INSTRUCTIONAL STAFF, 1971

FRANZ E. ANDERSON, Ph.D. Asst. Prof. Geology[1]. Oceanography and marine geology.

JOHN M. ANDERSON, Ph.D. Prof. Zoology[2]. Invertebrate zoology.

CLARA BARTLEY, Ph.D. Research Assoc. Microbiology[1]. Marine microbiology.

ARTHUR L. BLOOM, Ph.D. Assoc. Prof. Geological Sciences[2]. Coastal geology.

ARTHUR C. BORROR, Ph.D. Assoc. Prof. Zoology[1]. Marine protozoology.

WILBUR L. BULLOCK, Ph.D. Prof. Zoology[1]. Marine parasitology.

LOUISE F. BUSH, Ph.D. Prof. Zoology, Drew University. Invertebrate zoology.

ROBERT A. CROKER, Ph.D. Asst. Prof. Zoology[1]. Marine animal ecology.

WILLIAM DRURY, Ph.D. Director of Research, Massachusetts Audubon Society. Marine ornithology.

ALFRED EIPPER, Ph.D. New York Cooperative Fishery Unit[2]. Marine fisheries.

PERRY W. GILBERT, Ph.D. Director, Mote Marine Laboratory, Sarasota, Florida, and Prof. Zoology[2]. Ichthyology, especially elasmobranchs.

LARRY G. HARRIS, Ph.D. Instructor in Zoology[1]. Invertebrate zoology.

EDWARD J. HERBST, Ph.D. Chairman, Biochemistry and Prof. Biochemistry[2]. Marine biochemistry.

OLIVER H. HEWITT, Ph.D. Prof. Wildlife Management[2]. Marine ornithology and marine mammalogy.

RICHARD A. HOWARD, Ph.D. Director Arnold Arboretum, Harvard University. Insular floras.

MYOSHI IKAWA, Ph.D. Prof. Biochemistry[1]. Marine biochemistry.

GALEN E. JONES, Ph.D. Director Jackson Laboratory and Prof. Microbiology[1]. Marine microbiology.

JOHN M. KINGSBURY, Ph.D. Director Summer Program in Marine Science and Prof. Botany[2]. Marine phycology.

GERALD L. KLIPPENSTEIN, Ph.D. Asst. Prof. Biochemistry[1]. Marine biochemistry.

GENE E. LIKENS, Ph.D. Assoc. Prof. Ecology[2]. Physical and biological oceanography.

ARTHUR C. MATHIESON, Ph.D. Assoc. Prof. Botany[1]. Marine plant ecology.

THEODORE G. METCALF, Ph.D. Prof. Microbiology[1]. Marine microbial pollution.

LORUS J. MILNE, Ph.D. Prof. Zoology[1]. Marine ecology.

HUGH F. MULLIGAN, Ph.D. Assoc. Prof. Botany[1]. Marine phytoplankton.

JOHN J. SASNER, Ph.D. Assoc. Prof. Zoology[1]. Physiology of marine animals.

PHILIP J. SAWYER, Ph.D. Prof. Zoology[1]. Marine ichthyology, primary productivity.

JOHN STORR, Ph.D. Assoc. Prof. Biology, SUNY at Buffalo[3]. Marine ecology and marine photography.

PETER K. WEYL, Ph.D. Prof. Oceanography, SUNY at Stony Brook[3]. Physical and biological oceanography.

ELLSWORTH WHEELER, Ph.D. Asst. Prof. Zoology[1]. Marine zooplankton.

WILLIAM WISEMAN, Ph.D. Instructor of Zoology[1]. Physical oceanography.

LANGLEY WOOD, Ph.D. Chairman Zoology, and Prof. Zoology[1]. Ecology and physiology of marine animals.

[1] University of New Hampshire
[2] Cornell University
[3] State University of New York

GUEST LECTURERS, 1970

EUGENE ALLMENDINGER, Prof. Engineering, University of New Hampshire.

CLARA BARTLEY, Research Associate in Microbiology, University of New Hampshire.

TED BROWN, Captain, aboard R/V *Jere A. Chase*, University of New Hampshire.

ALFRED EIPPER, New York Cooperative Fishery Unit, Cornell University.

NORMAN FOYE, Lobsterman, Cedar Island, Isles of Shoals.

ED GLEASON, Captain, Trawler *Maria G*, Gloucester.

MARVIN GROSSLEIN, Fishery Biologist, Bureau of Commercial Fisheries, Woods Hole.

JOHN P. HARVILLE, Director, Moss Landing Marine Laboratories, California State College System.

JACK HOLSTEN, Director of Research, Bureau of Commercial Fisheries, Gloucester.

CHANNING KURY, Graduate student in ornithology, Cornell University.

JAMES MADRUGA, Captain, Trawler *Belinda II*, Gloucester.

FREDERICK MCGILL, Professor Emeritus, Newark campus, Rutgers University, and Manager, Conference Center, Star Island.

NED MCINTOSH, Captain, R/V *Jere A. Chase*, University of New Hampshire.

CDR. RICHARD MORSE, Chief, Oceanography Branch, U. S. Coast Guard, Washington, D.C.

ERNEST MCRAE, Assistant Base Director, Exploratory Fishing and Gear Research Base, Bureau of Commercial Fisheries, Woods Hole.

IRWIN NOVAK, Graduate student in geology, Cornell University.

RICHARD O'BRIEN, Director, Division of Biological Sciences, Cornell University.

WARREN RATHJEN, Fisheries Biologist, Bureau of Commercial Fisheries, Gloucester.

RANDALL VAN DRAGHT, Undergraduate student in conservation, Cornell University.

Crew of R/V *Delaware II*, Bureau of Commercial Fisheries, Woods Hole.

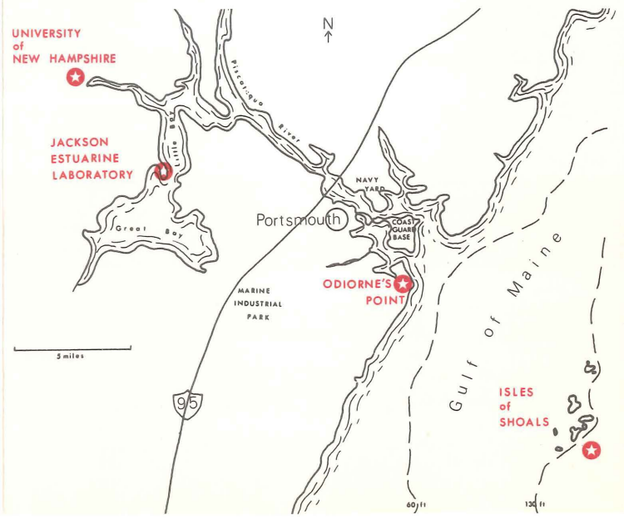
LOCATION AND FACILITIES

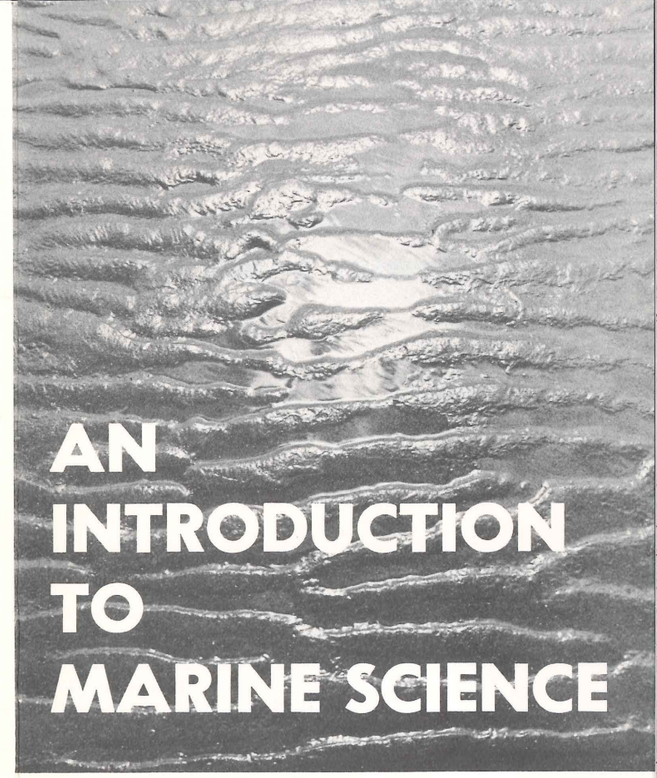
The first portion of this program is operated by Cornell University through the facilities of the Star Island Corporation on Star Island in the open Atlantic ten miles east of Portsmouth, N.H. (see map below). These nine small islands of the Isles of Shoals are mostly uninhabited granite masses rising from the 120-foot depth contour. Like ships at sea, they lie in unpolluted water well out on the continental shelf and support a flora and fauna that are uniquely rich and totally accessible. Room and board are provided for students and faculty in the conference center on Star Island. A large laboratory room is equipped with tanks, aquaria, sea table, and running seawater.

The second portion of the program is operated through the facilities of the University of New Hampshire, adjacent to the Great Bay–Little Bay estuary which covers more than 15,000 acres of southeastern New Hampshire. The estuary is rich in marine life and is relatively unpolluted. The dining, dormitory, classroom, library, and recreational facilities of the 7,000-student campus are used in the program. Some activities take place at the Jackson Estuarine Laboratory, a newly constructed marine laboratory on Adam's Point at the junction of Great Bay and Little Bay. The Laboratory is equipped with running seawater, a pier, and research facilities for biochemists, botanists, geologists, microbiologists, and zoologists. Additional land on the exposed coast at Odiorne's Point, opposite the Isles of Shoals, is available for field exercises.

CLOSING DATE

Application forms to Ithaca March 15, 1971.
Admissions announced April 10, 1971.





AN INTRODUCTION TO MARINE SCIENCE

JUNE 5 TO JULY 2, 1971

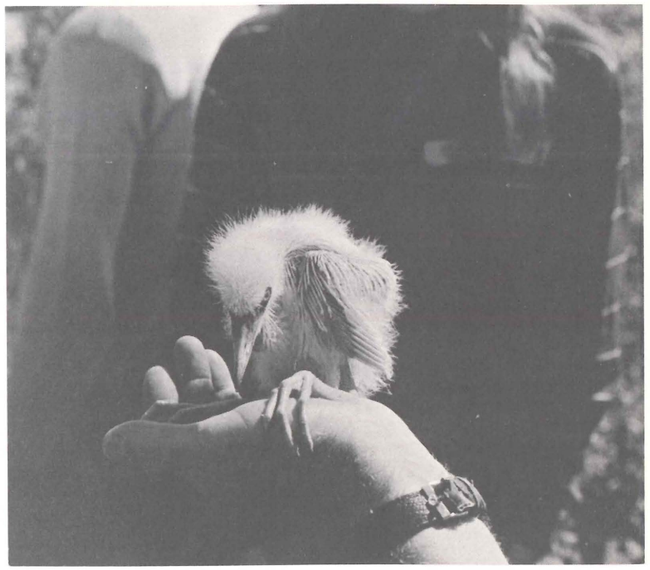
Isles of Shoals
Great Bay - Little Bay Estuary
New Hampshire - Maine

Cornell University
University of New Hampshire
State University of New York

CORNELL UNIVERSITY
UNIVERSITY OF NEW HAMPSHIRE
STATE UNIVERSITY OF NEW YORK

Summer Program in Marine Science...

is a general introduction to marine science, aimed primarily at undergraduates, drawing on the professional backgrounds of more than twenty-five faculty and nearly as many captains, fishermen, and others whose living is associated with the sea. Students who participate in this program are better able to make informed decisions during their further professional development. Later, if they enter a specialized marine occupation, they will understand better how their efforts can intermesh most productively with those of others.



DESCRIPTION

The combination of a major estuarine system at Portsmouth, N.H., and midcontinental shelf conditions at the Isles of Shoals ten miles offshore in the Gulf of Maine yields an unusual range of habitats and biota of remarkable richness in numbers of species and individuals. Classes have the opportunity to observe several hundred identified species of algae, invertebrates, marine fishes, and birds under natural conditions. Seals and, rarely, whales may be seen at close range. Lectures and field work with specialists will present a review of the important characteristics of these organisms and their ecology. A study by transect of the shores of Star Island, performed as a class project, yields an appreciation of the quantitative diversity of organisms at the land-sea-air interface, and their environmental relationships. Underwater observations are made possible by an optional diving program.

Marine fisheries are examined from two points of view: that of the biologist and that of commercial fishermen. Students will board fishing boats from the famous Gloucester fleet, and the captains will answer questions and demonstrate equipment currently in use. They will also discuss the economics of fishing as the fisherman sees it. The Bureau of Commercial Fisheries, National Oceanic and Atmospheric Agency, believes that cooperation with the scientific community will serve to strengthen the fisheries of the future. Therefore, at the Program's request, they have scheduled a day's exercise aboard the new 155-foot research vessel *Delaware II*, and will demonstrate and discuss with students techniques and problems of the Atlantic fisheries. Processing of fish products and economics of distribution from sea to consumer are covered in a trip through the Booth Fisheries factory at Portsmouth, one of the newest and largest fish-processing plants in the world. Most of the commercial (and some not yet exploited) species of fish, shellfish, and seaweeds obtainable from the Gulf of Maine will be procured and served fresh at meals.

Students will have an excellent opportunity to recognize the important marine and shore birds and to repeat classical observations on the behavior of gulls and cormorants, large nesting colonies of which are close at hand. The causes of the population explosion of gulls—especially as these relate to man's activities—and the consequences to airports, and the more subtle competitive relationship between black-backed and herring gulls will be discussed. The Isles of Shoals support the northernmost nesting colony of snowy egrets in the United States and the southernmost nesting colony of black guillemots. A study of the competitive pressures between gulls and herons on Appledore Island will also be described.

Basic tools and techniques of the oceanographer will be demonstrated aboard appropriate vessels available to the program. These include the *Viking* and the *Viking Star*, 65-foot ferries operating at the islands, the 45-foot research vessel *Jere A. Chase* and the 35-foot lobster boat *Osprey*, as well as numerous smaller boats and barges. Plankton hauls will be made and examined. Particular attention will be given to the measurement and significance of salinity and temperature gradients as they affect water density at various locations in the estuary and around the islands, and to bottom sampling and coring in the estuary. The penetration of light in the marine environment will be demonstrated. The causes and practical effects of tidal phenomena will be discussed.

Students will have an opportunity to observe techniques of small-boat handling, rules of the road, and safety afloat. Demonstrations will make clear the basic principles behind techniques of simple navigation, visual positioning, and use of marine electronics including radio beacons, sonar, and loran. The lighthouse on White Island will be visited and the role of the Coast Guard in placing and maintaining coastal aids to navigation discussed. The marine geology and physical oceanography of the estuary will be contrasted with geological features of the Isles of Shoals and placed in relation to the general geology of the Atlantic coast.

In well appointed laboratories at Durham and at the Jackson Estuarine Laboratory attention will be given to primary productivity, the microbiology of the marine environment, and the outstanding biochemical characteristics of marine organisms, especially the occurrence, physiology, and biochemistry of marine biotoxins. Motion pictures will be used to extend the coverage to additional important organisms and tropical waters. Distinguished guest lecturers will be scheduled to participate when possible.

CREDIT

A student who successfully completes this program will receive four credits on a Cornell or University of New Hampshire transcript at his choice. For transcript purposes the course is listed by the participating universities as follows:

Cornell Biological Sciences 364. *Introduction to Marine Science.* Credit four hours. Prerequisite, at least a full year of college biology. Daily lectures, laboratory, and field work. No formal examinations; grades are S or U (satisfactory or unsatisfactory).

UNH Marine Science 774. *Introduction to Marine Science.* Credit four hours. (Same description, except that grades are P or F; pass or fail.)

ADMISSION

This course is open to undergraduate or graduate students at accredited institutions who have had at least a year of college-level biology. Enrollment is limited. Preference will be given to those who appear able to profit most from this experience.

Costs total $540 which covers tuition at $65 per credit hour, fees, board, room, health insurance, boat and special transportation during the four-week period. Limited funds are available for scholarship support.

A few persons, especially teachers, who can show that this program would be particularly useful in their own circumstances may be admitted on a non-credit, restricted basis apart from the regular students.

APPLICATION

All applications and correspondence will be handled by Cornell University. The admissions committee includes two representatives from the faculties of each of the participating universities. Requests for application forms should be directed to

John M. Kingsbury, Director
Summer Program in Marine Science
B-20 Ives Hall
Cornell University
Ithaca, New York 14850

The participating universities offer several additional summer field courses in biology. Where possible, starting dates follow the termination of this Program. Further information will be sent those who request it when writing for an application for this Program.