



# Marine Resource Bulletin

A Sea Grant Advisory Service

Vol. XI, No. 4

VIMS, July/August 1979

## UPDATE ON OYSTER CULTURE by Dick Cook, Editor



*Dr. John Dupuy, center, demonstrates the spat collectors invented in France to several members of the Virginia oyster industry. This type collector, when used in culture operations, reduces hatchery costs by as much as 40 percent. VIMS has the only system of this type in the country.*

THE AMERICAN OYSTER, *Crassostrea virginica*, has been the premier shellfish of the mid-Atlantic region since before the days of Captain John Smith. He found it a staple in the diet of tribes along tidal areas. There were plenty of oysters around then, especially in Chesapeake Bay. Anyone with an appetite could wade out at low tide and get supper in a few minutes.

Now jump ahead to modern times and focus on Virginia, which together with Maryland, produces the bulk of America's oysters. Demand is still high, and the oyster industry is important to the economy of both states. Virginia, in fact, was the leading oyster producer until the late 50's, when the disease organism MSX seriously depleted natural oyster stocks in the high salinity areas of the lower Chesapeake. Production has been low ever since, and pollution and adverse economic conditions in the oyster industry have further aggravated the waterman's plight.

Enter Sea Grant and the Virginia Institute of Marine Science (VIMS) in the late 60's. Since that time, VIMS researchers have been involved in one or more aspects of oyster culture. These include breeding of disease-resistant seed oysters, development of an artificial food for oysters in a hatchery and design of an oyster seed hatchery system.

From 1969 to present, one of the principal investigators in this work at VIMS has been Dr. John Dupuy. His manual "Design and Operation of an Oyster Seed Hatchery" signaled the completion of a seven-year Sea Grant funded project. Improvements and modifications to the hatchery system, most significantly in the form of a time, labor and cost saving oyster spat collector, continue at VIMS today. Dupuy is highly enthusiastic about the collector, invented by Guy Maheo of Brittany, France.

The "French Collector" as it is called, is a collector grid package, a cube made up of eight



*These naturally selected "Dermo-resistant" oysters obtained from lower Chesapeake Bay are being used for the initial laboratory selection of Dermo-resistant offspring. The resulting offspring will be further selected and bred to increase resistance to the disease.*



*Invented by Dupuy to complement the French grid collector package for hatchery use, this rotating tank for setting larvae precludes the setting of spat on the tank surface.*

trays held together by elastic strips. Dupuy has incorporated four of the "French Collectors" into a system which involves a revolving tank containing special baffles which keep oyster larvae from setting on the sides and bottom. This unique system allows the setting of 80,000 oyster spat per tank. Seven to ten days after setting, the collector packages can be moved to a natural growout area, thus freeing hatchery space for future setting.

Two Sea Grant projects currently being conducted by Dupuy involve nutrition and disease resistance. The nutrition study is concerned with developing an artificial diet to replace three species of cultural algae presently being fed to larval oysters in the VIMS hatchery. The algae are *Pyramimonas virginica*, *Pseudoisochrysis paradoxa* and *Chlorella sp.*

Final analysis of the protein and lipid composition of the algae was completed in 1978. Present research is centering on the carbohydrate composition. When this phase is completed, the three major components will be manufactured artificially, bolstered with selected vitamins and then put in capsules. These will be tested as food for larval oysters in the seed hatchery system.

Cont. on Page 5



# FISH HOUSE KITCHEN

## THE ATLANTIC BLUE CRAB

*The Atlantic Blue Crab is enjoying one of its better years in Virginia's marine waters, and right now is a good time to take advantage of this abundance. Long a mainstay item of the commercial and recreational fishery, the delectable crab lends itself to a variety of recipes, most of which are very rich in the end product. Here are a few to try.*

### CRAB CUSTARD

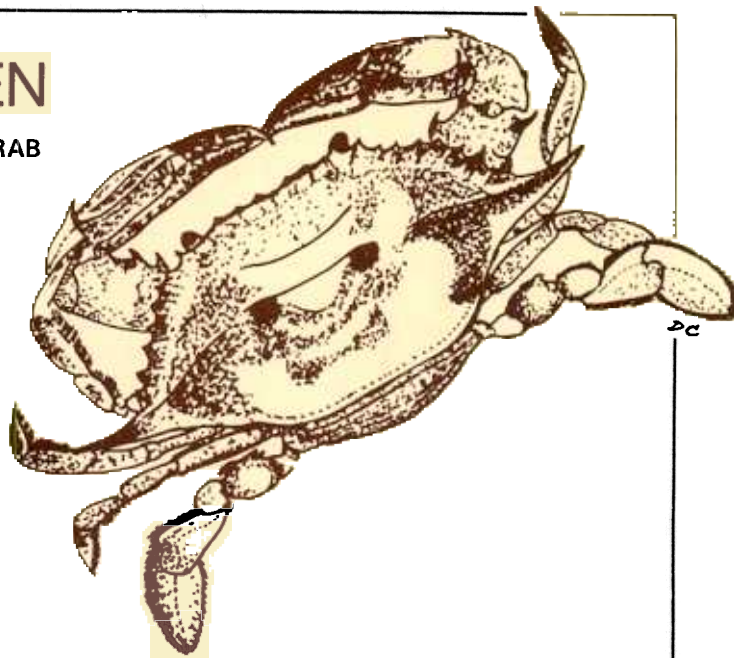
- 1 lb. crab meat, fresh or frozen (thaw)
- 2 T. melted butter or margarine
- 4 slices white bread
- 1 c. grated cheese
- 3 T. chopped parsley
- 1 T. minced onion
- 3 c. milk
- 4 eggs, well beaten
- 1½ t. salt
- ½ t. Worcestershire sauce
- ¼ t. white pepper
- Paprika

Drain crab meat. Remove any remaining shell or cartilage. Cut crab meat into ½-inch pieces. Pour butter in a baking dish, approx. 8 x 8 x 2 inches. Cut crusts from bread. Place bread in a single layer in the bottom of the baking dish. Place crab meat over top of the bread. Sprinkle cheese, parsley and onion over crab meat. Combine milk, eggs, salt, Worcestershire sauce and pepper; pour over crab meat. Sprinkle with paprika. Set baking dish in a pan containing 1 inch of hot water. Bake in a moderate oven, 350° F., for 45 to 60 minutes or until knife inserted in the center comes out clean. Makes 4 to 6 servings.

### VAN'S CRAB SOUP

- 1 lb. cooked crab meat, fresh or frozen (thaw)
- ¼ lb. butter
- 1 can (16 oz.) shoe peg corn (drained)
- 1 can (16 oz.) stewed tomatoes
- 1 c. cubed potatoes
- 1 small onion, chopped
- Salt, pepper, nutmeg, celery salt, basil<sup>®</sup> to taste

Cook potatoes and onions in water (to cover) 5-6 minutes in 5 qt. pot. Drain and reserve liquid. Add crab meat, butter, salt, pepper and spices to liquid and cook approx. 5 minutes over medium heat. Add tomatoes, corn, potatoes and onions to crab meat mix and heat through. Serves 6.



### QUICK n' EASY CRAB CASSEROLE

- |                       |                       |
|-----------------------|-----------------------|
| 1 lb. crab meat       | Green pepper, chopped |
| 1 lb. deveined shrimp | fine (if desired)     |
| ½ c. cream            | 1 can mushroom soup   |
| Bread crumbs          | 1 T. chopped parsley  |

Mix all ingredients together. Bake 25 minutes at 350 degrees until bubbly and brown.

### CRAB IMPERIAL

- |                     |                             |
|---------------------|-----------------------------|
| 3 T. mayonnaise     | ½ green pepper, chopped     |
| 1 pimiento, chopped | 1 lb. backfin crab meat     |
| ½ t. dry mustard    | 1 egg white, lightly beaten |
| Salt                | 2 t. Worcestershire sauce   |
| dash paprika        | Pepper, freshly ground      |

Saute green pepper in butter. Place meat, green pepper and pimiento into bowl. Combine remaining ingredients, fold into crab meat. Pile on scrubbed dry crab shells or individual casseroles. Garnish with pimiento strips. Bakes at 375 degrees for 20 minutes or until golden brown. Serves 3 to 4.

For an appetizer, use the imperial as a stuffing for mushrooms. Wash and cap two dozen large mushrooms. Cook mushrooms in 1 quart of water and 2 T. of salt for 2-3 minutes. Place mushrooms in buttered casserole dish and place heaping spoonful of crab imperial in each mushroom cap. Combine 1 T. mayonnaise and 1 T. milk and brush the top of each filled mushroom with this mixture. Sprinkle with paprika. Bake at 350 degrees for 15 minutes or until golden brown.

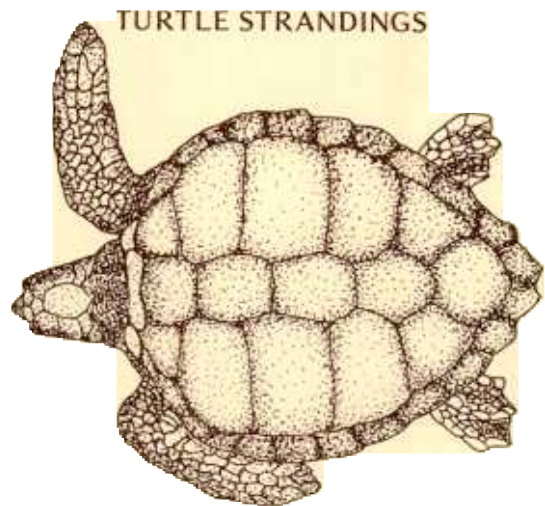
## NEW PUBLICATIONS

"THE ECONOMIC IMPACT OF THE SEA SCALLOP *Placopecten magellanicus* FISHERY IN VIRGINIA" by William DuPaul and Samuel Baker. Special Report in Marine Science and Ocean Engineering No. 222. ABSTRACT: An economic analysis of Virginia's offshore sea scallop industry. The report includes data on landings, employment, income generated and cost/revenue relationships of vessels for the years 1977-78. This report is useful to resource managers, local communities and other agencies concerned with fishery resources and their economic importance. First copy free, additional copies 50 cents.

"THE MARINE TURTLES OF VIRGINIA Families Cheloniidae and Dermochelyidae, WITH NOTES ON IDENTIFICATION AND NATURAL HISTORY" by J. A. Musick. ABSTRACT: Primarily designed as a field guide, this two-color booklet contains notes on the identification and natural history of the leatherback sea turtle and four species of hard-shelled sea turtles that occur in Virginia's marine waters. Detailed drawings showing distinguishing characteristics, plus the natural history and status in Virginia of each species, makes this a valuable contribution in an environmentally sensitive area. \$ 1.00 per copy.

"RECREATIONAL ATLANTIC MACKEREL (*Scomber scombrus*) FISHERY IN VIRGINIA" by Joseph W. Smith. Special Report in Applied Marine Science and Ocean Engineering No. 223. ABSTRACT: Compiled results of a sport fishery survey at Rudee Inlet, Lynnhaven Inlet and Wachapreague, Virginia during February - mid-April 1978. An abnormally cold spring of that year was responsible for the low abundance of mackerel in the Virginia fishing area. Unsettled weather and seawater isotherm are the factors controlling the success of the local season. Catch data were acquired by telephone interviews and intercept census of returning vessels. Free.

"CLEANING AND PREPARING THE COWNOSE RAY" by John Merriner and Joseph Smith. Advisory No. 18. ABSTRACT: A fully illustrated brochure on the catching, cleaning and cooking of one of Virginia's underutilized fishes. Excellent step-by-step photos by the authors graphically show the ease of cleaning and the abundance of tasty, bone-free fillets available in a single ray. Free.




A graduate student working out of the Department of Ichthyology at VIMS has been compiling data on marine turtle strandings in Virginia waters since late May, 1979. To date, Molly Lutcavage, generously assisted by a responsive public, has examined 101 dead marine turtles, with sighting reports filed on 100 more. Approximately 95% of the stranding reports have been of Atlantic loggerheads, with 4% Atlantic ridleys and 1% Atlantic leatherbacks. Of the loggerheads, Lutcavage reports that most are mature females.

The greatest number of reports have come from the Buckroe Beach area, with the Norfolk city beaches ranking second and the area from New Point Comfort to Gloucester Point tallying third. Scanty reports of strandings have come from the Eastern Shore.

This research effort, presently sponsored by the Sea Grant Program, is a continuing one. According to Dr. Jack Musick, Molly's research advisor, VIMS has requested funding from the National Marine Fisheries Service to further investigate these unexplained summer mortalities in lower Chesapeake Bay.





Marine Resource

# Bulletin

A Sea Grant Advisory Service

**DICK COOK** .....EDITOR

*Marine Resource Bulletins are produced by the Virginia Institute of Marine Science as a Sea Grant Advisory Services project. Subscriptions are available without charge on written request to the editor.*

---

William J. Hargis, Jr. ....Director  
Maurice P. Lynch. .... Sea Grant Director  
William D. DuPaul. .... Head, Advisory Services

# Wavelets

## HOW INDIANS LIVED IN TIDEWATER

by LINDA KELSEY AND ELIZABETH CORNELL

DO YOU THINK YOU COULD CLEAN a fish with a clam shell rather than a knife, or make a house from grass or catch a fish without a pole, line and hook? Indians that lived in Tidewater during the 1600's did all these things. Suppose there were no stores near you; could you find in Nature all the things necessary for living, such as food, clothing and tools?

Indians built settlements near rivers and wetlands for very good reasons. They traveled on the rivers, gathered food from the rivers and wetlands and used all manner of objects that lived, grew and could be found in the area of their village. Unlike modern city dwellers, Indians did not change their environment very much, and if they killed an animal for food, they would use all parts of the animal. The estuarine environment provided an abundant supply house to meet their everyday needs, and the Indians did not abuse their sources of food and building materials.

Records show that Tidewater Indians ate scallops, whelks, oysters, clams, mussels and fish in great abundance. Not only were these animals eaten for food, but parts of their bodies were used as tools, fertilizer and building materials. Shells became scraping tools which cleaned off hides and fish scales, digging tools for hoeing their gardens and wood-working tools. Clam and mussel shells became dishes, cup or spoons, depending upon size. Sharp pieces of shell were fashioned into knives and axes. Beaver jawbones were used in woodworking and turtle shells were made into rattles. Crushed shell was mixed with clay, which made for stronger pottery and ceramics.

"Wampum," or Indian money, was made from the thick purple portion of the clam shell or the white portion of the whelk or conch. Wampum beads could be strung into necklaces of different patterns to record special events such as treaties.

Edible marsh plants and various forms of seaweed were collected. The seaweed was either cleaned and eaten, dried and ground to use as a seasoning for other foods or wrapped around foods to preserve them for eating at a later time. Crabs and lobsters were roasted, baked, fried or smoked. If plentiful, they were dried and stored in underground pits. Clams and fish were dried by stringing them on sticks and splashing salt water on them to retard spoilage. Fish too small to be eaten were used as fertilizer.

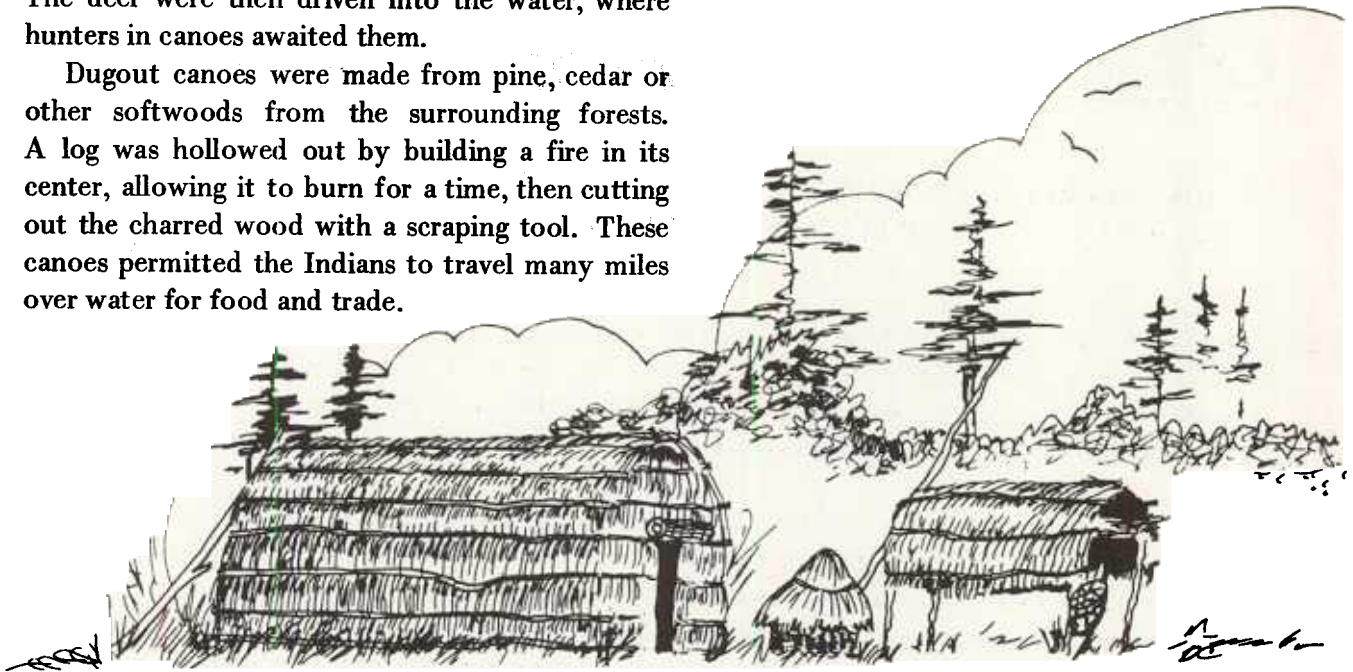
Deer and waterfowl were abundant in the headwater areas of rivers, and Indian villages were often built in these locations. Deer provided a major source of food and materials for tools and clothing. The deer drive was one successful method used in hunting these animals. The men of an entire village might turn out to form a line and force the deer to some



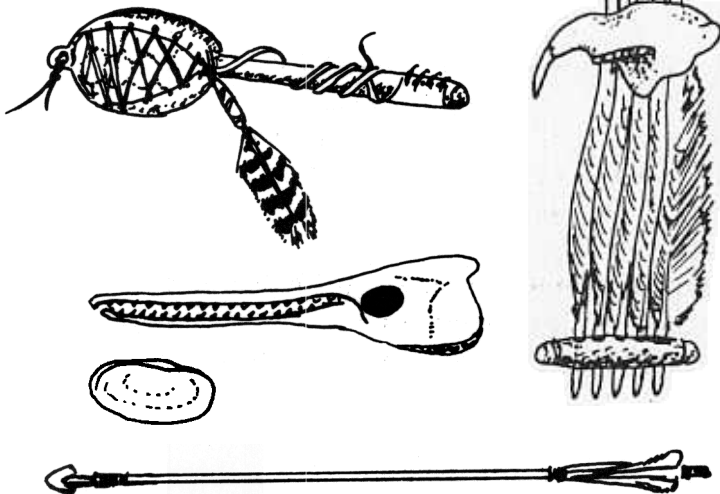


narrow point of land jutting out into the river. The deer were then driven into the water, where hunters in canoes awaited them.

Dugout canoes were made from pine, cedar or other softwoods from the surrounding forests. A log was hollowed out by building a fire in its center, allowing it to burn for a time, then cutting out the charred wood with a scraping tool. These canoes permitted the Indians to travel many miles over water for food and trade.



The Indians were very skillful in methods of capturing fish. For example, a device known as a weir, when extended into a stream, trapped fish in large quantities. It was made up of sticks and reeds woven together. Pockets in the weir served to collect the fish. Crabs, shrimp, snails and periwinkles also were collected. Spears or long arrows attached to lines were used for capturing fish in shallow water. At night, light from a torch or a small fire in a canoe attracted fish to the surface, where they could be captured by spears or fish rakes. The scales of some larger fish, such as gar, were dried and shaped into arrowheads for future fishing expeditions.

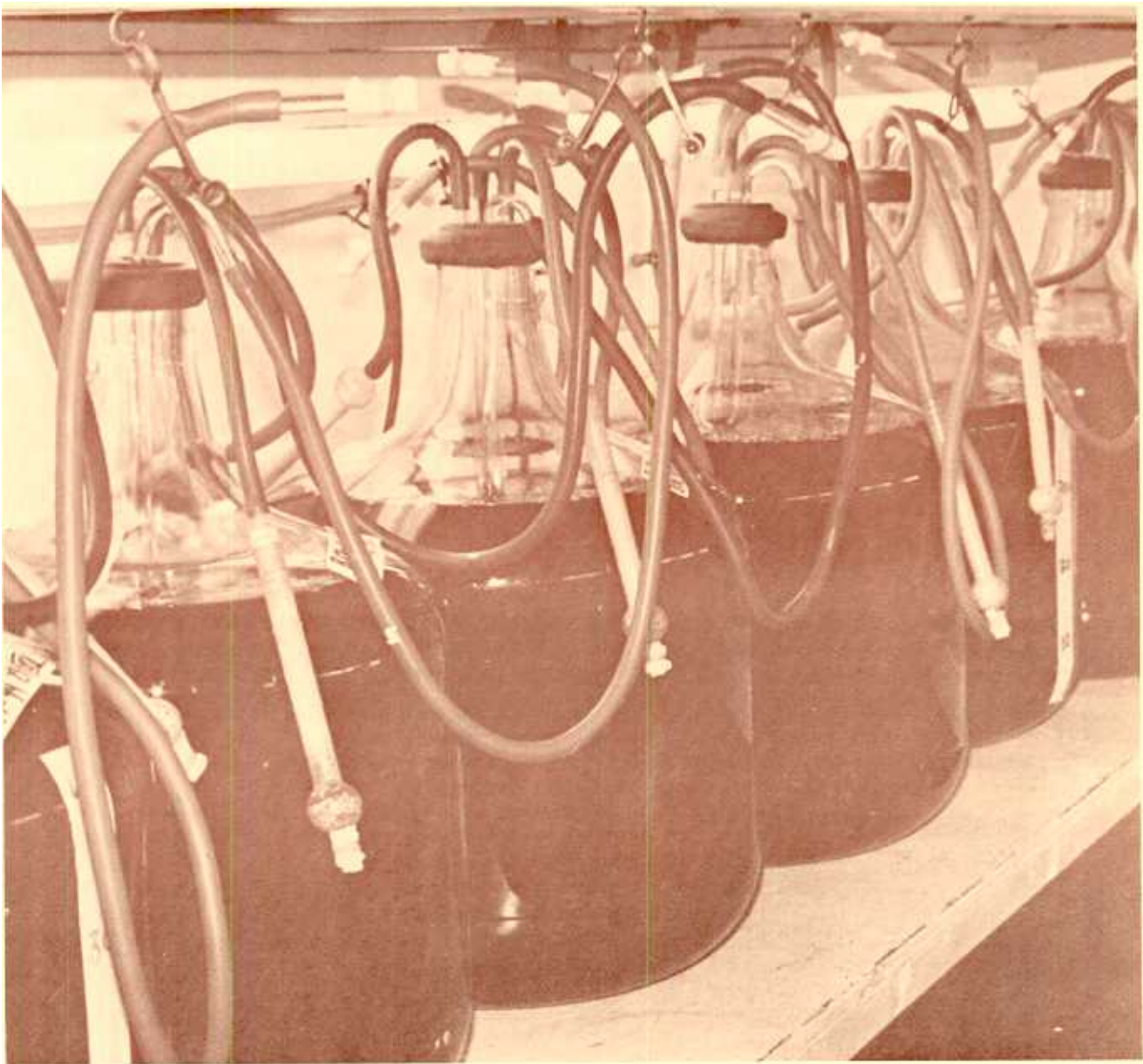


An Indian house or "wigwam" consisted of an arched framework of small green poles covered with mats made of marsh grass. The use of hollow reeds as matting acted as insulation, helping keep the house cool in summer and warm in winter. These grasses also were woven into flooring, bedding, mats, seats and pillows, and were used to make brooms and baskets, as well. Some of these construction methods may be seen today.

Mr. Errett Callahan, Director of the Pamunkey Research Center, is trying to reconstruct a typical Indian settlement as it existed in 1600, using no modern tools or materials. The village is located on the Pamunkey Indian Reservation on the banks of the Pamunkey River in King William County.

Building an entire village without the use of modern construction methods or tools is long, hard work. Mr. Callahan and his student volunteers must first make their tools and gather their materials by hand. Working from descriptions in seventeenth century records, they have already completed portions of the village. Visitors can walk inside a wigwam on a hot summer afternoon and feel cooler, or buy pottery made from Pamunkey River clay and ground oyster shells. A museum will be open to the public starting in the fall. For a close look at how Virginia Indians lived 300 years ago, try to visit this area soon.

*A part of the nutrition study Dupuy is now conducting includes three species of micro-algae isolated from the nearby York River which have proved to be excellent food for oyster larvae. The algae, kept in 10 gal. containers, are used to feed larvae in the hatchery.*



The second project Dupuy is conducting concerns breeding and selection of Dermo-resistant strains of oysters. "Dermo" is a popular term for *Perkinsus marinus*, an oyster disease in higher salinity areas along the East Coast. Where MSX depletion shows up at age 1 or older, Dermo kills oysters at age 2 or older.

In lower Chesapeake Bay, the combination of Dermo and MSX has virtually wiped out commercial oyster production in half the grounds. MSX-resistant strains have been bred and are showing a 90% survival rate in field tests.

Further testing and selection of even hardier strains of oysters may start this delicious seafood on the climb back to its former abundance, at least in pollution-free areas.

Testing for Dermo will be much easier, since this work can be conducted in the laboratory over a 12-month period, while MSX testing and selection required over 2 years of field work. In any event, the work continues on behalf of the oyster and those who enjoy its presence on their tables.



## BAY APPRECIATION WEEK

The Citizens Program for the Chesapeake Bay, Inc. public participation program is in the initial stages of organizing a Chesapeake Bay Appreciation Week. The purpose of the move is to focus attention on the unique and valuable resources of the Chesapeake and to give the eight million people who use these resources an opportunity to understand the ever increasing problems confronting the Bay.

This year's Bay Appreciation Week will be scheduled for October in order to take advantage of the many Bay-related activities and festivals conducted during this time, and a calendar of events, for distribution to Bay-area residents, is tentatively planned.

Any cities, towns or organizations wishing to participate in the Chesapeake Bay Appre-

ciation Week are requested to contact Mrs. Mary Kasper, 48 Maryland Ave., Annapolis, MD 21401. Phone (301) 268-1243 or (301) 269-0535.

## REEF CONFERENCE

A Regional Artificial Reef Conference is scheduled for September 13-15, 1979 at Daytona Beach, Florida. Co-sponsored by Sea Grant Programs from Virginia to Texas and by fishery-oriented agencies, the conference will deal with planning, construction and management considerations for artificial reef programs. For additional information, contact: Florida Sea Grant College, 11 Anderson Hall, University of Florida, Gainesville, FL 32611, Phone (904) 392-0931 or (904) 392-1837.

# Marine Resource Bulletin

**A Sea Grant Advisory Service**

VIRGINIA INSTITUTE OF MARINE SCIENCE  
Gloucester Point, Virginia 23062

ADDRESS CORRECTION REQUESTED

BULK RATE  
U S POSTAGE  
PAID  
Gloucester Point, Va.  
PERMIT NO. 6