, nondegradable traps, and use of explosives and poisons. The lack of data on the recreational fishery precludes the assessment of the impact of recreational divers on the resource which makes it difficult to determine if the recent decline in recorded commercial landings are due to overfishing or simply due to the recreational fishery taking a larger proportion of available resource. The mortality associated with continued use of undersize lobsters as live attractants is in conflict with this objective because the mortality associated with the use of immature undersize lobsters may jeopardize future recruitment potential (Lyons et al. 1981; Lyons 1986; Gregory and Labisky 1982). The loss in yield associated with undersize lobster mortality is compounded by the continuing annual increase in the number of traps fished that create an ever increasing demand for more undersize lobsters as attractants; consequently, greater numbers of undersize lobsters are being lost to the fishery each year.

Objective 2 — Increase Yield by Weight from the Fishery.

The primary management measure supporting this objective is the restriction on minimum size. Conversely, the primary detriment to achieving this objective is the undersize lobster mortality that is occurring due to illegal harvest and current fishing practices as discussed above under Objective 1. The fishery is primarily managed on a yield per recruit basis. Maximum yield per recruit occurs at 3.5 inches carapace length and the minimum size of 3.0 inches carapace length represents 85 to 90 percent of the available maximum yield. Because the Florida minimum size was 3.0 inches carapace length and that an increase in minimum size was potentially disruptive to the fishery economically, the Councils chose to maintain the 3.0 inch carapace length in conjunction with the closed season. However, the undersize lobster mortality due to illegal harvesting and current use of live attractants has effectively created a minimum size limit of about 2.5 - 2.75 inches carapace length (Warner et al 1977; Yang and Obert 1978; Lyons et al 1981). Consequently, yield production is currently at least 20 percent below that of maximum yield per recruit (see Exhibit 5-11 on page 5-20 of the Spiny Lobster FMP).

Objective 3 — Reduce User Group and Gear Conflicts in the Fishery.

The primary management measures supporting this objective are the restrictions on molesting and poaching another's trap, night fishing, and the establishment of the two-day recreational season. Since the FMP was implemented gear conflicts have been minimal, therefore, it appears the FMP has been successful in this regard. User group conflicts have also been alleviated by the two-day recreational season in the EEZ; some conflicts still occur in State waters due to the overlap of Florida's two-day season with the preseason trap deployment period. Inseason conflicts between recreational divers and commercial trappers still occur because most of the available fishing areas are restricted to the shallow nearshore waters in the upper Florida Keys, that is readily available to both user groups. In addition, poaching is reported to be a continuing problem, particularly in the upper Florida Keys.

Objective 4 — Acquire the Necessary Information to Manage the Fishery.

The statistical reporting system for spiny lobster was not implemented because Florida was in the process of implementing a statewide trip ticket system for the commercial fishermen and the Councils did not desire to burden the lobster fishermen with duplicate data collection systems. The potential exists for the Florida system to satisfy most of the Councils' data needs in the lobster fishery. However, under the Florida system as currently implemented the critical detailed effort and area of capture data are voluntary. In addition, little routine information is available on the sex and size composition of the landed lobsters; such information would be valuable for monitoring the impacts of fishing and environmental changes on the lobster population. Without a routine collection of landed lobster characteristics it will be extremely difficult to determine potential impacts of a change in (or maintenance of) FMP management measures. The NMFS has recently implemented a small-scale sampling program to measure lobsters dockside, however, it is unknown if the current sampling regime is sufficient to be representative of fishery landings since the fishery is prosecuted in a number of different geographic locations each with a different size composition of lobsters.

As the lobster fishery becomes more overcapitalized and competition increases among the major user groups — recreational and commercial — social and cultural data needs will become more critical. Currently, the above two user groups are not adequately identified by the Florida permit system. The Councils and NMFS have jointly funded an anthropological and economic study of the lobster fishery with particular emphasis on identifying alternative limited entry programs. Currently, anyone can enter the Federal fishery at no cost and enter the State commercial fishery for a $50.00 permit fee. Consequently, although there are only about 600 commercial fishing craft in the fishery, over 4,000 Florida permits have been issued as of the 1986 fishing season. Obviously, any consideration of a limited entry program must first identify the participants in the fishery and associated user groups. Due to the lack of data on even the major two user groups, it is not possible to adequately assess potential impacts of alternative management measures to assure fair and equitable treatment.

Objective 5 — Promote Efficiency in the Fishery.

This objective is primarily supported by the minimum size, seasonal closure, prohibition on trap poaching and night fishing, and the allowance of using undersize lobsters as live attractants. The minimum size provides the maximum dollar value for the commercial fishery and promotes harvesting efficiency for both commercial and recreational fishermen because a significant increase in minimum size would reduce the availability of legal lobster for at least one season. The seasonal closure provides economic benefits to the fishery by allowing the standing stock of legal lobsters to increase during the summer thus providing improved catch rates during the following fishing season while limiting total annual fishing costs. The prohibition on trap poaching and night fishing are complementary and promote efficiency by reducing theft.

The allowance of using undersize lobsters as live attractants has immediate short-term benefits in promoting efficiency. Live lobster bait used as an attractant is the most effective bait available to the fishery. Live attractants catch about three times more legal size lobsters than any other available bait.

5.0 DESCRIPTION AND STATUS OF THE SPINY LOBSTER FISHERY AND STOCK

5.1. Description of Data Available

Commercial catches of spiny lobster by month (pounds whole weight) are compiled by the National Marine Fisheries Service (NMFS) based on reports required of wholesale seafood operations and by the Florida Department of Natural Resources (FDNR) through the recently implemented commercial trip ticket system. Since the Florida system has been in place for only two years the primary data source is NMFS. Florida landings have historically been divided into two general areas (east and west Florida) represented primarily by Dade and Monroe Counties, respectively. Data on the number of traps fished per year have been obtained by the NMFS port agents and are the only historical index of fishing effort for the fishery; these data are obtained annually from wholesale fish houses.

Three main categories of unrecorded catch are known: (1) recreational catch of legal and undersize lobsters; (2) commercial legal size catch not sold through fish houses; and (3) commercial harvest of undersize lobsters. Recreational catch is unknown and probably substantial. The annual two-day sport diving season attracts considerable attention and, since its establishment in 1975, has become a major event with sport divers, attracting people from throughout the State.

The second category of unrecorded catch (catch passing directly from fishermen to retailers) has been reported to increase in recent years. Many Keys fishermen have obtained their own freezing facilities, marketing their own product some of the time and selling to licensed wholesalers at other times. Another apparently increasing trend is direct sales to trucking operations, which transport the fresh catch for direct sale in Miami and elsewhere.

In addition to unrecorded catch, an unknown proportion of the recorded catch is comprised of either undersize lobsters or from foreign waters, principally from the Bahamas. Landings of Bahamian lobsters were more likely to have been included in data from the east coast of Florida (Dade County) than in data from the west coast (Monroe County) in recent years.

5.2. Description of Fishery and Participants

Domestic commercial and recreational fisheries for spiny lobsters are limited primarily to southeastern Florida and the Florida Keys. Wood slat traps are the predominate gear in the commercial fishery. Fishing craft range from 16–55 feet in length, and most are constructed of fiberglass.

The greatest production of spiny lobster comes from Monroe County, which includes the Florida Keys. Fishing craft in the lower Florida Keys (Marathon to Key West) tend to be larger than those fishing in the upper Florida Keys (Key Largo to Long Key). Lower Keys craft now average 50 feet in length and may fish up to 5,000 traps, using a two-week soak time (Powers and Bannerot, 1984). Trips last up to five days and a craft may fish lines of traps many miles apart. A buddy system is often used so that one craft may watch another's trap line to reduce poaching, which occurs both among commercial fishermen and between recreational and commercial fishermen. In the upper Florida Keys, small day craft still dominate the commercial fishery, fishing 500–800 traps per craft.

Considerable quantities of spiny lobster are also taken by hand by recreational and commercial divers using SCUBA, hookah, or free diving. Commercial divers usually use SCUBA in the channels passing under the Overseas Highway and in various shallow natural and artificial habitats between the Keys and the offshore reef break. Significant commercial harvest by diving occurs in Florida Bay south of the Everglades National Park and into the Gulf of Mexico. Recreational divers exploit similar areas. In addition to diving, a small proportion of the recreational catch is taken with lights and bully nets at night on shallow flats and bays.

Little fishing effort for spiny lobsters occurs north of Monroe County on the west coast of Florida. The majority of lobsters not caught off Monroe County come from waters off Dade and Broward Counties. Commercial harvest by diving is not prevalent in Dade County. Recreational divers work the channels and flats between Cape Florida and Ragged Keys and the creeks from Ragged Keys to Key Largo, as well as numerous natural and artificial habitats on the shelf between the Keys and the offshore reef tract.

Commercial trapping is sharply curtailed north of Broward County. Limited diving effort, primarily recreational, occurs as far north as the West Palm Beach area.

5.3. Trends in the Fishery

In the five years since the fishery data were last examined, the number of traps used in the commercial fishery increased and reported landings have declined. Anecdotal information indicates recreational lobster fishing is becoming more popular each year. Without more effective management, the future probable condition of the fishery will be one of continued overfishing.

5.3.1. Landings and Effort

Annual landings, number of traps available for use during the year, and number of craft (boats and vessels) have shown a general increasing trend from 1952 to the early 1970's in the Florida west coast (Powers and Bannerot, 1984; Table 5.1). Since the early 1970's landings have become more variable (Powers 1985), but have exceeded seven million pounds only once (in 1979) since 1974, whereas fishing effort (number of traps and traps per craft) have continued to increase (Figure 5.1 and Table 5.1).

These effort data do not indicate the actual fishing mortality being exerted due to the absence of soak time information. Therefore, landings per trap is probably a biased index of abundance and most likely is an overestimate of abundance. Even so, catch per trap has shown a marked decrease in the west coast fishery (Table 5.1). The east coast fishery had a period of high landings with a large number of traps in the late 1960's and early 1970's; most of these landings were probably from Bahamian waters. The Bahamian government began enforcing its poaching laws in 1974 and subsequently landings and effort declined. Presently, the east coast fishery is operating at a low level.

Since 1975 the number of lobster permits issued by the State of Florida has doubled, increasing from approximately 1,800 to 4,000 in 1985. The cause of the dramatic increase in the number of permittees is probably due to a combination of factors, including increased daily harvest by recreational or part-time fishermen, increased Cuban immigrant fishermen, and possibly expectation of limited entry in the fishery. As the recreational fishery grows the number of recreational fishermen holding lobster permits will probably also increase. Many of the Cubans that immigrated to the U. S. in 1980 were probably fishermen and may have contributed to recent increases in the

number of lobster permit holders (Labisky et al., 1980) since lobster fishing is one of the major fisheries in Cuba. More importantly, however, may have been the expectation of limited entry. In the years preceding implementation of the FMP, lobster permit holders increased up to 4,100 in 1981 and dropped to 3,000 in 1982—the year the FMP was implemented. A similar increase occurred in 1985 as the result of publicity surrounding the Councils' interest in limited entry.

5.3.2 Prices and Costs

There were no major changes in price-determining variables during the period since the FMP was implemented. Real exvessel prices averaged slightly higher during the 1980-84 period than in the previous five years (Table 5.6), although there was no sig ificant trend over the ten-year period 1975-1985.

There was no evidence of significant structural change in the industry over the 1975-1985 decade that would invalidate the cost and returns analysis presented in the FMP document (and recapitulated in Tables 5.8 - 5.10). The industry has performed as expected for an open access fishery in which there is no obvious, strong relationship between spawning biomass and recruitment. Annual sustainable yield is probably beyond MSY due to growth overfishing. As real price goes up, the short-run effect is that real return to effort, defined in terms of a variable capital/labor combination of craft, traps and crew, tends to increase as well. To the extent that the opportunity costs (i.e. the alternative employment opportunities and interest rate) of these inputs do not change, more effort enters the fishery. This drives the return to effort back to or (because of lags, the imperfect realization of expectations, and the immobility of labor and capital) actually below the level of opportunity costs. The real price has increased slightly over the 1975-85 period (Table 5.6). The number of traps, especially on the west coast of Florida, has increased over the same period (Table 5.1). Consequently the value of catch per trap in 1984 dollars has tended to decrease over the period and the constant dollar value of catch per craft has tended to increase (the trends are not significant in either case), reflecting the increased number of traps in the fishery and the increased number of traps fished per firm (Table 5.7).

The firms sampled (Tables 5.8-5.10) were chosen to represent the full-time commercial industry. The firms fished an average of 1,085 traps each over the season, and reported total costs attributable to spiny lobster fishing of $26,032 for the 1978-1979 season. If the average for total cost of $24 per trap fished is taken to represent the cost of fishing each of the traps fished in 1978 or 1979, then a comparison with the value per trap fished on the west coast of Florida in 1978 or 1979 indicates that total costs were not fully recovered. The sample average for variable costs of $21 per trap fished would have been just recovered on average in the two years. This situation is to be expected in an open access fishery of the nature of the south Florida spiny lobster fishery.

5.4. Status of Spiny Lobster Stock

5.4.1. Stock Assessment

Season Length

The effective length of the fishing season, as indicated by monthly landings, is becoming shorter. Since 1979-1980, at least 85 percent of the seasonal landings from the Florida west coast were taken before the end of December; at least 93 percent were taken before the end of January (Powers and Bannerot, 1984; Table 5.2) If unreported catches

have occurred at either the same rate or follow a seasonal trend similar to recorded landings during this time period, then it appears that the entire fishery is becoming concentrated in time. The most obvious explanations are either that recruitment has declined during these years or that the fishing mortality rate has increased, or a combination of both. The pattern of monthly catches, the increase in number of traps, and anecdotal information about relative amounts of fishing effort lead to the conclusion that the fishing mortality rate has been high during recent seasons. However, without knowing the distribution of fishing mortality within a season, the effects of fishing and recruitment cannot be separated.

Abundance and Fishing Mortality

Beginning season abundance has been quite variable over the last five years but does not appear to follow a particular trend. Annual fishing mortality rate has been high with F being between 1.10 to 1.75 (Powers and Bannerot, 1984; Powers, 1985).

If the unreported catches have increased greatly over the last ten years, then either recruitment has increased or the pattern of recruitment has changed. However, the fishery is becoming increasingly dependent on new recruits and appears to be supported by a single year class. Consequently, the success of the fishery is dependent upon the strength of the entering year class of undersize lobsters that grew into legal size during the preceding closed season. The variability in annual catches in the past six to seven years is probably due to variability in recruitment (Figure 5.1).

Yield Per Recruit

The yield per recruit of spiny lobster was reexamined in 1984 to determine the effects of fishing practices on the potential yield of the fishery. Size of recruitment (l_r) was assumed to be 65 millimeters (2.5 inches) carapace length. The present legal size or size of first capture (l_c) is 76.2 millimeters (3.0 inches) carapace length. Two alternatives were also tested, l_c = 88.9 millimeters (3.5 inches) and l_c = 101.6 millimeters (4.0 inches). The monthly mortality rate was assumed to be M = 0.05. The yield per recruit was calculated based upon an August 1st recruitment date at size l_r = 65 millimeters carapace length. In addition it was assumed that fishing only occurred from August 1 to March 31 and that only natural mortality occurred between April 1 and July 31.

Two other sources of mortality were included in the analysis: (1) fishing mortality due to the harvest of undersize lobsters, F_s; and (2) fishing mortality due to the use of undersize lobsters as bait, F_b. It was assumed that yield to the harvester was derived from the rate F_s, whereas it was not for F_b. These rates were expressed in the analysis as a ratio relative to the fishing mortality rate on legal size lobster (F_s:F_1 and F_b:F_1).

At the present annual fishing mortality rates of approximately 1.25 – 2.0, if the baiting mortality of shorts is 40 percent of the total legal mortality (i.e, F_b/F_1 = .40) and harvest mortality of undersize lobsters is 40 percent (i.e., F_s/F_1 = .40), then the loss in yield per recruit is 20 percent to 50 percent (Figures 5.2 and 5.3). If the minimum size is increased, the potential yield per recruit is increased, but baiting practices would tend to negate this potential. Similarly, if a baiting mortality of 20 percent occurs then, the percent loss in yield per recruit is 10 percent to 30 percent.

There are several potentially controllable variables which contribute to the above yield per recruit values. Specifically, these are: (1) the legal size, (2) the magnitude of fishing, (3) the distribution of fishing, and (4) mortality of undersize lobsters, F_s and F_b.

First, changing the legal size does not have much potential for increasing yield per recruit if the short mortality practices are not changed concomitantly; simply increasing the legal size would worsen the problem of undersize lobster mortality.

Second, present fishing mortality rates are high. The concentration of fishing mortality at the beginning of the year makes yield per recruit losses greater than if fishing was distributed evenly throughout the year. It is unlikely the seasonal distribution of fishing effort can be indirectly controlled. However, if the total fishing mortality rate was reduced by approximately one-half and baiting practices were not altered, yield per recruit would increase 15 percent to 25 percent (if $F_b/F_1 = 0.4$) or 5 percent to 10 percent (if $F_b/F_1 = 0.2$).

Harvest of undersize lobsters between the sizes of 65 millimeters (2.5 inches) and 76 millimeters (3.0 inches) does not have much additional negative effect on yield as long as baiting mortality occurs since harvested lobster represent utilized yield, albeit illegal, (compare Figures 5.2 and 5.3). However, if the recreational effort is high, skewed strongly to the beginning of the season, or relative undersize lobster harvest (F_s/F_1) is greater than 40 percent, there may be additional yield losses due to this illegal harvest of undersize lobsters.

Baiting mortality has the most negative impact on yield per recruit. This is because it is a unharvested source of mortality which impacts small lobsters. Reducing the ratio of baiting mortality from 40 percent to 20 percent would produce a 10 percent to 15 percent increase in yield. Additionally, a reduction in effective effort would further improve yield to the fishery. Therefore, reduction in the unharvested mortality of shorts has the most potential for improving yield over any other single management action affecting yield per recruit.

The loss of undersize lobsters due to baiting mortality not only affects potential yield, as discussed above, but also reduces potential reproductive output of the population (Lyons et al., 1981; Gregory et al., 1982; Hunt and Lyons, 1986; Lyons, 1986). Thus the future stability of the resource is jeopardized by the current magnitude of undersize lobster mortality.

5.4.2. Assessment of Handling Practices of Undersize Lobsters

Effects of Air Exposure and Trap Confinement to Undersize Lobsters

Traps in the south Florida spiny lobster fishery are baited with live undersize lobsters, many of which are exposed to air for considerable periods aboard vessels before being placed in traps and returned to the sea. Average mortality rate of lobsters exposed for 1/2, 1, 2, and 4 hours in controlled field tests was 25.3 percent after four weeks of confinement (Lyons and Kennedy, 1981; Hunt et al., 1986). Approximately 42 percent of observed mortality curred within one week after exposure, suggesting that exposure may be the primary cause of death. Neither air temperature during exposure nor periodic dampening with seawater had significant effects on mortality rate. Mortality caused by baiting traps with undersize lobsters may produce economic losses in dockside landings estimated to range from 1.5 to 9.0 million dollars annually (Hunt et al., 1986).

Of those lobsters exposed to air experimentally, desiccation rates were faster in smaller lobsters (Vermeer, 1985). During a two-hour exposure, blood lactic acid levels increased more than 11 times, pH fell more than one-half point and ammonia concentrations nearly

doubled. Exposure-induced changes in blood parameters occurred most rapidly in the first 30 minutes and began to level off after two hours. In recovery experiments, all lobsters exposed for two hours then returned to the water for 24 hours survived, 75 percent had a delayed or absent tail-flip escape response, and most exhibited diminished defensive activity. These results indicate acute effects due to exposure do not directly cause mortality but inflict sufficient damage to sensitive nervous tissue to induce potentially lethal aberrations in escape and defensive behaviors (Vermeer, 1985).

Relative Effectiveness of Alternative Spiny Lobster Baits

Catch by traps baited with shorts was approximately three times greater than that obtained using any other bait currently available to the fishery (Table 5.3). There was no significant difference in average catch/trap among traps baited with cowhide, University of Florida processed bait, fish heads, or traps deployed empty (Hunt and Lyons, 1985).

Potential Gear Modifications for Reducing Undersize Lobster Mortalty

Two potential gear modifications that will reduce undersize lobster mortality include the use of live wells aboard fishing craft to reduce the exposure mortality and the installation of escape gaps in traps to reduce the catch rate of undersize lobsters which would not only reduce both trap confinement and on board exposure mortality but would also reduce illegal harvest of undersize lobsters for sale.

Fishermen report that undersize lobsters kept in a live well aboard fishing craft are more active than those kept in a open fish box, and are more effective as attractants (Hunt, 1985). However, undersize lobsters transported in live wells from one side of the Florida Keys to the other experience higher mortality than those moved within the region of capture; this mortality may be due to crowded conditions in the live well, duration of confinement during transport, or relocation to a different environment.

Careful, continuous use of a live well to transport undersize lobsters from trap to trap will likely reduce mortality during the first week or two of confinement in a trap. Mortality of undersize lobsters exposed to air is considerable during those first weeks of use as attractants (Hunt et al., 1986). Live wells may effectively address the air exposure component of undersize lobster mortality, however, other sources of mortality occur to undersize lobsters used as attractants. The combined effects of starvation and predation of lobsters confined in traps for extended periods are important components of total mortality of undersize lobster attractants (Lyons and Kennedy, 1981; Hunt et al., 1986). Live wells do not solve the problem of mortality associated with confinement for extended periods. Lobsters maintained in live wells may avoid exposure-related mortality, only to succumb later to starvation or predators; the entire amount of mortality previously ascribable to exposure will not be eliminated.

Traps with escape gaps are effective at reducing catch of undersize spiny lobsters (Hunt and Lyons, 1985; Frazel, 1986). Traps equipped with escape gaps caught significantly fewer undersize lobsters than did the control (no escape gap) commercial traps; Hunt and Lyons (1985) found traps fished in the upper Florida Keys with 2, 2 1/16, and 2 1/8 inch escape gaps caught approximately 73 percent, 91 percent, and 97 percent fewer undersize lobsters respectively than control traps (Tables 5.4 and 5.5) whereas Frazel, on the southeast Florida coast (February-January), found that traps equipped with 2 and 2 1/8 inch escape gaps caught 48 percent and 99 percent fewer undersize lobsters respectively (Table 5.11). The average size of lobsters caught in each of the Florida Keys traps were 2.7 (69), 3.0 (77), 3.1 (80), and 3.1 (78) inches (millimeter) carapace

length for lobsters captured in control, 2, 2 1/16, and 2 1/8 inch escape gap traps respectively during the fishing season. Similarly, Frazel found the average carapace length of lobsters in control, 2, and 2 1/8 inch escape gap traps to be 3.1 (79), 3.3 (83), and 3.5 (89) inches respectively.

In the Florida Keys study, the catch rate of legal size lobsters in two-inch escape gap traps (0.13 - winter; 0.90 - summer) was not significantly different, statistically, from standard commercial traps (0.19 - winter; 1.14 - summer). However, the catch rates of 2 1/16 and 2 1/8 inch escape gap traps were significantly less than that of standard traps; these traps respectively caught at least 40 percent and 63 percent (average of winter and summer catch rates) fewer legal size lobsters than the standard traps. Conversely, in the southeast Florida study, the catch rate of legal size lobsters in two-inch escape gap traps (0.40 lobsters/trap) was 1.7 times greater than the legal catch rate of the standard commercial trap (0.23 lobsters/trap) and the catch rates of traps with 2 1/8 inch escape gaps (0.25 lobsters/trap) were not significantly different from the standard commercial traps.

The differences observed in the above two studies on the effect of escape gaps are most probably related to differences in the average size of lobsters found in each geographic area; the average carapace length of lobsters caught in standard commercial traps was 2.7 inches in the Florida Keys and 3.1 inches in southeast Florida. These results indicate escape gaps are more effective in areas inhabited by larger lobsters; this phenomena has been observed in only one other spiny lobster population — New Zealand (Bain, 1967). Typically, traps equipped with appropriately designed escape gaps catch more legal size lobsters than traps without escape gaps (Bowen, 1963, Western Australia; Ritchie, 1966, New Zealand; Everson et al., 1984, Hawaii).

5.5. Status of the Slipper (Spanish) Lobster Stock

The species *Scyllarides nodifer* comprises the slipper lobster fishery, which occurs almost exclusively in the EEZ adjacent the west coast of Florida. The slipper lobster is also known as the bulldozer, Spanish, shovelnose, or sand lobster. The FMP includes the slipper lobster but only as an incidental species; no management program was implemented. However, the FMP states slipper lobsters should be included in the management unit if the status of the fishery changes.

Slipper lobster larvae are remarkably similar to spiny lobster larvae in their appearance and biology - each have an extended (nine to 12 month) larval period. Growth rates, behavior, and habitat preferences for juveniles and adults are not well known for either of the slipper lobster species (Ogren 1977). Spawning in S. nodifer females in the eastern Gulf of Mexico occurs primarily in the summer months of May - August (Lyons, 1970).

Slipper lobster have always been caught incidentally by the Gulf shrimp fishery, however recently, when localized concentrations are found or at certain times of the year, shrimp boats may fish directly for slipper lobsters. Although most lobsters are caught by trawls, there is also interest in developing a trap fishery.

Recorded landings of slipper lobsters in Florida have grown from 1,200 pounds in 1979 to 102,000 and 63,000 pounds respectively in 1983 and 1984. In 1984, 31 dealers on the Florida west coast reported landings of slipper lobsters worth $146,000 dockside. Virtually all the landings occur on the west and northwest Florida coasts; there are no recorded landings from elsewhere in the Gulf of Mexico. More importantly, approximately 43 percent of these landings occur during the reproductive season of May

through August. Interest in the harvest of slipper lobster is fueled by a favorable market that provides a wholesale price equal to that of the spiny lobster.

There is concern that the new fishery, if not managed, may impair the productivity of the slipper lobster stock particularly because a large proportion of the landings occur during the spawning season and that egg-bearing females are being harvested. Also, some Scyllarid fisheries elsewhere in the world have been unable to sustain a commercial fishery (Martins, 1985).

Specification of MSY, OY, TALFF, and EDAH

The current database is insufficient to quantitatively determine MSY, therefore MSY is set to be the same as OY. The OY for slipper lobster is specified to be all non egg-bearing slipper lobster that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions. Estimated EDAH is equal to OY and TALFF is set at zero pounds.

5.6 Description of Related Habitats

5.6.1 Condition of the Habitat

The spiny lobster occupies three major habitats during its life cycle. Larvae occur in the open ocean in the epipelagic zone of the Caribbean Sea, Gulf of Mexico and Straits of Florida. Postlarvae and juveniles occupy shallow coastal waters of bays, lagoons, and reef flats while the adults generally occur at seaward reefs and rubble areas. The slipper lobster exhibits a similar larval history but appears to exist as juveniles and adults on the outer continental shelf areas characterized by sandy bottom with rockey outcroppings (Lyons 1970; Ogren 1977). No specific information exists on the habitat requirements for the slipper lobster.

The oceanic environment of the Caribbean and Straits of Florida is characterized by relatively constant temperature, salinity and constantly low concentrations of nutrients and phytoplankton. For details of the physics and chemistry see Wust (1924), Corcoran and Alexander (1963), Vargo (1968), Wood (1968), and Capurro and Reid (1970).

The shallow near-shore rocks, grass beds and mangroves are habitats for spiny lobster postlarvae (pueruli) and juveniles. Pueruli are cryptic living in the subtidal fouling community on rocks, red mangrove roots, pilings, and seawalls. Juveniles take shelter in sponges, natural holes and crevices (Davis, 1978) and among urchins (Davis, 1971). Generally, as the size increases movement toward deeper water occurs.

The reef habitat of Florida curves south and westward from Miami to Key West and the Dry Tortugas. The length is approximately 325 kilometers. The Florida coral reef tract varies from half a meter below mean low water to a depth of about 25 m. Extensive rocky reef areas are found in depths out to 200 fathoms. Spiny lobster are known to occupy such areas out to at least 100 fathoms (E. Perez, personal communication).

The zonation from shore to Straits includes an urchin-encrusting algae zone, a *Porites* coral zone, an *Acropora* coral zone, an *Alcyonarian* soft coral zone, and a massive *Montastraea* coral zone (see for example Storr, 1964: 56).

Craig (1974) described the bottom topography and distribution of "reef" along the 40 miles of coastline between Port Everglades and Palm Beach. Much of this consists of

rocky ledges and hard bottom instead of true coral reefs. In spite of the non-coralline nature of this habitat, lobster population densities apparently reach 3,000-5,000/mi^2 based on conservative extrapolation of average catch data, but rapid changes are known to occur (Craig, 1974). Localized transitory movements between inshore and offshore reefs are known to fishermen and are statistically evident.

5.6.2 Habitat Areas of Particular Concern

The open ocean epipelagic zone of the phyllosoma larvae is subject to oil and tar pollution of increasing magnitude. International law concerning bilge water and oil spills and continued educational efforts should minimize this impact.

Research on the culture of phyllosomes has shown that water which is heavily laden with sediment is detrimental to the larvae since the silt settles on them and weighs them down, causing death (Crawford and de Smidt, 1922). Open ocean dumping should therefore be controlled to reduce flocculent materials.

The shallow water mangrove and grass flat nursery areas have been subject to past abuses of development, dredge and fill, sewage discharge, modified fresh-water discharge, brine discharge, thermal discharge, etc. Existing laws protecting emergent and subemergent vegetation from dredge and fill and present water quality laws of the Florida Department of Environmental Regulation, and federal agencies, Environmental Protection Agency and U.S. Corps of Engineers, offer protection to these environments if they are enforced.

There is a correlation between normal high salinity and the occurrence of *P. argus*. Austin (1972) suggested lobster phyllosomes cannot tolerate the shallow, nearshore waters of the west Florida estuarine system which were less saline than the offshore loop current in the Gulf of Mexico. As a result of Hurricane Alma in June 1966, and the St. Lucie canal discharge, the salinity of the Indian River estuary dropped to 6 o/oo on the surface and interrupted the normal monthly influx of pueruli (Witham, et al., 1968). Discharge of fresh water from the flood control structures was discontinued in September 1966, and monthly recruitment resumed in October (Witham, et al., 1968). Hence an increase of fresh-water discharge into the major lobster nurseries along south Florida could affect recruitment. Point sources of fresh-water discharge near major inlets in southern Biscayne Bay, Florida Bay or between various Keys could, if of sufficient magnitude, hinder recruitment and reduce extent of bay habitat for juveniles.

After pueruli settlement and after pigmentation is fully developed, rocky shallow-water habitats with mangroves and sea grass (*Thalassia testudinum*) beds are the most favored environment and serve as nursery areas for pre-adult populations (Munro, 1974). At the tip of south Florida adjacent to the Keys, turtle grass meadows are a principal vegetation type (Moore, 1963). They are common as well south of the Featherbed Bank in Biscayne Bay and Card Sound (Roessier and Beardsley, 1974), and in Florida Bay (Tabb and Manning, 1961), and throughout shallow areas of the Florida Keys (Turney and Perkins, 1972).

Some experimental replanting of areas devoid of marine sea grasses turtle grass (*Thalassia testudinum*) and halodule (*Halodule wrightii*) has been undertaken (Kelly, et al., 1971; Thorhaug, 1974).

The economics of replanting (Thorhaug and Austin, 1976) indicate a very high cost. The need to import seeds without a quarantine period also opens the danger of accidental

introduction of diseases, parasites or competitors from insular areas. Without more definite proof that the Thalassia detritus food web produces animals of direct benefit to man, the replanting should not be sponsored by the lobster industry.

Panulirus. argus is found on most shelf areas which offer adequate shelter in the form of reefs, rocks, or other forms of cover (Munro, 1974). Artificial reefs and other forms of man-made cover provide shelter from natural predators, but the evidence is inconclusive if the effect is one of concentration or if habitat improvement actually increases the standing stock or reduces natural predation. Chittleborough (1970) has shown that the natural mortality of pre-recruit P. longipes cygnus in Western Australian waters is directly related to the density of the pre-recruit populations, and postulated that the amount of shelter on a given reef might be a limiting factor, leading to high mortality amongst individuals which are unable to find a safe refuge by day. However, in coralline areas it seems unlikely that the amount of shelter offered by a reef would ever be a limiting factor, but this might be important in shelf areas which have a sparse coral cover (Munro, 1974). Davis (1976) created a concrete block shelter in south Biscayne Bay but demonstrated no net increase in the lobster population of the area after seven months, despite recruitment of small (35 mm CL, 1.4 inch) lobsters and migration of 90 mm CL (3.6 inch) subadults. The artificial habitat attracted lobsters in larger numbers from adjacent areas, but the overall population per unit area remained constant (Davis, 1976).

While shelter may not be a limiting factor on juvenile spiny lobsters in south Florida (Davis, 1976), during periods of movement from shallow nursery areas to offshore reefs it probably plays an important role as a refuge from predatory pressure.

Man-induced damage has occurred to reef habitats due to dredging, removal of corals and shellfish, and anchor damage in areas of high boater use, such as John Pennekamp Coral Reef State Park. Stirring of sand or mud at the bottom of a lobster den is sometimes used by recreational fishermen to cause the lobster to vacate a den (Dunaway, 1974). Silting of the spiny lobster habitat downstream from a sewage outfall construction (dredging) seemed to reduce commercial catches with a definite downplume avoidance of the reef habitat by lobsters (Craig, 1974). It is generally thought that the reef tract in the Florida Keys is healthy (stable), though present research is concerned with both natural and man-induced disturbances affecting the total coral reef habitat.

Both dredge and fill and sewage outfall programs are regulated by state (Department of Environmental Regulation) and federal (EPA/Corps of Engineers) permits with public hearings. Adequate consideration of lobster

stocks can be assured by active participation by the Gulf of Mexico and South Atlantic Fishery Management Councils.

5.6.3 Habitat Protection Programs

Mangrove islands, tidal passes, and surrounding shallow water habitats of southern Dade County are protected in Biscayne National Monument. The first 30 miles of coral reefs from Key Largo south are preserved as the John Pennekamp Coral Reef State Park and the Key Largo Coral Reef Marine Sanctuary. Further south, a five square mile coral reef off Big Pine Key will be protected under proposed regulations as the Looe Key Coral Reef National Marine Sanctuary. The Marquesas Keys are a National Wildlife Refuge, while the Dry Tortugas are preserved as a National Monument. In addition, the Everglades National Park preserves a large portion of the mangrove habitat of the state,

vast acreages of shallow grass beds and in its southern reaches, protects some lobster habitat.

Section 7 of Article II of the Florida Constitution provides that it shall be the policy of the State to conserve and protect its natural resources and scenic beauty. The Florida code (Ch. 17-4.28 and 4.29) regulates dredge and fill activities, (Ch. 7-4.02) protects submerged lands, (Ch. 17-3, Fla. Admin. Code) provides water quality standards and (Ch. 161 F.S.) protects beaches and shorelines. In addition, the Randall Act (Ch. 253 F.S.) prevents the sale of state-owned lands, except after conservation considerations are met. This Act stopped sale of state-owned submerged lands. By definition, submerged lands in Florida are those lands covered by the categories of water listed in Section 17-4.28(2), Fla. Admin. Code, and having plant dominance as therein listed. Some of the dominant plants are mangroves (black, red and white), as well as the major marine grasses (halodule, manatee, and turtle grass).

In addition Florida has established special use areas, including Aquatic Preserve System, State Wilderness System, the Environmentally Endangered Lands Program, the state park system, and wildlife refuges, with special protection for wildlife and a special Outstanding Florida Waters (OFW) designation.

Other programs, including the Land and Water Management Act of 1972, established special concern for "Areas of Critical State Concern" including the Florida Keys and "Developments of Regional Impact" which may need special regional environmental regulation.

The Federal Coastal Zone Management Act of 1972 (amended and given new authority in 1975) also encouraged Florida to set up programs "to preserve, protect, develop, and where possible, to restore or enhance the resources of the nations coastal zone for this and succeeding generations." Florida is currently developing its Coastal Management Program which will address environmental, economic, and institutional programs within a general resource management framework.

[illegible] landings (whole weight), number of traps fished and number of craft fishing in the south Florida spiny lobster commercial fishery 1952-1985 (calendar year)

	East Coast of Florida			West Coast of Florida			Florida Total				
Calendar Year	Reported Landings (lbs x 10^3)	No. Traps x 10^3	lbs/trap	Reported Landings (lbs x 10^3)	No. Traps x 10^3	lbs/trap	Reported Landings (lbs x 10^3)	No. Traps x 10^3	lbs per Trap	No. Craft	Traps Per Craft
1952	1156	10	112	447	5	99	1603	15	108	80	186
1953	1421	19	74	574	7	88	1995	26	77	147	175
1954	1223	19	65	722	12	62	1945	30	64	157	194
1955	1079	26	41	1210	13	93	2289	39	59	166	235
1956	799	16	49	2309	17	137	3108	33	94	128	257
1957	651	14	46	3384	22	154	4035	36	112	161	223
1958	623	11	56	2328	23	100	2951	34	86	187	184
1959	543	18	30	2635	34	78	3178	52	61	254	204
1960	719	19	38	2126	55	39	2845	74	39	221	333
1961	702	13	53	2100	39	54	2802	52	54	195	268
1962	672	16	42	2434	58	42	3106	74	42	248	300
1963	815	20	40	2770	60	46	3585	80	45	246	326
1964	786	40	20	2844	74	39	3630	114	32	341	333
1965	1329	49	27	4379	90	49	5708	139	41	332	418
1966	1686	76	22	3650	75	49	5336	151	35	488	309
1967	1677	94	18	2719	92	30	4396	186	24	528	352
1968	2234	70	32	3892	99	40	6126	168	36	452	373
1969	2929	68	43	4621	97	48	7550	165	46	440	374
1970	3018	69	44	5235	150	35	8253	219	38	492	445
1971	3418	79	43	4653	147	32	8071	226	36	520	434
1972	6267	98	64	4640	174	27	10907	272	40	599	455
1973	5622	133	42	4993	172	29	10615	304	35	671	454
1974	4139	144	29	5631	227	25	9770	371	26	690	538
1975	2319	92	25	4472	428	10	6781	520	13	823	632
1976	987	32	31	4136	315	13	5123	346	15	549	630
1977	1501	47	32	4693	408	12	6194	455	14	635	717
1978	891	43	21	4711	529	9	5602	572	10	672	851
1979	841	29	29	6939	565	12	7780	594	13	666	892
1980	999	35	28	5696	525	11	6695	560	12	595	941
1981	880	27	33	5014	517	10	5894	544	11	583	933
1982	857	40	21	5640	502	11	6497	542	12	539	1006
1983	654	35	19	3663	520	7	4317	555	8	550	1009
1984	205	20	10	5961	655	9	6166	675	9	610	1107
1985 1/	290	23	13	5018	541	9	5308	564	9	517	1091

1/ Preliminary

Table 5.2. Reported landings of spiny lobster (lbs whole weight) by season and month for the west coast of Florida commercial fishery

Catches by Year (Season) and Month

	August	September	October	November	December	January	February	March	Season
1959-1960	460727	353362	306273	368248	336855	174907	177472	134619	2392463
1960-1961	411804	279797	404489	316385	229668	132836	173584	149377	2097940
1961-1962	394132	327353	310625	372857	240634	189763	118053	245207	2198624
1962-1963	438487	329181	299664	419675	394713	223351	110885	208149	2424105
1963-1964	504439	417970	416763	458927	430196	246783	214706	191194	2888888
1964-1965	534358	413994	452829	508299	283257	182436	181693	426929	2983787
1965-1966	777651	584868	1157480	639829	434209	143043	134552	445667	4317299
1966-1967	647991	366745	590559	719041	283679	205385	109322	198787	3121509
1967-1968	530562	389328	497453	465146	340989	342983	287188	379719	3233368
1968-1969	708159	489229	642067	732068	339454	152848	266326	270233	3600368
1969-1970	971184	894683	709306	752694	635298	451886	383520	422867	5140558
1970-1971	1152538	1038109	1385181	1138968	959608	351651	218785	309366	6546026
1971-1972	1126292	735481	875685	767801	411155	454293	468239	259241	5890107
1972-1973	691349	678168	933893	736621	528908	374854	272058	226252	4434005
1973-1974	967647	995355	1006544	780385	649884	259325	184216	319846	5163282
1974-1975	1706642	864153	1492581	585822	991034	388347	221756	197578	6279825
1975-1976	1467456	897203	839039	567712	350943	263630	352525	312740	5851248
1976-1977	1043551	588312	819861	593926	328180	244856	144158	133235	3886499
1977-1978	1025338	859928	1228184	695970	437454	387752	122289	96471	4773378
1978-1979	848862	755954	1175285	794488	519159	425751	274125	199125	4984589
1979-1980	1424862	1299748	1266342	1165182	757671	497622	330513	216690	6958550
1980-1981	1499828	838512	893424	854746	408854	384361	183493	154550	5137768
1981-1982	1481675	686708	879248	764858	508992	252763	166788	147797	4808829
1982-1983	1420952	1120098	1098177	826036	415921	256777	147338	105562	5382845
1983-1984	990941	710539	555708	558158	284609	287989	156233	205983	3750168
1984-1985	1441342	1126283	1115928	976727	467668	328635	155586	180384	5792457
1985-1986 1/	1167195	1089365	743418	568234	630431	228995	125876	108831	4661595

1/Preliminary

Table 5.3 Comparisons of catch of all sized lobsters from traps of each bait tested June - August 1985. No adjustments for soak period have been made. Catch/trap=mean ± 1 SE. Statistical tests were made using ANOVA on log transformed data. The ANOVA was significant. A posteriori comparisons between means were made using the GT2-method recommended by Sokal and Rohlf (1981) for unequal cell sizes. Vertical lines to the right of Catch/trap are results of GT2 comparisons.

Treatment	Trap Pulls	Number of Lobsters	Catch/trap
Shorts	234	646	2.76 ± 0.22
Empty	238	221	0.93 ± 0.16
Cowhide	243	215	0.89 ± 0.12
Ache/Carr	218	186	0.85 ± 0.13
Fish Heads	240	187	0.78 ± 0.14
Catfood *	76	25	0.33 ± 0.18
A & G Lobster Bait	167	29	0.17 ± 0.05

* Catfood was tested only during the open season. Catch rates of traps of all baits were lower during the open season.

Source: Hunt and Lyons 1985b; Table 2.

Table 5.4 Comparison of catch in standard traps to traps with escape gaps, from experiments conducted October 1984 - January 1985. Catch rates have been adjusted for variable soak periods in order to reflect a constant soak period of 7 days. Catch/trap=mean ± 1 SE. Number of lobster rounded to nearest integer. Statistical tests were made using ANOVA on log transformed data. The ANOVA was significant for shorts and legals. A posteriori comparisons of means were made utilizing the GT2-method recommended by Sokal and Rohlf (1981) for unequal cell sizes. Vertical lines to the right of Catch/trap are results of GT2 comparisons.

Treatment	Trap pulls	Number of Lobsters	Catch/Trap
		SHORTS	
Standard	546	332	0.61 ± 0.07
2" Gap	552	67	0.12 ± 0.03
2 1/8" Gap	543	17	0.03 ± 0.01
2 1/4" Gap	534	2	0.01 ± 0.00
TOTAL	2175	418	
		LEGALS	
Standard	546	102	0.19 ± 0.03
2" Gap	552	70	0.13 ± 0.02
2 1/8" Gap	543	52	0.10 ± 0.02
2 1/4" Gap	534	9	0.02 ± 0.01
TOTAL	2175	233	

Source: Hunt and Lyons 1985a; Table 5.

Table 5.5 Comparison of catch in standard traps to traps with escape gaps, from experiments conducted June - August 1985. Catch rates have been adjusted for variable soak periods in order to reflect a constant soak period of 7 days. Catch/trap=mean ± 1 SE. Number of lobster rounded to nearest integer. Statistical tests were made using ANOVA on log transformed data. The ANOVA was significant for shorts and legals. A posteriori comparisons of means were made utilizing the GT2-method recommended by Sokal and Rohlf (1981) for unequal cell sizes. Vertical lines to the right of Catch/trap are results of GT2 comparisons.

Treatment	Trap pulls	Number of Lobsters	Catch/Trap
		SHORTS	
Standard	658	588	0.89 ± 0.07
2" Gap	664	198	0.30 ± 0.03
2 1/16" Gap	658	71	0.11 ± 0.02
2 1/8" Gap	672	37	0.05 ± 0.01
TOTAL	2652	894	
		LEGALS	
Standard	658	748	1.14 ± 0.09
2" Gap	664	596	0.90 ± 0.08
2 1/16" Gap	658	504	0.77 ± 0.07
2 1/8" Gap	672	482	0.72 ± 0.07
TOTAL	2652	2330	

Source: Hunt and Lyons 1985a; Table 6.

Table 5.6–Landings and Exvessel Value in the South Florida Spiny Lobster Commercial Fishery by Year for 1965–84

Year	East Coast Landings (lbs x 10^3)	East Coast Value ($ x 10^3)	West Coast Landings (lbs x 10^3)	West Coast Value ($ x 10^3)	Florida Total Landings (lbs x 10^3)	Florida Total Value ($ x 10^3)	Florida Total Unit Value ($ per lb)	Florida Total Unit Value (1984 $ per lb)
1965	1,329	752	4,379	2,467	5,708	3,219	0.56	
1966	1,686	810	3,650	1,659	5,336	2,469	0.46	
1967	1,677	1,058	2,719	1,675	4,396	2,733	0.62	
1968	2,234	1,580	3,892	2,828	6,126	4,408	0.72	
1969	2,929	1,933	4,621	3,325	7,550	5,258	0.70	
1970	3,018	1,830	5,235	4,088	8,253	5,918	0.72	
1971	3,418	2,932	4,653	4,124	8,071	7,056	0.87	
1972	6,267	6,254	4,640	5,517	10,907	11,771	1.08	
1973	5,622	5,748	4,993	5,914	10,615	11,662	1.10	
1974	4,139	5,068	5,631	8,325	9,770	13,393	1.37	
1975	2,319	3,026	4,472	6,837	6,791	9,863	1.45	2.10
1976	987	1,734	4,136	6,852	5,123	8,586	1.68	2.50
1977	1,501	2,526	4,693	7,899	6,194	10,425	1.68	2.39
1978	891	1,691	4,711	10,253	5,602	11,944	2.13	2.78
1979	840	1,783	6,939	13,285	7,779	15,068	1.94	2.31
1980	999	2,238	5,696	11,845	6,695	14,083	2.10	2.31
1981	880	2,211	5,014	12,390	5,894	14,601	2.48	2.64
1982	857	2,209	5,640	13,357	6,497	15,566	2.40	2.53
1983	654	1,654	3,663	9,093	4,317	10,747	2.49	2.58
1984	205	540	5,961	14,930	6,166	15,470	2.51	2.51

Source: Exhibit 9–1 of FMP, Table 5.1 of this amendment and personal communciation from E. Snell, SEFC.

Table 5.7–Value of Landings Per Trap and Per Craft in Both Current and 1984 Dollars for the Florida Spiny Lobster Fishery, 1975–84

		West Coast of Florida		Florida Total			
	Inflation	Value Per Trap		Value Per Trap		Value Per Craft	
Year	Factor *	Current $	1984 $	Current $	1984 $	Current $ x 10^3	1984 $ x 10^3
1975	1.450	16.0	23.2	19.0	27.6	12.0	17.4
1976	1.488	21.8	32.4	24.8	36.9	15.6	23.2
1977	1.423	19.4	27.6	22.9	32.6	16.4	23.3
1978	1.307	19.4	25.4	20.9	27.3	17.8	23.3
1979	1.190	23.6	28.1	25.4	30.2	22.6	26.9
1980	1.098	20.8	22.8	23.3	25.6	23.4	25.7
1981	1.065	21.0	22.4	23.4	24.9	25.9	27.6
1982	1.053	26.6	28.0	28.7	30.2	28.9	30.4
1983	1.035	17.5	18.1	19.4	20.1	19.5	20.2
1984	1.000	22.8	22.8	22.9	22.9	25.4	25.4
1975–84 Average of Constant $			25.1		27.8		24.34
(Standard deviation)			(3.84)		(4.63)		(3.54)

*Derived from the producer price index for processed foods and feeds as compiled by the Bureau of Labor Statistics and reported in the Statistical Abstract of the United States, 1985

Source: Derived from Tables 5.1 and 5.6

Table 5.8-Costs and revenues of Florida Keys spiny lobster fishermen including both spiny lobster fishery and secondary fisheries, 1978-79 season[a]

Item	Total firms	Boat length (feet) Less than 27	27-34	35-42	Greater than 42
SPINY LOBSTER:					
Gross revenue	40,912	20,862	34,395	39,725	61,961
Costs:					
Variable costs	23,063	9,751	16,766	23,491	38,056
Fixed costs	2,969	1,184	2,849	2,519	4,669
Total costs	26,032	10,935	19,615	26,010	42,725
Net revenue	14,880	9,927	14,780	13,715	19,236
SECONDARY FISHERIES:					
Gross revenue	12,459	3,378	6,995	14,442	22,299
Costs:					
Variable costs	9,510	2,272	4,262	9,619	19,828
Fixed costs	2,138	570	861	1,877	4,816
Total costs	11,648	2,842	5,123	11,496	24,644
Net revenue	811	536	1,872	2,946	-2,345
COMBINED FISHERIES:					
Gross revenue	53,371	24,240	41,391	54,167	84,261
Costs:					
Variable costs	32,573	12,003	21,028	33,110	57,885
Fixed costs	5,107	1,754	3,711	4,395	9,485
Total costs	37,680	13,777	24,739	37,506	67,370
Net revenue	15,691	10,463	16,652	16,661	16,891

[a]There were a total of 30 firms in the survey. Number of boats by size class were: less than 27 feet, 5 boats; 27 through 34 feet, 9 boats; 35 through 42 feet, 8 boats, and; greater than 42 feet, 8 boats.

Source: Prochaska, F. J. and Paul D. Landrum, Spiny Lobster, Stone Crab and Secondary Fishery Costs and Revenues in the Florida Keys, 1978-79 Season. Florida Sea Grant College Report Number 42, May, 1981.

Table 5.9-Costs and revenues for Florida Keys spiny lobster fishing by boat size, 1978-79 season

Item	Total firms	Boat length (feet): Less than 27	27-34	35-42	Greater than 42
	Dollars				
Spiny lobster revenue	40,912	20,862	34,395	39,725	61,961
Costs:					
Variable costs:					
Fuel and oil	3,559	1,770	2,413	3,855	5,671
Bait	3,297	1,753	1,281	3,464	6,363
Ice	131	34	0	73	399
Crew	8,339	2,532	5,990	8,314	14,636
Traps	4,610	2,088	4,256	4,250	6,946
Repairs	2,732	1,426	2,447	3,019	3,582
Other	399	148	379	516	459
Total variable costs	23,063	9,751	16,766	23,491	38,056
Fixed costs:					
Depreciation	2,791	1,093	2,528	2,352	4,585
Other	178	91	321	167	84
Total fixed costs	2,969	1,184	2,849	2,519	4,669
Total costs	26,032	10,935	19,615	26,010	42,725
Net revenue	14,880	9,927	14,780	13,715	19,236
Average costs per pound:					
Variable	1.29	1.07	1.14	1.37	1.38
Fixed	.17	.13	.19	.15	.17
Total	1.46	1.20	1.33	1.52	1.55

Source: (as in Table 5.8)

Table 5.10-Comparison of Florida Keys spiny lobster average production practices by boat size classes, 1978-79 season

Production item	Industry average	Size class (feet): Less than 27	27-34	35-43	Greater than 42
Hull:					
Length (ft.)	36.0	23.2	30.4	38.9	47.4
Age (yrs.)	5.3	7.8	4.6	8.6	1.5
Fabrication:					
Fiberglass (percent)	90.0	100.0	89.0	75.0	100.0
Wood (percent)	10.0	0.0	11.0	25.0	0.0
Engine:					
Horsepower	258.3	211.0	180.1	248.0	386.0
Fuel type:					
Gasoline (percent)	20.0	100.0	11.1	0.0	0.0
Diesel (percent)	80.0	0.0	88.9	100.0	100.0
Age (yrs.)	3.2	2.8	1.9	6.4	1.8
Traps:					
Number fished	1,085.0	660.0	1,055.6	1,043.8	1,425.0
Percent lost	28.1	18.6	28.8	30.7	28.5
No. pulled per day	255.5	180.0	223.9	280.0	313.8
Times pulled per season	36.5	27.4	27.3	48.5	40.5
Trip length (days)	1.3	1.0	1.0	1.5	1.8
Work days (hours):					
Running	2.3	1.2	1.8	2.6	3.4
Fishing	8.3	8.8	6.8	9.1	8.9
Unloading	.6	.5	.5	.6	.6
Total	11.2	10.5	9.1	12.3	12.9
Catch (pounds):					
Per trap per season	16.5	13.0	14.0	16.5	19.4
Per trip	157.5	89.7	114.9	142.5	263.0

Source: (as in Table 5.8)

Table 5.11. Comparison of catch for each gap size. Catch/Trap = mean + 1 SE. Vertical lines to the right are 95% comparison intervals for mean catch rates. Intervals derived from the GT-2 method for the comparison of means. Means whose intervals do not overlap are significantly different.

(A)	Trap Pulls	Legals Catch/Trap	Lobster Number
Standard	137	0.23±.07	32
2"	114	0.40±.13	45
2 1/8"	112	0.25±.07	28
2 1/4"	112	0.22±.08	25
Total	475		130

(B)	Trap Pulls	Shorts Catch/Trap	Lobster Number
Standard	137	0.16±.04	21
2"	114	0.10±.04	11
2 1/8"	112	0.01±.01	1
2 1/4"	112	0.01±.08	1
Total	475		34

Source: Frazel 1986; Table 4.

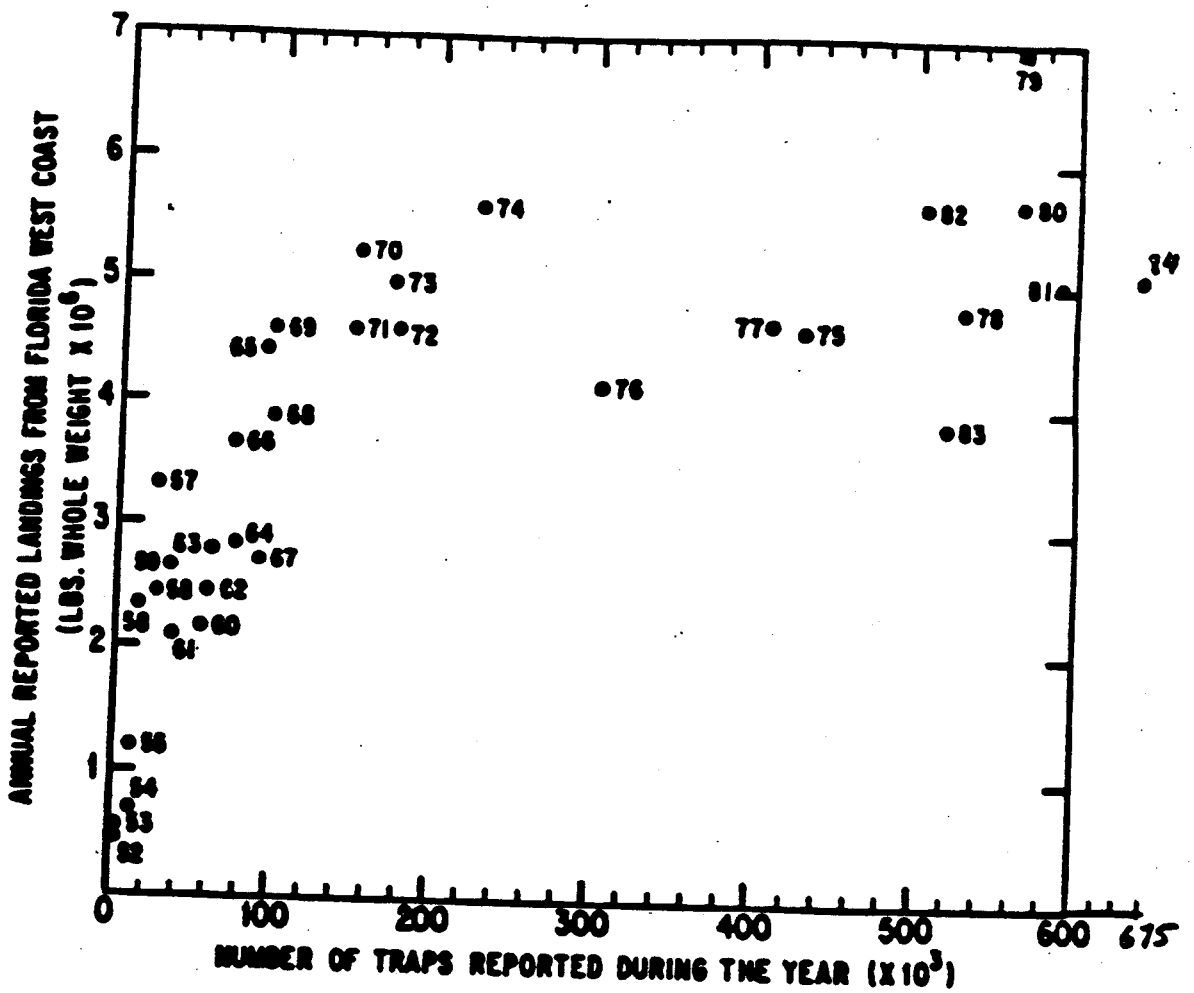

Figure 5.1. Annual reported landings of the Florida west coast commercial spiny lobster fishery versus number of traps reported by year. Source: Powers and Bannerot 1984; Figure 1.

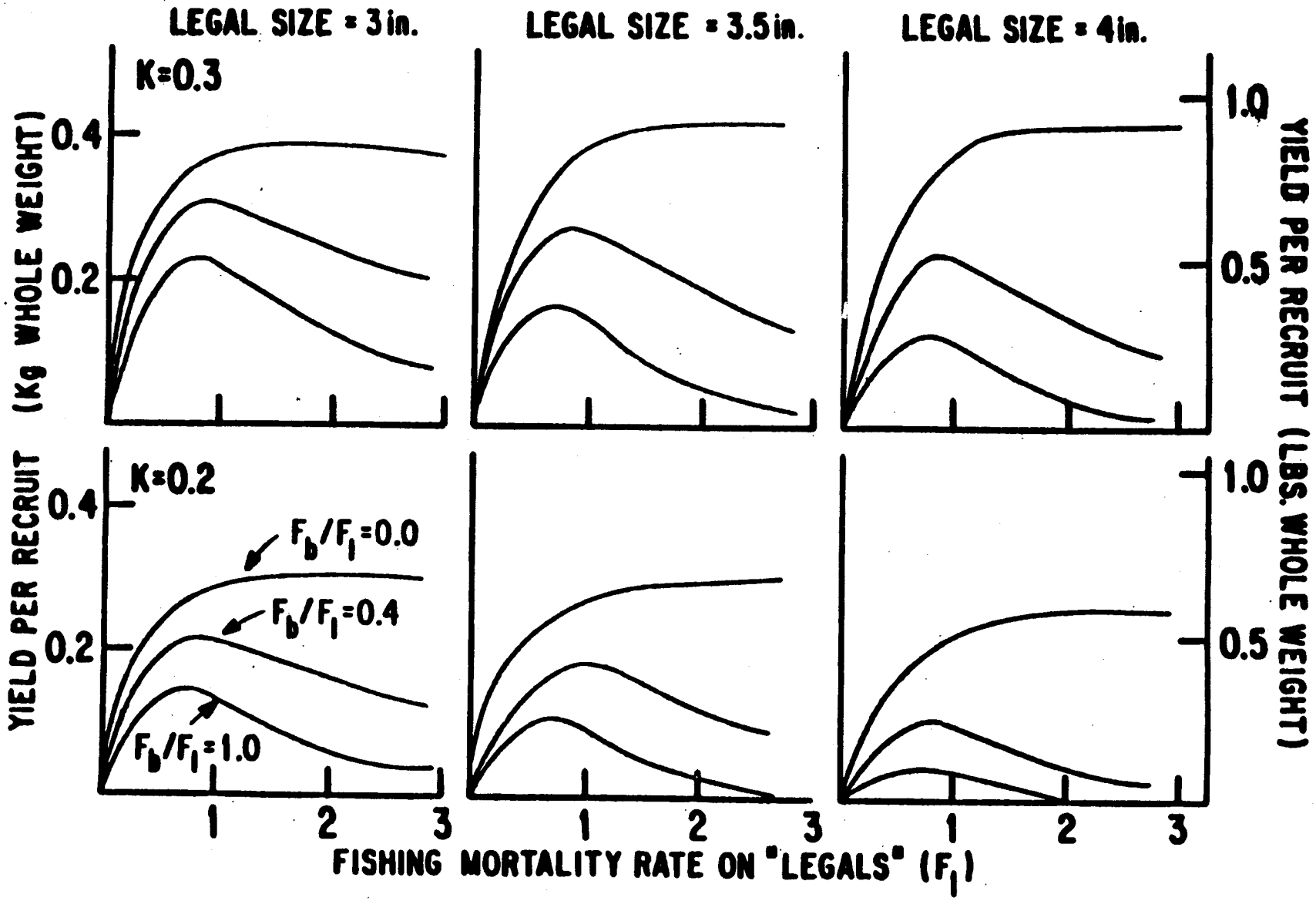

Figure 5.2. Yield per recruit with two alternative growth coefficients (K) and three different minimum legal carapace length (CL). Monthly natural mortality rate was 0.05, size of recruitment was 65 mm CL. Yields per recruit are plotted against fishing mortality rate on legal size lobster (F_l) using alternative ratios of the mortality due to baiting with sublegal lobsters (F_b/F_l). No other sublegal fishing mortality is included (F_s/F_l = 0.0). Fishing mortality rates are seasonal and are the cumulative sum of the monthly fishing mortality. Source: Powers and Bannerot 1984; Figure 5.

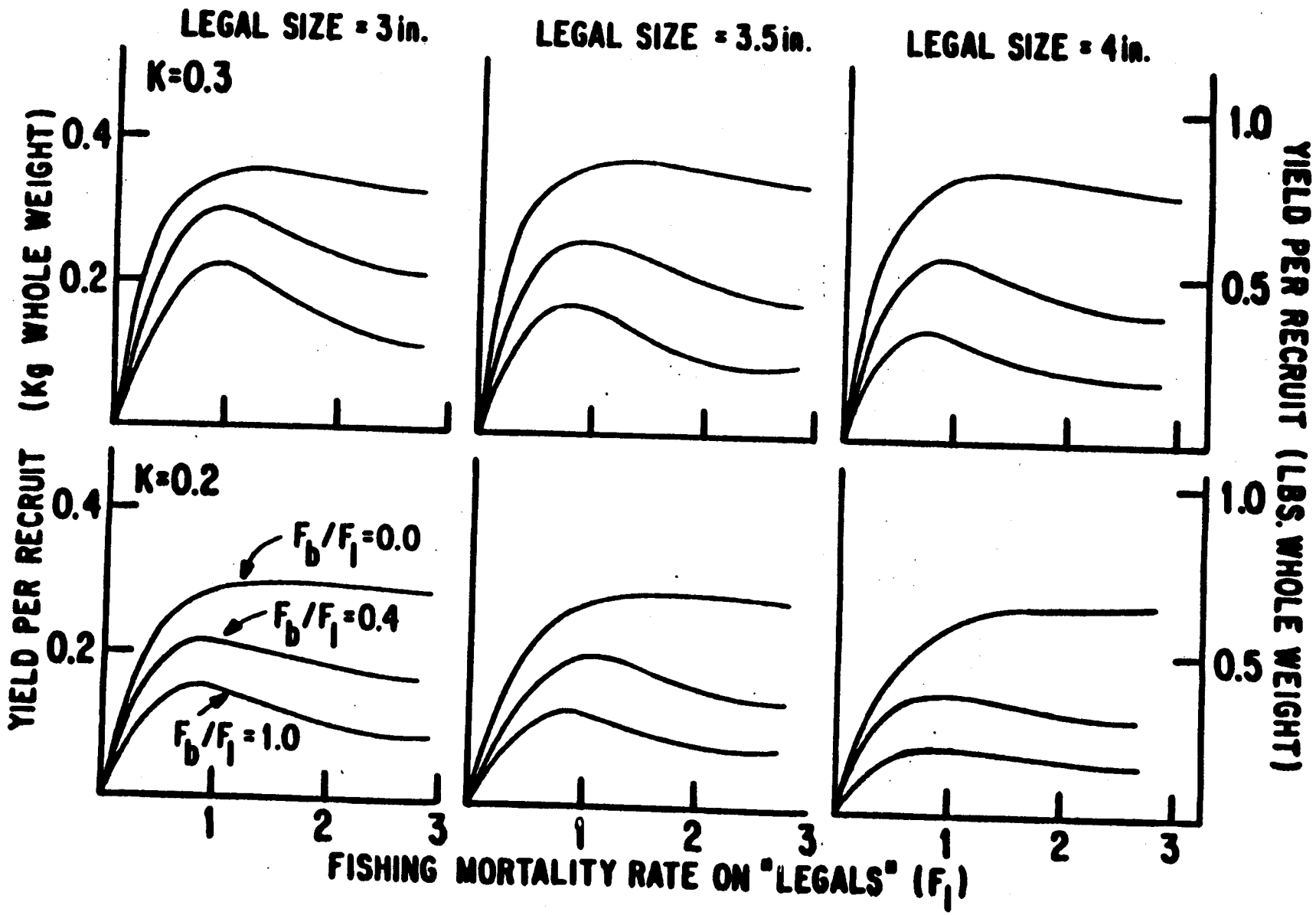

Figure 5.3 Yield per recruit calculated with two alternative growth coefficients (K) and three different minimum legal carapace length (CL). Monthly natural mortality rate was 0.05, size of recruitment was 65 mm CL. Yields per recruit are plotted against fishing mortality rate on legal size lobster (F_l) using alternative ratios of the mortality due to baiting with sublegal lobsters (F_b/F_l). Included is an assumed ratio of landed mortality of sublegal to legal lobsters of 0.04 (F_s/F_l = 0.4). Source: Powers and Bannerot 1984; Figure 6.

6.0 SUPPLEMENTAL REGULATORY IMPACT REVIEW AND INITIAL REGULATORY ANALYSIS

6.1 Introduction

Executive Order 12291

Executive Order 12291 established guidelines for promulgating new regulations and reviewing existing regulations. Under these guidelines each agency, to the extent permitted by law, is expected to comply with the following requirements: 1) administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action; 2) regulatory action shall not be undertaken unless the potential benefits to society for the regulation outweigh the potential costs; 3) regulatory objectives shall be chosen to maximize the net benefits to society; 4) among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society should be chosen to the extent practicable; and 5) agencies shall set priorities regularly with the aim of maximizing the aggregate net benefit to society, taking into account the condition of the particular industries affected by regulations, the condition of the national economy, and other regulatory actions contemplated for the future.

In compliance with Executive Order 12291, the Department of Commerce (DOC) and the National Oceanic and Atmospheric Administration (NOAA) require the preparation of a Regulatory Impact Review (RIR) for all regulatory actions which either implement a new fishery management plan or significantly amend an existing plan, or may be significant in that they reflect important DOC/NOAA policy concerns and are the object of public interest.

The RIR is part of the process of developing and reviewing fishery management plans and is prepared by the Regional Fishery Management Councils with the assistance of the National Marine Fisheries Service (NMFS), as necessary. The RIR provides a comprehensive review of the level and incidence of impact associated with the proposed or final regulatory actions. The analysis also provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve problems. The purpose of the analysis is to ensure that the regulatory agency or Council systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether the proposed regulations implementing the fishery management plan or amendment are major under Executive Order 12291. If the proposed regulations will have a significant impact on a substantial number of small entities, then an Initial Regulatory Flexibility Analysis (IRFA) will be prepared and incorporated into a joint document that also meets the requirements of the Regulatory Flexibility Act (RFA).

Regulatory Flexibility Act

The purpose of the Regulatory Flexibility Act is to relieve small businesses, small organizations, and small governmental entities from burdensome regulations and recordkeeping requirements. In as much Executive Order 12291 encompasses the RFA requirements, the RIR usually meets the requirements of both.

Enforcement Costs

No regulatory induced increases in Federal enforcement costs should occur due to implementation of this amendment. Enforcement costs are expected to remain constant but an increase in enforcement effectiveness should result from implementation of this amendment (Perry Allen, NMFS SERO Assistant Regional Director, personal communication).

6.2. Methodology

Procedural Framework

To the extent possible, biological, economic and social impacts are analyzed for both adopted and alternative management measures with regard to their effect on:

(1) Biological integrity of the stocks – the biological integrity of the stock must be protected.

(2) Economic productivity:

Price – Exvessel prices are used for the commercial fishery and as proxy values for the recreational fishery if appropriate to examine regulation–induced price effects.

Supply – Effects on production and marketing costs and related changes throughout the distribution system, and levels of participation in the recreational fishery.

Industry Benefits and Costs – Including, as appropriate, effects on number of fishermen, income distribution, investment in plant and gear, reporting burden, and other effects on vessels, crew shares, processors, and other user groups.

Government Cost – Administration, data collection, and enforcement costs.

(3) Social and cultural framework of affected communities — Potential impacts on employment opportunities and job displacements are considered, as well as enforcement capabilities.

The comparisons of alternatives for the several management measures are summarized in Tables 6.1 through 6.12. The tables indicate the direction of change expected from adopting the particular alternative both in the short term (considered to be less than two years or until the fishery adapts to a change, as appropriate) and the long term (after two or more years or after the fishery has adjusted to the new regulation). The "no action" alternative in the short run is considered the base case and, by definition, has no expected impact. However, in the long term, the no action alternative may lead to a deteriorated or improved situation, relative to the present. Only direction of change is presented as, in most cases, there was insufficient information to predict absolute amounts of changes in yield and, thus, economic returns and social consequences. Where quantitative estimates were available, they have been included in the text. "Biological impact" refers to the expected change in size of the population relative to the theoretical size at maximum sustainable yield, assuming that the population is currently below that size (if not, the impact is neutral, by definition). "Economic impact" refers to the expected change in the net value of output from the resource at a societal level (i.e. as opposed to the individual or firm level). "Social impact" refers to the changes in established, orderly life patterns (that are consistent with expressed normative societal

values) expected as a result of adopting the management alternative (i.e. "+" for reinforcement and "–" for disruptive change). The relative strength of the changes (in terms of orders of magnitude) among alternatives within each category of change are indicated by repetition of the direction symbols. Needless to say, changes cannot be compared between categories (i.e. a "+" biological impact does not necessarily cancel a "–" social impact).

Data Base

Data used in the RIR are contained in the FMP and in Section 5 of this amendment and includes recent research findings, landings, and stock assessment reports.

6.3. Regulatory Impacts of Proposed and Alternative Management Measures

6.3.1. Use of Undersize Lobsters as Attractants.

Problem

Both Federal and State regulations allow the possession and use of undersize lobsters as attractants in traps which hinders effective enforcement of the minimum size regulation. Florida has a particular problem with the Federal regulation which allows undersize lobsters to remain on the vessel until docked because Florida Marine Patrol officers usually attempt to enforce the minimum size regulation by inspecting suspect vessels en route to an unloading facility.

Recent research results document that up to 47 percent of the undersize lobsters used as attractants are dying as a result of the combined effects of on board handling, prolonged exposure to air, and confinement in traps. This mortality represents a significant loss in yield to the fishery and probably is the major factor contributing to the inability of the fishery to attain optimum yield.

6.3.1.1. Accepted Alternative: Up to 100 lobsters shall be allowed on board lobster trap-fishing vessels for use as attractants. All undersize lobsters must be immediately placed and kept in an aerated and shaded "open system" live well suitable to maintain the undersize lobsters alive and in a healthy condition until they are used in a trap as an attractant. The live well shall be large enough to provide at least three-fourths gallon of aerated circulating sea water per attractant lobster held on board the vessel.

Biological Impacts

The biological impacts of this alternative are positive both in the short and long-term. The use of live boxes (wells) may alleviate most of the exposure mortality but only relative, inversely, to the amount of injuries sustained while on board (Section 5.4.2).

Given that approximately 66 percent of the undersize mortality may be due to exposure (the most optimistic estimate), overall mortality of undersize lobsters used as attractants is 47 percent, and that a live well would reduce exposure mortality 100 percent, then, at best, the use of live wells will reduce undersize lobster mortality to about 19 percent. This reduction in undersize lobster mortality partially alleviates the current situation in growth overfishing loss in yield to the fishery, relative to maximum yield per recruit and the minimum size limit.

The reduction in number of lobsters allowed on board (from 200 to 100) will have a positive biological impact because it will reduce the relative length of time an attractant is held on board.

Economic Impacts

Live well prototypes are currently available in the industry. The top producing, more innovative, fishermen have been using them for the last few years because undersized lobsters kept in a live well are more lively when put back into the traps and provide an increase in catch rate over the use of attractants that are exposed to the air.

Maximum overall one-time cost to the industry due to this alternative may be approximately $122 thousand assuming all 610 lobster craft (Table 5.1) in the fishery will install the live well. Actual cost to the industry will be less, maybe substantially less, since some fishermen already possess a live well and not all fishermen may use undersize lobsters for attractants. A live well may cost between $100 - $200 apiece depending on construction method.

Since a reduction in the percent of baiting mortality from 0.4 to 0.2 would increase yield by 10 to 15 percent (Section 5.4.1), the decrease in baiting mortality effected by this option (from 0.47 to 0.19) would be expected to increase yield by a minimum of 10 to 15 percent or 522 to 783 thousand pounds which corresponds to an increase in overall net positive value of 1 to 1.5 million dollars to the fishery.

The reduction in number of undersize lobsters allowed on board (from 200 to 100) is expected to have a negligible short-term impact and a positive long-term impact due to resultant increase in undersize lobster survival due to the reduction in number of lobsters held on board. The relative impacts are dependent on the number of undersize lobsters returned immediately to the water without being held on board.

Social Impacts

The social impacts of this alternative in the short-term are negligible and in the long-term will be positive if alleviation of exposure mortality is not replaced by confinement mortality.

Each fisherman shall be responsible for maintaining an appropriate size live well according to the number of attractants on board at any one time.

6.3.1.2. <u>Rejected Alternative 1: No action.</u>

Biological Impacts

This no action alternative has been rejected by the Councils because it contributes to overfishing by permitting the practice of holding 200 undersize lobsters on board for use as attractants to continue, unchanged. Continuation of status quo results in overfishing (see Section 5) and violates the FMP objectives to protect long term yield (Objective 1) and to maximize yield by weight from the fishery (Objective 2).

Economic Impacts

Best estimates indicate there are three times more traps being deployed in the fishery than is required to catch optimum yield, therefore, although a prohibition on the use of

undersize lobsters as attractants may reduce individual trap catch rates by one-third it would not negatively affect overall yield on an industry-wide basis. Further, that the use of undersize lobsters as attractants does not increase overall yield is evidenced by the lack of an increase in annual landings since the practice of using live attractants was legalized in 1978. This alternative also prevents effective enforcement of the minimum size limit at sea.

Social Impact

The no action alternative will result in continued disruption of the fishing communities as the increasing mortality of undersize lobsters reduces available stock resulting in further increases in number of traps fished which will further increase the need for more attractants and already limited land-based trap storage areas (Meltzoff 1986). The issue of trap storage has become controversial in the Florida Keys due to the combined effects of continued population growth, increasing numbers of traps, and limited available land.

6.3.1.3. Rejected Alternative 2: Permit possession of undersize lobsters for baiting purposes only while the vessel is actively fishing a trap line in the EEZ.

Biological Impacts

This option does not directly address the mortality of undersize lobsters used as attractants, even though, relative to status quo, it would reduce undersize mortality by reducing the length of exposure since the transport of undersize lobsters would be restricted. Any prolonged exposure to air is detrimental to the stock and future yield.

Economic Impacts

This option would restrict the use of undersize lobsters in that fishermen would not be allowed to transport them between trap lines or from the EEZ into State waters both of which are currently allowed. Continued exposure of attractants to air has long-term negative economic impacts through loss of future yield. Due to the negative biological and economic impacts, the Councils rejected this alternative.

Social Impacts

This option would aid enforcement of the State regulation on the use of undersize lobsters because an individual observed in violation of the State statute would not be able to claim the undersize lobsters were captured in the EEZ.

6.3.1.4. Rejected Alternative 3: Prohibit the use of undersize lobsters as attractants.

Biological Impacts

This option would completely eliminate undersize lobster mortality due to exposure but not that due to confinement. If all harvesting of undersize lobsters could be prevented through increased enforcement against illegal fishing and elimination of undersize lobsters used as attractants, the combined effect of the rapid growth rate and increased survivability of undersize lobsters would greatly increase the number and weight of available legal size lobsters resulting in the increased yield and benefits to the fishery that was originally projected in the FMP.

Economic Impacts

The use of undersize lobsters as attractants increases the catch rate of legal lobsters relative to traps containing other baits and has become an integral part of the fisherman's operation. Both the extent of the use of shorts and the number needed to keep on board to adequately bait traps are unknown, however, fishermen contend the use of undersize lobsters is essential to their operation and prohibition of this practice would be detrimental. Individual traps with live attractants have a relative catch rate of three times greater than traps fished with other types of bait (Section 5.4.2). Clearly, in the short-term, anything that reduces the availability of undersize lobsters for attractants will decrease individual catch rates. Thus the industry is concerned that a prohibition on the use of attractants would disruptively reduce their catches creating a short-term disaster, consequently the industry is strongly opposed to adoption of this alternative.

Conversely, since traps with live undersize lobsters more effectively attract lobsters than traps without undersize lobsters the impact of this alternative, or any measure that would potentially reduce the catch rate of individual traps, is to create a more even distribution of lobsters among traps within a geographic region. On an industry-wide basis this alternative would not involve an additional cost to the fishing operation. It has been estimated (Hunt et al., 1985) that eliminating the mortality caused by baiting traps with undersize lobsters may produce long-term gains in exvessel value that exceed $1.5 million annually.

Social Impacts

It is not possible to quantitatively determine the impact of reducing the possession limit from 200 to 0. The expected immediate short term (first year) effect is that although on an industry-wide basis yield will not decrease due to the magnitude of excessive effort in the fishery. However, individuals, especially those in the middle Keys area may experience reductions in catches. Since lobsters do not leave the continental shelf, this alternative may affect the within season distribution of lobsters among geographic regions of the Florida Keys and thus among geographically immobile fishermen. Since the fall migration of lobsters out of Florida Bay and the Gulf of Mexico is to the west and southwest toward the Atlantic reefs (Gregory and Labisky 1986; Warner et al., 1977) any management measure that reduces the individual catch rate of traps will penalize those fishermen most dependent on the catch of lobsters in the Bay or Gulf to the benefit of those fishermen working in the Atlantic or western Florida Keys. This redistribution would tend to reverse the current trend of a shorter fishing season since it appears that part of the cause for the shortening of the season is the expansion of the Marathon fishing fleet into Florida Bay and the Gulf of Mexico since 1976; this expansion has effectively intercepted those lobsters that are migrating to the west and southwest as indicated by the dramatic shift in relative landings from the Key West and lower Keys to Marathon and the upper keys which apparently began in the 1977-1978 fishing season (Figures 6.1 and 6.2). Thus the short-term disruption (negative) would be displaced by a long-term stability in season length and distribution of catches (positive), assuming other factors such as an increase in effort were to occur.

Due to the potentially significant negative economic and social impacts, the Councils rejected this alternative.

6.3.1.5. Rejected Alternative 4: Require an escape gap to permit undersize lobster escapement.

Biological Impacts

Florida Department of Natural Resources (FDNR) research has shown that an escape gap permits undersize lobster escapement and alleviates both the on board exposure and confinement mortalities because it allows undersize lobsters to leave traps prior to and during trap pulling. Not all undersize lobsters would escape, therefore, some mortality would still occur if the use of attractants continued. Establishment of a properly sized escape gap in the fishery would protect most undersize lobsters, thereby increasing the most frequent size class to just above legal size. Increased abundance of legal lobsters will offset the effect of fewer undersize lobsters being available for bait by increasing the self baiting of escape gap traps with the 3 to 3 1/8 inch legal size lobsters and, as the average size of lobsters in the population increases, the relative catch rate of escape gap traps will increase over current catch rate levels because more lobsters (undersize and legal size) will be available to enter traps; although the undersize lobsters may not remain entrapped. The long-term catch rates would be less influenced by a change in baiting practices because as more undersize lobsters survive, both undersize and legal lobster abundance will consequently increase and natural baiting will occur, producing increased catch rates.

Economic Impacts

An escape gap, made of plastic or metal would add a small cost (about $.50 to $1.00) per trap to the overall cost of building traps. If the fishermen were allowed to use wood lathe for escape gap material then no cost would be involved in constructing an trap equipped with an escape gap.

To compensate for the probable cost of a manufactured escape gap a five - ten percent increase in the 1984, value of catch per trap would have to occur. Given the low price flexibility for spiny lobsters in terms of Florida landings this is equivalent to a five - ten percent in 1984, per trap yield and total industry yield, assuming number of traps constant. The estimated reduction in the ratio of baiting mortality to legal fishing mortality from 0.4 to 0.2 would increase yield by 10 - 15 percent (Section 5.4.1). Since a two - inch escape gap reduces undersize lobster catch by 73 percent (Section 5.4.2) while not significantly affecting legal catches it is feasible to assume this would produce at least a reduction in mortality ratios from 0.4 to 0.2. Then the net gain from requiring a two - inch escape gap would range from zero, in the worst case (highest cost - lowest increase) to ten percent or $750,000 (lowest cost - highest increase). This corresponds to a industry-wide positive net median increase of $375,000 from the 1984 levels of catch and value.

Conversely, the fishing industry contends the effectiveness of escape gaps in retaining legal lobsters has not been adequately demonstrated and the potential loss of attractants and legal lobsters may be significant enough to cause a short-term economic disaster within the industry.

Social Impacts

Some fishermen are concerned that an escape gap would be detrimental to their catch rates because undersize lobsters are an effective attractant for legal size lobsters. Enforcement, to be effective, would have to be conducted both at sea, by pulling traps to

check for an obstructed or closed escape gap, and at dockside when traps are stored during the closed season. The short-term impact of this alternative is negative due to potential disruption of common fishery practices. The long-term impacts would be positive as overall yield becomes stabilized at a higher level.

Due to the negative, and potentially significant, short-term economic and social impacts, the Councils rejected this alternative.

6.3.1.6. Rejected Alternative 5: Reduce the number of traps in the fishery to reduce the required number of undersize lobsters needed as attractants.

Biological Impacts

The mortality problem associated with the use of undersize lobsters as attractants is directly related to the number of traps deployed in the fishery. As the number of traps continues to increase the associated undersize lobster mortality will also increase. Powers and Bannerot (1984) estimate that reducing the total fishing mortality rate from present level by one-half and not altering baiting practices would increase yield per recruit by 5-25 percent depending on the ratio of baiting mortality to legal fishing mortality (see Section 5.4.1).

Economic Impacts

Assuming constant recruitment this would represent an increase in the 1980 - 1984 average catch of 0.3 - 1.5 million pounds worth $0.75 - 3.8 million at the 1980 - 1984 average price of $2.51 (in 1984 dollars). There would also be a significant cost reduction associated with this decrease. Assuming that the number of craft (firms) remained at the 1984 level of 610; the number of traps was halved to about 338 thousand; and that the 1984 total annual cost of fishing a trap was $7.00 (Prochaska and Landrum, 1981), then the industry savings in trap costs alone would amount to nearly $2.4 million. Thus, a first approximation of the gain from reducing the number of traps in the fishery in 1984 by half is a range of $3.2 - 6.2 million. This gain would be partially offset, however, by the costs of developing, implementing, and maintaining a system for effective control of effort (traps).

Social Impacts

The number of traps per vessel would have to be allocated in a fair and equitable manner and would involve significant government intervention. To allocate the number of traps each vessel can fish, information is needed from the fishermen on size of vessels, number of traps fished, etc. Enforcement, to be effective, would have to be conducted both at sea by pulling traps to check for tags and at dockside. However, with no limitation fishermen must exert increasingly greater effort on undersize lobsters to bait their increasing number of traps which must be deployed to remain competitive.

The Councils rejected this alternative for amendment 1. Due to the complexity of potential limited entry programs the Councils have decided to address this issue of overcapitalization through a second amendment, as soon as the ongoing East Carolina University spiny lobster limited entry research program is completed. As a first step, the Councils instituted a control date of January, 15, 1986 for the lobster fishery whereby anyone entering the fishery after the above control date will not be assured of future access to the spiny lobster resource if a management regime is developed and implemented that limits the number of participants in the fishery. Consequently, since

the necessary cultural data base is currently inadequate to properly evaluate limited entry in this amendment, the Councils rejected this alternative.

6.3.2. Commercial Fishing Permit

Problem

Currently, there are no permit requirements for lobster fishing in the EEZ. Historically, Florida has issued a general spiny lobster vessel permit for vessels fishing in State and Federal waters; all fishing vessels which operate in the EEZ also fish commercially in Florida waters, thus a single permit system was most effective. However, with the fishery becoming more overcapitalized and the resource overfished future allocation of the resource is inevitable. The Florida permit system does not adequately identify the various user groups harvesting the resource in either State or Federal waters. Currently, anyone can enter the Federal fishery at no cost and without numeration and can enter the Florida commercial fishery for a $50 permit fee. Consequently, approximately 4,100 Florida commercial permits were issued in 1986, although the NMFS can document only about 600 commercial vessels in the fishery. Clearly, the Florida permit system, alone, is inadequate as a basis for future improved management of this dynamic and growing fishery.

Obviously, any consideration of a limited entry program must first identify the participants in the fishery and their associated user groups. Both the Councils and NMFS are jointly funding an anthropological and economic study of the fishery with particular emphasis on identifying alternative limited entry programs. The success of the Councils and State of Florida in examining and possibly implementing a limited entry program will be determined by the adequacy and equitably of the management measures implemented, all of which are directly dependent on properly identifying and enumerating the major user groups within the fishery.

6.3.2.1. Accepted Alternative: A permit shall be required for fishing vessels engaged in harvesting lobsters for sale or for the harvest or possession of more than six lobsters per person per day. The permit shall be issued to either the vessel owner or operator and the applicant must have at least ten percent of his earned income from commercial fishing.

Biological Impacts

This option will have no direct short-term impact on the biology of the spiny lobster stock. However, because this alternative will improve enforcement capabilities and provide for better understanding of the commercial user group and its impact on the resource, an indirect, long-term positive impact on the lobster resource can be expected.

Economic Impacts

This option will have a possible short-term negative impact due to the marginal (part time) operators currently in the fishery that will be excluded from obtaining a permit by the ten percent earned income requirement. The number of operators who are at least partially dependent on the spiny lobster fishery and may be excluded by this option is unknown because many people (as many as 3,200 — excluding shrimp vessels) in the fishery who have obtained a Florida permit are not economically dependent on the fishery and have a Florida permit only so they can possess more than the Florida recreational possession limit of six per person per day. The long-term positive impact of this option is that the user groups will be better identified thus facilitating allocation of

the resource which will contribute to better management, attainment of optimum yield, and improvement in the economic viability of the fishery.

The administrative costs of maintaining the permit system will be significant but will be outweighed by the benefits of improved management resulting from improved knowledge of the users of the lobster resource and improved equitable treatment of the user groups.

Social Impacts

The social impacts of this alternative in the short-term may be somewhat negative in that a significant proportion (three-fourths) of current Florida permit holders may be ineligible for a Federal permit. The long-term impacts of this alternative should be positive in that it will permit improved identification of the commercial and recreational user groups and assure a valid basis for fair and equitable treatment to both groups when considering future management measures. No information exists on the proportion of current Florida permittees that would need a Federal permit and would not meet the Federal permit criteria. Most of the Florida permittees are probably recreational fishermen who desired an unlimited harvest but most likely fish in State waters. A smaller percentage of individuals are probably part-time commercial fishermen who fish in smaller vessels closer to shore (i.e., in State waters). Consequently, the number of individuals that fish in Federal waters and who would not meet the Federal permit requirements is unknown but considered to be significantly fewer than the approximately 3,200 out of 4,100 individuals that receive a Florida lobster permit (NMFS identifies about 600 full time lobster fishing vessels and there are about 300 shrimp vessels who presently receive lobster permits). The Councils consider that fishing activity associated with for-hire (charter, headboat, and party) fishing in itself was not considered as commercial fishing.

Additionally, without a Federal permit, if the State elected to revoke a permit, for the commercial harvesting of spiny lobster, due to an infraction of lobster regulations, the subject of the revocation could transfer his operation to the EEZ, claim to be a recreational fisherman, and continue to harvest considerable quantities of spiny lobster. Thus the Federal permit will ease enforcement because the possible use of permit sanctions will serve as a deterrent to potential violators.

The duplication of the State permit system, with this alternative, is necessary to: 1) identify those lobster fishing firms that can be considered as commercial fishermen, 2) provide an important enforcement tool by providing the opportunity for permit sanctions against repeat offenders, and 3) prevent recreational fishermen from circumventing the possession limit by claiming to be commercial fishermen.

The Councils and NMFS are currently funding a limited entry study of the spiny lobster fishery, therefore the Councils accepted this alternative as the most cost effective method of identifying the major lobster user groups and of assuring fair and equitable treatment to all users. This alternative also has the endorsement of the commercial lobster industry and of the Florida Marine Fisheries Commission.

6.3.2.2. Rejected Alternative 1: No action.

Biological Impacts

The no action option has no direct impact on the biology of the spiny lobster stock.

Economic Impacts

The no action option would have no direct short-term impact on the economy of the spiny lobster fishery but because it continues to allow unconstrained entry into the fishery the future economic viability of the fishery is threatened due to the resultant continued overcapitalization.

Social Impacts

The no action alternative has no short-term impacts but significant long-term negative impacts in that it continues to allow anyone to enter the fishery without enumeration. The lack of documentation prevents the identification of the different user groups and their magnitudes thus making any resource allocations practically impossible. The growth of the fishery in recent years has contributed to numerous conflicts among users. The no action alternative would jeopardize future fair and equitable treatment of all user groups, consequently the Councils rejected this alternative.

6.3.2.3. Rejected Alternative 2: Require a permit for all commercial fishermen actively engaged in lobster fishing in the EEZ.

Biological Impacts

This alternative would have no biological impacts different from those discussed under the accepted alternative.

Economic Impacts

This alternative would have significant and unjustifiable economic impacts on the fishery due to the burden of the permitting system. The administrative costs expected by permitting every commercial fishermen, including owner, captain, and crew would virtually triple the costs over that discussed under the accepted alternative, above.

Social Impacts

This alternative would have negative social impacts because permitting individual fishermen does not contribute to better understanding of the fishery over that of a vessel permit and the administration of this alternative would be difficult and possibly be perceived by the fishery negatively resulting in widespread lack of compliance and an additional enforcement problem that would not necessarily improve conservation of the resource. Due to the combined economic and social negative impacts, the Councils rejected this alternative.

6.3.3. Recreational Fishing Permit.

Problem

Currently, no quantitative information is available on the social and economic characteristics of the diffuse but important recreational component of the lobster fishery. The recreational users are increasing in numbers each year due to increased publicity through diving magazines but no documented information exists on the impact this user group is exerting on the resource which is already in an overfished condition. At the minimum, the recreational user group needs to be delineated to assure fair and equitable treatment when considering future alternative management measures.

6.3.3.1. Accepted Alternative: Require a permit for all recreational fishermen actively engaged in lobster fishing in the EEZ, with the provision that this measure is not to be implemented until the State of Florida implements a recreational fishing permit requirement for spiny lobster recreational fishermen within state waters.

Biological Impacts

This alternative would have no direct impact on the biology of the spiny lobster stock, but would have an indirect positive impact through improved management capabilities.

Economic Impacts

This alternative will have a negligible economic impact on the recreational industry due to the popularity of spiny lobster to tourists. Since people travel from throughout the State of Florida to harvest lobsters a permit requirement probably would not be a deterrent to fishing activity and thus associated businesses would not be negatively affected. In the long-term the economic benefits of a recreational permit would be evident through improved management of the fishery and assurance of fair and equitable treatment in the highly competitive lobster fishery.

The recreational fishery is prosecuted from docks, boats, homes, and numerous other places along the Florida Keys where a diver can get in the water from the shore. Consequently, a field sampling program is prohibitively expensive and difficult, if not impossible, to conduct. The most effective means of obtaining information from this user group is by first identifying the user group universe through a permit system, and then by subsequent sampling by either telephone or mail. The Marine Recreational Fisheries Statistics Survey (MRFSS) does not include spiny lobster fishermen in its sampling regime and, due to the nature of the lobster recreational fishery, the MRFSS can not include spiny lobster in a cost effective manner.

Social Impacts

This option would have a positive impact in that it will allow better identification of user groups, their impacts on the resource, and subsequently a more equitable allocation of the resource. Identification of user groups and their impacts are necessary for attainment of optimum yield. A recreational permit is the most desirable means of identifying this user group and of obtaining information concerning their impacts on the resource.

The Spiny Lobster Scientific and Statistical Committee and Advisory Panel, at the February, 1980 meetings, approved the issuance of separate permits to both commercial and recreational fishermen. This was again strongly recommended by the Advisory Panel in 1985. Due to the combined benefits of a recreational permit the Councils adopted this alternative as the most effective means of developing an understanding of this important user group, but due to potential confusion and limited effectiveness caused by an absence of a complementary Florida permit, the Councils desire to hold this management measure in reserve until Florida enacts a recreational permit that includes lobster fishermen.

6.3.3.2. Rejected Alternative 1: No action.

Biological Impacts

The biological impacts of the no action alternative are negligible in the short-term but expected to be negative in the long-term due to lack of information on the impacts of this important user group.

Economic Impacts

The economic impacts of the no action alternative are negligible in the short-term but expected to be negative in the long-term due to lack of information on the impacts of this important user group.

Social Impacts

The social impacts of the no action alternative are negligible in the short-term but expected to be negative in the long-term due to lack of information on the impacts of this important user group.

6.3.3.3. Rejected Alternative 2: Require a permit to be issued to the owner or operator for recreational fishing craft harvesting lobsters in the EEZ.

Biological Impacts

This option would have no direct impact on the biology of the spiny lobster stock.

Economic Impacts

This alternative would have no direct impact on the economics of the recreational spiny lobster fishery. Since the spiny lobster is a popular recreational species and people travel from throughout the State of Florida to harvest lobsters a permit requirement would not be a deterrent to fishing activity and thus associated businesses would not be negatively effected.

Social Impacts

This option would have no direct social impact on the recreational users but it is not optimal in identifying the recreational user group because not all recreational fishermen use boats, consequently, the user group will be poorly identified. Consequently, the Councils rejected this alternative.

6.3.4. Regular Fishing Season — Recreational Possession Limit

Problem

Florida regulations currently prohibit, without a $50 permit, possession of more than 24 lobsters per day per boat during the regular open season. Federal regulations do not specify a possession limit on any user group. The incompatibility between State and Federal regulations has hindered Florida's enforcement of its possession limit because an individual in possession of more than 24 lobsters in State waters can circumvent Florida's law by stating the lobsters were captured in Federal waters. Florida's possession limit is enforceable only if an individual is seen actively fishing in State waters; thus violators have a low probability of being caught. Both State and Federal enforcement officials agree that a possession limit would be a useful tool for enforcement, facilitating the

apprehension of trap poachers and commercial fishermen operating without a permit. Florida is proposing to change the possession limit in State waters to six per person per day for the 1987 fishing season and has requested the Councils do likewise in Federal waters.

6.3.4.1. Accepted Alternative: The recreational harvest and possession limit during the regular fishing season (August 5 – March 31) shall be six lobsters per person per day.

Biological Impacts

This option is not expected to have an impact on the biology of the lobster stock since most recreational fishermen do not catch six lobster per day (see Section 8.2.1.2 in the FMP).

Economic Impacts

The economic impacts of this alternative is expected to be positive since it will not reduce legal recreational catch but will deter or limit trap poaching by non-trap or diving lobster fishermen. With recreational diving effort increasing, a daily bag limit offers a method of absorbing increasing levels of participation without encouraging poaching from traps spreading the available resource more evenly among the participants.

Social Impacts

This alternative will have little or no impact on legitimate recreational fishermen, but could have a substantial positive effect on the orderly conduct of the fishery as a whole by providing a means to control trap robbing. The absence of a Federal possession limit has provided an avenue for shrewd fishermen to circumvent the State of Florida law on permit requirements and may have resulted in an increase in the incidence of trap poaching which reportedly has a significant impact on the trap fishery (particularly in the upper Florida Keys adjacent the Miami metropolitan area). A possession limit would serve as an effective method to curb excessive theft from traps. Current estimates in the FMP indicate that the average recreational fishermen catches between two and four spiny lobsters per trip. The relatively high recreational limit of six lobsters per person per day would serve as a deterrent to prevent a potential thief from robbing traps, obtaining a large number of otherwise legal lobsters, and then claiming that the lobsters had been legally caught in the EEZ as a recreational catch.

The Councils adopted this option primarily to aid enforcement of other regulations, and it is not intended as a bag limit to restrict overall recreational catch.

6.3.4.2. Rejected Alternative 1: No action.

Biological Impacts

The no action alternative would be expected to have no significant impact on the biology of the spiny lobster stock.

Economic Impacts

The no action alternative would be expected to have no economic impacts on the recreational fishery but a negative impact on the trap fishery due to poaching by divers.

Social Impacts

This alternative would have negative social impacts because it encourages conflict between recreational divers and commercial trap fishermen and reduces Florida's effectiveness in enforcing its possession limit. The combined measures of a commercial permit and recreational possession limit are needed to identify user groups for management purposes, to provide for the use and enforcement of permit sanctions, and to support enforcement of FMP measures related to poaching from traps.

6.3.4.3. Rejected Alternative 2: The recreational harvest and possession limit during the regular season shall be 6 lobsters per person per day or 24 lobsters per day per vessel.

Biological Impacts

This alternative would not be expected to have an impact on the biology of the lobster stock since most recreational fishermen do not catch six lobster per day or 24 lobsters per day per vessel (see Section 8.2.1.2 in the FMP).

Economic Impacts

This alternative would be expected to have a negligible negative impact on the recreational fishery support industry and no impact, over that of the accepted alternative, on the commercial fishery. The 24 lobster vessel limit may impact dive charter businesses since most charters carry six or more passengers, thus the vessel limit may limit the size of charters or cause potential passengers to not go on a charter boat due to concern over not being allowed their full individual possession limit.

Social Impacts

This alternative would have the same social impacts as the accepted alternative above (6.3.4.1). In addition, it may negatively impact the dive charter industry as noted above under economic impacts, through a reduction in potential charter size. Due to the negative impacts of the vessel limit the Councils rejected this alternative.

6.3.5. Recreational Fishing Season - Recreational Possession Limit

Problem

State and Federal regulations governing the possession limit during the two-day special recreational season are not compatible. Florida allows a six lobster per person per day limit, with no overall vessel limit whereas in the EEZ the limit is six lobsters per person per day with a maximum vessel limit of 24 lobsters per day. The differences in possession limit creates confusion to the public as to the possession limit and an enforcement problem in the EEZ.

6.3.5.1. Accepted Alternative: The recreational harvest and possession limit during the special two-day recreational fishing season shall be six lobsters per person per day

Biological Impacts

The biological impact of this option is positive because the actual recreational catch is usually fewer than six per person, thus the potential harm to the resource from dive fishing during the spawning season is limited.

Economic Impacts

The economic impact of this option is minimal but positive since the absence of a 24 per boat harvest limit may encourage more charter boat trips during the special two-day season.

Social Impacts

The Councils adopted this option to track Florida's regulation. This option reduces the current limitation on the sport diving industry, particularly on the dive boats, since "lobster hunts" during this two-day special season are becoming somewhat akin to "sportfishing tournaments", and the present 24 lobster per vessel cap may potentially restrict the size of charters that can be made for lobsters during this two-day season. The absence of the boat limit may encourage increased charter boat activity during the special two-day season. Also, having consistent limits in State and Federal waters will reduce confusion and contribute to easier enforcement.

6.3.5.2. Rejected Alternative 1: No action.

Biological Impacts

The biological impact of this alternative is negligible or positive because the recreational possession limit may be restricted more than the accepted alternative, depending on the relative frequency of vessels carrying more than four passengers where each has caught the maximum personal possession limit, therefore the negative impacts on the spawning stock would be less.

Economic Impacts

The economic impacts of the no action alternative is minimal, but possibly negative, since the daily vessel limit potentially restricts the size of diving charters.

Social Impacts

Florida allows six lobsters per person per day with no daily boat limit, whereas, the Councils limit the catch to six lobsters per person per day, with a maximum of 24 lobsters per boat, per day. The Councils rejected this option because 1) the no action alternative would maintain incompatible Federal and State regulations relating to the sport season possession limit, thus confusing recreational participants, 2) the current boat limit will probably not be enforced since it conflicts with State regulations and the Florida Marine Patrol is the primary enforcement agency in the spiny lobster fishery, and 3) the daily vessel limit potentially restricts the size of diving charters during the two-day sport season. On balance, the short-term social impacts of maintaining the status quo are negligible or negative while the long-term impacts are clearly negative.

6.3.6. Recreational Fishing Season Duration.

Problems

The two-day recreational seasons in Federal and State waters are different. This difference in the recreational season timing has been both a source of confusion to the diving public and an additional source of income for the tourist industry of south

Florida. The Councils originally established the recreational season to fall on the first weekend preceding the preseason trap soak period; whereas, the Florida recreational season was fixed at July 20–21. Since implementation of the FMP in 1982, the State of Florida Council representatives (from FDNR and FMFC) have assured the Councils that when the FMFC addressed spiny lobster that their intent was to change their recreational season to complement the Federal season. However, in the interim, the tourist support industry has become adapted to the split seasons. A problem with the split season is that the Federal season, without a complementary State season, forces the divers onto the outer reefs in the EEZ where the primary reproductive activity is occurring. The resultant handling of egg-bearing females is detrimental to the resource because there is no method of capturing egg-bearing females while diving without substantially damaging the egg mass.

6.3.6.1. Accepted Alternative: The two-day recreational nontrap season shall be the first full weekend prior to August 1, beginning with the 1988–1989 fishing season.

Biological Impacts

The biological impacts of this alternative are positive in that it shifts the recreational season further from the time of peak spawning activity, thus better protecting the reproductive potential of the population. The one year delay in implementation should have no significant negative impact on the population; it is the long term accumulated impact of not changing the recreational season that is harmful.

Economic Impacts

The economic impacts of this alternative are negligible since it only shifts the recreational season by one or two weeks. Since most lobsters move inshore after reproducing (Gregory et al. 1982) this change in recreational season should result in more lobsters available to divers in the shallower waters since Florida proposes to adopt a complementary recreational season.

Social Impacts

The social impacts of this alternative are negligible since it only shifts the recreational season by a week or two and provides the tourist and diving industries with an opportunity to adjust to the season change without disruption because most tourists and divers plan their trips at least a year in advance.

6.3.6.2. Rejected Alternative 1: No action.

Biological Impacts

The no action alternative has negative biological impacts because it maintains the recreational season closer to the peak period of spawning activity and will maintain a split recreational season resulting in capture of egg-bearing females which are found predominantly on the offshore reefs.

Economic Impacts

The no action alternative would have positive economic benefits to the tourist industry since it would maintain a split season. However, the long-term impacts on the fishery

overall would be negative since the benefits would be offset by continued damage to egg-bearing lobsters from the act of capturing and releasing them.

Social Impacts

The social impacts of the no action alternative would be negligible.

6.3.6.3. Rejected Alternative 2: The two-day recreational nontrap season shall be the first full weekend prior to August 1, beginning with the 1987-88 season.

Biological Impacts

The biological impacts would be the same as those outlined in the accepted alternative 6.3.6.1 above.

Economic Impacts

The long-term economic impacts would be the same as those outlined in the accepted alternative 6.3.6.1 above. However, the short-term economic impacts might be negative as recreational participants would not have had an opportunity to adjust their plans to the changed season dates, resulting in confusion and a burden on the tourist industry.

Social Impacts

The social impacts of this alternative would be negative during the first year because divers and tourists would not have an opportunity to adjust their plans. This alternative was rejected due to the burden it would place on the tourist and diving industry.

6.3.7. Closed Season Duration.

Problem

The reproductive season, as evidenced by fresh spermatophores and external eggs, for spiny lobsters in Florida is from April through September (Gregory et al. 1982); 77 percent of all reproduction occurs during the present closed season of April - July and 22 percent occurs during August, the first month of the open fishing season. Current fishing mortality is so high that over 80 percent of the adult stock is harvested during the open season. Consequently, the juveniles that mature during the closed season represents the major contributors to reproduction and the closed season is the only period during the year when these young adults have an opportunity to survive and reproduce at least once before being exposed to the fishery.

In addition, the major growth period of lobsters of all sizes is during the summer months (Hunt and Lyons, 1986) with mature and newly maturing lobster exhibiting the most growth, through molting, at the beginning and end of the reproductive season, thus significant growth occurs in August (D. R. Gregory, personal communication) and any reduction in fishing mortality during August will increase both reproductive activity and growth prior to the opening of the fishing season.

6.3.7.1. Accepted Alternative: The closed fishing season shall be from April 1 through August 5 with a preseason soak period beginning August 1.

Biological Impacts

The biological impacts of this alternative are positive because it provides for increased reproduction through improved protection of egg bearing females in a population that has had its reproductive potential significantly reduced from that of a lightly or moderately fished population (Lyons et al. 1981; Gregory et al. 1982). Increased reproduction will help maintain and increase long term yield from the fishery thus contributing to accomplishment of the benefits originally projected in the FMP.

Economic Impacts

The ten day delay in the opening of the fishing season may possibly have short-term negative impacts due to the resulting deferred income. However, positive benefits will accrue in the long-term, and possibly in the short-term through improved catch per unit effort when the fishery opens. Some fishermen report the ten day delay will negatively impact their total annual catch due to migration of some of the stock into areas inaccessible to the fishery. Although, the lobsters do migrate extensively in certain times of the year and at certain life stages it is not known if movements during the ten day period in question would reduce overall catch or simply delay harvest. Available scientific evidence indicates that movement of adult lobsters during this period is confined to localized inshore-offshore movements related to reproduction and little loss to the fishery would occur. Given the intense fishing mortality exerted in the beginning of the open season which typically results high initial catches in August with a decline through September until the autumnal migration, the ten day delay in the opening of the fishing season most likely will simply delay harvest and a portion of the harvested animals should be larger in size.

Social Impacts

The ten day delay in opening of the fishing season will have immediate short-term negative impacts in that the fishermen will be denied fishing opportunity for this period. In the long-term the fishery should easily adjust to the change because this alternative will result in no redistribution effects among fishermen due to high fishing mortality when the season opens. Increased protection of the reproductive stock and increased yield through increased growth should result in positive long-term impacts through improved stability of the resource.

Although, best biological and potential long-term economic benefits would accrue from extending the closed season through August the Councils accepted this alternative because it provided positive biological impacts, without immediate significant detrimental economic and social impacts.

6.3.7.2. Rejected Alternative 1: No action.

Biological Impacts

The biological impacts of the no action alternative are continued fishing mortality on the adult stock during the reproductive and primary growth season with consequent short-term loss in potential yield through harvesting of lobsters before molting and long-term loss in reproductive potential.

Economic Impacts

The economic impacts of the no action alternative are negative in the short-term due to the loss of yield by harvesting adults prior to and during the fall molting season and negative in the long-term due to possible loss of recruitment through continued harvesting of lobsters during the period of reproduction and growth. The Councils' rejected the no action alternative due to the combined biological and economic negative impacts resulting from continued fishing in July and August.

Social Impacts

The social impacts of the no action alternative are negligible in the short-term and negative in the long-term if the current closed season provides inadequate protection of the reproductive potential with the inevitable trend of increasing annual fishing mortality.

6.3.8. Closed Season Violations.

Problem

An unknown but large number of lobster traps are abandoned and left in the water during the closed fishing season. Traps are abandoned because 1) the fisherman was unable to locate them during the regular grace period of five days, 2) a marginal fisherman decides the cost to retrieve them is prohibitive, or 3) they were old traps, not worth salvaging. The abandoned traps continue to ghost fish throughout the closed season thus exerting an unknown but significant mortality on the population and loss of yield to the fishery. At sea enforcement has not been sufficient to remove all abandoned traps from the water due to the number of abandoned traps and because enforcement personnel do not have the resources to both search for and destroy abandoned traps as well as conduct their other at sea duties.

6.3.8.1. Accepted Alternative: In addition to the existing five-day post-season grace period of April 1 - 5, for removal of traps, a ten-day extension for trap retrieval shall be allowed, on an individual basis if a documented hardship or emergency prevented trap retrieval prior to the end of the April 1 - 5 grace period.

Biological Impacts

The biological impacts are positive because the removal of traps after the open fishing season will reduce closed season mortality caused by ghost fishing significantly. The proportion of the population affected by ghost fishing is unknown but believed to be significant given the large numbers of traps reportedly seen abandoned during the close season.

Economic Impacts

The short-term economic impacts of this alternative are positive because it will allow fishermen additional opportunity to retrieve traps, thus, allowing potentially substantial savings in operating costs. Benefits will be directly related to additional number of traps retrieved under this alternative. Long-term economic benefits will accrue as closed season ghost fishing is reduced, and a larger harvested yield is derived from the resource.

Social Impacts

This alternative will have positive social impacts and was recommended initially by the Intercouncil Spiny Lobster Advisory Panel because the number of traps per fishermen is becoming so great and are usually scattered over such numerous locations that it is getting more difficult each year to recover all traps within the five-day grace period, particularly if the weather is bad that week or if the fisherman has boat trouble. Currently, if a fisherman can not get his traps to shore before the end of the grace period, he will be in violation if he attempts to bring them to shore after the grace period resulting in a monetary loss to the fisherman and a potential loss to the resource due to ghost fishing. Thus this alternative provides an opportunity for the industry to retrieve its traps more effectively.

6.3.8.2. Rejected Alternative 1: No action.

Biological Impacts

The Councils rejected the no action option because continued closed season "ghost trap" fishing may harm the reproductive potential of the stock; this is particularly important since the reproductive component of the spiny lobster resource is already significantly reduced (Lyons et al., 1981; Gregory et al., 1982).

Economic Impacts

The economic impacts of the no action alternative is negative both in the short- and long-term. Ghost fishing reduces potential yield and benefits to the industry immediately and continued ghost fishing during the closed fishing season may jeopardize the future stability of the fishery.

Social Impacts

The social impacts of the no action alternative is negligible in the short-term but may be significantly negative in the long-term if continued ghost fishing further reduces the population and potential yield. The magnitude of the ghost fishing problem is also a drain on enforcement activities and any reduction in ghost fishing will improve enforcement effectiveness in other areas.

6.3.8.3. Rejected Alternative 2: A performance bond shall be required of all permitted fishermen requiring the removal of all traps at the end of the fishing season, with forfeiture of the bond for failing to remove traps by the end of the post-season grace period of April 1-5.

Biological Impacts

This alternative would have a positive biological impact because it serve as an additional deterrent to abandoning traps or fishing during the closed season.

Economic Impacts

This alternative would have a short-term detrimental impact because it would increase operating costs initially. The long-term impact would be positive because the consequent improved enforcement of the closed season would result in improved future catches. The administrative costs to government to operate a performance bond system would be

substantial and probably outweigh the potential benefits from improved future catches.

Social Impacts

Although this alternative would be a strong encouragement for the industry to remove traps at the end of the fishing season, it would penalize the responsible fisherman as well as the ones who either carelessly abandon their traps or actually fish them during the closed season. Consequently, due to the unfair burden on the industry and potential administrative costs the Councils rejected this alternative.

This option both restricts the number of traps abandoned during the closed season and allows for the violator to return money to society to partially offset the cost of enforcing the closed season management measure. The amount of the bond could be set to reflect the magnitude of the initial violation (e.g., the bond could be set at $5, $25, or $50 per trap found in violation) or the number of repeat violations (where the initial bond could be fixed at $100, $500, or $1000). The bond could be earmarked to cover enforcement costs or returned to general revenue.

6.3.8.4. Rejected Alternative 3: Permit individuals to salvage and keep traps left in the water during the closed season.

Biological Impacts

The biological impacts of this measure would be positive if lobsters were not harvested during the closed season under the guise of trap salvage. This measure would significantly reduce ghost fishing and thus further protect the resource.

Economic Impacts

The economic impacts of this alternative would be positive since retrieval of abandoned traps, valued at $10 to $20 each, would provide a reduction in total operating costs for those fishermen who salvage abandoned traps.

Social Impacts

The Councils rejected this option because it would be difficult for enforcement personnel to attempt to distinguish between salvaged and stolen traps, because the traps are permanently numbered with an individual's permit number. Additionally, enforcement against closed season fishing could be hindered with the adoption of this alternative.

6.3.9. Egg-bearing Lobsters

Problem

Retention of egg-bearing lobsters in traps is allowed in the EEZ but not in State waters. Although spiny lobsters are notoriously gregarious, egg-bearing lobsters exhibit a more solitary habit to protect the egg mass from damage which may result from close association with other lobsters. Thus, confinement of egg-bearing lobsters in traps is detrimental to their spawn and compromises the management measure prohibiting the possession and retention of egg-bearing lobsters on board vessels.

6.3.9.1. Accepted Alternative: All captured egg-bearing female shall be released immediately alive to the open water and not be retained in traps as attractants.

Biological Impacts

The biological impacts of this alternative are positive because the spawning potential of the lobster population will be further protected. The spawning stock size of the spiny lobster population has been considerably reduced from the original, unfished condition. Failure to adopt this measure would result in a further reduction in spawning stock due to the mortality of both the eggs and lobster from confinement and onboard handling. Egg-bearing lobsters, due to their lack of activity, probably can not escape traps as readily as non egg-bearing lobsters and the fragile eggs are damaged significantly by handling and by being confined in traps with other lobsters. Although nothing can be done to prevent egg-bearing females from entering traps, (except by changing the closed season—see Section 6.3.7) prudence dictates that egg-bearing females be protected to the maximum extent possible. FDNR research results indicate substantial mortality to lobsters kept within the trap for extended periods of time.

Economic Impacts

The economic impacts of this alternative in the short-term will be negligible since the proportion of egg-bearing lobsters relative to that of undersize lobsters available for use as attractants is minimal. In the long-term further protection of the spawning stock will help maintain and possibly increase future yield.

Social Impacts

This alternative will have no negative social impact. In fact, it is a measure consistent with the general philosophy of fishermen toward protection of egg-bearing lobsters. The Councils adopted this option both to prevent the potential mortality suffered by egg-bearing females held in traps and in an effort to make Federal and State regulations more compatible; this option tracks Florida's current regulation. This option follows the original intent of the Councils and is supported by the Intercouncil Spiny Lobster Advisory Panel and lobster industry.

6.3.9.2. Rejected Alternative 1: No action.

Biological Impacts

The biological impacts of this alternative are negative because an unknown but significant number of egg-bearing lobsters are captured in traps during the months of August and September. This alternative would have a detrimental impact on future recruitment to the fishery. The Councils rejected this option because recent evidence (see Section 6.4.2.) indicates the retention of egg-bearing lobsters in traps is potentially detrimental to the resource.

Economic Impacts

The economic impacts of this alternative in the short-term are negligible and in the long-term possibly negative due to potential reductions in recruitment caused by the mortality of eggs and egg-bearing females confined in traps.

Social Impacts

Although the FMP did not specify that egg-bearing females could be retained in traps, Federal regulations currently allow egg-bearing lobsters to be retained in traps; Florida regulations do not. This alternative maintains the inconsistency between State and Federal regulations, thus hindering enforcement.

6.3.10. Minimum Size Limit.

Problem

Most divers and fishermen measure both the carapace and tail, and if either meets the minimum size limit, the lobster is of legal size. This practice, due to differential growth between the sexes, allows the harvest of female lobsters slightly less than 3.0 inches carapace length (2.95 inches carapace length equals 5.5 inches tail length), whereas, male lobsters between 3.0 and 3.2 inches carapace length are prohibited (5.5 inches tail length equals 3.2 inches carapace length). However, since Florida regulations currently allow the harvest of 3.0 inch carapace length males, the Federal law is applied by enforcement similarly. With both body measures in effect, combined with slight differences in the wording of State and Federal definitions of minimum size, enforcement is difficult. The tail measurement is especially problematic because the tail is more flexible than the carapace and depending on measurement technique a particular tail length may vary as much as 0.25 inches.

6.3.10.1. Accepted Alternative: The harvesting of Panulirus argus spiny lobsters with a carapace length 3.0 inches or less; or if the carapace and tail are separated, with a tail length of less than 5.5 inches shall be prohibited.

Biological Impacts

This alternative has positive biological impacts because the minimum size limit will be based on the same measure used to calculate optimum yield. The carapace length is less flexible and allows a more precise measure than does the tail length. With the carapace length as the major measure of legal size within the industry better protection of immature lobsters will be effected. The few (number unknown) fishermen permitted to separate tails at sea will not likely compromise the intent of this alternative because most of the lobsters captured by fishermen making extended trips into the EEZ will be significantly larger than 3.0 inches carapace length.

Economic Impacts

This alternative will be minimally negative in the short term because a small (but unknown) portion of the females with 5.5 inch tails that are smaller than 3.0 inches carapace length will not be harvested. This short term loss will be minimal because at the growth of lobsters between 2.5 and 3.0 inches carapace length is rapid, thus harvest of these lobsters in the 2.95 to 3.0 inches carapace length will be delayed by at most three months. In the long-term the economic impacts will be positive due to greater survival of these undersize females, particularly in the first few months of the fishing season because August and September is a predominant molting period for lobsters in this size range.

Social Impacts

The Councils adopted this option to simplify the definition of minimum size and to reduce confusion as to the determination of a legal size lobster. This option tracks the minimum size limit proposed by the Florida Marine Fisheries Commission. The most practical size limit measure is the carapace length - it's fixed at the time of capture, whereas a tail length measurement is always subject to interpretation due to the flexibility inherent in the tail structure. Also, a single carapace size measurement for a whole lobster lessens the burden on enforcement agents.

6.3.10.2. Rejected Alternative 1: No action.

Biological Impacts

The biological impacts of this alternative is negative because it allows the harvest of female lobsters less than the scientifically determined optimum minimum size.

Economic Impacts

The economic impacts of this alternative are negligible in the short-term since it would not affect present fishing activity. In the long-term overall yield may be reduced slightly by continued harvest of undersize females.

Social Impacts

The Councils' intent is to follow Florida regulations with regard to the minimum size limit, but due to differences in the wording of the federal regulation, the two size limits are not the same. The Councils have rejected the no action alternative because of confusion as to the definition of a legal size lobster. The social impacts of the confusion created by status quo is considered negative in both the short- and long-term.

6.3.11. Tail Separation

Problems

During fishing trips of two days or more it is difficult to keep lobsters alive as is the practice during the typical one day fishing trips. Dead lobsters require refrigeration and removing the cephalothorax greatly retards spoilage of the tail. Historically Florida has issued a special permit to separate the carapace and tail of the spiny lobster (i.e., tailing) while at sea; otherwise tailing was prohibited. Currently, tailing is permitted in the EEZ. Failure to prohibit the possession of separated spiny lobster tails in the EEZ also effectively defeats any prohibition against the taking of, or possession of, speared lobsters and hampers both State and Federal efforts at enforcing the minimum size requirement. As lobsters are usually speared in the carapace, allowing individuals to legally remove the carapace in effect allows them to destroy evidence of an illegal practice. This weakens any efforts for dockside enforcement of the prohibition on spearing lobsters. Enforcement officers report evidence of undersize lobster harvest being associated with the spearing of lobsters.

6.3.11.1. Accepted Alternative: The separation of lobster carapace and tail at sea shall be prohibited except by special permit. To be eligible for a tail separation permit the fishing craft must have been assigned a commercial lobster permit, and must be operated for lobster fishing in the EEZ for two or more days from port. Furthermore, the permit

applicant (fishing craft owner or operator) must provide a signed statement that his fishing activity necessitates a tail separation permit.

Biological Impacts

The biological impacts of this alternative are positive both in the short term and long term. The prohibition against tailing at sea will serve as a deterrent to spearing which kills undersize lobsters, thus supporting the existing management measure prohibiting the taking of undersize and spearing of spiny lobsters.

Economic Impacts

The economic impacts of this alternative are negligible in the short-term and positive in the long-term since it should reduce undersize lobster mortality and result in increased yield of legal lobsters. Requiring the majority of the fishermen to maintain harvested lobsters in a whole condition will have no negative impact on their operations since the common practice in the fishery is to keep marketable lobster whole and alive when feasible. Special permits are available that enable fishermen making extended fishing trips to maintain a quality product for the market.

Social Impacts

This alternative has positive social impacts because it complements the Florida regulations on the prohibition of tailing at sea and has had the support of the Councils' advisory panels since the topic was first considered in preparation of the FMP. The Councils initially rejected this alternative in the FMP because it seemed a tailing prohibition was unnecessarily restrictive, however, the enforcement problems caused by the lack of a tailing prohibition have outweighed the potential restriction on business activity. The industry actually supports the tailing prohibition, with specified exceptions because by restricting the indiscriminate separating of lobster tails the consequent illegal activities of spearing lobsters and transport of undersize lobster tails is further curtailed without restricting the legal fishery. This option also has the support of both Federal and State enforcement officials.

The burden on the industry due to the requirement to obtain permits for tailing at sea is minimal, acceptable to the industry, and allows freedom of necessary legitimate business activity without harming the resource.

6.3.11.2. Rejected Alternative 1: No action.

Biological Impacts

The biological impacts of this alternative are negative because it would further encourage the illegal and detrimental activities of spearing and harvesting of undersize lobsters. The Councils have rejected this option because it encourages activities detrimental to the resource.

Economic Impacts

The economic impacts of this alternative would be negligible in the short-term and negative in the long-term due to loss of potential yield through spearing and harvest of undersize lobsters.

Social Impacts

This alternative continues to allow tail separation in the EEZ which prevents Florida from effectively enforcing its tailing prohibition. Failure to prohibit the possession of separated spiny lobster tails defeats the prohibition against the taking of, or possession of, speared and undersize lobsters because enforcement is necessarily conducted dockside or as the vessel is coming into port. Enforcement officers also report evidence of undersize lobster harvest being associated with the spearing of lobsters. The no action alternative encourages the illegal tailing of undersize lobsters since lobster tails are easier to conceal than whole lobster.

6.3.11.3. Rejected Alternative 2: Prohibit tail separation completely.

Biological Impacts

The biological impacts of this alternative would be positive for the same reasons described in 6.3.11.1. above.

Economic Impacts

The economic impacts of this alternative would be negative since it would force all vessel operators to make short one to two day fishing trips. Although it is expected only a few vessels make extended fishing trips, these few vessel produce relatively significant landings since they operate on segments of the fishable stock comprised of larger individuals. The number of fishing trips that would require tail separation to maintain product quality is unknown, but it would impose an unnecessary restriction on the fishery. The Councils' rejected this alternative due to the economic hardship it would have on those fishermen, usually highliners, which routinely make extended fishing trips in the EEZ.

Social Impacts

This alternative has both negative and positive social impacts. This alternative would substantially ease at-sea enforcement, but would significantly restrict the fishing activity of those fishermen that make extended (greater than two days) fishing trips.

6.3.12. Slipper (Spanish) Lobster

Problem

The landings of Slipper lobster have been relatively low (generally less than 100,000 pounds) but have exhibited an increasing trend in recent years. Approximately 43 percent of total landings have occurred during the reproductive season of May through August. Some fish dealers and Spiny Lobster Advisory Panel members have reported significant harvest of egg-bearing females during the summer months. The only available scientific study of a slipper lobster fishery provides evidence that slipper lobster populations can not sustain even a limited fishery without significant overfishing (Martins, 1985).

6.3.12.1. Accepted Alternative: The possession or stripping of egg-bearing females shall be prohibited. All captured egg-bearing females shall be released alive to the open water.

Biological Impacts

This alternative provides some protection to the resource since during the reproductive season (April–August) as many as 45 percent of the females captured in the trawl fishery may be egg-bearing (George Cline, personal communication). Thus, with this alternative the reproductive potential of the resource will be protected. The slipper lobster is a hardy animal and can be returned to the water unharmed from a trawl catch because trawling time is usually limited to 20 minutes when directly harvesting slipper lobsters (George Cline, personal communication).

Economic Impacts

This alternative may significantly reduce harvested landings in the short-term due to the release of egg-bearing females resulting in a short-term negative economic impact. However, this alternative is expected to result in the long-term maintenance of a fishery which would otherwise collapse, with a long-term positive economic benefit that more than compensates for the short-term negative impacts. No data exists on the number of vessels fishing nor the relative income of fishermen possibly affected by this alternative.

Social Impacts

The Councils adopted this option based on the recommendation of the Intercouncil Spiny Lobster Advisory Panel because of the potential detrimental impact the harvest of egg-bearing lobster may have on stock productivity. The social impacts of this alternative are unknown but are suspected to be minimal since the fishery is still in its early developmental stages. To the extent this alternative leads to a stable fishery over time; the social impacts are expected to be positive.

6.3.12.2. Rejected Alternative 1: No action.

Biological Impacts

The potential biological impacts of taking no action in protecting the resource is the potential collapse of the fishery while it may still be developing. Unrestricted harvest of juvenile and egg-bearing females will be detrimental to stock . Evidence indicates these lobsters can not sustain even a moderate fishery without some protection against overfishing. There is no information as to how long it would take a stock to recover from overfishing because growth and mortality parameters are unavailable.

Economic Impacts

The economic impacts of this alternative will most likely be positive initially as the fishery develops and the initial accumulated stock is fished up but become negative as overfishing occurs. A collapse of the stock would exclude this species from the commercial market for an undetermined period of time.

Social Impacts

The social impacts of this alternative will be negligibly positive initially but negative and disruptive when overfishing occurs.

6.3.12.3. Rejected Alternative 2: Establish a closed season during the reproductive period.

Biological Impacts

The biological impacts of this alternative would be positive since the stock would be most protected during the period when the slipper lobster is probably most vulnerable to harvest. Available evidence (see Ogren, 1977; Martins, 1985) indicates the slipper lobster may congregate inshore during the reproductive season.

Economic Impacts

The economic impacts of this alternative would be substantially negative initially since it would directly eliminate about 40 percent of the annual commercial harvest (Lyons, 1970; Davenport, NMFS, SEFC, personal communication; George Cline, University of Alabama, personal communication). This alternative would maintain the lowered catch over time and would be neutral or slightly positive compared to no action. Until more information is obtained on this fishery the Councils decided the accepted alternative would provide adequate protection of the stock with less of an immediate negative impact than the adoption of this rejected alternative would have.

Social Impacts

The consequent short-term social impacts of this alternative would be negative since it would completely displace the summer fishery thus excluding a potential source of income. Over the long-term a stable, though, much reduced, fishery would be maintained and this alternative would be less damaging than no action.

6.3.12.4. Rejected Alternative 3: Establish a minimum size limit.

Biological Impacts

The biological impacts of this alternative would be positive but no information exists on growth and maturity and consequently, the optimum minimum size limit can not be determined. Although the fishery is primarily a trawl fishery the physical hardiness of the Spanish Lobster may allow the return of undersize lobster to the water, thus a minimum size limit may be a feasible alternative. However, until more is known about the size of maturity and hardiness of Spanish lobsters, the Councils have decided to reject this option.

Economic Impacts

The economic impacts of this alternative would be somewhat negative initially, depending on the proportion of juvenile lobsters in the catch, but would provide a long-term positive benefit once an adequate size limit is established.

Social Impacts

The social impacts of this alternative would reduce total harvest initially but eventually help provide a long-term maximum yield, thus stabilizing the now developing fishery assuring a alternative work opportunity.

Table 6.1. Comparative Analysis of Management Alternatives for Retention of Undersize Spiny Lobster to Use as Attractants in Traps.

Alternative (Text reference)	Impact: + positive – negative 0 neutral			Symbol repetition indicates relative strength of impact		
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
100 in live well (6.3.1.1)	+	+	–	+	0	0 or +
No action (6.3.1.2)	0	–	0	–	0	–
EEZ baiting (6.3.1.3)	0	0	0	0 or –	0	0
Prohibit use (6.3.1.4)	+	+ +	0 or –	+ +	– –	+
Escape gap (6.3.1.5)	+	+ +	0 or +	+	– –	+
Reduce Traps (6.3.1.6)	+	+	0 or +	+ +	– –	+ +

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.2. Comparative Analysis of Management Alternatives for Spiny Lobster Federal Commercial Fishing Permit.

Alternative (Text reference)	Impact: + positive – negative 0 neutral			Symbol repetition indicates relative strength of impact		
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Vessel Permit (6.3.2.1)	0	+	0 or –	+	–	+
No Action (6.3.2.2)	0	0	0	–	0	–
Fisherman Permit (6.3.2.3)	0	0	–	–	–	–

* Less than two years or until the fishery adapts to the change.

** Two Or more years, or after the fishery had adapted to the change.

Table 6.3. Comparative Analysis of Management Alternatives for Spiny Lobster Recreational Fishing Permit.

Alternative (Text reference)	Impact: + positive – negative 0 neutral			Symbol repetition indicates relative strength of impact		
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Permit with Florida (6.3.3.1)	0	0 or +	0	0 or +	0	+
No Action (6.3.3.2)	0	0 or –	0	0 or –	0	0 or –
Boat Permit (6.3.3.3)	0	0	0	0	0	0

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.4. Comparative Analysis of Management Alternatives for Spiny Lobster Regular Season Recreational Possession Limit.

Alternative (Text reference)	Impact: + positive – negative 0 neutral		Symbol repetition indicates relative strength of impact			
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
6 Lobsters per person per day (6.3.4.1)	0	0	0 or +	0 or +	+	+
No Action (6.3.4.2)	0	0	0	0 or –	0	–
6/person or 24/boat (6.3.4.3)	0	0	0 or +	0 or +	0 or +	0 or +

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.5. Comparative Analysis of Management Alternatives for Spiny Lobster Recreational Season Possession Limit.

Alternative (Text reference)	Impact: + positive – negative 0 neutral		Symbol repetition indicates relative strength of impact			
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
6 lobster per person per day (6.3.5.1)	0 or –	0 or –	0 or +	0 or +	+	+
No Action (6.3.5.2)	0	0 or +	0	0 or –	0	–

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.6. Comparative Analysis of Management Alternatives for Spiny Lobster Recreational Season.

Alternative (Text reference)	Impact: + positive – negative 0 neutral		Symbol repetition indicates relative strength of impact			
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Weekend Prior to August 1st, 1988 (6.3.6.1)	0 or –	–	0 or +	0 or +	0	0
No Action (6.3.6.2	0	–	0	0 or –	0	0
Weekend Prior to August 1st, 1987 (6.3.6.3)	0 or –	–	0 or –	0 or +	–	0

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.7. Comparative Analysis of Management Alternatives for Spiny Lobster Closed Season.

Alternative (Text reference)	Impact: + positive – negative 0 neutral			Symbol repetition indicates relative strength of impact		
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
10-day extension (6.3.7.1)	+	+	0 or +	+	+	0
No Action (6.3.7.2)	0	0 or –	0	–	0	–

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.8. Comparative Analysis of Management Alternatives for Spiny Lobster Trap Retreival.

Alternative (Text reference)	Impact: + positive – negative 0 neutral			Symbol repetition indicates relative strength of impact		
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Extension (6.3.8.1)	+	+	+	+	+	+
No Action (6.3.8.2)	0	–	0	–	0	–
Bond (6.3.8.3)	+	+	–	0 or +	0 or –	0 or +
Salvage (6.3.8.4)	+	+	+	+	0 or –	0 or +

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.9. Comparative Analysis of Management Alternatives for Egg-Bearing Spiny Lobsters.

Alternative (Text reference)	Impact: + positive – negative 0 neutral		Symbol repetition indicates relative strength of impact			
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Release (6.3.9.1)	+	+	0	+	+	+
No Action (6.3.9.2)	0	–	0	–	0	–

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.10. Comparative Analysis of Management Alternatives for Spiny Lobster Minimum Size Limit.

Alternative (Text reference)	Impact: + positive, − negative, 0 neutral — Symbol repetition indicates relative strength of impact					
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Carapace 3 inch (6.3.10.1)	+	+	0 or −	+	+	+
No Action (6.3.10.2)	0	−	0	−	0	−

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.11. Comparative Analysis of Management Alternatives for Spiny Lobster Tail Separation.

Alternative (Text reference)	Impact: + positive – negative 0 neutral				Symbol repetition indicates relative strength of impact	
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Special Permit (6.3.11.1)	+	+	0 or +	+	+	+
No Action (6.3.11.2)	0	–	0	–	0	–
Prohibit (6.3.11.3)	+	+	–	–	0	0

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

Table 6.12. Comparative Analysis of Management Alternatives for Slipper (Spanish) Lobster.

Alternative (Text reference)	Impact: + positive – negative 0 neutral			Symbol repetition indicates relative strength of impact		
	Biological		Economic		Social	
	Short term*	Long term**	Short term*	Long term**	Short term*	Long term**
Egg-Bearing (6.3.12.1)	+	+	–	+	0	+
No Action (6.3.12.2	0	–	0	–	0	–
Closed Season (6.3.12.3)	+	+	—	0 or +	–	0 or –
Minimum Size (6.3.12.4)	0 or +	0 or +	–	+	–	+

* Less than two years or until the fishery adapts to the change.

** Two or more years, or after the fishery had adapted to the change.

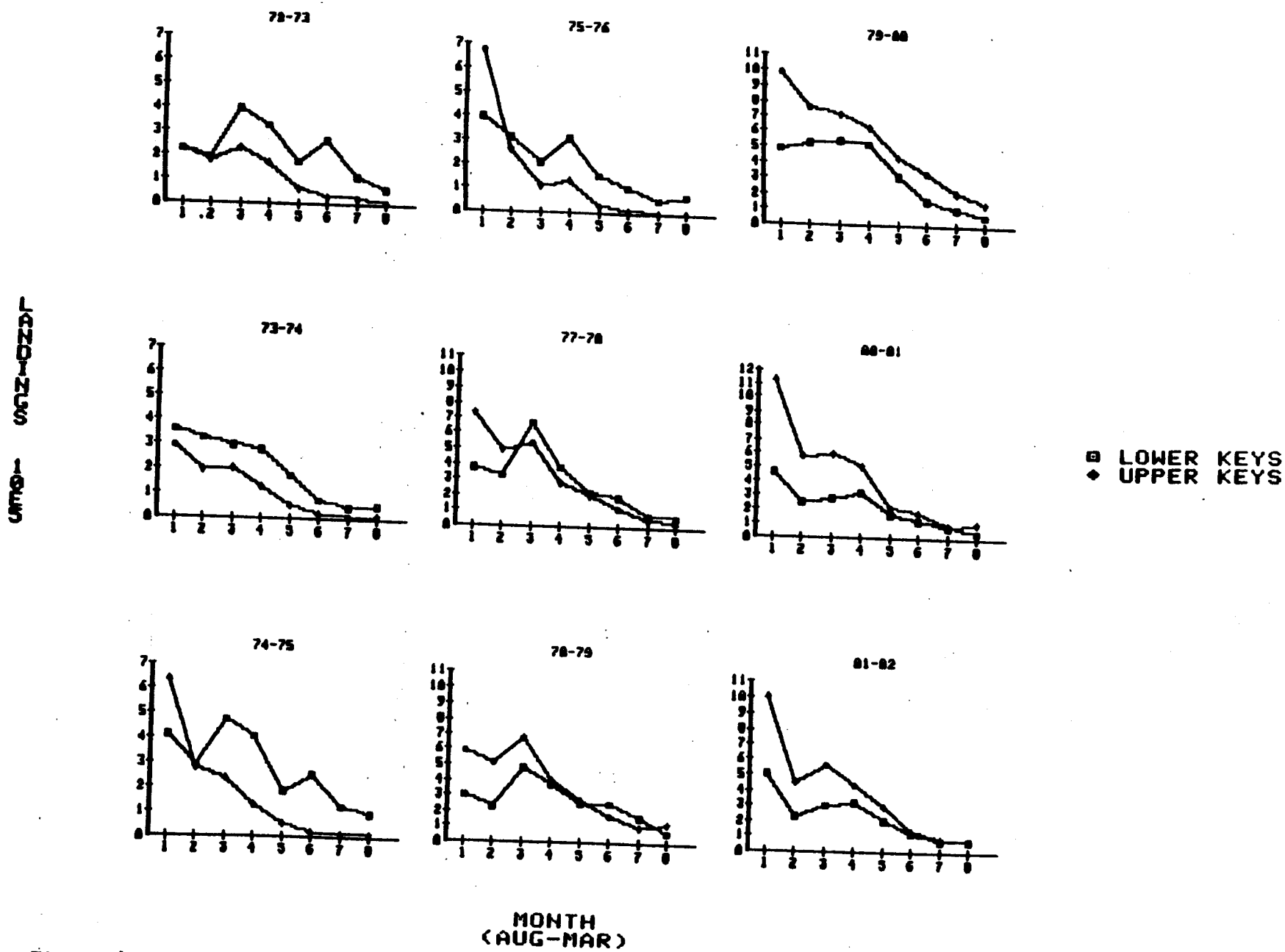

Figure 6.1. Monthly spiny lobster landings in the upper (Marathon north) and lower (Big Pine - Key West) Florida Keys from 1972 through 1982 by fishing season. Data for the 1976-77 fishing season not available. Data from 1972 through 1976 were taken from Market News Reports (New Orleans) and data from 1977 through 1982 were made available by Ernie Snell and Guy Davenport, SEFC, NMFS, Miami.

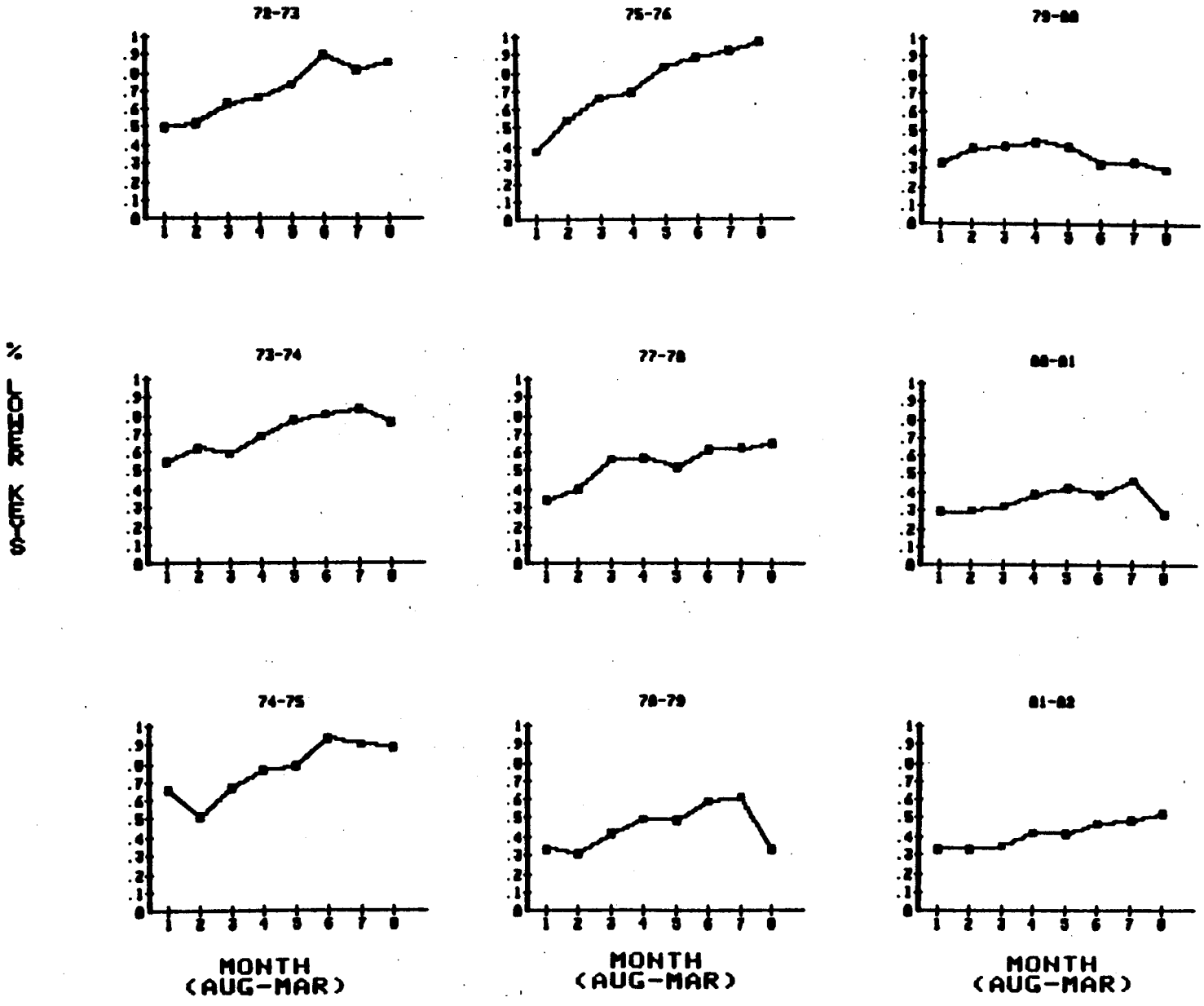

Figure 6.2. Monthly percent spiny lobster landings (Monroe County) landed in the lower Florida Keys from 1972 through 1982 with the exception of the 1976-77 fishing season. Source: See Fig. 6.1.

7.0 RESEARCH RECOMMENDATIONS

7.1. Special Recommendations to the Secretary

The Councils have recommended the following areas of needed information.

1. New baits or other fishing practices that offer economically viable substitutes for using undersize lobsters as attractants in traps;

2. Information on unreported landings from all user groups, most particularly the recreational fishery;

3. Better estimates of total mortality including natural as well as fishing mortality;

4. The source of lobster larvae recruited to the south Florida fishery;

5. Information on catch and effort and size composition, by geographic area;

6. The design and implementation of a system that will assist in locating and retrieving of traps and minimize conflicts between users of the resource;

7. The evaluation of the effectiveness of artificial and supplemental habitats in existing sanctuaries for juvenile lobsters.

8. The evaluation of the effectiveness of live wells in reducing undersize lobster mortality associated with their use as attractants.

7.2. Special Recommendations to the States

The Councils recommend that the states implement the management measures proposed in this amendment to the FMP within its State waters where applicable. The Councils further encourage the states to assist the Secretary in addressing and supporting the research and other special recommendations.

8.0 RELATED FEDERAL LAWS

8.1 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act is to control paperwork requirements imposed on the public by the federal government. The authority to manage information collection and record keeping requirements is vested with the Director of the Office of Management and Budget. This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

8.1.1. Proposed Data Collection Program

The Councils propose through this amendment to establish a permit system to 1) define commercial and recreational user groups, 2) establish a vehicle for permit sanction against repeat fishery violators, 3) prevent recreational fishermen from circumventing the possession limit, and 4) prevent indiscriminate separation of carapace and tail at sea which has encouraged other illegal activities.

8.1.2. Estimate of Reporting Burden and Cost

Approximately 1000 permit applications are expected to be received. The administrative costs of application form production, mailing, and review for eligibility determination is expected to cost about $4,400.00. The reporting burden on the public is expected to be about 170 hours for completing and filing permit applications at an approximate cost of $1000.00 for the time required and mailing costs.

8.2 Endangered Species Act and Marine Mammal Act

The proposed actions have no anticipated impact on threatened or endangered species or on marine mammals. A Section 7 consultation was conducted for the original FMP and it was determined the FMP was not likely to jeopardize the continued existence of threatened or endangered animals or result in the destruction or adverse modification of habitat that may be critical to those species; this amendment proposes no changes to the FMP relative to species included in the Endangered Species Act or the Marine Mammal Act.

8.3. Coastal Zone Management Act

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 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 proposed changes in Federal regulations governing spiny lobsters in the EEZ of the Gulf of Mexico and South Atlantic will make federal regulations more consistent with either existing or proposed Florida regulations. The other southeastern states do not have regulations governing spiny or slipper lobster.

While it is the goal of the Councils 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 Councils have concluded that this amendment is an improvement to the Federal management measures for the spiny lobster fishery.

This amendment is consistent with the Coastal Zone Management Program of the State of Florida to the maximum extent possible. This amendment was prepared with the assistance of Florida Department of Natural Resources and Florida Marine Fisheries Commission personnel.

This determination has been submitted to the responsible State agencies under Section 307 of the Coastal Zone Management Act administering approved Coastal Zone Management Programs in the States of North Carolina, South Carolina, Florida, Alabama, Mississippi, and Louisiana. The States of Georgia and Texas do not have approved Coastal Zone Management Programs.

8.4. National Environmental Policy Act — Environmental Assessment.

The discussion of the need for this amendment, proposed actions and alternatives and their environmental impacts are contained in Section 6 of this amendment.

The proposed amendment is not a major action having significant impact on the quality of the marine or human environment of the Gulf of Mexico and South Atlantic regions. The proposed action is an adjustment of the original regulations of the FMP to improve enforceability and fishery yield. 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. For a discussion of the need for this Spiny Lobster FMP Amendment please refer to Sections 4.0 and 8.0. Mitigating measures related to proposed actions are unnecessary. No unavoidable adverse impacts on wetlands or the marine environment are expected to result from the proposed management measures in this amendment (see Section 8.0).

Both the short- and long-term benefits of more compatible regulations, reductions in undersize lobster mortality and documentation of resource users will help to improve fishery production and to achieve the objectives of the FMP. Overall, the benefits to the nations resulting from implementation of this amendment is greater than management costs incurred.

RECOMMENDATION

Having reviewed the environmental assessment and the available information relating to the proposed actions, I have determined that there will be no significant environmental impact resulting from the proposed actions.

Approved: _____ _____

Name and Title Date

RESPONSIBLE AGENCIES:

Gulf of Mexico Fishery Management Council
881 Lincoln Center
5401 West Kennedy Boulevard
Tampa, Florida 33609
(813) 228-2815

South Atlantic Fishery Management Council
306 South Park Building
1 South Park Circle
Charleston, South Carolina 29407
(803) 571-4366

LIST OF AGENCIES AND PERSONS CONSULTED

Gulf of Mexico Fishery Management Council
- Spiny Lobster Advisory Panel
- Spiny Lobster Special Scientific and Statistical Committee
- Standing Scientific and Statistical Committee
- Law Enforcement Advisory Panel

Florida Coastal Zone Management Program

Florida Department of Natural Resources
- Florida Marine Patrol
- Division of Marine Resources

Florida Marine Fisheries Commission

National Marine Fisheries Service
- Southeast Fisheries Center
- Southeast Regional Office

South Atlantic Fishery Management Council
- Spiny Lobster Advisory Panel
- Standing Scientific and Statistical Committee

United States Coast Guard

9.0 BIBLIOGRAPHY

Austin, H.M. 1972. Notes on the distribution of phyllosoma of the spiny lobster, Panulirus spp. in the Gulf of Mexico. Proceedings of the National Shellfish Association 62:25-30.

Bain, J. 1967. Investigations into the effectiveness of escape gaps in crayfish traps. New Zealand Marine Department Fisheries Technical Report 17:1-11 +3 Tables and 7 Figures.

Bowen, B. K. 1963. Preliminary report on the effectiveness of escape-gaps in crayfish pots. Western Australia Fisheries Department Fauna Report 2:1-9 +4 Figures.

Capurro, L.R.A. and J.L. Reid (eds). 1970. Contributions on the physical oceanography of the Gulf of Mexico. Texas A&M University Oceanogr. Stu. 2: Gulf Publ. Co., Houston, Texas. 288 pp.

Chittleborough, R.G. 1970. Studies on recruitment in the West Australian rock lobster Panulirus longipes cygnus George: density and natural mortality of juveniles. Australian Journal of Marine and Freshwater Research 21:131-148.

Corcoran, E.F. and J.E. Alexander. 1963. Nutrient, chlorophyll and primary productivity studies in the Florida current. Bulletin of Marine Science 13(4):527-541.

Craig, A.K. 1974. New developments in the S.E. Florida spiny lobster fishery. Gulf and Caribbean Fisheries Institute 26:131-143.

Crawford, D.R. and W.J.J. de Smidt. 1922. The spiny lobster, Panulirus argus, of southern Florida, its natural history and utilization. Fishery Bulletin, 38:281-310.

Davis, G.E. 1971. Aggregations of spiny sea urchins, Diadema antillarum, as shelter for young spiny lobsters, Panulirus argus. Transactions of American Fisheries Society 100(3):586-587.

1976. National Park Service spiny lobster fishery research in Florida. Proc. Spiny Lobster Research Review Conf., 16 December, 1976, Key West: 6 pp. (mimeo.)

1978. Management recommendations for juvenile spiny lobsters, Panulirus argus in Biscayne National Monument, Florida. U. S. National Park Service, South Florida Research Center Management Rep. M-530. 32 pp.

Dunaway, V. 1974. Its lobster for fun and feast. Florida Sportsman Magazine 5(6):50-52, 54.

Everson, A. R., R. A. Skillman, G. L. Kamer, and J. P. Draper. 1984. Interim report on the laboratory trials phase of the spiny lobster escape vent experiment. Available from Southwest Fisheries Center, Honolulu Laboratory, National Marine Fisheries Service, Honolulu, Hawaii 96812.

Frazel, D. W. 1986. The effect of escape gaps on capture of the spiny lobster, Panulirus argus (Latreille), with notes on the impact of escape gaps on behavior. Master's Thesis, Nova University, Oceanographic Center, 8000 North Ocean Drive, Dania, Florida 33004.

Gregory, D. R., Jr. 1980. Reproductive dynamics of the spiny lobster, Panulirus argus (Latreille), in south Florida. Master's Thesis, University of Florida, Gainesville, Florida 32611.

Gregory, D. R., Jr. and R. F. Labisky. 1986. Movements of the spiny lobster Panulirus argus in south Florida. Canadian Journal of Fisheries and Aquatic Sciences 43:2228-2234.

Gregory, D. R., Jr., R. F. Labisky, and C. L. Combs. 1982. Reproductive dynamics of the spiny lobster Panulirus argus in south Florida. American Fisheries Society 111:575-584.

Gulf of Mexico and South Atlantic Fishery Management Councils. 1982. Fishery management plan, environmental impact statement, and regulatory impact review for spiny lobster in the Gulf of Mexico and South Atlantic. Available from the Gulf of Mexico Fishery Management Council, 881 Lincoln Center, 5401 West Kennedy Boulevard, Tampa, Florida 33609.

Hunt, J. H. 1985. Live well feasibility: Impressions from observation of three live wells used to maintain sublegal lobsters. Unpublished Manuscript. Available from Florida Department of Natural Resources, Marine Research Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Hunt, J. H. and W. G. Lyons. 1985a. Comparisons of catch rate and size frequency of spiny lobsters, Panulirus argus, captured in standard traps and traps with escape gaps. Unpublished Manuscript. Available from Florida Department of Natural Resources, Marine Research Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Hunt, J. H. and W. G. Lyons. 1985b. Relative effectiveness of six spiny lobster baits and attractants in the south Florida area. Unpublished Manuscript. Available from Florida Department of Natural Resources, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Hunt, J. H., and W. G. Lyons. 1986. Factors affecting growth and maturation of spiny lobsters, Panulirus argus, in the Florida Keys. Canadian Journal of Fisheries and Aquatic Sciences 43:2243-2247.

Hunt, J. H., W. G. Lyons, and F. S. Kennedy, Jr. 1986. Effects of exposure and confinement on spiny lobsters, Panulirus argus, used to bait traps in the Florida fishery. Fishery Bulletin 84:28-37.

Keithly, W. R., Jr. 1981. Florida spiny lobster fishing: Monthly allocation of economic inputs with consideration of population parameters and alternative fishing enterprises. Master's Thesis, University of Florida, Gainesville, Florida 32611.

Kelly, J.A., C.M. Fuss and J.R. Hall. 1971. The transplanting and survival of turtle grass, Thalassia testudinum in Boca Ciega Bay, Florida. Fishery Bulletin, U.S. 69(2):273-280.

Kennedy, F. S., Jr., J. H. Hunt, and W. G. Lyons. 1984. Catch rates of traps baited with sublegally sized spiny lobsters, Panulirus argus, with notes on effects of confinement. Unpublished Manuscript. Available from Florida Department of Natural Resources, Marine Research Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Labisky, R. F., D. R. Gregory, Jr., and J. A. Conti. 1980. Florida's spiny lobster fishery: An historical perspective. Fisheries 5(4):28-37.

Lyons, W. G. 1970. Scyllarid lobsters (Crustacea, Decapoda). Memoirs of the Hourglass Cruises 1(4):1-74. Available from Florida Department of Natural Resources, Marine Research Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Lyons, W. G. 1986. Problems and perspectives regarding recruitment of spiny lobsters, Panulirus argus, to the south Florida fishery. Canadian Journal of Fisheries and Aquatic Sciences 43:2099-2106.

Lyons, W. G. and F. S. Kennedy, Jr. 1981. Effects of harvest techniques on sublegal spiny lobsters and on subsequent fishery yield. Gulf and Caribbean Fisheries Institute 33:290-300.

Lyons, W. G., D. G. Barber, S. M. Foster, F. S. Kennedy, Jr., and G. R. Milano. 1981. The spiny lobster, Panulirus argus, in the middle and upper Florida Keys: Population structure, seasonal dynamics, and reproduction. Florida Marine Research Publications 38:1-45. Available from Florida Department of Natural Resources, Marine Research Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Martins, H. R. 1983. Biological studies of the exploited stock of the Mediterranean locust lobster, Scyllarides latus (Latreille, 1803) (Crustacea: Decapoda) in the Azores. Journal of Crustacean Biology 5(2):294-305.

Meltzoff, S. K. 1986. Predicting change and maintaining productivity in a fishery transformed by real estate development and tourism. Florida Sea Grant College Program Proposal R/LR-E-12. Available from University of Miami, Rosentiel School of Marine and Atmospheric Science, Marine Affairs, 4600 Rickenbacker Causeway, Miami, Florida 33149.

Moore, D.R. 1963. Distribution of the sea grass Thalassia testudinum in the United States. Bulletin of Marine Science. 13(2):329-343.

Munro, J.L. 1974. The biology, ecology, exploitation and management of Caribbean reef fishes. Pt V.I. The biology, ecology and bionomics of Caribbean reef fishes: crustaceans (spiny lobsters and crabs). Res. Dep. Univ. West Indies Zool. Dept., Kingston, Jamaica, 3: 1-57.

Ogren, L. H. 1977. Concealment behavior of the Spanish lobster, Scyllarides nodifer (Stimpson), with observations on its diel activity. Northeast Gulf Science 1(2):115-116.

Powers, J. E. 1985. An update of spiny lobster assessment data. Fisheries Analysis Division Contribution Number ML1-85-28. Unpublished Manuscript. Available from National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149.

Powers, J. E. and S. P. Bannerot. 1984. Assessment of spiny lobster resources of the Gulf of Mexico and southeastern coasts of the United States. Unpublished Manuscript (SAW/84/RFR/4). Available from National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149.

Prochaska, F. J. and P. D. Landrum. 1981. Spiny lobster, stone crab and secondary fishery costs and revenues in the Florida Keys, 1978-79 season. Florida Sea Grant College Report 42:135. Available from Florida Sea Grant, University of Florida, Gainesville, Florida 32611.

Ritchie, L. D. 1966. Crayfish pot escapement gap survey, November 1965 - January 1966. New Zealand Marine Department Technical Fisheries Report 14:1-9 +3 Tables and 13 Figures.

Roessler, M.A. and G.L. Beardsley. 1974. Biscayne Bay: Its environment and problems. Florida Academy of Sciences 37(4):186-204.

Statistical Abstract of the United States: 1985. National data book and guide to sources, 105th edition. United States Bureau of Census. Available from the Superintendent of Documents, United States Government Printing Office, Washington, District of Columbia 20402.

Storr, J.E. 1964. Ecology and oceanography of the coral reef tract, Abaco Island, Bahamas. Special Papers of the Geological Society of America. 79:1-98.

Tabb, D.C. and R.B. Manning. 1961. A checklist of the flora and fauna of northern Florida Bay and adjacent brackish waters of the Florida mainland collected during the period July 1957 through September 1960. Bulletin of Marine Science 11(4):552-649.

Thorhaug, A. 1974. Transplantation of the seagrass Thalassia testudinum Konig. Aquaculture 4: 177-183.

Thorhaug, A.T. and C.B. Austin. 1976. Restoration of seagrasses with economic analysis. Environmental Conservation 3(4):259-266.

Turney, W.J. and B.F. Perkins. 1972. Molluscan distribution in Florida Bay. Sedimenta III: 37 pp. Compartive Sedimentology Laboratory, University of Miami, Florida.

Vargo, G. 1968. Studies of phytoplankton ecology in tropical and subtropical environments of the Atlantic Ocean. Part 2. Quantitative studies of phytoplankton distribution in the Straits of Florida and its relation to physical factors. Bulletin of Marine Science 18(1);5-60.

Vermeer, G. K. 1985. Effects of air exposure on desiccation rate, hemolymph chemistry and escape behavior of the spiny lobster, Panulirus argus (Latreille, 1804). Unpublished Manuscript. Available from Florida Department of Natural Resources, Marine Research Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701.

Villegas, L., A. C. Jones, and R. F. Labisky. 1982. Management Strategies for the spiny lobster resources in the western central Atlantic: A cooperative approach. North American Journal of Fisheries Management 2:216-223.

Warner, R. E., C. L. Combs, and D. R. Gregory, Jr. 1977. Biological studies of the spiny lobster, Panulirus argus (Decapoda, Palinuridae), in south Florida. Gulf and Caribbean Fisheries Institute 29:166-183.

Witham, R., R.M. Ingle and A. Joyce. 1968. Physiological and ecological studies of Panulirus argus from the St. Lucie estuary. Florida State Board of Conservation Technical Series 53:1-31.

Wood, E.J.F. 1968. Studies of phytoplankton ecology in the tropical and subtropical environments of the Atlantic Ocean Part 1. Introduction to the series. Bulletin of Marine Science 18(1):1-4.

Wust, G. 1924. Florida and Antillenstrom. Veriff. Inst. Meeresk. Univ. Berl. 12:1-48.

Yang, M. C. K. and B. Obert. 1978. Selected statistical analyses of Key West spiny lobster data. Pages 4-7 in R. E. Warner (editor). Spiny lobster research review. Florida Sea Grant Technical Paper Number 4. Available from Florida Sea Grant, University of Florida, Gainesville, Florida 32611.