1-8-1971

Marine Resource Information Bulletin, Vol. 3, No. 1

Virginia Sea Grant

Virginia Institute of Marine Science

MARINE RESOURCE INFORMATION

VIRGINIA INSTITUTE of MARINE SCIENCE BULLETIN

Vol. 3, No. 1 January 8, 1971

YEAR-END HIGHLIGHTS OF VIMS ACTIVITIES

The Virginia Institute of Marine Science enters 1971 strengthened by continued growth in both research and academic capabilities and with a broader capacity to advise public agencies involved in environmental control and resource management. In sheer size, it ranks among the top ten oceanographic institutions in the United States and among the top three or four in terms of total state support

Public awareness of and concern for environmental quality was accented during 1970 with emphasis on the value of the sea and the coastal zone. Numerous studies by state and federal agencies and congressional committees underscored the importance of the coastal zone regions to the nation's economy, to public welfare and to the coastal states.

The resurgent awareness of coastal zone importance is not new in Virginia where several state agencies were organized and funded over decades to provide management of various aspects of coastal resources. The Virginia Institute of Marine Science was founded as early as 1940 (orginially the Virginia Fisheries Laboratory) for scientific study of the problems of marine resources and environments here. Its growth since that time has paralleled the Commonwealth's increasing utilization of marine resources and environments and the need for better information on which to base public resource management practices and decisions and water quality standards.

In recognition of the importance of the Chesapeake Bay and the Virginia Sea (Captain John Smith's name for the Continental Shelf Regions between Capes Cod and Hatteras), and in order to clarify research responsibilities and to encourage federal agencies to support Virginia's program, Governor Linwood Holton declared on June 22, 1970 that under the provisions of Chapter 9, Title 28 of the Code of Virginia, the Virginia Institute of Marine Science is the principal agency responsible for research, advisory services and education in the marine sciences, and, therefore, the Coastal Zone Laboratory program of the Commonwealth. A subsequent statement dated September 24, 1970 also declared VIMS the state's advisory agency on matters pertaining to marine science, marine environment and marine resources.

Virginia joined other maritime states, commonwealths and territories, in organizing the Coastal States Organization. Dr. William J. Hargis, Jr., director of VIMS, is currently serving as chairman of the organization containing some 27 member states.

The Virginia Institute of Marine Science has campuses on the York River at Gloucester Point and a permanent laboratory complex at Wachapreague on

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Eastern Shore. It is also responsible for directing Virginia's uses of the James River Hydraulic Model at Vicksburg, Mississippi. Its principal activities are conducted at the Gloucester Point campus where 69 professional scientists and 135 supporting personnel work. An additional roster of 3 scientists and 6 supporting personnel is quartered at the Wachapreague facility. The graduate enrollment in the educational programs, operated in affiliation with the College of William and Mary and the University of Virginia, increased from 66 to 80 during 1970, making this one of the largest marine science graduate training centers on the Atlantic Coast. Approximately 300 students, scientists and employees work and study at the Institute. The summer staff increases to over 350.

"In accordance with our responsiblities under the Code and with the needs of Virginia and the nation, we are building a strong, well-balanced, mission-oriented and basic research and development organization at VIMS," said Dr. Hargis. "During this decade, we plan to continue to improve services which will contribute to the orderly advance of the essential features of Virginia's economy while at the same time retaining water quality for recreational uses and seafood production. We also must supply information to public bodies and industries to help maintain environment, control pollution and to minimize destructive erosion processes. This will require an improved effort in all the basic and applied marine sciences and in marine technology."

VIMS representatives serve on the Governor's Council on the Environment, on the ad hoc Interagency Water Resources Coordinating Committee and on inter-state, state, and federal committees and task forces.

Cooperative state-federal projects have included development of disease-resistant oysters, survey of clam resources, biology of stinging nettles, studies of oil slicks, monitoring of pesticides and pollutants, processing and marketing of seafood, studies of striped bass and herring, and dissemination of the findings of research to management agencies, industry and to the general public. Close working arrangements with the Marine Resources Commission continue to result in greater services to the public fishing and recreational interests.

The close association and cooperation that has evolved between VIMS and the Virginia State Water Control Board and with federal agencies and various political subdivisions developed further into an effective mechanism for dealing with pollution abatement and control in Virginia streams and estuaries.

VIMS continues to work with the Virginia Department of Health, Virginia Division of Water Resources of the Department of Conservation and Economic Development, the U.S. Army Corps of Engineers, the U.S. Navy, the U.S. Army, the U.S. Coast and Geodetic Survey, the U.S. Environmental Science Services Administration, the U.S. Federal Water Pollution Control Administration, the National Aeronautics and Space Administration, the U.S. Bureau of Commercial Fisheries and the U.S. Bureau of Sport Fisheries and Wildlife to render services to all segments of the marine resource based economy of the Commonwealth.

Extension Services

VIMS has been involved since its inception with problems of the fishing industry, but this year, under a sea grant program, a full-time extension

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agent went into the field for the first time on January 1. Extension activities have included assistance with seed oyster investigations, a clam rearing experiment and an investigation of new fishing devices, as well as seeking means for utilizing new resources and dissemination of a variety of fishing industry information.

Mariculture of oysters, clams and scallops

Looking to the day when mariculture will be practiced as commonly as agriculture is today, continuing research is directed at culturing selected marine animals on a commercial basis. VIMS scientists are now concentrating on breeding oysters, clams and scallops and rearing them through larval and post-larval stages, as well as testing methods of growing them in the natural waters. The next step will be to develop the engineering necessary for pilot plants, then, a large scale operation.

A way to protect hard clam seed from natural enemies has been devised by scientists at the Institute. The new method involves spreading shell, gravel, orother materials referred to as aggregates over sand or mud bottoms before planting seed.

Growing seed clams to usable size for planting after they have been reared to setting has been a major obstacle. Holding millions of young clams in trays to avoid predators requires extensive handling, feeding and cleaning operations. The use of aggregate makes it possible for these tiny clams to be grown on bottoms instead of trays and should reduce the cost.

Clam survey

Hard clams, soft clams, scallops and oysters which support the middle Atlantic coast fisheries are expected to experience a decline in abundance in 1971. The exception is surf clams which are expected to increase sharply, according to VIMS forecast.

Scientists are engaged in determining the magnitude of hard and soft clam populations in the estuaries. Studies indicate that more hard clams could be taken from the lower part of the James and York rivers than are presently being harvested, but the soft clam beds are located largerly in the Rappahannock River. Further studies are needed to determine how large this resource is and how heavily it might be harvested.

Monitoring oysters

The monitoring of oyster beds in most Virginia estuaries was conducted weekly from May through October to determine the success of setting, the degree of fouling, the density of population and other observations designed to provide advice to the industry and management. Surveys of the condition of oysters in Virginia rivers are reported each month. Representative stations on public rocks are established and sampled beginning at the mouth of each river and proceeding to the transition zone between the fresh and salt water.

Disease studies

Microbiologists have continued their studies of the cell biology of marine disease-causing organisms and related forms. Studies of crab blood as a possible diagnostic tool in detecting the epidemics among crab populations are in progress. Scientists are studying the sources of free amino acids in

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invertebrates and in the environment. Oyster disease specialists have concluded three years of research to demonstrate that native Virginia oysters exhibit resistance to the disease MSX if the young are reared in areas where the disease is prevalent. Oyster production in lower Chesapeake Bay might be restored if successful production of seed in MSX infested areas could be maintained at a high level and predators could be controlled.

In the laboratory, resistant progency have been produced for the fifth successive year.

Fishery resources

VIMS fishery scientists have completed a five-year study of the fishery resources of the continental shelf of Chesapeake Bight which disclosed availability of some three hundred thousand tons of unutilized fish.

A summary and catalogue of the estuarine nurseries of striped bass, shad and river herring also was completed.

The outlook for the abundance of species of fish in the middle Atlantic coast fisheries in 1971 remains mixed, however. Spot are expected to be less abundant after the near record catch in 1970. Croaker and grey sea trout probably will continue to increase at the rate experienced in 1970, but the numbers will be far below those of the peak years in the 1940's, according to the VIMS forecast. Striped bass, although less abundant, will be of good size and the hatch of young in 1970 promises a good year for pan size stripers in 1972.

VIMS marine scientists assisted negotiators representing the United States in discussions with representatives from the Soviet government regarding coastal fisheries but no agreement could be reached on conservation measures to be applied to the river herring fishery. The matter will be reconsidered in January or early February and VIMS reports that the outlook for the river herring fishery will depend on the outcome of these negotiations.

Hybrid fish research

Striped bass and white perch were artificially cross-bred in the wet laboratory at VIMS in hopes of developing a fish similar to the striped bass which will not migrate from area rivers. It is hoped the research also will lead to development of a fast growing commercial and game fish that is healthier and more tolerant to pollutants than is the striped bass.

Crab stock and indutry

Specialists at VIMS accurately predicted the combined Virginia-Maryland blue crab catch for Chesapeake Bay at about sixty-five million pounds for the twelve months ending August 1970. They also forewarned crabbers and processors of crab meat that crab stocks are expected to be at low abundance for the twelve month season which began in September 1970. According to scientists studying blue crabs, the number of crabs hatched in 1969 was below the recent ten-year average. This decrease is expected to result in below average catches through next summer. Combined commercial catch for Maryland and Virginia for the period from September 1970 through August 1971 may be only 50 million pounds, the scientists report.

The long-range outlook for crab supplies is a brighter one. Small crabs

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hatched in 1970 are already present in Virginia waters in such large numbers that larger than average supplies are predicted for the twelve months beginning September 1971.

Under the auspices of the National Sea Grant Program, research in the soft crab project has been directed towards studies of the requirements for improved production of soft crabs. Emphasis has been placed on the development of a re-circulated sea water system. Comparisons of survival and soft crab yields were made on peelers subjected to various combinations of water quality and crowding conditions.

Jellyfish studies

VIMS is continuing research to control the stinging jellyfishes -- an annual summer nuisance to fishermen, water skiers and swimmers along the shores of the middle Atlantic states. The program initiated in April 1968 is designed to study the ecology and biochemistry of these pests, and knowledge gained will be applied to devising possible control measures.

Coastal wetlands

"Coastal Wetlands of Virginia" an interim report released this year, received wide acclaim from both laymen and the scientific community. Approximately 1,200 copies have been distributed, many at the request of persons in most of the fifty states and in several foreign countries. The report points out the importance of shallow waters, marshes and swamps to the estuarine environment and estimates the production and value of these systems. Dr. Marvin L. Wass, senior author of the report, was named the "Water Conservationist of the Year" for 1969 by the Virginia Wildlife Federation, Inc. as a result of his wetlands studies.

Ecology-pollution research

It has been demonstrated that sediments and their associated flora and fauna play an extremely significant role in the cycle of mercury in the aquatic environment. Sediments not only serve as sinks but also as conversion sites where inorganic mercury is transformed to poisonous organic mercural compounds. Sediments were analysed to locate sources of mercury in the James, York and Rappahannock rivers and also to establish the present background levels of mercury compounds in these rivers.

Following disclosure by Swedish scientists of findings of relatively high levels of mercury in fresh and saltwater fishes in their areas, VIMS conducted a survey to establish the levels of mercury in finfish and shellfish of Virginia's tidal waters. According to preliminary analyses, mercury levels in edible parts of fish and shellfish are less than 1/2 the value which the Food and Drug Administration has established as being potentially dangerous to human health. Indications are that Virginia's tidal waters are relatively uncontaminated by mercury.

PCB's, the simple name for a family of toxic chemicals called Polychlorinated Biphenyls, became a subject of concern after VIMS scientists confirmed that these relatively new chemicals are present in Virginia coastal and estuarine waters. The chemicals have properties similar to DDT and although not used as insecticides, are widely employed by various industries in plastic-based paints and varnishes, lubricants, insulators and other products.

Toxicity of the PCB's approaches that of DDT and their chemical and

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biological characteristics are similar, according to scientists studying the chemicals. They are strongly adsorbed on particles; they concentrate in animal fat, and they are transferred through the food chain. The scientists are determining the levels of PCB's in blue crabs and oysters and in estuarine sediments, and are seeking to trace the chemicals to their source.

Surface film and coastal zone problems

Chesapeake Bay surface film studies, part of an investigation of oil slicks and other surface films sponsored by VIMS and the Federal Water Pollution Control Administration, were begun in the bay in the spring. One phase of the study involves remote detection of surface films by sensors being developed by NASA's Wallops Island facility. Another involves a study by both VIMS and NASA scientists of the chemical makeup of slick forming materials.

VIMS oceanographers sampled films once a week at six places along the extent of the Chesapeake Bay Bridge Tunnel to learn more about the background amounts of surface pollution caused by films. These films can form from natural materials such as decayed byproducts of marsh vegetation, as well as from petroleum substances spilled into the water.

VIMS has begun a study of coastal zone oceanographic needs and data requirements to assist NASA in planning for oceanographic satellites to monitor surface phenomena of the oceans. The goal of the study is to list the most important oceanographic problems in the coastal zone and indicate the most promising remote sensing techniques for studying these problems by the use of satellites.

Beach erosion research

The movement of the water table in a tidal beach and its role in causing beach erosion or buildup has been carefully studied at Fort Story in Virginia Beach where VIMS scientists collected a series of measurements at 13 wells spaced along a line perpendicular to the shoreline and running from the dunes to the surf. A computerized mathematical model is being developed that will allow prediction of water table fluctuation, knowing only the slope of the water table at two wells and the characteristics of the ocean tides. Artificial buildup of beaches by controlled alteration of the water table may result from studies of the relationship between the groundwater flow and changes in sand volumes on the foreshore.

VIMS scientists also are making a complete analysis of shoreline erosion as well as the history and hydraulics of the inlets on Eastern Shore in an effort to provide factual knowledge for the development of sound management and planning decisions for this coastal area.

Hydraulic models

The construction of a hydraulic scale model of the entire Chesapeake Bay came a step closer to reality this year when VIMS scientists and technicians moved into the Rappahannock River and Mobjack Bay to record tides, currents, salinities and temperatures. The hydrographic data will be used by the United States Army Corps of Engineers in construction of the miniature version of the Bay.

Similar data were collected several years ago for a model of the James River built in Vicksburg, Mississippi. Like the James River Hydraulic Model,

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the Chesapeake Bay Model will duplicate nature on a small scale and will be able to demonstrate existing conditions of the bay or any new conditions induced by either man or nature. The model will be useful in studying the effects of dam and reservoir construction, channel dredging, shell planting, waste outfall and other projects.

Mathematical models

Gathering of data for a model of the upper York River and design of a mathematical model for use by VIMS, the Division of Water Resources, and the State Water Control Board was completed.

Last summer three scientists and a crew of over 40 used several boats in the Rappahannock River for a forty-day survey to study currents, tides, salinity, temperatures, dissolved oxygen, biochemical oxygen demand, and the basic configuration of the bottom. In addition, a dye study was conducted between Fredericksburg and Tappahannock to measure travel time of water in the river and the flow pattern. From these studies a mathematical model will be developed to solve the exact mathematical formulas which express the reactions occuring in the river. The mathematical model is flexible for the insertion of numerous conditions both for the present circumstances and for future conditions. The model is designed to be a living planning devise which would provide state and federal agencies with clearly defined alternative programs to derive maximum benefits from water resources.

Siltation of channels

In April, a fleet of small vessels moved into the Rappahannock River near Tappahannock where VIMS scientists probed the river waters to learn why unusually high concentration of silt occur in the coastal rivers where the freshwater first meets saltwater intruding from the ocean. Oceanographers measured current speed and direction, total suspended material and salinity in order to understand the processes which lead to an accummulation of sediment.

The Academic Program

The academic program continued growth with the addition of 8 new scientists and faculty members, allowing a student enrollment increase of 14. The number of courses now being taught has increased from 36 to 50. Majors are available in General Oceanography, Biological Oceanography and Marine Fisheries Biology. Within these general areas study in special areas may be undertaken (for example, physical oceanography, geological oceanography, marine pollution, biology, etc.). Six degrees were conferred during 1970, five M.A. and one Ph.D. The academic program is conducted by VIMS through affiliation with the College of William and Mary and the Univesity of Virginia.

Publications

A total of 77 publications were completed by VIMS personnel during 1970, including 45 contributions to scientific journals, 6 theses, 1 dissertation, 3 Applied Marine Science and Ocean Engineering reports, 1 Special Scientific Report, 3 Data Reports, 2 Occasional Papers in Marine Science, 16 issues of the Marine Resources Information Bulletin, 1 Marine Resources Advisory Series report, and 2 Educational Series booklets.

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CERTIFIED CRAB MEAT PLANTS IN NORTH CAROLINA*

North Carolina crustacea meat plants are certified by the North Carolina State Board of Health. All certificates expire December 31, 1971, unless revoked prior to that date.

Name	Address	Plant No.
Aurora Packing Co.	Aurora	N. C. 203
Belhaven Fish & Oyster Co.	Belhaven	N. C. 18
Carolina Seafood Co.	Aurora	N. C. 80
Caroon Brothers	Lowland	N. C. 27
Croatan Crab Co.	Wanchese	N. C. 41
Daniels Seafood Co.	Nags Head	N. C. 172
Engelhard Shrimp, Fish & Oyster Co.	Engelhard	N. C. 142
Fulcher Crab Co.	Oriental	N. C. 249
Ireland Brothers	Hobucken	N. C. 95
[illegible]land Seafood Co.	Lowland	N. C. 30
[illegible]erview Crab Co.	Oriental	N. C. 19
[illegible]und Packing Co.	Whortonville	N. C. 23
Swan Quarter Crab Co.	Swan Quarter	N. C. 34

*Prepared by members of the Tri-State Seafood Committee as an aid to seafood buyers in locating certified crab meat suppliers. Other plants will be listed as they are certified.

OYSTER MEATS QUALITY INDEX DECEMBER 1970

Surveys to determine the condition of oysters in Virginia rivers are directed by Dexter Haven, head of VIMS Department of Applied Biology. Representative stations on public rocks are sampled, beginning at the mouth of each river and proceeding to the transition zone between fresh and salt water. (See maps on page 10 for locations).

The Index number is obtained by comparing the actual size of oyster meats with the amount of space inside an oyster's shell cavity. The higher the Index number, the greater the amount and quality of meats that can be expected from a bushel of oysters. Using the Index, one can compare the potential meat yield of oysters of the same size from different growing areas, and from one season to the next.

Meat quality in December continued at a high level at all stations in the Rappahannock River and oysters are rated above average.

In the James River, conditions were similar to those for November. Quality index seemed to be highest in the upper river, and decline in the lower river. Oysters at Point of Shoals continue to show the highest quality index for the entire river.

In the York River, index fell sharply at all stations. This decline appeared to be unusually rapid; however, interviews confirmed results and suggested that yields fell from 1 to 1 1/2 pints per bushel.

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OYSTER MEATS QUALITY INDEX

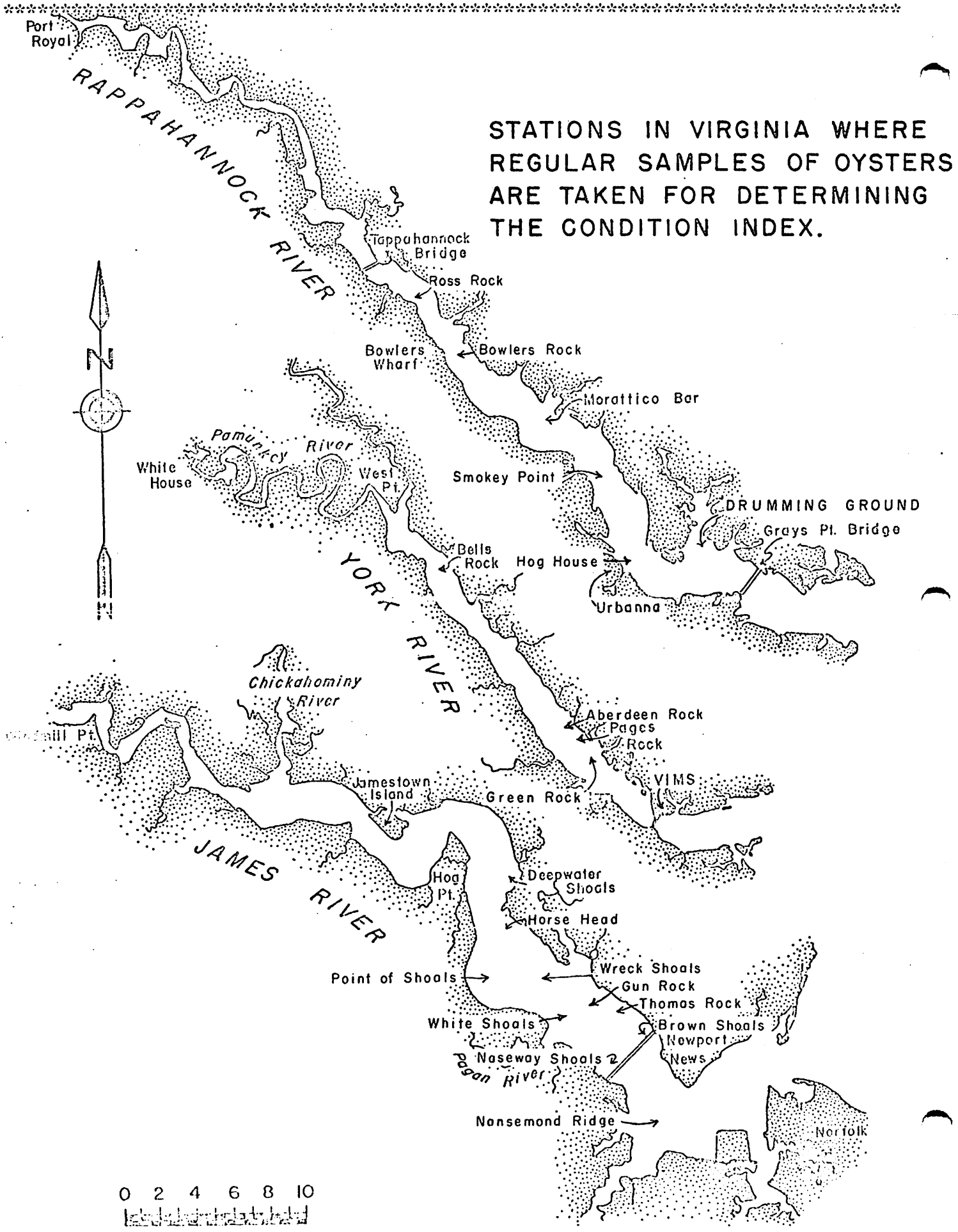
	September 1970	October 1970	November 1970	December 1970
JAMES RIVER				
Brown Shoals	6.1	5.6	5.1	---
White Shoals	6.7	6.8	6.0	---
Wreck Shoals				
shallow	6.5	6.6	6.2	6.7
deep	6.2	6.2	6.1	6.2
Point Shoals	9.1	9.3	9.1	9.7
Horsehead	6.7	6.8	6.7	6.9
Deepwater Shoals	8.6	8.6	8.2	8.6
YORK RIVER				
Green Rock	7.9	8.9	8.7	5.7
Pages Rock	6.7	7.8	7.7	5.4
Aberdeen Rock	7.1	7.9	7.9	6.1
Bells Rock				
deep	6.3	7.0	7.0	6.0
RAPPAHANNOCK RIVER				
Drumming Ground	---	---	---	8.5
Urbanna	9.3	12.9	12.9	12.5
Smokey Point				
shallow	---	9.8	10.8	10.6
deep	8.8	9.6	9.4	10.6
Morattico Bar				
deep	8.5	9.8	10.9	10.9
Bowlers Rock				
shallow	8.7	10.0	11.6	12.6
deep	---	10.2	11.4	11.2
Ross Rock	---	---	---	10.5

KEY TO INDEX NUMBERS

3.0 to 5.5 -- Below average

5.6 to 7.5 -- Average

7.6 and up -- Above average


STATIONS IN VIRGINIA WHERE REGULAR SAMPLES OF OYSTERS ARE TAKEN FOR DETERMINING THE CONDITION INDEX.
Port Royal
RAPPAHANNOCK RIVER
Tappahannock Bridge
Ross Rock
Bowlers Wharf
Bowlers Rock
Morattico Bar
Pamunkey River
White House
West Pt.
Smokey Point
DRUMMING GROUND
Grays Pt. Bridge
Bells Rock
Hog House
YORK RIVER
Urbanna
Chickahominy River
Aberdeen Rock
Pages Rock
Jamestown Island
Green Rock
VIMS
JAMES RIVER
Hog Pt.
Deepwater Shoals
Horse Head
Point of Shoals
Wreck Shoals
Gun Rock
Thomas Rock
White Shoals
Brown Shoals
Newport News
Naseway Shoals
Pagan River
Nansemond Ridge
Norfolk
0 2 4 6 8 10
NAUTICAL MILES

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