Marine Resource Bulletin

VOL. XVII, NO. 2 Virginia Sea Grant College Program-Virginia Institute of Marine Science-College of William and Mary SPRING 1985

Scott Hardaway

The Value of Wetland Vegetation: Big Fish Eat Little Fish Eat Detritus

by Susan Schmidt

Silhouetted in the marsh a great blue heron stalks patiently, then spears a fish with lightning speed. An egret tosses its head feathers, then freezes. Atop a channel marker in the tidal creek an osprey squawks from its stick nest.

A canoe rounding the curve surprises a raft of ducks; turtles slide off the log where they have been sunning. With the ebbing tide tiny periwinkle snails crawl back down grass blades. As evening darkens a whippoorwill calls courtship and frogs boom their bass drill.

Step to your knees in the muck and a sulfury smell escapes the ooze. If you live next to a marsh, you come to love its distinctive smell, its changing vista and progression of wildlife visitors as seasons pass.

There is a certain beauty to marshes. Besides their intangible aesthetic value, marshes are important biologically as food source and physically as habitat for fish. They also buffer against erosion and coastal flooding.

Marshes produce detritus, or decomposed plant material, which is flushed daily into an estuary by the tide. Microorganisms digest this plant detritus so that its nutrients become available to fish. Bigger organisms, in turn, eat the creatures that consume detritus: big fish eat little fish. Each step of predators and prey in the food chain is called a trophic level. At the base of the estuarine food chain, marsh productivity supports the commercial and sports fisheries in the Chesapeake Bay. Marshes are also important as spawning and nursery grounds for fish. Many fish seek shelter in marshes at some part of their life cycle.

Marsh vegetation changes with salinity, and marshes are classified by the dominant plant species. Marshes that line shorelines of the Bay and its tributaries, range in salinity from 0 to 32 parts per thousand (ppt). Tidal freshwater (0 ppt) marshes upriver are predominately arrow arum (*Peltandra virginica*) and pickerel weed (*Pontederia cordata*). Saltmarsh cordgrass (*Spartina alterniflora*) dominates brackish (18 ppt) and saltwater (32 ppt) marshes.

Mandated by the Virginia Wetlands Act of 1972, scientists at the Virginia Institute of Marine Science (VIMS) have inventoried all tidal marshes in the state.

there is a certain beauty to marshes

They have published maps of wetland vegetation in 26 counties and cities. According to Gene Silberhorn, head of the VIMS Wetlands Department, there are 212,875 acres of marsh in Virginia. Of these, 39,075 acres are along the Potomac, Rappahannock, Pamunkey, Mattaponi and Chickahominy and upper James Rivers; 91,100 acres in the Chesapeake Bay and its tributaries; and 82,700 acres behind the barrier islands of the Eastern Shore.

In the 1960s before protective legislation, 400 to 500 acres of marsh a year were altered. Had that trend of development continued, the projected annual loss in the '70s would have been more than 600 acres a year.

"Through the permit system," Silberhorn said, "approximately 25 acres a year are now lost; we don't know how much is lost illegally."

VIMS scientists also serve as advisors to the Virginia Marine Resources Commission (VMRC) and the U.S. Corps of Engineers, which jointly administer 700 to 800 permit requests a year to alter marshes. Each

each step in the food chain is a trophic level

county in Tidewater Virginia has a wetlands board of appointed citizens who make local land use decisions which may be appealed to VMRC.

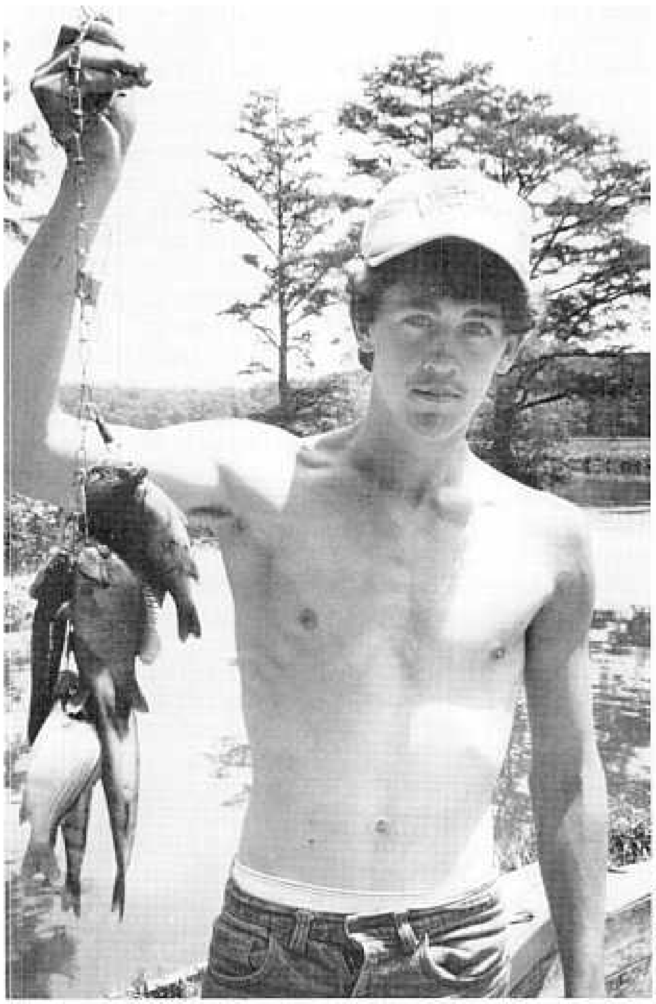
Based on productivity, wildfowl and wildlife utility, and fish spawning and nursery value, VIMS wetlands scientists have evaluated marsh types. Of 12 possible vegetation categories, the top four are saltmarsh cordgrass, arrow arum and pickerel weed, freshwater mixed (such as bullrush, sedges, ferns, wildrice), and brackish mixed (saltmarsh cordgrass, saltmarsh hay, black needlerush).

The productivity of saltwater marshes has long been studied by coastal scientists; magnitudes of biomass production range from 1 to 10 tons/acre/year, with a high of 7 tons/acre/year in Virginia. Few export data exist for tidal freshwater marshes.

"In the Chesapeake Bay," said Carl Hershner at VIMS, "we suspect that tidal freshwater marshes are more productive than salt marshes."

Working with his graduate students, Hershner is studying the structure and function of plant communities in Virginia's tidal freshwater marshes. Assisting Hershner in the field this summer is a team of high school students in the Governor's School for the Gifted at VIMS. In addition to groundwater transport and sedimentation, they are monitoring nutrient cycling, that is, the exchange of nitrogen and phosphorous between the marsh and the estuary. In another wetlands project Tom Barnard and Walter Priest are monitoring how quickly an artificial brackish marsh approaches the function of a natural system.

Under Sea Grant funding, two research projects at the University of Virginia are using new technology to generate new ideas about the value of wetlands as habitat and food source. By counting fish that are caught by flumes on fresh and salt marshes, William Odum and his student Carole McIvor are evaluating physical factors that make marshes valuable shelter for spawning and growth (see page 6). Jay Zieman is analyzing the comparative biological value of salt-marshes and submerged grasses by following detritus up the food chain from producer to consumer using a stable isotope marker (see page 8).



Susan Schmidt

Linwood Rowe II of Hayes holds up the string of fish he caught along the tidal freshwater marshes of Diascund Creek (above). The sun sets over the marsh in Killmon Cove in Northhampton County (top left).

people
on the water

Unlike so many other fisheries in Virginia, there are plenty of catfish to catch. Yet Virginia's 1984 catfish harvest of 848,053 pounds was only one percent of total finfish landings in pounds and in value.

"Catfish is the only thing we can catch year-round, but we can only sell 10,000 pounds a week," said Garland Hazelwood, president of Hazelwood Brothers seafood company on Diascund Creek in Lanexa. "Fishermen catch more catfish than we can sell."

Hazelwood says he buys and sells all the fish caught upriver: "catfish-most all year except when gear would freeze; eels-spring and fall; turtles-spring to mid-summer; perch, shad and herring in spring."

One day in mid-May Hazelwood Brothers loaded about 125,000 pounds of snapping turtles on a truck to Philadelphia to be processed for soup.

Catfish farms in southern states have been ruining the market for Virginia's river-caught catfish.

"Catfish from farmponds may be more uniform in size," Garland Hazelwood said, "but to me there's no difference in taste."

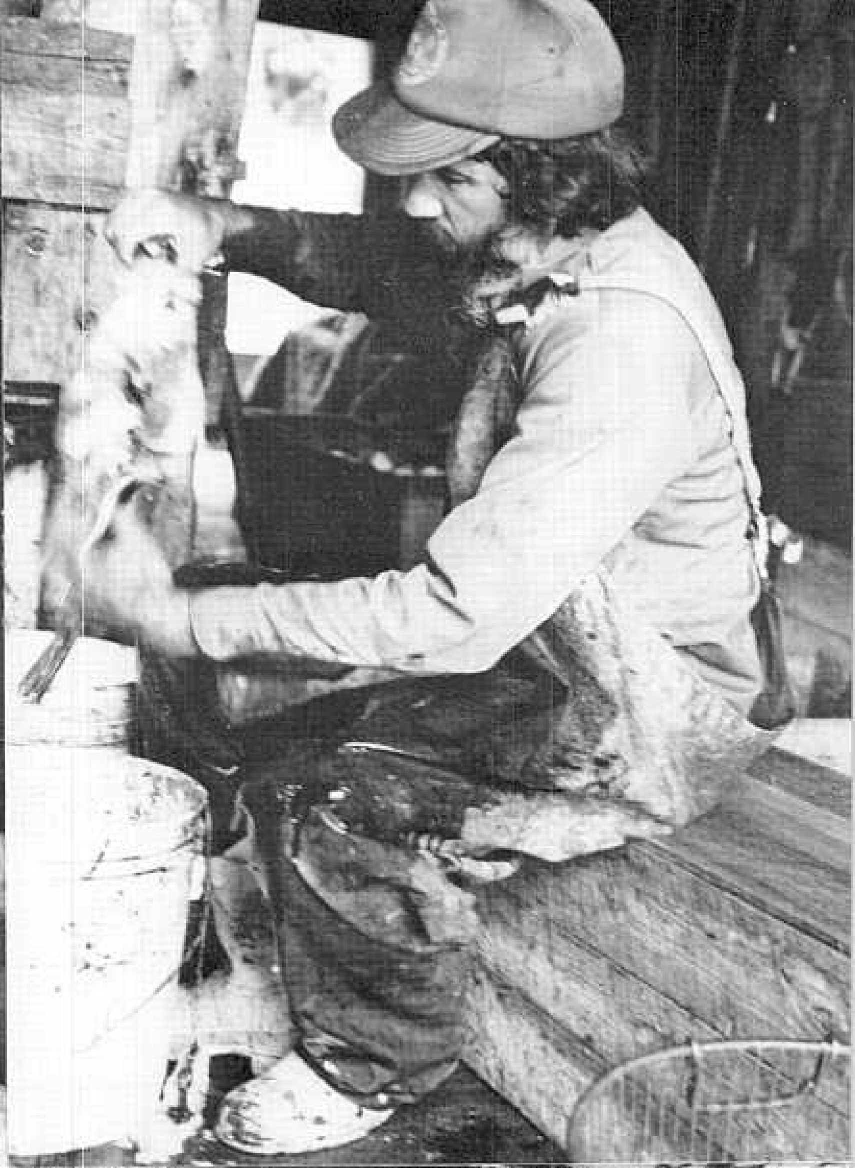
It is hard for fishermen in Virginia's rivers to make a living when their only year-round catch, catfish, is harder to sell.

Peter Pinholster and John Bradley work two boats in the James River tending 20 fike nets and 275 traps owned by Ryland Hazelwood, Garland's cousin. Every day that Pinholster and Bradley are on the river four to five hours, they must spend an equal amount of time peeling tough skins off the catfish. They can dress more than 100 pounds an hour and catch 600 to 1000 pounds a day.

Ryland Hazelwood says they have to release $200 to $1000 a week of rockfish they catch in the catfish nets, and he thinks the law banning rockfishing should be scrapped.

"If rockfish weren't there," Ryland Hazelwood said, "the state wouldn't have to tell us to throw them back. We don't make a fast buck. My daddy and granddaddy fished here, and we've alway thrown back little fish." *S.S.*

Ryland Hazelwood (above) drags a box of catfish into his fishhouse near Sandy Point on the James River. Alphonso Melvin cleans a snapping turtle (top left), and Peter Pinholster dresses a catfish (top right). Pinholster's sons, Paul and Peter Jr., stretch out an old fike net (right). Photos by Susan Schmidt.



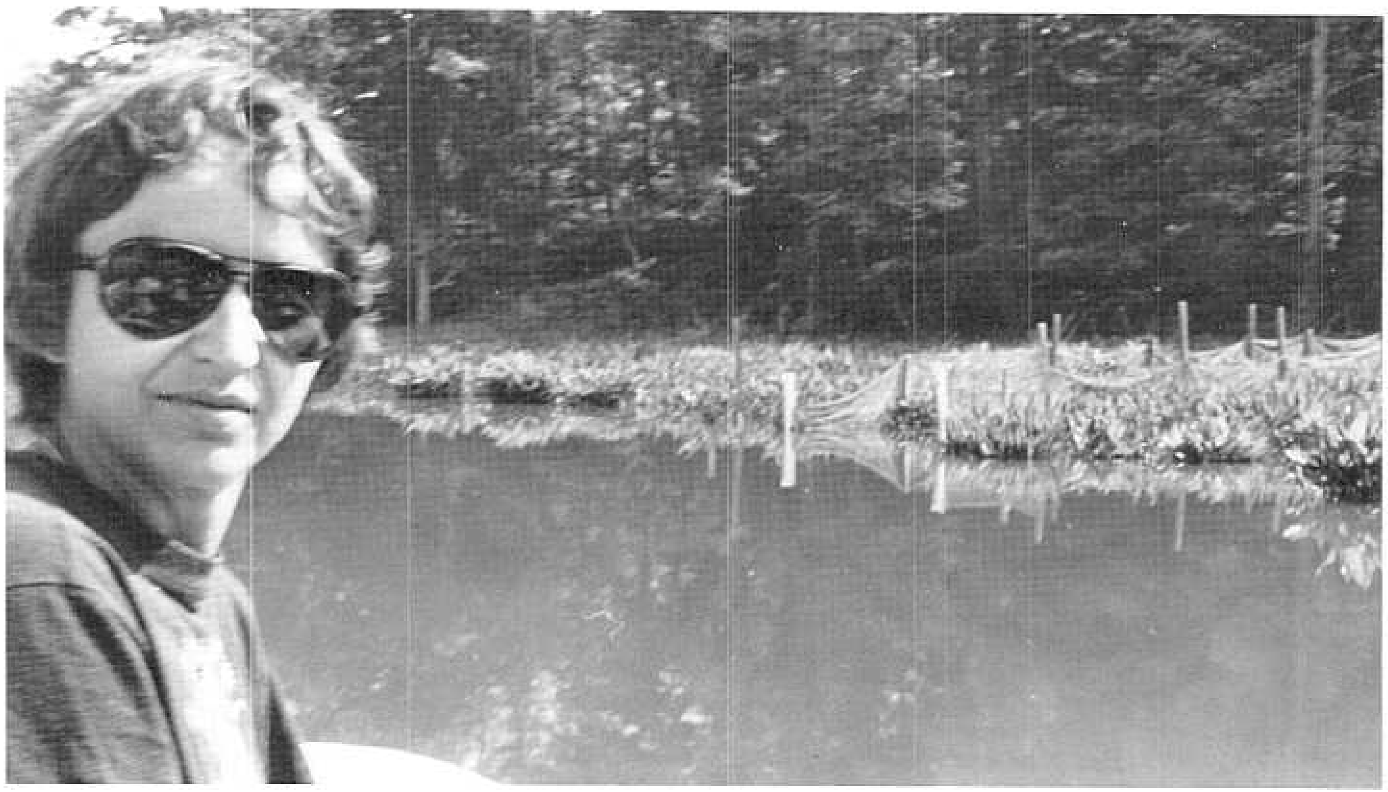
Monitoring Marshes as Fish Habitat

Which is more valuable- a fresh or a saltwater marsh? To decide whether all marshes are equally important, William Odum and Carole McIvor are looking at the degree of use by fishery organisms. Odum, chairman of the Environmental Sciences Department at the University of Virginia, is principal investigator of this Sea Grant project. As his graduate student, McIvor is conducting field comparisons of marshes over a range of salinities for her doctoral dissertion in environmental sciences.

According to Odum, the complexity of wetland plant communities increases as salinity decreases. Fifty to 100 species of plants form the tidal freshwater marsh community as opposed to the salt marsh which has 8 to 10 species. The appearance of a tidal freshwater marsh changes continually over a growing season. In winter the marsh is almost barren. Plants emerge in spring from underground rhizomes or as annual seedlings. By late summer bright flowers color the marsh.

McIvor surveys her sites to verify elevation and tidal range and samples during spring tides monthly from May to October. McIvor's freshwater site, 0 to 0.5 ppt, is Morris Creek off the Chickahominy River. Her saltier site, averaging 18 ppt, is Carters Creek off the York River. Each site has a variety of contrasting physical factors like the steepness of the adjacent creek bank, depth of flooding at high tide, and presence of adjacent submerged vegetation.

Odum, McIvor and a series of his graduate students


Susan Schmidt

To monitor marsh use by fish, Carole McIvor has installed six flumes in the tidal freshwater marshes along Morris Creek off the Chickahominy River.

have developed the flume to sample fish on the marsh surface. McIvor's flumes are two parallel nets which extend across the intertidal zone of her marshes, averaging 66 feet (20 meters) long and 5 feet (1.5 m) apart. At slack high water McIvor drops a block net in place at the mouth of the flume. As water recedes, fish are caught in a cod-end and retained under water. She removes samples when the marsh has drained. McIvor has tested her flumes' efficiency by releasing and capturing 80.5% of a marked population of fish.

McIvor says that flumes are useful to collect long-term data on seasonal species composition and density of fish. A flume is non-destructive of fish and of the marsh itself. The marsh grasses grow up around the flume and the tide does the mechanical work of catching the fish. Other sampling methods are

by late summer bright flowers color the marsh

poisoning by rotenone, electrofishing, tow and trawl nets, and fish traps.

This summer McIvor will try electrofishing in her freshwater site to determine which fish move onto the marsh surface versus those which remain in deeper water She will stun, scoop up, count and release fish she finds mid- creek. In her saltier site she must use a seine or trawl as she cannot electrofish in saltwater.

McIvor has observed that fish increase in number during the spawning season as young are recruited. The tidal freshwater marsh has more species richness, that is, more number of species present. The saltmarsh, however, has a larger number of organisms, but fewer species. In the saltmarsh the most common species McIvor finds are grass shrimp, mummichog and blue crab. In the tidal freshwater marsh, grass shrimp, mummichog and bluegill dominate.

Susan Schmidt

At high tide Carole McIvor and her son Don McIvor set a block net at the mouth of a flume on Morris Creek.

development should avoid shallow profile marshes

McIvor has observed that a marsh with a shallow subtidal profile bordered by submerged vegetation like eelgrass supports twice as many organisms as a similar marsh of the same size with a steep subtidal profile. One disadvantage she offers about steep sites is that predators wait where the water drops off to eat small fish as ebbing tide forces them off the marsh. In contrast at shallow sites, little fish can shelter more effectively in the subtidal to avoid predation during low tide.

Her second hypothesis is that fine-grain size sediments in shallow subtidal marshes support more food organisms like amphipods, other crustaceans and worms. Fine sediments, usually deposited on the curve of a tidal creek or river, are easier to burrow in for protection and trap more detritus.

In addition to its ecological significance, Odum and McIvor's study will produce criteria to identify a less critical path for a road to cross a marsh or to locate other structures such as marinas or aquaculture ponds. Based on her first year's results, McIvor advises the highway department to avoid more valuable shallow profile marshes, as well as those marshes which flood to an appreciable depth during high tide. *S.S.*

You Are What You Eat:
Using Isotopes to Chart the Food Chain

Decomposed plant material, or detritus, is often the bottom trophic structure in estuarine food webs. Working in the Chesapeake Bay with Sea Grant funding, Jay Zieman is exploring the origin of organic detritus that supports fish and shellfish. By comparing stable isotope ratios in animals and plants, Zieman will figure to what degree fish depend on seagrass or marshgrass.

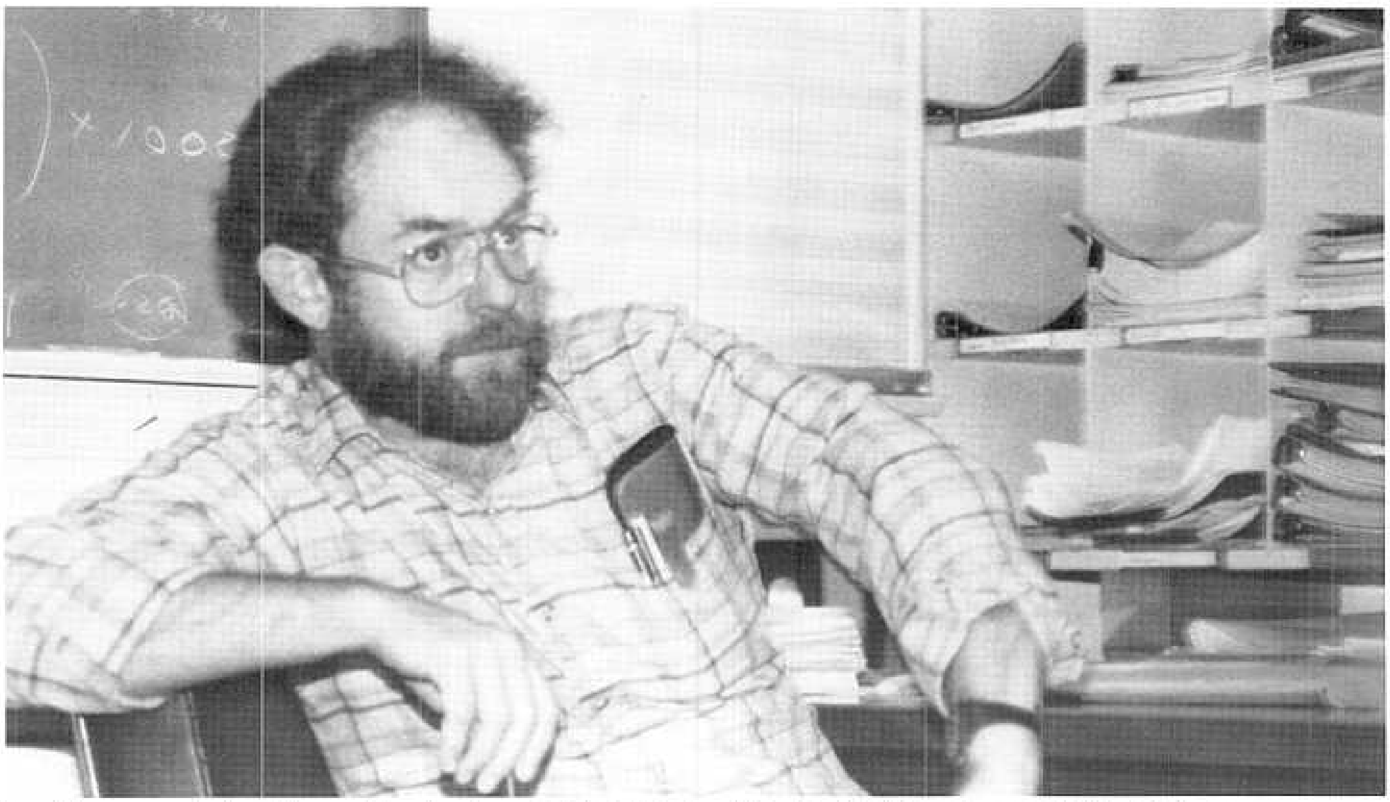
Isotopes of an element have the same atomic number and similar chemical behavior. Carbon, for example, has isotopes numbered 12, 13 and 14.

"Stable isotopes occur in distinct ratios in nature," Zieman explained. "Biological processes often discriminate slightly between isotopes. For example, heavier isotopes do not move as easily as lighter ones. Plants incorporate nitrogen, carbon and sulfur in photosynthesis such that the isotope ratio becomes a tag, or signature, for the plant, and an animal carries the isotope signature of its food source."

"You are what you eat," Zieman said.

Zieman and his associates, Aaron Mills at U.Va. and Steve Macko at Memorial University in Newfoundland, are determining isotope ratios of decomposing wetland grasses and of a few important species that eat them. First, Zieman collects plants and animals, dries and grinds them, and ships them to Canada where Macko has the sophisticated equipment to read stable isotope ratios. The carbon isotope ratio that Macko measures in a mass spectrometer is called "del Carbon-13," or the comparison of a sample to a standard.

Several years ago Zieman started sampling in South Florida Keys where he expected to find the greatest separation, or distance between values, for isotope ratios of estuarine plant material. The separation he found between mangrove and seagrass verified his technique. With increased understanding of the underlying processes, Zieman is now addressing the



Susan Schmidt

Jay Zieman explains the merit of using stable isotope ratios to identify an organism's food source.

Carl Hershner

Zieman will evaluate the path in the food chain to blue crabs and menhaden from brackish marshes like Whittaker Creek in Gloucester County.

closer isotope separation between marsh and seagrass in Virginia.

As a microbiologist, Aaron Mills helps determine the degree to which microorganisms colonize detritus. Zieman's Florida data suggest a different mode of detrital decomposition for seagrass and mangrove. During decomposition seagrass showed little change in carbon and nitrogen isotope ratios; mangrove showed little carbon change, but noticeable reduction in nitrogen. It is useful to know which stage of a plant an organism consumes to follow the path of isotopes. Organisms that consume mangroves have similar ratios

an animal carries the isotope signature of its food source

to the detritus and not the leaf, and Zieman and Mills found mangrove leaves and mangrove detritus have different signatures.

Like mangrove detritus in Florida, the litter of saltmarsh cordgrass *(Spartina alterniflora)* in Virginia has high carbon and low nitrogen. Mangrove is an analog for *Spartina* and tropical seagrasses are like the seagrasses in the Chesapeake Bay. Zieman has found that in much of Florida Bay organisms like pink shrimp obtain more nutritive value from seagrass detritus than from mangrove detritus. In the Chesapeake Bay he will follow the isotope pathways to determine the major food source for blue crabs and menhaden.

From its signature Zieman can often identify a plant's location. The isotope signature of a plant and the organisms that consume the plant depend on the source of nutrients. For example, plankton get their nitrogen and sulfur from the water column, and seagrass gets nutrients from sediments. Relative food values of different plants depend on location, season and age. Consumption of a food item does not necessarily mean assimilation of nutrients.

Zieman has selected his Virginia sites to show a range of differences in salinity and human influence. His saltmarsh study area on the Eastern Shore is influenced by the ocean. A seagrass bed in Guinea Marsh on the York River is a typical mid-Bay site.

With information from Zieman, Mills and Macko of relative food web values of marsh grass and seagrass in the Chesapeake Bay, managers can better protect the wetland vegetation that supports important species for commercial and sport fishing. *S.S.*

Catfish

Sit on a dock on any fresh or brackish river in Virginia, bait your fishhook with worms, and you will almost surely pull in that particular fish with whiskers said to resemble a cat's. Catfish use these long barbels around the mouth to locate food.

Catfish is available year-round, either reared in farm ponds or caught in rivers. Catfish has traditionally been prepared by deep-frying and served with hush puppies, but this fish can be baked, broiled or stuffed.

The United States leads all other nations in the consumption of catfish. Of 28 species of catfish in North America, most inhabit warm, slow-moving waters. The most common species locally is the channel catfish, averaging from one to three pounds in size.

Skin your catfish before cooking by drawing a knife around the fish behind the gills and stripping off the skin; catfish have no scales. Beware of heavy, sharp spines on its chest and back.

Deborah Hazelwood of Lanexa recommends these recipes in the Illustrated Encyclopedia of American Cooking published by Favorite Recipes Press in Nashville, Tenn.

BATTERED CATFISH

12 lb. catfish	frying oil
2 eggs, beaten	1 c. milk
cornmeal	

Mix eggs and milk. Cut fish into steaks and season with salt and pepper. Dip into milk mixture; roll in cornmeal. Drop into hot oil. Fry until brown, turning once. Drain on absorbent paper. Serve hot with hush puppies. Yield: 12 servings.

CATFISH MULLDOWN

2 lb. catfish	4 lg. potatoes
1/2 lb. bacon	3 lg. onions

Cut catfish fillets into 2-inch pieces. Reserve 2 slices bacon; chop remaining bacon. Peel onions and potatoes; cut into 1/4 inch slices. Render chopped bacon in 3-quart pot. Layer catfish, onions and potatoes in pot; sprinkle layers with salt and pepper. Arrange reserved bacon over top; cover pot tightly. Simmer until potatoes are tender and catfish is done. Salt and pepper to taste. Yield: 6 servings.

BAKED CATFISH DINNER

2 catfish fillets	1/2 c. tomato juice
2 tsp. onion powder	1 env. bouillon
1 c. peas and carrots	mix

Place fish in single layer in greased baking dish; sprinkle with salt, pepper and onion powder. Scatter peas and carrots over fish. Mix tomato juice and bouillon mix; pour over top. Bake at 400 degrees for 20 minutes or until fish tests done. Yield: 2 servings.

CREOLE CATFISH FILLETS

1 lb. catfish fillets	1/2 c. chili sauce
1/2 c. boiling water	1/4 c. flour
1 tbsp. minced parsley	1/4 tsp. paprika
2 tbsp. minced onion	2 tbsp. melted butter

Sprinkle catfish with flour, salt, and paprika. Place in shallow greased baking pan. Combine remaining ingredients; pour over catfish. Bake at 350 degrees for 20 minutes, basting frequently. Turn catfish; bake for 15 minutes longer, basting frequently.

WETLANDS RESOURCE MANAGEMENT: TEACHER GUIDE FOR GRADES 7-12

by C. M. Plummer

The Virginia Wetlands Act of 1972 mandates preservation of state wetlands. While public policy is designed to prevent destruction of marshes, it also allows "necessary economic development in a manner consistent with wetlands preservation."

Although perceived by some as trying to eliminate human impacts, environmental legislation recognizes people as part of the natural ecology. Environmental management includes humans and their economic need for growth and change. This exercise examines alternatives for compromise in tidal wetlands protection.

Mitigation, or reduction of adverse effects, offers means of compromise among wetland users. One possible technique is **compensation**, an exchange of one desirable natural system for another. For example, a developer might flood a field to create a wetland in exchange for developing established marshes.

In another process for mitigation called **wetland banking**, a surplus of marsh area is created anticipating future destruction. Roads and highways through low-lying areas must be built and maintained in wetlands. Recently, the Virginia Highway Department turned an old borrow pit into eight acres of tidal wetland to balance several small pieces of marsh that will be displaced by roads.

It is difficult, if not impossible, to simulate the complex interactions of a natural system. Scientists have many questions about compensation and wetland banking.

Are the newly created wetlands "equal" in ecological or habitat value to those destroyed? To begin, one must consider physical factors that organisms require like salinity, temperature, food availability, tidal range, shelter from predation.

How long does it take for a newly created marsh to reach the productivity or efficiency of a natural marsh? Productivity is the amount of biological material, called biomass, that plants produce.

And what about the loss of the habitat to be turned into a marsh? Perhaps the site a developer wishes to exchange is a tidal flat which is itself a valuable natural system.

As a class activity, students may take sides as these users of a marsh: for example, developer who wants to build houses, unemployed carpenter, fisherman, local citizen, Wetlands Board member, government regulator. Students should be encouraged to reach a compromise solution. In preparation students can attend a hearing of a local wetlands board.

These teacher guides can help set up classroom exercises in environmental decision-making.

(1) *WETLANDS GUIDELINES* , from Virginia Marine Resources Commission, Box 756, Newport News, VA 23607. Defines wetlands, describes legislation, explains permitting process and includes glossary.

(2) *TEACHER'S RESOURCE PACKET FOR STUDENT FIELD TRIPS INTO VIRGINIA ESTUARINE MARSHES AND CREEKS* , 1981; from Mathematics & Science Center, 2401 Hartman Street, Richmond, VA 23223. Excellent source guide for planning a field trip. Includes bibliography.

Publications

Available from Sea Grant Communications, VIMS, Gloucester Point, VA 23062:

(3) *TIDAL WETLANDS*, Silberhorn, Gene. Marine Schoolhouse Series Nos. 5, 6, 7. Three-part description of salt marshes, brackish marshes and freshwater wetlands in Va. Free.

(4) *4-H Marine Science Simulation Game, Land Use For Marsh Beach*. MEMS 01965 $.75

(5) *DECISION MAKING FOR THE COASTAL ZONE, GRADES 7-12*, MEMS 01527 $.75

6) *COASTAL AWARENESS A RESOURCE GUIDE FOR TEACHERS IN JUNIOR H.S* . (405) OR (406) SR.H.S. MEMS 405 and 406 $.75 each

(7) FILMS: *BILLION DOLLAR MARSH* , 16mm film; 45 or 26 min. versions. Explores conflicting points of view on marsh use. *THE SALT MARSHES*, 16mm film; 28 min. Importance and formation of a salt marsh. $7.50 rental fee

Announcements

VIMS Aquarium Needs Volunteers!

The Virginia Institute of Marine Science has hired Joe Choromanski to run the new aquarium in Watermen's Hall, and he is looking for volunteers to help him prepare the aquarium for a grand opening in the fall.

The VIMS aquarium needs a core group of "docents," or volunteers, for daily operation, special projects and public education programs. Docents will find a background in science helpful, but more necessary are energy, enthusiasm and some free time to commit. Initially, strong arms and mechanical ability will be useful in aquarium filter construction and aquascaping.

For information contact:
Joe Choromanski, Aquarium Curator
Sea Grant Marine Advisory Services at VIMS
Gloucester Point, VA 23062 (804) 642-7174

Marine Resource Bulletin
A Sea Grant Advisory Service

VOL. XVII, NO 2 SPRING 1985

Dr. Frank O. Perkins ....Dean/Director, Virginia Institute of Marine Science
Dr. William Rickards ....Director, Virginia Sea Grant College Program
Dr. William D. DuPaul. ....Director, Marine Advisory Services

The Marine Resource Bulletin is a quarterly publication of Marine Advisory Services of the Virginia Sea Grant College Program, which is administered by the Virginia Graduate Marine Science Consortium, with members at The College of Wlliam and Mary, Old Dominion University, University of Virginia and Virginia Polytechnic Institute and State University Subscriptions are available without charge on written request.

Susan Schmidt. ....Editor

Cover Note

Near Sandy Point on the James River, a Turkish ship heads upriver, passing the stakes of a fike net (right) and a catfish trap (foreground) on Ryland Hazelwood's dock. Just downriver are the productive tidal freshwater marshes of the Chickahominy River. Photo by Susan Schmidt.

Sea Grant Communications
Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

Address Correction Requested

Non Profit
Organization
U.S. POSTAGE PAID
Gloucester Point, VA
Permit No. 6

Catfish

Sit on a dock on any fresh or brackish river in Virginia, bait your fishhook with worms, and you will almost surely pull in that particular fish with whiskers said to resemble a cat's. Catfish use these long barbels around the mouth to locate food.

Catfish is available year-round, either reared in farm ponds or caught in rivers. Catfish has traditionally been prepared by deep-frying and served with hush puppies, but this fish can be baked, broiled or stuffed.

The United States leads all other nations in the consumption of catfish. Of 28 species of catfish in North America, most inhabit warm, slow-moving waters. The most common species locally is the channel catfish, averaging from one to three pounds in size.

Skin your catfish before cooking by drawing a knife around the fish behind the gills and stripping off the skin; catfish have no scales. Beware of heavy, sharp spines on its chest and back.

Deborah Hazelwood of Lanexa recommends these recipes in the Illustrated Encyclopedia of American Cooking published by Favorite Recipes Press in Nashville, Tenn.

BATTERED CATFISH

12 lb. catfish   frying oil
2 eggs, beaten   1 c. milk
cornmeal

Mix eggs and milk. Cut fish into steaks and season with salt and pepper. Dip into milk mixture; roll in cornmeal. Drop into hot oil. Fry until brown, turning once. Drain on absorbent paper. Serve hot with hush puppies. Yield: 12 servings.

CATFISH MULLDOWN

2 lb. catfish   4 lg. potatoes
1/2 lb. bacon   3 lg. onions

Cut catfish fillets into 2-inch pieces. Reserve 2 slices bacon; chop remaining bacon. Peel onions and potatoes; cut into 1/4 inch slices. Render chopped bacon in 3-quart pot. Layer catfish, onions and potatoes in pot; sprinkle layers with salt and pepper. Arrange reserved bacon over top; cover pot tightly. Simmer until potatoes are tender and catfish is done. Salt and pepper to taste. Yield: 6 servings.

BAKED CATFISH DINNER

2 catfish fillets   1/2 c. tomato juice
2 tsp. onion powder   1 env. bouillon
1 c. peas and carrots   mix

Place fish in single layer in greased baking dish; sprinkle with salt, pepper and onion powder. Scatter peas and carrots over fish. Mix tomato juice and bouillon mix; pour over top. Bake at 400 degrees for 20 minutes or until fish tests done. Yield: 2 servings.

CREOLE CATFISH FILLETS

1 lb. catfish fillets   1/2 c. chili sauce
1/2 c. boiling water   1/4 c. flour
1 tbsp. minced parsley   1/4 tsp. paprika
2 tbsp. minced onion   2 tbsp. melted butter

Sprinkle catfish with flour, salt, and paprika. Place in shallow greased baking pan. Combine remaining ingredients; pour over catfish. Bake at 350 degrees for 20 minutes, basting frequently. Turn catfish; bake for 15 minutes longer, basting frequently.