GULF STATES MARINE FISHERIES COMMISSION

SECOND ANNUAL REPORT
1950 - 51

To the

CONGRESS OF THE UNITED STATES

And to the

GOVERNORS AND LEGISLATORS

of

ALABAMA
FLORIDA
LOUISIANA
MISSISSIPPI
TEXAS

SECOND ANNUAL REPORT (1950-51) OF THE GULF STATES MARINE FISHERIES COMMISSION

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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

GULF STATES MARINE FISHERIES COMMISSION

ROSTER—OCTOBER 1951

HOWARD D. DODGEN
Chairman

HERMES GAUTIER
Vice-Chairman

W. DUDLEY GUNN—Secretary-Treasurer
ELLEN S. HOOVER—Office Secretary

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State of Alabama, Mobile, Alabama
W. C. HOLMES, M.D.,
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Florida Board of Conservation, Tallahassee, Florida
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State of Florida, Okeechobee, Florida
BRYANT PATTON, Representative,
State of Florida, Apalachicola, Florida

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New Orleans, Louisiana
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State of Mississippi, Pascagoula, Mississippi
LOUIS SIMMONS, President,
Gulf Coast Shrimpers and Oystermen's Assn.,
Biloxi, Mississippi

TEXAS

HOWARD D. DODGEN, Executive Secretary,
Texas Game and Fish Commission, Austin, Texas
JIMMY PHILLIPS, Senator,
State of Texas, Angleton, Texas
LAWRENCE A. KURTZ, Colonel, U. S. Army (Retired),
Seadrift, Texas

★Order of listing—Administrator—Legislator—Governor's Appointee

SUCCESSIONS ON THE COMMISSION DURING THE YEAR

W. C. HOLMES vice BERT E. THOMAS

COMMITTEES

COMMITTEE TO CORRELATE RESEARCH AND EXPLORATORY DATA

JOE O. BELL, Senior Biologist,
Alabama Marine Laboratory, Bayou LaBatre, Alabama
F. G. WALTON SMITH, Director,
Marine Laboratory, University of Miami,
Coral Gables, Florida
J. NELSON GOWANLOCH, Chief Biologist,
La. Department of Wildlife and Fisheries,
New Orleans, Louisiana
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Oyster Research Laboratory, Biloxi, Mississippi
J. L. BAUGHMAN, Chief Marine Biologist,
Texas Game and Fish Commission, Austin, Texas.

COMMITTEE TO CORRELATE FISHERIES LAWS

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Montgomery, Alabama
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La. Department of Wildlife and Fisheries,
New Orleans, Louisiana
REECE O. BICKERSTAFF, Representative,
State of Mississippi, Gulfport, Mississippi
ERMA BAKER, Attorney,
Texas Game and Fish Commission, Austin, Texas.

IN RESPECTFULLY SUBMITTING THIS SECOND ANNUAL REPORT THE COMMISSIONERS OF THE GULF STATES MARINE FISHERIES COMMISSION WISH TO EXPRESS THEIR MOST SINCERE GRATITUDE TO THE VARIOUS CONTRIBUTING AGENCIES OF THE FEDERAL AND STATE GOVERNMENTS AND STATE SPONSORED ORGANIZATIONS, INCLUDING THE DEPARTMENT OF THE INTERIOR —FISH AND WILDLIFE SERVICE, THE DEPARTMENT OF STATE—OFFICE OF THE UNDER SECRETARY, THE CONSERVATION DEPARTMENTS OF THE COMPACTED STATES, THE COMMISSION ADVISORY COMMITTEES, THE COUNCIL OF STATE GOVERNMENTS, THE ATLANTIC STATES MARINE FISHERIES COMMISSION AND THE PACIFIC MARINE FISHERIES COMMISSION. THIS ACKNOWLEDGMENT IS ALSO EXTENDED TO THE NATIONAL FISHERIES INSTITUTE, THE NATIONAL CANNERS ASSOCIATION, THE NATIONAL SHRIMP CANNERS AND PACKERS ASSOCIATION, THE OYSTER INSTITUTE OF NORTH AMERICA AND THE MAGAZINES, NEWSPAPERS AND PRESS ASSOCIATIONS SERVING THE GULF AREA. FURTHER ACKNOWLEDGMENT IS MADE OF THE VALUED AND WHOLEHEARTED COOPERATION OF ALL SEGMENTS OF THE FISHING INDUSTRY ON THE GULF WHO HAVE SO GENEROUSLY CONTRIBUTED TO THE SUCCESSFUL SECOND OPERATING YEAR OF THE COMMISSION.

HOWARD D. DODGEN, Chairman

HERMES GAUTIER, Vice-Chairman

W. DUDLEY GUNN, Secretary-Treasurer

COMMISSION ACTIVITIES
OCTOBER 1950 - OCTOBER 1951

The marine fisheries compact, entered into by the states of Alabama, Florida, Louisiana and Texas in July of 1949 and Mississippi in January of 1950, continues to attest in a high degree to the value of such interstate organizations. Until the formation of the Gulf States Marine Fisheries Commission there was no interstate fishery organization representative of the five Gulf states. Not having had such a central coordinating medium is the attributable factor for the long delay by the federal government in authorizing institution of offshore programs in fishery explorations and research. Also, prior to the signing of the compact, no medium was available to the states for joint interstate action designed to lead to the better management of the coastal fisheries.

STATE FISHERY PROGRAMS—Added impetus to existing fishery programs and the developing of new programs is now in evidence in all states. Monies derived from the sale of dead oyster and clam shells represent a preponderance of the funds being made available by the states for expanded research and reclamation work.

At a regular meeting, Brownsville, Texas, January 11-12, 1951, the Commission completed a study of the fishery laws of the several states and concluded that sufficient data of a biological character were not available to properly regulate such fisheries as the speckled trout, redfish and others of importance to the commercial and sports fishermen, and requested, by resolution to the state governors and legislatures, that consideration be given such studies.

The following is a resume of state biological research and reclamation activities, in progress and planned—

ALABAMA—A tentative oyster research program, to start in January, has been worked out. This program entails, mapping the water bottoms of Mobile Bay and Mississippi Sound; exploratory studies on potential grounds, including shell and seed plantings; spat set, and mortality checks; development of potential grounds per explorations; and reclamation and bottom stiffening studies. Such expanded activities in the oyster fishery will be carried on by the state marine laboratory, Bayou La Batre.

FLORIDA—Of special interest to the shrimp industry is the complete biological study of the Key West Brazilian shrimp. Technological study is being made of black spots on shrimp. Trash fish is being studied both qualitatively and quantitatively . . . . use in meal production being the objective. Sailfish, mullet and snook are the subjects of intensive observations, and tagging is being done on these species. A field laboratory has been set up at Panama City to further mullet research. A full-scale tuna program will be launched in January. Preliminary report on the now five-month old red snapper program nears completion. Developing and rehabilitating the Apalachicola oyster reefs is progressing at an accelerated pace. When personnel becomes available, programs involving the weakfish, redfish and others will be inaugurated. The University of Miami Marine Laboratory is carrying on the mentioned work for the Florida Board of Conservation.

LOUISIANA—The inshore program in Louisiana, in present progress, concerns oysters in continuation of the oyster research program that has been conducted for the last twenty-five years. Problems of growth and spat set, of pathology due to parasites, and pathology due to industrial and other pollution, are among the primary phases being studied. A project that will be worked out concerns participation in the standardized hydrological program involving systematic collection and analyses of water samples for the determination of the chosen indical chemical components. Laboratory facilities include the Department of Wildlife and Fisheries Laboratory on the campus of the Louisiana State University, Baton Rouge, and laboratory space available in the Sister Lake Laboratory and the Port of Entry Laboratory at Grand Pass, both of which are available as bases for surveys, field studies and experimental work.

MISSISSIPPI—The Mississippi Board of Higher Education has elevated the Gulf Coast Research Laboratory at Ocean Springs to a state university level. The Mississippi Seafood Commission, recognizing the need for restoring and developing the state's oyster reefs, has secured the services of the laboratory to initiate such a program. Studies of the reproductive cycle; the survey of reefs for those indicating best promise of yield; a study of improved methods of obtaining seed oysters; and investigations relative to mortality, are essential phases of the overall

plan. Shrimp studies will begin after the oyster investigations shall have gotten underway.

TEXAS—The Rockport Laboratory of the Texas Game and Fish Commission has undertaken a thorough exploration of the continental shelf of Texas, to determine the population of fish, molluscan and crustacean animals living thereon. Search will continue to be made for large concentrations of shrimp and edible fishes of special interest to the commercial fishing industry. With a view of extending the sports fishery, explorations will be made for tuna and other great game fishes. The project involves the mapping of all fishing grounds of the continental shelf and the obtaining of the life history of the animals inhabiting the offshore area to the 100 fathom contour. The extent of migratory habits of red snapper, mackerel, king fish, shrimp, and other marine animals will be determined through a tagging program. The project includes the determination of the extent and range of menhaden schools and the relationship of such schools to other pelagic fishes. Plankton studies are designed to determine the basic foods of the fishes. Temperatures, salinities, bottom samples and meteorological data as will aid in a better understanding of the movements of the water of the Gulf and water productivity are included in the research phase of the program. Research work on certain inshore fisheries as the redfish, speckled trout, oyster and crab will continue.

RECIPROCAL FISHERY AGREEMENTS—A resolution recommending to the governors and legislatures that consideration be given to the authorizing of reciprocal fishery agreements among the compacted states, was adopted at the Commission Brownsville, Texas, meeting January 11-12, 1951.

Resulting from action by the 1951 Alabama Legislature, that state can now enter into reciprocal agreements with any state involving any species of fish. Formerly, only shrimp was authorized.

The 1951 Florida Legislature did not add other species to the present reciprocal statute concerning shrimp.

It is understood the 1952 Mississippi Legislature will be asked to broaden the scope of reciprocal authority to include other than shrimp.

Alabama and Florida now have a reciprocal shrimp agreement. Mississippi and Louisiana have a similar agreement.

The Louisiana Legislature has not made any changes in existing laws on the subject of reciprocal agreements. The next regular session of the legislature will be in May of 1952. Sections 377, 500, 551, 552 and 554 of Title 56, Louisiana Revised Statutes of 1950, have been ruled unconstitutional, insofar as they affect non-resident fishermen and non-resident fishing boats, in Federal District Court. The decree was entered on August 20, 1951. Louisiana has filed a motion for a new trial which is now pending.

Texas does not have reciprocal fishery agreements with any state. Such authority was not extended by the 1951 Legislature. Texas waters are now open to fishermen of any state with the payment of an annual boat license of $6.00 plus $3.00 per fisherman on the boat plus $15.00 trawl license. Litigation in Texas on the same issues as have been raised in the currently pending Federal Court case in Louisiana was decided by courts in that state in favor of non-resident fishermen, some months ago.

THE SHRIMP STUDY—After many months of studying scientific information available on shrimp, the Commission voted to issue Informational Bulletin No. 1 at its April 19-20, 1951 meeting at Pensacola, Florida. The bulletin was directed to the legislators and marine fishery administrators of the several states, for such consideration as might be deemed appropriate in the development of state laws and regulations pertaining to the shrimp fishery. Sufficient time has not elapsed since the publishing of the bulletin to allow the states to thoroughly digest the material contained therein. A comprehensive report of the reaction to the suggested regulatory measures will probably be available for the spring 1952 Commission meeting. As more scientifically-sound information becomes available from continuing study of the shrimp the data will be passed in similar form to the proper state authorities.

SHRIMP IMPORTATIONS—In January, at the Brownsville, Texas meeting the Commission adopted and directed a resolution to the Congressional Delegations of the five Gulf States recommending that consideration be given to the setting of import quotas on shrimp from all foreign countries. At the April meeting

in Pensacola the Commission was requested by a representative of one large segment of industry to change its original recommendation to request that a tariff be imposed, rather than a quota, on shrimp imports. Another representative of industry requested that the Commission take no further action with regard to the possible limiting of imports. The Commission decided that the subject was deserving of further study. Since the April meeting, two very well defined schools of thought have developed. One segment of industry has been active in an endeavor to have importations regulated through the establishment of federal tariff legislation. The other segment of industry, after a series of meetings with Mexican shrimp interests, helped organize and joined an international group which is known as the Shrimp Association of the Americas. It is understood the purpose of this international organization is to increase consumer demand for shrimp, through advertising; through the raising of standards of quality; and through improved merchandising methods. It is further understood that this new association will derive its operating revenues from contributions by members of 1.875 mills per pound on all frozen shrimp to be marketed in the U. S.

At the second annual meeting of the Commission, Biloxi, Mississippi, October 18-19, 1951, the matter of shrimp importations was discussed at length with representatives of industry presenting their views on the matter. The Commission suggested that the shrimp industry on the Gulf give consideration to requesting an economic survey by the U. S. Fish and Wildlife Service, to which suggestion representatives of industry at the meeting expressed approval.

INSHORE OCEANOGRAPHIC SURVEY—A plan for an oceanographic survey of the coastal bays and estuaries was accepted at the October Biloxi, Mississippi, meeting and a resolution was adopted and directed to the U. S. Fish and Wildlife Service and the marine fishery administrators of the several states urging consideration of such a cooperating federal and state agency project.

The survey would supplement and complement the studies now being conducted in the open Gulf by the U. S. Fish and Wildlife Service.

The program provides for each state collecting and dispatching required samples taken from waters within its boundaries

and the analysis of the samples and compiling of data at a central laboratory.

The information to be acquired from such an oceanographic survey would include, but not be limited to, salinities, the basic nutrients (phosphate, nitrate) and the organic compounds which the scientists, in the first probings into this little-explored field, have already found to be essential to marine life:

THE PLAN

When and where the samples are to be collected.

The samples should be collected monthly at the points indicated on sketch maps to be provided, with all areas to be sampled as nearly at the same time as possible. This will call for about ten boat runs, each collecting at 25 stations. The exact plan for each, and the exact disposition of the stations, will be dependent on local conditions, and should be worked out with the field men in the several areas.

How the samples are to be collected.

When the water is under ten feet in depth, one sample will be taken, this at a level midway between surface and bottom. When the water is ten feet deep or over, two samples are to be taken, one at the surface, the other within two feet of the bottom. A Foerst sampler is recommended, with a stainless steel bucket to be used for taking the surface samples.

Preservation and storage of the samples.

The success of the entire project will be dependent upon this critical step. A "sample" will consist of five polyethylene plastic bottles (100 ml capacity) to be filled immediately from the bucket or Foerst cylinder.

The bottles will be serially numbered in bold figures. The field notes will list the date, hour, and position of the station and the serial numbers of the corresponding bottles. Immediately after filling, the samples will be frozen in a dry ice-alcohol bath and stored in the dry ice hamper. After this they must never be permitted to melt.

Disposal of samples.

When the collecting cruise is completed, the samples should be repacked with dry ice in an appropriate container (such as that used for shipping frozen foods) and shipped by **Rush** express as soon as possible to the laboratory. It is suggested that the cruises be terminated in or near the larger cities where dry ice and adequate shipping facilities are available.

MARINE FISHERIES STUDENT EDUCATION—Improving conservation of the marine fisheries through the building of a better understanding of the resource by educating the public, particularly students, was placed high on the work agenda for 1951-52 by the Commission at the October Biloxi, Mississippi, meeting.

The Commission Committee to Correlate Research and Exploratory Data have undertaken to—

Analyze the present activities, if any, and potentialities of available sources in each of the compacted states.

Ascertain such activities as may be conducted in other states.

Organize and mimeograph bibliographies that would be useful in drafting courses of study.

The Texas Director of Publications and Education has undertaken to prepare an outline of how material should be selected, arranged and disseminated.

The Commission is hopeful of the program having been developed to a point by the summer of 1952 that classes of instruction for coastal science teachers can be scheduled.

OTHER COMMISSION CONSIDERATIONS—

GULF RESEARCH PROGRAM, 1951-52—The progress of this program, concerning offshore marine biological and oceanographic surveys; Red Tide observations; and oyster research, was studied at the October Biloxi meeting and the Commission favored the several projects continuing as previously outlined.

GULF EXPLORATORY FISHING PROGRAM, 1951-52. The Commission voted at its second annual meeting not to request

the U. S. Fish and Wildlife Service to make any changes in the current program of by-species explorations until the Gulf waters have been completely explored for shrimp and a comprehensive report rendered as to conclusions. The present exploratory program coordinated with the U. S. Fish and Wildlife Service at a meeting in Mobile, Alabama, July 1950, involves the three species; shrimp-tuna-shark, with shrimp receiving primary consideration. (Activities of the U. S. Fish and Wildlife Service Branches of Fishery Biology and Commercial Fishing appear in detail in following pages of this report).

MONTHLY STATE LANDING RECORDS, 1951-52. Effort will be made during the year to improve catch records by—

Indicating area of catch, particularly shrimp.

Further breaking down statistics to separate edible from non-edible fishes.

Indicating in each monthly publication attributable reason for production fluctuations, such as, normal seasonal, weather, economic or others.

ANNUAL MEMBERSHIP DUES. The operating expenses of the Commission of $13,000.00 per annum were estimated for initial operations only and that amount was prorated among the compacted states. The compact provides that initial appropriations as are set forth below shall be made available yearly until modified by the Commission and approved by the legislatures of the respective states—

Alabama	$1,000.00
Florida	3,500.00
Louisiana	5,000.00
Mississippi	1,000.00
Texas	2,500.00
Total	$13,000.00

The Commission has recognized the initial total annual appropriation to be inadequate. Figures are now being compiled to indicate the lowest amount on which the Commission can efficiently function. Also, in this connection, latest state fishery production figures are being accumulated for the re-evaluating of state prorations.

COMMISSION MEETINGS—At the Brownsville, Texas, January 1951 meeting, the Commission adopted a schedule of two regular meetings each year, an Annual Meeting to occur on the third Thursday and Friday in October, and a Spring Meeting to occur on the third Thursday and Friday in April. Special meetings of the Commission may be called by the chairman when deemed necessary.

ACTIVITY REPORTS OF THE U. S. FISH AND WILDLIFE SERVICE, OCTOBER 1950 - OCTOBER 1951

BRANCH OF FISHERY BIOLOGY

GULF INVESTIGATIONS PROGRAMS

GULF BIOLOGICAL PROGRAM

GENERAL—The Gulf Fishery Investigations maintain headquarters at Galveston, Texas. From there the biological and chemical studies of the entire Gulf of Mexico are conducted. Field work is carried out with the research vessel **Alaska.**

Studies concerning the physical oceanography of the Gulf are conducted in cooperation with the Department of Oceanography of Texas A. & M. College, College Station, Texas.

At Sarasota, Florida a separate unit is maintained for a study of the "red tide" phenomena along the west coast of Florida. Field work at this station is done with the vessel **Pompano.**

Both the Galveston and Sarasota stations have chemical and biological laboratory facilities.

GALVESTON OPERATIONS

OBJECTIVES—The first objective of the biological program is to establish through oceanographic techniques the flow patterns of the major drifts of the Gulf of Mexico. This is being done through the assistance of, and in cooperation with, the Texas A. & M. College, Department of Oceanography.

These purely physical and chemical aspects of the program are to provide information leading to an understanding of the origin and movements of the young and eggs of various fishes. It is also expected that information will be gained leading to the delineation of the areas of greatest fertility, and the movements of eggs and larvae into or away from these areas. The importance of this in the survival of the juveniles is obvious. This constitutes the second objective.

The third objective is the collection of organisms other than fish for taxonomic and distributional studies with whatever ecological interpretations are possible. This objective is pursued largely through cooperative agreements with institutional and/or individuals peculiarly qualified to handle the special groups of organisms involved. In this case the Gulf Fishery Investigations act purely as a collecting and coordinating agency.

A highly neglected aspect of fishery biology has been the study of the organic nature of sea water and its application to the behavior and survival of marine organisms. It is possible to measure quantitatively certain specific organic compounds dissolved in the sea water. These factors are products of both the distributional and seasonal nature of planktonic make-up as well as the secular trend of overall productivity. The fourth objective is to study these factors and their ecological significance.

METHODS OF ACHIEVING OBJECTIVES—The first objective will be gained through the application of the classic methods of chemical and physical oceanography. This includes the collection and mathematical analysis of salinity and temperature data over a pre-selected network of stations.

The second objective will be derived from the results of the first, plus observations on the concentration and distribution of fish eggs and larvae, plus observations on the nitrate, phosphate and other chemical constituents of the water. The inter-relationships of these factors with possible upwelling and land drainage should provide the information desired.

The third objective is incidental to all others and the collections will be made from the material acquired through the plankton tows made in connection with the fish egg and larvae work.

The fourth objective is at present partly exploratory and is being expanded as rapidly as possible. The samples for this work come from the Nansen bottles.

STATION NETWORK—The cruise plans have been worked out in cooperation with the Texas A. & M., Department of Oceanography, so as to give a maximum number of sections perpendicular to known major currents in the Gulf of Mexico. The plan is laid out so that the entire Gulf is covered in three cruises. It is planned to cover the same area in each season of the year.

PROGRESS TO DATE

Difficulties encountered in conversion of the **Alaska,** recruitment of personnel, and obtaining necessary equipment delayed the start of active field work until April 1951. Since that time the **Alaska** has made three cruises, completing the initial coverage of the entire Gulf. A total of 125 stations were occupied during the three cruises. To occupy these stations the **Alaska** cruised about 7000 miles.

PHYSICAL OCEANOGRAPHY—As previously stated, the Department of Oceanography of Texas A. & M. College, through the office of naval research, is cooperating on this phase of the program. All data pertaining to water temperatures, bathythermograph recordings, and meteorology are processed and analysed by that agency. The Gulf Fishery Investigations has the responsibility of running the salinity determinations. These have been completed for all three cruises and the results turned over to Texas A. & M. College for analysis. There were a total of 1156 salinity determinations for the three cruises. To obtain these required the running of approximately three times that number of individual tests.

PLANKTON—Plankton collections have been made by conventional methods and also by means of a high speed sampler and a continuous surface sampler. The latter two methods are still in the experimental and improvement stage and results will not be covered except to indicate that both show very good promise. Unfortunately, the first high speed sampler was lost early on Cruise III. A new and improved model has been built but not as yet used. Likewise, improvements to the continuous sampler have been made but not tested.

The fish eggs and larvae have been separated from all plankton tows made to date. Work is in progress on identification and subsequent separation of species into series of developmental stages. This latter endeavor may take years to complete since but little background information on the life history of Gulf fishes is available.

Total volume of plankton (wet measure after settling) was determined for each sample and the relative abundance of the various groups of organisms recorded.

Based on the data collected so far, the following general observations are indicated:

In comparison to areas like the California coast or the North Atlantic the abundance of plankton in the Gulf of Mexico is sparse. Whereas tows in those areas may produce quarts or gallons of plankton, very few of the Gulf tows yielded a pint and a majority less than 100 c.c. on the basis of a half-hour tow with a ½ meter net. In fact, a number of tows yielded less than 10 c.c.

A greater abundance of total plankton exists in the waters over the continental shelf than exists in waters beyond the shelf. As regards relative abundance of fish eggs and larvae the preponderance was very definitely within the 100 fathom contour.

INORGANIC PHOSPHATE AND NITRATE—Analyses for inorganic phosphate and nitrate have been completed on all samples obtained on the three cruises for this purpose. These total 371 determinations for phosphate and a like number for nitrate. In order to obtain these, approximately three times that number of individual tests were necessary.

The following general observations appear warranted from data on hand:

Phosphate and nitrate concentrations are extremely low at all levels in waters inside the 100 fathom contour.

In that portion of the Gulf outside the 100 fathom contour extremely low concentrations of phosphate and nitrate exist in the surface waters. Both nitrate and phosphate concentrations rise steadily to a maximum between approximately 450 to 600 fathoms. Below about 600 fathoms the concentrations of phosphate and nitrate decrease slightly.

OTHER CONSTITUENTS IN SEA WATER—Work is in progress with respect to additional constituents of sea water. However, it is not feasible to report on these studies for the present.

GENERAL—Bottom profiles covering cruise routes have been prepared from echo-recordings. To these profiles are being added chemical, physical and biological data to facilitate analysis.

Of interest perhaps are the records of pelagic fishes taken by trolling between stations, and on station during the three cruises. The preponderance of these fish were taken inside the 100 fathom contour, the most abundant of which was the little tuna (**Euthynnus alletteratus**), followed by dolphin (**Coryphaena hippurus**), and king mackerel (**Scomberomorus cavalla**). Beyond the 100 fathom contour few fish were taken and, of these, sharks predominated, followed by dolphin. Records are maintained of size, sex and state of development of the gonads. By such records valuable information on distribution, spawning periods and areas may be accumulated.

It is much too early and data are not sufficient to draw any final conclusions. However, the results to date lend weight to the theory that, in general, the waters of the Gulf of Mexico lying beyond the 100 fathom curve are relatively sterile. Thus we may find that the economy of our fisheries is closely associated with that portion of the Gulf lying inside the 100 fathom contour, the inshore waters and contiguous land areas.

RED TIDE INVESTIGATIONS

In the shallow waters off the west coast of Florida there appears quite suddenly at irregular intervals a peculiar discoloration of these waters known as "red tide." The last occurrences of this "red tide" were observed during the fall and winter of 1946-1947 and the summer of 1947. Associated with these outbreaks are the death of millions of pounds of fish, many of which are valuable food fish, and the contamination of the beaches by the decaying fish which are washed ashore.

The immediate cause of "red tide" has been ascribed to a tremendous abundance of the dinoflagellate **Gymnodinium brevis** Davis which may be found in numbers up to 60,000,000 per quart

of water in the most heavily affected area. The death of fish is evidently caused by a toxic substance or poison of unknown nature which is associated with the occurrence of great numbers of **Gymnodinium brevis.**

OBJECTIVE—Inasmuch as the organism involved—at least for the last "red tide"—is known, the primary objective of the program is to determine what brings about an overgrowth of plankton and of **Gymnodinium brevis** in particular.

METHODS OF ACHIEVING OBJECTIVE—A bloom is a local phenomenon to start with and the factors which get it started may be confined in what we term "cells of water." To establish the validity of this the **Pompano** is engaged in examining what can be termed the "micro structure" of sea water in a very small area. This is done by taking many samples of the water and the organisms it contains as close together as possible in time and space.

A second approach to the problem involves the development of the fundamental mathematical structure of the growth and expansion of a population of organisms in one of the "cells of water" mentioned above.

The third method of attack concerns a physiological study of the dinoflagellates to determine the critical factors regulating their growth and reproduction. Once these factors are established they will be studied as they exist in the open sea and in the "cells of water."

PROGRESS TO DATE

The sampling over a prearranged series of stations extending from the rivers to the 100 fathom contour in the vicinity of Boca Grande for a study of the local oceanography, nutrients and plankton has been completed. The data collected are now being anlysed. One tentative conclusion is that the phosphate picture, in the area covered, is in agreement with the results obtained over the Gulf as a whole, from work with the **Alaska** for waters inside the 100 fathom contour.

All plankton collected during the past year has been examined and the data resulting are being set up on punch cards for analytical studies.

A recent small scale blooming of dinoflagellates in the Indian River section of Florida provided a testing ground for some of the newer ideas on plankton blooms.

Culture studies on the nutritional requirements of dinoflagellates and other marine organisms have been continued at the Service's Beaufort, N. C. laboratory.

The "methods of achieving objective" as listed in the preceding section were adopted during the month of September 1951. Since data collected under this plan are just beginning to accumulate, it is impossible to offer any findings.

GULF OYSTER INVESTIGATIONS

The purpose of the Gulf Oyster Investigations is to find out how to produce more and better oysters with the most economical expenditure of time and money. To achieve this end efforts have been progressed in several directions simultaneously. These different approaches to the problem include an understanding of the following:

The annual reproductive cycle of the Gulf Coast oyster.

The growth pattern of the oyster in relation to the maximum yield of meat.

The importance of parasites and predators in oyster mortalities.
Methods for improving the quality of our stock of oysters.

There are many facets to each of these separate approaches to the problem:

A study of the annual reproductive cycle of the oyster in a particular geographic area is of fundamental importance for a realistic approach to the problems of cultivation. As a background to the investigations, a study has been made of the seasonal production of spawn and its relation to the annual variations in salinity and temperature. Determinations have been made of the length of the spawning season and estimates of the amount of useful spawn produced. Records are now complete for a three-year period. Such records indicate the relative abundance of spatfall during the different months of the year, the survival of this spatfall and the interrelationships between the setting of oysters and other sedentary animals. These data provide information on when

to expect peaks of spatfall, when cultch can be expected to collect a commercially desirable set with a minimum of fouling organisms and how long cultch may remain in the water and still be commercially useful.

Although one might be inclined to discontinue such collections of background data after a period of three years, it has been found that recordings during this time show a considerable diversity in pattern. These studies will continue as long as the results appear fruitful.

A knowledge of the pattern of growth in oysters is most helpful in determining when the oyster planter should bed his oysters, what size is most satisfactory for seed purposes and how long they must grow for him to obtain the maximum harvest. In the early stages of the investigation a series of growth studies was initiated on individuals and on small populations of oysters. These studies have been conducted both in the field and under laboratory conditions. In the past year, these observations have been satisfactorily concluded and a great mass of data is in the process of analysis. These data show the seasonal increases in length and width of the animal, and what is especially important, they show the changes in the internal capacity of the shell and at what age in the oyster the most important changes in this dimension take place. Data collected also show the changes that oysters undergo when they are cultivated as compared to when they are left growing in the wild state. It is believed that the understanding of these data when published will serve as a real incentive to the oyster grower along the Gulf Coast to undertake a more intensive cultivation of his crop.

It has been found desirable to investigate intensively the relations between oysters and the different parasites and predators which are present in the Gulf area. Specific studies cover most thoroughly the ecology of the oyster drill. A two-year survey of seasonal growth rates of this animal has been completed, also, its feeding habits and the damage it does to oysters. Knowledge of the reproductive cycle and larval life and behavior patterns has been extended. These studies were undertaken in the hope of finding some clue to a more efficient control of this pest. So far experiments have been entirely unsuccessful in finding any new, economically feasible method for eradicating the drill.

One of the most important divisions of the research program is concerned with studies of heredity in the oyster. In this program the research consists of two parts. Oysters of known parentage are raised for use in controlled breeding experiments. With stocks of oysters of this type it is hoped to determine the relative importance of genetic factors in controlling growth, quality and resistance to disease.

A year ago the laboratory obtained its first stocks of oysters derived from a single pair of parents. During the past summer these first generation oysters have been crossed to obtain the second generation, that is, the grandchildren of the original oysters. Great difficulty with the culture of larvae was experienced during the summer and a sufficient supply for experimental purposes of second generation oysters is not yet assured.

The second part and corollary of this work is the study of similar factors in oysters of unknown parentage, that is, wild oysters, to determine how much certain characteristics may be controlled by the environmental conditions. During the past year a series of experiments have been completed which show that some of the most desirable qualities of commercial oysters, such as shape, shell appearance, and volume of meat per oyster may be largely controlled by good cultural practices. Work shows just as conclusively that the growth rate of individual oysters is very definitely a part of their hereditary complex. For example, oysters grown under carefully controlled conditions from the time they set until 24 months of age exhibit the most diverse rates of growth when kept in identical environmental conditions in laboratory tanks or when maintained in experimental trays in their natural habitat. The fact that first generation oysters which have been raised in the controlled breeding experiments also show great diversity in growth rates, indicates that the tracing of gene inheritance in the oyster is going to be a most tedious task.

The knowledge that growth rates are inherited, however, affords the greatest hope that by the artificial selection of seed stocks it may be found possible to eliminate slow-growing oysters from the cultivated reefs.

Work on the genetics of oysters assumes dealing with a single race of this animal. There is, however, some question as to whether the oysters growing in the North Atlantic waters represent

a variety distinct from those which exist in the Gulf. In the hope of throwing light on this point, oysters have been transplanted from Chesapeake Bay and are being grown at Pensacola. By following the reproductive development and growth patterns in these oysters and comparing them with Gulf oysters of similar age, it is hoped more information on this question may be obtained.

The main program of oyster research at the Fish and Wildlife Service Laboratory permits, from time to time, the investigation of allied problems which are either of short duration or require a relatively small expenditure of effort. During the past year the hard clam **Venus** was transplanted from New England to Gulf waters. These seed clams were planted in the early spring and by late summer had grown remarkably well. The population, however, was nearly wiped out by the oyster drill and by various crabs. This experiment is only one example of products which may have real commercial value in the Gulf area when methods are found through which predators can be controlled.

PLANS FOR FUTURE RESEARCH

During the past year several of the individual units of research which make up the program of the Gulf Oyster Investigations have been brought to a conclusion. These results are in process of analysis and much time during the coming winter and spring will be spent in the preparation of manuscripts describing the work.

Several new projects have been started at the Pensacola Laboratory, including the life cycles of the boring clam and the stone crab. Approximately 65% of the research time in the new year will be spent on continuing projects such as the seasonal study of the oyster in relation to environmental changes and the work on genetics of the oyster. This means that by next spring approximately 30% of the research time will be available for the initiation of new studies. Tentative plans are to devote some of this time to a more exhaustive study of methods for trapping or otherwise controlling the oyster drill. A graduate student at the Florida State College at Tallahassee is undertaking this fall a survey of the biology of the boring sponges infesting oysters.

BRANCH OF COMMERCIAL FISHERIES

GULF EXPLORATORY FISHING PROGRAM

Since October 1950 explorations by the **Oregon** have been planned to give emphasis to work on brown grooved shrimp, **Penaeus aztecus.** In the course of this work it has been both convenient and profitable to carry on fishing for other kinds of shrimp and to make observations on fish and other marine animals of the Gulf of Mexico.

During the year the **Oregon** traveled approximately 15,000 miles and spent 141 days at sea. Two trips were made into the southern part of the Gulf, one in the winter to the north and east part of Campeche Bank and one in the late summer to the Gulf of Campeche. Aside from these two trips most of the work was carried on in depths of greater than 20 fathoms in areas bordering the five Gulf States.

In many of the areas covered, particularly along the Florida coast, looking for trawlable bottom consumed many days of each trip. Mud lumps, rocks, coral, loggerhead sponges and shell were the major trawling obstacles encountered. A winter of unusually bad weather greatly reduced the number of days when trawling could be carried out without continual destruction of gear.

BROWN GROOVED SHRIMP—The concentration of exploratory effort has been on **Penaeus aztecus.** To date results indicate an unbroken stock of this species from off Pensacola, Florida across the north Gulf down to south Texas. Moderate concentrations of this species were found off Carmen, Mexico in depths of 20 to 30 fathoms. Heaviest stocks found to date have been located in areas where there is a narrowing of the continental shelf, and it is in these areas where the brown shrimp fishery is working at the present time. Between Aransas Pass and Pensacola brown shrimp have been taken in depths of from 19 to 65 fathoms. Between 25 and 50 fathoms they have been taken in every drag, although in varying amounts. Beyond the 50 fathom curve several small concentrations of very large shrimp (up to 3 per pound) were found off Pensacola and along the Texas coast. General information on size, sex ratios, and catch percentage have been recorded.

PINK GROOVED SHRIMP—The **Oregon** has, in the past year, surveyed the areas of the present fishery for pink grooved shrimp, **Penaeus duorarum,** and has attempted to extend the range of the fishing grounds. Following up several reports that pink shrimp are abundant all along the Florida West Coast several areas between Cape San Blas and Key West have been trawled. To date poor bottom conditions have prevented extensive exploration. Several experimental trawls, designed to overcome bottom obstacles, have been constructed. Preliminary tests comparing these trawls to conventional styles have been underway for several months. One design, the bottomless trawl, has proved to eliminate up to 95% of the loggerhead sponges. With this trawl perfected it is hoped that a much more intensive survey of potential pink shrimp beds can be carried out.

While exploring the areas surrounding the Campeche pink shrimp fishery the **Oregon** extended the grounds then being worked approximately 40 miles to the northwest. Throughout this area the bottomless trawl eliminated from 75 to 100% of bottom trash such as coral, sponges, and shell.

RED SHRIMP—The **Oregon,** in exploratory drags made in deeper water, has found one other kind of shrimp in sufficient quantity to be of commercial interest. This is the red shrimp, **Hymenopeneus robustus.** This species has been found continuously between Aransas Pass and St. Petersburg in depths between 190 and 240 fathoms. Both 40 foot try nets and 100 foot commercial nets have been used to establish range and abundance of the red shrimp. Investigations of the extent of the stocks are being continued by the **Oregon.** Other kinds of shrimp have been taken in deep drags, but thus far none except the red shrimp have been found in sufficient quantities to be of commercial interest.

TUNA—No active tuna work has been undertaken to date. All observations have been logged and charted. Several scattered schools of tuna-like fishes have been observed during the past year, however, it wasn't until last September that the **Oregon** was actually able to obtain specimens from observed schools. The species proved to be **Parathunnus atlanticus,** the Atlantic blackfin or bigeye tuna. Extensive schools of these fish were observed east and southeast of South Pass of the Mississippi River early in September. Throughout the past year trolling

lines have been run from the **Oregon** during daylight hours while the vessel was underway. In early August a blackfin tuna weighing 15 pounds was taken in this manner about 75 miles north of Alacran Reef, and though several other trolling rigs were hit and broken at the same time no surface fish were observed.

RED SNAPPER—One trip, in May and June, was devoted primarily to red snapper exploration. During this trip 11 trap sets were made and handlines or electric reels were tried in 28 areas. In addition, during the course of each trip, likely looking areas were fished and uncharted lumps recorded. Since time lost in the location of the best fishing spots is a considerable factor in the reduction of productivity per unit of effort, the use of Loran receiving equipment is being studied to learn whether it can effect important savings in time.

OTHER WORK—Experimentation with midwater trawls was carried out during August and September. A series of 13 drags of different sized trawls were made from two chartered shrimp boats. Additional midwater trawls of different sizes have been constructed for further testing during the coming year.

FINANCIAL REPORT

MOSES, RITTLER & DIENES
Certified Public Accountants
Audubon Building
New Orleans

July 13, 1951

To the Commissioners,
Gulf States Marine Fisheries Commission,
New Orleans, Louisiana.

Gentlemen:

We have examined the accounts of the Gulf States Marine Fisheries Commission, New Orleans, Louisiana, for the year ended June 30, 1951. 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.

We now submit our report on the examination, together with the following statements:

Exhibit "A"—Balance Sheet as at June 30, 1951

Exhibit "B"—Statement of Income and Expenses for the year ended June 30, 1951

Exhibit "C"—Statement of Cash Receipts and Disbursements for the year ended June 30, 1951

ORGANIZATION

The Gulf States Marine Fisheries Commission was organized pursuant to the provisions of Public Law No. 66 of the Eighty-first Congress of the United States, to promote the better utilization of the fisheries, marine, shell and anadromous, of the seaboard of the Gulf of Mexico, by the development of a joint program for the promotion and protection of such fisheries and the prevention of the physical waste of the fisheries from any cause.

The states entering the compact were Florida, Alabama, Mississippi, Louisiana and Texas.

The compact was approved on May 19, 1949 and was ratified by the legislatures of the member states.

FINANCIAL CONDITION

The financial condition of the Commission as at June 30, 1951 is set forth in the Balance Sheet submitted as Exhibit "A".

The cash in the National American Bank, New Orleans, Louisiana, was confirmed by a certificate obtained by us direct from the bank.

All recorded cash receipts were traced to deposits in the bank and the expenditures were verified by inspection of cancelled checks, properly approved authorizations, and other data.

The contributions receivable of $5,000.00 were due from the State of Texas.

Expenditures of $277.60 for furniture and fixtures were found to be proper. During the year under review, a 1950 Model Ford automobile was purchased for $1,645.80. Depreciation of $244.89 on these assets has been charged against income for the year ended June 30, 1951 at the following annual rates:

Ford Automobile	25%
Furniture and Fixtures	10%

The Federal income tax of $292.10 withheld from employees is in respect of amounts withheld from employees during the three months ended June 30, 1951.

OPERATIONS

The operations of the Commission for the year ended June 30, 1951 resulted in a net loss of $336.51. Details of the operations are given in the Statement of Income and Expenses, Exhibit "B", and are summarized as follows:

Income	$ 13,000.00
Expenses	13,336.51
Net Loss	$ 336.51

Under the provisions of Public Law No. 66, the several member states are to make annual contributions for defraying the expenses of the Commission. The amounts of these contributions and their annual due dates are as follows:

	Amount	Annual Due Date
Florida	$ 3,500.00	July 1st
Alabama	1,000.00	October 1st
Mississippi	1,000.00	July 1st
Louisiana	5,000.00	July 1st
Texas	2,500.00	September 1st
Total	$13,000.00	

CASH RECEIPTS AND DISBURSEMENTS

Particulars of the cash receipts and disbursements for the year ended June 30, 1951 are given in the Statement of Cash Receipts and Disbursements, Exhibit "C". A summary of this statement is as follows:

Cash Receipts	$20,633.34
Cash Disbursements	16,115.80
Cash Balance as at June 30, 1951	$ 4,517.54

GENERAL

Fidelity Bond. The officers of the Commission are covered under a fidelity bond in the amount of $30,000.00.

Appreciative acknowledgment is made of the courtesies extended our representatives during the examination.

Respectfully submitted,

/s/ Edw. S. Rittler, C.A., C.P.A.
Moses, Rittler & Dienes
Certified Public Accountants.

Exhibit "A"

BALANCE SHEET

GULF STATES MARINE FISHERIES COMMISSION

As at June 30, 1951

ASSETS

Current Assets:		
Cash in Bank and on Hand:		
National American Bank	$ 4,507.14	
Cash on Hand	10.40	$ 4,517.54
Member States Contributions Receivable		5,000.00
Total Current Assets		9,517.54
Other Assets:		
Revolving Travel Fund—W. Dudley Gunn	250.00	
Meter Deposit	10.00	260.00
Fixed Assets:		
Automobile	1,645.80	
Furniture and Fixtures	730.54	
	2,376.34	
Less Reserve for Depreciation	244.89	2,131.45
Prepaid Expenses:		
Bond Premium		40.00
Total		$11,948.99

LIABILITIES

Current Liabilities:	
Accounts Payable	15.74
Federal Income Tax Withheld	292.10
Total Current Liabilities	307.84
Net Worth	11,641.15
Total	$11,948.99

Exhibit "B"

STATEMENT OF INCOME AND EXPENSES
GULF STATES MARINE FISHERIES COMMISSION

For the year ended June 30, 1951

Income:		
Contribution from Member States:		
Florida		$3,500.00
Alabama		1,000.00
Mississippi		1,000.00
Louisiana		5,000.00
Texas		2,500.00
Total Income		13,000.00
Expenses:		
Salaries	$ 8,136.25	
Stationery and Office Supplies	294.12	
Printing Annual Report, etc.	347.55	
Traveling	2,041.02	
Court Reporting	237.38	
Rent	1,080.00	
Telephone and Telegraph	391.36	
Postage	104.21	
Dues and Subscriptions	6.00	
Electric Lights	44.65	
Insurance and Bonds	117.27	
Accounting	125.00	
Meeting Expense	50.47	
Contributions—Marine Laboratory, University of Miami	100.00	
Depreciation—Automobile	171.45	
Depreciation—Furniture and Fixtures	73.44	
Miscellaneous Expense	16.34	
Total Expenses		13,336.51
Net Loss		$ 336.51

Exhibit "C"

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

GULF STATES MARINE FISHERIES COMMISSION

For the year ended June 30, 1951

Cash in Bank and on hand as at July 1, 1950		$ 8,538.06
Cash Receipts:		
Contributions from Member States:		
Mississippi	$ 1,500.00	
Florida	3,500.00	
Alabama	1,000.00	
Louisiana	5,000.00	
Total Contributions from Member States	11,000.00	
Collections of Federal Withholding Tax	1,078.20	
Refund on Bond Premuim	17.08	
Total Cash Receipts		12,095.28
Total to be accounted for		20,633.34
Cash Disbursements:		
Purchase of Ford Deluxe Sedan	1,645.80	
Purchases of Furniture and Fixtures	277.60	
Accounts Payable	129.64	
Federal Withholding Tax Remitted	979.80	
Salaries	8,136.25	
Stationery and Office Supplies	294.12	
Printing Annual Report, etc.	347.55	
Traveling	2,025.28	
Court Reporting	237.38	
Rent	1,080.00	
Telephone and Telegraph	391.36	
Postage	104.21	
Dues and Subscriptions	6.00	
Electric Lights	44.65	
Insurance and Bonds	124.35	
Accounting	125.00	

Meeting Expense	50.47	
Contributions—Marine Laboratory, University of Miami	100.00	
Miscellaneous Expense	16.34	
Total Cash Disbursements		16,115.80
Cash in Bank and on Hand as at June 30, 1951		$ 4,517.54

BUDGET

GULF STATES MARINE FISHERIES COMMISSION

Fiscal Year 1951-52

Salaries	$ 9,200.00
Rent—Office	1,080.00
Bond and Insurance Premiums	181.50
Accounting Fees	175.00
Telephone and Telegraph	390.00
Electric Lights	65.00
Travel—Personal and Auto	2,500.00
Postage	125.00
Stationery, Printing and Office Supplies	650.00
Subscriptions	10.00
Miscellaneous	25.00
Furniture and Fixtures	200.00
Social Security	90.00
Reserve Fund for Depreciation	504.89
	$15,196.39

Approved by the Commission, October 19, 1951.