

Otoliths may hold key to monkfish migration

PORTLAND, ME – Monkfish is one of numerous species that we need to learn a lot more about in order to manage properly.

Jonathan Grabowski of the Gulf of Maine Research Institute (GMRI) is working with National Marine Fisheries Service (NMFS) scientists and members of the commercial fishing industry to increase our understanding of monkfish populations – particularly their migration patterns – to give state and federal managers important information on which to base their management decisions.

Typically, when you think about tracking the movements of fish, tags come to mind, either mark-and-recapture tags or transmitter, acoustic, or satellite tags.

However, in 2003, the Northeast Consortium sponsored a cooperative research project lead by Grabowski to use otoliths to track and identify migratory patterns of the southern and northern monkfish resources.

The otolith is the tiny bone located in the skull of a fish that is analogous to the human ear bone.

Similar to counting tree rings, we can tell how old a fish is by counting the annual marks or rings that appear in a cross section of the bone. Importantly, however, environmental factors such as water temperature, food supply, salinity, water chemistry, and population density also can cause marks to form.

Grabowski explained that formation of the otolith is largely influenced by the properties of the water in which the fish resides. In other words, trace metals retained in the otolith should indicate the properties of the water in which the fish spends time.

So, scientists can compare the core of the otolith, which was created during the larval or early postlarval phase, to the outer edges, which reflect the properties of the water where the fish was captured. This may allow scientists to figure out if fish are migrating among regions or returning to their natal grounds to spawn.

As long as water properties are distinct among estuaries, embayments, or regions of the ocean, this technique is quite effective and, Grabowski explained, has been used by a wide diversity of researchers working on fish population structure and migratory behavior.

Proven method

Two important examples of how this technique has improved our understanding of fish ecology are studies on cod population structure in the Gulf of St. Lawrence and weakfish along the Mid-Atlantic bight. These studies were especially important because genetic work was unable to distinguish among subpopulations.

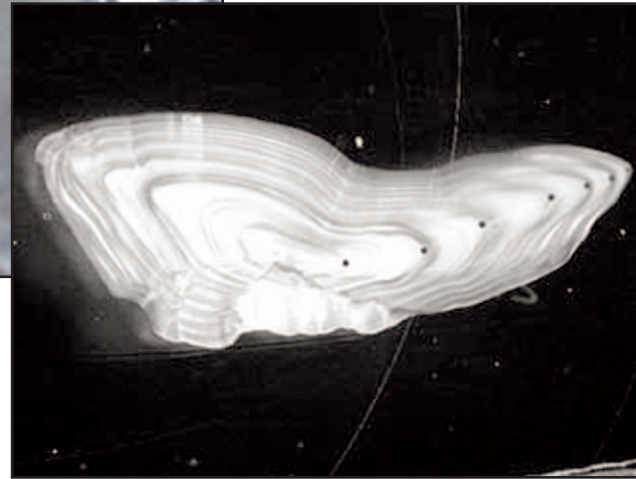
Survey data of juvenile and adult monkfish suggest that southern monkfish populations may be migrating northward and bolstering monkfish spawning populations off New England.



Anne Richard/Northeast Fisheries Science Center photo

Henri Franco of the Mary K with one of 200 monkfish he collected during a 2004 industry survey. Scientists will use the fishes' otoliths, or ear bones, to study monkfish migration patterns.

Below, otolith rings, marked with black dots, are used to age fish and may also record environmental factors such as water chemistry and population density.



Florida Fish and Game Conservation Commission photo

The examination of monkfish otoliths taken during industry monkfish surveys could help determine if that hypothesis is correct.

Monkfish management

New target total allowable catch (TAC) levels and adjustments to days-at-sea and trip limits went into effect in May and are scheduled to remain in place through April 30, 2007. The adjustments were based on protocols established by Framework Adjustment 2 to the Monkfish Fishery Management Plan, which went into effect in 2003.

Monkfish populations continue to be managed through two separate allocations, the Northern Fishery Management Area, which has a 7,737-metric-ton (mt) TAC for fishing year 2006, and the Southern Fishery Management Area, which has a 3,667-mt TAC.

The New England and Mid-Atlantic Fishery Management Councils are currently working on an amendment to the monkfish plan to reduce the tremendous variation in TAC and days-at-sea limits seen year to year in both regions.

If the otolith-testing cooperative research project produces a new understanding of monkfish migration and population structure, the management implications could be significant.

research vessel Albatross IV.

“The Albatross doesn’t catch monkfish well, but does give a signal of the resource,” explained Anne Richards, chair of the monkfish survey group and a center scientist.

The monkfish survey group has been a cooperative process from the beginning, Richards added.

“Industry members were given several statistical designs to choose from for the survey,” she said. “They weighed the pros and cons of each and made the final decision.”

The survey was conducted in 2001 and most recently in 2004. The group plans to continue but is unsure of funding for 2007.

In the spring of 2004, otoliths were collected from approximately 200 monkfish captured from Cape Hatteras to the Gulf of Maine aboard the Mary K, captained by Henri Franco.

More work needed

Before the otoliths are ready to be used to draw a roadmap of monkfish migration, Grabowski’s research team needs to fine-tune existing techniques used to prep the bones for analysis.

The team also needs to research the biogeochemistry of the northwest Atlantic to determine which metals will be the best indicators of the migratory patterns of monkfish. It is still unclear whether water properties such as metal signatures in the Gulf of Maine will differ substantially from the nearshore waters along the Mid-Atlantic Bight.

A very high-tech otolith examination

technique, called “laser ablation-inductively coupled plasma membrane spectroscopy,” will be conducted at Woods Hole Oceanographic Institute by co-principal investigator Gretchen Bath Martin of NMFS’s Beaufort, NC lab.

Grabowski and Bath Martin plan to begin data analysis and interpretation this fall following the completion of otolith processing.

Ken La Valley

Ken La Valley is an extension specialist with University of New Hampshire (UNH) Cooperative Extension/New Hampshire Sea Grant who is working to connect commercial fishermen interested in cooperative research with scientists who want to work with fishermen. He encourages anyone with ideas to get in touch.

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