Habitat Hotline Atlantic

Issues of Concern for Atlantic Marine Fish Habitat

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Use of New York Bight Habitat by Juvenile Yellowtail Flounder

by

Mark Malchoff
New York Sea Grant Extension Specialist

The Magnuson-Stevens Fishery Conservation and Management Act calls for the identification, conservation and enhancement of essential fish habitat (EFH), and is accelerating the need for descriptions of fish habitat for a wide range of marine species and their life history stages. To date, most studies off the northeastern coast of the United States have focused on the habitat requirements and population dynamics of adult groundfish, particularly flatfish and members of the cod family. Other works have investigated the ecology of larval stages for these same taxa. However, little is known about the habitat interactions of early juvenile stages (post-metamorphosis and settlement) of these species. Previous juvenile studies have utilized laboratory investigations or focused on estuarine dependent species. Very little field work has been conducted on the juvenile stages of groundfish species that reside entirely in continental shelf habitats.

Recently, a New York Sea Grant advisor, State University of New York (S.U.N.Y) faculty member, and Long Island commercial dragger completed a project designed to increase our understanding of how juvenile groundfish, especially yellowtail flounder, distribute themselves in the New York Bight. This research was funded through the Saltonstall-Kennedy Fisheries Development Program, and was aimed at filling in knowledge gaps about the habitat requirements of recently settled flatfish.

Fisheries oceanographic research is typically a very expensive proposition. It requires repeated visits to many preselected sampling points during a particular season. The repetitive collection of physical and biological data is needed to produce information which can explain how water mass characteristics and movements influence distribution, growth, and survival of juvenile fish. Problems may arise if sampling lacks geographic coverage, or spans only months when years may be required to detect trends in the data.

To address at least some of these concerns, Dr. Robert Cowen with the Marine Sciences Research Center at S.U.N.Y. Stony Brook, and Sea Grant Specialist Mark Malchoff proposed a 12-18 month sampling regime for this project primarily based upon the use of a dragger from Eastern Long Island. Malchoff and Cowen felt that commercial draggers could do the job normally reserved for research vessels for less expense. This approach would also assist an industry faced with cutbacks in days at sea as managers struggle to implement groundfish recovery plans. Following discussions with several vessel owners, Cowen and Malchoff selected the *F/V Illusion* to conduct eight, 96 hour sampling cruises between June 1996 and August 1997.

Graduate student Brian Steves conducted most of the field work and data analysis for the project, which was comprised of several objectives. First, the researchers sought to identify habitat requirements of young-of-year continental shelf flatfish. Commonly, flatfish start out life as floating eggs. Free swimming larvae hatch from these eggs and usually remain in the upper water column. After several weeks (45 days for yellowtail flounder), the larvae metamorphose and take on more adult-like behavior and appearances. This transition prepares the larvae for their benthic existence, and they settle out of the water column onto the ocean floor. Transitions occur within a few days for some species, and take only hours for others.

Transitional larvae may encounter a variety of benthic

substrates and different water masses with varying temperatures and salinities. In many cases, we do not know what mix of habitat characteristics such as temperature, salinity, and depth, constitutes "the right stuff" which will enable the survival and growth of a particular species. This study attempted to define some of the necessary juvenile habitat requirements for yellowtail flounder.

In addition, project scientists analyzed fish distribution data to determine how distribution changed over time, or from one area to the next. By studying these "spatial and temporal distributions," the researchers hoped to explain some of the year to year recruitment variability seen in groundfish populations.

Data collection and analysis - Eight sampling cruises were conducted aboard the *Illusion*, and two aboard the University's R/V *Onrust* during 1996 and 1997. Sampling tows took place at 21 stations during daylight hours (depth 65 -300 feet) on three transects in the New York Bight during each cruise. The gear consisted of a 6 foot beam trawl, with 1/8" mesh. The protocol initially required 5 short tows at each station, but the scientists scaled it back to three to allow visits to all 21 stations within 4 days. All recently settled juveniles were collected for further analysis, while larger fish were measured and returned to the water. Hydrographic data including temperature and salinity were recorded at each station subsequent to trawling.

Diverse juvenile community identified - The scientists discovered several things about the juvenile groundfish community off the NY/NJ coast. The sampling confirmed that a number of fish species utilize these environments. A total of 49 species were identified, ten of which were flatfish such as deepwater flounder, plaice, yellowtail founder, fourspot flounder, and window pane flounder. Yellowtails were by far the most numerically dominant, with about 20,000 specimens sampled.

Temperature and fish abundance data confirmed that juvenile yellowtail habitat, like that of the adults, seems to include the coldest bottom waters found on the shelf during the summer (see figure). From June to August, the highest juvenile yellowtail abundances recorded during the study coincided with distribution of cold (<46°F) bottom water known as the cold pool (see side bar). This pattern changed dramatically by late September, when the cold pool had dissipated, and juvenile yellowtail numbers had plummeted.

Several hypotheses have been proposed to explain the dramatic change in juvenile yellowtail abundance between summer and early fall of 1996. The fish may have grown large enough that they began to escape the trawl gear. This hypothesis is unlikely, given that many other larger flounders were observed without any catch reductions over time. A second possibility is that the maturing juvenile yellowtails simply moved to another area. This seems unlikely, since these juvenile yellowtails (most of which are less than 1.5 inches) would have had to travel over 30 miles offshore or 180 miles northeast over a period of five weeks in order to find their preferred temperature range.

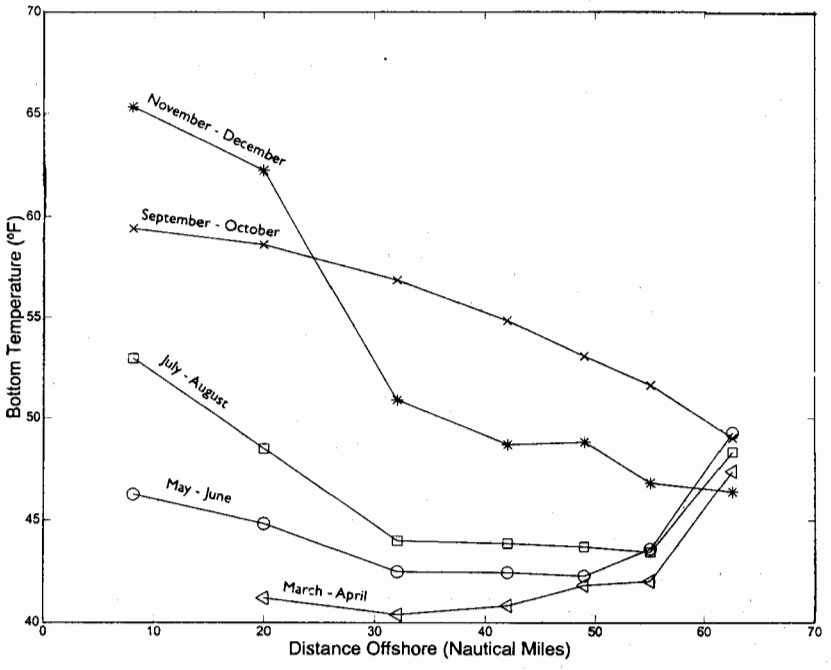
The most likely hypothesis offered by Steves and Cowen is that most of the yellowtails died, either directly or

The "Cold Pool"

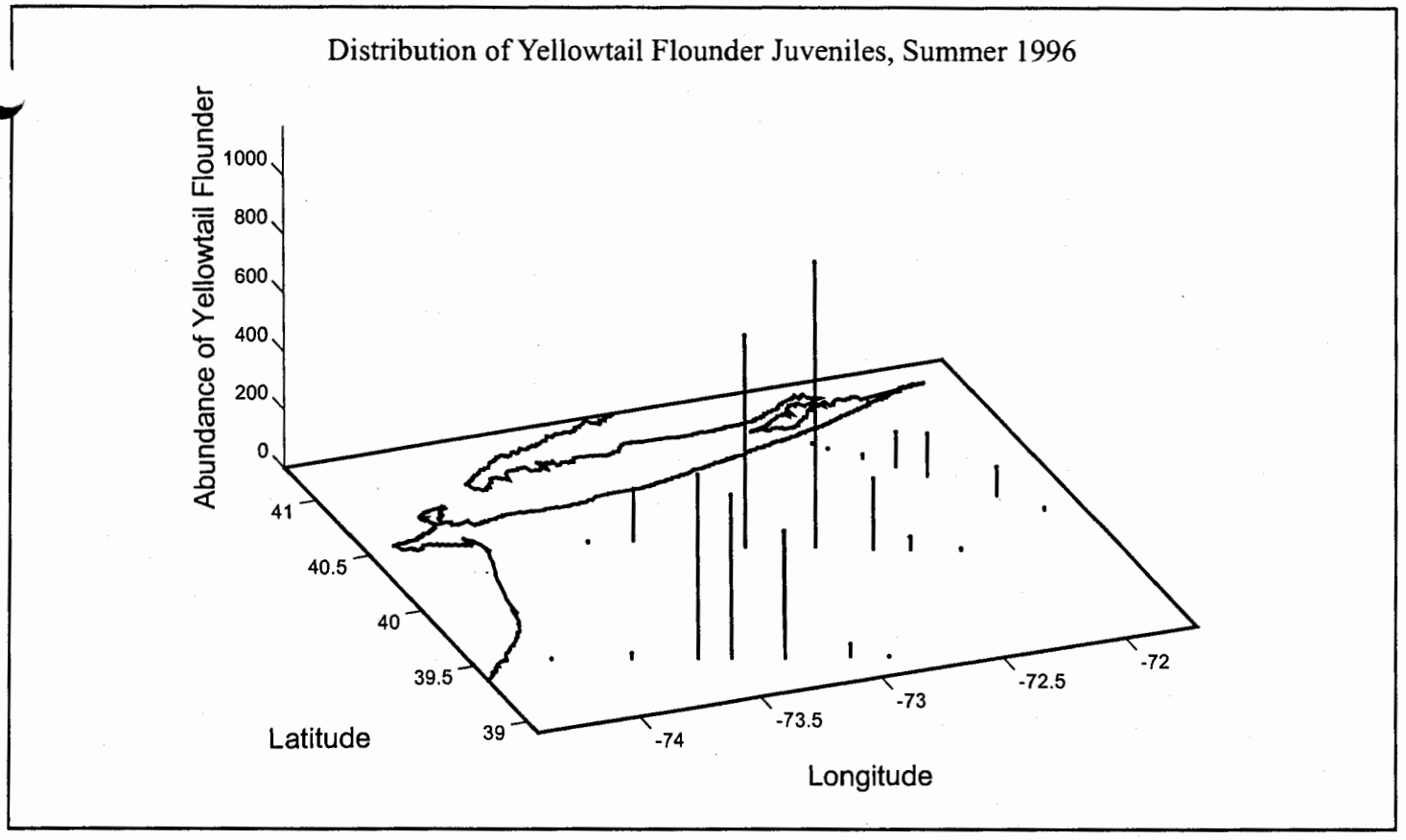
The cold pool has been well studied by physical oceanographers since it was first described several decades ago. It forms when surface water temperatures off the Atlantic coast begin warming in the spring. As the surface water gets warmer, it becomes less dense. By mid-summer a layer of warm, low salinity water floats above the cold, more saline bottom waters (see figure opposite). The two layers are separated by a seasonal thermocline across which no mixing occurs.

This annual pool of cold water stretches from Cape Cod to Cape Hatteras and out to the edge of the continental shelf. It is most pronounced in the New York Bight. Warmer, more saline "slope water" bounds the cold pool offshore, while shallow, coastal, warm water masses bound it inshore. Fish whose preferred temperatures coincide with the cold pool are effectively prevented from leaving it during the summer monthsby these warm water boundaries. Come fall, the water column "turns over," as the warm surface waters cool and become more dense, at which point even light winds cause mixing between the two layers.

In 1996, the turnover was abrupt, early, and "hot" relative to average years. Wave data show that two strong summer hurricanes (Fran and Edouard) put out enough wave energy to disrupt the seasonal thermocline and dissipate the cold pool. Unlike a normal turnover event in which warm water cools gradually and sinks, these storm events suddenly forced warm water into zones that would normally remain cool until well into the fall.



Bottom Temperatures June through October 1996 in the New York Bight



directly from the temperature increase after the turnover (see sidebar). Such a sharp increase in bottom temperature (>18°F mid-shelf) over the course of a passing hurricane would likely be a large source of metabolic stress. Absent any direct temperature induced mortality, such stress would undoubtedly increase rates of predation upon the yellowtail juvenile population.

Knowledge gained - Dr. Cowen felt the project successfully added to our knowledge of the early life history of several economically and/or ecologically important species. "Up to now, our knowledge of the habitat requirements of a whole suite of important fish has been limited - now we're getting that knowledge," said Cowen. "The detailed, species-specific habitat requirements identified in this project will aid in our understanding recruitment processes of these species."

"Scientists have known for a long time that much of the cohort strength of a year class is set in the first year," added Cowen. "If we know what all the habitat requirements are, we might be able to detect how a group of young-of-the-year fish are faring with that year's set of habitat conditions."

Further studies - Other data from the cruises and related projects in Cowen's Lab should continue to add to what we know about juvenile groundfish habitat interactions. Yet to be analyzed are growth rate data. With the ability of scientists to measure juvenile fish growth on a daily basis, it may be possible to compare growth rates within the study area, and see if some areas produce faster growth than others. Such differences may provide another tool that biologists can use to evaluate habitat.

This past summer Cowen's lab, in partnership with scientists from Rutgers University and National Marine Fisheries Service, conducted submersible dives using high resolution video imaging in the same areas as those sampled by the *Illusion*. Analysis of this video data may show how substrate types (i.e. gravel, sand, shell hash, etc.) combine with water column characteristics to influence juvenile groundfish distributions.

Steves and Cowen are still investigating the significance of the 1996 observed juvenile yellowtail abundance patterns. Unlike Southern New England and George's Bank, the New York bight has not previously been considered an important nursery areas for yellowtail flounder. The great abundance of juvenile yellowtails off Long Island during the early summer of 1996, however, suggests that the Bight could serve as important nursery habitat *in some years*.

While it is difficult and risky to draw conclusions upon one year's data, one is tempted to speculate about the results. If the recorded 1996 turnover event had taken place in the fall, it is unlikely that the NY Bight yellowtail flounder juvenile population would have been exposed to such severe temperature-related stress. Hence, 1996 could have seen the NY Bight contributing significantly to the recruitment of this species in the Southern New England area, had not powerful mixing events (e.g. hurricanes) caused drastic changes in the preferred nursery habitat of these flatfish. It's conceivable that every few years, the NY Bight becomes an important yellowtail flounder nursery habitat area.

Interestingly, the 1997 samples contain very few

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yellowtails. The settlement period discussed above is only one "critical period" faced during the early life history of marine fishes. To get large numbers of juveniles one must first have large numbers of larvae. For reasons yet unknown, it appears the 1997 failed to produce a good yellowtail "hatch" in the New York Bight.

As with most research, this project raises almost as many questions as it answers. However, this research effort has demonstrated that partnerships between industry and academia can add to what we know about fisheries habitat. With more information, managers should be better equipped to carry out the congressional mandate of the Sustainable Fisheries Act of 1996.

Mark Malchoff is a Fisheries Specialist at the New York Sea Grant Extension Program's Riverhead office. He can be reached at 516/727-3910 phone or email mhm4@cornell.edu.

Vice President Gore Announces Clean Water Initiative

On October 18, 1997, Vice President Gore announced a set of Clean Water Initiatives to celebrate the 25th anniversary of the Clean Water Act. In a memorandum to Heads of Departments and Agencies, he asked the Secretary of Agriculture (USDA) and the Administrator of the Environmental Protection Agency (EPA) to convene this effort.

Despite many successes in cleaning up the Nation's waters, significant challenges still remain. To help solve some of the problems, Vice President Gore directed Federal Agencies to prepare a comprehensive Action Plan within 120 days to improve and strengthen water pollution control efforts across the county. The Plan should be formed cooperatively to increase coordination and minimize duplication. Community groups and the public should be involved, and innovative approaches are encouraged. Three main areas were identified — protecting public health, preventing polluted runoff, and ensuring community-based watershed management.

Protecting Public Health

The EPA and Department of Commerce, acting through the National Oceanic and Atmospheric Administration (NOAA) will be responsible for working to protect public health. Objectives for this topic include:

- Identification of steps to reduce the need for fish consumption advisories, especially in regard to fetal and childhood development. Protection of children from beach and recreational water pollution will also be considered.
- Determination of nitrogen and phosphorous sources, and development of reduction strategies. Development of water quality criteria will be accelerated and a schedule for implementing a criteria system for nitrogen and phosphorous runoff will be established by 2000.

Preventing Polluted Runoff

Polluted runoff is the primary source of pollution to most of our nation's water bodies. The EPA, Department of Agriculture, and NOAA will work together to identify solutions. Objectives include:

- Determination of new standards for combating polluted runoff by EPA. The final regulations will be in place by March 1, 1999.
- Notification and additional guidance to states about the Conservation Reserve Enhancement Programs. The USDA will also work with the states on the proposals leading to agreements on water quality, soil erosion and fish and wildlife habitat needs.
- Implementation of the Coastal Nonpoint Pollution Control Programs for all 29 coastal and Great Lakes States. These programs will be in place by June 30, 1998; EPA will work with the states to make sure that they are all fully approved by December 31, 1999.
- Development of an action-oriented strategy to comprehensively address coastal nonpoint source pollution by EPA and NOAA.
- Development of strategies to ensure that Federal lands are models and laboratories for good planning and control and that Federal programs, actions, and activities do not contribute to development that worsens the problems.
- Development of a strategy to achieve a gain of 100,000 acres of wetlands by 2005 and two million miles of buffer strips to stop agricultural runoff by 2002. The USDA and EPA will both be responsible for determining if the goal has been met.

Ensuring Community-Based Watershed Management

The Action Plan will include a strategy for enhancing partnerships with states, local agencies, Tribal governmental, and local communities in order to enhance community based watershed management. Other objectives include:

- Development of a strategy by USDA to ensure agricultural producers in 1000 critical watersheds have technological and financial support to abate polluted runoff and comply with the standards.
- Development of a strategy by USDA along with the Department of Interior (DOI) to ensure proper stewardship of federally managed watersheds and restore wetlands damaged by prior management practices.

All elements of the Action Plan will provide for input from state and local agencies, Tribal governments, members of congress, and the public. For further information, contact Denise Coleman, USDA, at 202/720-1845 or Robert Goo, EPA, at 202/260-7025. *Adapted from Federal Register, November 7, 1997, Volume 62, Number 216, pages 60447-60449*

States Assist NMFS and Councils in Accessing Essential Fish Habitat Data

At the ASMFC Annual Meeting held October 20-23 in Hershey, PA, state representatives identified state agency data which are available to assist the National Marine Fisheries Service and fishery management councils in fulfilling the Essential Fish Habitat (EFH) mandates of the Magnuson-Stevens Act. Under the Act, NMFS and the councils are charged with identifying essential fish habitat for all federally managed species, and also describing threats and conservation measures for EFH. Much of the data collected by state marine fisheries agencies are instrumental for use in these tasks.

The availability of state marine fishery data was discussed at a workshop held in conjunction with the annual meeting. At the workshop, NMFS representatives from the Sandy Hook, NJ lab reviewed their work to date on preparing EFH source documents. The Sandy Hook lab has been charged with preparing the EFH background information for species under management by the New England and Mid Atlantic Fishery Management Councils. Lab Director Dr. Jeff Cross and fishery biologist Stu Wilk showed how NMFS data had been incorporated, and how state data could be used to fill in some of the nearshore information gaps. Each of the states then reviewed the data sets they thought would provide some of the missing information.

The state representatives were very accommodating in making their data available for the EFH initiative, and NMFS biologists expressed their appreciation. Both the states and the Commission recognize that although the EFH mandate does not apply to state and Commission managed species, the initiative will assist in improving protection for all marine fish habitat.

The development of the background information for northeast species is under the guidance of the Northeast Region Essential Fish Habitat Steering Committee. This Committee is made up of representatives from the two regional fishery management councils, NMFS Northeast Region, and ASMFC. Once the source documents are completed, the councils will use them to prepare fishery management plan amendments. For further information, contact Dianne Stephan, 202/289-6400.

Habitat Committee Adopts SAV Policy Implementation Plan

At the ASMFC's semi-annual meeting of the Habitat Committee, October 21, 1997, a plan for implementation of the Submerged Aquatic Vegetation (SAV) Policy was finalized and adopted. The plan outlines specific activities for the states and Commission in order to accomplish the goals, objectives, and actions outlined in the policy.

The Submerged Aquatic Vegetation Policy was adopted by the Commission earlier this year to encourage states to implement programs which will provide for SAV conservation. A background study prepared by the Habitat Committee found that state conservation programs vary widely up and down the coast, and many Commission managed species rely on SAV habitat at some time during their life history.

SAV systems are among the most productive ecosystems in the world. They perform a number of irreplaceable ecological functions, ranging from chemical cycling and physical modification of the water column to providing food and shelter for economically and ecologically important organisms. Commission managed species that use SAV habitat include lobster, striped bass, summer flounder eel, red drum, spotted seatrout, spot, croaker, tautog, bluefish, menhaden, black sea bass, and weakfish.

For a copy of the background study, policy, or implementation plan, contact Claire Miller at 202/289-6400.

Edwards Dam Re-Licensing Denied

On November 25, 1997, the Federal Energy Regulatory Commission (Commission or FERC) denied a new license for the Edwards Dam hydroelectric project, and ordered that the 160 year old dam be removed. The Commission's action followed the recommendations of the National Marine Fisheries Service, State of Maine and U.S. Fish and Wildlife Service. It is the first time in its history that the Commission has denied re-licensing a hydro project, and ordered the project decommissioned and the associated dam removed at the licensee's expense.

Removal of the dam will restore access to a 17 mile stretch of historic spawning habitat above the dam, including the full historic upstream migratory limit for Atlantic and shortnose sturgeon, striped bass, and rainbow smelt. The Commission found that relicensing the project, with the necessary environmental conditions such as mandatory fishways, would cost 1.7 times as much as removing the dam, and would not provide access to upstream spawning habitat for the four anadromous species that do not commonly use fishways.

The licensee is now required to develop a removal plan in consultation with the National Marine Fisheries Service and other parties within one year. Meanwhile, the licensee has 30 days to request a rehearing of the Commission's decision. The licensee's recourse beyond this is to appeal to the U.S. Court of appeals. *For further information, contact Jon Kurland, National Marine Fisheries Service, 978/281-9204 or email Jon.Kurland@NOAA.Gov.*

Best Wishes for a Healthy and Happy 1998!

Atlantic States Marine Fisheries Commission
1444 Eye Street, N.W., 6th Floor
Washington D.C. 20005

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Dianne Stephan
Editor

Claire Miller
Asst. Ed.

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