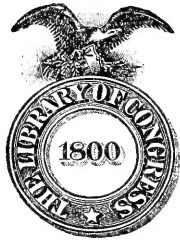


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DEPARTMENT OF COMMERCE

U. S. BUREAU OF FISHERIES

HUGH M. SMITH, Commissioner

THE BUREAU OF FISHERIES AND ITS BIOLOGICAL STATION AT BEAUFORT, N. C.

The United States Bureau of Fisheries was instituted in 1871 by the passage of a joint resolution of Congress creating the office of Commissioner of Fish and Fisheries, to be filled by a civil officer of the Government having a scientific and practical knowledge of the fisheries, who was to receive no additional compensation. Prof. Spencer F. Baird, then Assistant Secretary, afterwards Secretary, of the Smithsonian Institution, was appointed to the office and served until his death in 1887. By that time the duties of the position had



Laboratory at Fishery Station, Beaufort, N. C.

become so heavy as to demand the entire time and attention of the Commissioner, and soon after the office was divorced from other Governmental work and accorded an independent status and salary.

Until 1903 the organization was known as the United States Fish Commission and was responsible directly to Congress, but in that year it was made a bureau in the new Department of Commerce and Labor, now the Department of Commerce. As originally constituted it was an institution for investigating the condition of the fisheries in

respect to their alleged depletion, the causes which may have lead to their impoverishment, and the means by which they might be conserved and their productiveness increased. As a result of the scientific and statistical investigations, the Commissioner soon determined that certain fishes had decreased, and was able to recommend an efficient means for bringing about an increase or at least arresting further depletion. This was to be accomplished through the agency of fish culture, and little time was lost in securing for the project the sanction of Congress by an appropriation.

In 1872 a few salmon and shad were hatched and planted, and by 1880 eight species of fishes, including three kinds of salmon, two trouts, shad, whitefish, and carp, were being produced on a comparatively large scale and active experiments were being conducted to determine the methods best suited for other species.

This phase of the Bureau's work has now grown to enormous proportions, and in the fiscal year ended June 30, 1915, 49 species were propagated, these including, in addition to fishes, the lobster and several species of economically valuable fresh-water mussels. The total product of these was over four and a half billion eggs and young, which were planted in every State and Alaska. Some idea of the magnitude of the work of distributing these is indicated by the fact that it involved 637,716 miles of travel, of which 146,544 was by the Bureau's special cars and the rest by messengers. These marine and fresh-water fish and invertebrates were collected and hatched by 40 stations and 95 substations located in 34 States and Alaska. In addition 8,404,000 food and game fishes were rescued from overflowed lands, where they were in peril of being left by the receding waters, and returned to the safety of the streams.

Solely by reason of these fish-cultural operations and similar activities on the part of the States, the supply of trout and other game and food fishes in streams and small lakes is being maintained and increased, the whitefish of the Great Lakes is holding its own, the shad in certain waters is being saved from extinction, and the effects of heavy fisheries for the Pacific salmons and certain marine fishes are being compensated. As a result of transplanting, the Atlantic shad and striped bass are abundant on the Pacific coast, and the former are being shipped back in large numbers to supply the markets of their ancestral regions. Certain depleted salmon rivers of Maine recently have been planted with humpback salmon fry from the Pacific coast and small runs of breeding fish already have appeared in several of those streams, raising the hope that the nearly exterminated Atlantic salmon may be replaced by a worthy successor, better able to cope with the conditions established by the settlement of the country. It is believed that the recently inaugurated propaga-

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tion of fresh-water mussels will relieve the prospect of a depletion of the supply of raw material for the pearl-button industry.

The statistical work inaugurated as a necessary part of the original functions of the Bureau has been continued and enlarged. Periodical canvasses are made of the fisheries, usually by geographical regions, e. g., New England States, Middle Atlantic States, South Atlantic States, Gulf States, Pacific Coast States, Mississippi River and tributaries, Great Lakes, minor interior waters, and Alaska. In the last few years unusually comprehensive statistical reports have been published on the oyster, menhaden, lobster, and fresh-water mussels. This statistical information is not only of immediate interest to the fishery industries, but is highly important as a basis for determining the necessity and the measures for the regulation and conservation of the fisheries.

The regulation of the fisheries, whether in navigable waters or not, is a function of the government of the several States within which they are located, and until recently the Bureau of Fisheries had no executive duties in the enforcement of fishery regulations, although through its advisory capacity exercising large influence over fishery legislation. It is now charged, however, with the enforcement of the laws relating to the fisheries and the taking of fur-bearing animals in Alaska, and has entire administrative control of the Pribilof Islands, their native inhabitants, and the fur-seal herds which resort to them during the breeding season. The annual value of the fishery products of Alaska is about \$20,000,000, or over two and one-half times the original cost of the Territory to the United States.

The scientific work for which the Bureau was originally created has grown greatly in both quantity and scope. It embraces the study of the habits, distribution, diseases, and classification of fishes and other aquatic animals, especially those of commercial importance, and of their food and enemies. As any organism is controlled more or less by its environment, the study of a commercial species involves investigation of the other animals and plants with which it is directly or indirectly associated and of the physical and chemical characters of the waters in which it lives. The information necessary as a basis for the conservation and improvement of the fisheries, therefore, covers a wide field in aquatic biology, physics, and chemistry, and the scientific work of the Bureau is governed by an appreciation of these requirements.

The results of investigations are not always susceptible of immediate practical application, and to make them commercially valuable a considerable part of the Bureau's work consists of experiments to develop methods by which they can be applied to the needs of humanity.

Investigations and experiments are conducted by "field parties" working in all parts of the country, at the general laboratory in Washington, the marine biological stations at Woods Hole, Mass., and Beaufort, N. C., and the biological station on the Mississippi River at Fairport, Iowa. For marine investigations the Bureau has an able seagoing steamer, a coastwise steamer, and a fishing schooner with auxiliary gasoline engine power, and various launches and small boats are employed both on the coast and in interior waters. In addition to the small permanent scientific force, which is inadequate to meet the demands, the Bureau employs temporarily a large number of qualified investigators and assistants connected with universities, colleges, and other institutions of learning. Some of the practical scientific aid which the Bureau has extended to the fisheries in recent years consists of the location of new fishing grounds, the development of markets, and means of using wasted or neglected fishery resources, the development of methods of sponge, terrapin, and fresh-water mussel culture, causes of disease in fishes, surveys of oyster bottoms and recommendations for their conservation and utilization, recommendations for State fishery legislation, etc.

The results of the work of the Bureau are published in two series, the "Reports," of which there are 40, and the "Bulletins," of which 39 bound volumes have been issued to 1915. A recently established series of "Economic circulars" gives prompt information on subjects of economic interest. These and pamphlet separates of the papers included in the reports and bulletins are furnished to interested persons on application to the office of the Bureau, Washington, D. C. Mention of some of the work recorded in these papers is made in the following account of the equipment, functions, and accomplishments of the biological station at Beaufort.

The coast of North Carolina, with its rivers, its great salt, brackish, and fresh-water sounds, its sea shores, bights, and offshore banks, has long been noted for its fisheries. It is recorded of the Indian Chief Manteo that, after his visit to the ships of Sir Walter Raleigh's colony on Roanoke Island in July, 1584, he "fell to fishing, and in less than half an hour he had laden his boat as deep as it could swim." First the early explorers and later fishermen and naturalists have been attracted to the coastal region of North Carolina by the wealth of aquatic life—fish, oysters, clams, scallops, crabs, shrimp, terrapin, porpoises, seaweeds, and a host of living things which have no names other than those which science has given them.

Following the visits of the zoologists, Gill and Stimpson, in 1860, and Coues and Yarrow, in 1871-72, Beaufort became a resort for persons interested in biology, and for a period of 10 years some of

the professors and students of Johns Hopkins University maintained a laboratory here. Prof. Baird and others connected with the Bureau of Fisheries investigated the fishes of the region within the first decade of the Bureau's existence, but it was not until June 1, 1899, that a fisheries laboratory was established. This was in a rented building, but in 1900 Congress authorized the erection of a biological station, and on May 26, 1902, the present building was thrown open for research. Situated in a region in which fishing is a leading industry and where a considerable part of the population is largely or entirely dependent on the fisheries for a livelihood, the laboratory was established with the primary purpose of furnishing aid to that industry. Therefore, while scientific investigation must precede fish culture and the other phases of fishery conserva-



Laboratory on the left, mess house and pump house on the right.

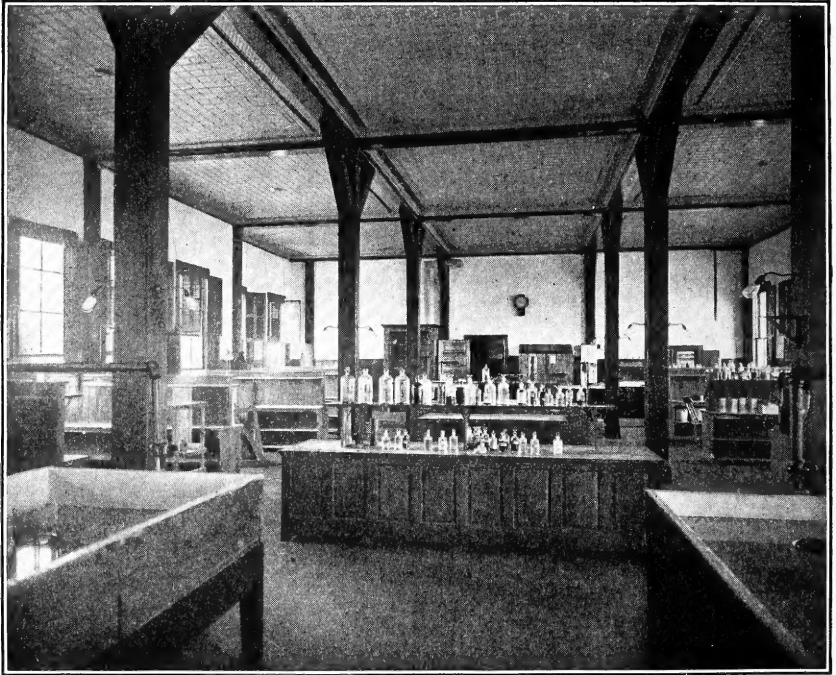
tion and development, to discover the laws and the facts which furnish the foundation for "practical" work, the laboratory does not stop with pure research but endeavors to make concrete application of the results.

THE STATION AND ITS EQUIPMENT.

The station is situated on Pivers Island, with an area of about 4 acres, about 150 yards west of the city of Beaufort. The plant consists of the laboratory building, a mess house and kitchen, power house and pumping plant, carpenter shop, boathouse and ways, and a terrapin-rearing house. Along the shores are four large concrete terrapin pounds, a concrete pool for sharks and other large fishes, and a landing pier. Most of the island is graded and planted with grass

and shrubbery and the more exposed shores are protected from erosion by sea walls of concrete and heavy granite boulders.

The laboratory building is a two-story frame structure, 70 feet long and 42 feet wide, with 2 two-story wings each about 52 feet long and 18 feet wide. The wings are occupied by six bedrooms each, for the accommodation of the enlarged scientific staff employed during the summer, while the central portion of the building is devoted to purposes of investigation, instruction, and administration. The laboratory occupies the entire second story, removed from the distractions and noises inseparable from those parts of the buildings



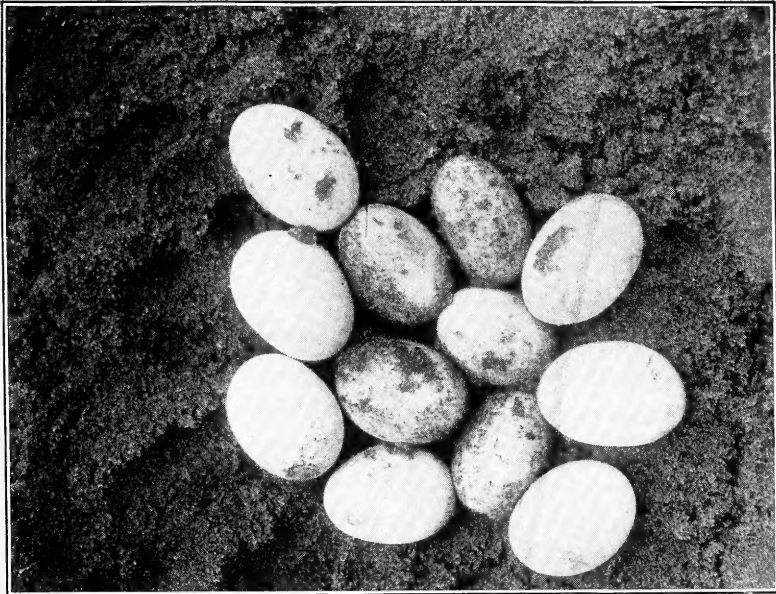
Interior of laboratory.

and grounds open to the general public. Along the north and south walls are alcoves for investigators, separated by half-height partitions, designed to interfere as little as possible with the free passage of light and air. Each is provided with a table and shelving and whatever aquaria, dishes, apparatus, and reagents may be required for the particular work in progress, and one or two high windows furnish light and ventilation.

Near each end of the laboratory are two large tank tables, with aquaria, affording facilities for keeping and observing the live plants and animals brought in from the waters of the harbor. Chemical reagents and other frequently needed supplies are kept in two long

locker tables conveniently placed in the center of the room, but the more bulky and fragile glassware and special apparatus is stored in the supply room on the first floor and issued as required. Sinks, a fume chamber, and a photographic dark room are located along the end walls of the room.

The museum occupies the first floor and is open to the public. It contains many animals and plants representative of the marine fauna and flora of Beaufort Harbor and its vicinity, and will prove of interest to the casual visitor, but particularly to those who fish or who explore the beach for the spoils thrown up by the waves. The specimens at present (1916) in the museum were preserved primarily for



Diamond-back terrapin eggs exposed in the nest.

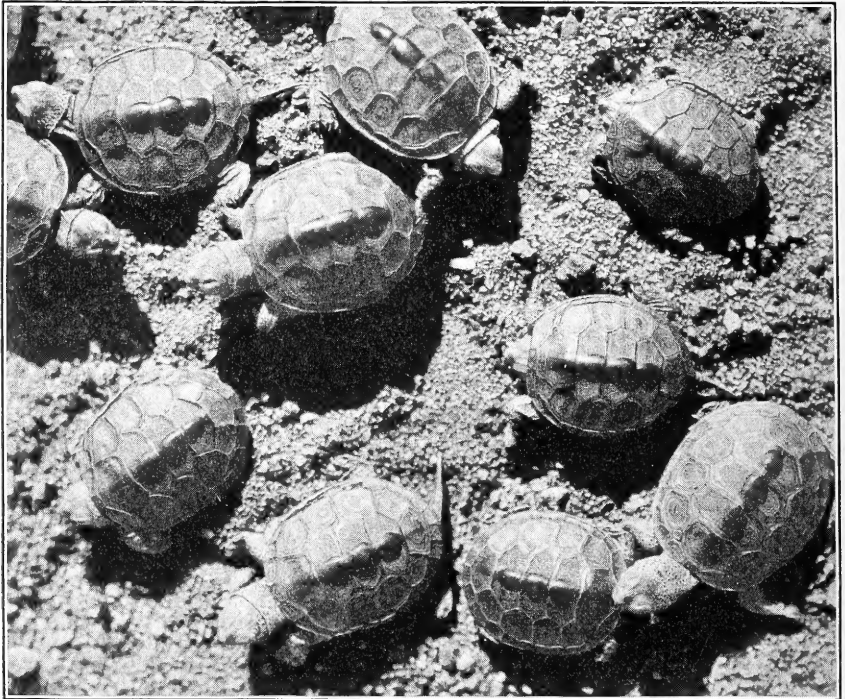
the use of investigators, but it is hoped eventually to have a specially prepared exhibit of greater interest and educational value to the general public. The tidal boxes and aquaria along the walls of the museum are intended for this purpose and are generally stocked with living organisms brought in by the collectors who daily scour the harbor and the shores in search of specimens.

The library is in a room at one end of the museum and contains about 1,000 volumes. While small, it has been selected with special reference to the needs of the investigators, who also may obtain books from the excellent main library of the Bureau in Washington and from the other unusually rich public libraries of that city.

The three other rooms corresponding to the library are used for offices, supplies, and special scientific purposes, respectively.

The laboratory building, as befits its needs, is abundantly supplied with both fresh and salt water. The former is derived from an artesian well, the flow of which varies with the tides, while the salt water is pumped from the harbor. The buildings and grounds are lighted by electricity carried by submarine cable from the city lighting plant.

There are attached to the station 2 launches, 26 feet and 33 feet long, respectively, and about 15 rowboats, which are used in making collections, and for special offshore investigations the Fisheries steamer *Fish Hawk* is detailed as required. There is an ample equip-



Diamond-back terrapin recently hatched, nearly natural size.

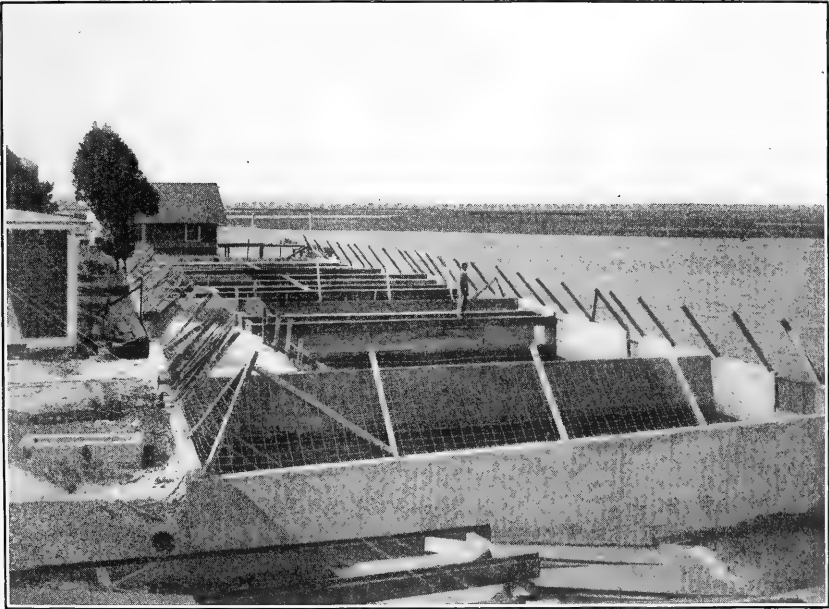
ment of the ordinary laboratory apparatus and the collecting gear consists of a pound net, stow nets, beam and otter trawls, seines, and various types of tow nets and dredges.

The radio station is a separate establishment operated by the Navy Department by courtesy of the Department of Commerce.

THE WORK OF THE STATION.

The laboratory concerns itself mainly with two interdependent lines of work. In the first place it aims to conduct scientific investigations to determine not only the life histories of aquatic forms of economic importance, but also "the histories of the animals and

plants upon which they feed or upon which their food is nourished; the histories of their enemies and friends, and the friends and foes of their enemies and friends, as well as the currents, temperatures, and other physical phenomena of the waters in relation to migration, reproduction, and growth." In the second place it strives to show how the knowledge thus gained may be applied to maintain our more important fishery industries against deterioration and to reestablish those already depleted by natural means or by perfecting methods for supplanting or replenishing natural stock with that grown under more or less artificial conditions, bearing the financial burden in experimental methods of scientific aquaculture and in the search for undeveloped or unknown fisheries.



Diamond-back terrapin pound.

A review of what has been accomplished at the station is impossible in this brief paper. Reference to several investigations, illustrating something of the diversity of the station's work, may prove of interest. One of the first was a report on investigations for the promotion of the oyster industry of North Carolina. Attention was called to the ways in which natural oyster reefs were formed under the conditions prevailing in this region; to the factors which one engaging in "oyster gardening" must consider; to the misfortunes and successes of some of those who had attempted oyster farming; and, by experimental oyster planting, to the fitness or unfitness of certain bottoms to oyster culture. When the State awakens to the need of encouraging its citizens to engage in this industry and

supplies the machinery for properly protecting oyster farms, this information will be in demand.

One of the investigators made a report on the vegetation of Shackelford Banks, calling attention to the changes which these banks have undergone from a region of forests reaching nearly to the water's edge on the seaward side, to one of barren desolation in which not even the huts of the fishermen are safe; and in several instances they have had to be abandoned and new sites sought. Means of establishing barrier drives, of reforesting the region, and the value of various plants as sand binders, etc., are discussed.

The work of the Fisheries steamer *Fish Hawk* in locating and charting some offshore blackfish grounds opens up new possibilities of special interest to local fishermen at a time when several of their important fisheries are at a low ebb. The largest bank, lying about 21 miles southwest of the bell buoy on Beaufort Bar is at least 7 miles long by about $2\frac{1}{2}$ miles wide. To enable fishermen to find it with greater ease, a first-class can buoy has been planted near its center by the Bureau of Fisheries.

One of the most unique and important constructive investigations has been the development of the artificial propagation of diamond-back terrapin whereby the cultural methods perfected at the laboratory may be duplicated and applied to the cultivation of terrapin as a commercial enterprise. With the development of the regions which the diamond-back inhabits, it will be increasingly difficult to maintain a natural supply. There is reason to believe that the commercial culturist may greatly increase the supply and cheapen the product.

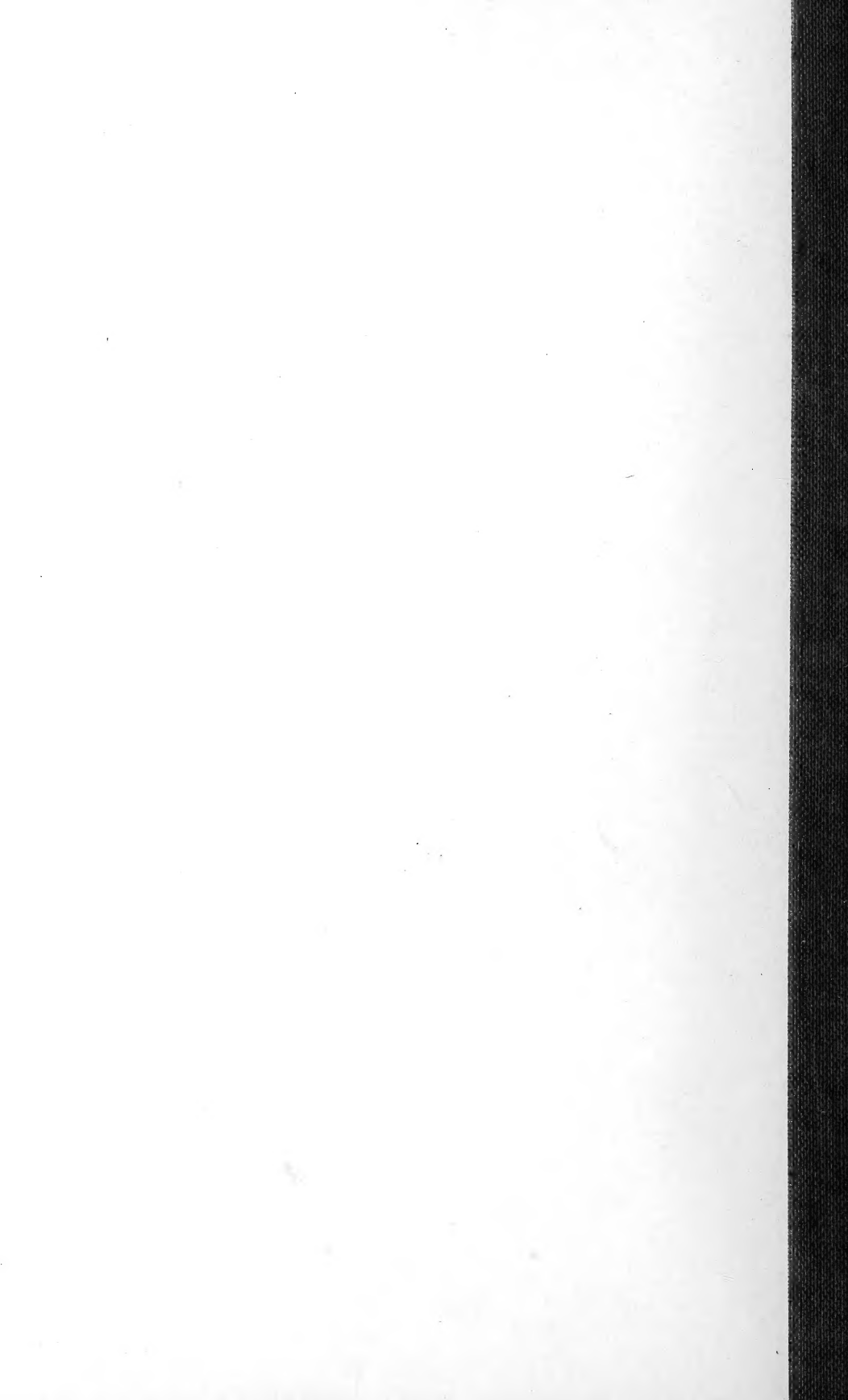
The station's plant affords a practical demonstration of working methods. Here, one seriously contemplating engaging in the industry may observe how the breeders, the eggs, and the young are cared for. Many problems of a practical nature as rate of growth, winter feeding to shorten the time of reaching a marketable size, etc., are being prosecuted. In its pens are terrapin hatched in the laying beds ranging in age from those just hatched to those 5 years old. The older broods have reached maturity and their progeny are being reared for comparison with their parents and the wild stock.

In cooperation with the Forest Service of the Department of Agriculture, studies of the shipworm and other marine borers have been conducted for several years with the ultimate object of determining how the damage to shipping, bridges, and wharves wrought by these destructive animals may be controlled and minimized. This is a problem of great interest to shipowners and engineers, but for which no satisfactory solution has been offered.

From the time the laboratory was first established to the present, the collection of information on the food, breeding, migrations, and

life histories of the fishes of the region has been an important part of the work, until, with the possible exception of the vicinity of the Bureau's laboratory at Woods Hole, the knowledge of these matters is more complete than for any other locality on the Atlantic coast. About 260 species of fishes are known from Beaufort and its vicinity. Experiments are now being conducted to determine if some of the principal food fishes can be artificially propagated to advantage.

While the chief aim is to render service to the fisheries, sight is never lost of the opportunity to carry on more abstract researches, and particularly to extend to volunteer investigators the facilities which the location and equipment of the laboratory afford. The publications in pure and applied science which have issued from the station cover a wide range and many titles.





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