A Fisheye View on Lake Ontario Coast

SUNY ESF student Patty Thompson getting water samples at Fairhaven Beach State Park on Irondequoit Bay, Lake Ontario.

If you're reeling in a record breaking Great Lakes salmon, it's likely to be a stocked fish, having been spawned in a fish hatchery and then released. But for plenty of fish species, life in Lake Ontario starts from eggs laid in quiet shallows. Just how productive are the nearshore habitats on Lake Ontario? New York Sea Grant has been funding a project to find out. Neil Ringler, Professor at the State University of New York College of Environmental Science and Forestry in Syracuse and Sea Grant Scholar Darran Crabtree have looked at the productivity of several areas of Irondequoit Bay, a wide scoop carved into the southern coastline of Lake Ontario just north of Rochester. Feeding into the bay are several streams and draining wetlands. How these wetlands serve as a nursery for lake fish is the subject of their recent project.

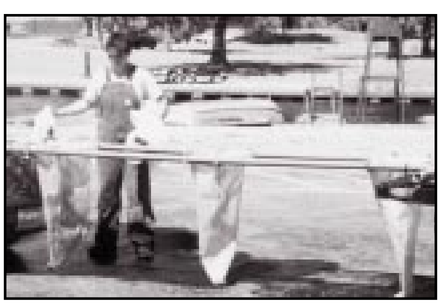
Work on this research project evolved when Ringler was asked to complete an impact statement for the installation of a flow-control device, a mechanism used to slow the water in the wetland, helping to retain nutrients there, while keeping the bay cleaner. He and Crabtree started studying the southern end of Irondequoit Bay in order to find out how flow-control devices affect the fish community. Evaluating the device was helpful, but more importantly, it opened up the question: does this qualify the bay as an estuary? These wetlands share several similarities with estuaries in that they serve as nurseries for young aquatic life and show some estuarine-like physical features. Although wetlands ringing freshwater lakes have small tidal cycles compared to marine estuaries, they do exhibit extreme reversals in water flow. These are not gravity-controlled fluctuations. They are apparently controlled by periodic seiches, the rhythmic movement of water driven by the wind.

Above: Darran Crabtree using a pushnet.

Below: SUNY ESF student Patty Thompson cleaning sampling nets at Fairhaven Beach State Park on Irondequoit Bay, Lake Ontario.

Page 9: SUNY ESF student David Park (top left) and Darran Crabtree (right and in bottom photo) do some night sampling on Irondequoit Bay.

All photos courtesy of Darran Crabtree.

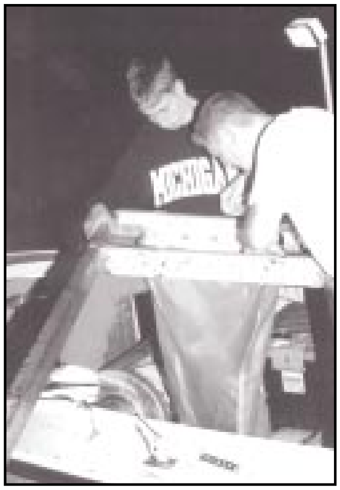


In another wetland, Fairhaven Beach State Park, they witnessed a full flow cycle occurring within 15 minutes. That is, water was first flowing out of the wetland and within 15 minutes reversed direction to flow back into the wetland. During this time fish larvae, still too tiny to swim, go swishing back and forth. Ringler and Crabtree are attempting to determine the significance of this phenomenon to young fishes.

Crabtree, a systems ecologist, is most interested in seeing how energy flows in and between habitats and ecosystems. His work deals with describing the regulation of energy flow at ecotones— the gray area between two ecosystems. The two ecosytems in this case are wetland/embayments and the lake. Just how important are these habitats to young fish?

First he had to establish which fish were breeding in the wetland. He found that resident and nonresident species had an even split totaling to about 35 species. Then he moved on to the question of whether young fish have greater production in wetlands, bays or in the adjacent lake.

Watch



Then he was interested in the rates at which this energy moved from nearshore to offshore environments. To quantify this, Crabtree used drift sampling nets to see how many larvae and embryos make the perilous journey from the wetlands to the embayments. During the critical transition from embryo to juvenile fish, the mortality can be as high as 99 percent.

Together in this project, Ringler and Crabtree are looking at three locations and documenting the variation in fish production over space and time. What they are finding is that small organisms passively drift from one area to another. Once they make it to a juvenile stage, fish actively swim. With some help from Lars Rudstam, researcher at Cornell's Biological Field Station, Crabtree is using acoustic methods to determine the amount of juvenile fish movement from nearshore to offshore.

Another factor that affects fish production is predation—the "eat and run"—or rather *swim* kind. Offshore predators may come into a quiet embayment, eat the young and then swim back out into the larger body of water. This kind of predation exists, however, it is too difficult to ascertain with numbers.

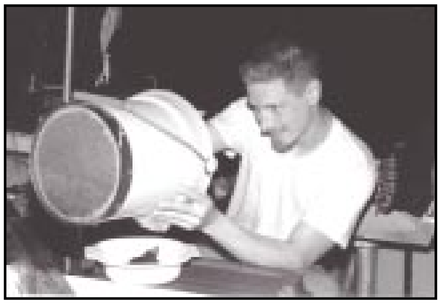
Another way of determining production is by simulating it based on relationships with environmental factors that influence it. For example, there are definite relationships between young fishes and the submerged macrophytes (plants) which provide a source of physical structure for them. Generally, the shoreline along Lake Ontario has limited physical structure. However, in embayments and wetlands, there are more plants in the littoral zone, more ways in which fish are protected, and of course, more forage for fish. According to Crabtree, "Young-of-the-year or YOY 'like' structure. It's where the plants are that you probably find fish, too." Crabtree uses "a model based on light and fetch (exposure to wind and waves) relationships for determining where macrophytes can grow across landscapes. The output is displayed using a GIS, (geographical information system.)"

The distribution of submerged macrophytes may be useful as a surrogate predictor for young fish habitat. Generally, sheltered sites offer greater protection than exposed sites. But some areas that look like they would be sheltered are affected by the prevailing wind making it harder for fish to live. Currently Ringler and Crabtree's model is based on Irondequoit Bay conditions. During the 1999 season, the model will be applied to other embayments as part of a validation step.

Crabtree presented his results to date at the International Association for Great Lakes Research conference in May. He'll continue sampling drifting fishes through the winter. In this way, he can document the temporal dynamics of young fish production throughout the year.

—Barbara Branca

Barbara Branca is NYSG's Communicator



The Making of a Sea Grant Scholar

As a student at Rockland Community College who spent his youth on the Hudson River estuary, Darran Crabtree learned from his environmental activism days working on Earth Day celebrations that he preferred biology in the field to policy making. When a mentor recommended ESF, he earned his B.S. degree there meeting Dr. Neil Ringler, well-known fish behaviorist and veteran Sea Grant researcher. Darran worked on the EPA-sponsored Environment Monitoring Assessment Program or EMAP after graduation, taking samples for the Northeast Lakes program. Then his funded graduate assistantship led him to work on aquatic benthic invertebrates and later with the Fish and Wildlife Service. When Crabtree had an opportunity to work with Ringler in proposing a research project, combining Ringler's fish expertise with Crabtree's interest in estuarine conditions led to research in the nearshore habitat of Lake Ontario. To keep apprised of his research, try Crabtree's website at: www.esf.edu/resorg/aquaticeco/darran.