AMENDMENT 8

TO THE

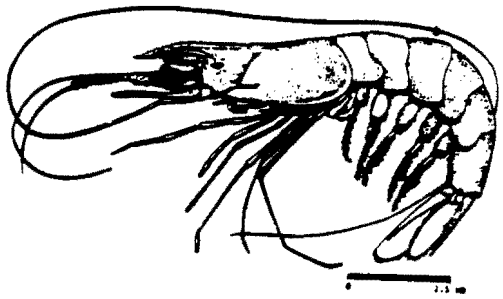
FISHERY MANAGEMENT PLAN

FOR THE

SHRIMP FISHERY OF THE GULF OF MEXICO

UNITED STATES WATERS

**(Includes Environmental Assessment
With Regulatory Impact Review)**



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SUMMARY

This amendment provides for a total allowable catch (TAC) and optimum yield (OY) of royal red shrimp (*Pleoticus robustus*) of up to 130 percent of maximum sustainable yield (MSY) for no more than 2 years in order to obtain scientific data for a better determination of MSY. It redefines overfishing as fishing in excess of OY. The fishery occurs in the Gulf of Mexico only in the EEZ (Exclusive Economic Zone).

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I. INTRODUCTION

The fishery management plan for shrimp in the Gulf of Mexico (FMP) was implemented in 1981, and royal red shrimp were included in the management unit. A crude estimate of maximum sustainable yield (MSY) for this species was given as 392,000 pounds of tails annually. Optimum yield (OY) was set at MSY. Because there was low domestic harvest capacity at that time, a total allowable level of foreign fishing (TALFF) was declared at 146,000 pounds as was then required by the Magnuson Act. The domestic annual harvest was then limited to a TAC of 246,000 pounds.

Amendment 5 in 1991 defined overfishing of royal red shrimp to be fishing in excess of MSY (equal to OY), and fishing is to cease when OY is attained.

Amendment 7, partially approved in 1994, eliminated the 146,000-pound TALFF for foreign fishing, transferring that amount of the allowable catch to the domestic fishery for a total of 392,000 pounds. There had been no foreign fishing for this species. Also approved was a framework measure for adjusting MSY and OY. Disapproved were measures specifying OY and the redefinition of overfishing, because OY was to be set above MSY.

An emergency rule allowing harvest of up to 474,000 pounds of royal red shrimp tails in 1994 was promulgated to prevent a closure of the fishery before the TALFF reserve could be eliminated by implementation of Amendment 7.

The Council's Scientific and Statistical Committee recommended an innovative approach for management of this little known resource on which a fishery is developing. The Council requested the NMFS Southeast Fisheries Science Center conduct a review of the fishery and suggest possible options for management. This amendment is based on that report, a Review of the Royal Red Shrimp Resource and Fishery in the Gulf of Mexico prepared by Albert C. Jones, James M. Nance, and William O. Antozzi, Jr.

Problems in the Royal Red Shrimp Fishery

1. The extent and sustainable yield of this fishery are not fully understood.

2. The data base is weak due to the low production and lack of catch effort data until 1994. Without these data the estimate of MSY cannot be improved, and the fishery is artificially capped at that level.

3. Increasing effort in the fishery with a low level of total allowable catch is likely to result in seasonal quota closures and over-capitalization in the fishery.

Objectives

1. To prevent overfishing the stocks.
2. To obtain better data on the resources.
3. To prevent unnecessarily restricting the fishery.
4. To provide economic stability and prevent over-capitalization.

Purpose and Need

Local market development for royal red shrimp in 1992 led to increased effort and landings. In 1993, landings reached the total allowable catch (TAC) for the domestic fishery. In 1994 landings reached 335,363 pounds with an exvessel value of $1.2 million. The Council developed Amendment 7 to the shrimp plan to delete a reserve for foreign fishing and set OY at MSY plus 10 percent or 431,000 pounds tail weight. It was to be subject to review if MSY is exceeded in two consecutive years. The OY was disapproved by NMFS because it violated the principle of fishing above MSY without an adequate mechanism for curbing harvests above MSY.

A problem has been a lack of effort data on which to define MSY. Fishing time is collected from vessel captains during interviews by NMFS port agents in random selection of vessels. Because there have been so few vessels engaged in this fishery (fewer than ten), interviews and the data base have been sparse until 1994. An update of the MSY in 1994 showed no significant difference from the earlier estimate of 392,000 pounds. Port agents are now attempting to obtain more effort information from these vessels.

For 1994, the Council requested and NMFS approved an emergency increase of TAC to 474,000 pounds of tails to prevent a quota closure before implementation of Amendment 7. The approved amendment's TAC (MSY) of 392,000 pounds is within the capacity of the current directed fleet of ten vessels which also seasonally fish for the penaeid species.

Conversion of a shrimp vessel to enable it to fish deeper waters for royal red shrimp, below 100 fathoms, is costly. It requires larger winches and special trawl doors. Despite these conversion costs, increases in the exvessel price per pound of royal red shrimp have attracted and may continue to attract new vessels into the fishery. For example, the number of vessels increased from 1 in 1989 to 10 in 1995 and the exvessel price for royal red shrimp increased by $.22 per pound from 1993 to 1994.

Proposed action will allow testing the response of the stocks to increased fishing effort.

The fishery will be monitored with data being gathered to provide better estimates of the sustainable yield of the fishery.

II. BIOLOGY AND HABITAT OF ROYAL RED SHRIMP AND RELATED SPECIES

Royal Red Shrimp

There are nine families of shrimps in the western central Atlantic Ocean that contain species of present or potential fishery interest (Cervigón *et al.* 1993). Some species in these families occur only or primarily in deep water. One of the deep water species is royal red shrimp (*Pleoticus robustus*), which was originally described as *Hymenopenaeus robustus* by Smith in 1885.

Most deep water shrimp species are known from descriptions of specimens collected in the 19th century during cruises of the early biological oceanographic research vessels. Additional specimens have come from later collections, especially from the operations of fishery research and exploratory fishing vessels. The original scientific descriptions of the species, and especially the later taxonomic revisions that reported on the additional collections, provide information on specific area and depth distribution of the species, some biological and life history information, such as reproductive characteristics and sizes of individuals, and general habitat descriptions (e.g., Pérez Farfante 1977). For royal red shrimp, additional detail information is available in a limited number of biological and life history studies (e.g., Anderson and Lindner 1971).

Royal red shrimp occur from Martha's Vineyard (Massachusetts) through the Gulf of Mexico and the Caribbean Sea to French Guiana (Pérez Farfante 1977). They live on the upper continental shelf at depths between about 180 and 730 m. Royal red shrimp are scarce in less than 250 m and not abundant at depths greater than 500 m. The highest concentrations have been reported off the northeast coast of Florida and in the northeastern part of the Gulf of Mexico at depths between 250 and 475 m. In contrast to their more common occurrence off the east coast of Florida and in the Gulf of Mexico, royal red shrimp seem to be rather sparsely distributed north of Cape Hatteras, throughout the Caribbean and off the northeastern coast of South America. Explorations by the fishery research vessels Oregon and Oregon II in the Caribbean region have indicated dense concentrations only off Cabo de la Vela, Cuba.

Royal red shrimp, along with scarlet shrimp (*Plesiopenaeus edwardsianus*), are among the largest of the deep water shrimp species. The largest specimens of royal red shrimp examined by Pérez Farfante (1977) were 219 mm total length (tl) (female) and 173 mm tl (male). Klima (1969) recorded a female within the 225-229 mm tl length class and a male within the 180-184 mm tl length class. The sizes at which maturation occurs were determined by Anderson and Lindner (1971) to be about 155 mm tl for females and 125 mm tl for males.

Anderson and Lindner(1971) reported that on the St. Augustine (Florida) Grounds, royal red shrimp apparently spawn throughout the year, with a peak between January and May. There is no indication of sex reversal in this species. Recruitment begins when the shrimp are approaching one year of age and are less than 100 mm tl. Maturity is reached in about three years. Most shrimp on the grounds are mature, and the life span appears to be no less than five years.

The larvae of royal red shrimp are unknown. Anderson and Lindner (1971) found neither larval nor postlarval stages in a large number of plankton samples collected over an extensive area seaward of the St. Augustine Grounds.

Anderson and Lindner (1971) present evidence from length samples for three distinct, younger, age groups of royal red shrimp on the St. Augustine Grounds. If the peak of spawning is in March, both sexes would be about 100 mm tl at 1 year of age. The older age groups which were present in the samples probably represent two or more additional years, giving a minimum life span of five years. Recruitment to the fishery is believed to start at about one year of age, but the shrimp are not fully recruited until

about two years of age and recruitment may not be complete until the shrimp are mature - about three years old.

Small royal red shrimp were scarce or absent from the collections made on the St. Augustine Grounds. In the combined length distributions, 55 percent of the females were longer than 160 mm tl and 61 percent of the males were longer than 125 mm tl (the lengths at which each sex is fully mature). Only 4 percent of the females and 6 percent of the males were less than 100 mm long. The smallest shrimp sampled were in the 56- to 60-mm length class. The authors concluded that gear selectivity did not cause the scarcity of shrimp under 100 mm long and the absence of them under 56 mm long. Apparently royal red shrimp do not appear on the St. Augustine Grounds at sizes smaller than about 55 mm. The habitat of these smaller sizes of shrimp is unknown.

Royal red shrimp have been found within a temperature range from 5°to 15°C, and at commercial levels of abundance between 9° and 12°C (Bullis 1956, Bullis and Cummins 1963). Maximum densities of this shrimp were reported in water temperatures from 9° to 10°C (Roe 1969). Temperature preference of royal red shrimp is indicated by a report that within 1 or 2 days after two incursions of cold bottom water off the northeast coast of Florida, shrimp moved inshore to waters 75 m shallower than those where they had been observed previously.

Commercial concentrations of royal red shrimp have been reported on the following types of bottoms: blue-black terrigenous silt and silty sand off the Mississippi River Delta; whitish, gritty, calcareous mud off the Dry Tortugas; and basically similar sand or silty sand (called "green mud" by fishermen) off the northeast coast of Florida (Bullis 1956, Bull and Rathjen 1959, Roe 1969). Anderson and Bullis (1970) reported direct observations of royal red shrimp from a submersible; the bottom here consisted of a grayish, loosely constituted sediment that readily clouded the water at the least disturbance.

Megalops or pink speckled shrimp (*Penaeopsis serrata*) are landed on occasion along with royal red shrimp. They are taken between 180 and 225 fathoms.

Related Species

Where direct information on the biology of royal red shrimp is not available, knowledge of the biology of closely related species, especially those inhabiting deep water, may supply useful information.

A species closely related to royal red shrimp is the prawn *Pleoticus muelleri*. This species inhabits the Argentinian Patagonian littoral. It is the object of a major commercial fishery and constitutes the largest percentage of the shrimp landings in Argentina. Data are available for *P. muelleri* on the life cycle, fecundity, larval morphology, spawning grounds, migrations, size composition, growth, population dynamics, and trophic relationships (Boschi 1989). Data are also available on the fishery regulations applied to this resource. This information might be applicable to the royal red shrimp *Pleoticus robustus*. However, although *P. muelleri* completes its entire

life cycle in the sea, it is a littoral species, inhabiting depths of 0-80 m. It is the only species of this genus which frequents shallow waters (Pérez Farfante 1977). Therefore, data on this species should be interpreted carefully and used with caution if applied to royal red shrimp.

Examples of other species of shrimp which inhabit deep water are the scarlet shrimp *Plesiopenaeus edwardsianus* (family Aristeidae) of the western Atlantic, the royal red prawn *Haliporoides sibogae* (family Solenoceridae) of the southwestern Pacific (southeastern Australia), a species of Pleoticus, *P. steindachneri*, from the Red Sea, that belongs to a genus found elsewhere only in the western Atlantic, and *Haliporoides triarthrus vnirio* (family Solenoceridae), which is found off the coast of southern Africa.

References for scarlet shrimp are not reviewed in this report.

For *Haliporoides sibogae*, females were larger than males, reaching a maximum size of 46 mm carapace length (cl) compared to 32 mm cl for males. Average size at sexual maturity was 30.8 mm cl for females and 25.8 mm cl for males. Females of this species apparently breed several times in their life, whereas males probably breed only once. Individual fecundity (ranging from about 58,000 to 140,000 oocytes) was relatively low compared with other penaeids, but oocytes were larger (mean diameter = 0.41 mm). Acoustical surveys of the continental slope between depths of 200 and 800 m off New South Wales, Australia, found commercial quantities of this species between 350 and 550 m. They were available both day and night, but daytime catch rates were usually higher. Length frequency data from all areas showed little variation with time.

For *Pleoticus steindachneri*, this species lives in the high temperature of the deep waters of the Red Sea. Depth distribution and distribution with respect to water temperature are described.

For *Haliporoides triarthrus vnirio*, this species is of considerable economic importance, being exploited from southern Mozambique and Natal. Survey data are available for abundance indices, catch composition, geographic and bathymetric distributions. Some limited information exists on the biology (sexual maturity, recruitment, and growth) of this species.

Again, although the above species of shrimp live in deep water and some aspects of their life history may be similar to those of royal red shrimp, conclusions about similarities should be made with caution.

III. DESCRIPTION OF THE FISHERY FOR ROYAL RED SHRIMP IN THE GULF OF MEXICO

Royal red shrimp have been a small component of Gulf shrimp landings since the early 1960s. A few shrimping vessels in the Gulf shrimp fishery have targeted royal red shrimp, but fishing effort has been variable and inconsistent until recent times. Participation in this fishery requires larger vessels and heavier gear than used in the fishery for shallow water penaeids.

The Gulf of Mexico shrimp fishery data base contains 2,286 records between the years 1962 and 1993 pertaining to royal red shrimp. These records were used to summarize, on an annual basis, the weight and value of the landings, the number of vessels fishing, the number of fishing trips made, the areas and depths fished, and the number of fishing ports utilized. These data are summarized below. Statistical zones in the Gulf of Mexico are shown in Figure 1.

Landings

Total annual landings of royal red shrimp from the Gulf of Mexico between 1962 and 1993 varied from 0 to over 300,000 pounds (Table 1, Figure 2). In only five years (1969, 1973, 1974, 1993, and 1994) were the landings over 200,000 pounds. The large fluctuations in landings from one year to the next suggest that market availability may be a more likely cause of the fluctuations than resource availability. Although there was a gradual downward trend in landings from 1973 to 1984, landings have increased consistently since 1988. The 1994 landings were 335,363 pounds.

Value

The total annual value of royal red shrimp landings was less than $200,000 in 13 of the 32 years from 1962 to 1993, between $200,000 and $400,000 in 14 years, and greater than $400,000 in 5 years (Figure 3). As with landings, there were large fluctuations in the value of the fishery in adjacent years. There is some indication in the statistical data series that a year of large landings was followed by a year of lower than expected value, possibly caused by lower prices.

Number of Fishing Trips

The number of fishing trips on which royal red shrimp were caught has also been small (Figure 4). In only four years (1969, 1974, 1976, and 1980) were there more than a total of 80 trips. There was no consistent trend in the number of trips over the 32-year period. It is most likely that these trips were ones on which only deep water was fished, since deep water shrimp fishing requires heavier gear than when fishing for shrimp in shallow water. It would not be likely that vessels could or would re-rig to heavier or lighter gear during mid-trip. This assumption, however, has not been tested by searching all data records in the shrimp data file.

The annual fishing effort for royal red shrimp has also varied significantly (Figure 5). In this figure no effort is shown in 1990-1993 because effort data were not collected in these years. The annual CPUE is shown for each year in Figure 6, except for 1990-1993 when there were no effort data and for 1986 and 1989 when effort data were too little to be used.

Number of Vessels

The number of vessels participating in the royal red shrimp fishery has always been small (Figure 7). In no year were more than 25 different vessels reported to participate in the fishery. In most years the number was less than 10. Over the total time period,

there is no consistent trend in the number of vessels. In 1993 the number of vessels reported was 9.

Areas Fished

There are 21 statistical grids in the Gulf of Mexico. Royal red shrimping was recorded in many of these grids during the 32 years (Figure 8). In any one year, however, fishing was recorded in only from 1 to 9 grid areas. In 5 of these years, 6 or more grid areas were fished, in 17 of the years, from 3 to 5 grid areas were fished, in 11 of the years only 1 or 2 grid areas were fished. There was no consistent trend in number of grids fished.

Fishing in recent years (1990-1994 to date) has been most prevalent in statistical zones 4 (off west coast of Florida), 10 (off Alabama), and 11 (off Mississippi) (Figure 9). Other statistical grid areas fished in these years include grid 2 (off the Dry Tortugas), grid 5 (off west Florida), and grid 9 (off northwest Florida). The fishery occurs exclusively in federal waters.

The statistical grid areas in the Gulf of Mexico are bounded inshore by the coast and offshore by latitude and longitude lines. Because the grids were established with mainly the shallow water shrimp fishery in mind, the offshore boundaries of the grids were generally set along latitude or longitude lines without consideration of water depths close to the outer boundaries of the grids. As a result, the 200-fathom depth contour, which is the common depth for royal red shrimp fishing, is inside some statistical grids, but outside others. Thus, port agents, in assigning the area of fishing for royal red shrimp fishing, often assigned the grid that was closest to the area of fishing, but these assignments may not have been made consistently. For example, a fishing area south of Alabama and west of Florida could have been assigned either to grid 10 (south of Alabama) or grid 6 (west of Florida). This problem of statistical grid definition has been addressed and the outer boundaries of the grid zones has been extended to include locations of greater depth.

Number of Ports Utilized

The number of ports utilized by vessels landing royal red shrimp varied from 1 to 9 (Figure 10). There appear to have been fewer ports utilized in recent years than in earlier years. In 1969 and 1973, landings of royal red shrimp were made at 9 ports. Since 1981, however, royal red shrimp have been handled at no more than 6 ports, and in 1990 to 1993 landings were made at only 2 or 3 ports. These ports were in Alabama, Mississippi, and Florida (Ft. Myers).

Market Situation

Royal red shrimp have experienced a limited and variable market from 1962 to 1994. Landings decreased in the 1980s but have been increasing since 1986. The product is supplied both to restaurants and to the retail trade.

The restaurant supply is primarily directed to those restaurants that know how to handle and prepare the product properly. Instructions on proper handling and preparation are important and need to be followed to ensure satisfaction of both restaurant owners and customers.

The retail supply, to be successful, also requires knowledge about how to properly prepare the product. This may entail a point of sale consumer education program on proper preparation of royal red shrimp.

Some of the factors that affect marketability are:

- Lack of name recognition: consumers often do not recognize the name "royal red" and thus the product is less easily marketed than shrimp with more familiar names, such as pink shrimp and white shrimp.

- Lack of visual recognition: the red color of royal red shrimp is unusual and unfamiliar to many consumers. This may cause some consumers to be reluctant to try royal red shrimp.

- Lower yield: royal red shrimp have a lower ratio of tail weight to total weight than other shrimps in the market. This increases the relative cost of the edible portion of the product.

- Mishandling: royal red shrimp require special handling. The flesh is soft and may break apart during processing (e.g., peeling and deveining). Royal red shrimp cook quickly and care must be taken not to overcook them since the product becomes tough when broiled or fried too long and disintegrates when boiled too long.

- Cost: prices are lower for royal red shrimp at all market levels (ex-vessel, wholesale, retail) than for penaeid shrimp.

Management Approaches

The royal red shrimp fishery in the Gulf of Mexico is a small, specialized component of the larger, more generalized shrimp fishery in the Gulf, which concentrates mostly on the shallower water brown, white, and pink shrimp. For royal red shrimp fishing, a few of the larger, more powerful shrimping vessels have at times rigged with heavier gear for deeper water fishing and targeted royal red shrimp. This effort has sustained a small, highly variable, fishery over the years. The fishery did not grow to any significant extent until after 1991. The inconsistent growth in the early years of the fishery is most likely due to poor market availability.

IV. MANAGEMENT ALTERNATIVES

Alternative A: No change. MSY, OY and TAC are set at 392,000 pounds, and the season closes when this amount is taken.

Discussion: The MSY is based on inadequate data, and restriction of catches at this level may prevent the acquisition of new catch and effort information at higher levels of harvest. The current cap may also be unnecessarily restrictive and prevent the achievement of a higher OY.

Alternative B: Delete royal red shrimp from the management unit but retain it in the described fishery for data collection purposes.

Discussion: The FMP provides no regulation for the royal red shrimp fishery other than the closure when catches reach the level of an imperfect MSY. The Council's Shrimp Advisory Panel recommended withdrawing the species from management because extensive management to adjust catches seasonally or limit access would not be cost effective. There are only about ten vessels in the fishery with annual landings of 300,000 to 400,000 pounds. More costly fishing gear is required, and the unit value of the royal reds is well below that of penaeid shrimps. The panel believes that economics will provide ample protection to the stocks because fishermen will cease fishing when the CPUE becomes low and unprofitable.

Because of the slower growth and longer life of this species, it is more vulnerable to overfishing than the other commercial species in the Gulf fishery. If overfishing does occur in an uncontrolled fishery, response time could be delayed and the stocks could be depleted. This alternative was not selected because of the potential risk of overfishing.

Alternative C: Provide seasonal adjustments and limited access to test response of stocks to various levels of fishing effort.

Discussion: Intensive management was considered as a method to develop a better estimate of MSY and determine if TAC should be increased. Effort could be regulated by TAC and limited access. Because of the potentially high cost of intensive management of a very small fishery, it was deemed to be impractical.

Preferred Alternative D: The Council, through a framework adaptive management procedure, may recommend that the Regional Director set a TAC (OY) for royal red shrimp no higher than MSY plus up to 30 percent for up to two consecutive years to test the resilience of the stock to fishing. NMFS will monitor catch, effort, area by capture and other data relating to the fishery on an annual basis for presentation to the Council. These data will be reviewed at least biennially by the Council's stock assessment panel which will prepare a report with recommendations for ABC and MSY.

Fishing for the season will close when TAC (OY) is reached. Overfishing is defined as fishing in excess of OY.

Following recommendation of the SEP, SSC and public comment the Council may recommend OY, TAC and MSY to the Regional Director who may implement the changes by regulatory amendment which will contain a regulatory impact review and an environmental assessment.

Discussion: The extent of the royal red shrimp resource is not known due to the lack of fishing effort. This same lack of effort has resulted in an MSY which may not reflect the actual extent of the stocks. The MSY, which may be underestimated, has resulted in a ceiling on the recently developing fishery. By allowing a moderate, temporary increase in catch and effort the Council's technical advisors can observe the effects on catch per unit of effort and recommend safe levels of fishing. While the Council seeks to prevent overfishing the stocks, it also requires sufficient data for management to achieve OY.

Amendment 7 defined overfishing for royal red shrimp as exceeding MSY by 10 percent or more in a fishing year. MSY is currently estimated to be 392,000 pounds of tails. The 10 percent increase or 39,200 pounds has been judged by the Council to be insufficient to test the resilience of the stock and detect changes in catch per unit of effort from increased harvest. This 10 percent increase amounts to only 5 vessel trips, the average catch of these vessels being 7,500 pounds per trip. The purpose of this amendment is to provide a better data base for perfecting MSY by allowing a prudent and short-term increase in TAC without endangering the stocks. It is judged that an increase in catch of up to 30 percent of MSY (an increase of up to 117,600 pounds) for up to two consecutive years could provide the Stock Assessment Panel and Scientific and Statistical Committee with additional data. The panels can then advise the Council on any needed revision of MSY or extension of the TAC to be accomplished by regulatory amendment.

The Council's industry advisory panel pointed out that this is a small fishery with relatively low value ($1.6 million in 1994), and it would not be cost effective to invest heavily in management. The current catch monitoring program can, however, provide the needed catch and effort information on the increased TAC at minimal cost.

Two consecutive years of harvest at a higher TAC is suggested as being a minimum trial period to test fish the stocks at a higher level, review the data, and propose future action. This limited period under the catch effort monitoring would also serve as a safeguard to prevent recruitment overfishing.

At the conclusion of the test period NMFS and the Shrimp Stock Assessment Panel will review the data and advise if changes are needed in MSY and TAC or if the test period should be extended or discontinued. Following a review by the Scientific and Statistical Committee and public comment, the Council will recommend appropriate action to be taken by the Regional Director through a regulatory amendment. This may include adjusting MSY, OY and TAC.

V. REGULATORY IMPACT REVIEW

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 any proposed regulations are a "significant regulatory action" under certain 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).

This RIR analyzes the probable impacts on fishery participants of the proposed plan amendment to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico (FMP).

Problems and Objectives

The general problems and objectives are found in the FMP, as amended, and in Section I of this plan amendment. The purpose and need for the present plan amendment are also found in Section I. The current plan amendment addresses alternative ways of managing the royal red shrimp fishery.

Methodology and Framework for Analysis

The basic approach adopted in this RIR is an assessment of management measures from the standpoint of determining the resulting changes in costs and benefits to society. The net effects are stated in terms of producer surplus to the harvest sector, net profits to the intermediate sector, and consumer surplus to the final users of the resource. In addition to these surpluses, there are public and private costs associated with the process of changing regulations for royal red shrimp.

Ideally, all these changes in costs and benefits need to be accounted for in assessing the net economic benefit from management of royal red shrimp. The RIR attempts to determine these changes to the extent possible, albeit in a very qualitative manner.

Management Measures

The full discussions of the proposed management alternatives are set down in Section IV of the amendment text. These are re-stated in the next subsection.

Impacts of Proposed Alternatives

Alternative A: No change. MSY, OY and TAC are set at 392,000 pounds, and the season closes when this amount is taken.

Alternative B: Delete royal red shrimp from the management unit but retain it in the described fishery for data collection purposes.

Alternative C: **Provide seasonal adjustments and limited access to test response of stocks to various levels of fishing effort.**

Preferred Alternative D: **The Council, through a framework adaptive management procedure, may recommend that the Regional Director set a TAC (OY) for royal red shrimp no higher than MSY plus up to 30 percent for up to two consecutive years to test the resilience of the stock to fishing. NMFS will monitor catch, effort, area by capture and other data relating to the fishery on an annual basis for presentation to the Council. These data will be reviewed at least biennially by the Council's stock assessment panel which will prepare a report with recommendations for ABC and MSY.**

Fishing for the season will close when TAC (OY) is reached. Overfishing is defined as fishing in excess of OY.

Following recommendation of the SEP, SSC and public comment the Council may recommend OY, TAC and MSY to the Regional Director who may implement the changes by regulatory amendment which will contain a regulatory impact review and an environmental assessment.

At present OY and TAC for royal red shrimp are the same as MSY of 392,000 pounds. Fishing closes when TAC is taken. This MSY was set in 1981 when the shrimp FMP was first implemented. In 1991 when overfishing of the species was defined under Amendment 5 as fishing in excess of OY, the expectation then was that such definition would have no material impacts on the fishing participants in the sense that no restrictive measures would be imposed on the fishery in the near future. Such expectation was partly based on the low level of landings of this species prior to the implementation of the overfishing definition. In fact, a TALFF of 146,000 pounds had been part of the FMP for about a decade, but no foreign country availed itself of this provision. Landings started to pick up in 1992 and first exceeded 300,000 pounds in 1993. This surge in domestic landings prompted the elimination of the TALFF, with the amount being made part of the domestic quota. Landings for 1994 are estimated to be about 335 thousand pounds, only about 60 thousand pounds below the TAC.

The royal red shrimp fishery is a small fishery relative to the brown, white, or pink shrimp fishery in terms of landings, harvest participation, and market. In 1994 landings of royal red shrimp were estimated at 335 thousand pounds valued at about $1.2 million. There were less than ten vessels in the fishery using 2 to 3 landing ports. Royal red shrimp are sold to restaurants or retail outlets in and around the ports of landing.

While the number of vessels harvesting the resource has remained relatively low in recent years, landings have increased enough to almost equal the TAC. If harvests continue to increase landings could exceed the TAC. In this situation, the fishery would close under Alternative A (status quo), but not under the other alternatives. Fishery closures are bound to result in adverse impacts on fishing participants. But if such closures result in rendering the fishery sustainable over the long run, long-run benefits from a sustainable fishery may outweigh short-run losses from closures.

In the case of royal red shrimp, two major issues need to be raised in order to determine the potential impacts of the various alternatives for managing this fishery. The first issue concerns the likelihood of a closure and the second relates to the potential benefits of the closure.

While historically the fishery has never reached the TAC of 392,000 pounds, harvests in the last two years have reached peak levels and are very close to the TAC. Before 1993, the highest landings occurred in 1969 when there were about 15 vessels in the fishery. Landings were also relatively high in 1973 and 1974 when there were more than 15 vessels. The last two years, 1993 and 1994, appear to be different. About 10 vessels operated in the fishery, but landings reached their highest levels. While there are other factors that may affect the level of landings, the experience in the most recent years indicates that a slight increase in either the number of vessels or effort expended by existing vessels may lead to catching the entire TAC.

The decision to enter or re-enter the royal red shrimp fishery depends on a host of factors. But the bottom line for that decision is whether the fishery offers better profit prospects than other fishing undertakings. The fishery is a deepwater fishery, and so requires larger costs than shallow water shrimp fisheries. Fishing for royal red requires larger vessels, longer distances to travel, heavier gear, and specific fishing skills. Royal red shrimp also need better handling, cooking, and overall processing procedures than penaied shrimp. In addition to being a relatively more costly operation, royal red shrimp fishing has not been attractive on the revenue side. This species of shrimp commands lower prices than penaied shrimp at corresponding market levels. Under such conditions on the cost and revenue sides of this fishery's operation, profitability appears to be low. But there are compensating factors. The relatively high direct cost of operation may be mitigated by relatively low indirect costs, such as the presence of fewer rivals and absence of managed closed and open seasons and of TEDs requirement. In addition, prices of royal red shrimp in recent years appear to be relatively higher than those in the past. It is also possible that over the last 30 years or so, some techniques in handling and cooking preparation have been developed by some buyers (restaurants and retail outlets) that they could increase their demand for royal red without sacrificing profitability. Given the foregoing, an increase in the number of participants in the fishery is not a remote possibility.

Jones et al. (1994) noted that fluctuations in landings for royal red shrimp are more likely due to market than resource availability. Given such claim, it is possible that the high landings in the last two years reflect a relatively strong market for the species. If this relatively strong demand persists, the ten or so vessels now involved in the fishery may increase their effort to take advantage of the market demand.

Given then the possibility of an increase in the number of participants in the royal red shrimp fishery and of an increase in effort of current participants, there is a good chance that the current TAC will be reached in the near future. Such likelihood increases if there is also an increase in abundance of shrimp in known fishing areas or if new fishing areas are developed. Under this condition, closure of the fishery may eventually be required if status quo is maintained.

Closure of the fishery has both short- and long-term implications. There is no doubt that the direction of short-term effects is negative for the harvesters and for dealers and retailers, since business plans would have to be dropped or revised at some additional costs. The market for this species is not well defined yet, unlike that for the shallow-water shrimp species. If, as mentioned earlier, the record landings in the most recent years indicate a market that is still developing, any closure would stunt further development of such market. Harvesters and dealers would be forgoing profits that could increase with the expansion of the market.

The long-term benefits that can accrue from closure of the royal red shrimp fishery crucially hinge on the current MSY estimate. If the current estimate is such that closure prevents overfishing of the resource, future economic benefits can be expected. Otherwise, constraining the fishery to the current level of MSY would yield long-term economic losses, in addition to the short-term losses.

The original Shrimp FMP adopted an MSY estimate of 392,000 pounds at a predicted fishing days of 1,290. The FMP also set OY equal to MSY. Under Amendment 5 to the FMP, overfishing was defined to be fishing in excess of OY. Assuming that the estimate of MSY is accurate, restricting harvest to MSY and closing the fishery when harvest exceeds MSY would be beneficial to the fishery since the stock will be prevented from deteriorating. If overfishing continues a stock may eventually reach a level when fishing operation becomes unprofitable. Under this situation, of course, fishing would be reduced to negligible level. The stock may not recover; or if it does, it may take a long while. In the meantime, producer and consumer surpluses that could have been generated out of the fishery would be foregone. Thus restricting fishing before the stock becomes severely overfished would enable the fishery to generate long-term benefits. If in addition to having a relatively accurate estimate of MSY, the management system adopted for the fishery is conducive to the development of an efficient fishery, the most likely harvest level would be even below MSY. In this case, closure of the fishery would be a remote possibility.

The royal red shrimp fishery, just like the shallow water shrimp fisheries, is managed under an open access system. The fact then that harvests have not reached or exceeded the current level of MSY is not an indication that the fishery has been operating at the most economically efficient level. It is more a case of a relatively undeveloped fishery, and the current high levels of catch may be an indication that the fishery is just now expanding. It may be noted that while the initial FMP determined the level of MSY, it also advised that the number be reassessed as new annual catch and effort data become available. This is perhaps an indication that the fishery may eventually expand.

MSY was re-estimated more recently, but the statistical linear fit between catch per unit effort and effort was poor, and no statistically acceptable estimate of MSY could be provided. In this case, one can cast doubt on the accuracy of the current level of MSY. And it is possible that if the current MSY estimate is used to trigger closure of the fishery and the fishery actually closes, long-run losses can arise from the closure.

One way of preventing both short-run and long-run economic losses in the management of royal red shrimp is to adopt any of the alternatives to status quo. Under Alternative B, the fishery will be allowed to expand and contract as profitability in the fishery correspondingly rises or falls. Data for management purposes would still be collected. In the long run, appropriate information about the stock and the fishery in general may be collected to enable better management of the fishery. However, there is some possibility that if effort expands rapidly, overfishing may occur. In this case, the information collected over a long period of no active management may not be too useful for managing the fishery.

Alternative C provides ample latitude for determining the range of harvest levels that the stock can support. The seasonal adjustment component of the measure would ensure that the fishery is allowed to expand commensurate with the increase in abundance and/or expansion of the market for royal red shrimp. The status of the stock would be monitored and evaluated. To the extent, however, that there are no established criteria under which the seasonal adjustments may be made, there is some possibility under this alternative overfishing can occur. In addition, there is no time frame specified to make seasonal adjustments for purposes of determining the appropriate level of MSY and OY so that the adjustments may be carried on for a long period to the possible detriment of the stock. If, on the other hand, the seasonal adjustments are made with a view to determine the more accurate level of MSY and OY for the fishery, severe overfishing may be avoided as the fishery is allowed to expand.

The limited access component of Alternative C could eventually ensure that employment of excess labor and capital will be prevented, or that the fishery will operate at an economically efficient level. But only certain types of limited access systems would effectively work to make the fishery economically efficient, and that system would have to be developed for the fishery.

Alternative C would require more management cost than either Alternative A or B. The cost may be small or substantial depending on how closely the fishery is monitored and studied and on the type limited access system adopted. But by allowing the fishery to expand so long as overfishing does not occur, the benefits from this alternative may be worth the management cost.

Alternative D, the preferred alternative, has effects similar to those of Alternative C. The fishery is allowed to expand beyond the current level of MSY but in a more specific way, i.e., by no more than 30 percent of the current level of MSY for up to two consecutive years. In this way short- and long-term losses to the industry would be avoided.

Harvest under Alternative D can be as high as 509,600 pounds (1.3 x 392,000). While significantly different from 392,000, it is still within the range of possible MSY estimates of the original FMP. In such earlier estimate, the upper bound was estimated to be 650,000 pounds with projected fishing days of 4,240. At the proposed upper level for expansion of the fishery, overfishing may occur. But the two-year condition serves to limit the effects of overfishing should it occur at that level of harvest. This implies that short-run losses from closures are avoided while the long-run benefits are not substantially reduced.

The two-year condition of Alternative D is partly analogous to the two-year condition for undertaking action to arrest overfishing for brown, white and pink shrimp. Overfishing for these latter species is based on an index indicating the number of parent shrimp during a certain period of the year. Overfishing occurs when the estimated parent stock falls below the index, but such condition has to occur for two consecutive years before any corrective action is to be implemented. And if the stock recovers after a year of being below the overfishing index, the index will be revised to reflect the resilience of the stock at low levels of parent stocks. While the overfishing definition for royal red shrimp differs from that of the shallow water shrimp species, there are certain features of the two fisheries that would make the two-year condition in both cases to have similar short-term and long-term effects on fishing participants.

Brown, pink and white shrimp fisheries are well developed fisheries, but the overfishing concept for these species has some level of tentativeness in the sense that the overfishing index will be revised depending upon the performance of the stock. The overfishing concept for royal red shrimp appears to be a relatively established concept in the sense that fishing beyond the optimum yield would be non-beneficial to the health of the stock and the economic status of the fishery. But the fishery itself is still developing, and the previous estimate of MSY, which is the basis for OY and overfishing, may need to be modified to reflect actual conditions in the fishery. In both cases, the two-year condition would allow better assessment of the condition of the stock while at the same time it would prevent short-run disruptions to fishing practices. The long-term economic effects are partly dependent upon the status of the stock. If an appropriate overfishing condition is derived in these fisheries, a sustainable fishery could be maintained. The bigger the fishery determined to be sustainable, the higher the economic benefits will be. It is worth stressing, however, that economic benefits from a fishery are likely to be higher when the fishery is under an environment that allows the fishing participants to be highly efficient.

The management cost for Alternative D would be higher than that for Alternative A or B, but lower than that for Alternative C.

Private and Public Costs

The preparation, implementation, enforcement and monitoring of this or any Federal action involves the expenditure of public and private resources which 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	$ 12,000
NMFS administrative costs of document preparation, meetings and review	4,000
Law enforcement costs	none
Public burden associated with permits	none
NMFS costs associated with permits	none
TOTAL	$16,000

The Council and Federal costs of document preparation are based on staff time, travel, printing and any other relevant items where funds were expended directly for this specific action. There are no other costs associated with this amendment.

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.

The actions in this amendment affect only a specific segment of the shrimp fishery -- the royal red shrimp fishery. Considering its small size, impacts on this segment of the shrimp fishery are not expected to amount to $100 million or more annually. None of the measures are expected to cause an increase in the price of shrimp to consumers. Although there is the potential for closing the fishery under Alternative A, the impact of such closure on shrimp prices is minimal. Alternative D, in fact, could slightly lower the price for royal red shrimp as harvest expands. Cost increases to the shrimp industry and the federal government are not likely to be effected by either Alternative A or B. Alternative C could add cost to the federal government, and such cost could range from small to substantial depending on how closely the fishery is monitored. Alternative D would add cost to the federal government, but such cost is not likely to be substantial. None of the proposed measures are likely to adversely impact competition, innovation, employment and investment. In fact, Alternatives B, C and D may have positive effects on employment and investment in the royal red shrimp fishery in the sense that the fishery is allowed to expand when both the stock and market conditions are favorable. The domestic shrimp industry is currently faced with strong competition from foreign suppliers. While the proposed measures may not adversely impact the competitive position of the domestic fishery, Alternatives B, C or D may partly offset strong competition from foreign countries in the domestic market for shrimp.

On balance, therefore, this regulation if enacted is deemed not to constitute a "significant regulatory action" under any of the mentioned criteria.

Determination of a Need for an Initial Regulatory Flexibility Analysis

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 royal red shrimp 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.

In general, a "substantial number" of small entities is more than 20 percent of those small entities engaged in the fishery (NMFS, 1992). At present there are less than 10 vessels engaged in the harvest of royal red shrimp. The Small Business Administration (SBA) defines a small business in the commercial fishing activity as a firm with receipts of up to $2.0 million annually. All of the current participants of the royal red shrimp fishery fall within such definition of small business. Since the proposed action will affect all the current harvesters of royal red shrimp, the "substantial number" criterion will be met.

Economic impacts on small business entities are considered to be "significant" if the proposed action would result in any of the following: a) reduction in annual gross revenues by more than 5 percent; b) increase in total costs of production by more than 5 percent as a result of an increase in compliance costs; c) 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; d) capital costs of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities; or e) as a rule of thumb, 2 percent of small business entities being forced to cease business operations (NMFS, 1992).

Each of the proposed measures does not directly affect the gross revenues or production costs of the shrimp harvest industry. Later specific measures under Alternative A may result in the fishery forgoing revenues. Also specific measures under Alternative C may raise production cost to new entrants in the event a limited access system is imposed. Alternatives B and D, on the other hand, would allow the industry to generate more revenues from the fishery. None of the proposed alternatives require a significant increase in compliance or capital costs. Finally, none of the proposed measures are bound to directly result in forcing any small businesses to cease operation, because there are no provisions that would reduce total revenues or increase total costs (from current ones).

From the foregoing it can be concluded that the proposed regulation would not have a significant economic impact on a substantial number of small business entities. Therefore, an IRFA is not required.

VI. ENVIRONMENTAL CONSEQUENCES

Affected Environment

The environment of the royal red shrimp fishery, as described in Sections II and III, will not be affected by this amendment.

Human Environment

There would be little socioeconomic or environmental impact unless overfishing should occur and the stock began to decline. At that time the Council would consider a range of management actions to reduce fishing mortality and the economic and environmental impact of each such option. Specific measures for a recovery program cannot be proposed now without more specific information.

Physical Environment

The actions proposed in this amendment will have no impact on the physical environment.

Fishery Resources

The proposed action is intended to allow an orderly development of the royal red shrimp fishery with monitoring to determine its sustainable yield. Four alternatives were considered:

Alternative A: No change. MSY, OY and TAC are set at 392,000 pounds, and the season closes when this amount is taken.

Alternative B: Delete royal red shrimp from the management unit but retain it in the described fishery for data collection purposes.

Alternative C: Provide seasonal adjustments and limited access to test response of stocks to various levels of fishing effort.

Preferred Alternative D: The Council, through a framework adaptive management procedure, may recommend that the Regional Director set a TAC (OY) for royal red shrimp no higher than MSY plus up to 30 percent for up to two consecutive years to test the resilience of the stock to fishing. NMFS will monitor catch, effort, area by capture and other data relating to the fishery on an annual basis for presentation to the Council. These data will be reviewed at least biennially by the Council's stock assessment panel which will prepare a report with recommendations for ABC and MSY.

Fishing for the season will close when TAC (OY) is reached. Overfishing is defined as fishing in excess of OY.

Following recommendation of the SEP, SSC and public comment the Council may recommend OY, TAC and MSY to the Regional Director who may implement the changes by regulatory amendment which will contain a regulatory impact review and an environmental assessment.

Of these alternatives only Alternative B has a potential risk to the fishery resources. If the cost of declining catch and revenue fails to constrain total fishing effort on this species, the possibility exists for overfishing. The other three alternatives provide for monitoring and contain procedures to prevent overfishing.

Effect on Endangered Species and Marine Mammals

Listed and protected species under the Endangered Species Act (ESA) and governed by the jurisdiction of NMFS that occur in the Gulf of Mexico include:

WHALES
(1) the (endangered) northern right whale - Eubalaena glacialis
(2) the (endangered) humpback whale - Megaptera novaeangliae
(3) the (endangered fin whale - Balaenoptera physalus
(4) the (endangered sei whale - Balaenoptera borealis
(5) the (endangered) sperm whale - Physeter macrocephalus
(6) the (endangered) blue whale - Balaenoptera musculus

SEA TURTLES
(7) the (endangered) Kemp's ridley turtle - Lepidochelys kempii
(8) the (endangered) leatherback turtle - Dermochelys coriacea
(9) the (endangered) hawksbill turtle - Eretmochelys imbricata
(10) the (endangered/threatened) green turtle - Chelonia mydas
(11) the (threatened) loggerhead turtle - Caretta caretta

Green turtles in U.S. waters are listed as threatened except for the Florida breeding population that is listed as endangered.

FISH
(12) the (endangered) shortnose sturgeon - Acipenser brevirostrum

NMFS has determined that shrimp trawling activities would adversely affect only sea turtles. Regulations requiring the use of turtle excluder devices provide an exemption for the royal red shrimp fishery because it is a deep water fishery where turtle capture is unlikely.

Bycatch

The megalops or pink speckled shrimp is a bonus bycatch in the royal red fishery between 180 and 225 fathoms. The principal finfish in the bycatch are in two genera (four species) of deepwater hakes. They have potential value as commercial species but must be processed promptly aboard the vessel to prevent deterioration of quality.

Bycatch on the royal red grounds may be described as relatively clean as compared with other trawl fisheries.

Effect on Wetlands

The proposed action has no effect on any flood plains, wetlands, trails or rivers.

Vessel Safety

The proposed actions do not impose requirements for use of unsafe (or other) gear nor do they direct fishing effort to periods of adverse weather conditions.

Data Collection

This amendment requires no additional data collection subject to the Paperwork Reduction Act.

Scientific Data Needs

To monitor shrimp stocks to determine whether overfishing occurs, the SEFC of NMFS currently monitors shrimping effort and shrimp catch by size (age) and area.

Federalism

This proposed action does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under E.O. 12612.

Coastal Zone Management Consistency

The Assistant Administrator has determined that this proposed action will be implemented in a manner that is consistent to the maximum extent practicable with the approved coastal zone management program of Florida, Alabama, Mississippi, and Louisiana. This determination was submitted for review by these states under Section 307 of the Coastal Zone Management Act.

VII. CONCLUSION

Mitigating measures related to the proposed action: no significant environmental impacts are expected; therefore, no mitigating actions are proposed.

Unavoidable adverse effects with implementation of the proposed action negative net economic benefits are discussed in the Regulatory Impact Review.

Irreversible and irretrievable commitment of resources involved with the proposed action government costs are not expected to change significantly, if at all, as a result of this action.

Recommendation

Finding of No Significant Environmental Impact

In view of the analysis presented in this document, I have determined that the proposed action in this amendment to the Fishery Management Plan for Gulf Shrimp would not significantly affect the quality of human environment with specific reference to the criteria contained in NAO 216-6 implementing the National Environmental Policy Act. Accordingly, the preparation of a Supplemental Environmental Impact Statement for this proposed action is not necessary.

_____ _____

Assistant Administrator for Fisheries Date

Responsible Agencies

Gulf of Mexico Fishery Management Council
Lincoln Center, Suite 331
5401 West Kennedy Boulevard
Tampa, Florida 33609
813-228-2815

List of Agencies and Persons Consulted

Gulf of Mexico Fishery Management Council's

- Scientific and Statistical Committee
- Shrimp Advisory Panel
- Shrimp Stock Assessment Panel

Coastal Zone Management Programs

- Louisiana
- Mississippi
- Alabama
- Florida

National Marine Fisheries Services

- Southeast Fisheries Center
- Fisheries Operations Branch - Southeast Regional Office

Trade Association

- Texas Shrimp Association
- Louisiana Shrimp Association
- Concerned Shrimpers of America
- American Shrimp Processors Association
- Southeastern Fisheries Association

All known vessel owner/operators fishing for royal red shrimp were provided with copies of the draft amendment.

Public Comment

No written comments from the public were submitted to the Council office. Public testimony opportunity was provided at the Council's meeting at 8:45 a.m. on July 19, 1995 at the Pier House, One Duval Street, Key West, Florida. No testimony was given.

List of Preparers

Gulf of Mexico Fishery Management Council

- Terrance R. Leary, Biologist
- Antonio B. Lamberte, Ph.D., Economist

The sections on biology, habitat, and description of the fishery were prepared by the NMFS SEFSC in a report prepared for the Council by Albert C. Jones, James M. Nance, and William O. Antozzi, Jr.

Table 1. Royal red shrimp landings in the U.S. Gulf of Mexico

YEAR	POUNDS (heads off weight)
1960	0
1961	0
1962	4,925
1963	6,245
1964	4,591
1965	17,045
1966	23,475
1967	37,706
1968	72,866
1969	271,292
1970	40,867
1971	64,081
1972	36,645
1973	230,794
1974	226,871
1975	122,607
1976	164,213
1977	150,705
1978	108,994
1979	154,410
1980	180,974
1981	100,407
1982	59,220
1983	77,518
1984	79,627
1985	36
1986	20,617
1987	76,475
1988	66,485
1989	74,173
1990	91,406
1991	89,190
1992	134,239
1993	327,090
1994	335,363

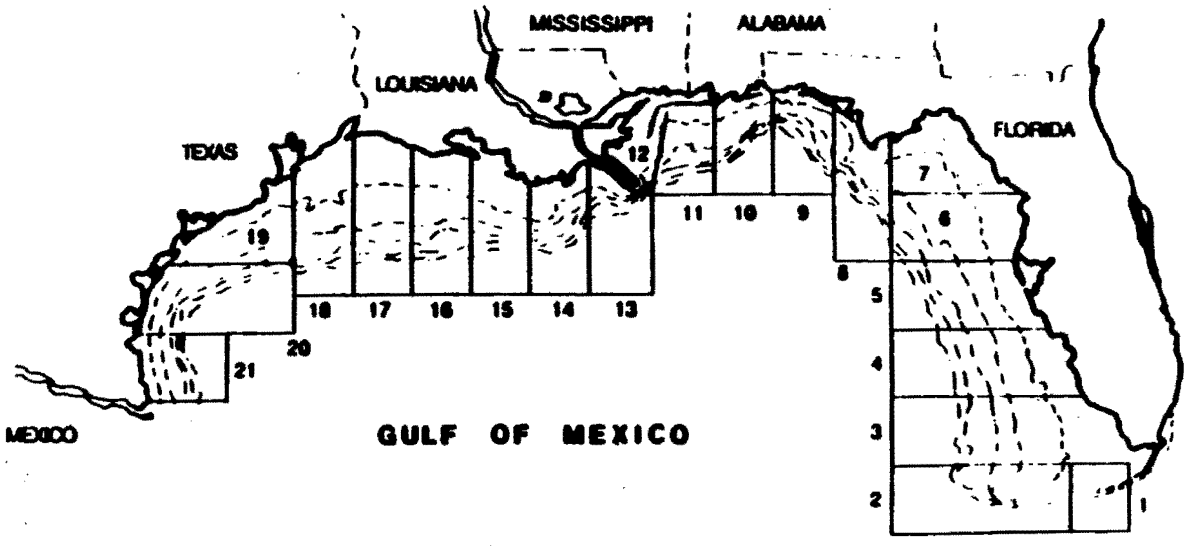

FIGURE 1.-Statistical zones in the Gulf of Mexico. Bathymetric lines represent 60-ft depth intervals.

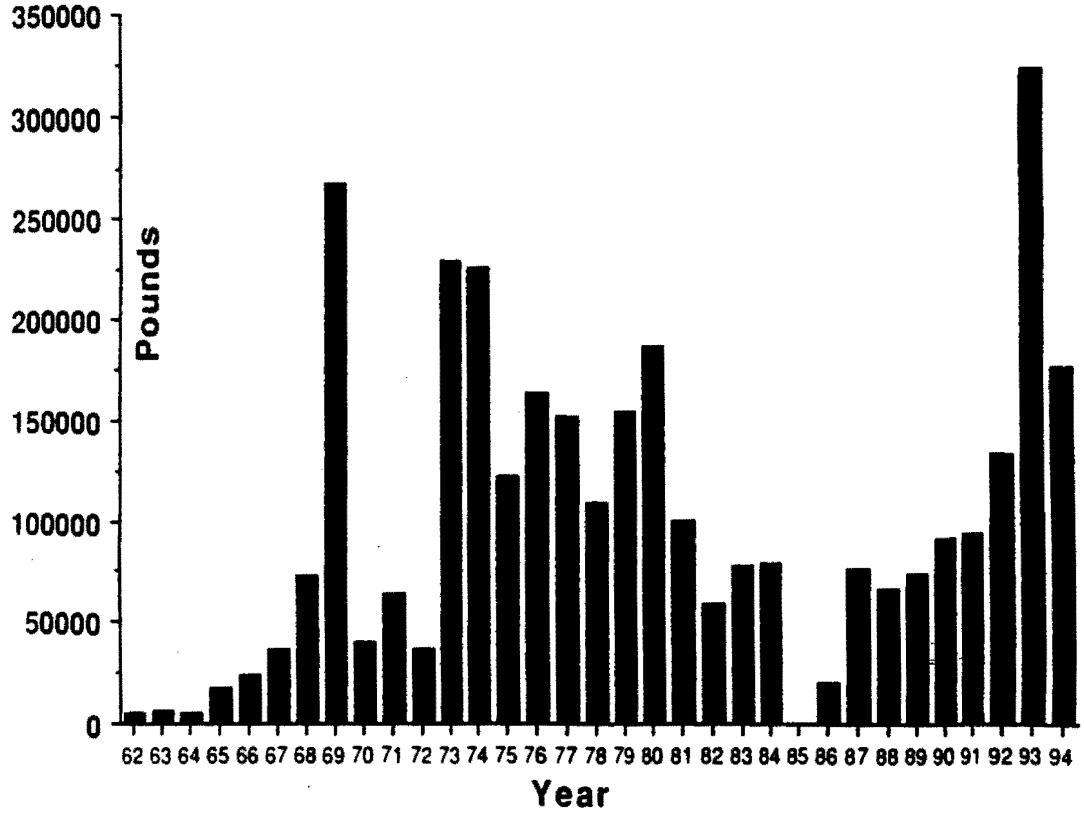

Figure 2. Annual landings (pounds, heads-off) of royal red shrimp in the U.S. Gulf of Mexico, 1962 to 1994 (to date).

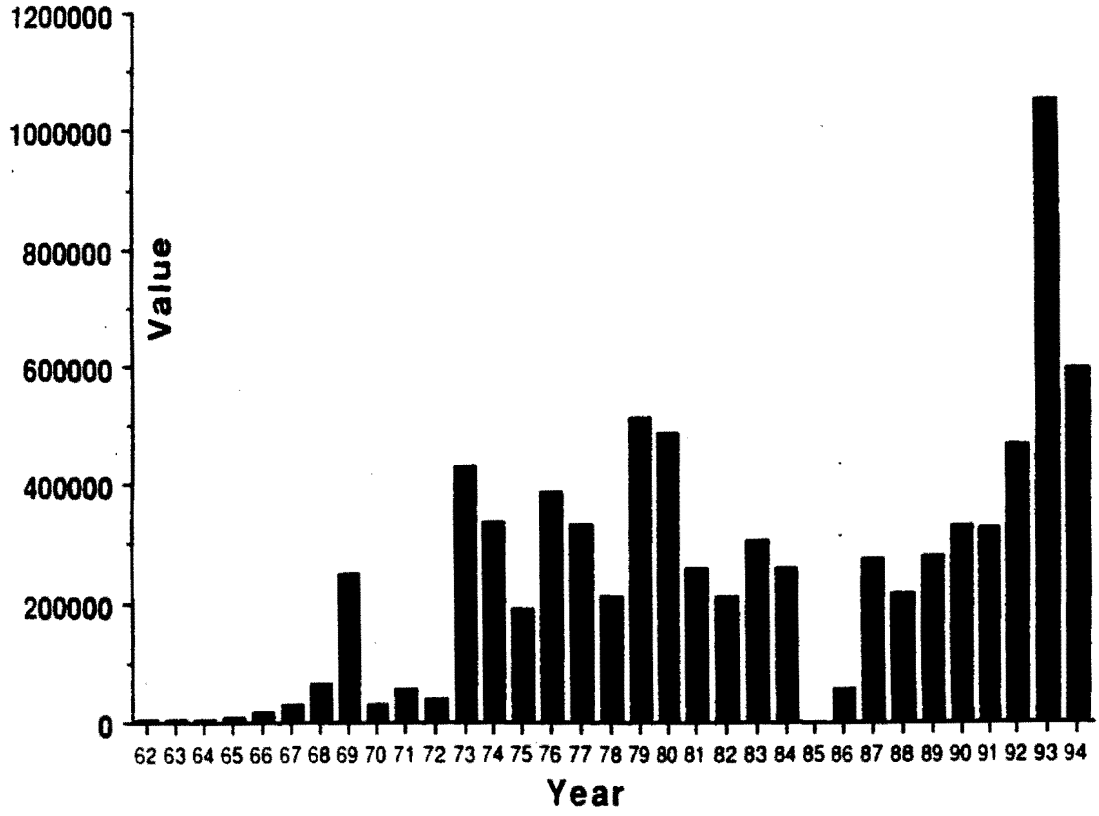

Figure 3. Annual value (dollars) of royal red shrimp landings in the U.S. Gulf of Mexico, 1962 to 1994 (to date).

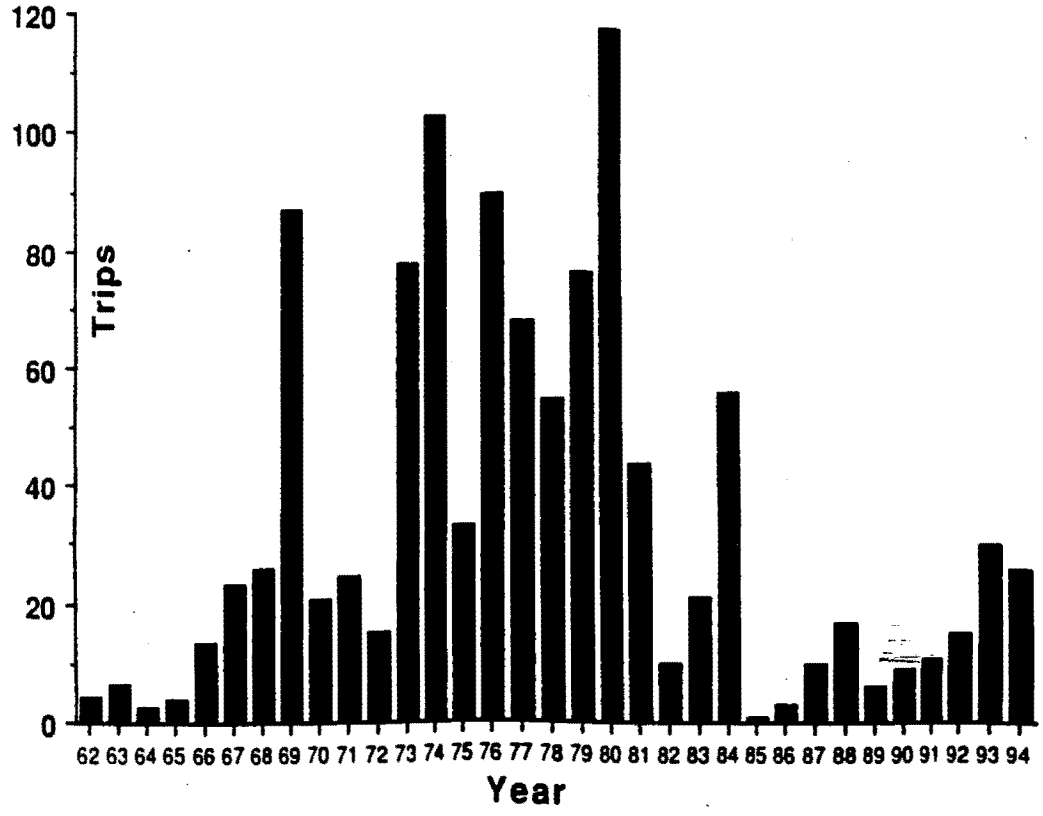

Figure 4. Annual number of fishing trips for royal red shrimp in the U.S. Gulf of Mexico, 1962 to 1994 (to date).

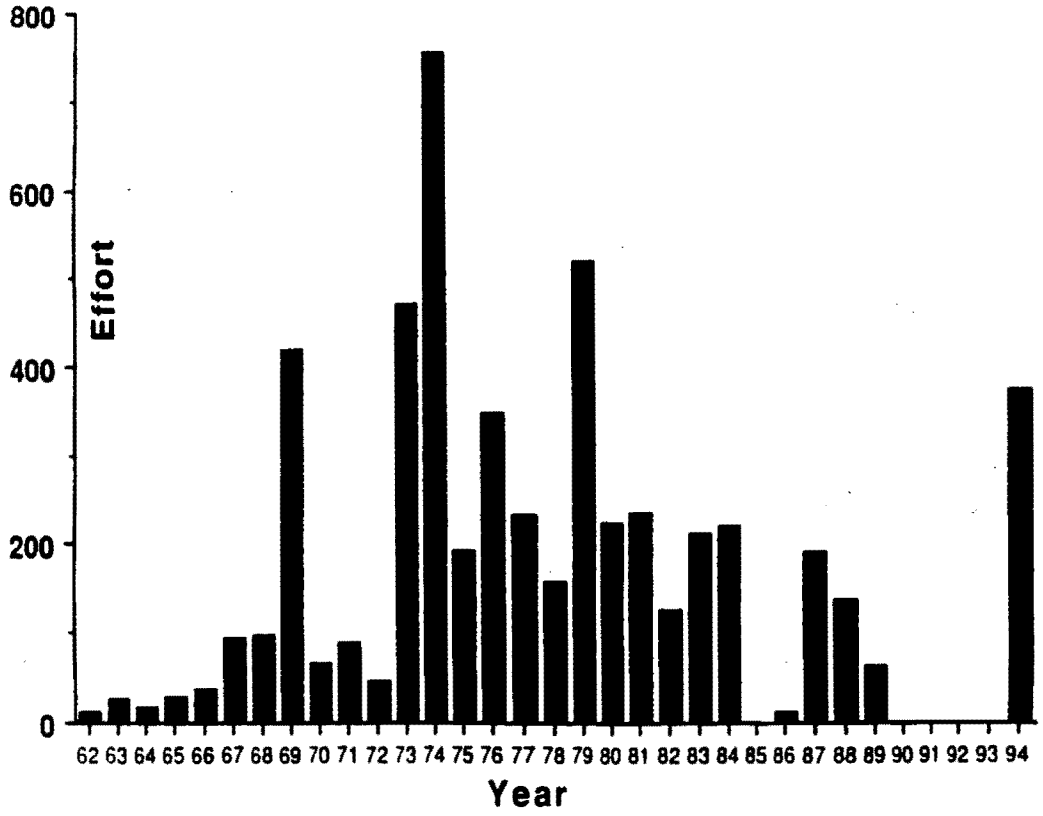

Figure 5. Annual effort (number of 24-hr fishing days) in the U.S. Gulf of Mexico, 1962 to 1994 (to date).

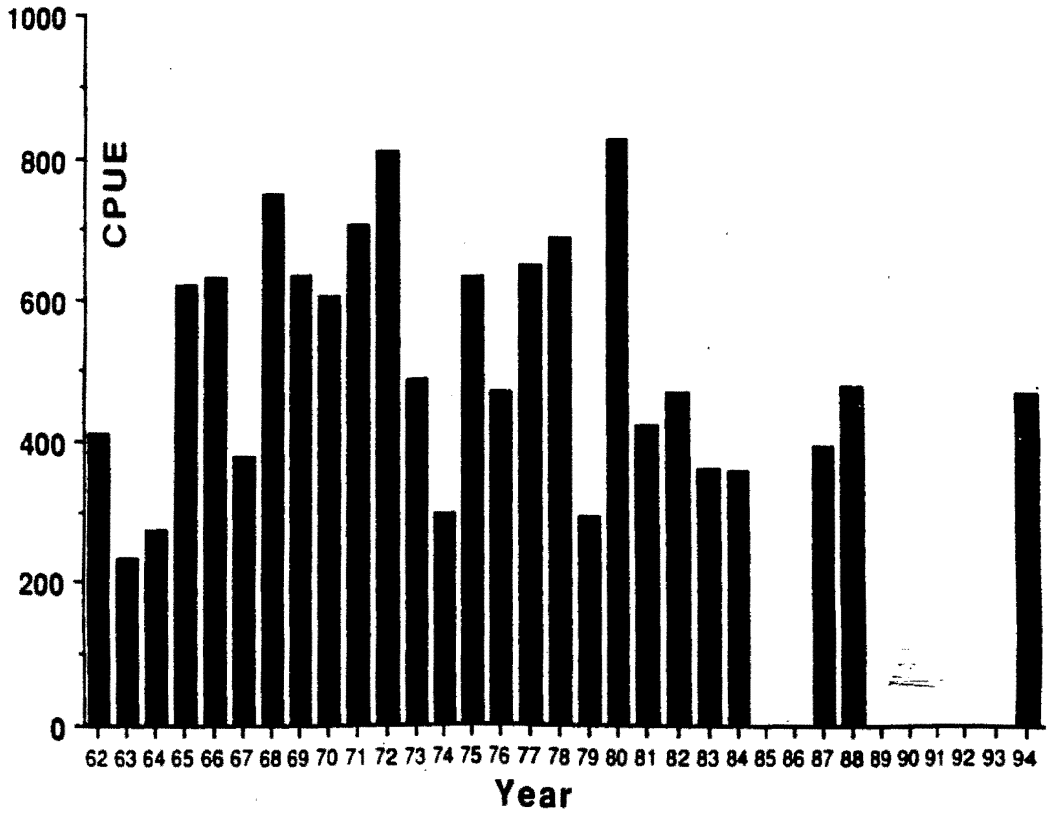

Figure 6. Annual CPUE (landings per 24-hr fishing day) in the U.S. Gulf of Mexico, 1962 to 1994 (to date).

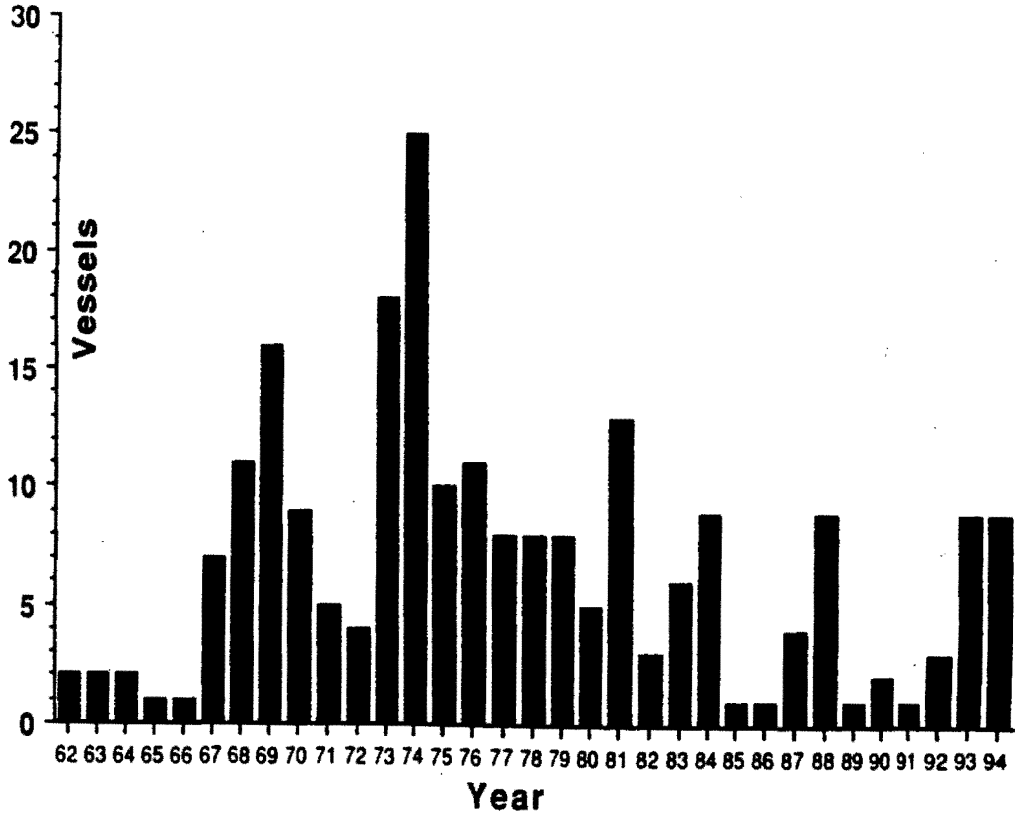

Figure 7. Number of vessels that landed royal red shrimp in the U.S. Gulf of Mexico, 1962 to 994 (to date)

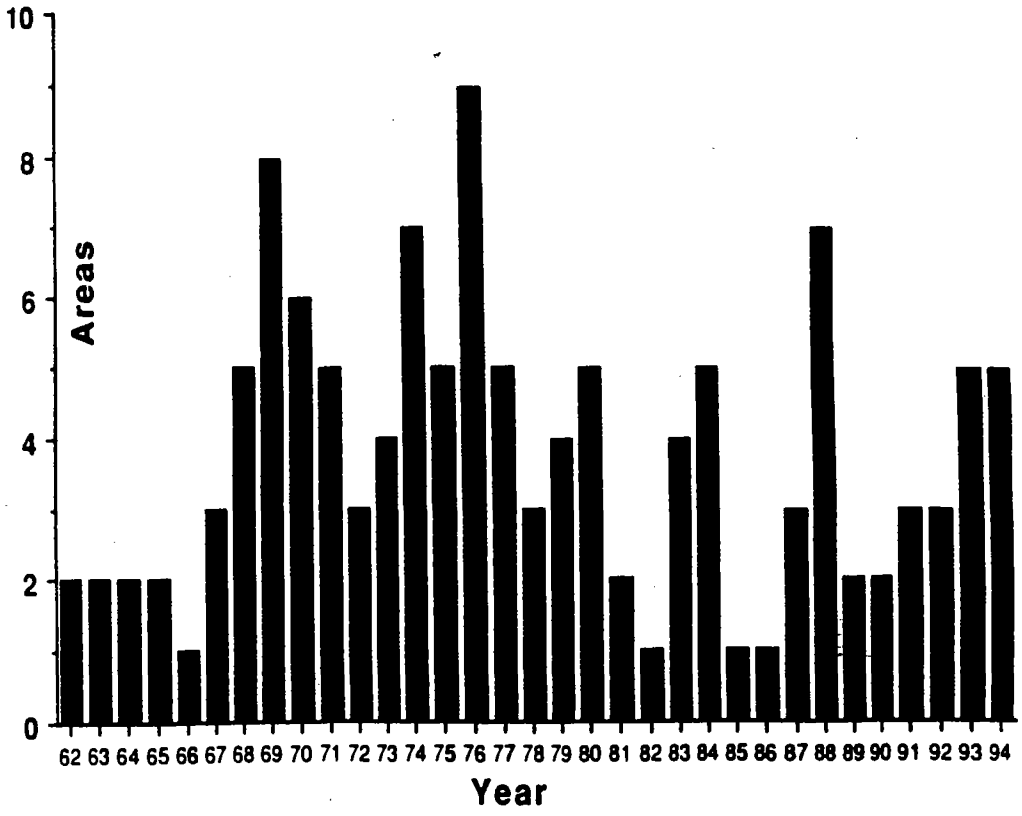

Figure 8. Number of areas (gulf shrimp statistical grids) fished in the U.S. Gulf of Mexico, 1962 to 1994 (to date).

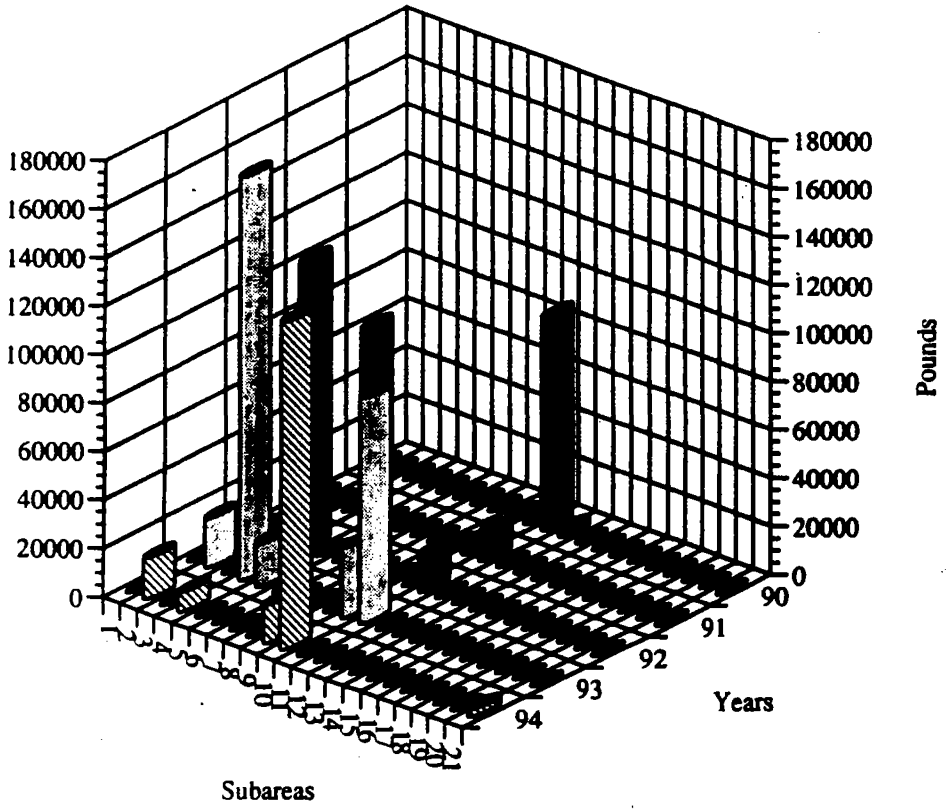

Figure 9. Landings (pounds, heads-off) of royal red shrimp caught in statistical grids of the U.S. Gulf of Mexico, 1990 to 1994 (to date).

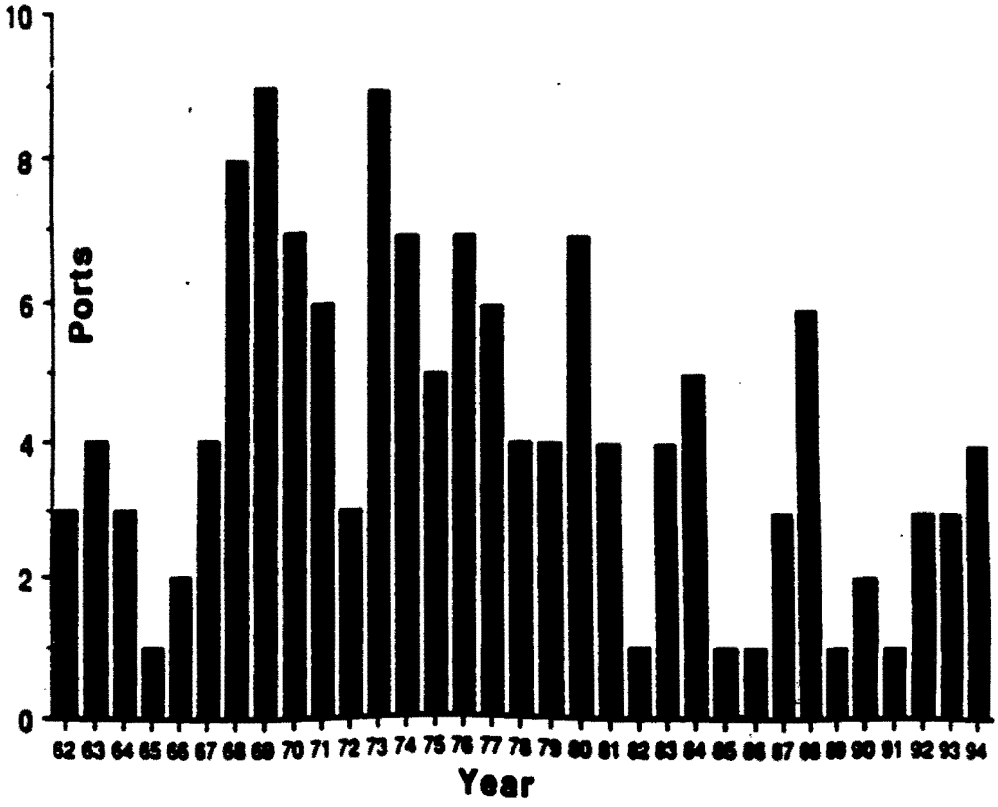

Figure 10. Number of fishing ports in the U.S. Gulf of Mexico at which royal red shrimp were landed, 1962 to 1994 (to date).