GULF STATES MARINE FISHERIES COMMISSION

TWELFTH ANNUAL REPORT
1960-1961

To The

CONGRESS OF THE UNITED STATES

And To The

GOVERNORS AND LEGISLATORS

Of

ALABAMA
FLORIDA
LOUISIANA
MISSISSIPPI
TEXAS

ACKNOWLEDGEMENT

In submitting this twelfth annual report the Commissioners wish to express their most sincere gratitude for the splendid co-operation of the members of the Congress and the Governors and Legislators of the compacted States. The Commission fully appreciates that such measure of success as has been attained in the past twelve years could not have been possible without such valued assistance. This acknowledgement is also extended to the directorates and staffs of federal, state and interstate agencies and to representatives of all organizations and individuals who have contributed toward the realization of the objectives of the Gulf States Marine Fisheries Commission.

Respectfully submitted,
L. D. Young, Jr., Chairman
Will G. Caffey, Jr., Vice-Chairman
W. Dudley Gunn, Director

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OF THE

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Presented in compliance with the terms of the Compact and the state enabling acts creating such commission and Public Law 66-81st Congress assenting thereto.

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

IN MEMORIAM

Williams C. Holmes
Commissioner, State of Alabama
1951-1961
Commission Chairman
1957-1958

Percy Viosca, Jr.
Commission Committee to Correlate
Research and Exploratory Data
1953-1961

GULF STATES MARINE FISHERIES COMMISSION

ROSTER — OCTOBER 1961

L. D. Young, Jr.
Chairman

Will G. Caffey, Jr.
Vice-Chairman

W. Dudley Gunn, Director

Emily C. Carr, Office Secretary

* COMMISSIONERS

Alabama

William C. Younger, Director,
Alabama Department of Conservation,
Montgomery, Alabama

Will G. Caffey, Jr., Senator
State of Alabama,
Mobile, Alabama

Max K. Lawrenz, Sr.
Foley, Alabama

Florida

W. Randolph Hodges, Director
Florida State Board of Conservation,
Tallahassee, Florida

Bruce J. Scott, Representative
State of Florida,
North Fort Myers, Florida

Walter O. Sheppard
Fort Myers, Florida

Louisiana

L. D. Young, Jr., Director,
Louisiana Wild Life and Fisheries Commission,
New Orleans, Louisiana

Alvin Dyson, Representative,
State of Louisiana,
Cameron, Louisiana

Sidney A. Bourg, Sr.
Lockport, Louisiana

Mississippi

William G. Simpson, Chairman,
Mississippi Marine Conservation Commission,
Biloxi, Mississippi

Stanford E. Morse, Jr., Senator,
State of Mississippi,
Gulfport, Mississippi

Hermes Gautier,
Pascagoula, Mississippi

Texas

Howard D. Dodgen, Executive Secretary,
Texas Game and Fish Commission,
Austin, Texas

Richard H. Cory, Representative
State of Texas
Victoria, Texas

* Order of listing - Administrator - Legislator -Governor's Appointee

SUCCESSIONS ON THE COMMISSION DURING THE YEAR

Max K. Lawrenz, Sr.	vice	W. C. Holmes
Bruce J. Scott	vice	Walter O. Sheppard
Walter O. Sheppard	vice	Vern Merritt
Sidney A. Bourg, Sr.	vice	James H. Summersgill
Richard H. Cory	vice	Wilson Southwell

COMMISSION OFFICERS ELECTED OCTOBER 20, 1961 FOR YEAR 1961-62

Chairman: L. D. Young, Jr., succeeding Walter O. Sheppard

Vice-Chairman: Will G. Caffey, Jr., succeeding L. D. Young, Jr.

STANDING COMMITTEES

ROSTER — OCTOBER 1961

Committee to Correlate Fishery Laws **(Committee 1)**

Committee To Correlate Research And Exploratory Data **(Committee 2)**

Shellfish Committee **(Committee 3)**

Estuarine Technical Coordinating Committee **(Committee 4)**

Committee Membership

George W. Allen (3-4)
Alabama Department of Conservation
Bayou La Batre, Alabama

Will G. Caffey, Jr. (1)
Senator, State of Alabama
Mobile, Alabama

William J. Demoran (2)
Mississippi Marine Conservation Commission,
Biloxi, Mississippi

Howard H. Eckles (4)
Bureau of Commercial Fisheries,
Washington, D. C.

Theodore B. Ford (4)
Louisiana Wild Life and Fisheries Commission,
New Orleans, Louisiana

Gordon Gunter (3-4)
Gulf Coast Research Laboratory,
Ocean Springs, Mississippi

Walter A. Gresh (4)
Bureau of Sport Fisheries and Wildlife,
Atlanta, Georgia

Robert M. Ingle (2-3-4)
Florida State Board of Conservation,
Tallahassee, Florida

Ellis C. Irwin (1)
Louisiana Wild Life and Fisheries Commission
New Orleans, Louisiana

Joseph C. Jacobs (1)
Assistant Attorney General,
Tallahassee, Florida

Terrance R. Leary (2-3-4)
Texas Game and Fish Commission
Austin, Texas

Jack C. Mallory (2-4)
Alabama Department of Conservation
Bayou La Batre, Alabama

Howard T. Odum (4)
University of Texas Institute of Marine Science,
Port Aransas, Texas

Cleburne A. Schultz (4)
Mississippi Game and Fish Commission,
Jackson, Mississippi

Lyle S. St. Amant (2-3-4)
Louisiana Wild Life and Fisheries Commission,
New Orleans, Louisiana

Paul E. Thompson (4)
Bureau of Sport Fisheries and Wildlife,
Washington, D. C.

Seton H. Thompson (4)
Bureau of Commercial Fisheries,
St. Petersburg Beach, Florida

H. Eugene Wallace (4)
Florida Game and Fresh Water Fish Commission,
Tallahassee, Florida

COMMISSION ACTIVITIES

OCTOBER 1960 - OCTOBER 1961

In view of this being the Twelfth Annual Report of the Gulf States Marine Fisheries Commission, it might be of interest to summarize a bit on the subject of the compact and to mention a few of its cooperative activities.

The Gulf States Marine Fisheries Commission is an interstate compact of the States of Alabama, Florida, Louisiana, Mississippi and Texas. The compact was signed in July of 1949.

Briefly, the purpose of the compact is to promote a proper utilization of the fisheries common to the seaboard of the Gulf coast states, by the development of a joint program for the promotion and protection of these fisheries, and the prevention of their physical waste from any cause.

In signing the compact the several member states did not relinquish any of their rights to regulate their own fisheries. In this connection, the Commission is given the power only to recommend the enactment of fishery laws to the Governors and the legislatures of the party states, and when representatives of the states agree the need exists, to suggest cooperative law enforcement procedures. In furtherance of its liaison activities, the Commission is authorized to consult with and advise the pertinent administrative agencies of the member states regarding fishery management problems.

The Commission is composed of three members from each of the five Gulf States. The head of the salt water fisheries administration of the state is one commissioner. The second is a member of the legislature. The third commissioner is a citizen who is appointed by the governor. The offices of chairman and vice-chairman of the Commission are rotated annually between the states. Regular meetings are held semi-annually, in March and October, and special meetings are called when considered necessary. Regular meetings are rotated from state to state in order that the commissioners may better familiarize themselves with the fisheries of the entire seaboard, and additionally so that executive and legislative branches of the states' government, industry, sportsmen and others can observe and participate in the cooperative effort that is being pursued by the Commission in interest of the fisheries resource.

The Commission receives annual membership dues from

the member states but not in a sufficient aggregate to support fishery research programs. From time to time the Commission suggests research work which might be accomplished at the state or federal levels.

When the Commission was created in 1949, the U. S. Fish and Wildlife Service, which agency is named in the compact as the primary research agency of the Commission, was operating an oyster research laboratory at Pensacola and a temporary laboratory at Sarasota, the latter having been established to investigate the red tide outbreak of 1947. At present, the Service maintains biological research laboratories at Pensacola, Galveston and St. Petersburg Beach. Additionally, the Bureau of Commercial Fisheries maintains a Pascagoula facility for exploratory fishing and gear development and technological research. It was at the Commission's request that the Pensacola laboratory was not deactivated in early 1950, and the other mentioned installations have resulted at least in some measure to the Commission's efforts.

The Gulf States Marine Fisheries Commission met twice during the past year. The regular spring meeting was held at Biloxi, Mississippi, March 16-17 and the annual fall session at New Orleans, Louisiana, October 19-20.

At the Biloxi meeting a resolution was adopted which requests the U. S. Fish and Wildlife Service to expand its Gulf Shrimp Biological Research Program to include the dynamics of the three leading commercial species of Gulf of Mexico shrimp: *Penaeus aztecus,* the brown shrimp; *Penaeus duorarum,* the pink shrimp; and *Penaeus setiferus,* the white shrimp. The resolution also requests that such studies include natural mortalities, and desirable times, places and sizes for harvest, in accordance with a proper utilization of the fishery. In support of requested expansion of the mentioned program, the Commission published a research prospectus for use by a group of Commissioners and scientific advisors which visited at Washington in early May with officials of the U. S. Fish and Wildlife Service, and members of the Congressional Delegations of the Gulf states. The quest for additional funds was prompted by a desire for a full implementation of the program, including the gathering, processing and publishing of associated statistical data. The Commission sought $500,000 for broadening of the program. The Congress appropriated $175,000 of the requested

amount for expenditure during the Federal fiscal year ending June 30, 1962. This amount is being expended in the normally highly productive area extending from the Mississippi River to the Rio Grande River, according to reports from the U. S. Bureau of Commercial Fisheries, with the following work in progress or planned:

1. Systematic sampling of species and size composition on the grounds.
2. Determination of migrations, growth and mortality by means of large-scale marking with vital stains.
3. Collection of data such as temperature, salinity, currents, and larval shrimp movements and abundance so an estimate can be made of the effect on shrimp of natural variations in the environment.
4. Sampling of shrimp landings from the area at the major ports to determine species and size composition, compare sizes landed with sizes actually caught, and determine the accurate species composition of mixed landings.

Additional funds to the extent requested would provide for a proposed expansion of the above work in the eastern Gulf, according to the Bureau, and additionally for:

1. Study of post-larval and juvenile shrimp under controlled conditions to determine what factors guide their movements from the offshore spawning grounds to various types of estuaries (information obtainable from such studies especially useful to a study of shrimp culture for commercial purposes).
2. Year-round systematic survey of the shrimp grounds of the western Gulf lying between 50 and 150 fathoms for information on abudance, distribution and size of shrimp for population biometric considerations in connection with possible offshore populations of a spawning reserve not now being exploited.

At the annual meeting in New Orleans, the Commission requested its five-member Committee To Correlate Research and Exploratory Data, together with a representative of the Bureau of Commercial Fisheries, to form a special committee to examine existing shrimp programs of the Gulf states and the Federal Government in an effort to better coordinate these programs and suggest standardized procedures.

Although considerable emphasis has been placed upon shrimp research at meetings during the year, other major fisheries such as the menhaden, other industrial fishes, oysters, speckled trout and other species have received careful consideration and have been subjects of reports presented at the two regular sessions of the Commission. Other presentations at meetings have included a report on the scope of Bureau of Commercial Fisheries activities for the Gulf area; a progress report on the Bureau's pesticides program; a summary of a recent economic survey of the Alabama seafoods industry; a report on progress of the Commission Estuarine Technical Coordinating Committee in preparation of the estuarine atlas and other activities; reviews of fishery legislation anticipated at the 1961 legislative sessions of the States of Alabama, Florida and Texas; underwater films of shrimp trawls in action; and other subjects. A field trip to Pascagoula in connection with the Biloxi meeting provided an opportunity for the group to visit the Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, including going aboard the research vessels; the Technological Laboratory; and a pet food plant where the Commissioners viewed the species and size composition of landings. The Louisiana Wild Life and Fisheries Commission Museum was visited during the fall meeting at New Orleans.

In addition to the mentioned group trip to Washington, D. C., the officers of the Commission attended a Chicago meeting of Interstate Compact Agencies, which was sponsored by the Council of State Governments. The Commissioners have enlarged the scope of their fisheries information during the year through attendance at meetings of the Wildlife Federation and other groups interested in the sport fisheries resource; in addition to meetings of the several regional and national associations representative of the commercial fishing industry. The Commission continues to stress the importance of liaison with the State and Federal agencies responsible for the salt water fisheries and promotes the exchange of pertinent information through the headquarters office at New Orleans.

The pages which follow the resolution of appreciation to the Congress and the U. S. Fish and Wildlife Service, present in summary certain 1960-61 activities thought to be of general interest, of the Alabama Department of Conservation, the Flor-

ida State Board of Conservation, the Louisiana Wild Life and Fisheries Commission, the Mississippi Marine Conservation Commission, the Texas Game and Fish Commission, the U. S. Bureau of Sport Fisheries and Wildlife, and the U. S. Bureau of Commercial Fisheries.

Continuing the rotation of meetings among the states, the next regular meeting of the Commission will be held at Galveston, Texas, March 15-16, 1962. The Thirteenth Annual Meeting is scheduled for October 18-19, 1962 at Dauphin Island, Alabama.

RESOLUTION

WHEREAS, the Gulf States Marine Fisheries Commission has made repeated requests for improvement in the shrimp statistical reporting program in the member states; and

WHEREAS, the importance of this fully implemented program has been recognized by the Congress of the United States and the Department of the Interior Fish and Wildlife Service in recent appropriations;

NOW, THEREFORE, BE IT RESOLVED: That the Gulf States Marine Fisheries Commission expresses its appreciation to the above agencies for this support in continued implementation of this essential part of the over-all shrimp study program.

* * * *

The foregoing resolution was adopted by the Gulf States Marine Fisheries Commission, October 20, 1961, at a regular Commission meeting held at the Monteleone Hotel, New Orleans, Louisiana.

W. D. GUNN, Director
Gulf States Marine Fisheries Commission

STATE ACTIVITIES

OCTOBER 1960 - OCTOBER 1961

ALABAMA

The research program of the Department of Conservation has continued at the Marine Laboratory at Cedar Point in cooperation with the University of Alabama. New equipment has been added by both the Department and the University and the laboratory staff has been increased.

Plans have been drawn for a modern laboratory and Seafoods Division office to be built on Dauphin Island. This plan has not reached its final stage but hopes are high that these much needed facilities will soon become a reality.

The major efforts of the laboratory's research program have been directed toward increasing oyster production on existing oyster reefs and establishing new reefs by an increased shell planting program. This operation was set back greatly in the spring of 1961 when ten weeks of flood waters and rain killed nearly 80% of Alabama's oysters. Efforts have since been increased to rehabilitate the old reefs and enlarge the new ones.

As of September 1, 1961 when oyster season opened it looked as though there would be almost no commercial size oysters available this year but that recovery of the reefs was progressing very satisfactorily.

FLORIDA

As in past years, the Florida State Board of Conservation, Salt Water Fisheries Division, conducts research through its own facilities in St. Petersburg and Apalachicola and by contract with the University of Miami. All three are under the supervision of the headquarters and director of research of the department in Tallahassee.

Oyster Division
Apalachicola

The decline of northern production centers has been responsible for a new surge of interest in Florida oysters. In order to better handle the increased activity, arrangements were completed for the hiring of an oyster biologist.

During the spring of 1961 approximately 65,000 bushels of shell were planted in Apalachicola Bay.

Marine Laboratory
Bayboro Harbor, Maritime Base
St. Petersburg

Reef Fishes

During the past year fish studies have turned from estuarine to offshore reef problems. Increasing fishing pressures in the inshore areas plus the implacable deleterious effects of a mushrooming urbanization, increase the potential importance of reefs, particularly those of the near-offshore.

Emphasis during the first year has been on the baracuda, a fish of increasing importance to anglers in the extreme southern part of the state. Tagging has indicated that baracuda migrate very little, generally speaking. Most of the fish returned were caught within a very few miles of the place where they were tagged, even though in a few instances they were at large several months.

Other studies, including the tagging of a variety of reef fishes indicated that reef species generally are "stay at homes," being recaptured in traps on the same reef over a period of several months.

Basic Shrimp Biology

Final write-up has been made on several years' observations on the pink spotted shrimp, *Penaeus duorarum* Burkenroad. The manuscript has been consigned to the Board's *Professional Series.*

Summaries are presented therein on the size of shrimp at offshore migration, growth rate, spawning season and food.

It seems likely from the studies reported upon that temperature may play an important role in determining the abundance of year classes because of its role in spawning stimulation.

Taxonomy and Biology of Minor Fish Species

Although not used directly by commercial men and anglers, many of the smaller species of fishes serve as food for the larger species and thus become important items for study. Investigations were continued during the year on the systematics and biology of several of these inconspicuous forms.

Shrimp Parasites

Research continued on the parasites of shrimp. A survey was completed on the intensity of infection in various parts of southeastern United States, the Gulf of Mexico, Caribbean and other tropical and sub-tropical waters. In addition, life history work was done on one of the nematodes found commonly.

Algae and Spermatophytes

Studies continued on the occurrence and abundance of various species of algae.

The basic biology of the spermatophytes having been largely dealt with in work of previous years, attention was focused during the past year of the possibility of establishing beds of *Thalassia* in areas where they do not now exist.

Spots were selected which appeared to be satisfactory and clumps and individuals were planted in submerged bottoms. Some of these prospered and increased.

The principal problem was erosion and future studies should be directed to a solution of that problem.

Red Tide

Samples are taken periodically throughout each year for presence and abundance of *Gymnodinium breve*. Any minor outbreak is inspected by airplane and sampling. Later, the permanent records made will be useful in correlating these dinofagellate blooms with weather and hydrographic conditions. These studies have now been carried out over a period of several years.

Basic Estuarine and Coastal Ecology

Frequent surveys made in connection with proposed construction projects, dredge and fill developments and other manmade changes provide raw data of great value for ecological interpretation. A synthesis has been started whereby ecological data and geographical distribution information is to be compiled by species for all animals and plants encountered. This long-term project is expected to result in several volumes of reference material for Florida's coastal waters.

During the past two years these inspections have been extended to include information relative to the establishment of artificial fishing reefs.

Marine Laboratory
University of Miami
(Contract work)

STATISTICS

Fishery landings of all commercial species are recorded by county. In addition, fish tickets are used widely in the industry on a voluntary basis. These tickets form the basis of yield per unit of effort evaluations.

SPECKLED TROUT

Tagging studies, carried out in the area around Fort Myers have been concluded. Results are presently being analyzed mathematically for conclusion on population dynamics including natural mortality.

FLORIDA BAY ECOLOGY

Much of the data obtained in previous years has been compiled into reports. These include an annotated check list of animals and plants encountered, hydrographic data and shrimp dynamics.

Sampling is continuing with emphasis on indicator organisms.

TRASH FISH CONVERSION

A report has been prepared on an investigation on the break-down of trash fish at sea utilizing natural enzymes catalyzed by the addition of acid.

HURRICANE DONNA

A detailed report has been compiled of the damage wrought by Hurricane Donna of 1960 to the areas of Florida Bay encompassed by its path. This will be of value in interpretating future disasters of a similar nature.

LOUISIANA

The Louisiana Wild Life and Fisheries Commission through its seafood section is gradually expanding its marine research and development program as rapidly as trained personnel become available. The Marine Laboratory at Grand Terre Island is now operating to the full capacity of its personnel and a long range program is rapidly becoming a reality. The principal programs at the present deal with hydrographic studies, shrimp and oysters.

HYDROGRAPHIC STUDIES

Continuous hydrographic studies are being made in the Grand Isle area and over as much of the adjacent coast as pos-

sible. The aim of this work is to estabilsh what may be considered normal or expected environmental conditions as compared to abnormal conditions. This information is then correlated with all phases of work on shrimp and oysters. Results from these studies indicate that 1961 was a most unusual year, both from a standpoint of salinity and the temperature. Salinities were far below normal throughout most of the summer. Water temperatures were above normal in late winter and early spring, and below normal in late spring. These data appear to coincide with the poor shrimp crop of 1961.

Shrimp Studies

Shrimp research in recent years in Louisiana was principally confined to studies of distribution, growth, and population modes. Much of this work dealt with the white shrimp *Penaeus setiferus*. In 1959-60 the program was expanded to do more work on the brown shrimp *Penaeus aztecus,* and the staff at the marine laboratory cooperated in much of this work. All shrimp studies are now assigned to the marine laboratory. The work now being carried out is in its initial phase but includes the following:

1. Attempts to determine the off-shore spawning areas, time of spawning, and factors affecting spawning of both *P. setiferus* and *P. aztecus*.
2. Growth rates distribution, and movements of both species in inside waters.
3. Studies of post larval arrival into the bays including density counts.
4. A staining program of tagging has been carried out in 1960-61 to determine movements from the bays to the open seas. In this work some 50,000 shrimp have been released: 33,000 in 1960, and 20,000 in 1961.
5. Hydrographic and weather data are being correlated with past and present production of shrimp.
6. Histological studies of the reproductive cycle at different ages and at different times of the year are in progress.
7. Controlled effects of temperature and salinity on very small shrimp is contemplated.

Oyster Studies

The research and management of oysters in Louisiana has followed much the same pattern as in past years. In 1960 oyster

production was excellent and a bumper seed year occurred.. In 1961 seed oysters are not as plentiful because of excessive fresh water, and a late spawning season resulting from low water temperatures. Adequate seed for planting is expected and if growth is normal, 1961 production should be successful. Fresh water did greatly reduce the snail *Thais* and eliminate much of its reproduction. *Dermocystidium marinum* is apparently greatly reduced because of fresh water or other causes. The net result should be excellent oyster conditions in 1962.

Studies and development of oysters in Louisiana in 1961 included the following:

1. Forty thousand cubic yards of shell were planted for cultch. This included 25,000 yards of clam shell planted in Black Bay, and 15,000 cubic yards of mud shell planted in the Lake Borgne-Raccoon Island area. Initial sets on the Black Bay shell exceeded 70%.
2. Sister Lake has been maintained on an alternate year harvest plan to maintain a high yield. Under this plan production increased from 15,000 barrels in 1957-58 to nearly 100,000 barrels in 1961.
3. Routine studies of oysters for *D. marinum* indicated a sharp reduction in the occurrence of the fungus after mid-summer of 1960. Extensive studies of summer oysters in 1961 have failed to show much evidence of infection in over 1000 samples. This study is being intensified and all phases of the procedure are being checked to rule out any possibility of error in examination.
4. Observations and studies of the snail *Thais haemastoma* have continued and are principally aimed at making a movie record of its life history, breeding, feeding, and general biology.
5. Studies of oil pollution of oysters and related industrial damage to oyster beds is routine. In 1961 complaints and problems have shown a general reduction except in cases of boat and barge traffic, and dredging and silting.
6. The use of radio-active tracers in studying oil intake by oysters is contemplated in cooperation with the Louisiana State University Biochemistry Department.

MISSISSIPPI

Work continued on the data collected on the fauna of the Louisiana coast off the Grand Isle region during the two previous years by the Gulf Coast Research Laboratory.

Work also continued on the data relating to racial studies, life history and to development of the eggs and gonads of the menhaden. A review of menhaden biology, with special reference to the Gulf menhaden, was published by the Fish and Wildlife Service. A paper on the distribution of the three species of menhaden in the Gulf of Mexico was published in Transactions of the American Fisheries Society. A paper on the cephalic lateral line system of these fishes was published in Copeia.

The Gulf Coast Research Laboratory established its own journal, called Gulf Research Reports, and Vol. I, No. 1 was published. This was a paper describing the distribution with natural history notes on all marine and brackish water mollusks of the State of Mississippi.

The study of the outflow of the Mississippi River was continued for the Office of Naval Research.

Forty-six senior and graduate students took advanced courses in marine geology and marine biology at the Gulf Coast Research Laboratory during the summer session. Twenty-two engineering students took a course in surveying which was especially related to the marine geological program and fifty high school students were given an introduction to the marine sciences with the cooperation of Louisiana State University and the National Sciences Foundation.

Laboratory scientists published papers on the following subjects during the year: pollution problems along the Gulf coast, studies on the proteins and salts in the blood of marine fishes, a new starfish from South America, and several others.

A member of the Laboratory staff has acted as biologist for the Mississippi Marine Conservation Commission and is a member of that body. During the year 196-61 he spent approximately half of his time on the Commission's business, and assisted the Marine Conservation Commission in the following activities:

Oyster Bottom Surveys and Shell and Seed Oyster Planting

During the first part of 1960 a survey of the productive and potentially productive oyster bottoms of the entire Mississippi Sound and bays was undertaken to ascertain the condition of the existing reefs and bottoms so that future plans for rehabilitating and enlarging of the oyster growing areas could be undertaken and so that a definite plan for the future could be adopted and put into effect.

During the summer of 1961 the Laboratory geologist joined with the Commission biologist and an employee of the U. S. Soil Conservation Service in studying the sedimentation of the bottom of Mississippi Sound by a new method which consists of a probe which gives off gamma rays and a receiving apparatus. It is hoped that the best bottom for oysters can be selected with this new tool.

From June 16-July 22, 1960, 30,000 barrels of fresh oyster shells were planted in the waters of the three coastal counties. The shells were planted on productive and once productive bottoms close to shore. The shells planted on productive bottoms were so placed as to enlarge those areas. Fresh oyster shells were collected at the canneries and were transferred to a 90 x 26 foot barge. The barge was maneuvered by the Commission work boat Uranus over the desired bottom. As the barge was being towed in the planting area, a 4-inch discharge pump was used to jet the shells overboard so as to distribute the shells evenly over the bottom. Thus far preliminary findings concerning the 1960 shell plantings look promising considering the late start that the Commission had in getting a program under way.

Seed oyster planting was carried out for the first time in recent years. Approximately 2,500 barrels of seed oysters were removed from areas where small oysters were thick; they were redistributed to areas that were sparsely populated. The work was done by Commission personnel using the Commission vessel Uranus. This project was conducted with two objectives in mind—one, to improve existing productive oyster bottoms and, second, to thin and cultivate over-crowded areas.

Another phase of the oyster bottom improvement program was instituted in 1961. This involved the dragging of the once productive outside reefs off Pass Christian by oyster dredges

following heavy spring rains; this was done with the idea that the shells would be turned over and clean, unfouled surfaces would be exposed prior to the spawning and setting period which takes place in late spring and summer.

Shrimp Investigations

Shrimp investigations during 1960 were not intensive; however, enough information was gathered to indicate that the migrations and other life habits of our commercial species of shrimp conformed with those found in the adjoining states. In the early part of 1960 the Commission undertook to revise some of its shrimping regulations based on the current knowledge of habits and migrations of the three commercially important species. Brown shrimp usually make their appearance in the bays and shallows around the last of March or the first weeks in April and grow approximately 2 inches per month from March to June. During the spring of 1961 small brown shrimp were not found in Mississippi Sound until April 27 and the numbers were relatively small. The numbers found decreased through the month of May and growth of the small brown shrimp progressed very slowly. During the last week in May the numbers of small brown shrimp increased slightly up until the second week in June, during which time another population of small shrimp averaging 70 mm. in length appeared in the deeper waters of the Sound and mingled in with the larger shrimp. During the month of June there was a noticeable decrease in the entire brown shrimp population. Possibly natural mortality exceeded growth due to the lowered temperatures of the water during the growing season. White shrimp appeared in Mississippi waters from two to three weeks late and they are in goodly numbers as this report goes to press.

TEXAS

Little change has taken place in the basic program established some years ago but the quality and quantity of the work performed has increased. For the first time in quite a few years the technical staff of the Coastal Fisheries Division, Texas Game and Fish Commission, has been unchanged and some degree of continuity has been attained. No resignations of biologists or chemists interrupted a program and the addition of one biologist allowed work to continue on schedule.

A special report called for by the Texas Shrimp Conserva-

tion Act, which analyzes shrimp data, was prepared and submitted during the year to the Governor and Members of the Legislature.

The report for fiscal 1958-59 contained a brief summation of some of the results of a salt water sports harvest survey. A similar survey was conducted early in this fiscal year. For purposes of comparison the following is taken from Page B-5 of the report on the results of that survey.

	1959-60	1957-58
Projected pounds caught (redfish, speckled trout, flounder, drum, shrimp)	26,322,000	39,586,000
Projected number of fishermen	665,200	748,000
Average number fishing days per fisherman	7.7	9.4
Average number hours fished per day	4.7	5.2
Average catch per unit of effort (pounds per man-hour of fishing)	1.09	1.08

It is readily apparent that the total poundage declined considerably and if this fact is considered alone it might be cause for some alarm. However, when the number of fishermen and days as well as the hours per day are considered it is not surprising that the total catch was off. Weather conditions were not suitable for long or frequent trips into the bays. A slight economic recession caused people to be somewhat more cautious in their recreational spending. These facts are borne out by the report. Yet, the fisherman who did go and try was, on the average, just as successful as in the second year previous. Continued samplings such as this will be of great value in measuring population trends of the fish species considered.

Field studies were continued in all major bay areas and resulted in much valuable information which is being reported separately. These reports on specific projects and jobs in each area are reproduced and distributed to interested agencies throughout the world.

Basic studies involving bottom type, vegetation and inventory of species have been completed for all major bay systems although much detail remains to be added. In this year seasonal abudance of various forms has been measured and an attempt made to relate this to hydrographic conditions and other environmental factors. Some pertinent information is presented here.

Oyster Fishery Investigations In Area MO-1 (Galveston Bay)

The spat set in 1961 was moderate to heavy with a peak setting period in late spring. Increased salinities permitted oyster population to expand slightly in the upper bay areas. Mussel fouling continued to be heavy in the upper bay. Conch predation was a serious problem in the lower bay areas during the spring but decreased considerably in summer after a period of heavy, local rainfall.

Market oysters were fairly abundant during the 1960-61 season but were below average in quality. Because of low winter salinities, oysters did not have a salty flavor nor did they reach full fatness. Fishing effort was heavy on Hanna's Reef in East Bay and on Todd's Dump in middle Galveston Bay. Other reefs were fished infrequently, chiefly because the oysters were thickly clustered or heavily fouled by mussels.

Shell dredging problems continued to demand attention. The shell planting program initiated in 1959-60 failed to gain public approval and was never able to function at maximum effort. However, 53,000 cubic yards of shell were planted and 61,000 barrels of oysters were transplanted. Construction was started on five new reefs bringing the total to twelve. Eight natural reefs were removed or partially removed and replaced in the process. All artificial reefs maintained populations of oysters.

Oyster Fishery Investigations In Area MO-2 (Coast Below Brazos River)

The fungus parasite *Dermocystidium marinum* incidence rating in all bays have been relatively low, probably due to reduced salinities, but, its continued presence is a potential threat.

Interest in leases for private oyster culture continued high although production from these areas were negligible. Cost of operation and yield from the leases is being studied in various bay areas for comparative purposes.

Coordinated Shrimp Study Program

The sampling information from this year's juvenile shrimp population as compared with the previous year's data indicated a decline in the crop of both brown and white shrimp.

In June over 39,000 brown shrimp were marked by injection with a biological stain and released in Aransas Bay. Although less than one per cent have been returned through com-

mercial shrimping channels, the locations of recapture indicate a southerly movement from the Pass during the summer months.

Correlation of data gathered in the bays with Gulf conditions was facilitated by the lease of a large shrimp boat capable of fishing deeper waters.

Region M-1 (Sabine Lake)

Regular samplings in Sabine Lake showed that area to be comparatively less productive than other bay areas. The large amount of river discharge leaves the area almost devoid of marine life at times.

Region M-2 (Upper Galveston and Trinity Bays)

Emphasis in biological studies was on commercial shrimp, blue crabs and game fish. Sampling stations were established in various bay habitat to observe brown and white shrimp from post-larval stages until they migrate out of the bays.

Blue crabs have become increasingly important to fishermen in recent years and more attention is being given to them. Data are collected in conjunction with other projects.

Low salinities observed in January and February are considered the prime cause of a relatively poor shrimp season.

Region M-3 (Lower Galveston Bay)

Commercial shrimp were sampled at various stations as a part of the unified coast-wide program. Game fish populations received particular attention and preliminary returns of tagged fish indicate very little movement.

Salinities were consistently higher in West Bay than in East Bay which appears to be affected more by Trinity River discharge. West Bay also supports more submerged vegetation than does East Bay.

Region M-4 (Matagorda and Lavaca Bays)

Vegetation surveys have thus far shown a major changeover, as far as species and abundance are concerned, at about 20° C. Shoal grass has remained abundant throughout the year. Widgeon grass, which began fruiting in June is increasing and spreading its distribution.

Shrimp samples indicate a late and relatively light harvest of white shrimp and a somewhat late season for browns. Both

pink shrimp and sea bobs were more abundant than in 1960 samples.

Oysters in East Matagorda Bay are suffering from excessive fresh water and an abudance of fouling mussels.

REGION M-5 (SAN ANTONIO AND ESPIRITU SANTO BAYS)

Studies have shown a rapid decline in the oyster population which has supported a heavy fishery for the past two seasons. The high mortality is attributed to fresh water flooding and an increase in the incidence of *Dermocystidium marinum* in San Antonio Bay. Early spat sets were killed by flooding and many mature oysters suffered the same fate.

Bait shrimping is concentrated largely on the white species and was apparently responsible for a very limited supply of commercial size shrimp being available at the time the commercial season opened. Brown shrimp constitute a small part of the bait catch and an even smaller part of the commercial catch.

A relatively small experimental oyster reef was built using shell from a local shucking house. The shell was placed on a semi-solid mud bottom and in early summer was found to have had a heavy spat set. This was killed by flooding but a later set will offer some index for future comparisons.

REGION M-6 (ARANSAS, COPANO AND MESQUITE BAYS)

Data gathered in Mesquite Bay indicate the intrusion of higher salinity Gulf water through Cedar Bayou has caused some changes in distribution of both plant and animal forms. The pass has continued to operate effectively although some south-migration of the gulf mouth has occurred.

Oyster populations have improved somewhat and it is anticipated that Aransas Bay will be allowed a short harvest season this year.

REGION M-7 (CORPUS CHRISTI AND NUECES BAYS)

Routine sampling revealed that the first juvenile brown shrimp appeared in mid-April and began moving out of nursery areas by mid-July. First catches of young white shrimp were made in July and were present as the year ended. Samples of the fish populations showed that croaker, spot and pinfish were most common generally and that anchovies were extremely abundant but in few localities.

REGION M-8 (UPPER LAGUNA MADRE)

Heavy rainfall during winter months reduced salinity to a record low of 7.6 ppt. and, as a result, no salinity over 45.0 ppt. was reported for the year. The small mollusk population was virtually exterminated and there followed a sharp reduction in the standing crop of black drum. All major species increased in abundance in autumn but became less plentiful during the summer months. For the year, the cumulative redfish population was up 20-30 percent while the trout population increased about 20 percent.

During most of the year forage and juvenile fish appeared to be scarce in comparison to previous years.

Mortality studies indicate that few trout survive over five years, that females live longer and grow larger than males, and that nearly 60 percent of the population is lost to natural mortality. This natural mortality was about five times as great as fishing mortality.

About 20 percent of the redfish crop is harvested each year but there is 70-80 percent loss due to natural mortality or emigration.

Shrimp are of minor importance in this region except to the live bait fishery. Few edible shrimp are produced. Grooved shrimp were about as abundant as in previous years but the peaks of abundance were of much shorter duration.

Trial oyster mats, placed in the area as fishing reefs, have remained in excellent condition and have attracted small fish. The oysters planted thereon did not survive.

REGION M-9 (LOWER LAGUNA MADRE)

The vegetative survey shows a marked increase in both the stand and range of shoal grass *Diplanthera wrightii.* Widgeon grass *Ruppia maritime* continues to extend its range northward past Port Mansfield particularly around spoil banks.

Brown shrimp are present throughout the year with peak abundance from April to July. White shrimp were notably more scarce this year than last. Both species are present in the lower Laguna Madre as sub-adult forms only since the adults do not utilize this bay area.

Oyster production from the area has been about one-third to one-half of the previous annual average and has shown no sign of recovery. Oyster populations in South Bay were seriously damaged in 1959 by spoil deposition resulting from main-

tenance dredging of the Brownsville ship channel. Results of studies of six experimental oyster reefs in Port Isabel Bay were not encouraging. While hydrographic conditions appear to be equal to or better than those in South Bay for the production of oysters, the extremely heavy summer growth of marine grasses and algae over the experimental reefs appears to prevent the establishment of these reefs as producers of commercial oysters. These reefs have become increasingly important in the sport fish catch.

Anchovies continued to be the most abundant winter forage fish with pig fish and pin perch serving this need in spring. Pig fish, pin perch, spot and croakers were present in fewer numbers but white perch or yellowtail showed an increase in both range and numbers as compared to the previous year.

The removal of black drum fish from the Laguna Madre of Cameron and Willacy Counties was continued as in the year before. The apparent success of the previous season was responsible for thirty-two applications being received. A total of twenty-two contracts were issued with only sixteen effective in either county. Total production of dressed drum was reported as 805,927 pounds with almost one-third of that amount reported in January. Repeated spot inspections of the total catch of these nets showed some 10% to be trout, redfish, or flounder and further that 1.6% of these "good" fish were dead when returned to the water. There is still considerable opposition to the program in spite of the fact that most reports indicate an increase in the populations of other species.

In addition to the job reports referred to earlier and the special shrimp report, several technical articles were prepared for publication. A bulletin on the Crabs of Texas has been completed and is in the hands of the printer. This should be available for distribution early in fiscal 1961-62.

U. S. FISH AND WILDLIFE SERVICE ACTIVITIES

OCTOBER 1960 - OCTOBER 1961

Bureau of Sport Fisheries and Wildlife

Activities of the Bureau of Sport Fisheries and Wildlife as they relate to Gulf fisheries were confined primarily to investigations of Civil Works projects conducted under the authority of the Fish and Wildlife Coordination Act. Project reports were prepared on all significant coastal projects, and these reports were coordinated with the Bureau of Commercial Fisheries and the affected State agencies.

Planning and construction of public and private projects for use of the coastal waters and lands continues at a rapid pace. An increasing competing use of coastal waters and increased problems associated with fresh water drainage projects demand coordinated efforts toward multiple-use planning for Federal, State, and local interests.

Investigations which warrant attention in this report include:

NAVIGATION PROJECTS

Mississippi River-Gulf Outlet Project, Louisiana: The Bureau, in coordination with the Bureau of Commercial Fisheries and Louisiana Wild Life and Fisheries Commission, continued its program of reporting on construction segments. These reports deal primarily with the development of effective methods to reduce the spread of spoil material. These studies will be continued through most of the construction phase of the project. Additional funds were provided, and the schedule for project construction was materially advanced.

Calcasieu River and Pass, Louisiana: Enlargement of the authorized ship channel to Lake Charles is under construction. Coordinated studies with the Bureau of Commercial Fisheries and the Louisiana Wild Life and Fisheries Commission were initiated to advise the construction agency of requirements for spoil control in the interest of fish and wildlife resources.

FLOOD CONTROL PROJECTS

Lake Okeechobee Regulation: The tentatively proposed South Florida Floodway which would discharge through Everglades National Park would affect major commercial and sport marine fisheries. With the cooperation of the Bureau of Com-

mercial Fisheries and other conservation agencies, steps have been taken to develop a comprehensive study on which to provide recommendations for the regulation of fresh water discharges necessary to protect the Tortugas shrimp fishery and other major fish industries.

Mississippi River and Tributaries Project: This project is nearing completion and the Chief of Engineers is preparing his report. Included in this report will be a consideration of recommendations by conservation agencies for fresh water introduction into the Louisiana Delta marshes for the benefit of fish and wildlife resources. The proposal for freshwater introduction would significantly enhance the oyster producing potential of these Delta marshes. The report of the Chief of Engineers will, therefore, be of considerable interest to the Gulf States Marine Fisheries Commission.

HURRICANE PROTECTION PROJECTS

Lake Pontchartrain Hurricane Protection Project, Louisiana: Model studies to determine the effects of this project and the Mississippi River-Gulf Outlet project on salinities in Lake Pontchartrain and related areas have been completed. From the results of this model study, recommendations as to gate sizes needed to maintain required salinity exchanges between the lake and the Gulf will be prepared.

NAVIGATION PERMITS

Private Construction: A great number of permits to private developers for a variety of projects ranging from pipe lines to dredge and fill projects were issued. The Bureau has attempted to comment only on the larger of these developments which would have the most significant effect on fishery resources. While the individual effects of these developments are usually small, their cumulative effects are large. The bait shrimp fishery in a few of Florida's bays has been noticeably affected. Other fisheries using inshore dependent marine species will undoubtedly be affected by the cumulative effects of all such developments.

Bureau of Commercial Fisheries

The Bureau of Commercial Fisheries, under the direction of its Regional Office in St. Petersburg Beach, Florida, again carried out an integrated and coordinated program, giving special attention to action requested by the Gulf States Marine

Fisheries Commission. A resume of the Bureau's activities follows:

PASCAGOULA EXPLORATORY FISHING AND GEAR RESEARCH BASE

During the interval July 1960 to June 1961, exploratory and gear research work was initiated or continued on the following projects: industrial fish explorations, gear research on experimental and conventional shrimp and midwater trawl designs and evaluation of controllable pitch propellers for use with standard shrimp hull forms, scallop and clam explorations, exploratory snapper trawling, and shrimp explorations. A total of 1,889 stations were occupied during the period by the Base research vessels Oregon, George M. Bowers and Silver Bay.[1]

INDUSTRIAL FISH EXPLORATIONS

The Oregon completed two exploratory cruises in the 3 to 50 fathom depth range between the Mississippi Delta and Brownsville, Texas, and one cruise off the Mississippi and Alabama coasts. Primary objective of these cruises was to determine the availability of industrial fish species to bottom trawling gear in the areas not presently fished by the commercial fleet. Commercial size catches (2,000 to 6,000 pounds/hour) were confined to the 3-20 fathom depth range off the western Louisiana and the eastern Texas coasts and in the 16-42 fathom depth range off the Mississippi and Alabama coasts. A secondary objective of these cruises was to delineate and chart foul bottom areas that are not indicated on current navigation charts.

The Silver Bay conducted a bottom trawl survey of industrial fishes off the east coast of Florida. Commercial concentrations were found along the 10 fathom curve south of Cape Canaveral.

GEAR RESEARCH

The Oregon conducted performance tests of experimental midwater trawl designs and different types of doors, depressors and elevators. Electronic instrumentation devices were designed and developed which recorded gear performance and fish be-

[1] The named Pascagoula based vessels may operate in the course of any year in an area served by the Atlantic States Marine Fisheries Commission, or elsewhere. Therefore, in order to present the total operation effort of a vessel it is sometimes necessary to include activities in other than the Gulf area.

havior patterns. Of particular interest was the development of remote controlled underwater movie camera gear to record performance data under conditions not suitable for SCUBA divers.

The George M. Bowers continued underwater shrimp trawl studies. Instrumentation and methods for measuring significant mechanical parameters of shrimp trawl gear were designed and tested. These included a trawl door angle-of-attack indicator, a door-to-net leg angle indicator, a trawl and door spread indicator, and a towing warp angle indicator. These instruments, and others now being developed, should prove invaluable in future investigations of shrimp trawl mechanics. Preliminary findings indicate that the configuration of a given shrimp trawl assembly varies widely, and is dependent upon towing speed, warp scope ratio, and flotation. Underwater movies of 40-foot balloon and flat trawls fished with several sizes of chain doors were obtained at various speeds and scope ratios. Model midwater trawls of three different designs were constructed and comparative towing tests conducted to evaluate the comparative efficiency of each versus the standard British Columbia midwater trawl.

The George M. Bowers was outfited with a 3-blade controllable pitch propeller. Steaming and towing tests made with the C-P propeller over the past 12 months indicate greater vessel maneuverability, significant elimination of torsional vibrations, a reduction in fuel consumption due to greater effective thrust from available horsepower, and increased propeller efficiency at both towing and steaming speeds.

Scallop and Clam Explorations

The Silver Bay completed follow-up cruises in September, January and April to further delineate the calico scallop bed discovered earlier off Cape Canaveral and to check on the seasonal occurrence of this species. Approximately 100 interested industry members accompanied the vessel during these cruises. Shell stocks of calico scallops, in sufficient quantities for processing tests, were delivered to the industry at Port Canaveral, Miami and Fort Pierce, Florida. Exploratory clam dredging was conducted by the Silver Bay off the Florida east coast. Catches of marketable hard clams (Venus sp.) were insiginicant; however, moderate quantities of dead shell were taken in the dredge indicating that this species has inhabited the area.

The Oregon made two trips to the calico scallop bed discovered off Pensacola during previous years to obtain shell stock for technological study.

Exploratory Snapper Trawling

Snapper trawling experiments were conducted by the Silver Bay off the Florida east coast in May 1961 to determine the commercial availability of snapper, grouper and related species. Catches of marketable species ranged to 1,000 pounds per one-hour tow. Gear damage was negligible.

Shrimp Explorations

The Silver Bay conducted exploratory shrimp trawling operations along the Florida east coast, Straits of Florida and the western edge of the Great Bahama Bank

No significant quantities of commercially important shrimp were taken in the areas surveyed. Surprising depth records were obtained for the pink (*P. duorarum*), Caribbean brown (*P. brasilienis*), and the Caribbean white shrimp (*P. schmitti*) when catches of 1 to 8 pounds were made in depths of 150 to 200 fathoms.

The royal red shrimp grounds previously discovered off the east coast of Florida were sampled by the Silver Bay during a cruise in May 1961 to compare the potential with that observed in previous years. Five tows completed in 164 to 191 fathoms produced 1,195 pounds of 31-35 count royal red shrimp.

The Oregon periodically sampled the royal red shrimp grounds discovered earlier between the Mississippi Delta and Pensacola, Florida, to compare catch rates with those of previous years and to gather information relative to the seasonal distribution of the species.

Gulf Breeze Biological Laboratory

During the year, the coordination of the Bureau of Commercial Fisheries' research program on agricultural chemicals has been centered at this laboratory. Chemical manufacturers are cooperating fully in providing samples for testing of the most important pesticides as well as new compounds which are of potential value. Currently, tests are conducted only in the laboratory. The immediate toxic effects on estuarine species such as crabs, shrimp and mullet are being determined as well as the effects of sub-lethal doses on growth and reproduction

in the oyster. Pesticide chemicals labelled with radioactive carbon are being used to determine how long they are stored in live oysters, and also to determine their effect on plankton productivity. Eventually, such labelled compounds will be used to trace the movement of pesticides in drainage areas following a commercial application. Laboratory facilities for this testing are being greatly expanded.

In conjunction with other Bureau laboratories, we have undertaken a study of the calico scallop. At present, little is known of its biology, how fast it grows, its population dynamics and other factors of importance to the establishment of a stable commercial fishery. Efforts to find previously fished populations in the Gulf near Pensacola have been unsatisfactory and samples are now being collected on a periodic basis in the Cape Canaveral area on Florida's east coast.

Studies to determine the resistance to disease of South Carolina seed oysters grown in Florida waters show that such oysters are not as susceptible to fungus infections as Pensacola oysters. On the other hand, they grow so much more slowly than local stock it would not be practical to import them.

The project to determine the effects of man-made changes on the ecology of a small bay near the laboratory is being expanded. Extensive surveys of the area fauna have been completed prior to significant artificial changes and it is going to be possible to document the effects due to man over a period of years. For comparative data, we have found it necessary to undertake a thorough inventory of the biota in the entire Pensacola Bay area. It is our intention to build a complete reference collection for the area and to record the seasonal changes in the animal communities. Such data will be invaluable in later years to serve as base lines for interpreting changes in these estuarine habitats.

Efforts to find ways of controlling the southern oyster drill are continuing. Approximately a thousand snails have been exposed to gamma radiation to determine dosage levels that will prevent the snails from reproducing without killing them. Levels used this year were too high and the snails eventually died. Surviving snails X-rayed the previous year with smaller dosages again failed to produce eggs and this partial success indicates that the idea is worth pursuing although the details of its commercial application are not yet clear.

During the past year, the laboratory staff has had five manuscripts accepted for publication and three other terminal project reports are being prepared for publication. The annual marine exhibit and lecture series for science classes was attended by more than 4,000 students in a ten-day period and sound movies of the lectures were made for national distribution as educational television shorts.

GALVESTON BIOLOGICAL LABORATORY

The Galveston Biological Laboratory conducts research on shrimp, industrial fishes, pesticides, red tide, and estuarine problems especially those concerned with engineering problems. Field personnel are also stationed at Pascagoula, Miami and St. Petersburg Beach.

SHRIMP PROGRAM

Completed analyses of four years (1956-1959) of detailed observations on catches of shrimp and fishing effort throughout the Gulf show that populations of all three major species, brown, pink, and white, undergo two periods of heightened spawning activity and thus produce two definable broods of young shrimp each year. There is good evidence that hurricanes, sweeping high turbulent waters over the estuaries, can cause decreased survival of a brood of young shrimp. Because fishermen in the high seas fishery (especially on the Campeche Banks) cull the smaller sizes of shrimp from their catches, it will be difficult to obtain reliable estimates of relative abundance of stocks on these far banks until we can secure unculled samples of the catches.

Relatively high recoveries on the Sanibel fishing grounds of juvenile pink shrimp stained and released in Pine Island Sound, coupled with no recoveries on the Tortugas grounds indicates that shrimp taken in the Sanibel and Tortugas fisheries probably depend on different nursery areas. More exact definition of the boundary must await future releases in the area between Pine Island Sound and Shark River.

Larval stages of the seabob, *Xiphopeneus kryeri*, have been identified and described for a forthcoming publication.

The numbers of postlarval shrimp entering Galveston Bay during March and April fell from 582 per sample (17 samples) in 1960 to 22 per sample (15 samples) in the same period of 1961. Associated hydrographic data are being analyzed for an answer to this sharp fall in numbers.

Industrial Fish Program

Preliminary studies of industrial-type fishes of the east coast of Texas over a 9-month period show that the most abundant species by both number and weight was the longspine porgy, *Stentomus caprinus*. The second most abudant by weight was the lizardfish, *Synodus foetens*, followed by the Atlantic croaker, *Micropogon undulatus*. This contrasts with the findings of the study in the Mississippi Sound area in which the leading species was shown to be the Atlantic croaker.

In the central Gulf area the total number of fishing trips in 1960 dropped 11 per cent from that made by the commercial fleet in the preceding year. On the other hand, the average catch per trip rose by 11½ per cent. Average-length-of-trip data for both years are not available, but this jump in fishing success is believed mostly due to a significant increase in trawler size (and power) and the correspondingly greater number of vessels with refrigeration facilities.

Also worthy of note is the tendency toward westward extension of the fishing grounds. With the advent of larger vessels and refrigeration equipment, increasing poundage of industrial species are being taken west of the Delta. Contrasted to only 16 per cent in 1959, an estimated 60 per cent of the total industrial fish harvest originated here in 1960. As in the past, all fishing was concentrated inside the 20 fathom contour.

Pesticide Program

The studies reported last year on postlarval shrimp were extended to include adult shrimp, both brown and white, and several estuarine fishes. The results show that most of the many types of chlorinated hydrocarbons are very toxic to all species. The toxicity is somewhat dependent on the formulation used, the liquid formulations being generally much more toxic than the solid.

Estuarine Program

Because of the growing need to understand the effects of man-made changes on the estuarine environment, a small estuarine program was initiated in 1961. The purpose was to develop a nucleus of personnel and preliminary knowledge, and to explore the type and scope of research necessary to predict the effects of engineering projects on the fisheries.

For the present, the estuarine work is divided into three projects:

1. Evaluation of estuarine data. The study of existing published and unpublished data to obtain a clear picture of the present state of our knowledge in order to determine how most effectively to attack the basic problems without duplication of effort.
2. Effects of engineering problems. Aimed at more or less empirical determination of the causes of effects on the fauna through study of conditions before and after construction of specific projects. Also advises on particular projects.
3. Ecology of nursery grounds. To determine the types of estuarine habitat suitable for different sizes and species of fish and invertebrates, how they are affected by fluctuations in the environment, and their interrelationships.

Much of the knowledge must be obtained from studying conditions before and after construction of specific projects; thus, in some cases, the project and adjacent waters constitute our "laboratory." The Corps of Engineers constructs large-scale models of some of its projects at the Waterways Experiment Station in Vicksburg, Mississippi. Tests with these models can be very useful in the prediction of project effects on the hydrography of an area.

Study of the Mississippi River-Gulf Outlet Project, carried on by the Texas A & M Research Foundation, is nearing completion after some 2½ years of intensive work. The field station at Hopedale, Louisiana, was closed in April, and the final report will be completed by midsummer. The wealth of data on biota in the low, medium and high salinity areas, and the extensive hydrographic observations will permit, perhaps for the first time, a full evaluation in later years of the long-term effects of a very large-scale channelization project.

Red Tide Program

Nearly 5,000 organic compounds have been tested to determine their toxicity to the red tide organism, and 88 of them proved to be as toxic or more toxic to *Gymnodinium breve* than copper sulphate. Tests are now in progress to determine whether any of these extremely toxic substances are sufficiently harmless to other marine fauna to warrant field testing.

All experimental and field work on red tide is being drastically reduced to permit analysis and preparation of reports on accumulated data. When these reports are completed, a reappraisal of red tide research will be made to determine the scope and direction of any future research.

Pascagoula Technological Laboratory

The staff of the laboratory consists of a laboratory director, a chemist, a food technologist, a bacteriologist, two technicians, and two clerk-typists. Three programs of studies are now under way at Pascagoula: chemical studies, bacteriological studies and products and standards development. In addition, the director supervises the Seafood Inspection and Certification Services Region 2.

Chemical studies on marine products included proximate composition analyses on industrial fish used for petfood and meal production. Samples are collected weekly from local plants for protein, oil, moisture and ash analyses. Chemical studies on reactions in canned seafoods is a more basic approach to problems of can corrosion, food discoloration, and struvite formation.

Bacteriological studies have been initiated to determine the separate effect of marine and terrestrial micro-organisms on seafoods stored in ice and later canned. Sanitation improvements should follow in-plant bacteriological studies to determine the numbers and source of micro-organisms found in frozen seafoods. Special methods and media were utilized to cultivate these marine bacteria.

Product development work continued on canned sardine-like fishes and mullet. Several methods of canning were utilized in processing sardines in oil and brine. Studies were continued on the development of a canned fish for mullet. Data were obtained on approximate costs and yield of processing these fish. A pilot plant for smoking mullet was set up and a leaflet published describing the construction and operation of the smokehouse.

The Seafood Inspection and Certification Services continues to grow with 20-22 plants now under Continuous Inspection. Approximately 22 inspectors and two supervisors provide inspection on as high as 1.5 million pounds of seafoods per week during the busy fall season. Although frozen raw breaded shrimp provides the bulk of the production, other frozen specialties such as shrimp-a-la-creole, casserole of crab meat, frozen

peeled raw deveined shrimp, breaded oysters, and TV dinners continue to grow in importance. The inspectors also provide lot inspection on occasions.

Statistics

An annual general canvass of the commercial salt water fisheries of each of the Gulf States was conducted. This canvass encompased the gathering and publication of data covering employment within both the fisheries and shore plant installations, production and value of landings and processed or manufactured seafood products, number of craft and types of gear engaged in the fisheries, and catch by gear by general waterbodies.

A report on the commercial and sport fishing and hunting harvests in the Lake Pontchartrain area was completed. Data for the report were collected for the Office of River Basins, and, together with reports covering biological and ecological studies, will form the basis for the Fish and Wildlife Service recommendations regarding the best type of hurricane protection structures from the standpoint of conserving fish and wildlife resources within the area.

Through the excellent cooperation of the conservation agencies of the respective States, the publication of monthly landings bulletins was continued. The inclusion of a value figure for each species in the Florida and Alabama bulletins, commencing January 1, 1961, has increased the usefulness of these publications. The inclusion of this feature in the monthly bulletins of the other States will be accomplished as soon as possible.

Through the efforts of the Commission, additional funds were provided for fiscal year 1962. These funds will be used to obtain detailed shrimp statistical data at ports not previously covered on a fulltime basis, and which have grown in volume of landings since the start of the detailed shrimp statistical program in 1955. A review of the shrimp statistical program as it applies to biological research was conducted at the Regional Office on June 20. Recommendations were made at that time regarding modifications in the monthly and annual *Gulf Coast Shrimp Catch by Depth and Area* which will, in turn, allow port agents more time to interview vessel captains regarding areas fished and productive and non-productive fishing effort.

Market News

Publication of accurate and current marketing information was continued by the issuance of daily Fishery Products Reports, together with monthly and annual summaries.

In addition to supply and market conditions in the major domestic fisheries, news articles in the daily reports have been expanded to include information on the status of foreign fisheries based upon reports of U. S. Embassy personnel. Considerable space has also been devoted to articles dealing with Congressional proceedings on fishery matters.

The daily Fishery Products Report also continued to serve as one of the foremost media for informing industry of the activities of other Branches of the Bureau and conservation agencies of the States. A specific example of this type of information is that published regarding the shrimp staining program during the past year.

The Bureau is active in fish and shellfish market development and administers the Government's fishery loan program.

PEAT, MARWICK, MITCHELL & CO.

Certified Public Accountants

Hibernia Bank Building

New Orleans 12, La.

ACCOUNTANTS' REPORT

Commissioners

Gulf States Marine Fisheries Commission:

We have examined the statement of income and expenses of Gulf States Marine Fisheries Commission for the year ended June 30, 1961 and related statement of resources as of that date. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying statements of income and expenses and resources present fairly the results of the financial transactions of Gulf States Marine Fisheries Commission for the year ended June 30, 1961 and its resources at that date, in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Peat, Marwick, Mitchell & Co.

New Orleans, Louisiana
July 7, 1961.

GULF STATES MARINE FISHERIES COMMISSION

Statement of Income and Expenses

Year ended June 30, 1961

Income:		
Member states contributions:		
Alabama		$ 1,000.00
Florida		3,500.00
Louisiana		5,000.00
Mississippi		1,000.00
Texas		6,000.00
Total member states contributions		16,500.00
Other income—sale of publications		150.00
Total income		16,650.00
Expenses:		
Salaries	$ 13,000.00	
Publication expense	672.08	
Traveling	1,192.36	
Office rent	1,080.00	
Stationery, printing and supplies	281.85	
Telephone and telegraph	426.77	
Postage	169.78	
Electricity	92.54	
Accounting	225.00	
Insurance	258.69	
Meeting expense	87.57	
Payroll taxes	274.50	
Depreciation	40.91	
Sundry	45.94	
Total expenses		17,847.99
Excess of (expenses) over income		(1,197.99)
Resources of the Commission, June 30, 1960		1,534.69
Resources of the Commission, June 30, 1961		$ 336.70

Statement of Resources — June 30, 1961

Cash (note 1)	$ 69.59
Meter deposit	10.00
Prepaid insurance premiums	121.50
Equipment—at cost less allowance for depreciation, $2,334.54 (note 2)	135.61
	$ 336.70

(For notes see accompanying supplementary information to accounts)

GULF STATES MARINE FISHERIES COMMISSION

Supplementary Information to Accounts

June 30, 1961

(1) Cash:

Cash receipts:			
Income (see accompanying statement)			$16,650.00
Repayment of travel advance			250.00
			16,900.00
Cash disbursements:			
Expenses (see accompanying statement)		$17,847.99	
Less adjustment for expenses not representing cash outlay:			
Decrease in prepaid insurance	$ 3.09		
Depreciation	40.91	44.00	17,803.99
Excess of (disbursements) over receipts			(903.99)
Cash balance June 30, 1960			973.58
Cash balance June 30, 1961			$ 69.59
Comprised as follows:			
National American Bank of New Orleans, checking account			$ 58.95
Petty cash			10.64
			$ 69.59

(2) Equipment:	Cost	Depreciation	Net
Amount at end of year:			
Automobile	$1,436.38	1,436.38	—
Furniture and fixtures	1,033.77	857.25	176.52
	2,470.15	2,293.63	176.52
Depreciation allowance for year	—	40.91	(40.91)
	2,470.15	2,334.54	135.61
Amount at end of year:			
Automobile	$1,436.38	1,436.38	—
Furniture and fixtures	1,033.77	898.16	135.61
	$2,470.15	2,334.54	135.61

(3) Fidelity bond insurance carried—$10,000.00 each on chairman, vice-chairman and secretary-treasurer of the Commission.

BUDGET

GULF STATES MARINE FISHERIES COMMISSION

Fiscal Year 1960-1961

Salaries	$13,000.00
Publication expense	600.00
Travel expense	1,500.00
Rent	1,080.00
Stationery, printing, supplies	375.00
Telephone and telegraph	425.00
Postage	185.00
Electricity	94.00
Accounting	225.00
Insurance	260.00
Meeting expense	150.00
Payroll taxes	275.00
Furniture and fixtures	800.00
Equipment maintenance	75.00
Sundry	60.00
Depreciation	45.00
	$19,149.00

(Approved October 21, 1961)