BULLETIN
OF
THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY
1938

FORTIETH SEASON

JUNE 15TH TO SEPTEMBER 15TH

1938

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THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY

JANUARY, 1938

Contents

Salsbury Cove, Maine

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THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY

(FORMERLY THE HARPSWELL LABORATORY)

Founded by John Sterling Kingsley in 1898

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HOMER W. SMITH
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HAROLD D. SENIOR, Salsbury Cove, Me.
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* *Members of the Executive Committee.*
[1] Treasurership vacant due to death of Mr. Guy E. Torrey in November 1937.

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Edward L. Young, Brookline, Mass.
L. Lorraine Young III, Harvard University

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HISTORICAL SKETCH

1898 Laboratory established at South Harpswell, Maine, by J. S. Kingsley.

1913 Reorganization of laboratory as a scientific corporation under the laws of the State of Maine with a board of ten trustees and J. S. Kingsley as director.

1921 Removal of laboratory to Salsbury Cove on Mount Desert Island, Maine, and designation as the Weir Mitchell Station of the Harpswell laboratory under the directorship of Ulric Dahlgren.

1922 Eighty acres of land near the Weir Mitchell Station purchased from Louis B. McCagg, since then developed as home sites for biologists working in the laboratory.

1923 Land for Weir Mitchell Station deeded by the Wild Gardens Corporation to the laboratory, the name of which was changed to the Mount Desert Island Biological Laboratory.

1926 H. V. Neal elected Director of the Weir Mitchell Station.

1928 Amalgamation of the Mount Desert Island Biological Laboratory with the laboratory founded by Clarence Cook Little at Bar Harbor. The latter was designated the Dorr Station with C. C. Little as director.

1929 Land opposite the Weir Mitchell Station deeded to the laboratory by John D. Rockefeller, Jr.

1931 William H. Cole elected Director of the Weir Mitchell Station, and R. L. Taylor, Director of Dorr Station.

1933 All instruction at the Dorr Station discontinued; facilities to be devoted to research in terrestrial and fresh water biology, under the same direction as the Weir Mitchell Station.

1935 Additional land opposite Weir Mitchell Station, containing fresh water pond, deeded to laboratory by John D. Rockefeller, Jr.

LOCATION

Mount Desert Island is situated on the coast of Maine, one hundred miles east of Portland. Its cold waters are extraordinarily rich in marine life, including forms found on rocky, surf-beaten shores, in muddy coves, on the sea bottom at a multitude of depths and conditions, and floating on the surface of bays, inlets, and open sea. Depths of over a hundred fathoms are found within twenty miles, where hundreds of pelagic forms are found on the surface in their season. The deep bottoms furnish brachiopods, huge actinians, basket stars, tunicates and other rare forms. Mud flats furnish a great abundance of invertebrates and plants. The tide rises and falls from eleven to fourteen feet, giving ample opportunity to secure many forms on the bottom or in rock pools, while the strong currents from the outer sea bring in many jelly-fishes and floating species not ordinarily easy to secure in still waters.

In the following list are mentioned some of the common aquatic animals which may be secured at Mount Desert Island for investigation during the summer season.

1. Many different types of bryozoa and rotifers—very abundant.
2. Several genera of colonial hydrozoa—very abundant; the scyphozoa *Aurelia, Cyanea* and *Melicerta*—frequently abundant; the actinozoa *Metridium* and *Sagartia*—abundant.
3. Nemerteans: *Cerebratulatus lacteus*—available in small numbers with ripe eggs from July to August 20th; and several other genera.
4. A great variety of annelids, including *Echiurus*—sometimes with ripe eggs and sperms; *Amphitrite, Clymenella, Myxicola* and *Piscicola*—abundant.
5. The brachiopod *Terebratulina*—very abundant.
6. The molluscs *Mya, Mytilus, Chrysodomus, Natica, Chiton, Yoldia, Saxicava, Acmaea, Dentalium, Astarte, Pecten maximus, Venericardium* and many others—abundant.
7. Many genera of echinodermata, including *Asterias, Ctenodiscus, Strongylocentrotus, Echinarachnius* (sexually mature June to October), *Ophiopholis, Cucumaria*—very abundant; *Crossaster, Solaster* and *Henricia*—available in moderate numbers.
8. Crustacea in great abundance and diversity.
9. The tunicates, *Cynthia, Molgula* and *Boltenia*—abundant.
10. The fresh-water fishes, *Perca, Micropterus, Euphomotis, Leptodoras,* etc.—abundant in the lakes.
11. The marine fishes, *Myxine,* the slime eel, and *Petromyzon*—abundant; *Fundulus heteroclitus,* with ripe eggs from July 1st to August 20th—very abundant; *Lophius,* or goosefish—easily obtainable; dogfish, skates, cod, haddock, sculpins, flounders, and hake—very abundant, the hake being sexually mature in summer.

Upon a survey of the fauna it becomes evident that a research laboratory, situated at some point on the gulf of

Maine, is highly desirable for the biologists of the country. Cape Cod, as has been pointed out in past years by Gould, Dana, Verrill, Packard and many others, is the dividing boundary between the more northern Acadian, and the southerly Virginian fauna and flora of the Atlantic coast, and no other boundary is so sharp in its delimiting of many species and genera. The Marine Biological Laboratory at Woods Hole serves as a point of access to the Virginian fauna and the Mount Desert Island Laboratory brings the worker in contact with the rich Acadian groups.

In addition to its marine fauna, the island, which comprises about one hundred square miles, has a range of bold, deeply divided, ice-eroded mountains that form a belt across its southern half. Their lower sides are clothed by forests, and between their peaks, rising at the highest to over 1500 feet, are lakes, streams, and marshes with rich fresh-water fauna and flora. Several of the lakes are large and deep; one of lesser size is 1100 feet above the sea. Brooks of cold water are abundant, containing trout and a great variety of northern fresh-water invertebrates. Besides being the home of numerous plant and animal communities, the island is on the migration route of many birds. The scenic features of the unusual combination of wooded mountains rising from the sea have been preserved for all time by the establishment of the Acadia National Park, the only national park in the country in direct contact with the ocean.

Situated in a region of great beauty, unspoiled by commercial exploitation or nearness to large cities, the laboratory has the advantage of being near the wild life sanctuary of the park which secures a permanent and singularly rich area for biological study. The usual summer climate of the island is pleasant and invigorating, with cool nights and daytime temperatures rarely exceeding 80°F.

CONTRIBUTORS AND SUBSCRIBING INSTITUTIONS

The financial support of the Mount Desert Island Biological Laboratory has come chiefly through contributions of summer residents of Mount Desert Island who are interested in biological research. To such gifts are added fees for laboratory tables and annual dues paid by members of

the Corporation. For several years a few colleges, universities, and foundations have supported research rooms occupied by members of their respective staffs. During 1937 rooms were supported by the following:

Carnegie Institution of Washington
Department of Embryology
The Johns Hopkins University
Department of Pharmacology
New York University Medical School
Department of Anatomy
Department of Physiology
Princeton University
Department of Biology
Rutgers University
Department of Physiology
Department of Zoology
Tufts College
Department of Biology
University of Minnesota
Department of Zoology

SCIENTIFIC FACILITIES

WEIR MITCHELL STATION

Research

At the Weir Mitchell Station in Salsbury Cove a group of buildings provides facilities for research in biology. All of the buildings are supplied with fresh water and electricity for light, heat and power of 110 volts, 60 cycles, single phase, alternating current. Distilled water gas and compressed air are also available. The main building contains 10 research rooms accommodating 2 persons each. Along the central hallway are 2 salt water shelves providing running salt water. A new research laboratory of 4 rooms for 2 workers each is expected to be ready for the 1938 season. Each room will have running fresh and salt water and 30 square feet of table space. A stock room in the main building supplies the equipment and reagents commonly required for ordinary experimental work in biology. All special and unusual pieces of apparatus and equipment must be requested well in advance or brought by the investigator. Another building with 2 research rooms is supplied with running salt water and a laboratory especially equipped for chemical studies. A fourth building

is arranged as a dark room for experimental and photographic work. Two other buildings provide space for a shop, an office and a library. The latter contains many of the American biological journals, several thousand reprints and about 1000 bound volumes. It is hoped that biologists will place the laboratory on their exchange lists. Books not found in the library may be borrowed by arrangement with the Boston Society of Natural History and the Boston Medical Library.

The sea water for the laboratories is pumped from well below the lowest tide by a lead pump into a 2100 gallon wooden reservoir, and is delivered through lead pipes and hard rubber spigots. Insulation of the reservoir prevents heating of the water, so that the temperature of water delivered to the aquaria is only from 1 to 2 degrees above that of the sea, which varies from 8 to 16°C. during the summer. Besides being cold the water is uncontaminated with wastes and oils, thus allowing prolonged observations on sensitive organisms in the laboratory.

For collecting and dredging in deeper water a thirty-foot cabin power boat, the *Dahlgren*, with equipment for hauling, towing and dredging at moderate depths is available. For work near shore a small motor boat and several row boats are supplied.

On the McCagg tract, about one-quarter mile distant, a small dwelling has been equipped for such research as does not require sea water. Six or eight investigators can be accommodated there.

Instruction

Beginning in 1938 a course in Invertebrate Zoology will be offered to college undergraduate and graduate students from July 6 to August 17 inclusive. A new laboratory, named in memory of Isabelle Zabriskie Hegner, has been built with special facilities for instruction in marine zoology. Emphasis will be placed on the study of living animals and the students will be urged to make as many of their observations as possible in the field.

The course will be in charge of Professor Ulric Dahlgren, of Princeton University, assisted by Drs. J. Wendell Burger of Trinity College and Gairdner B. Moment of Goucher College. It will consist of lectures, laboratory ex-

ercises, collecting trips, discussions and a thesis by each student on some aspect of zoology. Occasional lectures on special topics will also be given by other members of the laboratory colony, among whom are Professors Warren H. Lewis, Herbert V. Neal, Robert W. Hegner, Homer W. Smith, E. K. Marshall, Jr., and Dwight E. Minnich. The anatomy, taxonomy, development, physiology, ecology and distribution of animals representing the invertebrate phyla will be studied, with varying emphasis on each topic according to the species being considered. A final examination will be arranged for those who wish it, especially for those who plan to offer the course to colleges for credit. Students showing proficiency in the course may continue work at the laboratory after August 17, either independently or with some member of the staff, until September 15.

Tuition fee for the course will be $60 payable on or before July 6, 1938. If the fee is to be paid by a college or other institution for the student, notice to that effect must be received prior to July 6th. Applications for admission to the course must be received before May 10th, 1938 by Prof. William H. Cole, Rutgers University, New Brunswick, N.J., from whom application blanks may be secured upon request. Each application must be accompanied by an enrollment fee of $5. If the applicant is not accepted his fee of $5 will be refunded; otherwise it will be applied towards the tuition fee.

Each student should bring the following equipment: (1) microscope with low and high power objectives: (2) dissecting set, containing at least 1 scalpel, 2 needles, a pair of scissors and forceps; (3) loose leaf notebook for sheets 8½ by 11 inches; (4) suitable clothing for cold weather and for collecting, and, if possible, a pair of wading boots; (5) one of the following textbooks: vol. 1 of Parker & Haswell's Textbook of Zoology; Borradaile and Potts' The Invertebrata; or Pratt's A Manual of the Common Invertebrate Animals.

THE DORR STATION

The Dorr Station is located one and one-half miles south of Bar Harbor, and about seven miles from Salsbury Cove. It abuts on the Acadia National Park which is available for exploration and study. The land and buildings, which are

now the property of the Jackson Memorial Laboratory and which are available through the courtesy and cooperation of that institution, were originally provided by the generous gift of George B. Dorr, Superintendent of the Acadia National Park.

The station offers facilities for the study of plants and animals (exclusive of marine forms) in their natural environment. No instruction is offered.

The physical equipment consists of a wooden laboratory building, a dining hall, and tents with wooden floors. All of the buildings are supplied with running fresh water and electricity. The laboratory is equipped for elementary work in biology. All optical apparatus and all special and unusual supplies must be requested well in advance or brought by the investigator.

GENERAL INFORMATION

During 1938 the laboratory will be open from June 15th to September 15th.

Applications for use of the research facilities by investigators at the Weir Mitchell and Dorr Stations will be considered on May 1st, and assignments made according to order of receipt and special needs. Requests received after that date may have to be denied due to lack of space. Application blanks will be sent to anyone interested. They should be returned to Prof. William H. Cole, Rutgers University, New Brunswick, N.J., before May 1st, 1938.

The fees for use of research rooms during the summer season including ordinary glassware, chemicals and supplies is $100 at the Weir Mitchell Station, and $50 at the Dorr Station, payable July 1st, 1938. In special cases the Executive Committee may remit part or all of such fees. Applications for remission should be made as early as possible.

Board for those connected with the laboratory and their immediate families will be provided in the laboratory dining hall in Salsbury Cove at $8.00 per week. For others the charge will be $10.00.

Rooms may be found in the neighboring village at reasonable prices.

Salsbury Cove is an old fishing and farming hamlet on the north shore of Mount Desert Island, about five miles

from Bar Harbor and on the main road between Bar Harbor and Ellsworth on the mainland, the terminus of the Boston and Maine Railroad. The village of Salsbury Cove is a quiet market-gardening and farming community with its own post office and general store. Bar Harbor has good stores of every sort, an excellent hospital, express, telegraph, cable facilities, bus and boat service.

Those wishing to come to the laboratory by rail may arrive from Portland, Boston, New York, Philadelphia, or Washington on the Bar Harbor Express over the Boston and Maine Railroad, which will bring them directly to Ellsworth whence a bus runs through Salsbury Cove to Bar Harbor. Convenient rail connections from intermediate stations are served by the Boston and Maine, the Maine Central, the Boston and Albany, and the New York, New Haven and Hartford. An air line from Boston to Bar Harbor provides rapid service at only slightly greater expense than by rail. Prices of fares, staterooms, time of departure and arrivals and similar information may be obtained from travel bureaus. Through automobile roads from all sections of New England to Bar Harbor are excellent, with ample facilities for overnight stops. The laboratory car will meet arrivals in Bar Harbor, provided notice is received by the Director well in advance. Personal baggage and cartage of workers at the laboratory will be carried by the laboratory car for a nominal charge. Correspondents are advised against addressing mail to Mount Desert, which is the official name of Somesville, a village on Mount Desert Island. The correct address is:

The Mount Desert Island Biological Laboratory,
Salsbury Cove, Maine

View of Laboratory from Emery Cove

DIRECTOR'S REPORT FOR 1937

During the summer of 1937, twenty-six investigators and their assistants from 13 different institutions carried on studies in 15 subjects. The facilities of the laboratory were taxed to the limit emphasizing again the need of increased space and equipment. The executive committee has therefore been authorizd by the trustees to build a new research laboratory which is expected to be ready in 1938. It will consist of 4 rooms for 2 workers each, and will be more comfortable and efficient than the old building.

The seminar program for 1937 was as follows:

July 13, "Animals of the Antarctic" by Dr. Earle B. Perkins.
July 20, "The wasting disease of eel-grass" by Mr. E. L. Young III.
July 27, "Sulfanilamide in bacterial chemotherapy" by Dr. E. K. Marshall, Jr.
August 3, "Interpretation of the interaction of color factors of the guinea pig" by Dr. Sewall Wright.
August 10, "The breeding ecology of *Hydrolimax*" by Ulric Dahlgren.
August 17, "Fragmentation in the annelid *Nais paraguaycnsis*" by Dr. Libbie Hyman.
August 24, "The action of organizers on adult tissues" by Dr. Oscar Schotté.
August 31, "Moving pictures of normal and malignant cells" by Dr. Warren H. Lewis.

Visitors' Day on Wednesdays attracted over 800 persons who showed real interest in the marine displays and the experimental work being done. This represented a 300% increase over 1936, and was largely due to the cooperation of the Acadia National Park Naturalist, who included the laboratory in his weekly tour of the island. It is obvious from our experience of the past three years that the summer residents and visitors on the island are intensely interested in marine biology, and it is hoped that better facilities can be provided for them in the future.

At the annual meetings of the Corporation and of the trustees the following officers were elected: President, Ulric Dahlgren; Vice-president, Homer W. Smith; Treasurer, Guy E. Torrey; Secretary, Dwight E. Minnich; Clerk,

David O. Rodick; Director, William H. Cole; trustee for three years to fill the vacancy caused by the death of Duncan S. Johnson, Earl O. Butcher; members of the Executive Committee, Warren H. Lewis and E. K. Marshall, Jr.

Resolutions on the deaths of Duncan S. Johnson and Herbert N. Shenton who had given long and valued services to the laboratory, were read and unanimously adopted. Recently (Nov. 9, 1937) the laboratory suffered another serious loss in the death of Guy E. Torrey, who had served so efficiently as treasurer during the past four years. The following new members were elected to the Corporation: J. Wendell Burger of Trinity College; Gairdner B. Moment of Goucher College; Mrs. Duncan S. Johnson; Earle B. Perkins of Rutgers University and Edward L. Young of Brookline, Mass. Charles B. Lipman of the University of California was made an associate of the laboratory. The total membership of the laboratory is now 67.

As the result of many requests and in order to serve American biology more fully, the trustees authorized the Executive Committee to consider the resumption of instruction in biology in 1938. Accordingly it has been arranged to offer a six weeks' course in invertebrate zoology during 1938, a description of which appears elsewhere in this BULLETIN. Funds generously provided by Dr. and Mrs. Robert W. Hegner in memory of their daughter, Isabelle Zabriskie Hegner, have made possible a new building for instruction, equipped with special facilities for work in marine biology. With the new laboratory, a rich fauna, an abundant supply of cold sea water, ample aquaria space and a capable teaching staff, the laboratory is in a favorable position to conduct such a course.

During the season of 1937, in the absence of the Director, Dr. Earl O. Butcher of Hamilton College served very efficiently as Acting Director, to whom the laboratory here with expresses its sincere thanks.

The problem of securing adequate endowment or other guaranteed annual income still confronts the trustees. Increased contributions to the 1938 budget are very encouraging, but the laboratory is still unable to reduce the fee charged to investigators. It is hoped that some way will be found to finance the laboratory on a more permanent basis than by uncertain annual gifts.

The following workers were at the laboratory during the season:

Independent Investigators

Burger, J. Wendell, Trinity College
Butcher, Earl O., Hamilton College
Dahlgren, Ulric, Princeton University
Grenell, Robert G., New York University
Halsey, J. T., Tulane University
Hyman, Libbie, American Museum of Natural History
Lewis, Warren H., Carnegie Institution
Lewis, Mrs. Warren H., Carnegie Institution
Litchfield, John, Johns Hopkins University
Marshall, E. K., Jr., Johns Hopkins University
Miles, Samuel S., Johns Hopkins University
Minnich, Dwight E., University of Minnesota
Moment, Gairdner B., Goucher College
Perkins, Earle B., Rutgers University
Shannon, James A., New York University
Smith, Homer W., New York University
Smith, Willie, New York University
Young, E. L., III, Harvard University

Junior Investigators and Assistants

Atchley, John, Williams College
Chambers, Edward, Princton University
Keigher, Helen, New York University
Minnich, Benton, Minneapolis
Nauman, R. V., New York University
Reif, Charles, University of Minnesota
Smith, Lloyd, University of Minnesota
Smith, R. H., Princeton University

Laboratory Staff

Atchley, John, Assistant Collector
Butcher, Earl O., Acting Director
Russell, Walter G., Caretaker
Young, E. L., III, Collector

RESEARCH ABSTRACTS FOR 1937

The following abstracts summarize the results of investigations carried on at the laboratory during the summer of 1937. The reports have been edited only to insure uniformity of style and arrangement, but are otherwise in the form contributed by the authors. (For bibliographic reference it is recommended that the following form be used: "Bull. Mt. Desert Is. Biol. Lab., p.——.")

ABSORPTION AND EXCRETION OF SULFANILAMIDE IN FISH

E. K. Marshall, Jr. and John T. Litchfield, Jr.
Department of Pharmacology and Experimental Therapeutics, The Johns Hopkins University

The importance of sulfanilamide (para-aminobenzene-sulfonamide) in the treatment of certain bacterial infections, and the lack of a clear knowledge of its mode of action gives interest to any facts concerning its pharmacological action. In an effort to study some of the idiosyncrasies exhibited by human beings to this drug, which cannot be produced in the ordinary laboratory mammals, we have investigated its action on fish. Although the initial problem has yielded no definite results certain facts in regard to the toxicity and absorption and excretion of sulfanilamide in fish are of interest. Sulfanilamide is much more toxic for fish than for mammals. Death frequently results in both the dogfish *(Squalus acanthias)* and the sculpin *(Myoxocephalus octodecimspinosus)* from the injection of 125 milligrams per kilogram of sulfanilamide whereas in mammals several grams per kilogram are necessary to cause death.

Excretion in fish is very much slower than in mammals. Small amounts appear to be excreted by both kidney and gills. In both blood and urine of the dogfish and sculpin sulfanilamide is present partly as a conjugated derivative which can be converted to sulfanilamide by hydrolysis.

The absorption of sulfanilamide by various routes of administration was studied. Using the blood curve obtained from intravenous administration as a standard, it has been found that absorption is most rapid from the intestine, somewhat slower from intramuscular injection, and very slow when the drug is administered by mouth or intraperitoneally.