GULF STATES MARINE FISHERIES COMMISSION

SIXTEENTH ANNUAL REPORT
1964-1965

To The

CONGRESS OF THE UNITED STATES

And To The

GOVERNORS AND LEGISLATORS

Of

ALABAMA
FLORIDA
LOUISIANA
MISSISSIPPI
TEXAS

SIXTEENTH ANNUAL REPORT (1964-1965)

OF THE

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Of

ALABAMA
FLORIDA
LOUISIANA
MISSISSIPPI
TEXAS

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, Louisiana 70112

GULF STATES MARINE FISHERIES COMMISSION

ROSTER — OCTOBER 1965

Walter O. Sheppard
Chairman

James H. Summersgill
Vice-Chairman

W. Dudley Gunn, Director

Ellen S. Hoover, Office Secretary

* COMMISSIONERS

Alabama

Claude D. Kelley, Director
Alabama Department of Conservation
Montgomery, Alabama

L. W. Brannan, Jr., Senator
State of Alabama
Foley, Alabama

Vernon K. Shriner
Montgomery, Alabama

Florida

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

J. Lorenzo Walker, Representative
State of Florida
Naples, Florida

Walter O. Sheppard
Fort Myers, Florida

Louisiana

Joe D. Hair, Jr., Director
Louisiana Wild Life and Fisheries Commission
New Orleans, Louisiana

Spencer G. Todd, Representative
State of Louisiana
Franklin, Louisiana

James H. Summersgill
Golden Meadow, Louisiana

Mississippi

Charles Weems, Chairman
Mississippi Marine Conservation Commission
Biloxi, Mississippi

Ted Millette, Representative
State of Mississippi
Pascagoula, Mississippi

Joseph V. Colson
Waveland, Mississippi

Texas

J. Weldon Watson, Executive Director
Texas Parks & Wildlife Department
Austin, Texas

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

Virgil Versaggi
Brownsville, Texas

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

SUCCESSIONS ON THE COMMISSION DURING THE YEAR

Vernon K. Shriner	vice	Will G. Caffey, Jr.
J. Lorenzo Walker	vice	Bruce J. Scott

COMMISSION OFFICERS ELECTED OCTOBER 8, 1965

FOR YEAR 1965-66

Chairman: Walter O. Sheppard, succeeding Ted Millette
Vice-Chairman: James H. Summersgill, succeeding Walter O. Sheppard

STANDING COMMITTEES

ROSTER — OCTOBER 1965

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
Dauphin Island, Alabama

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

Charles R. Chapman (4)
Bureau of Commercial Fisheries
Galveston, Texas

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 Board of Conservation
Tallahassee, Florida

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

Terrance R. Leary (2-3-4)
Texas Parks and Wildlife Department
Austin, 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.

James E. Sykes (4)
Bureau of Commercial Fisheries
St. Petersburg Beach, Florida

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

ACKNOWLEDGEMENT

In submitting this sixteenth annual report the Commissioners wish to express their most sincere gratitude for the splendid cooperation 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 sixteen 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,
Walter O. Sheppard, Chairman
James H. Summersgill, Vice-Chairman
W. Dudley Gunn, Director

COMMISSION ACTIVITIES

OCTOBER 1964 – OCTOBER 1965

The Gulf States Marine Fisheries Commission met twice in regular session during the past year. The usual spring meeting was held at Mobile, Alabama, March 18-19. The sixteenth annual meeting was scheduled for October 6-8 at Miami, Florida, in joint session with the Atlantic States Marine Fisheries Commission, which marked the first such meeting of the two bodies. The Commissions met together and in general session the first day. On the second day all delegates participated in a field trip to the Miami Seaquarium and the Institute of Marine Science Laboratory, University of Miami, both located at Virginia Key, prior to attending separate afternoon sessions. Separate sessions were held on the third and concluding day except for a brief final general session. The executive officer of the Pacific Marine Fisheries Commission attended the Miami meeting which afforded an opportunity for the executive officers of the three coastal interstate fisheries agencies to review matters of mutual interest.

In connection with the Mobile meeting the Commission scheduled a session of state and federal pesticides research workers for the purpose of examining the extent of knowledge available on the reaction of pesticides on the fisheries and to discuss possible future research. The Commission's Shrimp Biological Research Committee, composed of state and federal marine biologists, also met during the course of the spring meeting. It was decided by the latter committee to delay publication of an Informational Bulletin (No. 3 in the series) until the spring of 1966 to await the gathering and processing of additional data on the three leading commercial species of Gulf of Mexico shrimp.

At the annual October meeting a session was scheduled to permit discussion between state and federal officials of initial thinking as to programs which might be undertaken under Public Law 88-309, the Commercial Fisheries Research and Development Act of 1964. In latter January 1966 it is expected that a meeting of the Estuarine Technical Coordinating Committee will be held to consider the possible implementation of cooperative state estuarine areas research; such research also a possibility for funding under Public Law 88-309. Coordination of fisheries biological and associated studies among the member

states and the U. S. Fish and Wildlife Service has been a practice over the years.

Commission action of general interest for the period includes the adoption of two resolutions at the spring 1965 meeting. One concerns a request for re-examination and reappraisal by the Secretary of State of the office of Special Assistant for Fisheries and Wildlife to the Under Secretary, in the light of the increasing scope of activity both domestic and international and the heavy duties of that office, and with the purpose of adding a sufficient staff and personnel to cope with the many increasing fisheries problems and matters of vital interest to the domestic fisheries. The second resolution requested that a meeting of industry and state health departments of the Gulf States be held in an attempt to establish uniform standards for interstate shipments of shellfish. The meeting was held May 7 at New Orleans. At the annual meeting a committee of three was appointed to look into the subject of a resolution which was presented for Commission consideration regarding the automation potentialities for the shucking of oysters.

The pages to follow present in summary certain research activities being progressed by those agencies most closely associated with the Commission. These cooperating agencies include: The Alabama Department of Conservation, the Florida Board of Conservation, the Louisiana Wild Life and Fisheries Commission, the Mississippi Marine Conservation Commission, the Texas Parks and Wildlife Department, the U. S. Bureau of Sport Fisheries and Wildlife and the U. S. Bureau of Commercial Fisheries.

Continuing the plan of rotating regular meetings among the member states, the interested public is cordially invited to attend the following scheduled 1966 meetings:

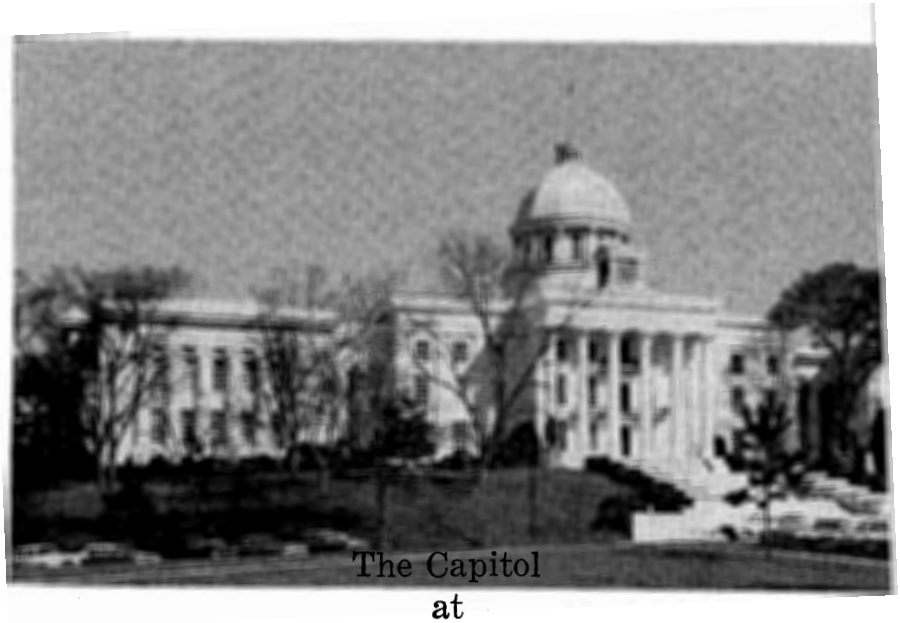
Biloxi, Mississippi, March 17-18

New Orleans, Louisiana, October 20-21

STATE ACTIVITIES

OCTOBER 1964—OCTOBER 1965

ALABAMA



The Capitol
at
Montgomery

The survey of the biomass of Mobile Bay and M Sound by the Alabama Department of Conservatior stricted this year to a concentrated effort in Grand data collected to date is being analyzed by the Uni Alabama's computer center and three masters' theses written on parts of this project.

The artificial fish haven project was continued a ginning to produce sufficient data for statistical analy liminary analysis indicates that the havens do produce ful sport fishing and while large groups of havens more fish than small groups, the increase is only slight not justify the increased cost of the large groups. Als of less than 40 feet are not as effective as deeper wate

With the help of the U. S. Public Health Service Alabama Department of Public Health, we began mo the pesticide levels in the waters and shellfish of Mobil

Preliminary investigations on the feasibility of oysters from rafts in Alabama waters were begun this

If the initial study shows promise, this will be continued on a larger scale.

SHRIMP

Shrimping activities continued throughout the fall and spring with moderate but steady catches being reported. Prices remained fairly stable. A good strike of shrimp was experienced in the eastern end of Mississippi Sound in April and close surveillance for small shrimp was begun. With the advent of these small shrimp, the season was closed in all Alabama inside waters during the middle of May and was reopened on June 17th. All waters were open for day and night shrimping (except for permanently closed areas) and size counts were strictly enforced. There have been very few violations in this respect during the entire season.

Since 1960, boats shrimping on the inside waters of the State of Alabama have been limited to one trawl, the length of which could not exceed 50 feet. However, effective May 1, 1965, a regulation was promulgated permitting these fishermen to use 2 trawls, if the combined length of these 2 trawls did not exceed 50 feet. Quite a few fishermen licensed their boats for this change but it is not known at this time if it brought about an increase in their catch.

OYSTERS

The Alabama oyster industry during the past season operated almost entirely on the planted oysters and shell in Grand Bay, Portersville Bay and Shell Bank Reef. This was a result of program planning and the cooperation of the oystermen throughout the area. This past season, the large producing beds off Cedar Point had just started to recover from a severe die-off of the spring before when they were closed by the Alabama Health Department because of pollution. Upon this closure order, the Mobile County oystermen moved into Grand Bay and by carefully working the oyster beds in that area, which had been planted since the 1961 season, continued throughout the rest of the oystering season. As a result of this planting, and the care exercised by the oystermen, there was no loss of working days this year because of pollution.

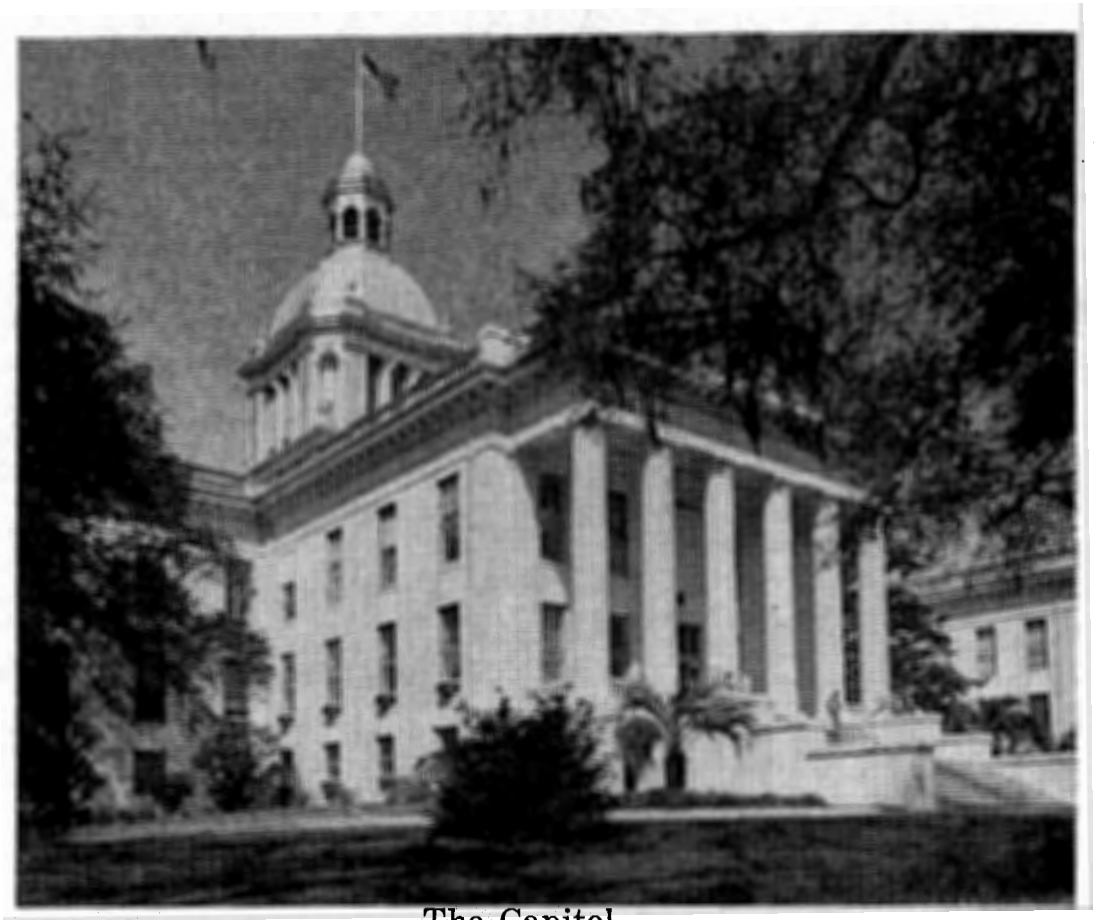
This year there was planted by the Department 15,160 barrels of seed oysters in Portersville Bay, 5,892 barrels in Heron Bay, 12,460 barrels in Grand Bay and 2,000 barrels on

Sand Reef off Dauphin Island, 3,416 barrels on Shell Bank Reef and 6,770 barrels in Fish River Reef. In addition to the above named seed oyster plantings, the Department is in the process of planting approximately 40,000 barrels of shell which have been collected from local oyster houses and stockpiled at various points in Mobile County. These shells will be planted in Mobile County in areas not subjected to pollution and fresh water mortality. At the same time the local contractor of dead-reef shell has replanted 20,000 barrels of shell for seed oyster production to offset the effects of dredging of an area off Point Clear in Baldwin County that was of good bottom characteristic but had no oysters on it at the time of dredging.

The Department of Conservation completed the construction of a shallow draft planting barge which will make possible throughout the year, the dredging and planting of seed oysters together with the planting of shell.

The Department of Conservation has increased the legal size of oysters in an attempt to improve the quality of the harvest material. This has brought about a great demand for the Alabama oyster. The oyster season has remained open throughout the entire year and in so doing has enabled the legal employment and operation of oyster houses to meet the demand for this material.

FLORIDA



The Capitol
at
Tallahassee

BOARD OF CONSERVATION—MARINE LABORATORY
ST. PETERSBURG, FLORIDA

RED TIDE STUDIES

Chemistry: Studies indicate thiamine and biotin could be as important to marine organisms as Vitamin B-12. Methods are being developed to learn more about biotin and thiamine in seawater.

Intensive river sampling is being conducted in both North and South Florida to determine the water's carbohydrate and amino acid content.

The river water is also being analyzed for Vitamin B-12, iron, sulfate, chloride, phosphate, nitrate, silica, chromate, manganese, copper, boron, and phenol content.

Phytoplankton: Routine sampling activities have continued in likely "Red Tide" areas of the Gulf ranging from Marco Island to Tarpon Springs.

Artificial Cultivation of Phytoplankton: Approximately 40 phytoplankton species have been isolated and grown under laboratory conditions.

This culture work has led to five publications on microscopic algae. The algae described may have a nutritional link or serve as indicator organisms for the "Red Tide".

Bacteriology: A paper dealing with bacterial isolates from an earlier "Red Tide" outbreak in Apalachee Bay will be published.

Identification work is continuing on the marine bacteria found at "Red Tide" stations in the Gulf.

FISHERIES

Oysters: (Laboratory) findings indicate dissolved glucose can be utilized by adult oysters in minute amounts. The quantity used is so small it would not affect oyster quality.

Feeding studies are continuing and will involve such nutrients as dried skim milk, finely ground corn meal, cornstarch, wheat and rice flour, plus ground dried seaweed.

Work has been initiated to determine the adult oyster's growth response to microorganisms such as algae and bacteria.

(Rehabilitation) As of July 31, 1965 there were 272 oyster leases totaling 7,839 acres. This is a new Florida record.

In a joint operation the Florida Board of Conservation and the Tampa Port Authority had eight barge loads of oyster shell planted in Upper Tampa Bay. The purpose was to create public oyster bars and enhance the area's recreational facilities.

(Depuration) Twelve experiments have been completed with an experimental pilot system using ultra-violet light as the bactericidal agent. The results indicate that problems imposed by a commercial operation could be overcome.

A paper dealing with depuration experiments in Florida was presented at a convention of the National Shellfish Association in Baltimore, Maryland.

Fishes: Accumulated fish tagging data is being summarized.

The study dealing with the red grouper's life history is continuing.

A field key dealing with Florida sharks has been prepared and published.

An extensive program of sampling for fish and invertebrates out to 50 fathoms off Pinellas and Lee counties was initiated.

The research vessel Hernan Cortez will be used on a three cruise series in Gulf waters as a part of Project Hourglass. The project's twofold purpose is to provide a broader latitude of sampling for marine research and to learn more about Florida's commercial fishing potential.

Exploratory Fishing: Algae. Collection and identification of algae found along Florida's West Coast is in progress.

Spiny Lobster: Lobster larvae identification in planktonic collections is continuing.

A lobster larvae bibliography is being compiled and will be published.

Studies are continuing at the Stuart field station on the spiny lobster's post larval ecology.

Clams: A shallow water survey of clam beds in Tampa Bay has been completed and data is being developed that will correlate them to bottom types.

Plankton: Detailed studies are now progressing involving blue and stone crab larvae in the Tampa Bay area.

A new research program concerning larval fishes in Florida waters is underway.

Library: Exchange agreements for world wide reprints and other publications have been expanded.

Since January 1, 1965, 693 reprints have been added to the library. By the end of 1965 we expect to reach a total of 1200. This figure would represent a new high for annual growth.

Shrimp: The shrimp studies starting in 1955 are terminated. Two publications dealing with commercial shrimp from Northeast Florida's coastal waters and the seasonal distribution for penaeid larvae and post larvae of the Tampa Bay area have recently been published.

Survey and Management: The normal work of reviewing coastal projects detrimental or beneficial to marine resources is continuing.

The publication of pamphlets and educational material about marine resources is being accelerated.

The Capitol
at
Baton Rouge

All construction at the Grand Terre laboratory of the Louisiana Wild Life and Fisheries Commission including the jetties was completed in late 1964 and early 1965. Unfortunately the September hurricane caused extensive damage to the marine laboratory and to the various camps on the oyster reservations. It is estimated that damage at the laboratory, involving mostly equipment and outbuildings will approximate $100,000. The main buildings and dormitories were not seriously damaged. It is expected that it will take from six months to more than a year to re-establish the facilities to their original situation.

Shrimp Studies

Shrimp studies in 1965 essentially followed the patterns of previous years. Attempts were made to expand the studies coast-wide particularly for postlarva by the use of sea planes in sampling. General results indicated postlarval densities were less than in 1964 but considerably higher than any other previous year. Juvenile densities were significantly higher than any year except 1963. This was reflected in a catch through the month of August in excess of 23 million pounds. This is greater than any year excepting 1963 for the eight-month period. Subsequent to August white shrimp catches were extremely light though it was expected that the later white shrimp production would be normal. Unfortunately, the center of the Louisiana coast was swept by hurricane Betsy and at this time it is impossible to determine present conditions on the shrimping grounds. It is hoped that the remainder of the season will be normal, if so we can expect shrimp production to be excellent.

Hydrographic Studies

Hydrographic information in Louisiana is available as in past years through the month of August; however, hurricane damage to all instruments makes it probable that no continuous information will be available from September 8 for the remainder of the year.

Oyster Studies

Work on oysters in Louisiana has been continued in a fixed pattern and degree of activities commensurate with the demands of the industry. Again in 1965 it was not deemed necessary to plant shells as cultch. However, it had been planned to plant shells during 1966 and hurricane damage to the natural reefs makes it mandatory. It is expected that the large shell plantings will be financed in part by the new federal monies under Act 88-309. Initial production for the natural reefs for the first week of September indicated nominal production; however, hurricane damage on natural reefs and on leased grounds indicates that the entire season may be a loss. Considerable acreage of private leases is now covered with silt and early plantings of oysters have been destroyed. Some oysters are still available on the seed grounds, however, it is improbable that a full planting can be expected for this season. Many oyster boats were

totally destroyed, most of the oyster canners were destroyed, and practically all of the private oyster camps. It will take a considerable period of time for the oyster industry to regain its original status as the number one producing state in the nation.

MISSISSIPPI

The Capitol
at
Jackson

GULF COAST RESEARCH LABORATORY

During the summer of 1964 classes in marine geology and biology were taught at the Laboratory and Summer Institute for selected high school students and teachers was also held. One hundred and four students were present during the season.

Sampling of postlarval shrimp was carried on throughout the whole year with the exception of December and January. Past experience has shown that incoming postlarvae are so scarce at that time it is not worth the effort to try to sample them. In the summer and fall of 1964 the average catch of post-

larval white shrimp was greater than in 1963. The Mississippi Sound catch of white shrimp (August through December) in 1964 was almost double that for 1963. Average salinity at postlarval sampling stations was considerably lower in 1964. A reduced sampling program in the spring of 1965 indicated an abundant supply of brown shrimp would be available to the fishery when the season opened. These indications were borne out by a good catch in Mississippi Sound waters. The current scarcity of white shrimp was indicated by low postlarval numbers early in the white shrimp recruitment period.

In April of 1965 transfer of the administrative offices, museum, and library was made from the R. L. Caylor Building to the new Oceanography Laboratory. The Caylor Building was rearranged on the inside to accommodate the National Science Foundation Marine Geology Conference which was operated jointly by the Laboratory and Millsaps College during the month of June. The thirty participants were all college professors.

The National Science Foundation approved a request for funds to support independent summer research projects by graduate students.

In the latter part of the fiscal year soil tests were made on the sites of the new dormitories and shop.

Mississippi Marine Conservation Commission

On July 7 the Mississippi Marine Conservation Commission accepted delivery of a surplus LCM, a self-propelled landing barge. It was decked over and used for shell planting and the moving of seed oysters.

Up to the end of July there was a very light summer mortality of market oysters on the offshore reefs, except for one reef 4½ miles off shore where the intrusion of salt water brought an invasion of the oyster drill, *Thais*. By the end of August summer mortality of 20 to 25 per cent was apparent on most reefs. Low salinities brought on by spring rains did not annihilate the drill population in Mississippi Sound.

The oyster tonging areas were opened September 1 but due to the hot weather, the condition of the oysters was poor at that time. The oyster dredging season was opened on February 15 and closed on March 9.

Patrol activities in the western part of the Sound were increased in December to prevent poaching on closed reefs by local and out of state boats.

During April there occurred a slight oyster mortality due to fresh water brought on by heavy rains in the southern part of the state. Salinities in all oyster areas fell below 2 parts per thousand for as long as two weeks. However, water temperatures were low and the mortality was negligible. Apparently the oyster borers were killed by the fresh water. In April the Commission started moving seed oysters from overcrowded areas to new areas and to some parts of the tonging reefs.

The total oyster production during this fiscal year was 93,000 barrels.

On April 30 all inshore waters were closed to the taking of shrimp.

During the month of April the Commission replaced the patrol vessel Hancock with a more modern boat.

In May of 1965 the Commission passed an ordinance prohibiting the creation of artificial fishing reefs without the sanction of the Commission.

The Commission placed buoys one mile offshore in Harrison County to mark the distance the menhaden fishing vessels should stay from shore.

TEXAS

The Capitol
at
Austin

Shrimp Project

A study to determine growth rates, movements, sizes, seasonal population levels and habitat requirements of commercial shrimps, while in the estuaries, is being conducted. To acquire this knowledge (needed for proper management) samples of shrimp are collected systematically with trawls and seines in each large bay system of the coast. This project is in its seventh year.

This year brown shrimp *(Penaeus aztecus)* were relatively abundant in all major bay systems in the spring. The success of offshore shrimping depends on the survival and growth of these shrimp before they invade the deep Gulf waters. Intensive bay shrimping, predation, and detrimental changes in the estuarine environment are dangerous limiting factors. When the Gulfward movement began in late May the brown shrimp were abnormally small. This smaller departure size may reflect changes in water condition (mainly fresh water influx) along

the upper coast. The influence, if any, this will have on future offshore shrimp catches is not now known.

To date, samples of white shrimp *(P. setiferus)* are indicative of a low population level; however, large waves (or groups) of this species often appear later in the year. Further comment on the status of white shrimp, at this time, would be premature.

Plankton Study

The plankton study for the past year involved studies of post-larval shrimp and fish and both larval and post-larval crabs. Activity consisted of semi-weekly samples with meter and half-meter diameter hoop plankton nets of millimeter square mesh in Galveston Ship Channel, Matagorda Ship Channel, Pass Cavallo, Cedar Bayou Fish Pass, Port Mansfield Pass, and Brazos Santiago Pass at Port Isabel. Weekly samples were taken with the meter hoop net and with a 3 by 1 foot beam trawl of millimeter mesh in the Port Aransas Ship Channel. All of the hoop nets used employed a flow meter to measure volume of water sampled. Pertinent hydrographic data were recorded from all stations.

Brown shrimp post-larvae measuring 12 to 13 mm. in length were taken in January at Port Aransas, Galveston, and Cedar Bayou with the latter containing the largest number. In February browns at a size of 11 to 13 mm. became more abundant; Cedar Bayou again producing most with 440 in the early monthly sample. The post-larvae continued to increase in abundance through April. March produced the greatest number; Cedar Bayou alone producing almost 1500 specimens in the sample. In April most of the browns were caught in the southern passes. Numbers of post-larval browns decreased through August.

White and pink shrimp began to appear in the samples in May and increased through June and July. Generally, fewer whites were caught. Noticeably smaller than other penaeids, the post-larval whites measured 5.6 mm. in length in May to 8.4 mm. in length through July. Channels producing the greatest numbers were Matagorda and Port Aransas.

Larval and post-larval crabs were caught in most samples from January through August in all channels. March and April were months of greatest abundance with Cedar Bayou Fish Pass producing an estimated 47,000 specimens in the end-of-month

sample. Extensive work on identification was begun on forms taken in the samples.

The most abundant associated crustaceans in the samples were copepods. *Mysids, Lucifer sp.,* and *Acetes sp.* were also common.

The most common post-larval fish taken consistently along the coast were menhaden which were most abundant in March, the Cedar Bayou sample producing 1500. Anchovies were common and most abundant in May and June. Pinfish were very abundant in March and April in Cedar Bayou and Port Mansfield Passes. In March most of the *Sciaenidae* and flat fishes were caught, again in Cedar Bayou. March was apparently the month of most abundance from January through August, and Cedar Bayou the pass most productive, due to the shallow restricted sampling area.

This initial segment was used to test the effectiveness of the sampling gear and to plot the ecological profile of the channels.

No definite correlation of hydrographic conditions with catch has as yet been determined for the period covered in this report.

Crab Project

The purpose of the coastwide crab project is to determine seasonal abundance, movements, growth rates, and habitat requirements of the blue crab, *Callinectes sapidus.*

Three waves of juvenile crabs were detected on the upper Texas Coast, while only two were apparent from San Antonio Bay, southward. Estimated growth of the spring group varied from 10-18 mm. per month.

There appears to be a decrease in the available crab stocks along the coast from north to south. This trend was apparent in commercial landings as the Galveston Bay - Sabine Lake area produced 60 per cent of the total Texas crab production.

About 2.3 million pounds of crabs (live weight) were landed in Texas in 1964; however, landings in 1963 were 700,000 pounds higher. Galveston Bay crab landings increased 90 per cent over the previous year's production, while those in Matagorda and Aransas Bay areas decreased sharply.

Information on the commercial crab fishery such as sizes caught, catch per unit of effort, sex composition, and meat yield is being obtained by systematic sampling of the commercial catch.

Field biologists are continuing present sampling techniques in an effort to establish an index of relative abundance of juvenile crabs which can be correlated to subsequent sub-adult and marketable adult crab populations.

Crab tagging on the upper Texas coast has been intensified, with special emphasis on female and sponge crab tagging in the lower bay.

Legislation to protect the egg-bearing female crab was passed by the 59th Legislature and will become effective in September.

OYSTER PROJECT

Oyster reef sampling was continued in the Galveston, Matagorda and San Antonio Bay systems but was discontinued in Aransas Bay and South Bay. Studies of mortalities among tray-held oysters were continued in Galveston and Aransas Bays. A preliminary study of the southern quahog *(Mercenaria campechiensis)* was initiated in Galveston Bay and South Bay.

The 1965 spring set of oyster spat was moderate to heavy in some areas of Galveston Bay, light in others. Spring flooding of the Trinity River may have curtailed spawning and setting. The Matagorda Bay set appeared to be light and survival of the spat was poor. Setting was also light in San Antonio Bay and, possibly, retarded by flood waters.

Seed oyster stocks declined slightly in Galveston Bay. Heavy mortalities occurred among seed oysters in Matagorda Bay during fall and winter 1964 and again in spring 1965. Seed oyster stocks were low in San Antonio Bay due to mortalities in 1964 but recovery was noted in some areas during 1965.

Market oyster stocks in Galveston Bay generally remained stable during 1965 although mortalities appeared to be increasing in August. Market oysters were scarce in Matagorda and San Antonio Bays.

Dermocystidium marinum was primarily responsible for mortalities among Galveston Bay oysters and was associated with fall mortalities in portions of Matagorda Bay. However,

"Aransas Bay disease" appeared to be the primary cause of mortalities in Lavaca and Matagorda Bays and was believed responsible for the 1964 mortalities in San Antonio Bay.

A record oyster harvest was reported for the 1964-65 season with the majority of oysters harvested in Galveston Bay. The increased production did not appear to be associated with an increased supply of market oysters but was due to an increase in fishing pressure.

FINFISH

Fish sampling continued with special emphasis on juvenile and adult trout, redfish, black drum, sheepshead and flounder. Principal juvenile sampling was accomplished with 6-foot bar-seine and 60-foot minnow seine. Adult fish were sampled with trammel nets and drag seines. Sampling was modified in all areas during the year to reduce the number of negative and insignificant samples and to increase significant samples in an effort to predict and indicate population trends of each species in each bay system. A preliminary analysis of field data indicates a successful spawn of all important food and game species over the entire coast. No significant change in numbers of adult fish in 1965 over 1964 was noted as changes in methods, periods and locations of sampling made comparisons difficult.

PESTICIDE MONITORING PROJECT

This study was initiated in July 1965 in cooperation with the Bureau of Commercial Fisheries, Fish and Wildlife Service. The presence of significant quantities of pesticides in the estuarine nursery areas could seriously affect production in the commercial and sport fisheries.

Oyster samples, taken from Galveston, Matagorda, San Antonio, Aransas, Corpus Christi, and the Lower Laguna Madre Bays were processed and sent to the Gulf Breeze Laboratory for analysis. Results of the first months samples showed traces of chlorinated hydrocarbon pesticides in Corpus Christi and Tres Palacios Bays.

GENERAL

Hypersalinity, prevalent in Texas Bays in 1964, was reduced slightly by increased rainfall in the spring of 1965. No major

freezes or severe storms occurred and conditions were more nearly normal than at any time since 1960.

The Port Aransas Gulf reef was enlarged with concrete material and both this reef and the one at Port Mansfield were marked with unlighted "nun" buoys, replacing lighted buoys.

The Capitol
at
Washington, D. C.

U. S. FISH AND WILDLIFE SERVICE ACTIVITIES

OCTOBER 1964—OCTOBER 1965

Bureau of Sport Fisheries and Wildlife

Primary activities of the Bureau of Sport Fisheries and Wildlife as they relate to the Gulf States Marine Fisheries Commission have continued to be work conducted under the authority of the Fish and Wildlife Coordination Act. New, and certainly of interest to the Commission is the current planning for establishment of two sport fisheries research laboratories along the Gulf Coast. Location and site selection for the two facilities are presently underway.

Investigations and status reports of items under the authority of the Coordination Act meriting attention include the following projects:

CENTRAL AND SOUTHERN FLORIDA WATER NEEDS

The Corps of Engineers' review of water requirements for Central and Southern Florida is in its second year of study. Drought conditions in South Florida have this year focused national attention to the water needs for the Everglades National

Park. Also, a better appreciation of the dependence of the Tortugas shrimp fishery upon the estuarine zones within the Park has been reached. The needs and establishment of water requirements for this fishery will undoubtedly continue to be an item for consideration by the Commission.

Comprehensive Review Report—Mississippi River Tributaries Project

The report is currently under consideration by the Congress and to date the recommendations for fish and wildlife features contained and have received favorable consideration. Of prime importance to the Commission is the freshwater diversion facilities which will afford discharge of Mississippi River waters into the coastal marsh and estuarine complex below New Orleans. The facilities are designed to offer water-quality management for fish and wildlife purposes.

Other Major Type Changes

In addition to the two specific projects discussed above, three categories of land water-use changes occurring along the Gulf Coast merit attention. As populations continue to increase in coastal areas, similar changes will undoubtedly accelerate. Accordingly, the single and combined effects of the project types listed does point up the urgency for area development of a multiple-purpose plan of coastal areas if all public interests are to be considered. Because of the importance of the fishery to the public interests, the Commission is an ideal medium for such action.

Estuarine Habitat Conversion

Several estuaries along the coast are under consideration for development from marine to fresh-water habitat. Provision of fresh water for municipal and domestic purposes is the objective of the conversion.

Beach Nourishment

A common practice in beach nourishment works is to dredge fill material from adjacent bay bottoms. In many instances this procedure is in direct conflict with fishery needs; therefore, the requirement for alternative methods for beach nourishment are evident.

Dredge and Fill Operation

Conversion of bay bottoms to filled-land areas continues to increase along the entire coast. If features cannot be developed and included in the project construction to mitigate detrimental effects to the fishery, some improvement in the total public approval for this particular type of land and water-use change is needed.

Bureau of Commercial Fisheries

The outlook for assessing the marine resources in the Gulf of Mexico, Caribbean and South Atlantic waters has been enhanced by the award of a contract for the construction of a $2 million vessel to replace the veteran exploratory fishing vessel Oregon. Construction time will be approximately two years. Construction of the research vessel for the Galveston laboratory has been delayed because of rebidding procedure which was required as a result of all previous bids far exceeding funds available. Research programs remained at approximately the same level except for increased emphasis on pesticide research. All of the Bureau programs in this area are directed by the Regional Office at St. Petersburg Beach, Florida. Program activities also are coordinated with recommendations from the Gulf States Marine Fisheries Commission. A summary of Bureau activities for the year ending September 30, 1965 follows:

Gulf of Mexico Exploratory Fishing and Gear Research Pascagoula, Mississippi

Bottomfish

A preliminary survey of the bottom-trawl fish potential of Florida west coast waters was conducted cooperatively by the Florida Board of Conservation, Division of Salt Water Fisheries, and the Bureau. The objectives of the survey were to obtain information on the availability, stock composition, and distribution of the bottomfish fauna within the 5-to-50-fathom depth range between Panama City and Dry Tortugas.

The Florida State research vessel Hernan Cortez was used to conduct the trawling operation which lasted from late April to mid-July. Fish catches were generally small. Vermilion snapper, red grouper, grunts, goatfish, and two species of sea bass provided the only indications of commercial significance. Poor

trawling bottom was encountered over most of the survey area, with frequent tears, hang-ups, and trawl damage. As a rule though, the modified New England trawls proved adaptable to the prevailing rough bottom conditions.

Although the results of the survey were not encouraging it is felt that additional explorations are required before conclusive results can be reached. A summary report of this survey was released.

A study to evaluate the common eel *(Anguilla)* resource of the Biloxi-Pascagoula River Basins is underway. Eel pots fished in the Pascagoula River during May and early June produced few eels, presumably due to lack of rainfall. Blue crabs, normally found in salt and brackish water, were captured in the eel traps set at least 20 miles from the river mouth. After a rainfall a trap set in the Bayou Casotte area produced twenty-five pounds of eels (forty individuals) and two fished near a Biloxi shrimp plant produced forty pounds (sixty individuals). A report will be issued when the survey is completed.

PELAGIC FISH

During the Hernan Cortez fish trawl explorations, troll lines fished between stations produced several king mackerel, Spanish mackerel, and little tuna. Large concentrations of the latter were seen in the 10 to 20 fathom depth area west and southwest of Cape Romano. Observation of surface schools, identified as Spanish sardines and round scad, were in the vicinity of Cape San Blas, Tampa Bay, Ft. Myers Beach, and Cape Romano.

A project proposal to survey the shark resources of the southeast Gulf has been submitted for consideration.

SHELLFISH

The equipment and material to initiate the evaluation of shark meat as a substitute bait for blue crab pots have been acquired; the project started during the middle of August.

Except for minor results obtained from the Florida bottomfish trawl survey, no explorations were conducted in the Gulf exclusively for shellfish. At least three species of Spanish lobsters (bulldozers) *(Syllarids)* were taken off the Florida west coast in fish trawls. Commercial sizes were captured in 59 out

of 210 trawl stations made, in depths from 10 to 50 fathoms from the Dry Tortugas area to Cape San Blas.

FAUNAL SURVEY

The transfer of the Oregon to St. Simons Island, Georgia, early in July 1964 redirected major station emphasis to the faunal survey program. Since that time, initial planning and development of fishery resource atlases has occupied the staff. Progress has been made on an atlas for the inshore Gulf shrimp fishery and preliminary designs for calico scallop and industrial bottomfish atlases.

Automatic data processing capabilities were expanded this year through the utilization of high speed hardware. Programming on the UNIVAC 1004 III data processor has provided the means for expressing catch data in terms of availability. These data have become invaluable in the evaluation and delineation of exploited and non-exploited resources. Additional project accomplishments include expansion of the phylogenetic code to include species coding and the compilation of phylogenetic listings for the fish and crustaceans collected by exploratory vessels. Approximately 1200 species of fish have been collected, many of which show indications of commercial potentiality.

A total of 156 lots containing some 110,000 specimens were shipped to the scientific community. Returned identifications expanded the card file by some 12,000 cards, emphasizing the valuable service rendered to both participants. Efforts were made to reduce the accumulation of specimens and to keep pace with new exploratory collections in order to expedite the dissemination of scientific materials.

MENHADEN

Off-season explorations were conducted from November 1964 to March 1965 in the eastern Gulf. Objectives were to determine the presence and availability of menhaden and related species, to study any migratory patterns noted, sample areas in and beyond traditional fishing grounds, determine operational conditions for both spotter aircraft and fishing vessels, and cooperate with the Bureau's Biological Laboratory at Beaufort, North Carolina in the collection of menhaden, other clupeids, plankton samples, and other data.

The program was based on two simultaneous operations, aerial scouting and gillnet sampling.

Aerial operations during the period of this report were between Pascagoula, Mississippi and the Florida Keys. Five monthly scouting flights were made beginning in November and some 1,355 fish schools were recognized during four of the flights. No schools were seen during the February flight which was made during a period of adverse sea and weather conditions caused by passage of a cold front through the area. Flights were made in a chartered aircraft equipped with an infrared radiation thermometer used to measure sea surface temperatures. The data collected during 163 aerial scouting stations were recorded in the Pascagoula ADP files.

Gillnet sampling was conducted during four monthly cruises of the George M. Bowers, beginning in December. Sampling was carried out within the 20-fathom curve between Panama City and Cedar Key, Florida. Adverse sea conditions curtailed operations to some extent and most stations were in ten fathoms or less in the Port St. Joseph-Carabelle area. Adult menhaden were taken during each month, December - March. Yellowfin menhaden, *B. smithi,* were caught during the cruises in December and March, and large-scale *B. patronus,* the principal commercial species in the Gulf, were taken each month. Sampling stations were made at random depths and at locations of fish recorded on the echo sounder. No surface schools of menhaden were recognized during gillnet operations; however, sets were made on surface schools of Spanish sardines, *Sardinella sp.*

During all operations cooperation was extended to other interested research agencies and to industry. The BCF Biological Station in St. Petersburg Beach received the sea surface temperature data collected on each flight as did the Oceanography Department of the Gulf Coast Research Laboratory, Ocean Springs, Mississippi. A commercial menhaden spotter from one of the menhaden companies participated in the February flight. A biologist from the BCF Biological Laboratory, Beaufort, North Carolina, participated in each sampling cruise and in one scouting flight. All menhaden specimens and plankton samples collected were furnished to the Beaufort Laboratory.

Flight and cruise reports were prepared and distributed after each monthly activity. A summary report of the season's activity has been submitted for publication.

Gear Research and Development Station
Panama City, Florida

Gear Research

The program at this station has been concerned principally with development of an electric shrimp trawl and the development of camera systems capable of recording the reactions of marine organisms. Development of the electric shrimp trawl embraced two projects, (1) to determine the behavioral response of commercial species of shrimp to varying electrical impulses under different oceanographic conditions, and (2) application of this information to the engineering design of the trawl. The project devoted to the development of camera systems for recording reactions of marine organisms in the natural environment has been productive of data useful in the gear and behavior studies. In these studies, it has been indicated that shrimp burrowed in the sea bottom leave their burrows more rapidly when stimulated with an increased voltage. There also appears to be a correlation between voltage and escape patterns. Studies on these will be conducted in order to determine their application to engineering modifications in the electric shrimp trawl.

Fishing gear trials conducted in three different areas in the Gulf of Mexico with a shrimp trawl equipped with the new battery-powered pulse generator indicated, in most instances, a slightly higher catch rate over the non-electric net, when both nets were fished simultaneously at night. However, the daytime catch rate was insignificant and indicated considerable effort would have to be expended to improve the overall performance of the electric shrimp trawl. This involves reexamining the existing electrical parameters to determine the degree the system would have to be modified or redesigned. After such modification, performance will again be checked in field tests.

Biological Laboratory
Galveston, Texas

A modest allotment will permit a start on the Gulf oceanographic program during FY 1966. The funds are sufficient to provide only a minimum staff with which to begin analyses of data already collected.

After investigating and concluding that the stocks of bottom fishes harvested by the industrial trawl fishery in the north-

ern Gulf of Mexico were not being overfished, this research program was phased out.

Shrimp Biology

In conjunction with investigations of the distribution, abundance, and survival of larval shrimp in waters over the Continental Shelf of the northwestern Gulf, a short-term study on the vertical distribution of shrimp larvae was completed and a manuscript submitted for publication. Research on the distribution and abundance of pink shrimp larvae on the Tortugas fishing grounds was completed under contract and a report is being prepared by the University of Miami.

The tabulation and analysis of oceanographic and meteorological observations made during monthly research cruises in the northwestern Gulf continue and two years' data are being prepared for publication. In addition, refined, short-term studies designed to measure ocean currents in shrimp spawning areas have been successfully completed.

A major accomplishment during the period covered by this report was the successful rearing of larvae of the commercially important pink and brown shrimp in small mass cultures. This development of a mass culture technique will permit rearing of large numbers of larvae for detailed physiological studies.

A study was initiated in December to determine the feasibility of rearing shrimp in ponds under seminatural conditions. The initial experiment is still in progress, however, results suggest that it may be possible to rear brown shrimp postlarvae to marketable size.

Following the development of a satisfactory sampling device, systematic sampling was begun in several areas in Florida Bay to study the ecology of the juvenile pink shrimp. Although preliminary in nature, results indicate a definite zonation of shrimp and associated organisms. In addition, postlarval movement into the bay is being studied in an attempt to derive an abundance index which can be used to predict the size of the resulting offshore population.

Shrimp Dynamics

Success in predicting brown shrimp abundance on offshore trawling grounds from earlier densities of postlarval and juve-

nile brown shrimp in estuarine nursery areas has led to an expansion of our former sampling program. Collections of post-larval shrimp are currently obtained on a routine schedule from four areas on the Texas coast and information pertaining to juvenile shrimp is collected from three bay systems. Also, a study has been started to determine how year-to-year differences in shrimp growth may be associated with changes in abundance.

Analyses of commercial landing statistics produced evidence that annual fluctuations in shrimp abundance result from environmental conditions affecting broad areas of the Gulf. Stock levels of geographically separate pink and brown shrimp have varied in the same manner during an eight-year period. The abundance of white shrimp during a given year seems to be independent of the other two species and to some degree related to the salinity of coastal waters during spring months.

Mark-recapture experiments were conducted to measure the growth, mortality, and dispersion of pink, brown and white shrimp. The results of laboratory studies conducted to screen potential marking agents for shrimp were published, as were results from other experiments which measured the effect of a biological stain on shrimp respiration.

Commercial catch sampling agents stationed at major landing ports conducted intensive surveys to evaluate the importance of shrimp discarding practices and to ascertain the reliability of catch statistics. The field aspects of net selectivity studies were completed.

Experimental Biology

This program continues the investigation of environmental influences on shrimp. Factors being studied include temperature, salinity, food, light, and parasites.

Continued research on shrimp parasites revealed that tapeworms common in shrimp in the Galveston estuary (1) are probably not significant sources of shrimp mortality, (2) will live at least 5 weeks in shrimp, and (3) seem to be much more common in shrimp from some bays than from others. These findings favor the possible use of parasites as biological shrimp "tags," which may permit the tracing of shrimp stocks from specific bays to offshore fishing areas and spawning grounds. Such a tool would be of considerable value in attempts to determine the contribution of specific bays to the offshore fishery.

Studies of shrimp behavior provided new insight into (1) the swimming speed capabilities of brown shrimp postlarvae and (2) the responses of white shrimp to low temperature. The results will be useful in interpreting the movements of these animals in the field.

Laboratory growth and survival experiments were of several types. The influence of light on growth of postlarval brown shrimp was found to be negligible. This conclusion strengthens confidence in our previous shrimp growth data obtained from experiments requiring the use of light. Another type of study tested for possible effects of laboratory handling on shrimp growth and survival. Results indicated no effect, again confirming the reliability of our methods employed in survival and growth studies.

Experiments comparing white shrimp with spring and summer brown shrimp have provided new evidence for temperature tolerance differences between species. In broadening our knowledge of the environmental requirements of both shrimp species, these results will permit a better understanding of seasonal distribution patterns of shrimp in estuaries.

Estuarine Studies

The seasonal patterns of distribution, size composition, and relative abundance of most commercially important species and many hydrographic and hydrological characteristics of the Galveston estuary can now be described in considerable detail. Significantly, most species, including the valuable white and brown shrimp, travel extensively while undergoing development in this estuary and so occupy several different hydrologic zones. For example, during 1963 and 1964 the smaller juvenile brown shrimp were concentrated in those parts of the estuary where salinity was less than 10%. As they grew, however, they occupied zones of higher salinity. They did not use extensively those portions of the estuary where salinity exceeded 25%.

The extent or size of a particular zone may be a major factor influencing the success or failure of a particular species. Fortunately, the Galveston estuary usually receives sufficient fresh water to provide a wide range of environmental conditions so that it accommodates at high levels many different estuary dependent species.

In order to classify an estuary and assess the value of its nursery habitat the types of zones most suited for each developmental stage of the major species are being studied to determine the amount of fresh water needed to maintain such zones for the maximum benefit of estuary dependent fishery resources. The salinity zonation relations are being studied first because of the direct and measurable effect of tributary discharge, but other factors are being investigated in a similar manner. These include temperature, depth, bottom sediment composition, primary productivity, pollution, nutrient levels, and geographic locations.

A draft report was completed on the Bureau of Reclamation's proposed Texas Basins project which described the estuarine fishery resources of the Texas coast in relation to freshwater discharge. The economic potential of fishery resources developed for this report now permits preliminary assessments in monetary terms of most projects that would directly modify or destroy estuarine habitat in the Texas estuaries. Research, however, must continue in order to provide the knowledge needed to improve these interim values to better defend fishery resources in the struggle to develop the water resources and estuarine basins of the Gulf coast.

BIOLOGICAL LABORATORY
GULF BREEZE, FLORIDA

PESTICIDES

Research projects are continuing to refine older techniques and develop new methods for evaluating the effects of synthetic organic pesticides on marine biota and detecting the presence of pesticide pollution in the environment. Substantial progress is being made in methods for detecting the organophosphate compounds which are both highly toxic and relatively transitory in the estuary. The screening program is being broadened to include more tests on microscopic plants that serve as food for oyster larvae, as well as tests on the larvae themselves. Modernization of an existing structure has added 1600 feet of efficient laboratory facilities for this microbiological work. Additional fiberglass tanks have been installed outdoors to increase our holding facilities for the shrimp and fish used in bioassay work.

Data are accumulating to show if estuarine animals such as crabs and fish are exposed to low levels, i.e., less than 0.05

part per billion, of a common pesticide such as endrin they may not be directly harmed by it and soon flush it from their tissues when they move into uncontaminated areas. A very small increase in concentration, however, may be critical and cause heavy fish mortalities after prolonged exposure.

A second area for concern is indicated in experiments in which oysters were exposed to levels of DDT which had negligible effect on the oyster's activities. These oysters accumulated DDT in their tissues and when they were, in turn, fed to fish, there was a heavy mortality in the fish population. This is typical of the pathways in which low levels of pollution in the environment can be biologically magnified until they cause damage at some higher level in the food chain.

A nationwide system for the monitoring of pesticide pollution in estuaries has been established. The size of this program and the necessity for the most efficient use of manpower has made it mandatory that this work be conducted on a cooperative basis. Agreements and contracts have been entered into with federal, state and university laboratories located in coastal areas.

The essential points of these agreements are that samples be collected at 30-day intervals from permanent stations in shellfish growing areas. The shellfish may be oysters, mussels or clams, depending on the area. In some instances, fish and plankton are collected as well. A technique has been developed for handling the samples without refrigeration. Samples are processed by the collecting agency and all are sent to the Gulf Breeze Laboratory for analysis of chlorinated hydrocarbon pesticide residues. To insure comparability of results, we feel it necessary that all samples be analyzed at one laboratory until the time when additional technical personnel can be trained in the methods. Samples are being collected now in seven states, including Florida, Mississippi, and Texas in the Gulf. It is anticipated that agreements will be concluded in four additional states soon. This program is scheduled to continue for several years so that a valid assessment of this type of pollution can be made, both on a seasonal and geographical basis.

During the year, laboratory staff members discussed pesticide problems and research progress at six meetings in the Gulf states. Twelve research reports were published or approved for publication.

Biological Station
St. Petersburg Beach, Florida

Estuarine

Estuarine studies of pre- and post-engineering effects upon biological production continued. Results showed that sediments and biota have not recovered to normal levels 10 years after construction of blind-alley water areas associated with dredge-fill developments investigated. Emphasis was placed on obtaining and analyzing biological and chemical data related to specific sites proposed for engineering alteration. The information was provided to other Federal and State agencies for use in evaluating probable effects of environmental changes on commercial species. In one case, creation of a 500-acre land mass for real estate development was stalled because of adverse State-Federal reports and resulting public opinion. Research began on methods of revitalizing barren segments of estuaries through reestablishment of biological communities. The first step was an attempt to create vegetative cover through transplantation of sea grasses in selected areas.

Red Tide

Biological and oceanographic data collections were completed on the Red Tide program for an estuarine and offshore plankton succession study. The purpose is to determine the relation of *Gymnodinium breve to* other plankton populations especially when approaching bloom stages. A symposium was held to delineate high-priority research needs. A contractural computer analysis was completed and showed that 61 per cent of the variability in abundance of *G. breve* is associated with variations in four measurable factors.

Technological Laboratory
Pascagoula, Mississippi

Chemistry

Further studies on the composition of blue crab, brown shrimp, Dungeness crab, ocean perch, and alewife have shown that the proximate composition, as well as the amino acid and trace mineral content, vary from species to species, from month to month, and from one type of tissue to another. The amino acid content of the brown shrimp *(Penaeus aztecus)* compares

very favorably with that of other sources of protein, although there is considerable variation in amount of the individual amino acids throughout the year. A comparison of the amino acid content of brown shrimp obtained off Galveston, Texas, with samples obtained at the same time, but in a different year, from the Mississippi Sound revealed that there were no significant differences in amount of amino acids present. A further study showed that there was little difference in amino acid level in brown *(Penaeus aztecus)*, white, *(P. setiferus)*, and striped pink *(Penaeopsis megalops)* shrimp tails taken at the same time in nearly the same location, although there were significant differences in quantitative content among the three species. Studies of the composition of fish and shellfish will be expanded next year to include both other species and other types of analyses.

A study of the chemical changes occurring in iced shrimp during the progression from Grade A condition through the inedible stage revealed a basic similarity in pattern among white, pink, and brown shrimp. The deterioration could be delayed by an extra wash at the time of capture. Further lengthening of storage life could be obtained by distributing an ice and shrimp mixture (2:1 ratio) in a well-iced shrimp box. The preliminary chemical studies indicated that there is a relation (1) between loss in nitrogen and grade, (2) between connective tissue degradation and softening in texture, and (3) between (1) and (2) and changes in the microbial population.

A cooperative study with the American Shrimp Canners Association was initiated to determine means of lengthening the quality shelf life of canned shrimp. Although the studies have not reached their conclusion, indications are that there are many factors not under direct control which influence the shelf life of canned shrimp. Furthermore, it is becoming apparent that the use of food additives to control one offending condition often changes the patterns of quality factors in a manner that may affect another condition adversely. It is expected that definite recommendations will be made during the next year when a full 24 months of storage has passed.

A limited market survey of various types of fresh and processed fishery products for the presence of chlorinated pesticide residues has been conducted. In general, there was a com-

plete absence of endrin, dieldrin, aldrin, heptachlor, and heptachlor epoxide from most of the fishery products examined. Such was not the case, however, with the residues of DDT, DDD, and DDE. Almost all of the fishery products examined thus far have contained traces of these last three residues. Indications have been found that certain types of heat processing may aid in eliminating DDT, DDE, and DDD from processed fishery products. An investigation into various methods of reducing the level of residue contamination will begin this next year.

MICROBIOLOGY

During the past year, the nutritional requirements of Cl. botulinum type E were studied in an effort to devise some means of control of this organism. It was found that no one amino acid, fatty acid, nucleic acid or vitamin was absolutely necessary for germination, vegetative growth, or sporulation of the organisms. Differences in certain acid requirements for toxin production were found from strain to strain. It was concluded that, since there seemed to be such individual nutritional requirements for each strain, it would be quite difficult to control the organism through nutritional means.

Oral reports of the presence of Cl. botulinum type E in Galveston Bay were confirmed. Since this was the first confirmation of the presence of this organism in Gulf of Mexico waters, a more thorough study of the incidence was thought necessary. Therefore, a contract between the Laboratory and the Atomic Energy Commission, Division of Medical Research, was negotiated late in the year to survey the Gulf of Mexico for the presence of Cl. botulinum type E.

A study of the presence of Salmonella in fish meal was completed. It was found that there is not an extensive carryover of Salmonella from year to year. Further, fish meal samples as they came from the end of operating dryers were Salmonella-free. Therefore, a series of recommendations for in-plant sanitation of such a nature as to prevent recontamination of the meal prior to shipping have been made. Primary emphasis should be placed upon the curing floor and storage area decontamination with rigid sanitary control thereafter extending even to public carrier facilities.

The initial survey of precooked, frozen seafoods for the presence of Salmonella, Staphylococcus, Streptococcus, coliforms,

and E. coli has been completed. Samples examined have included breaded shrimp, shrimp creole, breaded cod portions, haddock and pollock fish sticks. Results indicated a total absence of E. coli, fecal streptococci, Salmonella, and coagulase-positive staphylococci in the products examined. The overall total plate count reflected a rather good product picture.

Seafood Inspection and Certification

Processing plants under the USDI voluntary inspection program produce a variety of inspected fishery products. Of the 15 plants under this program in the Gulf and South Atlantic Region, 11 are located in the States of Texas and Florida. Each plant is under the continuous surveillance of a resident inspector to assure production of high quality fishery products which merit the U. S. grade shields. These services are financed by the participating firms and include lot inspection when requested, as well as the continuous inspection. The Commodity Exchange in Chicago requires U. S. graded shrimp and many states now have the same requirement for seafoods purchased for institutional use. Retail demand for graded products also has increased.

River Basins Studies

St. Petersburg Beach, Florida

This program, closely coordinated with the activities of the Bureau of Sport Fisheries and Wildlife, is devoted to problems arising from man's alteration of the marine environment. During the year, 81 reports were reviewed involving marine resources and several field surveys made.

Statistics

The fishery statistics program under the direction of the supervisory office in New Orleans continued to furnish data vital to state and federal research programs. There was an increased use of the data by industry, particularly the detailed shrimp statistics collected in the Gulf area. These were invaluable to manufacturers of advanced electronics and processing equipment and supplies in making preliminary assessments of the market potential for their proposed products in the fisheries of the Gulf states. Assistance was also furnished the fishing industry advisory committee to the U. S. Coast Guard in deter-

mining possible effects on fishery interests of a proposal to reduce light and fog horn intensities on Gulf off-shore oil structures. Using the detailed statistics, a chart was prepared which showed the magnitude of fishing operations throughout the western Gulf area.

Fishery statistics collected as a part of the regular continuing programs provided the basic data for the formula allotment of funds to the states under the provisions of Public Law 88-309, commonly known as the "Commercial Fisheries Research and Development Act of 1964."

Market News

The New Orleans Market News office continued to supply accurate and timely marketing information through the issuance of daily Fishery Products reports and monthly and annual summaries.

To conform more to industry practices, the format for the presentation of canned oyster and shrimp data was revised. Cumulative data were formerly reported on a seasonal basis. In the new format cumulative data are presented on a calendar year basis. A standard case of shrimp now represents 24 cans each containing 4½ ounces drained weight, and a standard case of oysters represents 24 cans each containing 4-2/3 ounces drained weight.

Marketing

Outstanding newspaper coverage was received on southern seafoods during the Bureau's four major annual promotions—Outdoor Fish Cookery during the summer, National Fish'n Seafood Month in October, the Christmas promotion, and Lent during the spring. A total of 331 newspapers in the Region having a combined circulation of 27.8 million devoted 9,958 column inches to southern seafoods.

The Florida Board of Conservation, the Southeastern Fisheries Association, and the Bureau launched a highly successful cooperative marketing program during the year. Specific efforts were made to expand markets for Spanish mackerel, royal red shrimp, swordfish, and mullet. One western cafeteria chain placed a sample order for 100,000 pounds of Spanish mackerel and it is expected that this market will be substantially expanded. One eastern restaurant chain just recently started

using boneless mullet fillets and royal red shrimp in its operations and initial successes point toward a large new outlet for these two products.

Marketing assistance was given to the newly developing swordfish industry of North Carolina. Coverage on swordfish was obtained on radio, television, and in the newspapers.

The continuing consumer education program of the Bureau resulted in Bureau-produced motion picture films being shown on television in the Region 169 times during the year; the equivalent of 855 radio station interviews being obtained; a total of 35 fish cookery demonstrations for professional food people; and, Bureau-produced video tapes on fish cookery being used 79 times by television stations.

Federal Aid to States

The Commercial Fisheries Research and Development Act of 1964 was funded during the year. The purpose of the Act is to assist the states in research and development projects that will lead to improvement in the commercial fisheries of the United States. The regional program was initiated shortly after July 1, 1965, and a Regional Coordinator appointed to maintain liaison with the states in this work. The Gulf States are eligible for the following maximum amounts when matching funds are provided, and State projects are approved: Louisiana, Texas, and Florida, $246,000 each; Alabama $40,300; and Mississippi $129,100.

Financial Assistance

Passage of two laws designed to assist commercial fishermen in vessel financing represent unprecedented gains in the Bureau's activities in this important field. The U. S. Fishing Fleet Improvement Act was signed into law late in 1964. The Fisheries Loan Fund extension bill was passed in July.

The U. S. Fishing Fleet Improvement Act, usually referred to as the Vessel Subsidy Program, provides a maximum subsidy payment of 50 per cent of the construction cost of qualified fishing vessels. Generally the vessels must be of advanced design, equipped with newly developed fishing gear, and capable of fishing expanded areas. So far nine applications from the Gulf States requesting subsidies for vessels having a total cost of $1¼ million have been received.

Enactment of Public Law 89-85 extended the life of the Fisheries Loan Program to 1970 and liberalized its provisions. In addition to making loans to commercial fishermen for equipment, repairs, refinancing, and maintenance, the Bureau may now assist fishermen in purchasing new and used vessels. Under the old regulations only replacement vessels could be financed through the Fisheries Loan Fund. In the Gulf States the Bureau has received 287 applications requesting $8,000,024.

The program for granting mortgage insurance for new vessel construction has grown in importance since 1962 and has become a major tool for industry members at all levels. Mortgage insurance dovetails into the Vessel Subsidy Program providing fishermen an opportunity to purchase subsidized vessels with down payments of only 12½ per cent of the vessel cost, and with long-term maturities and low interest rates. Forty-nine applications have been received from the Gulf States requesting $2,165,954.

PEAT, MARWICK, MITCHELL & CO.
(Combining Barton, Pilié, Hughes & Jones)
Certified Public Accountants
535 Gravier Street
New Orleans, La. 70130

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, 1965 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, 1965 and its resources at that date, in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year. Also, in our opinion, the accompanying supplementary information to accounts is stated fairly in all material respects when considered in conjunction with the financial statements taken as a whole.

Peat, Marwick, Mitchell & Co.

New Orleans, Louisiana
July 7, 1965

GULF STATES MARINE FISHERIES COMMISSION

Statement of Income and Expenses

Year ended June 30, 1965

Income—member states' contributions:		
Alabama		$ 3,500.00
Florida		4,500.00
Louisiana		6,000.00
Mississippi		1,500.00
Texas		6,000.00
Total income		21,500.00
Expenses:		
Salaries	$13,684.00	
Traveling	1,584.55	
Office rent	1,080.00	
Stationery, printing and supplies	337.09	
Telephone and telegraph	506.46	
Postage	223.60	
Electricity	39.11	
Equipment maintenance	44.29	
Accounting	250.00	
Insurance	248.94	
Meeting expense	283.43	
Publication expense	562.09	
Payroll taxes	307.53	
Depreciation	74.60	
Sundry	81.64	
Total expenses		19,307.33
Excess of income over expenses		$ 2,192.67

Statement of Resources — June 30, 1965

Cash (note 1)	$ 5,071.37
Traveling advance	250.00
Meter deposit	10.00
Prepaid insurance premiums	118.06
Equipment—at cost less allowance for depreciation, $2,581.02 (note 2)	456.33
Resources (net)—note 3	$ 5,905.76

For notes see accompanying supplementary information to accounts.

GULF STATES MARINE FISHERIES COMMISSION
Supplementary Information to Accounts
Year ended June 30, 1965

(1) The changes in cash balances during the year are summarized as follows:

Cash receipts:		
Income (see accompanying statement)		$21,500.00
Less advance contribution from Louisiana at July 1, 1964		6,000.00
Total cash receipts		15,500.00
Cash disbursements:		
Expenses (see accompanying statement)	$19,307.33	
Less adjustment for expenses not representing cash outlay:		
Decrease in prepaid insurance	2.34	
Depreciation	74.60	
Total cash disbursements		19,230.39
Excess of disbursements over receipts		(3,730.39)
Cash balance at beginning of year		8,801.76
Cash balance at end of year		$ 5,071.37
Comprised as follows:		
National American Bank of New Orleans, checking account		$ 5,069.91
Petty cash		1.46
		$ 5,071.37

(2) The changes in investment in equipment during the year are summarized as follows:

	Cost	Allowance for depreciation	Net
Balances at beginning of year:			
Automobile	$1,436.38	1,436.38	—
Furniture and fixtures	1,600.97	1,070.04	530.93
	$3,037.35	2,506.42	530.93
Balances at end of year:			
Automobile	$1,436.38	1,436.38	—
Furniture and fixtures	1,600.97	1,144.64	456.33
	$3,037.35	2,581.02	456.33

(3) The change in resources during the year is summarized as follows:

Resources of the Commission at beginning of year	$3,713.09
Excess of income over expenses during the year	2,192.67
Resources of the Commission at end of year	$5,905.76

(4) Fidelity bond insurance of $10,000.00 each is carried on the chairman, vice-chairman and director of the Commission.

BUDGET

GULF STATES MARINE FISHERIES COMMISSION

Fiscal Year 1965-66

Salaries	$14,000.00
Traveling	1,600.00
Office rent	1,080.00
Stationery, printing and supplies	400.00
Telephone and telegraph	500.00
Postage	250.00
Electricity	42.00
Equipment maintenance	50.00
Accounting	250.00
Insurance	265.00
Meeting expense	650.00
Publication expense	570.00
Payroll taxes	433.70
Depreciation	75.00
Sundry	90.00
	$20,255.70

(Approved October 8, 1965)