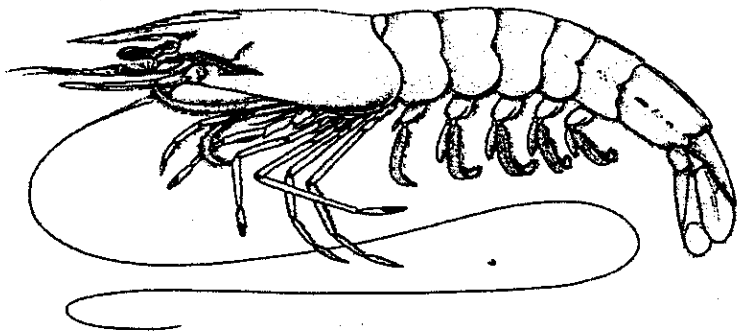
Select Council on Shrimp Management

Final Report



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Foreword

Louisiana's saltwater shrimp resources provide an estimated 12,710 full time job equivalents and an estimated economic benefit to Louisiana's economy of over one billion dollars ($1,000,000,000) annually. Louisiana has traditionally managed this resource as an open access fishery, providing easy entry into the fishery. As is typical of this type of management, the fishing fleet is larger than necessary to harvest the resource, resulting in economic inefficiencies. The majority of these harvesters fish part-time, requiring other jobs to earn the rest of their living.

Opportunities exist to modify the manner in which the saltwater shrimp resources are managed. Steps can be taken to "professionalize" the fishery, i.e. reduce number of harvesters. The mean size of shrimp harvested can be increased in an attempt to increase the profit margins of the harvester. Other actions can insure the perpetuation of the renewable resource, reduce conflicts with other user groups, and otherwise provide for the continuation of an industry deeply rooted in the culture and economics of the state.

As called for by Senate Concurrent Resolution 11 of the 1997 Louisiana Legislative Session, this report seeks to provide a structured outline for the consideration of such actions by the Industry Review Panel and the Legislature. By consensus, 19 individuals, with professional expertise but no financial interest in harvesting the resource present rational options for changing the manner in which Louisiana manages its shrimp resources. It remains up to the Industry Review Panel and the Legislature to decide if such changes are desirable.

*Shrimp on cover courtesy of National Marine Fisheries Service.

Overview

The Select Council on Shrimp Management was created by Senate Concurrent Resolution 11, 1997 (Appendix A) to "study the current and future management of Louisiana's shrimp resources and to make recommendations for future management objectives". The Council, composed of 19 professionals representing a number of disciplines, met on 8 occasions from the Fall of 1997 through the Summer of 1998. Notice of meetings and agendas were published so opportunity for public comment was ensured. Each Council member was provided with a copy of the document titled "1992 Fisheries Management Plan for Louisiana's Penaeid Shrimp Fishery" and a review of the current procedures used by the Department for setting annual shrimp seasons. Subcommittees formed for various tasks held additional meetings and reported their findings to the Council for consideration.

The Select Council found that deterioration of the coastal wetlands poses a grave threat to the long-term health of the shrimp resources of Louisiana. The current harvest strategy emphasizes employment opportunity at the expense of pounds and dollars. Changes in technology have led to an increase in harvesting activity in shallow water estuaries. Imports have depressed domestic prices over the last 20 years. At the same time, the cost of shrimping (insurance, boat repairs, etc) continues to escalate.

The objectives outlined in the "1992 Fisheries Management Plan for Louisiana's Penaeid Shrimp Fishery" by Louisiana Department of Wildlife and Fisheries were used as a starting point for discussion. These were modified, by consensus, to the present form then prioritized as "potential operational management objectives". The Select Council identified the highest ranking objectives as: enhancing economic benefits to the citizens of Louisiana; restoring, enhancing, maintaining and protecting habitat; and the perpetuating and enhancing of the harvestable portions/component of the shrimp stocks. Methods to achieve these objectives, hereafter referred to as "Opportunities and Approaches for Balancing Multiple Objectives", are presented in this report.

While all aspects of shrimp management were discussed, several major topics were identified as priorities.

Suitable habitat is essential for a viable shrimp resource and fishery. Every day Louisiana loses critical vegetated wetlands that serve as nursery areas for penaeid shrimp. Habitat protection is critical to sustainable shrimp harvest.

The Council concluded that increasing the size of shrimp harvested would enhance economic benefits. Protecting nursery areas is one tool for increasing the average size of shrimp harvested as well as reducing interaction with non-target species (bycatch) and reducing disturbance of estuarine habitat associated with bottom fishing gear. Other advantages identified are a reduction of conflicts between shrimpers and other fishing groups within these areas. Deferring opening dates can also increase the size of shrimp harvested. Displacement of certain user groups such as those using various boat sizes or gear types may occur,. The offshore waters, with some minor exceptions,

typically remain open year-round. Large quantities of small white shrimp are harvested during this period. Closures of these areas would protect the smaller shrimp from harvest and potentially allow for their harvest at a larger size.

Establishment of a licensing moratorium, and a permanent limit on the total number of licenses (Limited Entry) was identified as a method of consolidating economic benefits and increasing economic efficiency.

The dockside prices paid for shrimp in Louisiana, after adjustment for inflation, have declined over the last 20 years. Competition from increasing imports are seen as a major contributing factor. Development of a "Mark of Quality Seal" program where consumers are willing to pay more for Louisiana shrimp because of better quality is suggested as a management possibility.

It is suggested that a "leadership training program" may be modeled after the LSU Agricultural Leadership Development Program.

Changing the shrimp season closure criteria was also explored. This concept involves closing "sub-zones" to protect smaller shrimp in these areas while allowing other areas within the larger zones to remain open.

More refined areal management involves redefining the present three zones and opening of larger bays to shrimping first, followed by opening of interior marsh habitat. This option is similar to the "protected nursery area" option except that these areas would eventually be opened, but on a delayed basis.

Management decisions are based on fisheries independent and dependent data. Providing the best data to management entities should lead to better decisions and a healthier fishery. Trip tickets are strongly endorsed, as is better collection of biological data, especially in the Territorial Sea.
While all aspects of shrimp management were discussed, several major topics were identified as priorities.

FINDINGS

- Reduced shrimp resource yields are expected in the future because of marsh habitat loss.

- The current Louisiana harvest strategy for shrimp does not seek to maximize yield in pounds or dockside value. Pounds and dollars produced from the fishery can be increased by harvesting shrimp at a somewhat larger size.

- Changes in harvesting technology have increased shrimping activity in shallow water nursery areas and have resulted in the increased harvest of smaller, less valuable shrimp.

- Dockside prices paid to shrimp harvesters have failed to keep pace with inflation since 1980, contributing to a severe cost/price squeeze.

- Benefits of increased revenue to shrimp harvesters created by management changes will be offset by new entrants into the fishery unless the number of participants is controlled.

- The Louisiana commercial shrimp fishery has in recent history been overcapitalized (more fishing effort than necessary for production). The fact that the number of resident commercial shrimp gear licenses issued has declined by 47 % from 1989 to 1997 with no parallel decline in landings indicates over capitalization.

- Shrimp imports have increased three-fold in 25 years and an increasing share of imports are arriving into the United States pre-processed.

- The shrimp industry harvesting sector is extremely diverse, landing a wide variety of sizes of shrimp from many gear types and habitats. Changes from the current harvest strategy will likely redistribute the opportunity to harvest shrimp among the participants.

- Louisiana shrimp harvesters are typically individual vessel owner/operators rather than part of multi-vessel fleets. They are highly independent and few belong to trade associations, thus resulting in a low level of organizational leadership.

- At current rates of harvest, the shrimp resource is not recruitment overfished. Changes in harvest rates, especially coupled with deterioration of coastal wetlands may, however, affect recruitment.

- Shrimp harvesting is a long-term occupation. The average captain of a vessel 35 feet long and longer has over 21 years of shrimping experience. Almost 27% have more than 35 years and less than 5% have 5 or fewer years of experience.

- In spite of preferences for domestic Louisiana shrimp within segments of the food service (restaurant) industry, most shrimp are marketed in the United States as an undifferentiated product or commodity with low levels of brand or source identity.

- Commercial shrimping as an occupation is an important social, cultural and economic activity. The majority (73%) of shrimpers using vessels 35 feet long and longer describe themselves as full-time shrimpers. Of the shrimpers with alternate employment, 32% also participated in another type of commercial fishing.

- The increased presence of oil and gas activities and recreational users in the coastal area have altered the social, cultural, and economic role of the shrimp industry.

- According to a 1992 survey of commercial shrimp harvesters, shrimpers are generally satisfied with shrimping as a way of life and occupation, but have a gloomy view of the future. Less than 25% would encourage their children to become shrimpers.

- From 1989 to 1997 there has been more attrition in Louisiana in the smaller vessel size classes relative to larger vessel sizes classes: under 19 ft, decreased by 61 %; 19-24 ft, decreased by 57%; 25-30 ft, decreased by 55%; 31-50 ft, decreased by 47%: 51-65 ft, decreased by 38%; over 65 ft, decreased by 33%.

Objectives for the Management of the Shrimp Fishery

When pursuing multiple objectives, individual objectives may often be in conflict with each other. The enabling Resolution recognized this and called for exploring opportunities to balance conflicting objectives. The Select Council on Shrimp Management used as a starting point the objectives outlined in the 1992 document entitled "A Fisheries Management Plan for Louisiana's Penaeid Shrimp Fishery." After a review and discussion of those objectives, the Select Council developed the refined new objectives as follows, in order of importance (see Table 1):

1) Enhance Economic Benefits to Citizens of Louisiana

Shrimping has been a part of Louisiana's economy and social fabric for over one hundred years. In 1996, over 12,000 full time job equivalents were associated with the shrimping industry. Non-commercial take, for both fishing bait and home consumption, has been an activity enjoyed by thousands; in 1996, over four thousand recreational trawling licenses were sold. Together, these activities support an infrastructure of net makers, mechanics, shipyards, etc. Besides employment opportunities, the state benefits directly through the collection of severance, income and sales taxes. The total overall economic impact to the state in 1996 is estimated at over one billion dollars.

2) Restore/Enhance/Maintain & Protect Habitat

Penaeid shrimp require estuaries to survive and thrive. As Louisiana's wetlands disappear, so will their capacity to maintain present level of shrimp production. Louisiana's shrimp species composition has changed radically since the 1930's when ninety five percent of the harvest was white shrimp. By the late 1940's, white shrimp still made up over seventy percent of Louisiana's shrimp landings. During the 1990's, white shrimp generally were less than fifty percent of the harvest, being partially replaced by the more brackish brown shrimp. Many scientists attribute environmental changes for this decline in white shrimp stocks. Some areas are under marsh management practices that restrict ingress/egress of shrimp. Restoration and marsh management efforts should be balanced to consider long and short-term needs of these organisms.

3) Perpetuate & Enhance the Harvestable Portion/Component of Shrimp Stocks

Given the availability of suitable habitat, penaeid shrimp, like Louisiana's other living natural resources are self sustaining under proper stewardship. Louisiana's estuarine and marine shrimp are part of a larger Gulf of Mexico stock. Stock assessments have been conducted on all the major species, and none have been found

to be in danger of collapse through recruitment overfishing at present harvest levels. Habitat degradation, particularly in the estuarine wetlands where shrimp spend most of their juvenile life, is widely believed to be the gravest threat to Louisiana shrimp stocks and may, in time, decrease the harvestable portion of this fishery.

4) *Minimize Adverse Impacts of Harvest on Habitat and Other Living Marine Resources*

Bycatch of non-targeted fish, shellfish, reptiles and mammals has received considerable attention. For example, gear modifications (Turtle Excluder Devices and Bycatch Reduction Devices) are now mandated by National Marine Fisheries Service in an attempt to reduce impacts by the shrimp industry on selected species. While little information exists on the impact of bottom fishing gear on habitat, there is no question that there is an effect. Some influencing factors probably include bottom type, gear, and time of year.

5) *Enhance Social & Economic Contribution to Coastal Communities*

The availability of seafood contributed heavily in the establishment of many of Louisiana's coastal communities. These communities, New Orleans included, have depended on these resources for subsistence and added income for centuries. The fishing boat is the most valuable possession of many families. Community festivals and celebrations revolve around the abundance of these resources. These links have made seafood, particularly shrimp, a major part of the social and economic fabric of the coastal region. Opportunities to derive more monetary benefit from the shrimp industry will benefit these communities.

6) *Reduce Waste of the Resource*

Most harvesting activities involve some degree of waste. Waste of the Louisiana shrimp resource involves the following concepts; a) discarding practices, b) unobserved shrimp mortalities associated with fishing activities, c) reduction in potential yield created by harvest at sub-legal and unmarketable sizes and d) waste created by under-exploitation of the resource. Methods suggested to avoid waste include closing areas known to harbor smaller shrimp, increasing mesh sizes and prohibiting the use of salt boxes to separate the catch. Methods such as these may also lessen "waste " of other organisms. While some waste is unavoidable, methods to reduce it as much as possible will benefit the industry.

7) *Maintain/Expand & Enhance Quality of Data*

Managers use a wide array of data resources when recommending actions to manage fisheries. Initial season opening and closing recommendations from the LDWF to the Commission are primarily based on fisheries independent sampling comparisons to baseline data obtained from years past, and hydrological data. The Commission in turn balances these recommendations with social and economic factors and various legislative mandates to set the season. Obviously the better the data, the better the ultimate decision. This document suggests scenarios involving closure of the State's Territorial Waters at different times. Our knowledge of shrimp population dynamics in Territorial Waters is not as comprehensive as what we know about the inside waters. To properly manage these waters to optimize shrimp harvest and not be overly restrictive (reduce shrimp harvest) our knowledge of these waters must expand. Landings data are critical when assessing the success of management as well as better determining the effects of natural disasters on our resources and harvesting sector.

Table 1. Prioritized Objectives Adopted by Select Council

No.	Objective	Total
1	Enhance Economic Benefits to Citizens of Louisiana	35
2	Restore/Enhance/Maintain & Protect Habitat	36
3	Perpetuate & Enhance the Harvestable Portion/Component of Shrimp Stocks	41
4	Minimize Adverse Impacts of Harvest on Habitat and Other Living Marine Resources	56
5	Enhance Social & Economic Contribution to Coastal Communities	64
6	Reduce Waste of the Resource	64
7	Maintain/Expand & Enhance Quality of Data	72

Each Council Member ranked Objectives in order of importance (1-7), with 1 being the most important and 7 being the least important. Rankings were combined for an overall total.

Opportunities for Changes in Management

Introduction

Once the Select Council on Shrimp Management developed the preceding objectives, they explored a number of possible opportunities to enhance the fishery while balancing these multiple objectives. A total of twenty-one possible opportunities emerged from this process.

After careful consideration and discussion, the Council selected ten of these twenty-one opportunities for further development under its charge. These ten opportunities are listed in Table 2 and discussed in the following text.

The remaining opportunities were considered by the Council to be potentially meritorious but not of highest priority or were being addressed through other channels. These opportunities, listed in Table 3, were not further explored by the Council.

Table 2. ***Opportunities for enhancing the Louisiana Shrimp Fishery which are further developed in this document.***

#	Opportunity	Link to Objectives	Ranking	Total[1]
1	Protected Nursery Areas: A-Habitat B-Organisms	1, 2, 3, 4, 5 6	11 H 2 M	15
2	Deferred Seasonal Openings (Opening Criteria Change?)	1, 3	8 H 5 M	18
3	Limited Entry (Control # of Participants) (Moratorium)	1, 3, 5	9 H 3 M 1 L	18
4	More Refined Area Management	1, 3, 4, 6	9 H 2 M 2 L	19
5	Change Season Closure Criteria	1, 3, 6	7 H 6 M	19
6	Leadership Development Program	5	8 H 4 M 1 L	19
7	Data Collection Actions	3, 5, 7	7 H 6 M	19
8	Territorial Sea Closure (Winter)	1, 3, 4, 5	8 H 3 M 2 L	20
9	Habitat Conservation Actions	2, 3, 5	7 H 5 M 1 L	20
10	Mark of Quality Seal Initiative (Program)	1	6 H 6 M 1 L	21

[1] Rankings: High=1, Medium=2, Low=3
Ratings are total of votes on each item.

Table 3. ***Opportunities for enhancing the Louisiana Shrimp Fishery which the Select Council on Shrimp Management considered as being developed elsewhere or as being meritorious for future consideration but not of highest priority.***

#	Opportunity	Link to Objectives	Ranking	Total[1]
11	Minimum Count Size - White Shrimp: A-Change to Larger than 100/lb B-Extend 100 ct throughout the season	1,3, 6	3 H 7 M 3 L	26
12	Use of Special Seasons	1,3, 6	3 H 7 M 3 L	26
13	Direct Appropriations for Research on Shrimp Harvest Methods: Impact/Habitat/Target/Non-Target	5, 7	3 H 5 M 5 L	28
14	Marketing Uniqueness of Louisiana Shrimp (Taste?)	1	2 H 6 M 5 L	29
15	Gear Prohibitions or Restrictions	2, 5, 6	8 M 5 L	31
16	Prohibit Salt Boxes	4, 6	2 H 3 M 8 L	32
17	Increase Mesh Size	1, 4, 6	6 M 7 L	33
18	Night Fishing Restrictions	1, 3, 4	6 M 7 L	33
19	Off Season Employment Alternatives	5	1 M 12 L	38
20	Address Viral Risks	4	1 M 12 L	38
21	User Group Conflicts	2	13 L	39

[1] Rankings: High=1, Medium=2, Low=3
Ratings are total of votes on each item.

Opportunity 1 - Protect Nursery Areas

Link to Objectives

Objectives 1, 3, 4, 5, and 6 can be pursued by establishing protected nursery areas.

Description

Closed nursery areas are used by many coastal states to manage penaeid shrimp. Currently over 286,000 acres are permanently closed to trawling in Louisiana. Expansion of this concept to include additional areas would accomplish multiple objectives. The primary nursery grounds for juvenile penaeid shrimp were delineated by White and Boudreaux (1977). Acceptance of all or part of proposed areas as shown on the maps developed by White and Boudreaux (1977), Savoie (1993) or Select Council (1998) provide a useful starting point for creating additional closed nursery areas.

Rationale

Since 1960 there has been evidence of a decrease in the size of the shrimp landed in Louisiana as well as other Gulf coast states. It is generally accepted that this has been the result of increased fishing pressure on juvenile shrimp. A number of factors have contributed to this.

A major component in the increased harvest of small shrimp is probably the introduction of the shallow draft skimmer-rig fishery. Other factors include: 1)inshore double-rig trawling; 2)more efficient electronics, engines and gear; 3) competition for space as total numbers of boats has increased; 4) increase in the recreational shrimping fleet which has traditionally fished the shallow marshes, and 5) erosion of interior marshes has resulted in more accessability to nursery areas where smaller shrimp are more prevalent.

"Protected Areas", "Sanctuaries" and "Marine Reserves" currently exist in most coastal states including Louisiana. The use of closed areas is one method of reducing fishing pressure on small juvenile shrimp, protecting habitat and reducing waste. Small juvenile shrimp primarily occupy shallow marsh areas and move to the more open, deeper lakes, bays and Gulf waters as they grow to larger sizes. These measures would also likely decrease the interaction of shrimp harvesting activity with some non-target estuarine species which also use shallow marsh areas and reduce disturbance associated with bottom fishing gear.

This reduction of small juvenile shrimp harvest is expected to increase overall size at harvest and ex-vessel value. While there are economic benefits, there are no indications at this time that such a measure would significantly increase overall shrimp numbers. Present growth overfishing has resulted in a decrease in landings of larger, more valuable shrimp.

Anticipated Outcome

Eliminating fishing pressure in nursery areas to allow juvenile shrimp to grow without interference would reduce the taking of small shrimp, thus providing opportunity for these shrimp to grow and move into the larger lakes and bays (staging areas)and provide for the harvest of larger shrimp which would increase overall dockside value. This action would also likely reduce the taking and discard of juvenile finfish and crabs in these areas, reducing potential user group conflicts with crabbers, and recreational fishers. This would also reduce potential disturbance to the habitat in these areas caused by vessel traffic and fishing gear.

Conversely, this action may limit opportunities for small vessel operators and displace a segment of the shrimping industry which has traditionally fished the shallow marsh areas. Also, this action may concentrate more vessels in those areas open to harvest. Increased fishing effort in open areas may increase interaction problems between shrimpers and other fishers in these open areas. Establishing enforceable boundaries for protected areas would be difficult.

Opportunity 2 - Defer Season Openings

Link to Objectives

Objectives 1 and 6 can be pursued by delaying the opening dates of both the brown and white inshore shrimp seasons. Delayed season openings provide the potential to increase the pounds and value of shrimp harvested by catching larger sizes of shrimp.

Brown Shrimp

Description

The current seasonal opening of brown shrimp is based upon projected count size (50% = 100 count/lb or larger). The proposed measure would delay the seasonal opening by 1) increasing the percentage of the stock expected to reach the opening requirement from 50% to a larger percentage and/or 2) by increasing the size criteria from 100 count/lb brown shrimp to, perhaps, 90 or 80 count/lb brown shrimp.

Rationale

The best scientific information on growth and mortality of brown shrimp indicates that they are currently harvested at sizes smaller than those which would bring in the most pounds and dollars to the fishery. Increases in pounds landed and the dollar value of landings are expected if the traditional seasonal openings are delayed until shrimp have reached a larger size.

At current levels of fishing mortality, increases in pounds harvested and dollar value of the harvest are predicted for a wide range of brown shrimp sizes that are larger than 100 count/lb. The potential level of this increase varies, depending on the level of natural mortality (the rate at which shrimp die due to natural causes). While the exact rate of natural mortality is not known, a range of values is accepted. At the highest accepted rate of natural mortality the maximum expected poundage increase is 11%, while at the lowest accepted rate it is 29%. These maximum benefits can only be attained if the fishery is opened when shrimp sizes range from 70 to 30 count/lb.

While these counts may be too large for the majority of the Louisiana harvest, they do tell us that benefits will be gained in pounds and dollars by delaying the seasonal opening of the fishery until a larger than 50% percentage of the harvest is expected to be 100 count/lb, and/or increasing the count criteria from 100 count/lb to 90 or 80 count/lb.

Anticipated Outcome

Any reasonable delay in the opening date of the brown shrimp season is expected to increase yield in pounds and the dollar value of harvest if effort levels are held constant.

Because brown shrimp move from the shallow inshore areas to the open inshore bays and ultimately to the Gulf as they grow to larger sizes, the areas of harvest will likely be changed.

Time Element

With the single exception of the May 1999 opening of the brown shrimp season in Zone 2 (which must open by the third Monday date), this action can be accomplished by the Commission.

White Shrimp

Description

Delay the opening of the white shrimp fishery to the third Monday in September for three years. Monitor the stock and fishery during this time to assess the impact on yield and ex-vessel value.

Rationale

The best scientific information on growth and natural mortality of white shrimp indicates they are harvested at sizes smaller than those which would bring the most pounds and dollars to the fishery. Increases in pounds landed and in the dollar value of harvest would occur if the traditional seasonal opening is delayed.

At the current levels of fishing mortality, increases in pounds landed and dollar value of the harvest are expected for delays in seasonal openings which extend beyond the third Monday in August. Delays into the earlier weeks of September provide poundage and dollar benefits at the highest accepted rate of natural mortality. At the midpoint of the accepted rate of natural mortality, increases in pounds landed and dollar value are expected for delays which extend into October. At the lowest accepted rate of natural mortality, increases in pounds landed and dollar value are expected for delays in seasonal openings which extend as late as April.

The potential level of this increase is variable, depending on the level of natural mortality and the extent of the delay. At the highest rate of natural mortality the maximum expected poundage increase is 5%, while at the lowest rate it is 35%. While the fishing season would be shortened, more pounds would be landed and the dollar value of the harvest would be greater.

Anticipated Outcome

Delays of the white shrimp seasonal opening will increase pounds landed and the dollar value of the harvest up until a time where the growth potential of the stock is exceeded by natural mortality. Because white shrimp move from the shallow inshore areas to the more open inshore bays and ultimately to the Gulf as they grow to larger sizes and as they respond to lower water temperatures in the Fall, the areas of harvest will likely change.

Time Element

This action could be implemented by the Commission as early as 1999.

Opportunity 3 - Limit Entry into the Fishery

Link to Objectives

Fishery management increasingly includes procedures to control the number of participants. This occurs in both state and federal waters of the United States and throughout the rest of the world. The purpose of such programs is relatively straightforward; controlling the number of vessels and, indirectly, the overall level of effort in a fishery. To the extent that the long-term level of effort is reduced by controlling the number of participants, fishing mortality may be reduced (Objective 3) and economic benefits to the citizens of Louisiana may be enhanced (Objective 1). A reduction in waste of the resource (Objective 6) may also arise from controlling the number of participants.

Description

Throughout the 1970's, demand for shrimp was strong relative to available supply. This resulted in price increases above inflation for the harvested product and industry profits. Given relatively few obstacles to entry, participation in the harvesting sector expanded, reducing to some extent catch per unit effort among vessels in the fleet and overall industry profits. Due to the high price of shrimp however, overall level of participation remained high even though entry into the fleet resulted in lower long-term industry profits. The price of harvested shrimp has fallen sharply since the early 1980's, however, due to a large increase in world production of shrimp and the subsequent export of much of this product to the U.S. market. The decline in the price of harvested shrimp has resulted in a significant decline in the fleet size since the mid-1980's. Though catch per vessel has likely increased due to the reduction in fleet size, long-term profits are relatively low.

The above discussion implies that, as long as an open access management policy exists, fleet size will respond positively to economic (i.e., increased prices and reduced costs) and environmental (i.e., factors enhancing shrimp abundance) signals that would result in a short-term increase in industry profits. Similarly, negative economic or environmental signals will result in a contraction in profits and a reduction in fleet size. Long-term profits, after either expansion or contraction in fleet size, will be smaller.

Rationale

Controlling the number of participants limits the number of vessels in a fleet and, hopefully, the overall level of effort. To the extent that the long-term level of effort is curtailed, long-term industry profits occur. In the Louisiana shrimp fishery, for example, the number of licenses could be "capped" at the number currently being held with the additional condition that the current holders may not transfer the license to other individuals. If then, say, the harvested price increases, the "cap" will ensure that the economic signal of higher prices does not encourage entry of additional vessels with the exception that inactive licenses may become active. To the extent that the overall level of effort is reduced in the long run, fishing mortality may be reduced, aiding in the achievement of perpetuating the shrimp resource (Objective 3). Finally, to the extent that effort is reduced, there is likely to be a reduction in the capture of resources referred to as bycatch.

The issue of controlling participation in the inshore component of Louisiana's shrimp fishery has been addressed several times dating back to at least the 1970's. St. Amant (no date), for instance, made the recommendation that the "commercial fishing license should be priced to exclude all but the serious commercial fishermen dependent on the stock for a livelihood." In scoping meetings held throughout the coast in the early 1990's to examine sanctuaries, 54% of the fishermen completing the questionnaire indicated that it was their opinion that too many shrimpers were in the fishery while only 27% indicated that the number was about right (16% expressed no opinion). As to the question "Should 'limited entry' be used to manage the number of shrimpers?", approximately 40% responded affirmatively while 47% responded negatively (about 12% had no opinion). However, when asked "Should license fees be increased to manage the number of shrimpers?", 82% of those responding indicated they were opposed to using license fees to control the number of shrimpers. These findings, however, should be tempered by the fact that the question, as stated, was vague in nature in that there was no accompanying discussion regarding details as to what type of limited entry program would be established.

The extent to which the overall level of effort in the Louisiana shrimp fleet will be limited by controlling the number of participants will depend upon whether, and to the extent to which, "capital stuffing", defined as the increase in effective fishing power per vessel, occurs in the fishery after controlling the number of participants. This increased power could be reflected in increased vessel size, horsepower, net size and configuration, etc. While current regulations restricting the number and types of gear that can be employed in the Louisiana inshore shrimp fishery (e.g., the number and size of nets) may lessen the ability of participants to expand fishing power, at least in the short run, empirical evidence suggests that long run capital stuffing may occur even in those fisheries which are heavily regulated.

Anticipated Outcome

Those individuals who wish to participate in the Louisiana shrimp harvesting sector but do not qualify for a license will bear the majority of the burden associated with an access control program, while those that qualify will receive the long-run benefits. Participation by people not initially qualifying, however, can be addressed by the state's policy on transferring licenses.

Time Element

In terms of a time frame associated with a program to manage the number of participants, the following is offered for consideration:

1. The 1999 general session will be the focus of action;
2. Initiate a shrimp gear license moratorium during the year 2000 and 2001 license periods inclusive of notice of intent.
3. To be eligible for a license during this moratorium, one must have held a valid shrimp gear license in two of the last three years (1997,1998, and 1999).
4. The transfer of ownership of licenses during the moratorium shall be prohibited except to spouse, child, or legal guardian or in conjunction with the sale of a licensed vessel.

5. The moratorium bill must include language instructing LDWF to develop a managed access program (MAP), including considering establishment of an income qualifying criteria, for presentation to the 2001 legislative session. The moratorium bill will permit LDWF to develop the MAP via its staff, assembling a committee of staff and other knowledgeable individuals, or by contractor.

Opportunity 4 - Refine the Areal Management Concept

Link to Objectives

Objectives (1) "Enhance economic benefits to citizens of Louisiana" and (6) "Reduce waste of the resource" can be pursued through development of more refined areal management concepts utilizing staggered opening dates within shrimp management zones combined with delayed openings of interior marsh nursery habitats.

Description

Development of a series of staggered inshore season openings would be used based upon recruitment and emigration patterns, average size and variable growth rates of shrimp between estuaries. Openings would be confined to larger coastal bays and lakes and subsequently followed with delayed openings of interior marsh habitats. Possible geographic sub-units for consideration include the following:

- Borgne Unit: Area from the Mississippi state line to the southern shore of the Mississippi River Gulf Outlet (MRGO) bounded by the Gulf Intracoastal Waterway (GIWW) and the inside line of waters of Breton and Chandeleur Sounds as described in the menhaden rule (Title 76:VII.307D).
- Delacroix Unit: Area from the southern shore of the (MRGO) and the eastern shore of South Pass of the Mississippi River bounded by the GIWW and the inside line of waters of Breton and Chandeleur Sounds as described in the menhaden rule (Title 76:VII.307D).
- Breton/Chandeleur Unit: Area of Breton and Chandeleur Sounds as described in the menhaden rule (Title 76:VII.307D).
- Barataria Unit: Area from the eastern shore of South Pass of the Mississippi River to the eastern shore of Bayou Lafourche at Belle Pass.
- Timbalier/Terrebonne Unit: Area from the eastern shore of Bayou Lafourche at Belle Pass to the eastern shore of Bayou Grand Caillou.
- Central Unit: Area from the eastern shore of Bayou Grand Caillou to the western shore of the Atchafalaya River.
- Vermilion Unit: Area from the western shore of the Atchafalaya River to western shore of Freshwater Bayou.
- Calcasieu Unit: Area from the western shore of Freshwater Bayou to the Texas state line.

Delineation of interior marsh habitats may be accomplished utilizing the proposed areas shown on the maps developed by White and Boudreaux (1977), Savoie (1993) and Select Council (1998).

Rationale

The Shrimp Management Zone concept developed in 1975, is currently utilized in establishing staggered zone opening as well as closing dates, when biologically justifiable. Smaller zone concepts which better recognize differences in average size of shrimp between and within estuarine systems should be used. Application of these concepts, resulting in staggered opening and closing dates within smaller units accompanied by delayed openings in primary nursery habitats, would allow for increased economic benefit resulting from inshore harvest of early emigrating shrimp populations while providing increased protection to populations of smaller newly recruited shrimp.

Anticipated Outcome

Utilization of more refined areal management concepts would allow for increased opportunity for the harvest and sale of larger sizes of shrimp. Additionally, reductions in waste of the shrimp resource associated with discarding practices, unobserved mortalities and harvest of small shrimp would be achieved.

However, increased conflicts among fishermen may result if fleet concentrations develop. Inshore fleet components currently operating in interior marsh nursery habitats may experience a net loss of resource availability or have to change fishing patterns created by the delay in season openings in these habitats.

Time Element

The Louisiana Legislature has granted the Louisiana Wildlife and Fisheries Commission authority to regulate seasons in territorial waters, consequently such management measures may be implemented without enacting new legislation. Utilization of the 100 count/lb standard for closure of the inshore white shrimp season would necessitate legislative removal of language in LRS 56:468 exempting white shrimp minimum count size in the period between October 15 and the 3rd Monday in December of each year, which at earliest could occur within the 1999 general legislative session.

Opportunity 5 - Alter Season Closure Criteria

Link to Objectives

Objectives (1) "Enhance economic benefits to citizens of Louisiana" and (6) "Reduce waste of the resource" can be pursued with changes in criteria utilized in establishing inshore seasonal closures.

Description

Changes in criteria utilized in establishing inshore seasonal closures when applied to geographic sub-units within current shrimp management zones would allow for season extensions limited to larger coastal bays and lakes. Inshore harvest of the shrimp resource would be allowed to continue until that time management closing criteria is specifically met in those waters. Possible geographic sub-units for consideration include the following:

- Borgne Unit: Area from the Mississippi state line to the southern shore of the Mississippi River Gulf Outlet (MRGO) bounded by the Gulf Intracoastal Waterway (GIWW) and the inside line of waters of Breton and Chandeleur Sounds as described in the menhaden rule (Title 76:VII.307D).
- Delacroix Unit: Area from the southern shore of the (MRGO) and the eastern shore of South Pass of the Mississippi River bounded by the GIWW and the inside line of waters of Breton and Chandeleur Sounds as described in the menhaden rule (Title 76:VII.307D).
- Breton/Chandeleur Unit: Breton and Chandeleur Sounds as described in the menhaden rule (Title 76:VII.307D).
- Barataria Unit: Area from the eastern shore of South Pass of the Mississippi River to the eastern shore of Bayou Lafourche at Belle Pass.
- Timbalier/Terrebonne Unit: Area from the eastern shore of Bayou Lafourche at Belle Pass to the eastern shore of Bayou Grand Caillou.
- Central Unit: Area from the eastern shore of Bayou Grand Caillou to the western shore of the Atchafalaya River.
- Vermilion Unit: Area from the western shore of the Atchafalaya River to western shore of Freshwater Bayou.
- Calcasieu Unit: Area from the western shore of Freshwater Bayou to the Texas state line.

Delineation of primary shrimp nursery habitats may be accomplished utilizing the proposed areas shown on the maps developed by White and Boudreaux (1977), Savoie (1993) and Select Council (1998).

Rationale

Current area closure criteria by zone is too broad geographically to provide for maximum benefits. Closure of the spring brown shrimp season in areas delineated as primary white shrimp nursery habitats may be accomplished with modification to current management criteria. Current management practices utilized in establishing closure criteria for the brown shrimp season within each shrimp management zone rely on the percentage (>10%), relative number and general

distribution of juvenile white shrimp taken in LDWF trawl samples. Expansion and application of this criteria to identifiable geographic sub-units within shrimp management zones which experience temporal delays in white shrimp recruitment patterns would result in protection of small developing white shrimp in nursery habitats while providing for continued inshore harvest of larger brown and white shrimp found in lower estuaries.

Utilization of the 100 count/lb legal minimum size criteria for the fall white shrimp season closure would provide increased protection to that segment of the population which traditionally over-winters in both the inshore and territorial waters of Louisiana.

Anticipated Outcome

Seasonal extensions based upon area specific closure criteria and limited to large coastal lakes and bays would allow for increased opportunity for inshore harvest and sale of the shrimp resource. Additionally, reductions in waste of the shrimp resource associated with discarding practices, unobserved mortalities and harvest of small and sub-legal shrimp would be achieved.

Utilization of seasonal extensions may result in some net loss of shrimp resource availability to the offshore fleet component of the fishery. Strictly applied closure criteria may also result in net loss of resource availability to inshore fleet components of the fishery operating in nursery habitats.

Time Element

The Louisiana Legislature has granted the Louisiana Wildlife and Fisheries Commission authority to regulate seasons in state waters, consequently such closures and extensions may be implemented without enacting new legislation. Utilization of the 100 ct/lb standard for closure of the inshore white shrimp season would necessitate legislative removal of language in LRS 56:468 exempting white shrimp minimum count size in the period between October 15 and the 3rd Monday in December of each year, which at earliest could occur within the 1999 general legislative session.

Opportunity 6 - Create a Leadership Development Program

Link to Objectives

The viewpoints of stakeholders can best be incorporated when they flow from effective leadership. Leaders can contribute to the development and achievement of Louisiana's objectives for shrimp resources. These objectives include: enhancing the economic benefits of shrimp harvests, perpetuating the harvestable component of shrimp stocks, and protecting essential habitat.

Description

Louisiana's renewable shrimp resources can be managed to achieve re-evaluated objectives. Leaders must be developed via training in a format specifically dealing with the complexities of the objective. A public interest clearly exists for self improvement of people to: 1) become more knowledgeable about the scientific aspects of management issues, 2) become more effective communicators and 3) learn decision making skills that move stakeholders beyond conflicts to solutions. This matter of leadership development can be initiated by the public sector. There are two approaches: 1) a new specialized program could be developed for fisheries leadership development and training or 2) diversifying an existing program to include fisheries.

The first approach, a newly created fisheries resources leadership program would require designation by a public body of the group/agency charged with initiating the effort. From that point the specifics, eligibility, application process, curricula and costs would be addressed. A review of programs with similar goals is advisable. The Louisiana Agricultural Leadership Development Program and the North Carolina Natural Resources Leadership Institute are examples worthy of review.

From these reviews the second alterative would be evaluated. Rather than replicating an existing program, the feasibility of developing a special session should be evaluated. For example, the established Louisiana Agricultural Leadership Development Program could serve as host of special sessions. A class of individuals associated with utilization of the public's fisheries resources could be selected. A curriculum prepared for the fisheries session would assure focus on factors pertinent to attaining Louisiana's objectives for its renewable fisheries resources. The special session or special class approach must be thoroughly evaluated first.

Rationale

The Select Council on Shrimp Management concluded that attaining Louisiana's management objectives will require an investment for improved science and leadership. It is the overlooked role of consensus building from effective industry leadership that needs attention. The need is for people to stop focusing on their disagreements. Agreements must arise from realization of common interests. When change is necessary, industry leaders can inform others of the basis and associated benefits. This will require that the leadership void be confronted. It will be necessary to develop new leadership with public investment just as investments are commonly made in shrimp research.

The utilization of publicly owned natural resources must satisfy near term needs and sustain future options. Clearly understood objectives for use of a resource must be present to judge the appropriateness of harvest programs and management agency oversight. Harvesters of the resource and others with stewardship interests participate in the formation of resource use objectives. They are also needed to advise on means of achieving objectives. This participatory management is especially important given the varied interests involved in Louisiana's major publically owned renewable resource, shrimp. Shrimp harvesters are not a uniform group as to boat size, gear used, preferred shrimp size at harvest and many other factors. There are also differences by region of the state that can be divisive. Acknowledging interests of shrimp processors and recreational shrimpers heightens the prospect that development of shrimp harvesting policies will be a challenge.

Time Element

A necessary step is direction from the 1999 general session of the legislature. A concurrent resolution from the Louisiana Legislature calling for a review of the special fisheries class as a diversification of the Agricultural Leadership Development Program is proposed.

Opportunity 7 - Maintain /Expand and Enhance the Data Collection Program

Link to Objectives

Opportunity 7 is directly linked to all objectives (1 through 7). To enhance economic benefits to the citizens of Louisiana, enhance social and economic contribution to coastal communities, perpetuate and enhance the harvestable portion/component of shrimp stocks, restore/enhance/maintain and protect habitat, minimize adverse impacts of harvest on habitat and other living marine resources and reduce waste of the resource, data for management purposes must be available.

Description

Expand and enhance the fishery data collection program by increasing the number of collection areas and environmental monitoring stations, incorporating the use of commercial gear, establishing a logbook data collection program, and periodically conducting social and economic studies of the shrimp business/industry system and resource user groups.

Rationale

Louisiana's interests can only be protected, and its shrimp management objectives achieved, with scientifically defensible data collection programs that can reliably demonstrate trends in the fishery. Time series data are necessary to assess the effects of various harvesting techniques, gradual and catastrophic changes in habitat, the success of various management procedures, changes in demand for and utilization of shrimp, and the social and economic well being of those individuals and communities associated with the shrimp fishery.

The LDWF should be the focal point for collection of data. The Department is charged with protecting, conserving and managing the shrimp fishery in such a way that will ensure a sustainable level of shrimp resources for future generations while providing maximum benefits to the citizens of Louisiana including the various consumer and resource user groups. To accomplish this management objective, the Department must not only maintain but expand and enhance its environmental, biological, social and economic data collection programs. Currently environmental, hydrological, climatological, species abundance, size distribution and other biological data are collected within identified Coastal Study Areas using various sampling techniques and gear. It is important to continue to collect, these time series data in order to provide continuity necessary to evaluate existing and alternative shrimp management objectives and to manage the shrimp fishery based on current law.

Incorporating the use of commercial gear into the data collection program will provide actual fishing condition information to evaluate existing and alternative shrimp management objectives better. It will enable the Department to measure the effects of various commercial gears on fishery habitat and by-catch organisms and provide scientific data to evaluate and measure the impact of proposed gear modification and regulations on catch prior to implementation. Part of these data could be collected through cooperative efforts with shrimp fishermen.

Increasing the number of data collection areas and environmental monitoring stations will increase the ability to assess the impact of management decisions and climate/environmental conditions on the fisheries, fishing communities and user groups. Currently, National Marine Fisheries Service (NMFS) port agents collect landings, location fished, gear used and price information through wholesale and retail dealer audits and at dockside interviews (trip intercept program). A state trip ticket program is scheduled to begin on January 1, 1999 that will eventually replace the NMFS collection program. The state program will collect information on vessel number, gear used, general fishing area, species harvested, product form or condition of products sold, quantities sold and purchase price received by fishermen at dockside. It will not collect fishing effort or capture trip cost information necessary to assess the impact of management strategies and achievement of management objectives.

The establishment of a logbook data collection program will enable the Department to track fishing effort and catch by location, identify areas of concentrated shrimp harvest and provide information on fishing patterns and trip costs. Cost information will enable the Department to incorporate economic factors into management decisions, identify high cost items and provide scientists with information to identify research needs.

Periodic collection of social and economic data from shrimp fishermen and their families would provide a basis to estimate the impacts of regulatory decisions on them and coastal communities. Information such as age, income, household size, work experience, family background, financial conditions, perceptions, etc., will provide valuable data to assess impacts of management decisions and determine the best approach to assist individuals and fishing communities affected by management changes.

Periodic collection of social and economic data from the seafood business/industry system would provide information to assess the impact of management decisions on the state's economy. Information on the industry's organizational structure, size, product and marketing diversification, employment, marketing margin, product distribution, etc. will provide information to measure the impact of management decision on the state's economy and maximize benefits to the citizens of Louisiana.

Anticipated Outcome

Expanding and enhancing the data collection program will increase the Department's knowledge of Louisiana's shrimp resources, allow for better planning and management of the fishery, facilitate identification and response to changes in essential habitat and environmental conditions, and improve the ability of the Department to manage the resource. These data will enable the Department to better estimate the impact of management decisions on shrimp fishermen, their families, fishing communities, and the seafood business/industry system. These data will also provide information on how to assist individuals and communities affected by management change, facilitate development of new management alternatives, allow monitoring of economic benefits to the citizens of Louisiana and the social and economic contributions of shrimping to coastal communities. It will also provide opportunities for shrimp fishermen to participate in data collection and management decisions.

Time Element

The Department could implement enhanced data collection procedures as soon as funds became available.

Opportunity 8 - Close the Territorial Sea in Winter/Spring to Shrimping

Link to Objectives

Objectives can be pursued through increased utilization of seasonal closures of portions of Louisiana territorial waters.

Description

Areal closures in Louisiana territorial waters, primarily between the Mississippi River and Freshwater Bayou, where large populations of small white shrimp traditionally over-winter, provide the potential to increase the size of shrimp harvested. Added consideration should be given to implementing extended spring territorial sea closures in areas dominated by large numbers of small brown shrimp.

Rationale

As a result of low water temperatures throughout winter and early spring, growth in small shrimp declines and essentially ceases at temperatures below 10°C (50°F). Most late fall-recruited white shrimp over-winter in near shore Gulf waters and subsequently move into shallow inshore waters as water temperature increases in early spring. Seasonal Territorial Sea closures during portions of winter and spring accompanied by spring openings would result in delayed harvest of significant populations of smaller white shrimp while additionally providing those shrimp increased growth opportunities. Timing of such closures should allow for harvest of seabobs when they are at optimal numbers and provide the most possible protection for small over-wintering white shrimp. An increased segment of this over-wintering population would thus become available for harvest at larger sizes both offshore and, particularly, inshore.

Spring shrimp closures for territorial waters (and possibly the Exclusive Economic Zone) may be put in place prior to the opening of the spring inshore season to provide opportunity for growth of brown shrimp following emigration from estuaries. Currently, levels of fishing pressure are such that brown shrimp are harvested heavily upon leaving inshore waters. Inshore waters are currently closed to provide growth opportunities to brown shrimp; closing territorial waters at the same time would provide for enhanced growth opportunities and increased value.

Spring seasonal opening recommendations within territorial waters would be based upon criteria utilizing the relative number and average size of shrimp available for harvest.

Anticipated Outcome

Seasonal closures of portions of Louisiana territorial waters would allow for greater economic benefit to citizens of Louisiana through increased yield and value resulting from the harvest and sale of larger sizes of shrimp. Additionally, reductions in waste of the shrimp resource associated with discarding practices, unobserved mortalities and harvest of small and sub-legal size shrimp would be achieved.

However, increased utilization of Territorial Sea closures will result in loss of economic benefits from harvest and sale of available shrimp, especially seabobs, if timed wrong. Such closures may result in loss of economic benefit associated with the rates of natural mortality occurring within the unfished population and under-exploitation of the resource. However, natural mortality rates may be relatively low at this time of year.

A Territorial Sea closure to enhance brown shrimp growth would ideally result in a somewhat larger size of brown shrimp at harvest, and therefore increase revenue levels to harvesters. It is anticipated that significant quantities of smaller-than-optimal-size shrimp would still be harvested because of size distribution within the population.

It is likely, however, in years of high production that a concurrent spring opening of inshore and offshore waters would result in brown shrimp harvest levels exceeding processing capacity. This now sometimes occurs in years of high production when the inshore season opens, but the situation may be worsened. Harvest opportunity will also change. Fishermen who are currently harvesting in territorial waters before the inshore season opens and selling these shrimp at usually higher prices will, with a concurrent opening, be competing in a common marketplace with other harvesters.

Time Element

The Louisiana Legislature has granted the Louisiana Wildlife and Fisheries Commission authority to regulate seasons in territorial waters, consequently such management measures may be implemented without enacting new legislation. A complementary closure of federal waters (EEZ) would require amendment to the Gulf of Mexico Fishery Management Council's Shrimp Management Plan.

Opportunity 9 - Conserve Habitat

Link to Objectives:

Habitat Conservation is linked to Objectives 5 and 6 in the Shrimp Management Plan.

Description

Wetland habitats must be monitored to determine their effectiveness as areas of essential shrimp habitat. A properly designed monitoring program should be included as a final step in all wetland restoration research efforts. The monitoring program must include both habitat and organisms to be effective. Many of the current CWPPRA projects have monitoring efforts designed into the projects, however, these monitoring programs are looking only at the habitat and not the organisms involved. Management structures and water levels could be better designed and operated to accomplish both goals, if proper consideration is given to system-wide effects. Basin-wide plans should be based on concepts such as the Ford/Palmisano recommendations with an aim of long-term maintenance of estuarine habitats. All pertinent state and federal agencies should address hypoxia in offshore waters in Louisiana by supporting to the maximum extent possible, restoration of the natural nutrient absorption and distribution capacity of the Mississippi - Atchafalaya delta complex in ways which restore and enhance the shrimp habitat values of the Gulf of Mexico out to the 60 fathom contour off Louisiana. All pertinent state and federal agencies should consider marine and shrimp resources when restoring, creating, or maintaining wetland habitats. The Louisiana Legislature can amend existing statutes and enact new legislation that requires pertinent state agencies to give strong consideration to protecting and enhancing shrimp habitat while performing their respective missions. Specifically, the Louisiana Department of Wildlife and Fisheries, Marine Fisheries Division, should be directed to comment on all Coastal Use Permits, CWPPRA projects, and §404 permits affecting shrimp habitat. The following agencies should be directed to consider avoiding or minimizing adverse affects on shrimp habitat in their respective decision making processes: the Louisiana Department of Environmental Quality - §401 certification and NPDES permitting; the Department of Natural Resources, Coastal Management Division-Coastal Use Permitting and federal consistency determinations; the Department of Natural Resources, Coastal Restoration Division-CWPPRA decisions; and the Department of Health and Hospitals-compliance with the State Sanitary Code. All other state agencies which are found to affect shrimp habitat should be required to give full consideration to protecting such habitat.

The Louisiana Legislature and the Louisiana Congressional Delegation should take steps to ensure that the U.S. Army Corps of Engineers, the Environmental Protection Agency, the National Marine Fisheries Service and the Gulf of Mexico Fisheries Management Council comply fully with the Essential Fish Habitat requirements of the Federal Sustainable Fisheries Act which requires consideration of shrimp habitat.

The regulatory avenues for protecting shrimp habitat listed above are discussed more fully in the next section. There are also many avenues are available to the shrimp industry to provide input into agency actions affecting shrimp habitat. The shrimp industry should monitor agency actions and regularly utilize these input mechanisms.

Rationale

Wetland areas are the single most important nursery habitat available to penaeid shrimp in Louisiana. Research has shown that these wetland nursery habitats not only allow small shrimp access to necessary food resources, but they also create an area that affords cryptic protection from potential predators. Wetland habitat loss, or alteration, through subsidence and erosion, unnatural freshwater/ sediment flow, oil and gas exploration, development and production, and seawater intrusion, have been occurring in Louisiana for many years. Because of the sustained loss in total wetland areas over the past several years, many state and federal programs have been developed and established to restore, create and maintain these important habitats.

Wetland habitats are very complex systems and are a composite of several different regions or areas. These areas include pools, creeks, inner marsh (areas of a marsh surrounded only by marsh) and outer marsh (areas of a marsh adjacent to open water areas). Research has shown that these different areas in a wetland habitat have differential usefulness with regard to nursery habitat for maturing penaeid shrimp. Irregular marsh, a marsh with high levels of surface area at the marsh/open water interface, provides excellent habitat for penaeid shrimp to grow and mature. Man-made wetland habitats can be just as effective as natural wetland habitats if properly engineered and developed. Haphazard creation or restoration of marsh areas will not yield nursery areas where shrimp development can occur in an effective manner.

Proper marsh creation is only the first step in effective wetland development. Many marsh management practices deny access to estuarine animals because these areas are maintained for other purposes. Some traditional nursery grounds (ex. White Lake and Grand Lake) are now primarily freshwater reservoirs for agriculture or duck, alligator, and leases. In many circumstances, marsh management structures are operated by state and/or federal entities using these same guidelines. Sometimes when ingress is allowed, natural egress is denied in favor of water level (for other species) or harvest within the managed area.

The natural winter/spring inundations maintained for centuries our vast, productive wetlands. To say that these mechanisms no longer work, or should be managed for individual whim is to lose sight of the forest for the trees. The industry should embrace projects that ensure long-term sustainability of shrimp production. We seem to accept that the industry must change, but habitat is at its best possible productivity as it exits today.

Waters from the Mississippi - Atchafalaya delta complex once flowed into and through a network of wetland habitats before finally flowing into the Gulf of Mexico. Nutrients and other organic materials were trapped in this complex matrix of wetland habitats where they were utilized by a variety of organisms or stored in the sediments. As the water flow patterns of the Mississippi - Atchafalaya delta complex have been naturally and mechanically altered, less water flow through the marsh has been accomplished, and as a result a more direct route to the Gulf of Mexico has been established through the years. This nutrient enriched water is a major stress in Louisiana coastal ecosystems. Effects from this nutrient enrichment include reduced sunlight, loss of aquatic habitat, a decrease in dissolved oxygen, and impacts on living resources such as shrimp. Generally, excess nutrients lead to eutrophication within a system. As the individuals from the enhanced algal

production die, they sink to the bottom and decay. During the decay process, available oxygen is used and the water may become hypoxic.

There are many point and non-point sources of excessive nutrients in the Mississippi - Atchafalaya delta complex watershed. Research has shown that the transport of these nutrients is a very complex process that is controlled by many factors along the watershed. Scientific investigations have documented an enormous area of the Louisiana continental shelf with depleted oxygen levels (< 2mg/l) beginning in the early spring and ending in the fall. In 1993 the spatial extent of this zone was measured at 18,000 km^2. The zone has remained at about this same size each successive year. Model simulations and research studies have produced considerable evidence that nutrient loading from the Mississippi and Atchafalaya river systems is the dominant factor in creating this hypoxia problem.

If the regulatory agencies focused their full attention on shrimp habitat protection and conservation, significant improvement in shrimp habitat would probably occur. But it is still possible that new statutory and regulatory measures may be needed in the future. The State of Louisiana could bolster both state and federal agencies' resolve to bring their full authority to bear in protecting shrimp habitat by demonstrating a strong commitment to that end. Many of these state and federal agencies could have industry advisory committees to provide input into protection and conservation issues involving habitat restoration efforts.

State agencies in the best position to protect shrimp habitat are the Louisiana Department of Wildlife and Fisheries (DWF), the Coastal Management Division of the Louisiana Department of Natural Resources (CMD/DNR) and the Louisiana Department of Environmental Quality (DEQ). Federal agencies are the U.S. Army Corps of Engineers (Corps), the Environmental Protection Agency (EPA), the National Marine Fisheries Service (NMFS) and the Gulf of Mexico Fishery Management Council (Gulf Council). The DWF has significant authority to influence the State and Local Coastal Resources Management Act's Coastal Use Permitting (CUP) Process by way of a memorandum of understanding between the DWF and CMD/DNR. The DWF also has authority to comment on federal permits affecting fish and wildlife habitat under the Fish and Wildlife Coordination Act (FWCA) which, while not as strong as its CUP commenting authority, can still influence federal decisions. The DEQ has the authority to block Clean Water Act §404 permits issued by the Corps by withholding CWA §401 Water Quality Certification. Fish and wildlife habitat impacts are one factor the DEQ must consider in its §401 certification decisions. The CMD/DNR as the CUP permitting agency has ample authority to consider estuarine habitat impacts and condition permits to eliminate, minimize, or compensate for those impacts. Under the federal consistency provisions the Corps cannot issue a §404 permit over objections by CMD/DNR; this is effectively a veto power.

The federal agencies also have significant regulatory authority to control impacts to Louisiana wetland habitat. The Corps is the primary agency for the §404 permit program. The EPA has veto power over §404 permits when habitat impacts (404 (b) (1) guidelines) are not addressed. The NMFS may influence habitat considerations in §404 permit decisions through its FWCA commenting authority. The Gulf Council and NMFS have been given increased authority to protect fishery habitat through the Essential Fish Habitat provisions of the Federal Sustainable Fisheries Act. The Gulf Council is required to designate essential fish habitat (EFH), comment on federal and state

activities likely to substantially affect the EFH of an anadromous fishery and recommend measures to avoid and mitigate adverse affects on EFH. Federal permitting agencies are required to provide a detailed written response addressing the Council's recommendations.

Anticipated Outcome

The anticipated outcome from the recommendation is to provide habitats that are conducive to maintaining shrimp harvest levels at or above current levels.

Time Element

The shrimp industry needs to take an active role in bring attention to the role habitat plays in shrimp production. Without this effort from industry leaders, habitat conservation in Louisiana will remain at its current level. With this push from industry, the Louisiana Legislature can, in its 1999 session, require all relevant state agencies to implement these actions. The Louisiana Legislature can, in its 1999 session, pass a joint resolution seeking to have the Louisiana Congressional Delegation pass national legislation requiring all relevant federal agencies to implement these actions.

Opportunity 10 - Create a Mark of Quality Seal Initiative

Link to Objectives

This recommendation is linked to the first and fifth objective, which, respectively, are to (1) enhance economic benefits to the citizens of Louisiana and (5) enhance social and economic contribution to coastal communities.

Description

A voluntary quality assurance program should be developed under the direction and leadership of the Louisiana Seafood Promotion and Marketing Board. The aim of the program is to develop a set of good management practices along with a dedicated marketing and advertising program to achieve higher margins for "premium quality" Louisiana shrimp products. Louisiana shrimp harvesters and processors would be eligible for this program. However, not all shrimp harvesters, processors or products would immediately qualify under the program. The overall aim would be to establish a program to differentiate certain shrimp products from the "commodity market" which characterizes much of the current harvest of Louisiana shrimp.

Advertising and marketing this Seal of Quality program would be an integral component of the plan..

Rationale

A market differentiation strategy may produce economic benefits. Shrimp are marketed in the United States as an undifferentiated product or commodity with low levels of brand and source identify in spite of preferences for domestic Louisiana shrimp within segments of the food service (restaurant) industry. By improving the quality, and aggressively differentiating and marketing Louisiana harvest as "premium quality, premium tasting" shrimp, the value of the landings should increase.

Anticipated Outcome

The value of shrimp sold under the Seal of Quality Program would increase. Benefits would derive to both harvesters and processors who participate in the program. Non participating processors and harvesters would have economic incentive to join the program if, indeed, it is successful in increasing the value of shrimp landings marketed under the Seal of Quality Program.

Time Element

The enabling legislation of the Seafood Promotion and Marketing Board already empowers it with certain powers and duties relative to the inspection and regulation of seafood processors. Since the Board currently lacks proper staff and resources to carry out this function, the Seal of Quality Initiative would require an act of the Legislature as well as additional funding for implementation and operation. Sources of additional funds may include an increase and dedication of the shrimp

severance tax, voluntary payments from participating processors/harvesters, or a dedication of general funds from the Legislature. Other funding options may exist and should be examined by the Seafood Promotion and Marketing Board in conjunction with the Legislature and the industry.

Law Enforcement Considerations

The enforcement of regulations designed to generate compliance with fishery laws is unique. The heart or backbone of any regulation designed to protect, enhance, restore or sustain a fishery resource is directly proportional to law enforcement's ability to generate and maintain compliance. The term law enforcement, used broadly, is not merely inclusive of the Division's ability to perform a specific task. Law enforcement is the ability to establish compliance by providing adequate deterrence and creating a conducive atmosphere for compliance. Doing so maximizes the benefit to the resources through adequate management, and ultimately benefitting the users. Enforcement personnel provide multiple missions, with many service variables including officer presence and education. Adequate, concise, and rationalized regulations, along with successful apprehension and adjudication of violators provide this endowment.

Officer presence is one of the most effective aspects of the compliance initiative. However, inadequate officer presence is one of the most urgent situations that exist in Louisiana, especially along the coast. Statistically Louisiana has more coastline than any other state in the continental United States. Louisiana's bountiful habitat is conducive to evasion and one of the most difficult terrains to patrol. Increased numbers of officers and adequate equipment are the most essential elements for the success of any of these opportunities/recommendations or any law or regulation. Without this element other resources suffer and users directly feel any impact of rededicated patrol efforts to an already slender force presence.

Laws and regulations must be effective to work in a positive fashion. They must be clearly developed, easily understood, and unequivocally applied. They must possess language that adequately defines, allows, or prohibits activities to achieve desired results. The regulation should be designed to benefit the stocks biologically, and the citizens sociologically and economically. Clear regulations combined with adequate enforcement presence should equate to compliance, because a law without officer presence offers no deterrence. Laws, when applied in an adjudicatory process. must provide sufficient penalties that do not create a mere cost of doing business philosophy and provide a cost more than just a portion of one night of outlawing opportunity. They must not choke the judicial system. Furthermore, the existence of a good law with adequate penalties does not always guarantee any certainty of sufficient prosecution or adjudication. Officer presence together with all the existing variables provide the most optimum conditions. The failure to adequately supply any variable sets the stage for failure to achieve the desired condition. There are many possible deterrence variables in penalties associated with activities that can exist with officer presence. Penalties should include first offense mandatory monetary fines not requiring jury trials coupled with mandatory suspension from engaging in licensed activities for which the violation occurred, forfeiture of catch and equipment. The severity of penalties must increase upon second and subsequent offenses. Officers and the Department must possess as much power legally available to achieve and carry out its mission and to perform actions necessary when criminal charges are initiated and violators apprehended.

The questions that must be applied to any opportunity, recommendation or law is how important is its success or what level of success is desired. How important are all these efforts by the persons involved, and the ability to protect, enhance, restore and sustain fishery resources to the citizens of

Louisiana and resource users? This question is answered with the amount of emphasis placed on the enforcement needs assessment associated with the proposed opportunity, recommendation or law. The implementation of legislation designed to enhance and formulate new mechanisms to improve fisheries without adequate enforcement needs assessments creates a paper house effect. This effect eliminates possibilities to fully realize potential effects of all biological, social, and economic efforts attempting to better manage the fisheries for present and future prosperity.

Appendix A
Enabling Legislation

ENROLLED

Regular Session, 1997
SENATE CONCURRENT RESOLUTION NO. 11
BY SENATOR ULLO

A CONCURRENT RESOLUTION

To create a Select Council on Shrimp Management and a Shrimp Industry Review Panel to study the current and future management of Louisiana's shrimp resources and to make recommendations for future management objectives.

WHEREAS, the shrimp industry is Louisiana's most valuable commercial fishery with 22,250 shrimp gear licenses issued in 1995 and shrimp production worth $144 million dockside in that same year; and

WHEREAS, strategic and operational shrimp management objective for the benefit of the state of Louisiana have not been reevaluated in over twenty-five years; and

WHEREAS, the national and international shrimp market situation has dramatically changed in those twenty-five years, due primarily to the advent of massive overseas mariculture operations resulting in vastly increased amounts of shrimp being imported; and

WHEREAS, the fishing power of Louisiana's shrimp harvesting sector has increased due to improved gear, more powerful vessels, better electronics and an increased number of harvesters.

THEREFORE, BE IT RESOLVED that the Legislature of Louisiana does hereby create a Select Council on Shrimp Management to identify and define potential objectives for shrimp management in Louisiana, and to explore those opportunities and approaches for multiple objectives so as to provide optimum social and economic benefits to the state.

BE IT FURTHER RESOLVED that the Legislature of Louisiana also hereby creates a Shrimp Industry Review Panel to review the council's recommendations.

BE IT FURTHER RESOLVED that the Select Council on Shrimp Management shall be composed of the following nineteen members:

(1) The assistant secretary of the office of fisheries of the Department of Wildlife and Fisheries, or his designee.

(2) The shellfish program manager of the Department of Wildlife and Fisheries.

(3) Three marine fisheries biologists from the Department of Wildlife and Fisheries, appointed by the secretary.

(4) Three marine advisory agents from the Louisiana Cooperative Extension Service appointed by the director of the extension service.

(5) Two university sociologists appointed by the governor.

(6) Two university marine economists appointed by the governor.

(7) One economist from the Department of Wildlife and Fisheries, appointed by the secretary.

(8) One representative from the Department of Economic Development, appointed by the secretary.

(9) One biologist from the National Marine Fisheries Service, appointed by the service's regional director.

(10) One attorney from the Louisiana Sea Grant Legal program.

(11) One university biologist experienced in shrimp management appointed by the director of the L.S.U. Coastal Fisheries Institute.

(12) The executive director of the Louisiana Seafood Promotion and Marketing Board.

(13) One representative from the enforcement division of the Department of Wildlife and Fisheries.

BE IT FURTHER RESOLVED that the Select Council on Shrimp Management shall develop a written report of its findings and shall submit the report to the Senate and House Natural resources committees and to the Shrimp Industry Review Panel no later than September 1, 1998. This report shall include:

(1) The Select Council's evaluation of the shrimp industry's potential to provide social and economic benefits to the state.

(2) Identified and prioritized potential operational management objectives for the Louisiana shrimp industry.

(3) Opportunities and approaches for balancing multiple objectives so as to optimize the industry's ability to provide social and economic benefits to the state.

(4) Legislative instruments that would implement the objectives prioritized by the Select Council.

BE IT FURTHER RESOLVED that the secretary of the Department of Wildlife and Fisheries, or his designee, shall organize and convene the first meeting of the Select Council no later than September, 1997, and that the assistant secretary of the office of fisheries, or his designee, shall be the chairman.

BE IT FURTHER RESOLVED that the Shrimp Industry Review Panel shall be composed of fifteen members from the Louisiana shrimp harvesting, processing, or marketing sectors, appointed by the governor based upon recommendations from the secretary of the Department of Wildlife and Fisheries, as well as each member of the legislature whose legislative district includes all or part of a coastal parish.

BE IT FURTHER RESOLVED that the secretary of the Department of Wildlife and Fisheries, or his designee, shall organize and convene the first meeting of the Review Panel no later than October 1, 1998.

BE IT FURTHER RESOLVED that the Review Panel shall meet, elect a chairman and hold such meetings as may be necessary to review the Select Council's report and to develop recommendations for legislation.

BE IT FURTHER RESOLVED that the Review Panel shall make a report of its findings to the legislature before the 1999 Regular Session of the Legislature.

BE IT FURTHER RESOLVED that this Resolution shall be transmitted to the governor, the secretary of the Department of Wildlife and Fisheries and to the secretary of the Department of Economic Development.

_____

PRESIDENT OF THE SENATE

_____

SPEAKER OF THE HOUSE OF REPRESENTATIVES

Appendix B
List of Committee Members

John Roussel
Asst. Sec., Office of Fisheries
La. Dept. of Wildlife & Fisheries

Mark Schexnayder
Shellfish Program Manager
La. Dept. of Wildlife & Fisheries

Martin Bourgeois
Marine Fisheries Biologist
La. Dept. of Wildlife & Fisheries

John Burdon
Marine Fisheries Biologist
La. Dept. of Wildlife & Fisheries

Conrad "Pete" Juneau
Marine Fisheries Biologist
La. Dept. of Wildlife & Fisheries

Sandy Corkern
Area Agent (Fisheries)
LSU Cooperative Extension Service

Jerald Horst
Area Agent (Fisheries)
LSU Cooperative Extension Service

Kevin Savoie
Area Agent (Fisheries)
LSU Cooperative Extension Service

Dr. Forrest Deseran
Sociologist
Louisiana State University

Dr. Robert Gramling
Sociologist
University of Southwestern Louisiana

Dr. Walter Keithly
Marine Economist
Louisiana State University

Dr. Kenneth Roberts
Marine Economist
LSU Agricultural Center

David Lavergne
Economist
La. Dept. of Wildlife & Fisheries

Stanley Fulcher
Research & Statistics Asst. Dir.
La. Dept. of Economic Development

Dr. James Nance
Marine Fisheries Biologist
National Marine Fisheries Service

James Wilkins
Attorney
La. Sea Grant Legal

Dr. Richard Condrey
Marine Biologist
Louisiana State University

Karl Turner
Exec. Director, La. Seafood
Promotion & Marketing Board

Lt. Col. Charles Clark
Enforcement Division
La. Dept. of Wildlife & Fisheries

Appendix C
Meeting Dates

Roll Call/Attendance	11/19/97	1/29/98	3/25/98	5/26/98	6/15/98	6/16/98	7/22/98	8/10/98	8/24/98
Marty Bourgeois	X	X	X		X	X	X	X	X
John Burdon	X			X	X	X	X		X
Charlie Clark/ Jeff Mayne	X							 X	X X
Richard Condrey	X	X	X	X	X		X	X	X
Sandy Corkern	X	X	X	X	X	X	X	X	X
Forrest Deseran	X	X					X		
Stan Fulcher/ Jason Stagg	X	 X	X X	X X	X	X	X	X	
Bob Gramling	X	X	X	X			X	X	X
Jerald Horst	X	X	X	X	X	X	X	X	X
Pete Juneau/ Mike Harbison	X		X X	X X	 X	 X	X X	X X	X X
Walter Keithly	X	X	X	X	X	X	X	X	X
David Lavergne	X	X		X			X		X
Jim Nance	X	X	X	X	X	X	X	X	
Ken Roberts	X		X	X	X	X	X	X	X
John Roussel	X	X	X	X	X	X	X	X	X
Kevin Savoie	X	X	X	X	X		X	X	
Mark Schexnayder	X	X	X	X	X	X	X	X	X
Karl Turner	X	X	X		X	X	X	X	X
James Wilkins	X	X	X	X	X	X	X	X	X

Appendix D
Definitions

Economic benefit - a policy which will provide the opportunity to achieve long-term profitability and stability in the shrimp fishery.

Marketing margin - the difference between the price consumers pay for a product and the price received by the fishermen for the raw product.

Seafood business/industry - all the firms that are involved in supplying inputs or services to fishermen or that handle, process, or manufacture seafood and seafood by-products and that distribute, wholesale, or retail these products to the final consumer.

Waste of the Louisiana shrimp resource involves the following concepts; a) discarding practices, b) unobserved shrimp mortalities associated with fishing activities, c) reduction in potential yield created by harvest at sub-legal and unmarketable sizes and d) waste created by under-exploitation of the resource.

Appendix E
Legislative Instruments

To be provided.