

# Research Laboratories Cluster Midway on Coast

## Duke Laboratory Trains Biologists, Provides Facilities for Research

By DR. C. G. BOOKHOUT

(Editor's Note: Dr. Bookhout is director of the Duke University Marine Laboratory, Pivers Island, Beaufort, N. C.)

The Beaufort-Morehead City area is as well known biologically as any region between Miami, Fla., and Woods Hole, Mass.

Prominent biologists between 1860 and 1900 reported Beaufort was a strategic spot for biological research because of the richness of its flora and fauna. It is not surprising, therefore, that there are now several marine laboratories within close proximity of one another in this area.

The Institute of Fisheries Research of the University of North Carolina is devoted to practical problems associated with oyster and clam production, shrimp distribution and development, and finfish populations.

The United States Fish and Wildlife Service has two laboratories on the northern half of Pivers Island—one devoted to shad and menhaden fisheries along the Atlantic, and one to isotope research on marine invertebrates and fish.

On the southern half of Pivers Island is the Duke University Marine Laboratory. It is a part of Duke University and is not supported by state or federal funds, nor is its research program as limited to purely practical problems.

Nevertheless, its diverse program has furnished much information concerning the physical and biotic environment of North Carolina's coastal waters that has either a direct or indirect relationship to the practical programs of the other two laboratories and to fishery problems in general.

**Marine Problems Studied**

Members of the zoology and botany departments of Duke University are free to work on any problem they choose, but since the Duke University Marine Laboratory was established in 1938 by Dr. A. S. Pearse, an increasing number of faculty members have devoted their research energies to marine problems.

At the present time there are four members of the botany department working in different fields of marine science: Dr. Terry Johnson in marine fungi, Dr. H. L. Blomquist in marine algae, Dr. Harold Humm in marine algae, and Dr. Jethro Manly on phytoplankton.

In the zoology department there are seven staff members doing marine research at Beaufort: Dr. I. E. Gray in marine ecology, Dr. Karl Wilbur in cellular physiology, Dr. Edmund Cummings in comparative physiology, Dr. John Vernberg in physiological ecology, Dr. H. S. Roberts in cytology, Dr. Wanda Hunter in parasitology, and Dr. C. G. Bookhout in invertebrate zoology.

Two additional members of the zoology department, Dr. Howard Odum, oceanographer and limnologist, and Dr. Muriel Sandeen are doing marine research elsewhere.

The fisherman might well ask what relation is there between research at the Duke University Marine Laboratory and practical fishery biology. But let's look at marine fungi and how much damage they are doing. It is recognized that fungi are killing oysters in Louisiana and young hard clams in Connecticut. Fish that are injured are frequently attacked by a fungus which kills them.

Wooden structures are also destroyed by fungi. Since there are relatively few specialists in this field in the United States, Dr. Johnson's research in this field may be of real service to North Carolina and to the country.

**'Grass' Classified**

Dr. H. L. Blomquist and his students have classified almost all of the algae in North Carolina commonly known as "grass." He has also worked on the taxonomy of other vegetation which may well have an important bearing on the abundance of commercially important shellfish, shrimp, and fish.

For example, it is now recognized that the bay scallop was ecologically associated with eel grass. When it became diseased and died, the bay scallops disappeared.

Dr. Alphonse Chestnut and Dr. William Fahy of the Institute of Fisheries Research have consulted with Dr. Blomquist in reference to the identity of other plants which may take the place of eel grass.

Dr. Harold Humm, while a resident investigator at the Duke University Marine Laboratory, worked out a method of developing agar from seaweed from the South Atlantic and Gulf Coasts. An account of this research was published as Bulletin 3 of the laboratory.

Funds for this investigation were provided by the General Education Board and the War Production Board. Prior to World War II, 80 per cent of the agar used in the United States was imported from Japan.

**Factory Established**

As a result of Dr. Humm's work, an agar-producing factory was established at Beaufort. For a time the fisherman could sell the "grass" caught in their nets and thus make a small amount of money

from a product that had been merely a nuisance before.

If the algae or "grass" had remained plentiful in this area the agar factory would be in operation today. Unfortunately, the reasons for fluctuations are not known. Further research may give the answer.

Dr. Humm is also the only marine bacteriologist in the area. Thus he is currently studying not only the free living bacteria but also those which are destructive to rope and animals in the sea.

**Life Depends on Plants**

It is well known that productivity of the sea is dependent upon the amount of plant production because plants are the only organism in the sea which can synthesize organic matter from inorganic substances in significant quantities.

The plants which are most important are the minute microscopic diatoms and dinoflagellates. The Duke University Marine Laboratory has recently published a comprehensive bulletin on the diatoms of Beaufort by Dr. Hustedt, world's authority in the field.

Dr. Jethro Manly, botany department, Duke University, has made another comprehensive study of the diatoms of the Beaufort region.

The next step in our research program is to determine how much organic material can be synthesized in a unit volume of water in a given time. Dr. Howard Odum, a limnologist and oceanographer who recently joined the zoology staff at Duke University, has studied such problems in Florida and in the mid-Pacific. Thus he is well trained to determine the capacity of these waters to produce phytoplankton, the base of the food chain in the sea.

This type of research is beset with difficulties, but some approximation may be obtained by direct counts of microscopic plants, pigment analysis of phytoplankton, and chemical analysis of sea water. Dr. Odum will be working on this general problem at the Duke University Marine Laboratory next summer and in the future.

**Food Chain**

Phytoplankton and detritus may serve directly as food for oysters, clams, and menhaden. Generally, however, it is eaten by microscopic animals or by larval stages. These are in turn consumed by small shrimp and fish. These serve as food for large shrimp or fish of commercial value. Each of the marine laboratories in the Beaufort-Morehead City area is vitally interested in this food chain.

The microscopic animals and larval stages which float make up the zooplankton. They are the consumers of much of the phytoplankton. Dr. C. G. Bookhout and his graduate students have worked on certain phases of this problem.

Dr. William Sutcliffe Jr., Director of the Bermuda Biological Laboratory, made a qualitative and quantitative study of the zooplankton of Beaufort Harbor while a graduate student at Duke University. He identified copepods which serve as important food for fish and showed how their number varies throughout the year.

Dr. Bookhout and his students have been engaged in making detailed life history studies of organisms which make up part of the zooplankton. To date, studies have been made on snails, polychaete worms, barnacles, crabs, and shrimp, all direct or indirect food sources for fish.

The barnacle research has been supported by the Office of Naval Research for the past five years. For the past two years, Mr. Car-



Dr. C. G. Bookhout heads marine lab

ter Broad, resident investigator at the Duke University Marine Laboratory, has been able to rear "grass shrimp" from the egg through all larval stages to the adult condition in the laboratory. To the writer's knowledge, this has been the first time an investigator has been able to accomplish this feat in the United States.

Through numerous experiments he has been able to determine the proper nutritional requirements to raise shrimp with little mortality. These studies have been supported by the Office of Naval Research and the National Science Foundation.

By using these same techniques he should be able to rear commercial shrimp of the area in the laboratory. This has not been done but it will be the program of research of Mr. Broad for the coming years.

**Studies Published**

Since the establishment of the laboratory in 1938 many papers have been published in ecology by Dr. A. S. Pearse and Dr. I. E. Gray and their graduate students. They have studied the distribution of many groups of animals, including crabs and fish.

Through their studies in the field and others in the laboratory, they have been able to determine the tolerances of local animals to changes in salinity, temperature and other physical factors in bays, estuaries, and the ocean.

These studies should provide basic information for fishery programs such as the menhaden investigation which is now being done by the U. S. Fish and Wildlife Service.

In the field of physiology, Dr. Karl M. Wilbur and his graduate students are making experimental studies on the shell deposition in oysters using tracer techniques.

Dr. John Vernberg, a physiological ecologist, is studying the effects of temperature on crab and fish respiration.

Dr. Edmund Cummings, formerly of North Carolina State College, but now a member of the zoology department at Duke University, is investigating the effect of changes of salinity on kidney and gills in mullet and other fish.

He has shown that mullets can adjust to a change from ocean water to fresh water in a comparatively short time in the tanks at the Duke University Marine Laboratory.

When small mullet are adjusted to fresh water they can be taken to fresh water ponds and raised to edible fish. They grow more rapidly in fresh water, but they will not breed in it.

**Parasites Studied**

From 1938 to 1950, Dr. A. S. Pearse published numerous papers on the parasites of marine organisms in the Beaufort area. Many See DUKE LAB, Page 2, Sec. 7

About midway between the Virginia and South Carolina line, four fisheries research laboratories cluster together on the North Carolina coast.

On Pivers Island at Beaufort are located the Duke University Marine Laboratory and two Fish and Wildlife laboratories. Several miles west of Pivers Island at Morehead City is located the Institute of Fisheries Research of the University of North Carolina.

The work done at these laboratories is described on this page.

## Dr. A. F. Chestnut Heads Fisheries Research Unit

University, State Join Hands to Bring Newest 'Lab' into Being

Dr. A. F. Chestnut, Morehead City, past president of the National Shellfisheries Association, heads the Institute of Fisheries Research at Morehead City.

The institute is the newest of the four located in the central coastal Beaufort - Morehead City area. It was established by action of the Board of Trustees of the University of North Carolina Sept. 29, 1947.

Dr. Chestnut, the institute's third director, succeeds W. A. Ellison Jr., Beaufort, N. C., who resigned several months prior to Dr. Chestnut's appointment.

Serving as acting director of the institute during those intervening



Dr. A. F. Chestnut directs staff

months was Dr. Austin B. Williams, who had joined the staff in 1951.

Establishment of the institute was made possible through the cooperation of the University of North Carolina and the State Department of Conservation and Development. Deeply interested in the project on behalf of the Department of Conservation and Development were the late Roy Hampton of Plymouth, Josh Horne of Rocky Mount and Bruce Etheridge of Manteo, a past director of the department.

As early as 1941 the Department of Conservation and Development had recognized the need for research, but World War II came along and no concrete plans were made.

**President Makes Request**

In the fall of 1944 President Frank Graham of the University of North Carolina requested that a project in marine biology be undertaken as a university function. To examine the possibilities, the necessity and potential of that project, Dr. Robert E. Coker, head of the Department of Zoology, was appointed.

A committee named by President

See INSTITUTE, Page 6, Sec. 7

## Beaufort Lab Wears New Look

By JAMES E. SYKES

(Editor's Note: Mr. Sykes is a member of the staff of the Fish and Wildlife Station, Pivers Island, Beaufort, N. C.)

Pivers Island, headquarters of the United States Fish and Wildlife Service research activities in this area, has recently undergone marked changes in appearance.

The grand old cupola crested laboratory building on the island, for many years a familiar landmark to Carteret County residents, no longer stands welcoming home shrimp and menhaden vessels as they return to their docks through Beaufort Inlet.

Almost as suddenly as the turning of a tide she has completely vanished, and in her place stands the ultimate in laboratory buildings, staffed with men who have had special training in the field of fishery research, and equipped with the most modern of biological apparatus.

Brick facing shields the new laboratory from the hurricanes which played hob with the exterior of the old wooden structure. Hundreds of square feet of thermopane glass admit sunlight to the interior and retain cool air in the summertime and warm air in the winter. The air is treated by a twin unit air conditioning system.

One end of the 168-foot long, one story structure houses seven offices, a photographic dark room, a small scale laboratory (for reading fish scales to determine age, spawning frequency, etc.), and a library. The interior walls are finished in light green tile.

The library, one of the most complete on the east coast on fishery biology, contains volume after volume of scientific literature dating back for well over a century. The latest reference books are available to the staff and visiting researchers. These consist of publications from the United States and many foreign countries as well as text books on physics, chemistry, mathematics, oceanography, and many specialized fields of biology.

**Laboratory Facilities**

The other half of the building is devoted to laboratory facilities such as aquaria and salt water tables in which live specimens of marine forms may be held, a chemical table equipped with gas, air, and running water upon which experiments may be conducted, a storeroom for scientific equipment, and individual cubicles for researchers.

At the present time two coastwise scientific investigations are underway at this laboratory. They are (1) a study of the white shad which spawn in our fresh water streams each spring, and (2) a study of the menhaden which is the most familiar species in this area and among the most important economically.

In addition to the two staffs, a statistical agent of the Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, makes his headquarters here.

Gone are the three frame maintenance buildings which stood on the north shoreline of the island nearest the causeway. They housed the carpentry shop, the net loft, and the water and heating systems. A long brick building, similar to the laboratory now graces this site.

The new maintenance building accommodates garage, storage, water pumping and heating facilities, and a carpentry shop. Between the two new buildings a concrete courtyard serves as a parking area. A dormitory building, replacing the dormitory rooms which came down with the old building, is expected to be constructed in the near future.

On May 13 of this year the new laboratory buildings were formally dedicated to the conservation of our fishery resources by John L. Farley, director of the U. S. Fish and Wildlife Service.

**Zoologists Visit**

Scientific fishery research was in its infancy in 1860 when two zoologists named Gill and Stimpson visited Beaufort and decided that this area would make an ideal resort for persons interested in biology.

Then zoologists Coues and Yarrow in 1871-72 further stimulated interest in the multiplicity of fauna and flora of the region. A short time later professors and students of Johns Hopkins University set up a small laboratory here.

It was in 1871 that the U. S. Bureau of Fisheries was instigated. The Bureau was the predecessor of the U. S. Fish and Wildlife Service. Prof. Spencer Fullerton Baird, Secretary of the Smithsonian Institute, was appointed to the office of Commissioner of Fish and Fisheries and served until his death in 1887.

Professor Baird was among the outstanding zoologists of his day. Although he investigated the fish and fisheries of the Beaufort region and was instrumental in establishing a laboratory here, he did not live to see this accomplished.

On June 1, 1890, the U. S. Bureau of Fisheries established a See BEAUFORT LAB, Pg. 4, Sec. 7



Members of the fisheries laboratory staff are, front row, left to right, Elijah Garrison, mechanic; Don LaPointe, James Sykes, William Davis, biologists; John Mason, buildings and grounds; and Mrs. Olive Davis, secretary; back row, left to right, Kenneth F. Chier and Jack Lewis, biologists, Claude Guthrie, superintendent of buildings and grounds; Charles Walburg, biologist; and Gerald B. Talbot, chief, Middle Atlantic Fisheries Investigations.



The menhaden investigations staff are, front row, left to right, Walter Moore, Charles Rothmayr, biologists; Mrs. Thelma Penny, administrative officer; Miss Maureen Downey, secretary; and Fred June, chief, menhaden investigations; back row, left to right, Earl Deubler, Robert Lewis, Doyle Sutherland and Joe Higham, biologists.

### New Research Realm

## Laboratory Conducts Radioisotope Studies

Radioisotope studies on marine algae, shellfish, and fishes are being conducted at the Marine Biological Laboratory of the U. S. Fish and Wildlife Service located on Pivers Island at Beaufort.

These investigations on the accumulation, body distribution, and rate of loss of radioactive elements by marine organisms are carried on by Dr. Walter A. Chipman, director, and his staff, as a joint project of the Fish and Wildlife Service and the Atomic Energy Commission.

The work deals with the physiology of marine plankton, which serve as food organisms for marine animals and fishes, and the uptake of chemicals from this food by shellfish and fishes, particularly oysters, clams, scallops, and menhaden.

The accumulation and body distribution of radioactive materials contained in their food is also investigated in shrimps, crabs, croakers, bluefish, and albacore. Some of the major things to be learned from these studies are an understanding of the feeding activities of shellfish and fishes, how the chemical elements in the food are utilized, and in what form and at

what rate elements are excreted from the body.

Besides Dr. Chipman, the director, the staff consists of four research biologists, Dr. T. R. Rice, who received his degree at Harvard University; Dr. Donald K. McLoughlin, who received his degree at the University of Illinois; T. J. Price, who received his masters degree at the University of Maryland; and John P. Baptist, who received his master's degree at Bucknell University.

An assistant biologist, Miss Joyce Smith, is completing her master's degree at Duke University. On the permanent staff also are John Parkin, boat captain; Charles F. Willis, fisheries assistant; and Mrs. Audrey Lewis, secretary. Four assistant biologists are employed during the summer months.

The project has excellent facilities for obtaining fish and shellfish, and for holding fish in ponds and tanks supplied with a good flow of sea water. The laboratory, a one-story white frame building, has a plankton culture and research room, a biology and physiology room with flowing salt-water tables and tanks, a biochem-

### Tagged Trout Taken Off Oregon Inlet

A fish tag, attached to a spotted trout in Virginia last fall, was returned to the Virginia Fisheries Laboratory early this year from North Carolina.

Tagged in Lynnhaven Inlet on Oct. 27, 1954, by W. H. Massmann and C. E. Richards of the Gloucester Point Laboratory, this fish was recaptured in a haul seine at Oregon Inlet, North Carolina, about 80 miles from the point of release.

Each year, numbers of these fish migrate into Lynnhaven Inlet, and many fishermen believe that these trout remain in the inlet throughout the winter, moving out later.

The tagging was done to provide information on the movements of these fish.

ical research laboratory room, offices and a room for measurement of radioactive materials which is very well supplied with the necessary electronic instruments.

The various laboratory rooms are especially well-equipped with scientific instruments for the work. The information gained in these studies appears in reports to the Atomic Energy Commission and the Fish and Wildlife Service, as well as in scientific journals.

The investigations, although of the nature of basic fundamental research, have phases which later develop an applied use and as such become valuable to the fishing industry.



Personnel at the shellfish laboratory are, front row, left to right, Jack Price and John Baptist, biologists; back row, left to right, Miss Rebecca Smith, laboratory technician; Dr. T. R. Rice, biologist; Dr. Walter Chipman, chief, shellfish investigations; Dr. Don McLoughlin, biologist; and Mrs. Audrey Lewis, secretary. Absent when the picture was taken were John Parkin, boat captain, and C. Fred Willis, fisheries assistant.



Dr. Lillian Youngs, research associate of Dr. H. E. Lehman, right, study hybridization of sea urchins in the new Duke research laboratory. Dr. Lehman is associate professor of zoology, UNC.