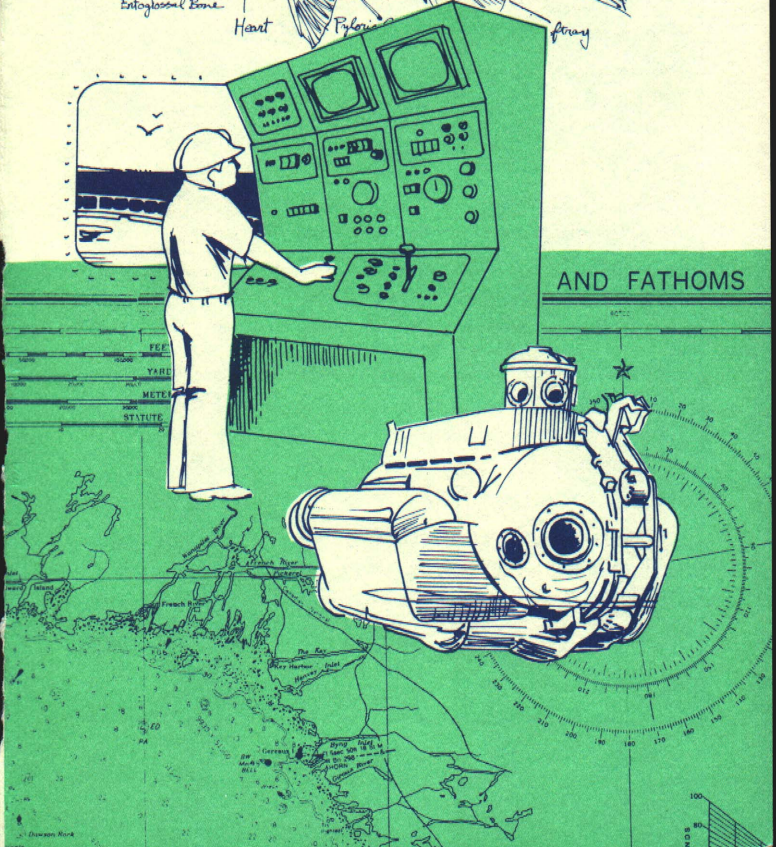
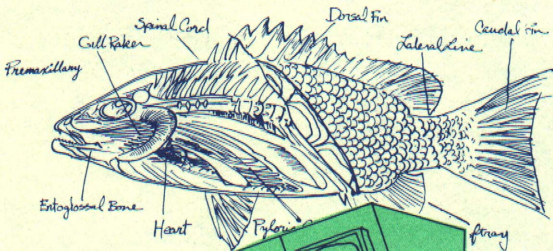


Scientific Marine Careers

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Cooperative Extension Service
Michigan State University



Marine Careers

This is designed to help students gain a better understanding of the many marine-type careers. This is not a comprehensive listing, but includes examples of job descriptions from scientific, professional, and technical fields.

It should also assist college-oriented students in choosing high school and college courses that will prepare them for these positions. A number of colleges and universities offer undergraduate courses in marine-oriented subjects.

No effort has been made to specify undergraduate courses that would lead to graduate school placement in the various disciplines. Individual graduate schools' requirements should be obtained from the respective schools.

Some of the job opportunities do not require college degrees but may instead require special training. Students should request further information on this training from their guidance office or career resource center.

Michigan, along with certain other states, is instituting marine vocational/technical programs at the high school level. Contact the Michigan Department of Education for a list of these schools.

Training for certain jobs may be obtained by "on-the-job" experience without the need for post-secondary school studies. The availability of these jobs depends upon the condition of the general job market.

Wherever mentioned, the word "marine" is used in its broadest context, referring to both salt and fresh water systems.

Scientific Careers

Education/Training

At the scientific level, applicants usually must have a college or advanced degree, a broad inter-disciplinary background in science and mathematics, and further specialization in one major area of study. Job experience is also frequently required, especially for non-entry-level positions.

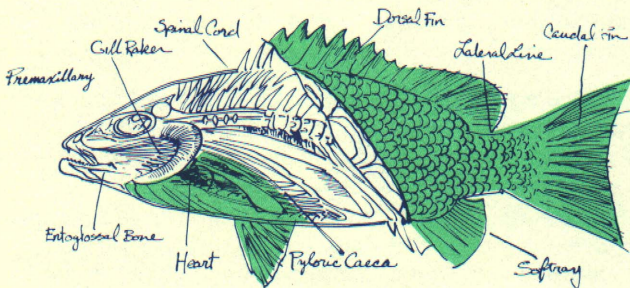
Job Availability

While the diversity of positions in the scientific job market is good, the number of openings within each category is small, with certain exceptions.

Biological Positions

Biological Oceanographers (Aquatic Biologists) study marine plant and animal life, and seek knowledge of the environmental factors affecting them. Areas of study include the effects of pollution, extraction methods of food and drugs, and maintenance of natural balance. Specialities are marine mammalogy, ichthyology, bacteriology, algology, phycology, parasitology, pollution biology, and invertebrate zoology.

Fisheries Scientists study biological, chemical, and physical factors that will, when coupled with fishing demands, affect the population dynamics of finfish



and shellfish. They suggest management actions necessary to conserve overfished populations.

Marine Bacteriologists identify diseases of marine life and seek ways to control them. They develop ecologically sound methods of detecting and destroying harmful bacteria in the marine environment.

Marine Food Scientists study such facets of marine foods as their composition, nutritional value, methods of preservation and preparation, and marketing techniques.

Aquaculturists research, design, and implement methods used in the production of marine plants and animals in modified environments.

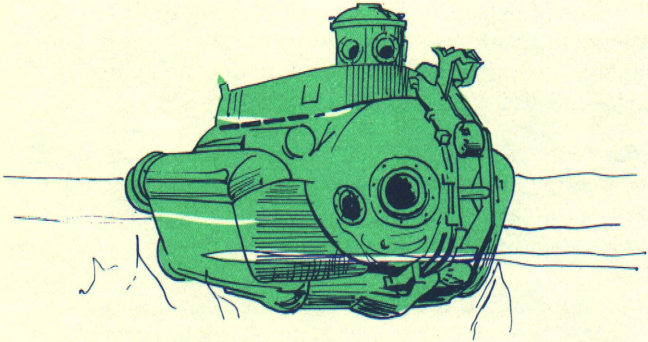
Biochemists study the chemical composition of living organisms within the oceans. They identify and analyze the chemical processes related to biological functions.

Marine Biomedical Specialists are medical personnel who apply their backgrounds to the often unique medical problems encountered in the marine environment.

Physiologists probe into the structure and function of plant and animal organs, tissues, and cells. They study the effects of the life processes of marine plants and animals on the marine environment, and vice versa.

Fisheries Technicians assist fisheries scientists. They should be familiar with population and environmental survey techniques, tagging procedures, collecting methods, organ and tissue removal, and stomach analysis for food and feeding habits. Fisheries technicians help design and construct fishing gear and fishways, and aid in fish farming and hatchery production.

Microbiologists make quality control checks to ensure that precautions are taken to maintain proper sanitation requirements. They investigate activities of bacteria and other microorganisms in the manufacture, spoilage, and deterioration of food. This involves isolating, culturing, and identifying microorganisms that cause food decomposition, as well as those of public health significance. They also determine how foodstuffs become contaminated and work toward inhibiting the development of objectionable microorganisms.



Chemical Positions

Chemical Oceanographers study the chemical composition of seawater, the relationship between organic and inorganic compounds found in the sea, the presence of dissolved nutrients, and the sources of organic matter. They perform research on the chemical composition of sediments, desalinization, and the extraction of rare seawater components.

Chemical Technicians assist chemical oceanographers in conducting analytical laboratory procedures such as measuring salinity and dissolved oxygen, analyzing and tabulating data, and assembling and using scientific apparatus.

Geological Positions

Geological Oceanographers study topographic features, rocks, and sediment characteristics of the ocean floor. They determine the development and changes of the oceans through examination of fossils, rocks, and minerals. They also assist in the location of petroleum and mineral deposits beneath the sea, and aid in the engineering of tunnels, bridges, and dams.

Geological Technicians aid geological oceanographers in analyses of components of the earth's crust under the oceans, and in drawing maps and charts depicting the locations and descriptions of geological formations.

Hydrologists study water resources, their distribution, characteristics, and effects in relation to human activities.

Physical Positions

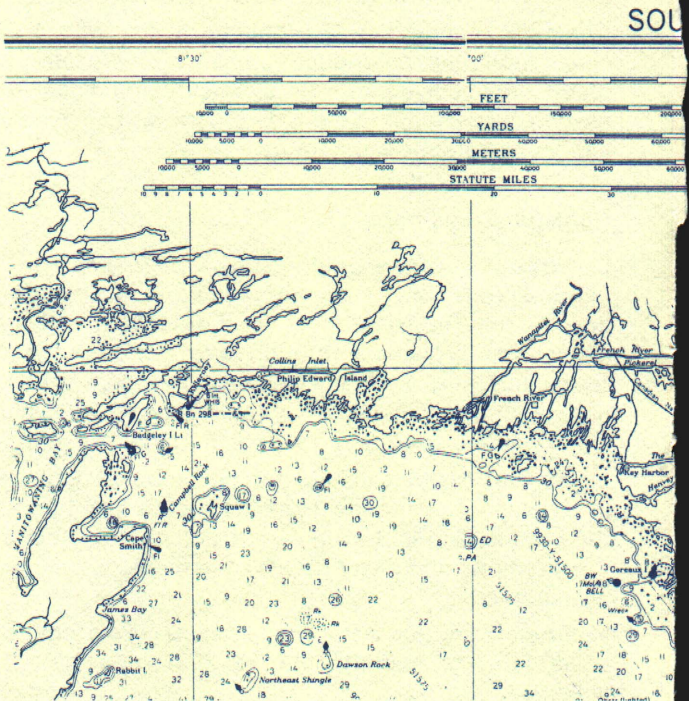
Physical Oceanographers study physical properties of the ocean environment such as temperature, seawater density, the ability of seawater to transmit light and sound, characteristics of currents and tides, and relationships between the atmosphere and the sea.

Marine Physicists observe and analyze various forms of energy, the structure of matter, and the relationship between matter and energy as they relate to processes occurring in the oceans.

Cartographers design and construct maps of physical oceanic features. They also compile data pertaining to those features.

Meteorologists study atmospheric conditions and related data to obtain information for short-term and long-range weather forecasting. They conduct research on long-range forecasting, radio wave propagation, and severe weather phenomena such as typhoons and hurricanes.

Hydrographic Survey Technicians assume responsibility for operating standard surveying instruments, including bottom grabs, sextants, measuring instruments, depth recorders, wire drags,



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and navigational equipment. They read charts and assist cartographers in the field. These technicians assist with data acquisition, processing, and analysis, as well as interpretation of the original data. Work ranges from surveying and engineering in tidal and coastal areas to geomagnetic and hydrospace seismological observations.

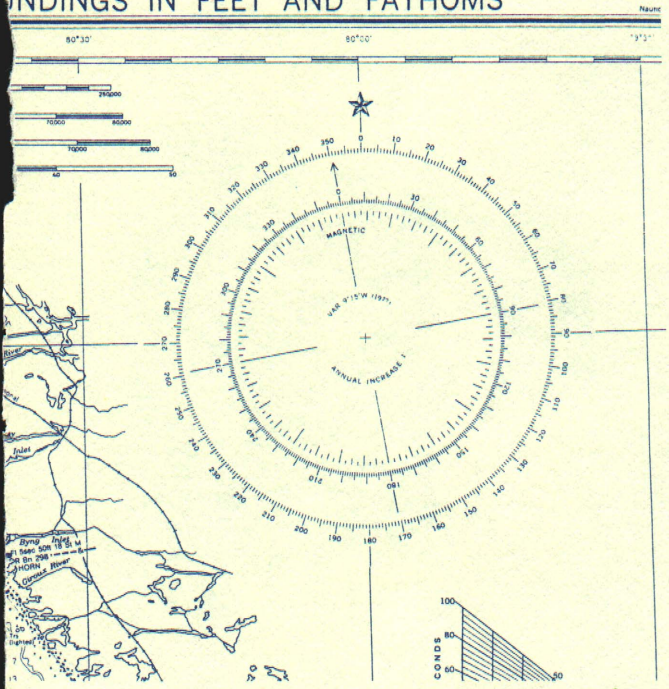
Marine Engineering Technicians aid in the research and development necessary to coastal and amphibious engineering. The work deals with hydro-mechanics, waterfront structures, and amphibious equipment. They assist various hydraulic, structural, and general research engineers to set up experiments, conduct experiments, and perform theoretical investigations, including data reductions, machine computations, and marine engine operations.

Environmental Positions

Marine Ecologists study the mutual relationship between organisms and their environments. They examine effects of environmental influences such as rainfall, temperature, season, and state of tide on these organisms.

Water Pollution Technicians work with scientists to determine the extent of pollution in bays, estuaries, and the oceans; and they are involved in research

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concerning the control and abatement of industrial and other pollutants. These technicians participate in surveying various geographic areas, as well as in designing sampling systems. They assist life scientists in conducting ecological studies in waters suspected or known to be polluted.

Social Science Positions

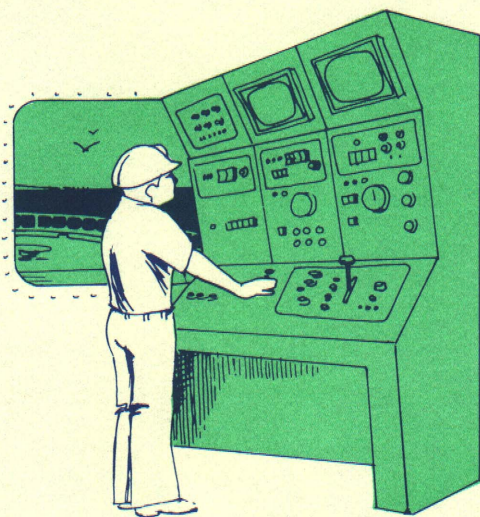
Marine Geographers study special characteristics of the earth's terrain, sediments, vegetation, and climate in relation to the oceans. They analyze maps, aerial photographs, and observational data collected in the field.

Maritime Historians focus their attention on historical events that were influenced by the marine environment.

Marine Anthropologists study how the marine environment has helped to shape the physical, social, material, and cultural development of man.

Marine Sociologists study the effects of the marine environment on the origin and evolution of human society, the progress of civilization, and the laws controlling human institutions and functions.

Nautical Archaeologists study history through the underwater remains of early human cultures, discovered primarily by systematic excavations.



General Scientific Positions

Limnologists study freshwater ecosystems in the broadest context, encompassing biological, chemical, geological, and physical parameters.

Limnological Technicians carry out work of an oceanographic nature on fresh water lakes. They take water samples, carry out field and laboratory analyses, measure physical parameters, and care for and maintain the sampling and measuring equipment used in hydrography. Limnological technicians perform routine lab tasks such as weighing and mixing solutions, and perform quantitative studies on water and the life forms in it.

Systems Analysts and Computer Programmers analyze scientific processes and problems associated with the collection, organization, and reporting of data, and convert the data to a form suitable for automatic data processing equipment.

Applied Statisticians survey, collect, organize, interpret, summarize, and analyze numerical data related to sampling. Through the use of statistical tools, they interpret the data gathered in marine-related studies.

Oceanographic Technicians assist oceanographers in a variety of chemical and physical tests and analyses, such as tide and current studies, water analysis for dissolved gases and minerals, and wave studies. They maintain cleanliness and order in the laboratory ashore and afloat, keep up the inventory in the laboratory stock, calibrate and operate measuring and surveying instruments used in oceanographic data acquisition, keep records, plot graphs and profiles, and reduce processed oceanographic station data to a standard format.

Deck Support Technicians assist the deck support party aboard an oceanographic vessel. They should have a familiarity with a broad range of physical, chemical, meteorological, biological, and geological oceanographic sampling techniques and measuring instruments. These technicians are required to rig these instruments and sampling devices for over-the-side use, to operate all types of oceanographic winches and booms during actual operations, and to stow and repair many of these tools when they are not being used. They crate and label all equipment and samples for shipment to shore installation.

Applied Research Technicians design new equipment using basic marine science concepts.

Oceanographic Instrumentation Technicians determine

instrument accuracy, modify equipment, and design new auxiliary apparatus.

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