THE BULLETIN

Volume 12 Mount Desert Island Biological Laboratory Salsbury Cove, Maine



VOLUME 12 1972

THE BULLETIN THE MOUNT DESERT ISLAND BIOLOGICAL LABORATORY SALSBURY COVE, MAINE

John W. Boylan Editor

Associate Editors: Leon Goldstein, Thomas A. Maren, Bodil M. Schmidt-Nielsen

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iii

vii

х

xiii

xviii

1 109 CONTENTS

Description of Facilities Officers, Trustees, Committees, and Staff Scientific Personnel 1972 Research Programs 1972 Seminars 1972 Research Reports Indexes

⁷icture laken by George C. McKay, Jr. Jackson Laboratory Bar Harbor, Maine



Visiting Scientist 1972

HERMANN RAHN

Distinguished Professor of Physiology State University of New York at Buffalo

DESCRIPTION OF FACILITIES

The Mount Desert Island Biological Laboratory is an independent marine biological station on the coast of Maine near the mouth of the Bay of Fundy which provides a research facility for investigations on local flora and fauna. There is basic laboratory space for 32 research programs. Certain specialized equipment is available. During 1972 there were 96 scientific personnel in 32 research groups representing 30 institutions both here and abroad. There were 47 professional scientists and 24 students in the 1972 programs.

No formal courses are offered, but some advanced undergraduate, graduate, medical, and post doctoral students spend the summer as assistants to senior investigators, thereby gaining research training. Most of these students are selected by the investigators from their home institutions.

History and Organization

The Laboratory was founded in 1898 by J.S. Kingsley of Tufts College, and its original location was at South Harpswell, Maine. The site at Salsbury Cove was donated to the Laboratory by the Wild Gardens of Acadia, a group instrumental in the establishment of Acadia National Park, and removal to this location was completed in 1921. The first laboratory buildings, the original salt water system, and some of the residential cottages were constructed or obtained by the gifts of local summer residents.

The Mount Desert Island Biological Laboratory was incorporated in 1914 under the laws of the State of Maine as a nonprofit scientific and educational institution, and it is owned and operated by the Trustees and members of the Corporation. At present there are 281 members of the Corporation. It functions without full-time professional administrative personnel and in most ways it is a cooperative enterprise. Income is derived from membership dues, laboratory fees, cottage rentals, investments, private and corporate donations, and grants. The business and scientific management of the Laboratory is in the hands of the Director and the Board of Trustees.

The Directors have been: Ulrich Dahlgren, Princeton University (1920-26); H.V. Neal, Tufts College (1926-31); William H. Cole, Rutgers University (1931-40); Roy P. Forster, Dartmouth College (1940-47); J. Wendell Burger, Trinity College (1947-50); Warner F. Sheldon, University of Pennsylvania (1950-56); Raymond Rappaport, Jr., Union College (1956-59); Alvin F. Rieck, Marquette University (1959-64); William L. Doyle, University of Chicago (1964-67); Charles E. Wilde, Jr., University of Pennsylvania (1967-70); H.V. Murdaugh, Jr., University of Pittsburgh (1970-72).

Location

Mount Desert Island lies in the Gulf of Maine about 150 miles northeast of Portland, Maine, and is connected to the mainland by a short bridge. Year round air service is available to Bangor, Maine with seasonal service to Bar Harbor Airport. The island has an area of more than 100 square miles and is traversed east to west by a range of glaciated mountains and north to south by a narrow fiord six miles long that partially divides the east and west halves. Among the mountains lie several deep fresh water lakes and shallow ponds. Much of the mountainous area is a part of Acadia National Park. The Island is separated from the mainland and adjacent islands by narrow deep bays. Spring tides average 13.2 feet and neap tides 8.7 feet. The many varied biological resources of the Acadian area are readily available. In summer, the cold waters of the Gulf of Maine are rich in marine life. The rocky shores, mud flats and strong tidal currents provide a variety of habitats. Fresh water lakes and ponds and the mixed terrain give further diversity to the forms available. Certain of these are abundant, others are scarce. The research abstracts in past Bulletins will give a good indication of the common forms. (See especially Vol. 5, No. 1.) The director will be glad to furnish an estimate of the availability of any special forms. Special arrangements may be made for collections in Acadia National Park.

Physical Plant

The Laboratory is situated on a tract of about 150 acres fronting on Frenchman Bay at Salsbury Cove in the Township of Bar Harbor. In addition to shore frontage, the Laboratory owns part of a fresh water pond and brook, and its land varies from meadow and forest to sphagnum bog. Investigation is carried on in single story buildings of frame construction located along the shore. These buildings are as follows:

(1) Neal Laboratory. This, the oldest and largest of the laboratory buildings, was remodeled in 1955 and now contains eight laboratories: four large rooms that will each accommodate 3 to 4 persons, and four small rooms suitable for single investigators. All rooms are provided with gas, and fresh and salt water. Water troughs, aquaria, and larger tanks are located along the north wall outside.

(2) Halsey Laboratory was remodeled in 1961 and consists of four rooms each capable of accommodating 3 to 4 persons. The rooms all have gas, fresh and salt water. Refrigerators, ovens and aquaria are located on a common terrace at the entrance to the building.

(3) Marshall Laboratory, a new year-round facility containing four laboratories and a common instrument room, will be available for occupancy in the Spring of 1973. This building has a full basement.

(4) The Kidney Shed is a single large laboratory. It accommodates two research groups.

(5) Hegner Laboratory contains 10 laboratory rooms provided with salt and fresh water each accommodating 1 to 2 persons.

(6) Karnofsky Laboratory, constructed in 1970, contains 4 large laboratories, one large enough to accommodate 2 research groups.

(7) The Darkroom-Laboratory erected in 1962 contains one laboratory suitable for 2 to 3 persons and is equipped with salt and fresh water, and a photographic darkroom for general use.

(8) The Instrument Room was renovated in 1955 for the purpose of housing equipment used in common by members of the Laboratory. In 1969 one-half of this space was equipped as a research laboratory.

(9) *Biophysics Building*. This air-conditioned building was erected in 1965. It houses isotope counting systems, ultracentrifuges, spectrophotometers, and a chemical hood.

(10) Shop and Stockroom. The shop contains power and hand tools for woodworking; the stockroom has chemicals, glassware, analytical balances, a fume hood and an area for glassworking, and an isotope vault.

(11) Office and Library. A separate building was constructed in 1955 to contain the Director's Office and to house the business records and library. The library is small, comprising reference texts for biology and medicine, a few complete journals (Biological Abstracts, Biological Bulletin and the Journal of the Marine Biological Association), as well as monographs.

(12) Dahlgren Hall, the former village schoolhouse, was purchased and converted to use as a meeting hall; it houses a reprint collection. The single large room can seat about 120 persons. It is equipped with projectors for regular lantern slides, 35 mm slides, and 16 mm silent motion pictures.

(13) The Dining Hall. This dining hall and living room for about 20 junior investigators and students was built in 1963. It is operated by a cook-manager. A small general library of books and records, and a record player have been furnished by private donation.

(14) Bowen Hall is one of the finest remaining examples of early 19th century Island architecture. It now serves as one of two dormitories and has a common room for young women.

(15) Dock. The dock consists of two floats with livewells and attached live cars for storage of specimens. It is attached to the shore by an inclined ramp and a bridge and abutment.

(16) Collecting Boars. A 32' gasoline powered collecting boat, the Squalus, was purchased in 1958. It is provided with a circulating water tank for the transportation of specimens. Some simple dredging gear is available for collecting purposes and arrangements can be made with local fishermen for offshore specimens. A Nova Scotia skiff with an outboard motor is also used for collecting and skiffs are available to investigators.

Housing

Sixteen cottages suitable for families with children stand on land owned by the Laboratory and are within easy walking distance of it. The cottages are rented by the season, or occasionally for shorter periods. Occupants must supply their own blankets, linen, and silver, pay for utilities (electricity and gas), and pay the Laboratory for the use of the cottage (including water rent and garbage disposal). Rent is \$520 to \$890 per season, depending upon the size of the cottage. A few privately owned cottages are also available for rental near the Laboratory, and in other communities on the island. An automobile is essential for family mobility in the area.

Single investigators, student assistants, and couples without children rent rooms in the village and take their meals in the Laboratory Dining Hall. The weekly charge for meals is based on selfsustaining nonprofit operation.

In order to encourage private construction and ownership of cottages by workers, the Laboratory has a policy of issuing leases on certain plots of laboratory land. Provision is made for sale or rental of the cottages to other workers in case the owner finds it impossible to continue to work at the Laboratory. In this way, the Laboratory is able to encourage capital investment by individuals and at the same time ensure that the land will remain under its own jurisdiction. At present seven cottages are privately owned in this way.

Recreational Activities

Mount Desert Island has long been known to have one of America's most desirable summer climates. The ocean, rocky shores, and mountains provide scenery of unexcelled beauty. The distance from large metropolitan areas has so far helped to keep it relatively unspoiled. Swimming, hiking, mountain climbing, picnicking, boating and sailing, tennis, golf, and other sports are readily available. Acadia National Park with its excellent naturalists' program contributes to the general interest. There are small museums of Indian and local lore, public gardens, a good public library and cultural exhibits. Proximity to the Jackson Laboratory adds scientific interest and resources. Salsbury Cove is an old fishing and farming community on the northern shore of the Island near the main road from Bar Harbor to Ellsworth. It has one general store. The Laboratory colony comprises about 100 adults and 60 children of assorted ages, and forms a considerable portion of the summer population of the village. Bar Harbor, the largest town on Mount Desert Island, is about six miles from the Laboratory and provides many of the services of a city including excellent shopping facilities and a good hospital.

Acknowledgements

The Mount Desert Island Biological Laboratory is indebted to the National Science Foundation for substantial support during the past decade. Funds for renovations of buildings and new construction have permitted the laboratory to expand and upgrade its facilities. Contributions to operating costs and for specialized research equipment have greatly improved the efficiency of research activities. The individual research projects which have been served by this laboratory are variously funded by private and government agencies and by individuals and all of these projects have benefited from the National Science Foundation grants to the laboratory. Current support under grant GB 8662 is gratefully acknowledged.

Applications

Fees for research space vary according to the demand made on the facilities. They range from \$300 to \$900 depending on the space assigned and the number of workers. All investigators have the use of the general facilities, but special arrangements are necessary if unusual demands are anticipated. Investigators are urged to bring their own specialized equipment and chemicals. On occasion, the Laboratory may be able to provide apparatus which would have long-term usefulness for other workers. Since the Laboratory is closed for nine months of each year, the general policy has been to maintain as little delicate or especially valuable equipment as possible. Isotope counting systems and ultracentrifuges are available on a fee basis. Persons planning to use isotopes must make prior arrangements in conformity with our Radiation Safety Committee requirements.

Limited fellowships are supported by funds from the Ulrich Dahlgren Memorial Fund (a gift from the American Philosophical Society).

Application and inquiries should be addressed to the Laboratory Director: Dr. H.V. Murdaugh, Jr.

July 1 - August 31	Mount Desert Island Biological Laboratory
	Salsbury Cove, Maine 04672
September 1 - June 30	Department of Medicine
	University of Pittsburgh
	School of Medicine
	Pittsburgh, Pennsylvania 15213

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MDIBL

xi

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RESEARCH PROGRAMS - 1972

Addink, Albert D.F.

Effect of Temperature on Cerebrospinal Fluid pH in Squalus acanthias

Addink, Albert D.F., Robert M. Woodworth, Erik R. Swenson, Thomas H. Maren Electrolyte Physiology of the Endolymph in Squalus acanthias

Bend, John R., James R. Fouts, Roberta J. Pohl

- 1. Effects of Pretreatment with Polychlorinated Biphenols or Phenobarbital on Metabolism of Chemicals by Liver from the Skate
- 2. Metabolism of Chemicals by Liver and Gill of Dogfish, Skate, Crab, and Flounder
- 3. Tissue Distribution of Polychlorinated Biphenols after Oral Administration to the Flounder

Cala, Peter M.

Osmotic and Ionic Regulation of Flounder (Pseudopleuronectes americanus) Erythrocytes

Conrad, Gary W.

Polar Lobe Formation in the Eggs of Nassarius obsoleta, Mud Snail

Crawford, Richard B., Anthony M. Guarino

DDT Incorporation and Distribution in Fundulus heteroclitus

Cserr, Helen F., Joseph D. Fenstermacher, David P. Rall

Comparative and Developmental Aspects of CSF and Brain-Barrier Systems

Cserr, Helen F., Andres Roomet, Clifford Patlak, Frank Sheldon, Megan Dethier, Ernest S. Owens, Joseph D. Fenstermacher

Quantitative Measurements of Brain Capillary Permeability by Ventricular Perfusion in the Dogfish

Deetjen, Peter

Dynamics of Hydrogen Ion Secretion by the Skate Nephron

Deetjen, Peter, Dorothy E. Antkowiak, John W. Boylan

- 1. The Site of Urea Reabsorption in the Nephron of the Skate, Raja erinecea
- 2. Effect of Amonium Chloride Loading on Excretion of Urea and Salt by the Dogfish, Squalus acanthias

Doyle, William L.

- 1. Cytological Effects of Amiloride on Squalus Intestine
- 2. Cytology of Secretion of Endolymphatic Fluid in Squalus

Doyle, William L., Franklin H. Epstein, John N. Forrest

Fine Structure of the Gills of the Eel (Anguilla), the Rock Eel (Pholis), and the Stickleback (Pungitius) Under Various Transport Conditions

Epstein, Franklin H., John N. Forrest, Ann R. Epstein

- 1. Effects of Ethacrynic Acid on Chloride Efflux in Saltwater Eels
- 2. Ion Fluxes Across the Gill and Their Relation to Enzyme Activity
- 3. A Test of the K⁺-Exchange Hypothesis of Sodium Excretion by the Gills of Saltwater Teleosts

Fenstermacher, J., and A. Roomet

- 1. Measurement of Cerebrospinal Fluid Production in Squalus acanthias.
- 2. The Distribution of Acetazolamide and Ouavain in Squalus acanthias.

Fenstermacher, J., A. Roomet, and H.F. Cserr

Measurements of Brain Extracellular Space and Capillary Permeability by Ventricular Perfusion in Squalus acanthias.

Fleischner, Gerald M., Irwin M. Arias

- 1. Search for Organic Anion Binding Protein in Flounder Kidney
- 2. Studies of Australia Antigen in Molluscs

Fleischner, Gerald M., Leon Goldstein, Irwin M. Arias

Effect of Adaptation to Fresh Water on Serum Protein Concentrations in Skates

Forster, Roy P., John W. Danforth

- 1. Mechanism of Bulk Fluid Transport by Aglomerular Renal Tubules of the Goosefish, Lophius americanus
- 2. Transport of Strong Electrolytes Across Urinary Bladder Epithelia of Various Marine Teleosts

Goldstein, Leon, Anne Backus

Trimethylamine Oxide Biosynthesis in Shark Liver

Goldstein, Leon, Susan D. Harley

Role of Intestinal Bacteria in Urea Metabolism in Skates

Grant, William C., Jr.

The Effect of DDT on the Behavior of Hermit Crabs (Paguridae)

Grant, William C., Jr., Raymond L. Francis, Claire R. Berman Behavioral Ecology of Hermit Crabs (Pagurus acadianus and Pagurus pubescens)

Guarino, Anthony M., Joseph D. Fenstermacher, Patrick D. Briley, Jackie B. Call Distribution and Metabolism of Anticancer Agents and Other Model Compounds in Biliary, Urinary, and Central Nervous System Compartments

Guarino, Anthony M., David P. Rall, John B. Pritchard, Jackie B. Call Comparative Aspects of Biliary and Urinary Excretion of Phenol Red and Indocyanine Green in the Dogfish, Flounder, Hagfish, and Skate

Guarino, Anthony M., Susan Schneiderman, Marion Kinter Fate and Distribution of Methylmercury in the Dogfish

Hickman, Cleveland, Jr., William B. Kinter Studies on Renal Handling of PEG and Inulin in Winter Flounder

Hogben, C. Adrian M., Mary Brandes, Lynn Hogben Electrophysiology of Squalus Gastric Mucosa

Hogben, C. Adrian M., Roy P. Forster, Mary Brandes, John W. Danforth Electrophysiology of the Teleost (*Hemitriptertus*) Bladder

Hogben, C. Adrian M., John P. Hayslett, Donald Schon, Mark Epstein Electrophysiology of Perfused Squalus Rectal Gland

Huang, K.C., Li-Ren Chang Effect of Diphenylhydantoin and Vasopressin on Membrane Permeability of Flounder Intestine

Kamaky, Karl, Jr., William B. Kinter Development of a System to Study the Teleost Chloride Cell with the Ussing Chamber

Kleinzeller, Arnost, Elizabeth M. McAvoy Transport of Sugars Across the Peritubuler Membrane of the Flounder Kidney Tubule

Kleinzeller, Arnost, John B. Pritchard, Elizabeth M. McAvoy Handling of Some Sugars by the Flounder Kidney

Maack, Thomas

Adaptation of Organic Acid Transport in the Flounder Kidney

Maren, Thomas H., A.D.F. Addink

The physiology of Electrolytes in Endolymph of Squalus acanthias, Transport of Ions into Aqueous Humor, Perilymph and Cranial Fluid of S. acanthias

- Maren, Thomas H., Peter Deetjen Micropuncture Studies of Renal Acidification in *R. clavata*
- Milman, Harry S., Anthony M. Guarino The Distribution of L-asparagine Synthetase in the Organs of Aquatic Species
- Morad, Martin, Robert Feldman, James Weiss Electro-Mechanical Properties of the Tunicate Heart

Murray, Marion

Reinnervation of Optic Tectum of Fundulus by Regenerating Optic Axons

- Murdaugh, H. Victor, Jr., Alvin P. Shapiro, Henry J. Berliner Studies of Renin and Catacholamine Interrelationships in the Diving Seal, *Phoca vitulina*
- Myers, Jack D., H. Victor Murdaugh, Jr., Margaret V. Ragni, Henry J. Berliner, Elizabeth W. Murdaugh Further Studies of Diuretic Drugs on Renal Function in Squalus acanthias
- Opdyke, David F., John F. Cook, Jr., Alan E. Rauch Relation Between Dorsal Aortic Blood Pressure and Plasma Volume in Squalus acanthias
- Opdyke, David F., Steve Messing, James McGreehan, John F. Cook, Jr., Alan E. Rauch Effect of Atropine on Cardiac Bradycardia Induced by Spinal Cord Stimulation in Squalus acanthias

Peirce, E. Converse II, Barbara Kent

- 1. Changes in Blood Flow Distribution with Acid Loading in Squalus acanthias
- 2. Gill Reflex Response and Lactic Acid in Squalus acanthias
- 3. Oxygen Dissociation Curves in Squalus acanthias

Pritchard, John B., Anthony M. Guarino, William B. Kinter Pharmacokinetics of DDT in Winter Flounder

Pritchard, John B., David Peakall, Robert Risebrough, William B. Kinter

- 1. Effects of DDE on Calcium Transport in the Duck Oviduct
- 2. Studies on the Mechanism(s) of DDE Induced Egg Shell Thinning in Domesticated Mallard Ducks

Rahn, Hermann

Gas Permeability of the Cormorant and Herring Gull Egg

Rappaport, Raymond

Establishment of Cleavage Furrows by Mitotic Spindles

Renfro, J. Larry

Salt and Water Movements in the in vitro Flounder Bladder

Renfro, J. Larry, Dale Benos, Yogendra Patel, Bodil M. Schmidt-Nielsen Distribution of Ch₃-Hg-Cl and HgCl₂ in *Fundulus heteroclitus* and their Relationship to Na Kinetics

Roomet, Andres, Megan Dethier, Ernest S. Owens, Frank Sheldon, Joseph D. Fenstermacher Cerebrospinal Fluid Production and Absorption in Normal and Drug Treated Dogfish

Rout, Robert W., Li-Ren Chang, K.C. Huang Effect of Bacterial Toxins on Ion Transport Across the Flounder Intestine

Schmidt-Nielsen, Bodil M., Yogendra Patel Renal Tubular Urea Transport by the Skate as Affected by Infusion of Trimethyl Amine Oxide

Schmidt-Nielsen, Bodil M., J. Larry Renfro, Dale Benos, Yogendra Patel Extracellular and Intracellular Spaces Ion Concentrations in Various Tissues of Flounder, Eel, Skate, and Hagfish

Schon, Donald, C. Adrian M. Hogben, John P. Hayslett, Mark Epstein Studies on the Perfused Rectal Gland of Squalus acanthias

- Schwartz, Robert J., Richard B. Crawford, Charles E. Wilde, Jr. Characterization of Proteins and RNA Synthesized During Development of Fundulus heteroclitus Embryos
- Sheldon, Frank, Megan Dethier, Ernest S. Owens, Joseph D. Fenstermacher, Clifford Patlak The Distribution of Labelled Ouabain and Acetazolamide in the Dogfish after Intravenous and Intraventricular (Brain) Injection

Theil, George B., Mary F. Theil

The Molecular Characteristics of Certain Mammalian and Piscine Hemoglobins and Myoglobins

EVENING SEMINARS 1972

All evening seminars held at 8:00 P.M. in Dahlgren Hall, Salsbury Cove, Maine.

Wed., July 5	Dr. Hermann Rahn; State University of New York at Buffalo Medical School. "A New Way of Looking at Acid-Base Regulation"
Tues., July 11	Dr. Hermann Rahn; State University of New York at Buffalo Medical School. "Gaseous Exchange and Egg Shell Engineering, Hummingbird to Ostrich"
Tues., July 18	Dr. Leon Goldstein; Brown University. "Nitrogen Metabolism, Environmental Physiology, and the Evolution of Fishes"
Tues., July 25	Dr. William C. Grant, Jr.; Williams College. "Behavior and Ecology of Hermit Crabs in the Frenchman's Bay Area"
Wed., August 2	Dr. Richard M. Hays; Albert Einstein College of Medicine. "The Amide Pathway in the Toad Bladder: Specific, Vasopressin-Sensitive and Independent of Water"
Tues., August 8	Dr. Thomas H. Maren; University of Florida College of Medicine "Physiological Aspects of the Chemistry of Water"
Tues., August 15	Dr. Leonard B. Kirschner; Washington State University. "Relation of Filtration Devices to the Evolution of Invertebrates in Fresh Water"
Tues., August 22	Dr. Alvin P. Shapiro; University of Pittsburgh School of Medicine. "Renin and Catecholamine Interrelationships"

INFORMAL THURSDAY NOON SEMINARS

Based mainly on work done here, or work relating directly thereto. Two 20-minute presentations, or one 40-minute talks.

July 20	Dr. Gary Conrad; Kansas State University "Mechanism of Polar Lobe Formation"
	Dr. Raymond Rappaport; Union College "Building a Cell Division Mechanism"
July 27	Dr. Bodil Schmidt-Nielsen; The Mount Desert Island Biological Laboratory "Extracellular Spaces of the Flounder"
	Dr. J. Larry Renfro; The Mount Desert Island Biological Laboratory "Osmoregulatory Role of the Flounder Bladder"
August 3	Dr. Franklin H. Epstein; Harvard University Dr. William L. Doyle, University of Chicago Dr. John N. Forrest, Yale University Dr. Karl Karnaky, Jr., The Mount Desert Island Biological Laboratory "Correlation Between Sodium Transport, Na-K ATPase Activity, and Gill Ultra- structure in Teleosts"
August 17	Dr. Franklin H. Epstein; Harvard University Dr. Karl Karnarky, Jr., The Mount Desert Island Biological Laboratory "Does the Chloride Cell Transport Chloride?"