

**AMENDMENT 6**  
**TO THE**  
**FISHERY MANAGEMENT PLAN**  
**FOR THE STONE CRAB FISHERY OF**  
**THE GULF OF MEXICO**  
**(Includes Environmental Assessment and Regulatory Impact Review)**



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**813-228-2815**

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### **Abbreviations Used in this Document**

<b>AP</b>	<b>Advisory Panel</b>
<b>Council (or GMFMC)</b>	<b>Gulf of Mexico Fishery Management Council</b>
<b>CPUE</b>	<b>Catch Per Unit Effort</b>
<b>EA</b>	<b>Environmental Assessment</b>
<b>EEZ</b>	<b>Exclusive Economic Zone</b>
<b>FDEP</b>	<b>Florida Department of Environmental Protection (formerly Department of Natural Resources)</b>
<b>FMFC</b>	<b>Florida Marine Fisheries Commission</b>
<b>IRFA</b>	<b>Initial Regulatory Flexibility Analysis</b>
<b>NMFS</b>	<b>National Marine Fisheries Service</b>
<b>OFF</b>	<b>Organized Fishermen of Florida</b>
<b>RA</b>	<b>Regional Administrator, NMFS</b>
<b>RIR</b>	<b>Regulatory Impact Review</b>
<b>SAFMC</b>	<b>South Atlantic Fishery Management Council</b>
<b>SEFSC</b>	<b>Southeast Fisheries Science Center</b>
<b>SSC</b>	<b>Scientific and Statistical Committee</b>
<b>State</b>	<b>State of Florida (FDEP and/or FMFC)</b>
<b>FMP</b>	<b>Fishery Management Plan</b>
<b>MCCF</b>	<b>Monroe County Commercial Fishermen, Inc.</b>
<b>RFA</b>	<b>Regulatory Flexibility Act</b>
<b>ITQ</b>	<b>Individual Transferable Quota</b>

# STONE CRAB FISHERY MANAGEMENT PLAN - AMENDMENT 6

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## **1. PUBLIC REVIEW**

A total of three public hearings were held to obtain public comments on this plan amendment with one additional final hearing held during the Gulf Council meeting in Point Clear, Alabama on January 21, 1998. The public comment period for this amendment ended on January 15, 1998.

Public hearings were scheduled as follows from 7:00 p.m. to 10:00 p.m.

January 6, 1998	January 7, 1998	January 8, 1998
Regional Service Center	Naples Depot Civic-Cultural Center	Plantation Inn & Golf Resort
County Building	1051 5 <sup>th</sup> Avenue South	9301 West Fort Island Trail
2796 Overseas Highway	Naples, Florida	Crystal River, Florida
(U.S. Highway 1)		
Marathon, Florida		

## **2. LIST OF AGENCIES AND PERSONS TO BE CONSULTED**

Gulf of Mexico Fishery Management Council:	Scientific and Statistical Committee Stone Crab Advisory Panel
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Coastal Zone Management Programs:	Florida
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National Marine Fisheries Service:	Southeast Fisheries Science Center Southeast Regional Office
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Florida Marine Fisheries Commission

## **3. LIST OF PREPARERS**

Gulf of Mexico Fishery Management Council  
-Wayne Swingle, Biologist  
-Antonio Lamberte, Economist

## **4. HISTORY OF MANAGEMENT**

The Fishery Management Plan for the Stone Crab Fishery of the Gulf of Mexico (FMP) was implemented on September 30, 1979 (44 FR 53519). The FMP resolved an armed conflict over competing gear use between stone crab and shrimp fishermen operating in the Exclusive Economic Zone (EEZ) off southwest Florida and extended Florida's rules regulating the fishery into the EEZ. The management area of the FMP is limited to the EEZ seaward of the west coast of Florida in the Gulf of Mexico (Gulf). The FMP has been amended five times. Amendment 1 was implemented on November 8, 1982 (47 FR 41757), and specified a procedure for modifying the zoned area to resolve the gear conflict. Amendment 2 was implemented on August 31, 1984 (47 FR 30713), and

established procedures for resolving gear conflicts in central west Florida. Amendment 3 was implemented on September 25, 1986 (51 FR 30663), and included management measures to enhance survival of crabs held on board vessels and prohibited harvest of egg-bearing female crabs. Amendment 4 was approved on February 19, 1991 (56 FR 6837), and contained provisions for adding a scientifically measurable definition of overfishing and an action plan to arrest overfishing, should it occur, as required by the Magnuson Act National Standards (50 CFR 602), a section on vessel safety considerations, and a revised habitat section as required by the Magnuson Act.

Amendment 5 was implemented on April 14, 1995 (60 FR 13918) and placed a three-year moratorium on registration of stone crab vessels by the Regional Administrator (RA) of the National Marine Fisheries Service (NMFS). This was done for the period, April 15, 1995 - June 30, 1998, because the Florida Legislature proposed a state moratorium on issuance of permits while the industry considered development of a limited access system. Amendment 5 also included a protocol and procedure (framework measure) under which the RA could approve for implementation in the EEZ certain types of rules proposed by the state of Florida after review by the Advisory Panel (AP), Scientific and Statistical Committee (SSC), and Gulf of Mexico Fishery Management Council (Council). Amendment 5 also updated the description of the fishery habitat and the factors affecting this habitat. The Council published a control date effective July 24, 1995 (60 FR 37868) for the commercial fishery; the effect of which was to notify fishermen entering the fishery after this date that they may not be allowed to participate in the fishery if that date is used in a limited access program to limit entry.

## **5. DESCRIPTION OF FISHERY AND UTILIZATION PATTERNS**

The description of the fishery and utilization patterns are described by Muller and Bert (1997) in their 1997 Update on Florida's Stone Crab Fishery which is appended to this document. The Executive Summary of this Appendix is repeated here, whereas the tables and figures describing the fishery are in the Appendix. The Executive Summary of Muller and Bert (1997) is as follows:

- The stone crab fishery does not harvest the crab but rather fishers remove the claws from the crabs and then return the crabs to the water. Approximately 10% of the claws observed by samplers in the fish houses have been regenerated. Since males have larger claws, males enter the fishery earlier and the majority of the claws are taken from males. Female crabs have already spawned one or more seasons by the time their claws reach legal size.
- Landings in weight of claws have been increasing for more than 30 years, fluctuations surround the trend line. For example, the landings in the 1981-82 and 1982-83 seasons were substantially above the trend line but those from the 1983-84 and 1984-85 seasons were below the trend line. More recently, landings from the 1990-91 through 1994-95 seasons were above the trend and landings from the 1995-96 season were below. A preliminary estimate of 1996-97 based on October-January landings indicate that the 1996-97 landings were also below the trend line.

- Effort also has increased during the past 30 years. The number of traps in the fishery has increased from 14,000 traps in 1962-63 to an estimated 798,000 traps in 1995-96. The number of commercial trips has increased from 19,000 per season in 1985-86 (the first season with trip information available) to 32,000 trips per season in 1995-96. Landings have not kept pace with the increases in either measure of effort.
- Catch per trap has fluctuated widely, and has shown a decreasing trend. Catch rates have dropped rapidly from more than 20 pounds per trap in the 1960s to less than 10 pounds per trap by 1971 to less than 5 pounds per trap by 1983. Catch rates declined as the number of traps increased. Although the catch per trap since 1983 has been very low, it has declined only slightly with the doubling of traps. However, the catch per trip, which has higher resolution, indicates that the catch per trip has declined since 1993-94. The preliminary 1996-97 catch rate is the lowest of the series and has the highest effort.
- Monthly catch per trip during the fishing season typically declines sharply during the season.
- Plots of landings on effort indicate that as effort has increased, landings have not increased at the same rate. Both measures of effort, number of traps and number of commercial trips, indicate that the fishery is either operating at its maximum (traps) or slightly past the maximum (trips).
- The catch rate of juvenile crabs from the fishery independent stone crab monitoring project in Tampa Bay provide a good estimate of the commercial fishery's catch rates three years later. The first year of the juvenile index (1989-90) did not predict the 1992-93 commercial catch rates well but from 1990 through 1993 there was good correspondence between juvenile catch rates collected in the sampling and the catch per trap three years later (1993-94 to 1996-97). Correlations between monthly commercial catch rates and the juvenile catch rates indicate that some juveniles enter the fishery at approximately 27 months after settlement, these are presumably males. Some juveniles also enter the fishery 38 months later, these are principally females.
- The juvenile index in Tampa Bay raises serious concern. If juvenile catch rates from the monitoring program continue to predict future commercial catch rates, there could be a scarcity of stone crabs in the Tampa Bay region in the 1999-2000 fishing season because catch rates of juveniles collected in Tampa Bay in 1996-97 were not significantly different from zero. While it remains to be seen if this relationship holds in other areas of Florida, fishery independent sampling has potential as an early warning system for this fishery.
- Based on the results of these analyses, we recommend that the Marine Fisheries Commission continue with their plans to reduce effort in the stone crab fishery.

## **6. PURPOSE AND NEED FOR ACTION**

### **Vessel Registration**

The purpose of the proposed action is to either extend the moratorium on registration of stone crab vessels by the RA or to enter into a cooperative agreement with the State of Florida under section 304(d)(1) of the Magnuson-Stevens Act, whereby only the state will administer the permit system rather than sharing that responsibility with the RA under the Fishery Management Plan (FMP). This action is needed to provide additional time for the industry and the state of Florida to develop and implement a limited access system for the fishery (see Amendment 5).

## **7. PROBLEMS REQUIRING A PLAN AMENDMENT**

The original FMP required vessels operating in the fishery to be registered by the appropriate state or federal agency and assigned an identification number and color code for vessel and gear. 50 CFR Part 654 provided that if a vessel permit (and color code) could not be obtained from Florida, that the RA of NMFS could issue the number and color code for operation in the EEZ.

Through Amendment 5, the Council implemented a temporary moratorium on registration of vessels by the RA. Even though the FMP provided authority to the RA to register vessels, no vessels have ever been registered by NMFS since the FMP was implemented in 1979. All participants in the fishery have been permitted by the state of Florida in lieu of federal registration. The Council proposed the moratorium because the Florida legislature was considering a moratorium on the issuance of state permits; and without the federal moratorium, persons could have circumvented the state moratorium. The Florida moratorium on permits became effective on July 1, 1995.

The industry, through workshops held by the Council's Stone Crab AP, determined that limited access was needed in the fishery and had the opportunity to suggest the structure of such a program. The AP, through a series of public meetings, developed their recommendations for the structure of a limited access program. The Council submitted their recommendations to the Florida Marine Fisheries Commission (FMFC) who developed an options paper on the program and presented it at additional public workshops for comment. The FMFC, after reviewing these findings with the fishery associations representing stone crab fishermen, will make its recommendations on the program to the Florida Legislature.

The problem being addressed is that the Federal moratorium may expire before legislative action is taken. If the moratorium expires many persons, who were excluded by the state moratorium, would probably apply to the RA for permits because many commercial fishermen were displaced by the Florida net ban. Both the net ban and state moratorium on the issuance of additional stone crab permits became effective on July 1, 1995. There are already too many persons holding permits which allows them to commercially fish for stone crabs. As of the implementation date of the state moratorium in 1995, there were 6,501 permits issued, of which only 1,556 had stone crab landings,

and 1,102 permittees had landings of 500 pounds or less annually. The limited access program proposes to significantly reduce the number of permitted persons.

## **8. PROPOSED ACTIONS**

### **A. VESSEL REGISTRATION**

**Preferred Alternative:** Continue the FMP's temporary moratorium on registration<sup>1</sup> of stone crab vessels by the RA. Such moratorium shall be for up to 4 years duration.

**Rejected Alternative 1:** NMFS will enter into a cooperative agreement whereby the state of Florida will administer the permit system for the stone crab fishery, as provided by the Magnuson-Stevens Act under section 304(d)(1).

**Rejected Alternative 2:** No action - Do not implement a FMP moratorium on stone crab vessel registration or end the federal registration requirements.

**Discussion:** The original FMP provided that "no permits will be required for vessels fishing for stone crabs in the EEZ. All vessels fishing for stone crabs in the EEZ, however, must be registered (enumerated) by the appropriate federal or state agency." The FMP further provided that the purpose of such enumeration was for the collection of data necessary to properly manage the fishery. To collect these data the FMP required that all fishermen turn in daily trip tickets.

In order to identify vessels fishing and persons who would report, the original regulations (44 FR 53520) required each vessel fishing in the management area to display their Florida permit number and color code. These regulations also provided that persons who could not get a Florida permit could apply to the NMFS RA for a number and color code for vessels and trap buoys. No one has applied to the RA since the FMP was implemented in 1979. Amendment 5 placed a 3-year moratorium on the RA issuing any vessel number or color code because the Organized Fishermen of Florida (OFF) was working with the Florida Legislature to place a moratorium on issuing any new permits. That legislation finally passed and became effective July 1, 1995. The regulations for Amendment 5 required all vessels harvesting stone crabs in the management area must comply with Florida rules (62N-8.001 and 46-13.002[2][e] and [f]) for permits and color codes.

Following the moratorium, the Council's Stone Crab AP, OFF, the Monroe County Commercial Fishermen, Inc. (MCCF) and FMFC have worked toward development of a limited access program for consideration by the legislature. The moratorium on federal regulations will expire on June 30, 1998, and there is some concern that legislative action by the state may be delayed beyond that date. The Preferred Alternative would provide for extension of the federal moratorium period for up to 4

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<sup>1</sup>Registration means the vessel would be issued an identification number and color code which identifies it and allows operation in the EEZ fishery.



years to allow ample time for the state legislation to be implemented and for the Council to develop an amendment instituting the program in the EEZ.

Rejected Alternative 1 would invoke the provisions of Section 304(d)(1) of the Magnuson-Stevens Act allowing NMFS to delegate administration of permitting to the state. This action is envisioned as a permanent transfer of authority over permitting to the state, as was done for commercial spiny lobster permits for participants fishing for lobster in the EEZ off Florida. Under the Stone Crab FMP, the original reporting requirement by federal trip ticket was replaced by an amendment to require the use of the Florida Trip Ticket System instead. Therefore, the original purpose of identifying persons to report under the FMP by requiring a vessel permit identification number is no longer a valid purpose. Rejected Alternative 1 would end the federal requirement in lieu of the state requirement.

To date the industry and state (FMFC) have made good progress and have developed provisions for a license limitation system that would exclude permit holders with no record of landings during recent years. The only area in which agreement has not been reached is for provisions to reduce the number of traps. The current proposed measures would require a reduction each time a license is transferred to another person, but the industry and state have not reached a consensus on the percent reduction that would occur. This caused a one-year delay in submitting the limited access package to the Florida Legislature. The two industry associations MCCF and OFF feel that this issue will be resolved in the near future allowing the legislature to take action in 1999 with the state law to be effective July 1, 1999. The Council will, at that time, complete a draft amendment that proposes to extend the license limitation program to the EEZ.

**Biological Impacts:** If the federal moratorium on vessel registration ends before the state legislation and Council amendment for a limited access system are implemented, the stock could potentially be impacted by a large influx of new participants entering the fishery from the group of fishermen displaced by the net ban. The biological information presented by Muller and Bert (1997) in the Appendix indicates that the maximum production level available from the resource has been reached. Any further increase in effort will definitely result in reduced catch per unit effort (CPUE) (see Appendix, Figure 5). The 1995 landings have declined over that for previous years (Appendix, Figures 1 and 2). Muller and Bert (1997) indicated that recruitment to the fishery has declined over the past two seasons. More recent information for landings during the 1996-1997 season indicated an increase in landings above the trend line (Figures 1 and 2). Fishermen reported very good landings during the 1997-1998 season, but total landings have not been completed. Nor has the juvenile index from monitoring traps in the Tampa Bay area been completed for these two seasons or used to predict future harvest for that area.

**Socioeconomic Impacts:** When the current federal moratorium on registration of stone crab vessels by the RA was implemented on April 15, 1995, it did not present itself as a binding constraint. No vessel registered with the RA before the moratorium. More importantly, the corresponding state (Florida) moratorium did not become effective until July 1, 1995 so that new permits could still be secured from the state for a certain period of time. The present situation is now different. Given the state moratorium and initiative to establish limited entry in the stone crab fishery, discontinuing the

federal moratorium would only invite more entrants from both speculators and fishermen displaced by the Florida net ban. This would adversely affect existing participants, if substantial entry occurs, by reducing their respective shares of harvest. In addition, it would tend to worsen the efficiency problems of this fishery. The fishery is already overcapitalized both in terms of gear deployed with approximately 798,000 traps deployed in 1995-96 (Appendix, Table 1) and in terms of the number of permitted vessels which at the start of the moratorium totaled 6,501 of which only 1,556 had stone crab landings with the majority landing only 500 pounds or less annually. Gains in landings have not been very significant since 1982-83, when approximately 350,000 traps were deployed (Appendix, Figure 1, Table 1). CPUE has declined significantly since that time (Appendix, Table 1).

## **9. REGULATORY IMPACT REVIEW (RIR)**

### **9.1 Introduction**

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: 1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action, 2) it 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 the problem, and 3) it ensures that the regulatory agency 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 are a "significant regulatory action" under the criteria provided in Executive Order 12866, and whether the proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act of 1980 (RFA). The primary purpose of the RFA is to relieve small businesses, small organizations, and small governmental jurisdictions (collectively: "small entities") of burdensome regulatory and recordkeeping requirements. The RFA requires that if regulatory and recordkeeping requirements are not burdensome, then the head of a federal agency must certify that the requirement, if promulgated, will not have a significant effect on a substantial number of small entities.

This RIR analyzes the probable impacts that the proposed alternatives for Amendment 6 to the Stone Crab FMP would have on the commercial stone crab industry.

### **9.2 Problems and Issues in the Fishery**

The general problems in the fishery are enumerated in the section Problems in the Fishery of the Stone Crab Fishery Management Plan (FMP), as amended. The specific problems addressed by this proposed plan amendment are enumerated and discussed in Sections 6 and 7. The issue identified for plan amendment involves the expiration of the federal moratorium on vessel registrations.

### 9.3 Objectives

The general management objectives are enumerated in the section Management Objectives of the Stone Crab Fishery Management Plan, as amended. This amendment is intended to address the problem and issue identified for the fishery as a result of excessive effort (see Appendix).

### 9.4 Management Measures

The proposed actions and specific management measures are fully stated and discussed in Section 8. The management actions considered are those corresponding to the problems identified. These are restated or described in the following section where their potential impacts are analyzed.

**Preferred Alternative:** Continue the FMP's temporary moratorium on registration<sup>1</sup> of stone crab vessels by the RA. Such moratorium shall be for up to 4 years duration.

**Rejected Alternative 1:** NMFS will enter into a cooperative agreement whereby the state of Florida will administer the permit system for the stone crab fishery, as provided by the Magnuson-Stevens Act under section 304(d)(1).

**Rejected Alternative 2:** No action - Do not implement a FMP moratorium on stone crab vessel registration or end the federal registration requirements .

As discussed in Section 5, the stone crab fishery in the Gulf is essentially a Florida fishery. In the past, the fishing area was mostly in the shallow waters off Monroe, Collier, Manatee, and Pinellas Counties; but in recent years, fishing expanded to areas in deeper waters for most Gulf coastal counties from Monroe to Franklin. In addition to resolving gear conflicts between shrimp and stone crab fishermen, the FMP (as amended) simply extends the Florida rules into the EEZ. In addition the FMP's management area is limited to the EEZ seaward of the west coast of Florida, and off Monroe County, Florida includes the EEZ in the Atlantic Ocean.

Under the Florida rules, a permit is required to commercially fish for stone crabs. While a state permit is sufficient to fish in both state and EEZ waters, the NMFS RA is also authorized to issue a vessel identification number to allow fishing in the EEZ, but only to those who cannot secure a state permit. Both issuance of new state permits and federal vessel identification number are currently under a moratorium while Florida is developing a limited access program for the stone crab fishery. The Preferred Alternative and Rejected Alternative 1 would mainly extend the federal moratorium until the limited access system is implemented by the state and adopted in federal waters (through a procedure established under Amendment 5).

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<sup>1</sup> Registration means the vessel would be issued an identification number and color code which identifies it and allows operation in the EEZ fishery.

Currently in the Gulf area, there is in effect a moratorium on the issuance of new commercial permits for reef fish. This was first implemented in 1992 under Amendment 4 to the Reef Fish FMP, and has been extended by Amendment 13. A similar moratorium has been proposed for king mackerel under Amendment 8 to the Coastal Pelagics FMP. One major intent of the reef fish and king mackerel moratoria is to prevent an influx into the fishery of more vessels while a limited access system is considered. To date, only a limited access system for the red snapper component of the reef fish industry has been proposed under Amendment 15; however, limited access systems are being contemplated for other reef fish species and king mackerel. Moratoria adopted or considered for fisheries under the jurisdiction of other regional fishery councils have served mainly as pre-conditions to limited access systems for the subject fisheries.

Higgs (1978) studied the probable socioeconomic effects of a moratorium then proposed for the groundfish fishery by the Pacific Fishery Management Council. His major conclusions were: 1) slight deterioration in the efficiency of resource use; 2) an increase in the number of licensed gear operators; 3) small proportional increase in effort; 4) an increase in the market value of licenses; 5) no significant effects on prices of fish, on participation in alternative fisheries, on alternative employment, on incomes of operators, on the value of vessels and gear, and on the activity in boat building, service industries, and coastal communities; 6) slight increase in social conflict among fishermen; 7) some restriction on the independent way of life in the fishery; 8) certain distributional effects; and, 9) a possible substantial increase in management and enforcement costs. The Pacific Council's Scientific and Statistical Committee (SSC) determined that these effects were mainly short-term in nature and were not determined in the context of either the long-term or a succeeding limited entry system. The SSC, however, agreed with the Higgs (1978) report in its assertion that a moratorium, not followed by an effective limited entry system, would result in adverse consequences. The SSC also concluded that greater social and economic costs would occur upon implementation of a limited entry program that was not preceded by a moratorium.

Since the current proposal to extend the moratorium may be viewed as a prelude to a limited access system in the stone crab fishery, it appears more appropriate to consider mainly the short-term effects along the lines determined by Higgs (1978). With respect to the long-term effects, it is deemed sufficient to reiterate the Pacific Council's SSC conclusion that adverse consequences are bound to occur if a moratorium is not followed by an effective limited access system.

#### No Action versus Extension of the Moratorium

The stone crab fishery is already overcapitalized both in terms of number of gear deployed and number of vessels. Stone crab traps increased from about 14 thousand in 1962/63 to 798 thousand in 1995/96. For the same period, landings increased from 300 thousand pounds to 2.828 million pounds; consequently, pounds per trap fell from 20.5 to 3.5 (Table 1, Appendix). Vessels at the start of the moratorium totaled 6,501 of which only 1,556 had stone crab landings with the majority landing only 500 pounds or less annually. The number of trips also increased from about 19,000 in 1985/86 to 34,000 in 1995/96 (Table 2, Appendix). Estimated number of participants rose from

1,139 in 1985/86 to 1,689 in 1995/96. Given an overcapitalized fishery, any addition of vessels, as could happen under Rejected Alternative 2, would only worsen the situation.

Since the moratorium and its extension affects only the entrance of additional vessels and not the deployment of traps, there is still a good possibility that fishing effort may increase beyond current level even with the extension of the moratorium. It is instructive to note at this stage that there is a current proposal to limit the number of traps in the stone crab fishery under a limited entry system (Williams, 1997). While this may eventually prevent an increase in effort from an increase in the number and use of traps, it could in the interim prompt current participants to invest in more traps. A significant increase in the number and use of traps would only negate the effects of the moratorium extension.

Under a moratorium and its extension, licenses will command values well above the cost of obtaining them, and this value will increase with increases in the demand for stone crabs. Adams and Prochaska (1992) conducted both long-term and short-term ex-vessel price analyses for the stone crab fishery in Florida. While they found that ex-vessel prices were significantly related to claw landings and income over the short- and long-term period, such prices were not very responsive to changes in claw landings. Prices, nonetheless, were found to be relatively responsive to income changes. Thus, growth in income, particularly over the long-run, would exert an upward pressure on prices. A major implication of these findings is that over the long-run when income increases, value of licenses under a moratorium would increase. Nonetheless, the realization of such increased license value will depend on the nature of license transferability during the moratorium and the duration of the moratorium. If licenses are not transferable during the moratorium, except perhaps on hardship cases, any value accruing to the licenses may not be converted to cash.

A slightly similar situation to licenses occurs with respect to the value of the fishing crafts. A moratorium may increase the value of fishing crafts, but only in a very small proportion relative to the increase in the value of licenses. Such increase may occur in the event that only those fishing crafts that receive permits at the start of the moratorium may be employed in the fishery. Most likely, however, such value increase will be included in the license value in the event of transfer by sale. In a situation where licenses may be transferred to vessels not originally licensed at the start of the moratorium, no such increase in vessel value will ensue. The absence of relevant information precludes us from verifying whether or not a change in the value of fishing craft did occur during the moratorium.

Since the moratorium and its extension do not apply to traps, no increases in the value of traps may be expected from implementation of a moratorium or its extension. In consideration of some limited entry proposal that may limit the number of traps one can possess and/or use, the value of traps may eventually decrease.

Any of the alternatives that would extend the moratorium is not expected to reduce the number of participants in the stone crab fishery to the point that reductions in harvest would ensue. The current level of harvest capacity in the fishery is deemed to be sufficient to harvest the resource so that no

shortage in stone crab supply may be expected as a result of extending the moratorium. Under such condition, any changes in prices for stone crabs may then be brought about either by changes in demand or changes in harvest conditions such as the change in stock levels or fishing conditions. In this sense, all three alternatives would have similar effects on the ex-vessel price for stone crabs.

Since none of the alternatives for extending the moratorium is expected to substantially reduce the current number of fishery participants, implementation of a moratorium is not expected to affect participation in alternative fisheries, alternative employment, and incomes of operators. Naturally, those who are not currently in the fishery, be they prior or prospective participants especially those displaced by the net ban, would face restrictions on their fishing and employment opportunities. The extent of such restrictions cannot be assessed with existing information. With respect to incomes of operators, an extension of the moratorium may be expected, at the least, to limit the likelihood of existing operators experiencing a reduction in incomes since new entrants would be practically disallowed in the fishery. While an extension of the moratorium may be expected to limit activities in boat building, service industries, and affected coastal communities, it is believed that the extent of such effects is relatively small since the potential limitation resulting from an extension of the moratorium would be relevant only to future changes in these activities which are likely to be relatively small considering the changes in the industry in the last three to five years.

It may be recalled that one major motivation for the formulation of the stone crab FMP was to resolve the conflict between shrimp and stone crab fishermen fishing in the same areas in the EEZ (see Section 4). One of the causes of this conflict was the increasing number of stone crab and shrimp fishermen fishing in the same areas, and newcomers were not knowledgeable of existing fishing arrangements, thus contributing to exacerbation of the conflict (Overbey, 1987). This conflict was resolved and both groups of fishermen are greatly aware of the limits of their respective fishing activities. By continuing to limit the number of stone crab fishermen, especially the new entrants, an extension of the moratorium offers a good chance of ensuring that these previous conflicts not re-occur. This extension, however, would not affect the number of shrimp fishermen entering the fishery and fishing in the same areas.

In assessing the importance of tradition as a rationale for government intervention in fisheries management, Cicin-Sain (1978) remarked that the tradition of individual freedom of choice is as equally important as the tradition of economic efficiency. A moratorium may be seen as a first step toward limiting individual freedom in the stone crab fishery. While prevention of the re-occurrence of conflict between shrimp and stone crab fishermen may be enhanced through the moratorium and its extension, the acceptability of the moratorium may partly depend on how strongly it is perceived as a first step toward limiting individual freedom in the stone crab fishery. At the time the moratorium was considered, it appeared that acceptability of a moratorium was relatively high as partly evidenced by the effort of the industry (mainly OFF) to institute a moratorium at the state level. In addition, a telephone poll of the Gulf Council's Advisory Panel for stone crab indicated support for this action. A similar or even higher level of acceptability to extend the moratorium may be expected of these individuals, especially at the face of proposals to institute limited entry in the fishery. It is not unexpected that a contrary position would be taken by those who are faced with

limited opportunities, especially those displaced in other fisheries by regulations or laws such as the net ban.

The moratorium itself has not resulted in incurring substantial additional management and enforcement costs. A similar situation may be expected of the alternatives to extend this moratorium. State licenses will continue to be issued but this time limited to at most the same number of participants in the current moratorium. Beyond the moratorium and into the limited access regime, we can expect additional management costs for the proper functioning of the system, but this cost item cannot be evaluated until a more specific form of a limited access system is being considered.

## **9.5 Private and Public Costs**

The preparation, implementation, enforcement, and monitoring of this or any federal action involves the expenditure of public and private resources that can be expressed as costs associated with the regulations. Costs associated with this specific action include:

Council costs of document preparation, meetings, public hearings, and information dissemination . . . . .	\$5,000
NMFS administrative costs of document preparation, meetings, and review . . . . .	2,500
Law enforcement costs . . . . .	none
Public burden associated with data collection . . . . .	none
NMFS costs associated with data collection . . . . .	none
TOTAL . . . . .	\$7,500

The Council and Federal costs of document preparation are based on staff time, travel, printing, and any other relevant items where funds would be expended directly for this specific action. There are no additional law enforcement costs with this plan amendment. The data collection action imposes costs on the public and NMFS. The NMFS costs associated with the data collection include those that would be expended for compiling information. It is felt that the identified costs comprise the major cost items for the preparation and implementation of this amendment.

## **9.6 Summary of Regulatory Impacts**

While an extension of the moratorium simply maintains the basic rule now in effect, and so would be considered in principle to have no effects on fishing participants, certain issues have been noted above. By preventing new entrants into the fishery, an extension of the moratorium would prevent

a further deterioration of economic efficiency in the fishery, unless an increase in the number of traps would ensue. This latter increase could result from limited entry considerations during the moratorium. Further, current participants would not experience a reduction in their overall share of the harvest, thus preserving to some extent their economic viability in the fishery.

Other effects of a moratorium would continue to occur under any of the alternatives that would extend it. An increase in the value of licenses more than an increase in value of fishing crafts would occur. Since the number of current participants in the fishery would not be reduced and given the overcapitalized nature of the fishery, an increase in the price of stone crabs due to an artificial supply shortage is very unlikely. An extension of the moratorium would not affect participation in alternative fisheries, alternative employment, and incomes of operators of those who are currently in the fishery, but it would further limit the activities of prospective entrants to the fishery. An extension of the moratorium may partly obviate the re-occurrence of previous conflict between stone crab and shrimp fishermen. Extending the moratorium would restrict individual freedom of fishermen, and it would be expected to elicit strong opposition from those displaced by other regulations or laws. A moratorium extension is expected to incur only minimal administration and enforcement cost, although a later limited access system may involve substantial cost for its effective functioning.

## **9.7 Determination of a Significant Regulatory Action**

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: a) an annual effect on the economy of \$100 million or more; b) a major increase in costs or prices for consumers, individual industries, federal, state, or local government agencies, or geographic regions; or c) significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

An extension of the moratorium would not restrict the current number of participants in the fishery; thus it is not expected to have an effect on the economy of \$100 million or more. In addition, the stone crab fishery had an ex-vessel value of only about \$15.7 million in 1992. The highest recorded value was in 1990 and was only about \$15.9 million. Since harvest would not be restricted, no major cost or price increases for consumers and stone crab and related industries would result from extending the moratorium. The costs to federal and state government agencies of formulating and implementing the moratorium are expected to be relatively small since it would mainly continue the current practice. There are no expected cost or price increases in the geographic region where stone crab is a major fishery. To the extent that an extension of the moratorium would not reduce the current number of participants in the stone crab fishery, no significant adverse effects on competition, investment, productivity, innovation, or the competitive status of the domestic fishery, vis-a-vis its foreign rivals, would arise. Employment in the fishery of prospective entrants would be limited under a moratorium, but the quantitative extent of this probable effect cannot be determined.

On the basis of the foregoing discussion, it is determined that the proposed regulation would not constitute a major regulatory action as stipulated under E.O. 12866.



## **9.8 Determination of the Need for Initial Regulatory Flexibility Analysis (IRFA)**

### **Introduction**

The purpose of the Regulatory Flexibility Act (RFA) is to relieve small businesses, small organizations, and small governmental entities from burdensome regulations and record keeping requirements. The category of small entities likely to be affected by the proposed plan amendment is that of commercial businesses currently engaged in the stone crab fishery. The impacts of the proposed action on these entities have been discussed above. The following discussion of impacts focuses specifically on the consequences of the proposed action on the mentioned business entities. An Initial Regulatory Flexibility Analysis (IRFA) is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." In addition to analyses conducted for the Regulatory Impact Review (RIR), the IRFA provides an estimate of the number of small businesses affected, a description of the small businesses affected, and a discussion of the nature and size of the impacts.

The Regulatory Flexibility Act requires a determination as to whether or not a proposed rule has a significant impact on a substantial number of small entities. If the rule does have this impact then an Initial Regulatory Flexibility Analysis (IRFA) has to be completed for public comment. The IRFA becomes final after the public comments have been addressed. If the proposed rule does not meet the criteria for "substantial number" and "significant impact," then a certification to this effect must be prepared.

### **Substantial Number of Small Entities Criterion**

There were 1,689 participants in the stone crab fishery for the year 1995/96, although in terms of business entities the number would be substantially less. According to a recent survey of the commercial reef fish fishery (Waters, 1996), the number of reef fish boats that fished for stone crab ranged from 69 in May to 114 in November. Considering that this was a survey of reef fish vessels, actual number of vessels that fish for stone crabs would be greater. In fact, a total of 647 vessels fished for stone crabs in 1992. All of these stone crab harvesting entities affected by the rule will qualify as small business entities because their gross revenues are less than \$3 million annually. Hence, in general the criterion of a substantial number of the small business entities comprising the stone crab harvesting industry being affected by the proposed rule will be met.

### **Significant Impact Criterion**

The outcome of "significant impact" is less clear but can be triggered by any of the five conditions or criteria discussed below.

The regulations are likely to result in a change in annual gross revenues by more than 5 percent. To the extent that alternatives to extend the moratorium would simply maintain current rules, vessels participating in the stone crab fishery would not experience reductions in gross income. On the other

hand, if the moratorium is allowed to expire, entering vessels could replace some of the current participants as to reduce their gross revenues by more than 5

Annual compliance costs (annualized capital, operating, reporting, etc.) increase total costs of production for small entities by more than 5 percent. The public burden to comply with the provisions of this amendment has been estimated to be practically nil as no additional permits, gear modifications, or other similar changes in this category are required.

Compliance costs as a percent of sales for small entities are at least 10 percent higher than compliance costs as a percent of sales for large entities. All the firms expected to be impacted by the rule are small entities and hence there is no differential impact.

Capital costs of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities. General information available as to the ability of small business fishing firms to finance items such as a switch to new gear or new species or new fishing areas is that the banking community is becoming increasingly reluctant to finance changes of this type, especially if the firm has a history of cash flow problems. Significant effects of this type are not expected to occur from any of the alternatives that would extend the moratorium, but may occur if the moratorium is allowed to terminate.

The requirements of the regulation are likely to result in a number of the small entities affected being forced to cease business operations. This number is not precisely defined by SBA but a "rule of thumb" to trigger this criterion would be two percent of the small entities affected. The accompanying RIR indicates that the action to extend the moratorium would not force any vessels out of the fishery. However, exit is a possibility in the event the moratorium ends and a substantial number of vessels enter the fishery.

## Conclusion

While the proposed rule would affect a substantial number of small business entities, its effect is determined not to be significant if a simple extension of the moratorium is adopted. Allowing the moratorium to expire could result in such impacts being significant.

## **10. ENVIRONMENTAL CONSEQUENCES**

### **10.1 Physical Environment**

The actions presented in this amendment will have no impact on the physical environment since they are primarily related to revision of the FMP administrative system for registering vessels.

### **10.2 Fishery Resources**

The alternatives for revising of the FMP administrative system will have no, to a small beneficial impact on the stone crab fishery resources (see Discussion under Section 8).

### **10.3 Human Environment**

Extension of the moratorium will benefit the historical and existing participants by preventing additional overcapitalization of the fishery in terms of gear deployed, thereby preventing reduction in the harvest level for these participants and the associated adverse socioeconomic impacts.

### **10.4 Impact on Other Fisheries**

The proposed moratorium extension contained in this amendment may result in additional participants entering other fisheries. Currently, an effort limitation (or trap certificate) system exists for spiny lobster and a moratorium on reef fish vessel permits. Persons may enter those fisheries only by purchasing spiny lobster trap certificates or a reef fish vessel permit. Entry into other state or federal fisheries is not similarly constrained. In the absence of the moratorium extension, more traps may be fished and more bycatch species (principally grunts and sea bass) may be taken. Persons potentially could enter federal or state fisheries for sharks, mackerels, or shrimp; all of which are overcapitalized. With sufficient capital resources, they could enter offshore fisheries for tuna and golden crabs that are not overcapitalized.

### **10.5 Effect on Endangered Species and Marine Mammals**

A Section 7 consultation has been completed by NMFS indicating no impact of the proposed actions in Amendment 6 on endangered species or marine mammals.

### **10.6 Effect on Wetlands**

The actions presented in this amendment have no effect on wetlands.

### **10.7 Conclusion**

Mitigation measures related to the proposed action and fishery: No significant environmental impacts are expected; therefore, no mitigating actions are proposed. Unavoidable adverse effects with implementation of the proposed actions and any negative net economic benefits are discussed in the Regulatory Impact Review. Irreversible and irretrievable commitment of resources involved with government costs are those related to preparation and approval of the amendment, but they are mainly one-time expenditures.

### **10.8 Finding of No Significant Environmental Impact**

In view of the analysis presented in this document, I have determined that the fishery and the proposed action in this amendment to the Fishery Management Plan for the Stone Crab Fishery of the Gulf of Mexico would not significantly affect the quality of the human environment with specific reference to the criteria contained in NDM 02-10 implementing the National Environmental Policy Act. Accordingly, the preparation of a Supplemental Environmental Impact Statement for this proposed action is not necessary.

Approved: \_\_\_\_\_  
Assistant Administrator for Fisheries

\_\_\_\_\_  
Date

## **11. OTHER APPLICABLE LAW**

### **11.1 Habitat Concerns**

Stone crab habitats and related concerns were described in the FMP and updated in Amendments 2, 4, and 5. The actions in this amendment do not affect the habitat.

### **11.2 Vessel Safety Considerations**

Actions proposed in the amendment have been reviewed by the U.S. Coast Guard and have no effect on vessel safety.

### **11.3 Coastal Zone Consistency**

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 requires that all federal activities that 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 reef fish in the EEZ of the Gulf of Mexico will make no changes in federal regulations that are inconsistent with either existing or proposed state regulations.

It is the goal of the Council to have complementary management measures with those of the states.

This amendment is consistent with the Coastal Zone Management program of the state of Florida, to the maximum extent possible; and other Gulf states are not affected. This determination has been submitted to the responsible state agency under Section 307 of the Coastal Zone Management Act administering approved Coastal Zone Management programs in the state of Florida.

### **11.4 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.

The Council proposes, through this amendment, to establish no additional permit or data collection programs.

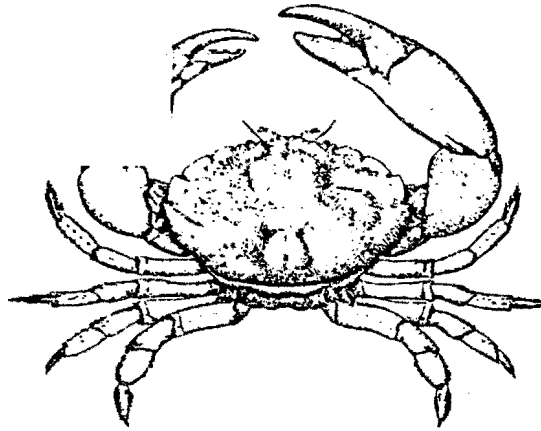
### **11.5 Federalism**

As the amendment document currently stands, no federalism issues have been identified relative to the actions proposed in this amendment; therefore, preparation of a federalism assessment under Executive Order 12612 is not necessary.

## 12.0 REFERENCES

- Adams, C.M. and F.J. Prochaska. 1992. Stone crab (genus menippe) claw exvessel price analyses for Florida. In Bert, T.M. (ed.) Proceedings of a Symposium on Stone Crab (Genus Menippe) Biology and Fisheries. Fla. Mar. Res. Publ. No. 50. pp. 44-49.
- Higgs, R. 1978. Preliminary report on the probable socioeconomic effects of a moratorium on the issuance of new vessel licences in the Pacific Ocean commercial salmon fishery. Pacific Fishery Management Council, 526 S.W. Mill Street, Portland, OR 97201, 100 p.
- Cicin-Sain, B. 1978. Evaluative criteria in making limited entry decisions: an overview. Paper presented to the Workshop on Limitation of Entry into Fisheries, Lake Wilderness, WA.
- Muller, R. G. and T. M. Bert. 1997. 1997 Update on Florida's Stone and Fishery-Report to the Marine and Fisheries Commission. FDEP, FMRI. Mimeo. File Rpt. 20 p. plus tables
- National Marine Fisheries Service (NMFS). 1992. Appendix 2.d: Guidelines on regulatory analysis of fishery management actions. In Operational guidelines for fishery management plan process. National Marine Fisheries Service, Silver Spring, Maryland.
- Overbey, M.M. 1985. Fishery management in a multiple-use conflict: the stone crab and shrimp fisheries conflict of the Gulf coast of Florida. Florida Sea Grant, University of Florida, Gainesville, FL 32611, 29 p.
- Waters, J.R. 1996a. An economic summary of commercial reef fish vessels in the U.S. Gulf of Mexico. NOAA. NMFS. Beaufort Laboratory. Memo Rpt. 63p. With Appendices A through H.
- Williams, R. 1997. Stone crab limited entry. Florida Marine Fisheries Commission, 2540 Executive Center Circle West, Suite 106, Tallahassee, FL 32301. 11 p.

## **APPENDIX**



### **1997 Update on Florida's Stone Crab Fishery**

#### **Report to the Marine Fisheries Commission**

**Robert G. Muller and Theresa M. Bert**

**June 11, 1997**

**Department of Environmental Protection  
Florida Marine Research Institute  
100 Eighth Avenue Southeast  
St. Petersburg, Florida 33701-5095**



## 1997 Update on Florida's Stone Crab Fishery

### Executive Summary

- . The stone crab fishery does not harvest the crab but rather fishers remove the claws from the crabs and then return the crabs to the water. Approximately 10% of the claws observed by samplers in the fish houses have been regenerated. Since males have larger claws, males enter the fishery earlier and the majority of the claws are taken from males. Female crabs have already spawned one or more seasons by the time their claws reach legal size.
- . Landings in weight of claws have been increasing for more than 30 years, fluctuations surround the trend line. For example, the landings in the 1981-82 and 1982-83 seasons were substantially above the trend line but those from the 1983-84 and 1984-85 seasons were below the trend line. More recently, landings from the 1990-91 through 1994-95 seasons were above the trend and landings from 1995-96 season were below. A preliminary estimate of 1996-97 based on October-January landings indicate that the 1996-97 landings were also below the trend line.
- . Effort also has increased during the past 30 years. The number of traps in the fishery has increased from 14,000 traps in 1962-63 to an estimated 798,000 traps in 1995-96. The number of commercial trips has increased from 19,000 per season in 1985-86 (the first season with trip information available) to 32,000 trips per season in 1995-96. Landings have not kept pace with the increases in either measure of effort.
- . Catch per trap has fluctuated widely, and has shown a decreasing trend. Catch rates have dropped rapidly from more than 20 pounds per trap in the 1960s to less than 10 pounds per trap by 1971 to less than 5 pounds per trap by 1983. Catch rates declined as the number of traps increased. Although the catch per trap since 1983 has been very low, it has declined only slightly with the doubling of traps. However, the catch per trip, which has higher resolution,



indicates that the catch per trip has declined since 1993-94. The preliminary 1996-97 catch rate is the lowest of the series and has the highest effort.

- . Monthly catch per trip during the fishing season typically declines sharply during the season.
- . Plots of landings on effort indicate that as effort has increased, landings have not increased at the same rate. Both measures of effort, number of traps and number of commercial trips, indicate that the fishery is either operating at its maximum (traps) or slightly past the maximum (trips).
- . The catch rates of juvenile crabs from the fishery independent stone crab monitoring project in Tampa Bay provide a good estimate of the commercial fishery's catch rates three years later. The first year of the juvenile index (1989-90) did not predict the 1992-93 commercial catch rates well but from 1990 through 1993 there was good correspondence between juvenile catch rates collected in the sampling and the catch per trap three years later (1993-94 to 1996-97). Correlations between monthly commercial catch rates and the juvenile catch rates indicate that some juveniles enter the fishery at approximately 27 months after settlement, these are presumably males. Some juveniles also enter the fishery 38 months later, these are principally females.
- . The juvenile index in Tampa Bay raises serious concern. If juvenile catch rates from the monitoring program continue to predict future commercial catch rates, there could be a scarcity of stone crabs in the Tampa Bay region in the 1999-2000 fishing season because catch rates of juveniles collected in Tampa Bay in 1996-97 were not significantly different from zero. While it remains to be seen if this relationship holds in other areas of Florida, fishery independent sampling has potential as an early warning system for this fishery.

- Based on the results of these analyses, we recommend that the Marine Fisheries Commission continue with their plans to reduce effort in the stone crab fishery.



## 1997 Update on Florida's Stone Crab Fishery

### Background

Studies of the stone crab fishery were conducted by either the Department of Environmental Protection (Savage et al. 1975, Sullivan 1979) or Florida Sea Grant (Bert et al. 1978) until the Gulf of Mexico Fishery Management Council developed a fishery management plan in 1982 (GMFMC). The National Marine Fisheries Service analyzed the fishery for the Council (Powers 1983, Phares 1985, Phares 1989, Bolden and Harper 1992, and Bolden 1993). The Marine Fisheries Commission is considering recommending a trap reduction program similar to the program developed for the spiny lobster fishery and has asked for an update on the fishery.

Two species of stone crab are harvested in Florida. *Menippe adina* occurs westward from Cape San Blas and *Menippe mercenaria* occurs throughout peninsular Florida and extends into North Carolina. The species interbreed such that hybrid stone crabs occur from the Big Bend region to Tampa Bay. Since stone crab landings from Escambia through Gulf counties (*Menippe adina*) are quite small (typically less than 800 pounds of claws) and are harvested by fewer than 10 fishers, they will not be considered further in this analysis.

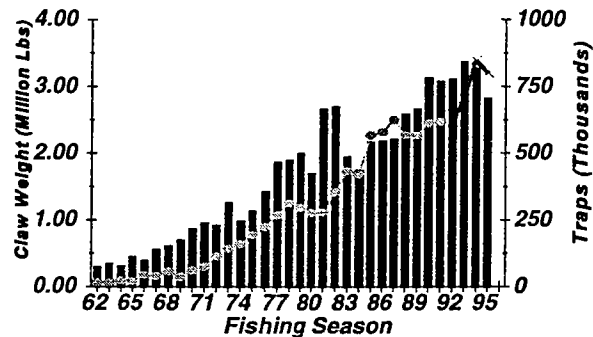
The stone crab fishery is atypical in that stone crabs are not killed or harvested but rather the claws are removed and the crabs are returned to the water. The fundamental assumption is that crabs can regenerate claws by molting; thus the new claws can potentially be harvested again. Most of claws are harvested from male crabs because males have larger claws (Sullivan 1979). By the time that females have developed legal sized claws (2 3/4 in or 70 mm), the females have been mature for one or more spawning seasons.

Initially, stone crabs were a by-catch in spiny lobster traps in the Florida Keys. Eventually, markets were developed and stone crabs became a fishery in its own right. Savage et al. (1975) noted that in 1973 stone crabs were trapped from Franklin county through Brevard County, that most of the landings were from Collier and Monroe counties, and that East Coast landings accounted for only about 6% of the statewide landings. The pattern remains unchanged today. The fishing season extends from

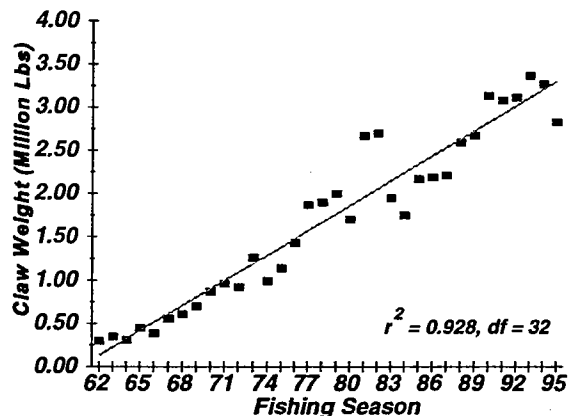
October 15 through May 15. After October 15, 1973, fishers could harvest both sexes of stone crabs as long as the female crab is not carrying eggs.

## Landings

Although there are people who capture stone crabs for recreation and take the claws for home consumption, stone crab landings are only available from the commercial sector of the fishery. Stone crab landings prior to 1986 were reported by dealers to the National Marine Fisheries Service (NMFS) and afterwards through the State of Florida Marine Fisheries Information System, commonly known as the trip ticket program. The NMFS General Canvass information consists of monthly landings and value by dealer. The only measure of effort from NMFS's General Canvass is the number of traps estimated by the dealers for their fishers. The trip ticket program collects landings by individual trip and, in addition to the information collected previously by NMFS, trip tickets contain information such as the Saltwater Products License number of the fisher, gear deployed, number of sets, depth fished, numbers of traps, time away from the dock, the species, quantities, and prices for all species landed on the trip. For this analysis, the trip ticket information included tickets that were



**Figure 1.** Historical Gulf coast stone crab landings of claws in pounds and numbers of traps by fishing season. Bars - landings, line with ellipses - traps, line with X - estimated traps.



**Figure 2.** Linear trend in landings of Gulf Coast stone crab claws.

received by the Department of Environmental Protection through March 21, 1997. Thus, the landings data are assumed to be complete through the 1995-96 fishing season.

Landings of stone crab claws were less than 500,000 lbs until 1967-68 (Table 1, Figure 1). Gulf coast landings increased to 1,000,000 lbs by 1973-74 and recent landings have exceeded 3,000,000 lbs. Over the period from 1962-63 through 1995-96, the increases have been almost linear (Figure 2). In 1981-82 and 1982-83, the landings were noticeably above the trend line and 1984-85 and 1995-96 were below. Commercial fishing was eliminated from Everglades National Park after December 31, 1985.

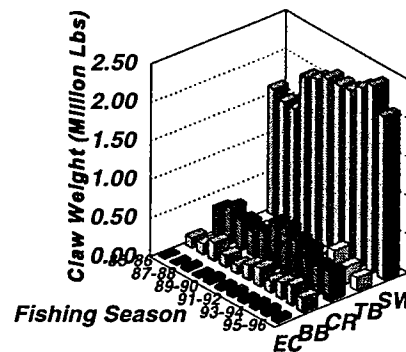
### Geographical Distribution

Based on the extent of hybridization and patterns of fishing activity and landings, the fishery was divided into five regions.

The Big Bend region which has the highest proportion of stone crab hybrids consisted of landings from Franklin through Levy counties. The Crystal River region which has high proportions of intermediate and *M.*

*mercenaria*-like hybrids, consisted of landings from Citrus through Pasco counties. The Tampa Bay

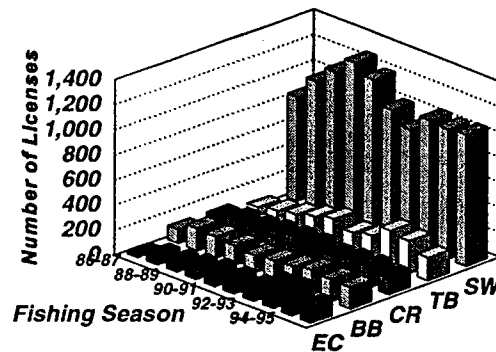
region, which has a low percentage of predominantly *M. mercenaria*-like hybrids, consisted of Pinellas through Sarasota counties. The Southwest region which has essentially only *M. mercenaria*, consisted of Charlotte through Monroe counties. The Atlantic coast region consisted of all of Florida's east coast counties. As noted earlier, most of the stone crab claws are harvested in the Southwest region, especially in Collier and Monroe counties (Figure 3).



**Figure 3.** Landings in claw weights by region. EC - Atlantic Coast, BB - Big Bend, CR - Crystal River, TB - Tampa Bay, SW - Southwest.

### Numbers of Participants

When the trip ticket program was originally implemented in October 1984, the Saltwater Products License (SPL) number could not be retained as part of the data record in the landings file. The State Legislature removed that restriction in 1986. By the 1987-88 fishing season, there were very few landings without SPL numbers. Statewide, the number of licenses that landed stone crabs in a given season has varied from 1,139 in 1986-87 to 1,880 in 1993-94 and down to 1,689 in 1995-96 (Table 2, Figure 4). The numbers of participants varied among the regions with the similarity that the number of licenses was less than the peak in every region. On the Atlantic coast, the number of licenses increased to 211 in 1994-95 and then declined to 139 in 1995-96. In the Southwest region, the number of licenses increased to 1,276 in the 1989-90 fishing season, then declined to 915 in 1992-93 and was 1,049 in 1995-96. In the Tampa Bay region, the number of licenses increased to 282 in 1993-94 and declined to 182 in 1995-96. In the Crystal River region, the number of licenses increased to 168 in 1991-92 and then declined to 144 in 1995-96. In the Big Bend region, the number of licenses increased to 192 in 1993-94 and then declined to 171 in 1995-96.



**Figure 4.** Regional participation by fishing season. EC- Atlantic coast, BB - Big Bend, CR - Crystal River, TB - Tampa Bay, SW - Southwest.

## Effort

Although the ideal measure of effort in this fishery would be the number of traps pulled during a season, the only measures of effort available in the this fishery are the estimated number of traps by season available since the 1962-63 fishing season and the number of commercial trips available since the 1985-86 fishing season.

## Numbers of Traps and Catch per Trap

The historical measure of effort is an annual estimate of

the number of traps provided by wholesale dealers to NMFS for their fishers. These trap estimates were not available for the past four seasons, therefore we estimated the number of traps in those years based on the total numbers claimed by fishers on their annual Saltwater Water Products License applications. The number of traps from NMFS General Canvass averaged 38% (CV = 6%) of the total number claimed on their license applications; therefore, we multiplied the traps numbers from the applications by 38% to get comparable number for the past four seasons.

The number of traps in the stone crab fishery has increased twenty-fold during the past 30 years from less than 40,000 traps to approximately 800,000

traps (Table 1, Figure 1).

There has been an increase in the number of traps in the three most recent years, partly in response to a trap reduction program that is being discussed (Tom Matthews personal communication).

Powers (1982) and Phares (1985, 1989) noted that

number of traps does not account for differences in how the traps are fished.

The number of traps in the fishery would provide a useful measure of effort if

all of the traps were fished the same way and were pulled the same number of times per fishing season.

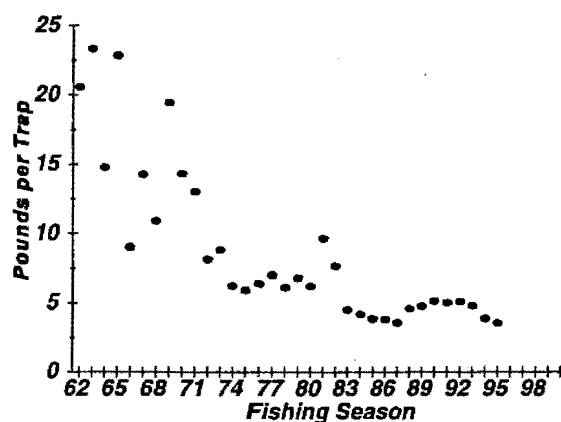


Figure 5. Historical catch per trap by fishing season.

As mentioned above, the historical catch per trap is the landings from the fishing season divided by number of traps in the fishery that season. Although this measure is coarse, it provides some insight into the historical development of the fishery. The catch per trap fluctuated markedly in the early years (Figure 5) partly reflecting the availability of crabs and partly the developing skill of the fishers. By 1972, the catch per trap had stabilized around 7-8 lb per trap during a season. The catch per trap increased significantly during the 1981-82 season and then declined. The catch per trap stabilized around 3-4 lb per trap after the 1983-84 fishing season. The catch per



trap was the lowest of the time series in 1995-96. The catch per trap has been relatively stable over the past decade (Figure 6) considering the potential effects of fluctuations in juvenile survival, predation, and other environmental perturbations. This stability has been sustained by the incorporation of improved technology, better navigation equipment, use of trap haulers, and by exploring alternative fishing areas.

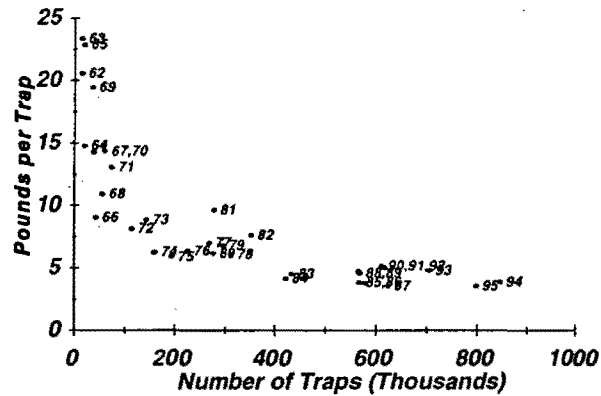


Figure 6. Historical catch per trap by numbers of traps.

#### Numbers of Trips and Catch per Trip

The number of commercial trips has also increased in recent years (Table 2). In Monroe County, many of the stone crab license holders (73%) also have spiny lobster endorsements. In response to the spiny lobster trap reduction program and the lower number of lobster trap certificates, some fishers are making more stone crab trips. The effect of this shift is to increase the number of trips without increasing the number of participants.

The catch per trip was standardized with a general linear model and adjusted for seasonal effects (month), geographical differences (county), and trip duration (days). Adjusting for trip duration is necessary ( $F = 5788$ , d.f. = 1, 308094,  $P < 0.0001$ ) because some dealers only settle up with their fishers weekly. Thus, although stone crab trips only last one day because the claws have to be cooked before they

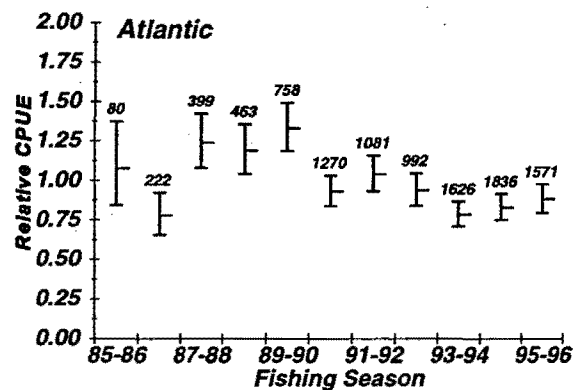
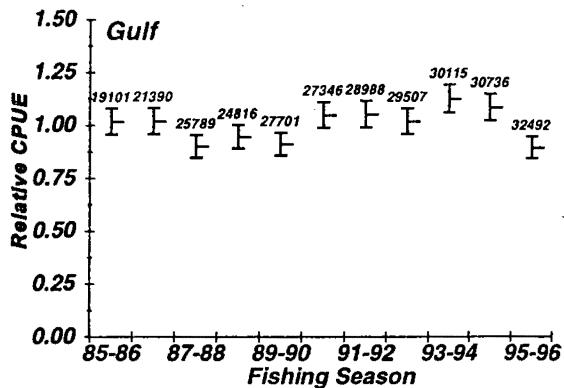


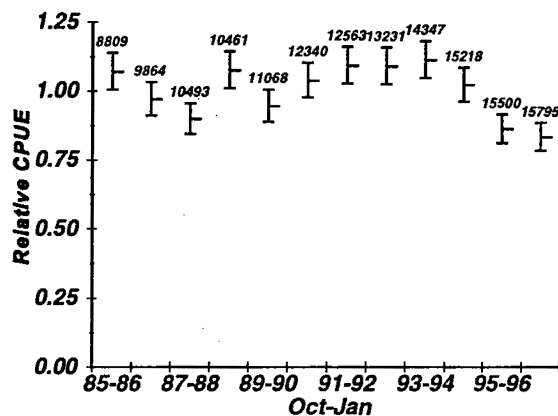
Figure 7. Atlantic coast standardized catch per trip. Number of trips, vertical bar - 95% confidence interval, and dash - mean.

can be frozen, some tickets reflect more than one day's fishing. The standardized catch rates are normalized to their mean so that a value of 1.0 indicates that the season's catch rate was equal to the average of the 11 fishing seasons; similarly, values less than 1.0 indicates seasons with below average catch rates. On the Atlantic coast, catch rates were variable and higher in the early seasons, except for 1986-87 (Figure 7). The lowest catch rate was in 1993-94 and has slightly increased since then. On the Gulf coast, the relative catch per unit effort was below average 1987-88 through 1989-90, then increased, peaked in 1993-94, and then declined (Figure 8). The lows in the late 1980s could reflect the closure of the Everglades and the displacement of those fishers to new grounds.

To investigate whether the catch rate in the current season was also low like the 1995-96 fishing season, we extracted landings from October 1996 through January 1997. New catch rates for the time series were calculated using only October through January data. The relative catch rates from the early season indicate a steeper decline early in the series. The 1988-89 value was higher than before but the 1996-97 value was even lower than the 1995-96 catch rate (Figure 9). When the catch rates from the early season are plotted on the number of trips in



**Figure 8.** Gulf coast standardized catch per trip. Number or trips, vertical bar - 95% confidence interval, dash - mean.



**Figure 9.** Gulf coast catch rates in the beginning of the fishing season, October through January. Number of trips, vertical bar - 95% confidence interval, dash - mean.

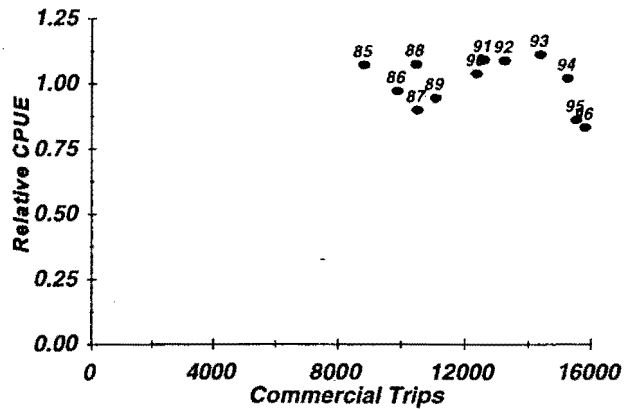
the same months, the catch rates from the two recent seasons are the lowest in the time series (Figure 10).

The two measures of effort are independent and both measures show a decline in the 1995-96 fishing season. Preliminary data indicate that the catch rates from 1996-97 are lower than 1995-96.

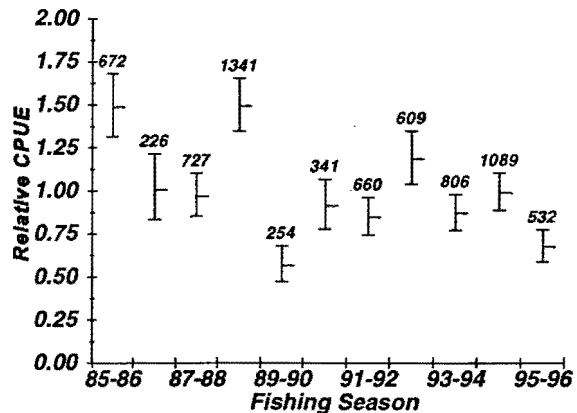
Octopus, a predator on stone crabs, was mentioned as an possible explanation for low stone crab abundance in the 1984-85 season (Lindberg et al. 1989). Octopus catch rates on the Gulf coast from trip tickets indicate that octopus were above average abundant in the mid-to-late 1980s and that their catch rates have been lower in recent years (Figure 11). Further, the number of commercial trips landing octopus is small relative to the number of trips landing stone crabs (Table 2).

### Population Analyses

Models are used to synthesize information and to identify and summarize patterns. Many fishery models attempt to estimate fishing mortality rates by age and fishing season; however, these models are inappropriate for stone crabs because the animal is released after legal claws are removed. Length-based approaches also are not suitable because the size of regenerated claws does not indicate crab size. Therefore, we used empirical models to identify whether landings continue to increase as the number of



**Figure 10.** Relative catch per trip and the number of October through January trips. The years refer to the beginning of the fishing season.



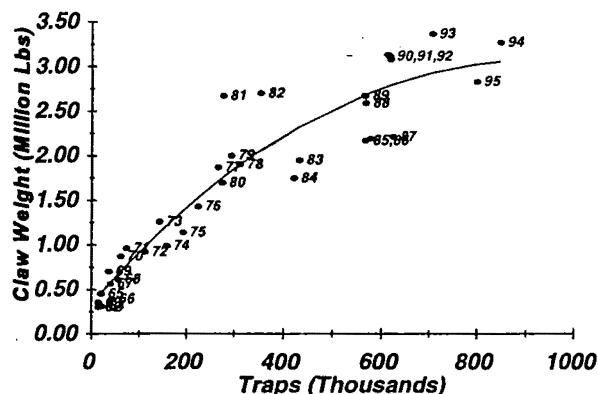
**Figure 11** Gulf coast octopus catch rates by stone crab fishing season using all gears. Number of trips, vertical bar - 95% confidence interval, dash - mean.

traps have increased (similar to equilibrium surplus production) or to identify recruitment patterns from monthly landings within fishing seasons (DeLury Depletion Model, for example see Basson et al. 1996 or Rosenberg et al. 1990).

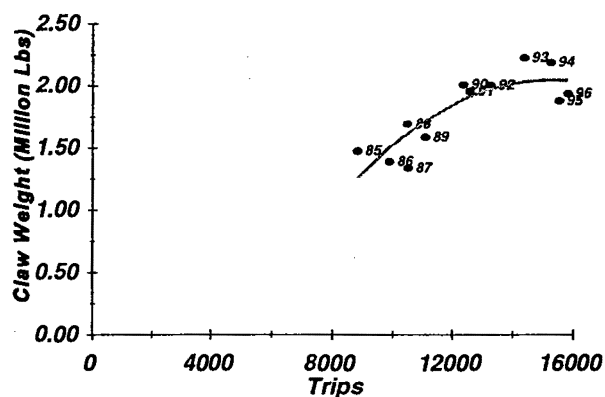
### Catch versus Effort

Hilborn and Walters (1992) do not recommend using equilibrium models because fisheries rarely attain equilibrium. However without assuming equilibria, a curve can be fitted to the observations as a simple means of summarizing landings and effort. As noted above, both landings of stone crab claws and effort have increased. When landings are plotted on the number of traps, landings from the developing fishery tracked the increase in traps quite closely up to about 300,000 traps (Figure 12). At higher effort, the landings were more variable for a given level of traps and did not continue to track effort indicative of a fully exploited fishery. A possible explanation is that there are so many traps that a crab has a choice of traps to enter or, in other words, the crabbing grounds have become saturated with traps. The curve in the figure indicates that if additional traps are put into the fishery and the fishery continues to operate as it has, landings will remain between 3,000,000 and 3,500,000 pounds.

Just as the landings did not keep pace with increased numbers of traps, landings do not keep pace with increased numbers of trips. Landings have increased only slightly



**Figure 12.** Landings in pounds of claws on the number of traps.



**Figure 13.** Landings by trip using only data from the beginning of the season, October through January.

beyond the level harvested with 75% of current trips (Figure 13). As with the discussion with traps, the additional trips are not adding to the overall landings. This indicates that the fishery is less efficient because the additional trips increase the cost of fishing without commensurate higher landings.

#### Recruitment Trends

Estimates of recruitment into this fishery are not as straight forward as in other fisheries because crabs can re-enter the fishery after sufficient molts for their claws again to attain legal size.

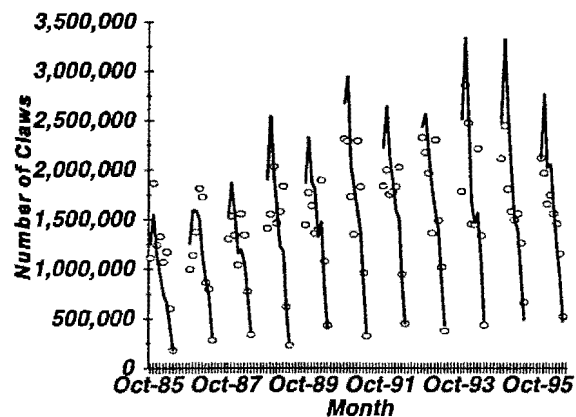
As a first attempt to identify trends in recruitment into the fishery, we used the DeLury Depletion Model to determine how many legal sized claws were required in each October to mimic the dynamics of monthly landings, effort, and catch rates for the period from October 1985 until May 1996. The equations in the DeLury Depletion model are:

$$Nbar_t = (R_t + N_t)e^{-M/2} + C_t/2 \quad (1)$$

and

$$C_t = q E_t Nbar_t \quad (2)$$

where  $Nbar_t$  is the average number in the population at time,  $t$ ;  $R_t$  is the recruitment in numbers at time,  $t$ ;  $N_t$  is the number in the population at the beginning of time,  $t$ ;  $M$  is the natural mortality rate;  $C_t$  is the catch during time,  $t$ ;  $q$  is the catchability coefficient that relates the mortality expended by one unit of effort; and  $E_t$  is the effort expended during time,  $t$ . We used a natural mortality rate of 0.35 per year based on a maximum age



**Figure 14.** Monthly landings in number of claws as predicted by the DeLury Depletion model. Open ellipses - observed landings, line - predicted landings.

of 8 years (Restrepo 1989). Catch per unit effort is obtained by dividing equation 2 by  $E_t$ . The model used monthly landings, trips, and standardized catch rates from October 15, 1985 through May 15, 1996 to estimate the recruitment. To simplify the model, recruitment of legal claws is assumed to occur in October.

The model captures the seasonal depletions (Figure 14) reasonably well ( $r^2 = 0.59$ , d.f. = 77) with well balanced residuals. The resulting pattern in recruitment increased to a peak in 1993-94 and then decrease (Figure 15). The natural mortality rate that we used is lower than Ehrhardt's et al. (1990) estimate of 0.939 per year. When the DeLury model is recalculated with the higher value, the estimated population size is higher but the relative changes remain the same -- a decrease after the 1993-94 season.

Monthly fishery independent estimates of post-settlement juveniles exist for Tampa Bay beginning in December 1988. The intention is to use juvenile settlement to predict subsequent recruitment into the fishery in a manner similar to the use of puerulus settlement in palinurid lobsters (Pollock 1986, MacDonald 1986, and Phillips 1986). Five traps are pulled biweekly in each of four sites. The number of juveniles are counted when the traps are scraped clean of fouling

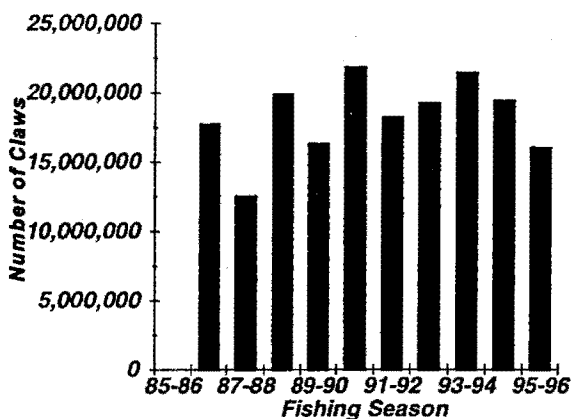


Figure 15. Recruitment trends in numbers of claws by fishing season estimated from DeLury model.

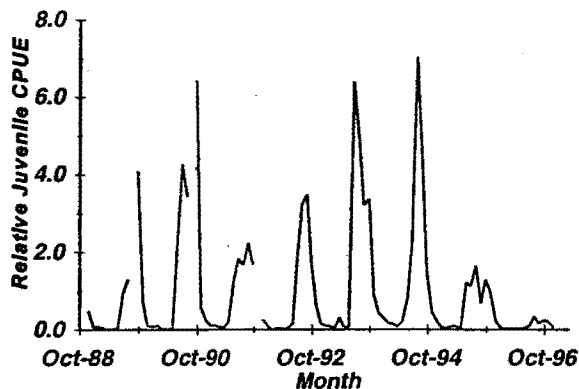


Figure 16. Monthly standardized catch rates of juvenile crabs from Tampa Bay monitoring program.

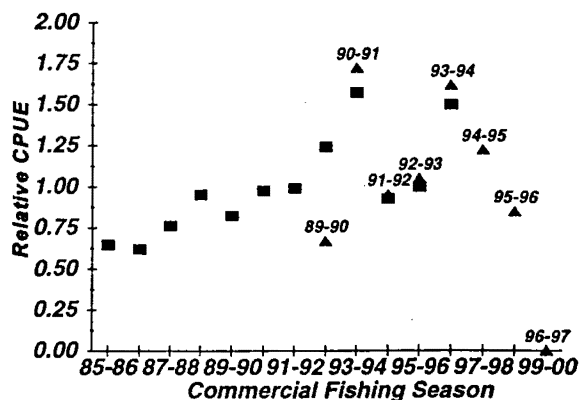
biota every other trip. The monthly, standardized catch rates show distinct differences among fishing seasons (Figure 16). During the 1996 spawning season very few juvenile crabs were observed.

When the monthly juvenile catch rates are compared to the monthly commercial catch rates, there are two high correlations. The first occurs between juveniles and subsequent entry into the fishery with a time lag of 27 months ( $r = 0.64$ , d.f. = 41) and the second occurs between juveniles and subsequent entry into the fishery with a time lag of 38 months ( $r = 0.79$ , d.f. = 41). These results are consistent with Restrepo's (1989) estimate that male crabs enter the fishery at 2.25 years and female crabs enter later.

When the number of juvenile crabs is superimposed on the standardized lagged catch rates from the Tampa Bay region, there is good correspondence except for the first year (Figure 17). Since the catch rate of juvenile crabs in the 1996-97 fishing season was not significantly different from zero and if future commercial catch rates continue to track the juvenile index, then the catch rates in the Tampa Bay region can be expected to be much lower in about three years.

## Regulations

Stone crabs are regulated under Florida Administrative Code, Chapter 46-13. The statute covers *Menippe mercenaria*, *M. adina* and their hybrid forms. Only the claws of stone crabs can be removed. The minimum size for claws is 2-3/4 inches in length, measured by a straight line from the junction of the elbow "hand" (the crushing part of the claw) to the tip of the lower immovable finger of the hand. It is unlawful to remove claws from egg-bearing female stone crabs or to have any egg-bearing female



**Figure 17.** Commercial catch rates (squares) from the Tampa Bay region (using data from October through January only) and juvenile catch rates (triangles) by fishing season.

stone crabs on board a vessel. The open season is from October 15 to May 15. Additional regulations include type of trap design, when the traps can be deployed and Division of Law Enforcement notification of post season trap retrieval, prohibition on the use of spears or hooks, buoy and vessel marking requirements, and requires a Saltwater Products License with a restricted species endorsement. The recreational harvest of stone crabs is restricted to a bag limit of 1 gallon of claws, a maximum of five traps that meet all of the commercial trap design criteria, a buoy marked with the letter "R" together with the name and address of the fisher unless the trap is fished from a dock, and the requirement that recreational traps be pulled manually and during daylight hours only.

### **Condition of the Stock**

Stone crabs are difficult to assess from the information typically collected from fisheries. Landings are composed of claw weights categorized by size, but the presence of regenerated claws and the number of claws harvested per crab confound the interpretation. Given these caveats, the low catch rates in the stone crab fishery argue against further expansion of this fishery. With either measure of effort, the landings are not keeping pace with increases in effort. The landings appear to have reached their peak in recent years. The fishery has experienced good years, with crabs readily available, and poor years. The dramatic increases in catch rates in the fishery, for example the 1981-82 fishing season, have been followed by steep declines, for example the 1983-84 fishing season. It appears that we are currently in the decline following the increase in 1993-94. The estimated recruitment into the fishery has been down the past two years. Fluctuations in juveniles possibly explain some of the volatility. Juvenile crabs in Tampa Bay were highly available in the 1990-91, 1993-94 fishing seasons. The almost complete absence of juvenile stone crabs in the 1996 spawning season does not bode well for the stone crab fishery in Tampa Bay two or three years from now. The Institute will continue to monitor the relationship between juvenile catch rates and the subsequent commercial catch rates. The juvenile index demonstrates the utility of the fishery independent sampling Tampa Bay and the program should be expanded to additional areas.

### **Research Needs**



The primary research need for stone crab management and assessment is the expansion of the fishery independent monitoring project because this program provides information on future recruitment, sex ratios of the crabs, detailed catch per trap, claw weight to claw size, and number of legal claws per crab.

### Literature Cited

- Basson, M., J.R. Beddington, J.A. Crombie, S.J. Holden, L.V. Purchase, and G.A. Tingley. 1996. Assessment and management techniques for migratory annual squid stocks: the *Illex argentinus* fishery in the Southwest Atlantic as an example. Fisheries Research 28: 3-27.
- Bert, T.M. 1989. Summary of workshop on current issues related to stone crab (Genus *Menippe*) biology and fisheries, p. 108 to 115. In T. M. Bert [ed.] Proceedings of a symposium on stone crab (Genus *Menippe*) biology and fisheries. Florida Department of Natural Resources. Florida Marine Research Publication Number 50.
- Bert, T.M, R.E. Warner, and L.D. Kessler. 1978. The biology and Florida fishery of the stone crab, *Menippe mercenaria* (Say), with emphasis on Southwest Florida. Florida Sea Grant. Technical Paper No. 9. 82 p.
- Bolden, S.K. 1993. Summary of the Florida Gulf Coast commercial stone crab fishery 1962-1992. NOAA. National Marine Fisheries Service. Southeast Fisheries Science Center. Contribution No. MIA-92/93-84.
- Bolden, S.K. and D.E. Harper. 1992. The Florida Gulf coast stone crab fishery: landings and effort 1962-1991. NOAA. National Marine Fisheries Service. Southeast Fisheries Science Center. Contribution No. MIA-91/92-86. 22 pp.
- Ehrhardt, N.M., D.J. Die, and V.R. Restrepo. 1990. Abundance and impact of fishing on a stone crab (*Menippe mercenaria*) population in Everglades National Park, Florida. Bulletin of Marine Research 46:311-323.
- Hilborn, R. And C.J. Walters. 1992. Quantitative fisheries stock assessment: choice, dynamics, and uncertainty. Chapman and Hall. New York. 570 p.

Lindberg, W.J., T.M. Bert, and G.P. Genoni. 1989. Alternative hypotheses for low landings in the Cedar Key stone crab fishery (Genus *Menippe*) fishery, 1984-85, p. 50 to 57. In T. M. Bert [ed.] Proceedings of a symposium on stone crab (Genus *Menippe*) biology and fisheries. Florida Department of Natural Resources. Florida Marine Research Publication Number 50.

MacDonald, C.D. 1986. Recruitment of the puerulus of the spiny lobster, *Panulirus marginatus*, in Hawaii. Canadian Journal of Fisheries and Aquatic Sciences 43:2118-2125.

Phares, P.L. 1985. Analysis of stone crab stock assessment data from 1979 to 1985 and evaluation of the logbook data collection system. NOAA. National Marine Fisheries Service. Southeast Fisheries Center. Fishery Analysis Division. Contribution No. ML1-85-27. n.p.

Phares, P.L. 1989. Analysis of trends in catch, effort, and catch per unit effort in the Florida stone crab (Genus *Menippe*) fishery, p. 18 to 25. In T. M. Bert [ed.] Proceedings of a symposium on stone crab (Genus *Menippe*) biology and fisheries. Florida Department of Natural Resources. Florida Marine Research Publication Number 50.

Phillips, B.F. 1986. Prediction of commercial catches of the western rock lobster *Panulirus cygnus*. Canadian Journal of Fisheries and Aquatic Sciences 43:2126-2130.

Pollock, D.E. 1986. Review of the fishery for and biology of the Cape rock lobster *Jasus lalandii* with notes on larval recruitment. Canadian Journal of Fisheries and Aquatic Sciences 43:2107-2117.

Powers, J.E. 1982. Report of the Southeast Fisheries Center stock assessment workshop August 3-6, 1982. NOAA. National Marine Fisheries Service. Southeast Fisheries Center. Miami Laboratory. 229 p.

Restrepo, V.R. 1989. Growth estimates for male stone crabs along the Southwest Coast of Florida: a synthesis of available data and methods. Transactions of the American Fisheries Society 118: 20-29.

Rosenberg, A.A., G.P. Kirkwood, J.A. Crombie, and J.R. Beddington. 1990. The assessment of stocks of annual squid species. *Fisheries Research* 8:335-350.

Savage, T., J.R. Sullivan, and C.E. Kalman. 1975. An analysis of stone crab (*Menippe mercenaria*) landings on Florida's west coast, with a brief synopsis of the fishery. Florida Department of Natural Resources. Florida Marine Research Publication Number 13. 37 p.

Simonson, J.L. and R. J. Hochberg. 1989. An analysis of stone crab (Genus *Menippe*) claws and their use in interpreting landings on Florida's west coast, p. 26 to 35. In T. M. Bert [ed.] Proceedings of a symposium on stone crab (Genus *Menippe*) biology and fisheries. Florida Department of Natural Resources. Florida Marine Research Publication Number 50.

Sullivan, J.R. 1979. The stone crab, *Menippe mercenaria*, in the Southwest Florida fishery. Florida Department of Natural Resources. Florida Marine Research Publication Number 36. 37 p.

## LIST OF TABLES

1. Historical landings for the Gulf coast stone crab fishery.
2. Regional landings, effort, and participation.

Table 1. Historical landings for the Gulf coast stone crab fishery. Landings prior to 1986 are from the National Marine Fisheries Service's General Canvass and afterwards from Florida's Marine Fisheries Information System. The number of traps are from NMFS General Canvass except for the estimated numbers in the last four seasons.

Fishing Season	Landings		Pounds per Trap
	Claw Weight (1000 Lbs)	Number (1,000 Traps)	
62 - 63	300	14.6	20.5
63 - 64	350	15.0	23.3
64 - 65	310	21.0	14.8
65 - 66	450	19.7	22.8
66 - 67	390	43.2	9.0
67 - 68	560	39.3	14.2
68 - 69	610	55.9	10.9
69 - 70	700	36.0	19.4
70 - 71	870	60.8	14.3
71 - 72	960	73.7	13.0
72 - 73	920	113.3	8.1
73 - 74	1,260	143.0	8.8
74 - 75	990	159.1	6.2
75 - 76	1,140	193.2	5.9
76 - 77	1,430	224.4	6.4
77 - 78	1,870	267.0	7.0
78 - 79	1,900	312.2	6.1
79 - 80	2,000	294.7	6.8
80 - 81	1,700	275.7	6.2
81 - 82	2,670	277.6	9.6
82 - 83	2,700	353.5	7.6
83 - 84	1,950	432.8	4.5
84 - 85	1,750	421.4	4.2
85 - 86	2,170	567.1	3.8
86 - 87	2,190	577.6	3.8
87 - 88	2,210	624.0	3.5
88 - 89	2,590	567.1	4.6
89 - 90	2,670	565.6	4.7
90 - 91	3,130	611.3	5.1
91 - 92	3,080	617.3	5.0
92 - 93	3,111	615.8	5.1
93 - 94	3,366	705.2	4.8
94 - 95	3,267	846.9	3.9
95 - 96	2,828	798.8	3.5

Table 2. Regional landings, effort, and participation.  
Data from Florida's Marine Fisheries Information System

a. Landings of stone crab claw weights in pounds by region.

Fishing Season	Panhandle Escambia - Gulf	BB Franklin - Levy	CR Citrus - Pasco	TB Pinellas - Sarasota	SW Charlotte - Monroe	EC Atlantic Coast Inland	Statewide
85-86	3,888	130,422	364,786	36,934	1,634,959	3,951	2,174,940
86-87	114	139,014	459,740	41,045	1,547,456	8,683	2,196,052
87-88	362	231,213	378,210	58,036	1,541,969	34,506	2,244,296
88-89	1,352	147,639	314,989	102,502	2,028,090	20,283	2,614,855
89-90	248	98,839	378,183	99,887	2,094,651	49,194	2,721,002
90-91	185	189,256	603,323	148,879	2,185,293	30,525	3,157,461
91-92	87	235,583	606,359	146,046	2,176,148	44,366	3,208,589
92-93	199	144,879	535,272	232,886	2,198,214	32,250	3,143,700
93-94	174	210,745	492,888	353,470	2,308,673	57,330	3,423,280
94-95	212	258,309	364,814	221,684	2,421,534	60,500	3,327,053
95-96	1,669	180,829	375,737	161,910	2,107,887	41,502	2,869,534
Mean	772	178,793	443,118	145,753	2,022,261	34,826	2,825,524
CV	151%	28%	23%	66%	15%	53%	17%

b. Numbers of commercial trips by region.

Fishing Season	Panhandle Escambia - Gulf	BB Franklin - Levy	CR Citrus - Pasco	TB Pinellas - Sarasota	SW Charlotte - Monroe	EC Atlantic Coast Inland	Statewide
85-86	23	1,896	2,656	574	13,975	80	19,204
86-87	4	2,119	3,013	563	15,695	222	21,616
87-88	9	3,171	3,324	920	18,374	399	26,197
88-89	26	2,308	2,588	1,167	18,753	463	25,305
89-90	9	2,200	2,902	1,303	21,296	758	28,468
90-91	11	2,425	3,280	1,917	19,724	1,270	28,627
91-92	6	2,471	3,947	1,729	20,841	1,081	30,075
92-93	3	2,049	3,716	2,385	21,357	992	30,502
93-94	24	3,264	2,994	3,249	20,608	1,626	31,765
94-95	23	2,646	2,498	2,880	22,712	1,836	32,595
95-96	9	2,209	3,150	2,339	24,794	1,571	34,072
Mean	13	2,433	3,097	1,730	19,830	936	28,039
CV	66%	18%	15%	53%	15%	64%	16%

Table 2. Continued. Regional landings, effort, and participation.  
Data from Florida's Marine Fisheries Information System

c. Numbers of participants as measured by Saltwater Products License numbers

Fishing Season	Panhandle Escambia - Gulf	BB Franklin - Levy	CR Citrus - Pasco	TB Pinellas - Sarasota	SW Charlotte - Monroe	EC Atlantic Coast	Inland	Statewide
85-86	no data	no data	no data	no data	no data	no data		no data
86-87	3	110	106	64	830	26		1,139
87-88	4	177	137	93	1,012	79		1,502
88-89	12	170	138	122	1,145	86		1,673
89-90	6	154	158	160	1,276	109		1,863
90-91	9	137	166	200	1,197	130		1,839
91-92	5	151	168	150	1,017	126		1,617
92-93	3	162	141	182	915	119		1,522
93-94	4	192	158	282	1,048	196		1,880
94-95	4	177	166	258	1,036	211		1,852
95-96	4	171	144	182	1,049	139		1,689
Mean	5	146	135	154	957	111		1,507
CV	65%	37%	36%	53%	36%	57%		36%

d. Numbers of Saltwater Products License stone crab endorsements

Fishing Season	Panhandle Escambia - Gulf	BB Franklin - Levy	CR Citrus - Pasco	TB Pinellas - Sarasota	SW Charlotte - Monroe	EC Atlantic Coast	Inland	Statewide
89-90	48	460	295	646	1,949	1,049	118	4,565
90-91	66	555	345	704	2,142	1,305	149	5,266
91-92	61	517	338	689	2,085	1,377	138	5,205
92-93	62	510	357	718	2,052	1,393	135	5,227
93-94	73	549	370	716	2,006	1,486	145	5,345
94-95	85	624	394	800	2,092	1,661	152	5,808
95-96	93	661	435	962	2,208	1,769	168	6,296
96-97	74	528	347	734	1,875	1,348	145	5,051
Mean	70	554	362	748	2,076	1,434	144	5,387
CV	22%	12%	12%	14%	4%	17%	11%	10%