



# Marine Resource Bulletin

A Sea Grant Advisory Service

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*Left, Jack Musick, Ichthyology Museum supervisor, and assistant curator Bill Raschi examine a preserved mako shark, one of more than 6,000 "lots" in this regional collection of fishes. Below left, Raschi takes measurements on a voucher specimen prior to cataloging the fish.*



**A LIBRARY OF FISH**  
by Dick Cook, Editor

THERE ARE TWO "LIBRARIES" of sorts at the Virginia Institute of Marine Science...one is the conventional type, complete with stacks of books, file cards and several librarians. The other is composed of row upon row of glass jars, stone crocks and stainless steel coffins, each containing one or more fish. Two graduate students curate this collection, which goes by the name of the VIMS Ichthyology Museum. In a layman's interpretation of the word "museum," it's not that any more than it is a library. What it is, is a regional scientific collection of fishes, cataloged, curated and available for study to members of the international scientific community.

The museum was originally set up in 1967 as a depository of freshwater and marine specimens, documenting the fish fauna in the marine region between Cape Cod and Cape Hatteras and in the fresh and brackish waters of the State of Virginia. These parameters allow an investigating scientist to know the collection's area of emphasis, although fishes from other regions of the world are not barred from inclusion.

The museum functions primarily as a storage facility for "voucher" specimens. Scientific studies require documentation, and voucher specimens insure that in the future, scientists will be able to check the validity of such things as species identification, size, sex, etc. of specimens that have been the object of past scientific studies.

As an aid to the scientific community in the study of races or regional evolution of fishes, the museum is equally valuable. On the other hand, it probably isn't a particularly good place to tour with the family on a Sunday afternoon, unless they get excited over colorless fish stacked in glass jars and labeled in Latin. But if you think you may have stumbled onto something new or different while wetting a line or fishing a net, it can be an exciting visit. Chances are that if you caught your fish in Virginia waters, you'll find a lookalike in the Museum. Just telephone ahead to set up an appointment, so one of the curators will be on hand to help you out. Many new specimens have been brought in by Virginia's commercial fishermen and sport fishermen. They are greatly appreciated.

The Museum's secondary function is to aid in the teaching of VIMS graduate students and other students by VIMS professors. Museum curators try to keep representative specimens of major groups on hand, even if they don't occur in our area, because they are important in teaching students about the biology and/or evolution of fishes. This breaks over into the freshwater and deep-sea study areas as well as the Chesapeake Bay and nearshore regions.

For example, Virginia has one of the most diverse fish faunas in the United States, for many reasons that are associated with the State's geological history in the mountainous sector. There is much speciation, or changes occurring in species of fish, in the Roanoke drainage system, alone. VIMS teachers always try to schedule one or more field trips to that area of the state each term, simply because it is a good place for students to learn about evolution. Consequent-

ly, through these and other field trips, the Museum has acquired a substantial collection of Virginia's freshwater fishes. Any scientist working in this area of study needs an established depository. The Museum provides this service.

VIMS was primarily an estuarine institute for many years; it's only been in the last 10 years or so that her scientists have collected material from the continental shelf and offshore.

Over the last decade, one of the major research projects in the Ichthyology Department at VIMS has been supported by the National Science Foundation. The project involves periodic trawl sampling of fish life on the continental slope off Virginia, on the continental rise and out into the abyssal plain, to depths of several miles. This effort has resulted in VIMS having one of the best deep-sea benthic fish collections in the world.

Not surprisingly, VIMS scientists are constantly publishing new findings on fish collected from these remote areas, and most of the voucher specimens are deposited at the Museum. New species are routinely sent to the National Museum in Washington, DC. Plans for the future call for proposals to conduct similar efforts in the tropics, to compare with work already completed.

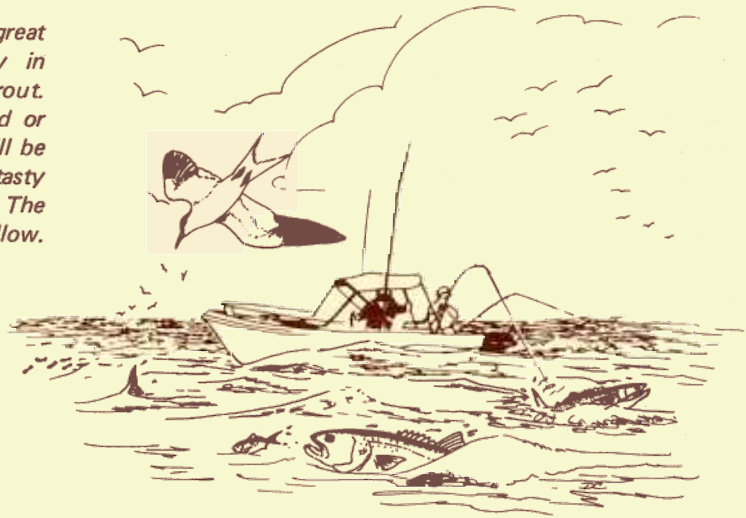
Trawling is a mainstay collection method at VIMS, and likely museum specimens are handled as follows: Once the net comes up, the catch is washed off, identified, counted, weighed and measured. A decision is then made as to how many specimens are needed for voucher purposes. Of the more common species, a subsample normally is saved to be brought back to the Museum.

Aboard the vessel, a 10% formalin solution is used to preserve all materials which are to be brought back. It is necessary, especially in summer, to get the fish into preservative (or to get the preservative into the fish) as quickly as possible. A number of small fish, often 50 to 100 or more, may be preserved as a lot in a single jar (a "lot" may also be a single fish). Larger fish up to several pounds normally would have an incision cut into the right side before being immersed in the preservative. This step allows the formalin to reach the internal organs quickly, while still leaving the left side intact for possible scientific illustration purposes. Still larger fish, sharks or rays for example, would be injected repeatedly with the formalin, thus insuring rapid and even penetration of the chemical.

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# THE FISH HOUSE KITCHEN

*Two species of saltwater fish that are in great abundance in Virginia right now, particularly in Chesapeake Bay, are the bluefish and gray trout. Both of these species are excellent when baked or broiled, filleted or stuffed. Blues and trout will be with us all summer, so for economical and tasty dining, include them in your menus often. The recipes listed below are quick and easy to follow.*



## FILETS A' LA CREME

2 lbs. trout or bluefish or other fish fillets	2 T. butter
¾ c. sour cream	½ c. mayonnaise
1 T. garlic salt	2 med. onions
1 T. lemon balm	1 T. seasoned salt
2 fresh lemons	1 T. lemon pepper
1 T. paprika	2 T. parsley
mushrooms (optional)	1 c. white wine (dry)

Combine and mix all spices (except paprika) in bowl. Marinate fish fillets in wine and half of the spice mixture for 2 hours. Place fish in pan, skin side down, and dot with butter. Ring onions and place over fish. Sprinkle with rest of spices. Mix mayonnaise and sour cream and spread over top, place lemon wedges around fish and sprinkle with parsley and paprika. Bake at 350° for 20-25 minutes or until fish flakes easily when tested with a fork. Serve over brown rice. Serves 6.

## FILETS ESPAGNOLE

2 lbs. trout or bluefish or other fish fillets	¼ c. chopped onion
2 T. flour	3 T. butter or other fat, melted
¼ c. chopped green pepper	1 t. salt
2 c. canned tomatoes	½ t. sugar
1 bay leaf	Dash pepper
	1 whole clove

Saute onion in butter until tender. Blend in flour. Add remaining ingredients except fillets, and cook until mixture thickens, stirring constantly. Remove bay leaf and clove. Arrange fillets in a well-greased shallow baking dish, skin side down, and cover with sauce. Bake in a moderate oven, 350°, for 25-30 minutes or until fish flakes easily when tested with a fork. Garnish with parsley sprigs and lemon wedges and serve hot. Serves 6.

## FILLETS ORANGE

2 lbs. trout or bluefish or other fish fillets	¼ c. grated onion
2 T. lemon juice	2 T. orange juice
½ t. salt	2 t. grated orange rind
1/8 t. pepper	1/8 t. nutmeg

Cut fish into 6 portions. Place in a single layer, skin side down, in a well-greased baking dish, 12 X 8 X 2 inches. Combine onion, orange and lemon juice, orange rind and salt. Pour over fish; cover and place in refrigerator to marinate 30 minutes. Sprinkle fish with nutmeg and pepper. Bake in a moderate oven, 350°, for 25-30 minutes, or until fish flakes easily when tested with a fork. Makes 6 servings.

## FAST FILLET BROIL

2 lbs. trout or bluefish or other fish fillets	3 T. soy sauce
¼ c. garlic French dressing	¾ t. ground ginger

Place fillets in a single layer, skin side down, on a bake and serve platter or in a baking dish (16 X 10 inches) that has been lightly greased. Combine French dressing, soy sauce and ginger. Pour sauce over fish and let stand 10 minutes. Broil about 4 inches from source of heat for 10-15 minutes or until fish flakes easily when tested with a fork. Baste once during broiling with pan drippings. Garnish with lime slices and/or fresh parsley. Serves 6.

**PROJECT CREST**  
by Mary Sparrow  
Elementary Education Specialist

THE CREST OF A WAVE is its highest point. This symbol was selected to represent PROJECT CREST, a new marine environmental studies program for gifted students in the Gloucester County School System. The program was initiated by School officials and funded by the Department of Education, Commonwealth of Virginia. The goal of the program is to encourage gifted students to strive to achieve their academic and intellectual potential.

The program, which is supplementary to the existing curriculum, is two-fold in purpose:

1. to provide opportunity for creative and intellectual exploration
2. to develop an awareness of the beauty and value of the marine environment and a sense of responsibility for its protection and wise use

Students in the CREST program attend a weekly one-hour class lead by a VIMS Sea Grant staff member. A variety of teaching and learning techniques are utilized to explore topics relating to the marine environment. Students learn through examples in literature, history, science and other disciplines. Since young people interact with the water world mainly through recreation, water safety is stressed.

Field trips, guest speakers, independent study, individual conferences, study groups, specialized clubs and service projects are vehicles for learning. Service projects provide the opportunity for students to become actively involved in their community. The projects benefit the student body of the school and/or the community at large, and provide the chance to reinforce learning while sharing it with others. One of the service projects completed this year was a marine science newspaper. Students contributed reports, stories, riddles and games on marine topics. Following are some examples of their efforts.

**SPIDER CRABS** by Chris Corr, Grade 4

Crabs belong to the world's largest animal group, the arthropods, or joint-legged animals. The arthropod group has over 650,000 kinds of animals. Crabs are crustaceans; there are 25,000 different kinds of crustaceans. Crustaceans have segmented bodies with their skeletons on the outside, and jointed legs. The

skeletons are made of chitin, a tough, hard, horny material.

Spider crabs (of the family Majidae), with long, thin legs, resemble giant spiders. They live in water up to 600 meters deep. All have more or less triangular shells. The largest spider crabs are four meters from the tip of the longest leg to the opposite tip, the smallest are only about 4 centimeters long.

Spider crabs, which are slow, have a carapace usually covered with barnacles, algae and occasionally a sea anemone, another type of marine animal.


Spider crabs sometimes place bits of seaweed, sponges and other materials on their backs for camouflage to disguise themselves and escape their enemies.

A number of species are found in shallow waters on both Atlantic and Pacific shores.

Spider crabs do not usually get eaten by humans because they do not contain much meat.

**SHRIMP** by Andrea Martin, Grade 5

Shrimp are slender shellfish related to crabs and lobsters. Shrimp are a popular food and one of great value to U.S. fishermen.

Shrimp live in fresh and salt water in nearly all parts of the world. Some live on the shore, where they hide all day in the mud and come out to eat at night. Others swim in groups in deep cold waters. A shrimp generally swims forward, but can swim backwards by moving his fan-shaped tail. Most shrimp have gray, brown, white, pink, blue and striped bodies. Some can change color to match their surroundings. Small shrimp eat plankton (small drifting plant and animals). Some shrimps clean the gills and scales of other fish. 

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

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TIDAL WETLANDS--PART III, FRESHWATER WETLANDS  
by GENE SILBERHORN



IN THE UPPER REACHES OF AN ESTUARY such as Chesapeake Bay or towards the upper parts of tidal rivers along the coast, one may find *freshwater marshes* and *swamps*, two types of wetlands that take many years to form. Here there is still a rise and fall of the tide, but the water contains little if any salt. Most of these wetlands occur at least 30 miles and as far as 100 miles or more from the ocean. Because there is little or no salinity or salt in the water, many different species of plants and animals may live in these very productive natural areas. On one acre of tidal freshwater marsh, for example, you may find as many as 50 different species of plants.

At the peak of the growing season, these marshes are quite colorful with the blooms of various species of broad-leaved plants, sedges, rushes, grasses and shrubs. You may see white and green blossoms, along with such colors as yellow, purple, blue, red and pink. The green foliage ranges from the large, fleshy leaves of Arrow Arum, Pickerelweed and Arrowhead to the long, strap-like leaves of Cattail, Wild Rice and Giant Cordgrass. Many of the plants are very fragrant, such as the pink flowering Swamp Rose or Sweet Flag, (a relative of Jack-in-the-Pulpit). Tidal swamps are often associated with tidal marshes, but swamp vegetation is dominated by trees such as Bald Cypress, Tupelo Gum, Black Gum, Pumpkin Ash and other water-loving species.

Tidal marshes and swamps in Virginia are best developed along the James River and its tributaries from Hog Point Refuge in Surry County to Richmond; and then all along the Mattaponi and Pamunky Rivers, starting about 5 to 7 miles above West Point to where Route 360 crosses both rivers. On the Rappahannock River, large tidal wetlands can be found all the way from Tappahannock to Fredericksburg. Along the Potomac River, a number of tributary creeks from the Colonial Beach area to nearly Washington are vegetated with freshwater marshes.

These areas mentioned above are also the most productive herring and shad spawning areas in the Commonwealth. Tidal freshwater wetlands contribute organic material (detritus) which, along with brackish and salt marshes, generates the estuarine food web. (See WAVELETS, Marine Schoolhouse Series Nos. 5 & 6). Such wetlands are very valuable as waterfowl and wildlife habitats. Ducks and geese arrive each autumn by the thousands to feed upon the seeds and/or fruits of Wild Rice, Arrow Arum, Pickerelweed, Swamp Dock, Smartweed, Water Hemp and many others. They also dig up the roots and rhizomes

of Wild Rice and Giant Cordgrass and the tubers of Duck Potato. During these periods, the marshes may look as if they were plowed. Amazingly, these same marshes come back to life when the weather warms up the next spring and are rich with vegetation again by the peak of the growing season.

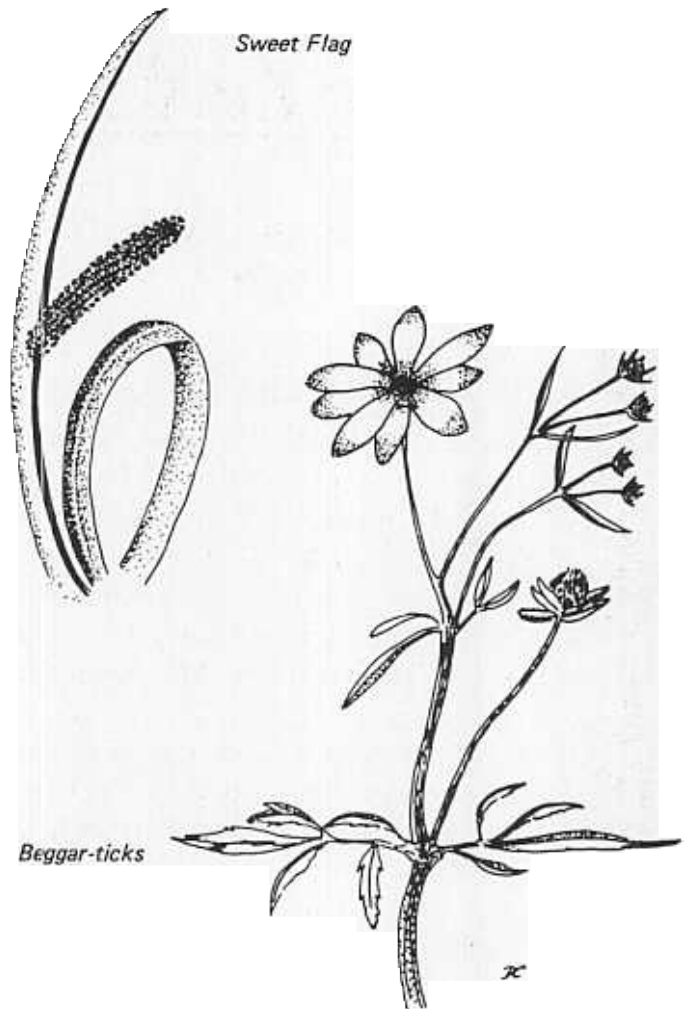
A change in the seasons brings about dramatic modification in the marshes. During the winter they look like nothing more than raised mud flats. The succulent, broad-leaved plants totally decompose except for their underground parts. A few dry stalks of sedges, rushes and grasses may still remain. In late March or April, the spike-like shoots of Arrow Arum and Pickerelweed poke up through the mud. By May or early June, these broad-leaved plants usually dominate the marsh. As the season progresses they are followed by

*This issue of "Wavelets" completes our series on the marshes and swamps of Virginia. Illustrations are by Dick Cook and are adapted from the drawings in Dr. Silberhorn's excellent book "Tidal Wetland Plants of Virginia," available for \$ 3.00 from the VIMS/Sea Grant Publications Office.*

sedges, grasses and rushes. By midsummer, many marshes are a mass of yellow blooms of Beggar-ticks, a late blooming plant also known as Tick-seed Sunflower.

By the time waterfowl arrive in the fall, most of the Wild Rice grains have been eaten by Red-winged Blackbirds, but other foods are still available. Competition for survival between plants and animals, even of the same species, is readily observed in a marsh.

There is much that is yet to be learned about freshwater marshes and swamps. Only in the last several years have scientists been studying the ecological function of tidal freshwater wetlands. Perhaps you'll be able to explore one of these interesting and valuable wetlands in your area this summer. For safety's sake, explore with your favorite adult.



*Redwinged Blackbird on Wild Rice*



Row upon row of glass jars, each containing fish, make up the Museum's voucher specimen collection. Bill Raschi adds a new one.


Upon return to the Museum, all specimens are spread out in a special preparation room where large blower fans remove the noxious formalin fumes. The fish are then soaked out several times in water and finally are placed in containers holding an alcohol-water solution which prevents bacterial growth. Colors fade quickly, but the taxonomic features so important to researchers studying fine details are preserved. Glass jars (if small fish) and individual specimens (if large fish) are then tagged and are ready for cataloging. Containers range from 2- quart glass jars up to a 4' X 5' X 8' stainless steel bin, complete with buckled down top, for holding a dozen or more sharks and/or other large fishes.

All told, the Museum's collection now includes approximately 6,500 lots, 5,500 of which are cataloged, 500 "in house" ready to be cataloged and another 500 from the donated Chesapeake Bay Collection, Solomons, MD. In addition to these, the curators try to keep a supply of the more common regional species in the Museum to give away as gifts to other major museums or to use as trading material.

The Museum does not maintain a type specimen collection; that is, one that includes specimens upon which descriptions of new species are based. Type specimens are important in the study of taxonomy and systematics. There are vast national establishments that provide this service. When VIMS scientists do work that involves type specimens, they turn to collections such as that in the National Museum of Natural History in Washington, DC. The National Museum cannot provide the complete formal regional representation that is provided at the VIMS Museum, however.

An observer looking down into the large bin on a collection of a half dozen or so 6 to 7 foot sharks might ask, "Where do you draw the line?" According to Dr. Jack Musick, supervisor and motivating force behind the Museum from the start, there is no line:

*"The sharks are a good example. The grey sharks, the Carcharhinidae, are large, obvious and abundant around the world, from the tropics through the temperate zone. Still, it has only been in the last year or so that scientists have come to understand their taxonomy. Before that time, all we had to study were dried sets of shark jaws...the rest of the animal was too big and unwieldy for most people to bother with. It's only been since museums have had the facilities and people have had the time to prepare specimens that the identification and relationship of these grey shark species have been possible."*

The Museum, to reiterate, is a service-oriented facility. It serves educators, students, scientists and members of the general public. It's voucher specimen collection grows with the findings of VIMS scientific efforts in new areas, and its current Virginia fish fauna collection is informative to anyone wanting to find out what's in the fauna at this time. 

#### HARBORFEST STUDY

Norfolk's Third Annual Harborfest, held in June, is the subject of an economic study by the Virginia Institute of Marine Science of the College of William and Mary. To assist the City of Norfolk and the Harborfest Planning Committee, VIMS Sea Grant Marine Advisory Services took aerial photos of the crowds, interviewed more than eleven hundred patrons and surveyed downtown businesses. The study report will be released in late summer.

FISHERIES SYMPOSIUM  
by Anne Marshall

AMONG THE DISCUSSION items covered at the Fourth Annual Recreational Fisheries Symposium (Fort Lauderdale, Florida, May 7 and 8) was that of a marine recreational fishing license. The theoretical and practical values of such a license were debated back and forth among sportfishermen, state and federal government agencies, sportswriters and representatives from industry and research institutions.

Government agencies view the marine license idea as a way to provide information on the angler population, the amount of fishing activity and size of harvest, not to mention a new source of revenue for necessary sport fishing research and conservation programs. Nat Reid, a spokesman for marine anglers in Florida, suggested that that group's opposition to the license idea might stem from distrust of bureaucrats and the inability, to date, of the Florida Department of Natural Resources to implement a valuable

sport fish management program. B. J. Putman, a Florida party boat operator, approved the marine license concept, because as a member of the Gulf Regional Fisheries Management Council, he felt he should represent the interests of the fish instead of the fishermen.

The licensing debate was not resolved at the Symposium, but ideas and opinions, pro and con, were fairly aired. While most people appreciated the theoretical value of licensing saltwater anglers, there was considerable doubt as to whether anglers themselves could be convinced of the need and practical worth of such a concept. A model statute for a state license program was presented by Chris Weld, National Coalition for Marine Conservation.

Proceedings of the Symposium should be available early in 1980. For proceedings of past symposiums of this sort, contact the International Game Fish Association, Dept. MRF, 3000 East Los Olas Blvd., Fort Lauderdale, FL 33316. 🐟



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