American Fisheries Society Recognizes Hoffman

Editor's Note: VIMS graduate student Joel Hoffman was awarded second place in the Student Writing Contest during the American Fisheries Society's 135th annual meeting in September. The award recognizes students who do an excellent job communicating the value of fisheries research to the general pubic. Hoffman's piece, which is scheduled to appear in the March issue of the AFS journal Fisheries, *is reprinted below courtesy of AFS. Founded in 1870, AFS is the world's oldest and largest professional society representing fisheries scientists.*

Do American shad grow on trees? Linking forests with the life history of a marine fish

It's not yet sunrise. I hold tight to the side of a small, wooden skiff as it bounces across the rough chop of the James River. Icy water splashes my face, turns my lips salty, and runs down the inside of my oilskins. At the helm, commercial fisherman and marina operator Marc Brown keeps the outboard engine at full throttle. His business opens early and he wants to get back before dawn. Years ago, Marc, and generations of his family before him, fished to sell American shad. Now Marc fishes to monitor a closed fishery.

On this March morning, we are heading to a staked gill net to count American shad returning to spawn in the James River. Like oysters and Atlantic sturgeon, the American shad is emblematic of the wealth of aquatic resources that greeted early colonists arriving in Chesapeake Bay. Today, their stocks are a shadow of their former size. Despite the fishing moratorium, increased access to blocked spawning habitat and stock-enhancement with hatchery-reared fish, recovery in the James, York and Rappahannock rivers has been slow.

American shad are anadromous—they spend their first year of life in coastal rivers and their adult life in the ocean. In the spring, adults return to spawn in the river in which they were born. This complicated life history means it is hard to gauge where conservation measures will matter most—should we focus on conserving spawning and nursery habitat, or should we cut back fishing on adults? Fishery scientists know that habitat conservation must be part of a recovery plan, however we lack basic data on how American shad use river habitat. My research aims to address this problem.

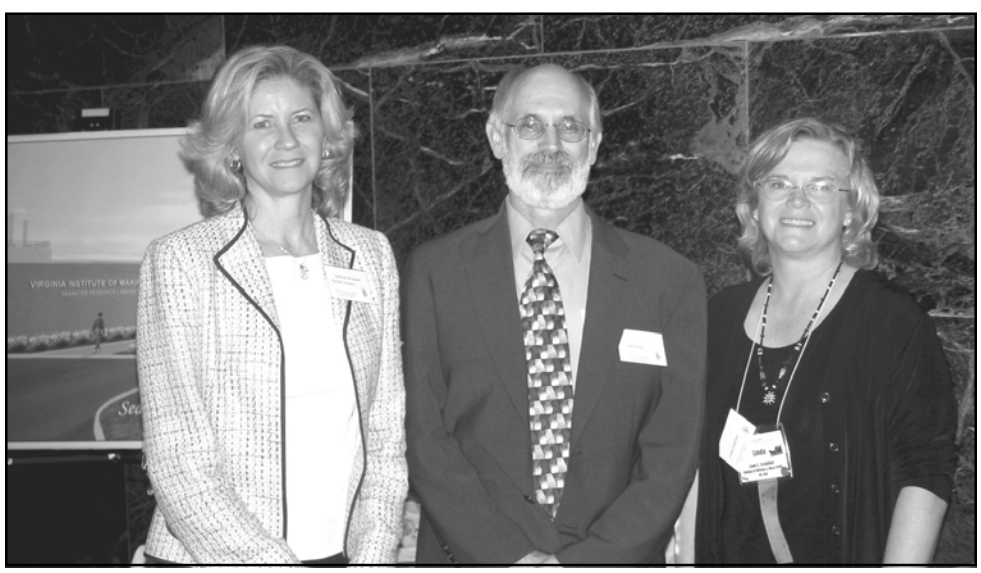
It's not easy to find scientific techniques that can identify connections between fish and their habitat. For the past two decades, scientists have been developing the use of biomarkers: chemical signatures picked up by fish from their environment. A useful biomarker is the stable isotope of carbon, carbon-13. Carbon-13 is quite rare in nature. Different types of plants, such as trees, marsh plants and algae, have slightly different amounts of carbon-13 in them. Consequently, we can use the carbon-13 signature to determine where plant material came from.

Why is carbon-13 useful? A complex mix of plant material forms the base of river food webs. When microscopic crustaceans (called zooplankton) and aquatic insects eat this material, they incorporate the signature into their tissue. When American shad eat zooplankton and aquatic insects, they incorporate the same signature into their tissue. By measuring the carbon-13 in American shad, I can identify whether their diet was based on plants from the forest or the river.

I studied American shad in the Mattaponi River, a large tributary of the York River that supports the most American shad of all Virginia's rivers. From May to July 2003, the signatures in the zooplankton, aquatic insects and American shad all resembled forest and marsh plants. I obtained similar results in early May of 2004, but by June the signatures in the zooplankton and American shad mostly resembled the algae in the river. What happened? The spring and summer of 2003 were very wet. The combination of high river flow and turbid water prevented algae from growing. Consequently, the zooplankton and aquatic insects consumed the material washed into the river from the adjacent forests and marshes. In 2004, river flow was lower, the water was less turbid and the algae bloomed, providing food for zooplankton. As a result, the fish's diet was based on material from the forest and marshes before the bloom and algae after the bloom.

VIMS graduate student Joel Hoffman searches a push net for young American shad.

These findings are important because they link the forests and marshes to the river food webs upon which American shad depend. In a sense, American shad are growing on trees! Changes to the land surrounding the river—from removing streamside trees to urbanization—probably have a significant, though indirect, impact on American shad habitat. If we are to bring back American shad and restore the fishery that is so important to Marc Brown and other watermen like him, we may need to conserve the ties between the land, the river and this marine fish.



Norfolk Southern Corporation hosted an alumni reception for VIMS in conjunction with the Estuarine Research Federation's 18th biennial conference in Norfolk in October. Norfolk Southern has a 20-year history of support for VIMS' programs, including a major contribution to Andrews Hall, VIMS' new research building named in honor of Cynthia and the late Senator Hunter B. Andrews. Here, Ms. Kathryn McQuade of Norfolk Southern (L) joins VIMS Dean and Director John Wells (C) and VIMS researcher and out-going ERF President Dr. Linda Schaffner (R) during the reception.

Dr. Steve Kaattari (facing camera) discusses his work on oil-spill tracking with participants in VIMS' Associates Day celebration. VIMS holds the event each year to honor and recognize supporters and volunteers from the local community. Drs. Howard Kator and Mike Unger also hosted laboratory tours during the event.