Marine Resource Bulletin

A Sea Grant Advisory Service

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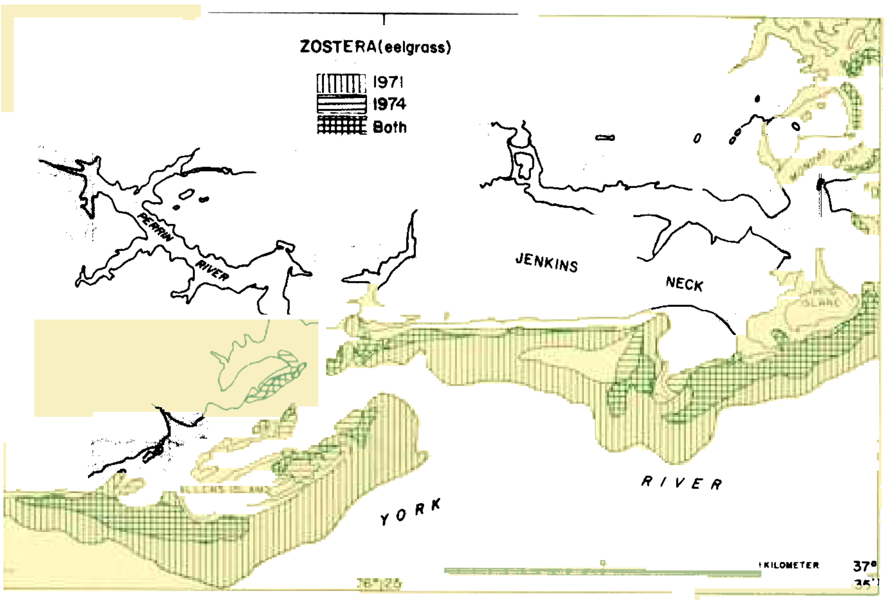
EELGRASS BEDS DECLINING IN CHESAPEAKE BAY



Eelgrass is a plant that grows under salt water. It produces flowers and seeds, and has all the properties other plants do. It acts as a nursery for several fish species and protects the shore from erosion. And it may be in danger of disappearing in the Chesapeake Bay.

Eelgrass has nothing to do with eels, but the name gives an idea of how the plant looks when it sways in the water. This resource has been undergoing major fluctuations in abundance during the last three years. In 1971 and 1974 two rivers in the system, the York and the Rappahannock, showed an eelgrass decrease from 493 to 141 hectares and 700 to 4 hectares of eelgrass respectively. The overall reduction of eelgrass in the lower Chesapeake Bay was 36% during this three-year period.

Without eelgrass, much of the Chesapeake Bay would be a barren, sand environment. The plant protects the shoreline by trapping and holding sediments in its roots. Small animals essential to the food chain live both on eelgrass blades and in the sediments. Large fish such as trout and striped bass feed in the beds, as do blue crab and shrimp. They also use eelgrass for protection, especially for juveniles. Watermen familiar with the plant beds know they're an excellent place to fish.

Eelgrass is found on the Atlantic Coast from North Carolina to Canada, and on the Pacific Coast from California to Alaska. It also grows off the coasts of Japan and western Europe. Because the plant needs light for photosynthesis, it grows only in from one to six feet of water. Little research has been conducted on eelgrass in the Bay. Scientists have realized the importance of the resource but have not studied it systematically.

Fluctuations in eelgrass beds are not new. In the 1930s eelgrass disappeared, then returned during the next thirty years. Scientists are unable to test theories about changes in eelgrass beds experimentally because the plant cannot be grown in culture for over a month. Thus, researchers must gather facts to discover the state of the environment over time to arrive at conclusions.

VIMS scientist Robert Orth has collected historical data on the abundance and distribution of eelgrass beds using aerial photographs and topographic maps from the 1930s to the present. He also charted the average temperature and temperature range for the coldest and warmest months for the last 20 years. Data indicated that mean water temperature during winter has increased steadily in the area since 1970. Eelgrass in Virginia is close to its southern limit; the increase in water temperature could be sufficient to cause the reduction of the beds. Future research may include restocking of the resource by man to speed up the natural process on a small scale. Additional uses of eelgrass are also being considered. The plant already has limited use as garden compost and packing at crab wholesale houses.

TIDEWATER RIVER POLLUTION STUDIED

A group of VIMS physical oceanographers is using mathematical models to study how much pollution enters southeastern Virginia's rivers, and how much more they can safely take.

Section 208 of the federal Clean Water Act requires a regional study of water quality which is accomplished by local governments with federal funds. In Tidewater Virginia, a consortium called the Hampton Roads Water Quality Agency received a $2.5 million grant from the Environmental Protection Agency, the agency that determines water quality standards. The consortium is composed of the Peninsula and southeastern Virginia (Norfolk and Virginia Beach) planning districts, which are interested in how population and industrial growth affect land use, and the Hampton Roads Sanitation District, which is interested in water quality.

The consortium has contracts with various agencies, including VIMS, to study non-point sources of water pollution. This means studying runoff from city streets and farms rather than waste disposal from industrial or municipal treatment plants. Non-point pollution will become increasingly important as other sources of pollution are controlled.

The $.5 million VIMS study first measures the type and amount of material entering rivers in the two planning districts. These rivers include the Nansemond, Pagan, Elizabeth, Little Creek, and the Lynnhaven on the southside; the Back and Poquoson on the Peninsula; and the York and James. Scientists gather data on nutrients and solids in water samples at 25 sites, then estimate from the data how much pollution is going into each river.

The computerized mathematical models of the rivers are made using measurements of oxygen, nutrients, and bacteria. The model fits one real situation based on physical and biological principals, then it is verified for other situations. After verification, scientists can assume a different set of conditions and run the model to see how the river's characteristics would change. Most of the work should be completed by June 1977.

Developing a river water quality model is similar to managing your checking account. You must know both how much is coming in (your paycheck) and how much is going out (your rent, grocery bill). Similarly, scientists keep track of the materials entering and leaving each segment of the river.

The mathematical models are used to answer questions about the state of Tidewater Virginia's rivers. Water, including oceans, has a limit to the pollution it can accept. Through modelling, scientists can determine if too much pollution is entering the system and how much can enter the system before problems arise. Government planners can then determine pollution allowances.

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ANN GREER .... EDITOR

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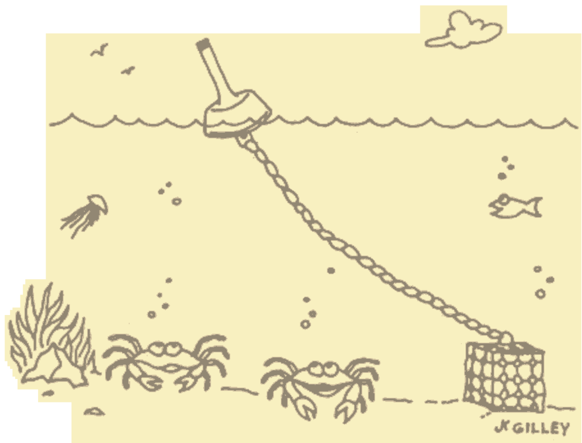
William J. Hargis, Jr. .... Director

CRAB POT FLOAT



"It doesn't look like a milk jug to me."

There's a new invention for crabbers tired of improvising corks and sticks, plastic milk jugs, and Clorox bottles for crab pot floats -- a float designed and manufactured especially for crab and lobster pots. The polyurethane device is bright orange to prevent cracking from the sun. The color also makes the floats easier to see when the pots are brought up or when heavy outboard traffic threatens to destroy them. Because of the special design, the float won't sink or disappear in turbulent water. This 8-inch-wide by 14-inch-tall float has been tested by crabbers around Tangier Island. The floats will retail for $1.00 — $1.10 each, and can be ordered from the man who developed it: Robert Sinclair, One Southerland Drive, Hampton, VA.

A CLOSER LOOK....

at the DEPARTMENT OF GEOLOGICAL OCEANOGRAPHY

Changes in the earth's core result in dramatic and often dangerous alterations on its surface, such as volcanic mountains and earthquakes. Less striking but equally interesting changes take place on the bottoms and shores of the earth's waterways. These topographical changes are the subject of study for geological oceanographers.

The geological oceanographer's area of study extends from beaches to ocean bottoms. These scientists describe the kinds of rocks and sediments found and explain why these materials are found in a particular location. They also study the long-term evolution of the earth as it effects the underwater terrain.

VIMS geological oceanographers have been organized as a department five years, but the activities involved have gone on since the early 1960s. The institute's interest in geological processes is directly related to the needs of the Commonwealth. Thus, researchers gather data on the state's shorelands, the Chesapeake Bay and adjacent tidal rivers, and the offshore continental shelf.

Shoreline Studies:

Following a long-term historical study of shoreline erosion in Virginia, the department is making a detailed evaluation of the present shorelands resource. The resulting information is published in Shoreline Situation Reports for each county. Scientists have also successfully applied a method of erosion control, a configuration of large sandbags called a sill, to approximately 3,000 feet of shoreline. Specialists will make site visits and advise property owners about possible solutions to erosion upon request.

In addition, shoreline specialists have undertaken a study for the Environmental Protection Agency to determine the tidal elevation of the upper limit of wetlands. This finding will help regulatory agencies assess their jurisdictions for permits. A study of how sediment is transported into and out of marshes is another ongoing project. Research on the characteristics and stability of tidal inlets has become important due to increasing shoreline development.

Estuarine Studies:

Primary emphasis is given to the filling with sediment of the Chesapeake Bay and connecting tidal rivers, such as the James, York, and Potomac. Because of the topography of the Bay, sediments from the rivers are trapped and the Bay is filling at a slow but continuous rate. Scientists study how much sediment has been deposited, its location, and the pathways of movement. Data on sediment deposits is important in maintaining channels and assessing the effects of dredging.

Recently, the Newport News shipyard needed 2.5 million cubic yards of sand for construction. VIMS geologists monitored the dredging operation

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CLAM PEARLS ARE A RARE BUT DELIGHTFUL FIND

Oriental pearl oysters aren't the only mollusks that manufacture gem-quality stones. A clam found in Virginia's waters produces a pearl which is slightly softer than the oyster pearl, but more varied in size, shape, and color.

The hard clam (*Mercenaria mercenaria*) which produces the pearl is found from New England to the Gulf of Mexico. It is the species eaten in chowders and on the half shell.

You may not come across a clam pearl unless you're a shucker or have more than your share of luck. People in the clam industry know their value and rarity. There are stories of clam dealers hoarding the pearls, and shuckers hiding them in their mouths when they find the stones at work. Many folks who find pearls have them set in jewelry. These pearls, which if sold cost around $35, are more rare than pearls found naturally in oysters.

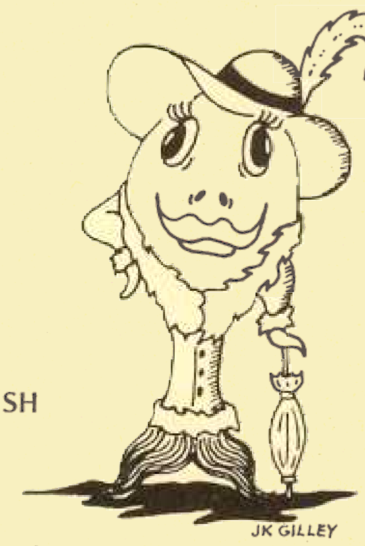
The pearls are ¼ inch or smaller. They may be round or oval, but most are shaped like slightly flattened balls, similar to M&M candy. Colors range from white and rose to deep purple, often with more than one color occurring in each pearl. Cooking destroys the gem quality.

A clam is formed when a parasite or other foreign substance enters the mollusk, which then tries to isolate the material with a secretion used to build its shell. The pearl takes on the properties of the hard clam shell, which is shiny, iridescent, and of varying colors.

The species is known for its longevity – hard clams may live 20 years and grow 3-4 inches long. A clam pearl will then become relatively large as it grows slowly by layers.

At present, there are not enough clam pearls found in nature to make the product commercially marketable. But these pearls, along with others of gem quality produced by mollusks on Virginia's coasts, may be a commodity for the future.

THE FISH HOUSE KITCHEN



Fish is a wise alternative to our beef-ridden diets. It is lower in calories, fat, and cost. But people need to know how to buy and cook fish to fully enjoy its advantages. Here are a few tips:

WHAT TO LOOK FOR IN BUYING FISH

Fresh Fish
- bright, clear, bulging eyes
- reddish pink gills
- firm flesh with no traces of drying or browning
- no "fishy odor"
- a surface free of dirt or slime

Frozen Fish
- solidly frozen when purchased
- little or no odor
- moisture-proof wrapping with little or no air space between the fish and wrapping

FISH COOKERY

Know Your Product

For best results, you need to know whether fish is fat or lean. Lean fish require the addition of fat during cooking to retain flavor and moisture. Some examples:
Fat fish – bluefish, mackerel, salmon, shad, tuna, whitefish
Lean fish – cod, croaker, haddock, halibut, bass, rockfish, trout, flounder

Handle Gently

Because fish flesh is delicate, try to handle as little as possible. Frozen fillets and steaks do not have to be thawed before cooking as long as additional cooking time is allotted. Do not thaw breaded frozen fish items before cooking. Thaw fish in advance if you wish to stuff it.

Never Overcook

Cooking fish at too high a temperature or for too long a time can thoughen the fish and destroy natural moisture and flavor. Pierce fish at the thickest point; if it flakes easily, it is done.

A CLOSER LOOK, continued

to help insure that no damage was done. Through their research, the scientists hope to determine the location of additional sand for use in such operations, as well as polluted sediments to avoid.

Continental Shelf Studies:

Wave refraction research comprises a large segment of this work. By systematically studying the effects of changing bottom topography on ocean waves the potentially dangerous sites for oil drilling equipment, the best sites for spoil disposal, and the location of mineral resources can be predicted. Scientists are also surveying bottom sediments.

Remote sensing aids geological oceanographers by tracing the movement of water masses. Photographs made by satellites show patterns of suspended sediment. This project has been supported for four years by the National Aeronautics and Space Administration to develop applications of remote sensing in marine science. For example, water containing sewage effluent in the port of Hampton Roads was traced by remote sensing instead of costlier methods.

Geological oceanographers at VIMS work directly with the physical properties of the state's shorelands and waterways. In addition to increasing basic knowledge of geological processes, this research helps determine the biological species to be found and the feasibility of man's use of a particular area.

OLD WARSHIPS MAKE LASTING ARTIFICIAL REEFS

During the Second World War the U. S. government constructed its first assembly-line warships. These vessels were made of steel in several basic parts which could be interchanged to produce cargo ships, tankers, and hospital and maintenance vessels.

The mass production of these Liberty Ships was a little too successful. After the war surplus ships were docked at military installations around the country, including the James River Fleet at Fort Eustis.

Then in the early 1970s the federal government decided to give the unused Liberty Ships a final mission -- to serve as artificial reefs off the coasts of the U. S. With the passage of Public Law 92-402 it became official.

When fishing in fresh or salt water, knowledgeable fishermen seek out rocky areas or sunken ships. Organisms used for food by fish can attach and grow on these hard surfaces much easier than on sandy or soft bottoms. There is also more space for these encrusting organisms within a smaller area, and naturally the fish congregate where the food is. It multiplies their chances for survival, and may afford a spawning habitat.

The Tidewater Artificial Reef Association, composed of businessmen with an interest in sport fishing, was among the organizations active in getting the law passed to convert the Liberty Ships. Individual states were required to apply to the U. S. Maritime Commission, who apportioned the ships. The Virginia Marine Resources Commission (VMRC) was delegated by the state to administer the project, and six Liberty Ships were turned over to this state agency.

The vessels are cut to the second deck level, and all the deck gear is removed. Then they are flushed out with chemicals and water to ensure against pollution after submersion. VMRC contracts this scrapping operation to private companies.

Tugs tow the dismantled ships to a prearranged location, and personnel from the Little Creek Amphibious Base sink the vessel by setting explosives in its sides and bottom.

Five Liberty Ships have been sunk off the coast of Virginia since the summer of 1974. The last ship will be sunk in April of this year. Two ships are sunk about 9 miles off Wachapreague on the Eastern Shore, and three are 30 miles east of Cape Henry at Triangle Wrecks. VMRC will gather information on fishing success in these areas from a questionnaire to be put on charter and head boats. The commission also plans to publish a brochure on the locations of the reefs and to put out identifying buoys.

The steel Liberty Ships can remain in the water for 100-150 years before beginning to disintegrate. They are an environmentally safe way to increase sport fishing catches in Virginia's waters. Though being sunk to create an artificial reef is perhaps not as noble as going down in battle, these World War II relics have found a use for several decades to come.

A VIMS educational service

marine mailbag

Q: I am a senior in high school and am very interested in a career concerning marine sciences. I would like some information on acceptance to the Virginia Institute of Marine Science.

Janet Sater, Maryville, TN

A: VIMS is the School of Marine Science of the College of William and Mary in Williamsburg. The School grants the degrees of Master of Arts and Doctor of Philosophy in Marine Science. Majors in Biological Oceanography (Marine Biology), General Oceanography (Physical, Chemical or Geological areas), and Fisheries Oceanography (Marine Fisheries Biology) are available at both levels.

Most students taking courses have completed a four-year undergraduate program. College students interested in marine biology or marine fisheries biology should take genetics, comparative anatomy of vertebrates, botany, microbiology, several chemistry courses, and general physics. College mathematics through trigonometry is important, and calculus is recommended.

The prospective student of general oceanography should have an undergraduate major in physics, meteorology, chemistry, mathematics, or geology. Students of the first three subjects should take fluid mechanics or gas dynamics and have mathematics through calculus.

In all disciplines an overall grade average of at least 2.5 on a 4.0 scale should be maintained, with a B in the major field desirable.

For further information and an application, write Dr. William J. Hargis, Jr.;Dean, School of Marine Science; Virginia Institute of Marine Science; Gloucester Point, VA 23062.

STUDENTS IN MARINE SCIENCE

(EDITOR'S NOTE: There are almost 100 students working toward their M.A. or Ph.D. degrees at VIMS. Many students are conducting original research for a thesis or dissertation. Articles such as the following will appear periodically in the Bulletin outlining graduate student research.)

Carol Lake is completing a Ph.D. in Marine Science with an emphasis on chemical oceanography. For four years she has been investigating how clay in estuarine sediments absorbs phosphates and polyphosphates.

Phosphates and polyphosphates are released into estuaries in sewage effluent and cause algal and plant blooms. This overabundance of plant life destroys the aesthetic properties of the water, and can decrease oxygen which would normally be used by fish.

Clay, a common sediment component in Virginia's estuaries, absorbs phosphates and may act to regulate the increasing flow of these chemicals into the water. Ms. Lake made an initial investigation of how the clay sediments could be important.

She employed both laboratory and field data in her research. Estuarine sediments are composed of four clay minerals. She simulated estuarine conditions in the laboratory and measured phosphate uptake. She also took samples from the Elizabeth River near the Lambert Point Sewage Treatment Plant to study the composition of the sediments there.

Soil scientists have studied the uptake of phosphates on land, but the subject has never been undertaken in the marine environment. Ms. Lake's research was funded in large part by Virginia Polytechnic Institute's Water Resources Research Center, and her work will be published in an upcoming *VPI Bulletin*.

NEWS FOR FISHERMEN

VIMS has a supply of the 1977 edition of the Tax Guide for Commercial Fishermen. The tax guide is for use in preparing 1976 returns, and will assist commercial fishermen in becoming familiar with federal tax laws as they apply to the fishing business. For example, it explains the available choices as to when and how certain kinds of income will be taxed, and when and how certain expenditures may be deducted. You may receive this publication by writing the *Bulletin* editor or calling (804) 642-2111, extension 112.

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