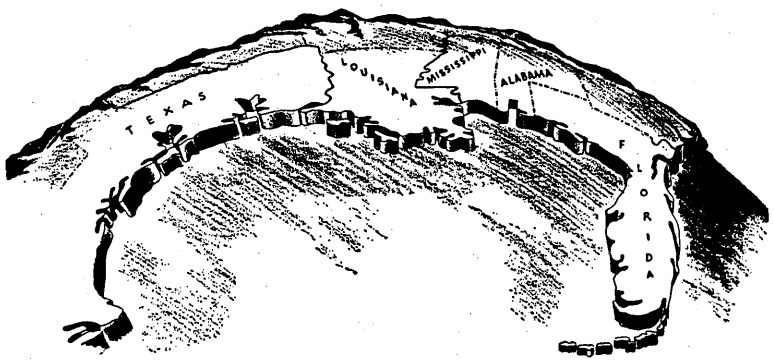
Gulf States Marine Fisheries Commission



RESEARCH PROSPECTUS NO. 1

The

BROWN SHRIMP (*Penaeus aztecus*)
PINK SHRIMP (*Penaeus duorarum*)
WHITE SHRIMP (*Penaeus setiferus*)

Of The

GULF OF MEXICO

April 1961

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GULF STATES MARINE FISHERIES COMMISSION
312 Audubon Building
New Orleans 16, Louisiana

I. Introduction

Since 1910, with the foundation of the Gulf Biologic Station of the State of Louisiana at Cameron, various state and federal agencies, working from North Carolina to the Rio Grande, have studied shrimp. It is only in relatively recent years, about twenty years ago, in fact, that the numbers, kinds and species of shrimp in the Gulf of Mexico and the Caribbean region were properly described and recorded. With the formation of the Gulf States Marine Fisheries Commission in 1949, a medium was established for a coordinated and cooperative state and federal research effort, and the former spasmodic application of studies has been gradually disappearing.

Agencies cooperating with the commission have contributed a good deal toward a better biological understanding of the shrimp fishery over the past several years, but much information is still desired for its proper utilization. Agencies cooperating with the commission in shrimp, as well as other biological studies, include; in addition to the U. S. Fish and Wildlife Service, its compact-designated primary research agency, the Alabama Department of Conservation, the Florida State Board of Conservation, the Louisiana Wild Life and Fisheries Commission, the Mississippi Marine Conservation Commission and the Texas Game and Fish Commission. The Gulf Coast Research Laboratory, the Marine Laboratory, University of Miami, the Institute of Marine Science, University of Texas, the Marine Laboratory, Texas A&M College, and the Biological Department, Tulane University, have also contributed toward a better biological understanding of the shrimp.

II. Biological Notes

The chief commercial fishery is concerned with three species, the pink or spotted shrimp, the brown shrimp, and the white shrimp. These species are distributed in fishery concentrations from Cape Hatteras, North Carolina around the Florida and Gulf Coasts southward to the Bay of Campeche in the southern Gulf of Mexico. The scattered and somewhat spotty research carried on over the years did not yield relatively complete life history data on the shrimp until about eleven years ago. Very briefly, it may be said that the shrimp spawn in offshore waters

of the various coasts at depths ranging from about 12-30 fathoms. These areas are fairly close to the coasts, but nevertheless lie within the region commonly known as the high seas.

All shrimp of the family Penaeidae, the leading commercially important family in the South Atlantic and Gulf, spawn in high salinity waters. These shrimp are all similar in that they hatch as larvae of a very primitive type, which undergoes twelve to fourteen changes or moults as the little animals drift into shallower water. The brown shrimp and the white shrimp apparently must enter the bays, where they grow up in brackish water at lower salinities than that of the offshore region where they were spawned. The white shrimp, apparently, prefers waters of lower salinity than the brown shrimp, and, therefore, the major production of this species is in the coastal waters of Louisiana which are strongly influenced by the mighty outflow of the Mississippi River. The greatest brown shrimp production comes from Texas waters where the salinities are somewhat higher. Relatively few pink shrimp are produced in waters of Louisiana and Texas and in contrast, they are produced abundantly in the highly saline waters of Florida Bay, from which they move offshore to support the outstanding pink shrimp fishery of the Tortugas grounds. Thus, the white and brown shrimp depend upon bay waters of low salinity for their nursery grounds, but low salinity waters are not necessary for the pink shrimp. However, all three species have a corresponding life history in that they are spawned offshore and then come inshore to grow up. It is also known now that all three species of shrimp grow at a very fast rate, probably at a minimum of 1/25 of an inch per day during the warm months, and possibly at twice this rate in some instances. It is further known that these three kinds of shrimp grow up, reach maturity, spawn and that a large majority of them dies at a little more than a year old. A few live on to the age of about three years, but they are negligible in numbers and extent. The offshore limits of shrimp are fairly well known, but the movements of shrimp along the shores and the overlapping of the various populations are as yet almost completely unknown.

III. Production and Value of the Fishery

The shrimp fishery is now and has been for a good many years the most valuable one of the United States. During the

year 1959 landings of shrimp in the Gulf states ports amounted to 193 million pounds. The Gulf and South Atlantic fishery together produced considerably more than 200 million pounds of shrimp. The Gulf of Mexico landings were worth 50 million dollars to the fishermen as a dockside value. However, after the shrimp leave the dock, they go into the channels of trade through the wholesaler, the shipper, the retailer, the restauranteur, and finally the consumer. The total value of shrimp in the Gulf states alone certainly amounts to more than 100 million dollars to the annual economy of the United States. The shrimp fishery is extremely important to our country and in its relationships to our sister nations to the south, where shrimp fisheries also exist.

IV. Additional Research Needed

A. At the present time we know the general outline of the life history of the shrimp and this is all we have upon which to administer the fishery—the most valuable one in North America. This information has been variously and somewhat differently interpreted by the various state authorities with results for good or ill which no one knows. The following statement is a summary of the different laws promulgated by the various states.

APPENDIX A

SHRIMP, *Commercial (bait excluded)*

Variations in Maximum Weight Requirements, and Closed Seasons in the Gulf States:

State	Maximum Per Pound Weight Restriction *With Heads*	*Headless*	*Closed Seasons*
Alabama	50* (White) 68* (Brown)	75* 90	Set by regulation of the Director of Conservation. Usually, closed seasons are from middle of January to middle of March and from middle of June to 2nd Monday in August. Applies to both inside and outside waters.
Florida	45	67	None specified. Director of Conservation is empowered to stop shrimping when it is determined a majority of shrimp being caught exceeds the maximum weight requirement. Applies to both inside and outside waters.
Louisiana	68**	Not Shown	Between December 21 and April 30, both inclusive dates; and between July 1 and the 3rd Monday in August. Applies to waters landward of three miles seaward from the Continental coast line; such waters being classified as inside waters. In Cameron Parish the application is to waters landward from the shore line.
Mississippi	68	Not Shown	Between June 10 and the 2nd Monday in August. Subject to change by ordinance. Applies to both inside and outside waters.
Texas	39 (White) 30 (Brown)	65 50	December 16 to August 14, both inclusive dates; for waters landward from the Gulf shore line; such waters being classified as inside waters. June 1 to July 15, both inclusive dates, for waters seaward from the Gulf shore line and within the state's jurisdiction. Certain powers are vested in the Game and Fish Commission to change the 45 day period by up to 15 days at either end.

* Alabama—Director has authority to decrease but not increase the count.

** Louisiana—There is no weight restriction beginning May 1 and ending June 30. There is no weight restriction on brown shrimp from November 15 to December 20. Weight restriction does not apply to seabobs which may be sold through commercial channels in open season.

weight restriction on brown shrimp from November 15 to December 20. Weight restriction does not apply to seabobs which may be sold through commercial channels in open season.

CLOSED SEASONS (MARKED X)

	ALABAMA (All waters)	FLORIDA	LOUISIANA (Waters landward of 3 mi. seaward from Continental coast line)	MISSISSIPPI (All waters)	TEXAS (Inside water)
Jan.	X (Middle of)		X		X
Feb.	X		X		X
Mar.	X (Middle of)		X		X
Apr.			X		X
May					X
June	X (Middle of)			X (6/10)	X
July	X		X	X	X
Aug.	X (2nd Monday)		X (3rd Monday)	X (2nd Monday)	X (8/14)
Sept.					
Oct.					
Nov.					
Dec.			X (12/21)		X (12/16)

Alabama — Director sets closed seasons. Per pound count is factor. Closed seasons are generally as indicated.

Florida — No specified closed season. Director closes when average count per pound fails to meet weight requirement.

Louisiana — Same closed seasons for Cameron Parish except that the application is to waters landward of the shore line.

Mississippi — Subject to change by ordinance.

Texas — June 1 - July 15, subject to moving up to 15 days at either end. Application is to Gulf waters.

General — All dates shown in the exhibit are inclusive dates.

It is obvious that the above shrimp laws are uncoordinated and are probably, at least in part, ineffectual. We have reached the point where we must understand at least the major parameters affecting the populations of all three species of shrimp before proper utilization of this resource can be had.

B. We do not know enough to properly administer the shrimp fishery because we do not understand what is sometimes called the dynamics of the shrimp populations. It is herewith proposed that the federal government prosecute these studies for the benefit of the fishery, and the following resolutions are included as a proper statement of that fact.

RESOLUTION

WHEREAS, shrimp is now the most valuable aquatic resource of the United States; and

WHEREAS, the shrimp industry and its problems for many years failed to receive attention commensurate with their importance; and

WHEREAS, research on the animals upon which this resource is based have advanced to the point where mathematical analysis is required to bring understanding to its needed stage of development;

NOW, THEREFORE, BE IT RESOLVED that the statistical program of the U. S. Fish and Wildlife Service inaugurated in 1956 be continued and that all possible aid and means be provided to insure the continuance and enhancement of the gathering and tabulation of landings information relating to shrimp; and

BE IT FURTHER RESOLVED that the program of statistical analysis inaugurated in Galveston, Texas, under the able leadership of Dr. George Rounsefell and Dr. Joseph Kutkuhn be given every possible encouragement and support; and

BE IT FURTHER RESOLVED that the U. S. Fish and Wildlife Service whose facilities, manpower and means far exceed those of any individual state, be encouraged and urged to undertake, or sponsor by contractual arrangements in suitable institutions, full-scale tagging and sampling studies to develop statistical evaluation of the most vexatious of the gaps in our present ability to understand our shrimp resources. These investigations should be planned to develop quantitative information on

the mortality of shrimp, not only from natural causes but from fishing effort as well.

BE IT FURTHER RESOLVED that the information requested on population dynamics is considered critical and of utmost importance in the effective management of the leading money producing crop of marine animals of southeastern United States.

* * * * *

The foregoing resolution was adopted by the Gulf States Marine Fisheries Commission, October 21, 1960, at a regular Commission meeting held at the Colonial Inn, St. Petersburg Beach, Florida.

W. D. Gunn, Secretary-Treasurer
Gulf States Marine Fisheries Commission

RESOLUTION

Resolved by the Gulf States Marine Fisheries Commission that there be an expansion of biological research to include the dynamics of the three leading commercial species of the Gulf of Mexico shrimp by the U. S. Fish and Wildlife Service; such studies to include natural mortalities, and desirable times, places and sizes for harvest, in accordance with a proper utilization of the fishery.

* * * * *

The foregoing resolution was adopted by the Gulf States Marine Fisheries Commission, March 17, 1961, at a regular Commission meeting held at the Buena Vista Hotel, Biloxi, Mississippi.

W. D. Gunn, Secretary-Treasurer
Gulf States Marine Fisheries Commission

To expound this matter a bit further, we submit that the following facts must be ascertained with precision: (1) The delimitations of the total range of all species or of the individual populations within these species, (2) Size characteristics of all discrete populations, (3) The rate at which shrimp grow, and (4) The rate at which they die.

In the following sections these matters will be discussed in more detail. First, however, it should be noted that fortunately, the spawning population and its size does not seem to be a limiting factor for shrimp production within any conceivable varia-

tion of the size of shrimp populations. Shrimp eggs and larvae are produced in trillions and possibly even greater numbers, and there always seems to be a great oversupply.

(1) We know that the white shrimp of the South Atlantic apparently does not intermingle or comingle with the shrimp of the northern Gulf of Mexico. Preliminary, doubtful, and uncertain information at present indicates that the population of Tortugas pink shrimp is separated and delimited from that of the pink shrimp up the coast of Florida on either side. The situation with regard to the brown shrimp is probably similar, but it is not understood. Definite data on these points which would describe and delimit the various populations of shrimp should be obtained.

(2) Aside from the delimitation process itself, we should have some knowledge of the amount of shrimp within any given area to which a population is confined. It is obvious that this second point can only follow the determination of the first. It should also be obvious that regulations applied to one population of shrimp may not be equally applicable to a separate and discrete population a few hundred miles away.

(3) Insofar as shrimp are a one year crop and must be utilized very quickly or not at all, the matter of how fast they grow and when the population reaches a peak in total mass or total numbers, available to the fishery, is an extremely important matter. Growth rate and its variance with season, age, and density of population should be rather rigidly determined.

(4) Utilization of the above knowledge will not be practical unless we find out a great deal more concerning the rate of death of shrimp, or to state it another way, their mortality rate and longevity. Mortality takes place in the natural environment more or less continuously. It is influenced by a multitude of factors, many of which are unknown. The most important of these is doubtless predation upon shrimp by other organisms that live in the sea. Shrimp are favorite food not only of man, but of a great many animals. Biologists have stated that shrimp are preyed upon by a vast host of animals that live over, in and on the borders of the sea, ranging from jellyfish to crabs, birds and porpoises. The rates of natural mortality doubtless vary between the estuarine or nursery grounds and the offshore regions. They vary with the sizes and ages of the shrimp in degrees that are totally unknown and which at present can only be surmised

in a broad and unsatisfactory manner. A second type of mortality is caused by man himself, and it is called fishing mortality. At the present we do not know whether man is depleting the stock or underfishing it, which is to say not utilizing it to the fullest extent possible. (We are not proposing that the shrimp fishery is at present depleted, because there is no evidence one way or the other. However, we propose that the facts be ascertained so that depletion can be avoided on the one hand and that the shrimp stock be properly and fully utilized on the other).

V. Conclusion

Methods and processes for these studies are available, but only small scale studies have been made. They concern the tagging of shrimp by dyes and other methods which will yield information as to where and how fast shrimp travel from their nursery grounds, how fast they grow and how fast they die. It is imperative that such studies be initiated upon the three main species of shrimp upon which our present resources depend for the purposes of proper future administration. No one state has the facilities or the resources to study all of these factors, and we appeal to the federal government through its established agencies to undertake this necessary work at the present time to prevent the sad estate into which some of our other major fisheries have fallen.

We believe that these studies will cost in the neighborhood of three to five hundred thousand dollars a year, but that they are not necessarily continuing and the major phases of the work should be finally and forevermore completed within three to five years, if properly prosecuted. After this information is gathered the future variations in the populations of shrimp with variations in the climate, in the hydrographic regimes, as they are delimited by the original study, can be followed by the particular states involved with relatively small expenditures of money that can be met within the resources of said states.

There are a great many phases of shrimp biology which need to be studied, such as their behavior and physiological relationships and the effect upon them of pesticides and other pollutants, especially in the estuarine areas. Thus, it is not our purpose to suggest that all efforts be devoted to population studies, but we feel that this is the outstanding need for better utilization

of the shrimp fishery now. Therefore, it is proposed by the Gulf States Marine Fisheries Commission that the Bureau of Commercial Fisheries of the Fish and Wildlife Service be requested to prepare an outline of such population studies with the requisite budget and that the monies for this work be provided by the federal government and that such work be prosecuted by the Bureau of Commercial Fisheries as soon as it can be planned and carried out.