

# stages



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## Upcoming Meetings

25th Annual LFC  
Sandy Hook, N.J.  
August 8-13, 2001  
[www.sh.nmfs.gov/lfc2001.html](http://www.sh.nmfs.gov/lfc2001.html)

American Fisheries  
Society, 131st Annual  
Meeting August 19-23  
Phoenix, Arizona  
[bfritz@fisheries.org](mailto:bfritz@fisheries.org)

26th Annual LFC.  
Bergen, Norway  
July 2002  
<http://www.fishlarvae.com>

## Changing of the Guard

Taking over the helm of the ELHS is the new President Dr. Art Kendall. After a distinguished career in fisheries, Art has “officially” retired, but will be remaining very active with a continuing association with NOAA, and other organizations. We are extremely lucky to have you, Art, and extend to you a warm welcome. We also wish you success in the completion of your book, and sincerely hope that you enjoy the challenge of your Presidential role with ELHS (See picture of Art presenting award to student paper winner at 24<sup>th</sup> LFC). Susan Sogard is our new Secretary. Thanks Sue, we wish you well for the days ahead and look forward to working with you.

### Outgoing Officers.

We extend our gratitude to two people who are stepping down from their executive roles in ELHS: Jeff Govoni, our past President, and Dave Secor, our past Secretary. These two have served our Section with enthusiasm, pride in  
(cont'd. p. 3)

## Announcement of next meeting:

## 25th Annual Larval Fish Conference

August 8-13\*, 2001 · Sandy Hook, New Jersey, USA

The National Marine Fisheries Service's (NMFS) Howard Laboratory on Sandy Hook, New Jersey, is pleased to host the 25th Annual Larval Fish Conference. This Conference, sponsored by the Early Life History Section (ELH) of the American Fisheries Society, offers an international forum for the presentation and discussion of research on the early life history of fishes. The early life history is considered to include events that occur from reproduction through the embryonic and larval periods, and into the early juvenile portion of the life history. This period is a dynamic one for fishes with changes in a fish's form, capability, and ecology occurring at an especially rapid rate.

**PROGRAM · *Transitions in the early life history of fishes - “It's about change”***

(Continued from page 1)

The theme chosen for this Silver Jubilee Conference gives testimony to the importance of changes in the early life history of fishes. The Steering Committee interprets 'change' broadly for this Conference.

The Conference will commence on August 9th with an Opening Address by Art Kendall. Art will provide us with poignant perspectives from his long and distinguished career in fisheries ecology which began at Sandy Hook. The Conference keynotes and contributed papers will be structured around the following thematic areas.

**ONTOGENY** - changes in size, developmental stage, morphology, physiology, diet, and mortality risks associated with ontogenetic change; the basis and importance of ontogenetic transitions that punctuate the life cycle (e.g., fertilization, hatching, metamorphosis, maturation). Keynote address: Masaru Tanaka, Kyoto University, Japan.

**HABITAT** - changes in habitat use with life stage, season, and location; natural and human sources of habitat change; shifts in diet, condition, and mortality associated with changes in habitat. Keynote address: Robert Cowen, University of Miami, USA

**PHYSICAL PROCESSES** - changes in location and survival of early life history stages due to advective transport and diffusion; the degree and consequences of climatic and oceanographic change. Keynote address: Jeffrey Govoni, National Ocean Service, USA.

**METHODS** - changes in fisheries research methodologies and how these have affected our understanding of fish early life history (e.g., changes in surveying populations, culturing fish, assessing fish condition, measuring fish size and shape, quantifying fish behavior, analyzing fish otoliths, modeling fish populations and applying statistical techniques). Keynote address: Donald Hoss, National Ocean Service, USA.

**PARADIGMS** - changes in the status of recruitment hypotheses; revisions and enhancements to our understanding of key biological, ecological, and physical processes affecting the early life history of fishes. Keynote address: Kenneth Frank, Bedford Institute of Oceanography, Canada.

**SCHEDULE** • Science sessions will be plenary and take place from Thursday, August 9, through Sunday, August 12, 2001. Registration and a social will occur on Wednesday, August 8th. A picnic at Sandy Hook will be held in the evening of August 9th at historic Fort Hancock, on Sandy Hook. Participants will be able to tour the NMFS Howard Laboratory and historic sites on the "Hook".

Poster sessions will be highlighted during two afternoon poster socials. These will be followed by 'Open Evenings' for which attendees will be presented an abundance of options for food and drink. A Conference Banquet Cruise will be held on the last evening (August 12th) aboard a motor yacht from which we will take in views of New York City and surroundings by water. Field trips and tours will be available for attendees on Tuesday, August 13th with the exception of an optional NY Mets baseball game on the evening of August 11.

**VENUE** • The Conference will be held at Monmouth University in West Long Branch, New Jersey ([www.monmouth.edu/](http://www.monmouth.edu/)). The campus has complete housing and dining accommodations. We suggest that those who fly to the Conference use Newark International Airport.

**DEADLINES** • Abstracts are to be submitted via e-mail and are due by April 30, 2001. Registration fees must be postmarked by April 30th to avoid a late fee. For further details, visit our website at ([www.sh.nmfs.gov/lfc2001.html](http://www.sh.nmfs.gov/lfc2001.html)), or contact us by e-mail at: [lfc2001@sh.nmfs.gov](mailto:lfc2001@sh.nmfs.gov).

*Join us in New Jersey for a special Silver Jubilee LFC Celebration!*



\* Please note change in Conference dates from our First Announcement.

## **The Masthead**

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## **Changing of the Guard (con'd)**

roles, friendliness, and professionalism.

Both are extremely "busy" scientists, yet have contributed generously of their time and efforts, and have kept our Section operating smoothly, while maintaining and fostering a high component of interest and stimulation for research in early life history of fishes. Thanks Jeff and Dave.

## **24<sup>th</sup> LFC at Gulf Shores, Alabama**

We want to extend our thanks to Jim Cowan and his organizing committee for all their efforts in organizing the 24<sup>th</sup> LFC in Alabama. Jim even managed to provide a nearby tornado for a little extra excitement! The papers and posters were interesting, and the hotel very accommodating, providing a good setting to make new contacts and renew acquaintances with colleagues from around the fisheries world. So what more can you ask? Thanks Jim, for hosting this meeting. We all know how much work it must have been, so please accept our appreciation.

## **2000 Business Meeting , Early Life History Section 24<sup>th</sup> Annual Larval Fish Conference Gulf Shores, Alabama November 2000**

**Attendance** (J. Govoni, presiding)

Meeting began 5:50 Wednesday. Twenty-seven members attending.

No quorum, but meeting continued for informational purposes and to poll members on issues discussed at EXCOM Meeting.

### **I. Approval of Minutes**

Minutes of 1999 ELHS Business Meeting approved by President due to tacit comment.

### **II. Committee Reports**

A. Treasurers Report (J. Govoni reported for K. Lang)

Expenses during 1999-2000 were related to production of Stages newsletter and included travel, mailings, and software purchase. ELHS made a \$1000 contribution to Parent Society Transactions of American Fisheries Society journal backlog publications, which was generous compared to most other AFS subunits. ELHS allocated \$2500 for the Lee. Fuiman and Bob. Werner book on use of ELHS studies in fisheries ecology. Approximately \$ 24,000 remains in

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general account. President Govoni summarized by indicating that ELHS is fiscally sound. The S. Richardson Endowment is up to \$10,000.

#### B. Standing Committees

1. Nomination and Mail Ballot Committee (J. Govoni reporting for J. Cowan)

**Jeff Isely** and **Chris Chambers** have been placed on ballot for President-elect; **Bruce Comyns** and **Rich McBride** have been placed on ballot for Secretary-elect. Mail ballot will be sent out in November by Jim Cowan.

2. Time and Place Committee (J. Govoni reporting)

In 2001, the LFC entitled "Transitions in the early life history of fishes - It's about change" is planned for 9-14 August at Sandy Hook NJ (C. Chambers, M. Fahay, D. Witting, and S. Lewis, steering committee). In August 2002, the LFC meeting will be held in Bergen Norway (Howard Browman, host).

Ken Able, reporting for Chris Chambers and Sandy Hook steering committee, provided prospectus for 2001 LFC. A web-site has been set up at [www.sh.nmfs.gov/lfc2001.html](http://www.sh.nmfs.gov/lfc2001.html) \_\_Themes for meeting include ontogeny, habitat, physical processes, methods, and paradigms. The venue is Monmouth University, a small liberal arts college at W. Long Branch, New Jersey. Ken recommended that the most convenient airport to the university was Newark International Airport, NJ.

Howard Browman reported on his preparations for the 2002 Bergen LFC meeting, scheduled for 29 July - 2 Aug. 2002. Venue may be just outside of Bergen at Solstrand Fjord Hotel. First call for papers will be published Feb. 2001. Multiple sponsors have already been approached with some success. Themes may include developmental neurobiology of fishes, development of immune systems in fishes and pathogens, genetics and development of visual system in fishes, morphological development and physiological function in fishes, role of essential fatty acids in fishes, biology and ecology of transition stage fishes, and predaceous invertebrates. Pro-

ceedings of the meeting will be published.

#### C. Sessional Committees

1. S. L. Richardson Award Committee (G. Klein-MacPhee reporting):

Work was completed during 1999-2000 to develop criteria for the award. Last year, 27 students competed for the award; 20 are competing this year. ELHS EXCOM voted to increase the award to \$300. Jim Cowan suggested that the award be split to permit awards for both platform and poster presentations. J. Govoni deferred the suggestion to **Old Business**.

2. Student Travel Grant Committee (R. McBride reporting):

This year there were six applicants for grants. Two completed applicants - M. Wuenschel and A. Quatrini - received grants, \$300 each. Criteria for application were articulated by R. McBride and include letter of application, ELHS membership, abstract, commitment to attend, and letter from major advisor.

3. Conference and Symposium Publications Editorial Committee: (L. Fuiman and J. Govoni reporting).

Jeff. Govoni solicited member discussion on whether ELHS should support member publications that are unrelated to Larval Fish Conference Symposia. Jeff Govoni proposed that ELHS should permit submission of proposals for seed money or partial support of significant publications or texts. This proposal was unanimously supported by EXCOM. In discussion of the proposal at the Business meeting, Darrel Snyder indicated the need to develop oversight of proposal approval process. Discussion ensued related to reformulating current Sessional Committee to one that oversees approval of proposals that seek publication support. Lee Fuiman agreed to carry on as chair (1-year term) to develop proposal format and criteria. Dave Secor volunteered to participate in the reformed committee.

#### D. Ad Hoc Committees -

Life Time of Appreciation was also presented to John Dower (*in absentia*) as ELHS Web Master.

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John Dower was recognized for his efforts in vastly improving the ELHS Web-site.

#### **IV. New Business**

##### A. Installation of Offices (J. Govoni, reporting)

Art Kendall was installed as President ; Sue Sogard was installed as Secretary.

##### B. New Proposals (Art Kendall Presiding)

J. Govoni reported that:

J. Cowan had reported an informal survey of members indicated lack of interest among membership. J. Isely and others at 2000 Business Meeting Achievement Award Committee (J. Cowan reporting) urge ELHS to continue developing this award. J. Isely also offered to assist with models of AFS award criteria. Discussion ensued related to recipient criteria, name of award, and frequency of award. EXCOM approved continuation of the committee. J. Isely volunteered to chair the Ad Hoc committee.

#### **III. Old Business**

##### A. ELHS Web Gallery (J. Govoni, reporting)

Due to copy-write issues the gallery that was once posted on ELHS website has been dismantled. A link to ICLARM's LarvalBase serves now as its place keeper. Some members have suggested posting larval fish atlas on ELHS website should be pursued but this issue was tabled given insufficient justification to pursue the idea at this time.

##### B. Proposal for Student Poster Award (J. Govoni, reporting)

At 1999, LFC, J. Hare and D. Hoss awarded the *Crystal Fish Award* to best student poster. EXCOM and Business Meeting participants agreed that judging criteria and award guidelines needed to be developed and requested that Jon Hare and Don Hoss form an *Ad Hoc* Committee to come up with award proto-

col. Art Kendall (President-elect) committed to seeing that the protocol was in place in time for the poster award to be given at 2001 LFC.

##### C. Transitions, recognition, and appreciation (J. Govoni, reporting).

J. Govoni recognized T. Miller (*in absentia*) for his 5 years of service as editor of Stages. A Certificate of Appreciation was presented at this meeting to Tom (in absentia). At the 2000 Ex Comm meeting, officers voted unanimously to increase S.R. Award to \$500 for 2001 LFC.

D. Snyder informed members that he is trying to web-ify and update his bibliography of early life history studies for posting on the ELHS website.

#### **V. Adjournment (7:30 pm)**

## 24<sup>th</sup> Larval Fish Conference, Gulf Shores, Alabama

The 24<sup>th</sup> LFC was held at the Gulf State Park Resort Hotel and Convention Center, Gulf Shores, AL. It was sponsored by a number of fisheries - related organizations and University Departments, (thanks to Jim Cowan and his committee's hard work) and the facilities were roomy, pleasant, with good food available right on premises. Of course there were lots of interesting restaurants nearby, one of which boasted shrimp served in 34 different ways! The hotel and villas were right on the beach, very reasonably priced, and beach walks could be enjoyed to clear the heads of intellectual problem- solving and other enigmatic and perplexing fishy matters.

There were three theme sessions organized around the topics of global change and fish habitat; fish embryology and larval development, and essential fish habitat and early life history stages. As well, there was a good variety of contributed papers, and many excellent student papers. In total, 43 papers, 19 student papers, and 11 posters were presented.

The first theme session discussed the effects of several factors on essential fish habitat: global temperature changes, climatic changes, solar uv effects on zooplankton, sea level rises, and the nature of the habitat itself, for larval fish survival. The embryology them session covered aspects such as quantifying and predicting developmental processes, integrating ecology and developmental phases (first feeding, etc.). It also included papers on structural development and taxonomic problems in early life, and identification of eggs by mtDNA. The third theme session covered topics from as broad as recruitment of alewife in Lake Michigan - yes, the whole lake- to a study of performance of larval bluegills held in containments where predation, feeding, and habitat were assessed.

At the banquet, the student award was presented for the Sally Richardson Prize. The proud winner was **Veronica Caceres**, for her presentation: "Small scale turbulence and feeding ecology of fish larvae." She carried out her experiments on fathead minnow (*Pimaphales promelas*) and Atlantic silver-side (*Menidia menidia*) with Tom Miller.



President Art Kendall presents the Sally Richardson award for best student paper in early life history studies to Veronica Caceres, at the 24th Larval Fish Conference Banquet, Gulf Shores, AL, November 10, 2000. (Photo courtesy of Darrel Snyder)

### Letter to Editor

While President of our organization, The Early Life History Section of the American Fisheries Society, I did not promote an ambitious agenda; I aspired no new projects or expanded horizons. My aim was stewardship. Our organization had, at-the-time, new Standing Rules, developed under Past-President Jim Cowan, that fleshed out our existing By-Laws. My vision was simply the implementation of these new Standing Rules; to get the various committees—Standing, Sessional, and *ad hoc*—erected and functioning. While our membership grew slightly, but not substantially, I sought to improve membership involvement in our organization, by appointing people to committees and to improve membership services. I wanted to keep our organization moving forward.

Involvement in the function of our organization takes the form of participation in the annual Business Meeting. Unlike the balance of AFS Units, of which we are one, the ELHS does not conduct its Annual Business Meeting at the Annual (national) AFS Meeting; we choose to conduct our Business Meeting at our Annual Larval Fish Conference, this because we have better overall attendance there. We seldom, however, muster a *quorum* of voting (Full) members, and this contingency, as a consequence, relegates the Business Meeting to a meeting for information dissemination. Decision making, during the course of a calendar year, is often necessary, especially for deci-

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sions that move money within, or from, our immediate organization. Decisions are made by vote of the Executive Committee: the President, President-Elect, Secretary, Secretary-Elect, and Treasurer. While President, I tried to gain a sense of the attitudes of our membership, by broaching these decisions at the Business Meeting, but out of necessity, some decisions had already been made beforehand.

Some decisions that concern the conduct and function of our organization will always have to be made quickly, before we can gather our membership at a Business Meeting, and we may never muster a quorum of Full Members, but there is a procedural possibility that might ameliorate the problem. If the Business Meeting was scheduled before the Executive Committee Meeting, at the Annual Larval Fish Conference, the Executive Committee would be able to gain a sense of the attitude of our membership, on certain issues, before decisions about these issues were made. This scheduling will be difficult, undoubtedly, inasmuch as our Annual Larval Fish Conferences are short (three to four days) and crammed with sessions of contributed presentations and posters (the means with which we communicate our science), along with necessary and important social events (the other means of communication); in the past we have barely been able to schedule both a Business Meeting and an Executive Committee Meeting. But, it's worth a try, isn't it?

Jeff Govoni, Past President

## International News

### **Request for books on larval and juvenile fishes for Christian— received through Grace Klein- McPhee, Narragansett Lab, R. I.**

This gentleman is particularly interested in environmental factors related to distribution and abundance of larval and juvenile fishes. If anyone has papers or extra books they could donate to help him in his studies, please send them to him.

We have no last name, but his email is:

cbo6@astago.com

**Address:** Jalan Sapta Praselya 1/65  
Samarang, Central Java,  
Indonesia 50192

### **New Scientist joins Bill Leggett Group at Queens University, Ontario**

Tom Johnston has joined the research group with Bill Leggett's workers at Queens University in Kingston, Ontario. Tom has several projects on the go, but his primary interest at the moment is an investigation into natural history features which may lead him into unraveling the variations in egg quality of walleye and sauger. Egg size is one of the traits he will be analyzing in relation to maternal size. Egg quality (e.g., lipid proportions and quality) investigations are also underway, in collaboration with some other labs, Tom's idea being that lipid content may be a factor in maternal-transferal of contaminants, and therefore important in embryonic survival mechanisms.

We will be providing a more detailed account of Tom's studies in the next issue of Stages, along with other investigations going on in this group. In the meantime, Tom's web page is:

<http://biology.queens.ca/~johnston/>

## **Canadian Conference for Fisheries Research Jan 4-6, 2001.**

Royal York Hotel, Toronto, Ontario

The CCFFR, our Canadian counterpart to AFS, met for its annual meeting in Toronto this year. We meet concurrently with the SCL (society of Canadian limnologists). About 400 scientists attended, 300 fish-oriented biologists, and 100 limnologists. The 5 keynote speakers addressed various topics within the framework of the current crisis in preserving the ecology of freshwater systems in Canada. Of 95 papers and 65 posters presented, about 10 dealt with the topic of early life history. Several dealt with the relationships between the survival of 0-age cod and eel grass (R. S. Gregory and students from Memorial University in Newfoundland) and the remainder addressed various freshwater problems (e.g., spawning ecology of Pacific salmonids in the Great Lakes, early life history survival of over-wintering walleye post larvae, growth rate and recruitment of rainbow smelt larvae, differences between walleye and sauger eggs and young, and emergence ecology of age 0 sea lamprey). I will be glad to pass along authors' names or Abstracts, if any of our readers are interested.

Perce Powles (Editor)

## **Kuroshio Research Division, National Research Institute of Fisheries Science, Japan**

Dr Shinji Uehara, reporting through Dr. Iain Suthers

A six-year research project, FRECS (Researches on the Fluctuation of recruitment of fish eggs and larvae by changes of spawning grounds and transport pattern in the East China Sea), has started in 2000 with the full sponsorship of Research Council Secretariat of the Ministry of Agriculture, Forestry, and Fisheries. The target species of the project are Japanese common squid, *Todarodes pacificus*, and Japanese horse mackerel, *Trachurus japonicus*. Shinji Uehara, Takumi Mitani, and Minoru Ishida are work-

ing on the survival mechanism of young *T. japonicus* in relation to oceanographic condition, especially to the interaction of the Kuroshio and adjacent coastal waters, which likely play an important role in the transport and survival of the larvae.

We are also developing DEPM techniques for round herring, *Etrumeus teres*, which inhabits the coastal waters of southwestern Japan. In addition, comprehensive information on the distributions of eggs and larvae of *E. teres* and Japanese sardine *Sardinops melanostictus* have been obtained from intensive samplings.

Shinji currently has a one-year study leave at Iain Suthers' laboratory and is participating in two programs, which are the oceanographic relationships of recent otolith growth of pilchard, *Sardinops sagax* and the inter-calibration of growth indices (recent otolith growth, RNA/DNA, and cell cycle analysis) using snapper, *Pagrus auratus*.

Iain Suthers  
School of Biological Science,  
The University of New South Wales,  
UNSW SYDNEY 2052  
<http://www.life.unsw.edu.au/famer/>

## **1995 Sydney International Larval Fish Conference Book now available**

Item from Jeff Leis, Australian Museum

This book is being offered at a special price of \$25 + p and p Australian.

The normal price is \$65.00

Contact: [sales@publish.csiro.au](mailto:sales@publish.csiro.au)

## **Larvae of the Indo-Pacific**

The Book, Larvae of the Indo-Pacific Fishes (Publisher, Brill - this is not fishy pun) by Leis and Carson, is now published: Brill 870 pp.(www.Brill.nl). The price depends on method of purchase and location. Price is lower if the book is sent to a non-U.S.-address. The official price is U.S. \$ 237.00 But it is worth trying an on-line place like Amazon,(www.

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Amazon.com) or if you can purchase it in Guilders, that is usually a good deal (depending on exchange rate)

### **The Polish Plankton Sorting and Identification Center: Part 2**

By: Arthur W. Kendall, formerly with the Alaska Fisheries Science Center, Seattle WA

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(Part 1 of this article appeared in the previous issue of Stages [Vol. 21, no. 2]. This is the concluding part. In part 1 I mentioned that the highly trained staff of the ZSIOP: Zakład Sortowania i Oznaczania Planktonu has partnered with the National Marine Fisheries Service for over 26 years in fisheries assessment and ecological research. The role of the ZSIOP laboratory, located in Szczecin, Poland has been mainly in processing both ichthyoplankton and zooplankton samples collected during a variety of programs carried out by the Northeast, Southeast, and Alaska Fisheries Science Centers.)

Among the remarkable things about the staff of ZSIOP is their breadth of taxonomic expertise. They routinely identify fish larvae collected by the Northeast Fisheries Science Center from off the northeast coast of the U.S., as well as those collected by the Southeast Fisheries Science Center from off the southeast U.S. coast and in the Gulf of Mexico, and those collected by the Alaska Fisheries Science Center from off the U.S. west coast and from the Gulf of Alaska and the Bering Sea. They have identified and helped solve taxonomic problems with larvae in all of these areas. Małgorzata Konieczna, the head of the ichthyoplankton group

at ZSIOP, is co-author on several papers being prepared with scientists from the Southeast Fisheries Science Center. I would be willing to put the ability of the ZSIOP staff to identify fish larvae against any other laboratory in the world!

Over the years many visits have been associated with the work of ZSIOP. Annually, there is a meeting of the principals (Plankton Sorting Center

Advisory Committee) involved both from Poland and the U.S. The site of this meeting alternates between the U.S. and Poland. The work of the laboratory during the previous year is reviewed and the work for the coming year is planned during these meetings. Besides these meetings, there have been numerous exchanges of scientists to introduce new procedures and clarify taxonomic problems. During the course of these meetings and exchanges, we have become well-acquainted with each other and each other's families. In 1999, as part of the celebration of the 25<sup>th</sup> anniversary of the cooperative work between ZSIOP and NMFS, we prepared and presented to the staff of ZSIOP a poster that was a photo-collage of these visits. It is titled "More than colleagues: friends", to express the closeness of the personal relationships that have developed over the years.

Many of the Poles we deal with are fluent in English, while most of the Americans have only learned a few Polish phrases at best. However, one phrase that we know and use frequently and earnestly is "Dziękuję bardzo" (Thank you very much). Another "Sto Lat" (Roughly: may you live 100 years), is the traditional Polish toast, without which no gathering is complete. With the successes of over a quarter of a century for this endeavor, it may be appropriate now to toast ZSIOP with a rousing "Sto Lat"!

**Thanks for this article, Art. The work which has been carried out by this organization is appreciated by a lot of people around the world.**

## Regional News

### News from the Northeast Region ELH

Tom "Motz" Grothues, NE Rep.

#### Maine Department of Marine Resources

From Maine, Mark Lazzari at the Maine Department of Marine Resources reports on a coastal survey of groundfish larvae funded by a grant from the Fishing Industry Development Center. The survey was in conjunction with the groundfish spawning closure enacted by the State of Maine in 1999. May 1999 sampling included 26 stations sampled with a 1-m diameter plankton net pulled obliquely at the surface, at 10 m, and 20 m. Eight stations were occupied in Penobscot Bay, nine in Saco Bay, and nine along the coast between bays. In June, only the Penobscot Bay and mid-coast regions were sampled. The survey collected 14 species, including the commercially important cod, American plaice, winter flounder, mackerel, redfish, and cunner. In terms of density, >90 % were cunner, fourbeard rockling, mackerel, or radiated shanny. Cunner were most common in the mid-bay region, mackerel and winter flounder in Saco Bay, and fourbeard rockling and shanny equally distributed along the coast. Cod, redfish, and plaice larvae were rare. Cod larvae occurred only in Saco Bay, redfish larvae in Penobscot Bay, and winter flounder in both Penobscot and Saco Bay. Ninety six percent of the larvae were collected in June.

Check out MDMR at <http://janus.state.me.us/dmr/>.

#### Rutgers University Marine Field Station

Several studies by Ken Able and Rutgers University Marine Field Station (RUMFS) colleagues (postdoctoral fellows, graduate students, technicians) and collaboration with other scientists have been conducted over the last three to four years. The emphasis has been on young-of-the-year (YOY) fishes of estuarine, nearshore and continental shelf habitats. A summary of progress on deciphering the early life history of a variety of economically and ecologically important species in the Middle Atlantic Bight has been recently published (Able and Fahay 1998). Other foci include investigations of metamorphosis and settlement, habitat quality and the evaluation of the success of habitat restoration, especially for salt marshes.

Two ongoing studies are addressing larval fish ecology on very different temporal and spatial scales. Over the last 12 years ichthyoplankton assemblages have been sampled weekly in a consistent fashion (1 m plankton net, 1 mm mesh at Little Sheepshead Creek) to capture fishes entering Little Egg Inlet with Atlantic Ocean water on night flood tides. During this period over 2,000 samples containing approximately 210,000 larvae representing over 100 species have been captured and examined (see Witting et al. 1999 for analyses concerning period from 1989-1995). This long-term data set provides a time series of species abundance that is being used to discern long-term trends for a number of species such as the recovery of *Clupea harengus*.

Prompted, in part, by observations of *Conger oceanicus* leptocephali in the ichthyoplankton collections of ingressing larvae, Geoff Bell (formerly an undergraduate student, now a graduate student at North Carolina State University) has studied morphological and behavioral aspects of metamorphosis (Bell et al. in review). Other studies that have benefited from this long-time series of ichthyoplankton collections included a comparative study of *Brevoortia tyrannus* recruitment in New Jersey and North Carolina estuaries in collaboration with colleagues at NMFS - Beaufort (Warlen et al. in review).

On a shorter time scale, Ken and Angie Podlinski have been working with the Army Corps of Engineers on assessing nearshore ichthyoplankton assemblages along ocean beaches in northern New Jersey. They are interested in characterizing the summer larval fish assemblages because so little is known for these shallow ocean waters. The Army Corps is evaluating any potential impacts that beach nourishment may have on these assemblages. Sampling was conducted monthly, May through July, from 1995 through 1999, with 0.5 m plankton nets and 1 m bongo nets, both with 0.5 mm mesh. Over 1,500 samples were taken in surfzone and near shore areas. In the surf zone samples, over 7,500 larvae were collected throughout the entire sampling period with 39 species being represented. In the near shore samples in one year alone (1997), 75,000 larvae were collected with 37 species being represented. As expected, samples were dominated by *Anchoa mitchilli* and *Menidia menidia* but other species that showed up in large numbers in-

cluded *Lophius americanus*, *Cynoscion regalis*, *Brevoortia tyrannus*, *Tautoga onitis*, *Tautogolabrus adspersus*, *Scophthalmus aquosus* and *Scomber scombrus*. Finding larvae of some of these species so close to the beach was surprising. Considering that the average size of the larvae collected was 4.5 mm SL, it is possible that these waters may provide spawning areas for some of these species.

Gregg Sakowitz is a Master's student in the Graduate Program in Ecology and Evolution with interests in habitat selection by larval and juvenile fishes. His research is focusing on behavior of *Fundulus heteroclitus* and *Cyprinodon variegatus* in the laboratory. He hopes to apply his findings to habitat use patterns observed in natural and restored marshes.

In fall of 1999, Melissa Neuman received her Ph.D. in the Graduate Program in Ecology and Evolution working on the early life history and ecology of windowpane (*Scophthalmus aquosus*). From that work, one manuscript has been accepted for publication and another ("Timing and duration of early ontogenetic events in windowpane: a quantitative assessment of the larval to juvenile stage transition") is in preparation. Also, Melissa is continuing to collaborate with physical oceanographers to study the potential effects of episodic, coastal upwelling events on the ingress of estuarine-dependent larval fishes to a southern New Jersey nursery area during the summer months. She began a postdoctoral appointment at Rutgers University in June 2000, where her work will include assisting RUMFS Director Ken Able in managing the research and educational activities at the laboratory. The rest of her time will be devoted to continuing research with early life phases of temperate fish species. Specifically, she hopes to gain a better understanding of how early ontogeny may affect recruitment success in species that exhibit varying life history patterns.

Janet Duffy-Anderson finished postdoctoral work at RUMFS in the fall of 1999, where she and colleagues focused on evaluating how human alterations affect fish habitat use in the near-shore environments of an urban estuary. New York Harbor served as a model to determine how man-made structures influence the distribution, feeding, and growth of eco-

nomically and ecologically important YOY fishes such as *Microgadus tomcod* (Metzger et al. in review), *Pseudopleuronectes americanus*, and *Tautoga onitis* (Duffy-Anderson et al. in review). In 1999, they examined how prey availability and feeding success of YOY *P. americanus* varied around large, municipal piers (Duffy-Anderson and Able, in review). Janet recently moved west to take a research position at the NOAA/NMFS Alaska Fisheries Science Center in Seattle. There, she will identify biological sources of recruitment variation in marine and estuarine fish larvae. Specifically, she is interested in: 1) the contribution of density-dependent sources of mortality to overall cohort success, and 2) the behavioral and environmental factors affecting fish/prey distribution and covariability. Currently, she is examining the sensory development of larval and juvenile walleye pollock *Theragra chalcogramma* and the impacts of that development on functional responses in the field (feeding shifts, diel vertical migration).

In a continuation of studies begun many years ago Sue Sogard (now at NMFS in Newport, Oregon) and colleagues have completed an extensive analysis of *P. americanus* settlement in four New Jersey estuaries (Sogard et al. in review). Similar studies of this species on a broader geographical scale across identical habitats in different estuaries in New Jersey and Connecticut have examined the distribution and abundance (Goldberg et al. in review) and growth (Phelan et al. in press). Other studies are addressing food habits for the YOY of this species (Vivian et al., 2000). Rich McBride is still publishing papers from his dissertation that address issues of larval distribution and settlement for *Prionotus evolans* and *P. carolinus* (McBride et al. in review).

Pete Rowe, a postdoctoral fellow, and colleagues are addressing the lack of knowledge regarding juvenile fish assemblages of ocean beaches in New Jersey. Over the past two years (mid-May to late-October 1998-99) they captured 65 species in 477 beach seine tows along ocean beaches (many as YOY). This compares to 75 species taken in 283 tows along nearby estuarine beaches. Dominant species on ocean beaches by total abundance included *Menidia menidia*, *Anchoa mitchilli*, *Pomatomus saltatrix*, *Menticirrhus saxatilis*, *Ammodytes americanus* and *Brevoortia tyrannus*. YOY *P. saltatrix* are considered by some to be estuarine-dependent. Analysis of data sets from northern and southern New Jersey ocean beaches during 1995-1998 and the adjacent inner continental shelf indicate that the YOY (30-260 mm FL) of multiple cohorts use ocean habitats as nurseries from mid-July until their southward fall migration in late-September to mid-October (Able et al. in review). YOY bluefish on ocean beaches fed on a variety of invertebrates and fish prey but their diet changed with size; they were primarily piscivorous and feeding predominantly on engraulids by 80-100 mm FL. Thus, based on an analysis of distribution, abundance and feeding, YOY bluefish in the Middle Atlantic Bight are not strictly estuarine-dependent. In light of these results, Pete and Ken established a tag-and-recapture program to assess habitat fidelity and habitat specific growth of YOY bluefish in ocean habitats in 1999 and 2000.

While most of the emphasis at RUMFS has been on benthic fishes, Stacy Hagan completed her Master's thesis on YOY of the pelagic fish assemblages in Great Bay, New Jersey with an emphasis on seasonal and diel variation in assemblage structure. The results of these extensive, quantitative pop-net collections are submitted, and one (Hogan and Able, is in Review. Stacy is now the senior technician at RUMFS.

The restoration of areas dominated by the invasive plant *Phragmites australis* (common reed) to native salt marsh grasses is ongoing throughout much of the northeastern U.S. However, little is known about the response of fishes to this restora-

tion. As a preliminary step in evaluating YOY fish response to vegetation type and associated microtopography, Diana Raichel investigated *Fundulus heteroclitus* larvae, juvenile, and adult abundance and distribution among three marsh types within the Hackensack Meadowlands, NJ as part of her Master's degree at the Rutgers University Ecology and Evolution Graduate Program. She collected pit trap samples (n=18) biweekly in June, July, and August of 1999 from *Spartina alterniflora*, *Phragmites australis*, and bare substrate sites. She found dramatically higher larval and small juvenile abundance in *Spartina* relative to the *Phragmites* and bare substrate stations. Larger juveniles and adult mummichog were similarly abundant across all three habitats. Her results and those of similar studies by Stacy Hagan and Ken Able in the Delaware Bay and elsewhere (Able and Hagan, 2000), suggest that the low abundance of larvae in *Phragmites* marshes may be due to a lack of appropriate spawning substrate and/or larval fish microhabitats on the marsh surface.

A variety of other studies at RUMFS has emphasized the juvenile stages of fishes that use estuaries. Much of that work is being carried out in Delaware Bay and surrounding marshes (Able et al., 2000) as part of a series of projects begun in 1996 with funding largely from the Public Service Electric and Gas (PSE&G) Estuary Enhancement Project (EEP). EEP restoration of some 10,000 acres of marshland provided some unique opportunities for the study of fish recruitment to, and utilization of mesohaline and oligohaline salt marshes.

Both James Chitty (Graduate Program in Ecology and Evaluation) and Steven Teo (Graduate Program in Oceanography) earned a Master's degree at Rutgers University for their work on the role of marshes as nursery grounds for resident marsh fishes. James compared a restored salt hay farm and a reference marsh along the Delaware Bay as habitat for young sheepshead minnow, *Cyprinodon variegatus*. He found similar abundance and size frequency distributions among restored marsh pond, intertidal creek, and a reference marsh pond habitats from May-December 1998 using coded

wire tagging and recapture methods. Recapture rates were greatest in restored intertidal creek habitat (9.3%) and less in reference (6.7%) and restored (4.7%) marsh ponds. Tagged fish displayed site fidelity with 92.5% of those recaptured remaining within their tagging site for up to 113 days. Growth rates of tagged fish were similar between restored (0.06 mm/d) and reference (0.09 mm/d) marsh ponds but significantly higher in restored intertidal creek (0.13 mm/d) habitat. James recently began work with an environmental consulting agency.

Steven Teo investigated the movement and population dynamics of juvenile and adult *Fundulus heteroclitus* in a restored marsh in Delaware Bay. Working in waist-deep mud and donating several gallons of blood to greenhead flies, he tagged some 15,000 fish. Mummichogs proved to have ranges on the scale of tens of hectares/hundreds of meters scale, rather than the tens of meters found previously. Steven also improved upon previous estimates of the growth and production of mummichog. He left RUMFS to begin a Ph.D. with Dr. Barbara Block of Stanford University on the effects of oceanography on tuna movement; i.e., bigger fish, bigger pond.

Postdoctoral fellow Michael J. Miller and his associates at RUMFS recently wrapped up a study on the ecology and life history of some YOY estuarine and coastal fishes in southern New Jersey. Mike and Dave Nemerson also analyzed five years of data to characterize the early life history of larval and YOY Atlantic croaker in the Delaware Bay system and found that these early life stages extensively used marsh creeks (Miller et al. in review). In order to follow up on these findings, they used internal coded wire microtags to study the movements and growth of YOY *Micropogonias undulatus* in tidal creeks in both restored and reference marshes (Miller and Able in review). YOY Atlantic croaker showed a strong tendency to remain within the same tidal creeks until egress in the fall. In 1999, Mike, in collaboration with Pete Rowe, addressed the biology of YOY *Menticirrhus saxatilis* in a tag-and-recapture study along estuarine and ocean beaches in southern New Jersey. The YOY used both estuarine and ocean beach habitats and showed very rapid individual growth rates.

Mike moved to Japan in 2000 to begin postdoctoral research with Dr. Katsumi Tsukamoto at the Ocean Research Institute of the University of Tokyo. There he is developing identification methods for leptocephali and is studying their distributional ecology in the western Pacific Ocean.

Tom Grothues joined RUMFS in May 1999 as a postdoctoral fellow after finishing studies at SUNY-Stony Brook on larval fish exchange around Cape Hatteras. With Ken Able and a small army of graduate technicians, students, and volunteers, he became involved in monitoring the success of marsh restoration efforts over the length of Delaware Bay. In the lower bay, the opening of formerly diked salt hay farms to tidal inundation created new fish nursery habitat. Juvenile fishes appear to utilize restored salt hay farm habitat in the same way as reference habitat (Able et al. in press, in review). Attempts at eradication of invasive common reed in the oligohaline upper bay should allow re-growth of more favorable grasses (*Spartina alterniflora* and *S. patens*). The effort is aimed directly at the marsh surface and the YOY of species such as *Fundulus heteroclitus* and *Menidia menidia* that live there, but could impact the larger fish assemblage through trophic cascades. Understanding of restoration effects in the upper bay is being addressed by the addition of restored, un-restored, and naturally unaffected (i.e. no reed growth) sampling locations within a single large oligohaline marsh tract. Tom plans to further use the long-term data sets from Delaware Bay to address questions on recruitment and early life history of estuarine fishes.

The dissertation of fifth year Ph.D. student Dave Nemerson is an integral part of the Delaware Bay salt marsh restoration monitoring project. Addressing geographic, seasonal and ontogenetic patterns in the food habits of five fish species, Dave's work seeks to determine the quality of restored marshes as forage habitat for YOY fish. During field seasons in 1997 and 1998, he assembled one of the largest estuarine food habits data sets ever collected, detailing the food consumed by over 15,000 individual fish of five species (*Anchoa mitchilli*, *Morone americana*, *Leiostomus xanthurus*, *Micropogonias undulatus*, *Cynoscion regalis*), stratified by fish size, month, site, creek order,

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and tide-stage of collection. With data simultaneously collected on fish distribution and abundance, size structure and food habits, he will be able to assess many aspects of the trophic ecology of fishes, including the nature of spatial and temporal resource partitioning of YOY fishes, patterns of ontogenetic feeding behavior and the suitability of restored marsh sites as fish nursery habitat. Preliminary results indicate that restored marshes, particularly in the more saline reaches of the lower bay, provide nursery habitat that is at least equivalent to nearby reference sites.

Work in Delaware Bay continues with Ken Strait and John Balleto, both Rutgers University graduate students (Graduate Program in Ecology and Evaluation) at RUMFS. Ken Strait will be examining aspects of the distribution and life history for YOY *Morone americana* and *Morone saxatilis*. Although these species have been intensively studied in a variety of habitats and fishery scientists have a general understanding of their life history and seasonal movements, limited information is available concerning specific use of tidal marsh habitats and the adjacent bay by YOY. In addition to published data sets for the Delaware Estuary, Ken will be analyzing the extensive, unpublished datasets compiled by Public Service Electric and Gas Company in association with its Salem Generating Station monitoring programs. Multiple-year data sets from small marsh creeks, large marsh creeks, near shore shallows, and the open bay will be examined to elucidate information concerning relative abundance, habitat use, growth rate, daily and seasonal movement, and ontogenetic changes in these parameters.

John Balleto will be investigating aspects of the early life history of sciaenid fishes of Delaware Bay, specifically, *Cynoscion regalis*, *Leiostomus xanthurus*, *Micropogonias undulatus*, *Bairdiella chrysoura*, *Menticirrhus saxatilis*, and *Pogonias cromis*. He will examine how physical, chemical and biological factors affect the distribution and habitat utilization of these species while focusing predominantly on YOY. Analysis will be based on a variety of Delaware Bay data sets, including those collected by the states of New Jersey and Delaware and PSE&G's Es-

tuary Enhancement Program. These are large data sets, some of which span 20 years.

A collaborative effort between Bob Cowen and Mark Sullivan (University of Miami), Mike Fahay (NMFS, Sandy Hook) and Ken Able extends an understanding of settlement of fishes to the continental shelf. Through the study, they have been examining patterns of habitat use and spatial scales of settlement in the New York Bight since 1994. As a result of four submersible cruises, they have much improved understanding of the spatial scales necessary to assess patterns of settlement (Sullivan et al in review) and determined that settlement seems to vary with individual species with distinct patterns evident over the 20 - 90 m sampling depth range. The dominant species observed during the summer sampling period include: *Limanda ferruginea*, which appears to be associated with a cool pool of water on the mid-shelf; *Hippoglossina oblonga*, which is the most inshore and shallowest in its distribution, *Citharichthys arctifrons*, which is found in the deepest transects and *Merluccius bilinearis*, which can be found across a broad depth range. Subsequently, they have extended these studies to include the impact of scallop dredging on settlement particularly for *L. ferruginea*.

In a continuing effort to improve our understanding of YOY fish habitat on the inner continental shelf Ken and colleagues (Bob Diaz and Randy Cutter of the Virginia Institute of Marine Science and Roger Flood of SUNY - Stony Brook) have been mapping habitats with detailed multi-beam bathymetry and assessing fish use of habitats with a towed camera sled at the Long-Term Ecosystem Observatory (LEO-15) outside Little Egg Inlet during 2000.

As of this writing, Ken Able is on a short sabbatical at the NOAA/NOS Center for Coastal Fisheries and Habitat Research in Beaufort, North Carolina. He will return to Rutgers in May 2001.

The RUMFS website is at <http://www.marine.rutgers.edu/rumfs/index.html>

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#### **Northeast Utilities Environmental Laboratory, Waterford, CT**

NUEL, located at Millstone Nuclear Power Station on the shore of Niantic Bay in eastern Long Island

Sound, presently consists of 15 scientists and technicians having specialties in various disciplines of aquatic ecology and marine biology. Investigators include Dale Miller, Ernest Lorda, Christine Tomicheck, Dave Colby, Greg Decker, Dave Dodge and Don Danila. Studies of power plant impact have been ongoing at Millstone since the late 1960s, with many of the current monitoring programs in place since the mid-1970s. Besides various finfish sampling programs, including an extensive program examining the winter flounder, current work also focuses on American lobster, eelgrass, benthos, and the rocky intertidal community. Former sampling programs included woodborers and biofoulers, phyto- and zooplankton, and studies of shellfish. Of relevance to early life history of fishes, an ichthyoplankton entrainment monitoring program has been in place since 1976, gathering information year-round on the densities of various fish eggs and larvae passing through the condenser cooling-water system of Millstone Station. From late winter through early summer, scientists at the lab deploy weekly a 60-cm bongo sampler from one of the laboratory's two 36-foot research vessels in targeting larval winter flounder at three stations within the nearby Niantic River (flounder spawning grounds) and one in Niantic Bay. Following larval metamorphosis, sampling continues for demersal juvenile flounder with a 1-m beam trawl from late May through September at two stations within the Niantic River. Both programs have been completed since the early 1980s. In the past, NUEL scientists have completed a number of special field studies on larval winter flounder distribution (for example, in relation to tide or diurnal period) and in more recently, on the spatial and temporal distribution of tautog eggs in waters near Millstone during their summer period of occurrence.

Throughout the years, Northeast Utilities and Millstone Station has committed to many cooperative studies, primarily with researchers at universities within Southern New England. At present, NUEL is undertaking two winter flounder stock identification studies using larvae. Yolk-sac larvae were collected earlier this year at winter flounder spawning grounds within the Niantic and Thames Rivers and near the mouth of the Connecticut River. Larvae are being

characterized using two methods: nuclear DNA and multi-elemental analysis. Each of these three winter flounder stocks could present a unique genetic or trace metal signature. With time, many of these larvae are transported away from these spawning areas into Long Island Sound, where some of them become susceptible to entrainment at Millstone Station. Researchers are currently collecting the older, more developed larvae typically entrained at Millstone and will endeavor to determine their origin, based on the findings of the initial part of this study. A second study just beginning is the examination of the survival of winter flounder larvae following their entrainment through the plant cooling-water system. Heretofore in impact assessments, 100% mortality of entrained fish eggs and larvae was assumed, although there is considerable anecdotal information that many individuals survive plant passage.

Working with Alden Research Laboratory of Holden, MA, NUEL members designed a pump sampler to be used at the power plant discharge to collect ichthyoplankton following entrainment. They will examine larvae for initial mortality and will hold survivors for up to 96 hours to examine for any latent mortality. They will also target tautog and cunner eggs in this study later in the year. Finally, a collaborative effort with the University of Connecticut, will examine the total seasonal fecundity of tautog, a serial spawner. The objective of this work is to verify the findings of Geoffrey White's research on tautog reproductive biology in Virginia for the more northerly Long Island population. Adult tautog will be captured and held for spawning in tanks at the University of Connecticut's new Avery Point facilities. Fortunately, this species spawns readily and predictably in the laboratory.

For more details on ecological studies conducted at Millstone Station please contact  
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**From the laboratory Judith Weis at Department of Biological Sciences, Rutgers University in Newark, NJ.**

Graduate student Maryanne Carletta is investigating the development of thyroid gland abnormalities noted previously in a population of mummichogs from the polluted Piles Creek (off the Arthur Kill). As adults and juveniles, the thyroid gland of these fish is hugely enlarged, and the T4 levels are also elevated. T3 levels are lower than that of reference fish from Tuckerton, but that difference is not statistically significant. The fish have abnormal behavior as well, being generally "slow." They are poor at catching grass shrimp prey and are more easily captured by predators. Maryanne is studying larval fish from Piles Creek and Tuckerton, examining thyroid hormone levels as well as the histological appearance of the gland, and is finding that about 15 mm TL is the point at which affected fish begin to diverge from normal in regards to histology and hormone levels.

Jennifer Samson is studying responses of larval mummichogs (*Fundulus heteroclitus*), sheepshead minnow (*Cyprinodon variegatus*), and juvenile winter flounder to the toxic dinoflagellate, Alexandrium. Exposure of *Cyprinodon* larvae is directly by consuming the algae, while exposure of *Fundulus* larvae and juvenile winter flounders (*Pseudopleuronectes americanus*) is via a copepod vector. She is examining how much consumption can cause mortality and how much causes behavioral effects, and is also looking at gut retention time for the toxic meal in the different fish species.

## North Central Region

Bruce Comyns reporting

This report begins with an overview of the ongoing yellow perch research in Lake Michigan to determine the reasons for recruitment failure of this species dur-

ing the past decade. This work has involved many researchers from the four states around the lake (Wisconsin, Illinois, Indiana and Michigan). Much of the information for this review was provided by David Clapp of the Michigan Dept. of Natural Resources in the form of a portion of a recent annual report submitted by the Yellow Perch Task Group (YPTG). This group was formed in 1994 and has subsequently been given the following charges: consolidate the available data on yellow perch in Lake Michigan and assess its compatibility; evaluate and study the discreteness of stocks in the lake; and develop a multi-agency initiative to identify likely causes for the lack of perch recruitment.

The YPTG has completed a summary of data collection efforts by research and management agencies around Lake Michigan. Where possible, these efforts have been standardized across jurisdictions. This initial charge will be fulfilled when standard procedures are used to sample yellow perch throughout the lake. The second charge, to evaluate and study the discreteness of stocks in the lake, is in the final stages of completion; 66,020 fish were tagged during the period 1996-1999 (~6% return), and a study of perch genetic structure is underway at the University of Minnesota (Loren Miller and Anne R. Kapuscinski, Principal Investigators).

The third charge of the YPTG, i.e. to identify likely causes for the lack of perch recruitment, is particularly germane to the study of the early life-history of fishes because many signs point to early life stage failure. This ongoing research initiative represents a significant lake wide coordination effort involving management agencies, universities and Sea Grant researchers from throughout the basin. This research has been largely based on 17 hypotheses that were developed in 1995 by the YPTG to address possible factors limiting survival of yellow perch. Based on research efforts by YPTG members several of the initial hypotheses were rejected, and in 1999 a revised list of hypotheses was compiled. It was concluded that pre-demersal survival is limiting recruitment, although it was recognized that more work is needed to assess the potential influence that a stock-recruitment relationship may have on recruitment. Sub-hypotheses for possible explanations for the low pre-demersal

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survival address predation by alewife, water temperature, advection, and diet, including zooplankton density, size and composition. Many of these hypotheses are being actively addressed by current funded research projects. The results of several of these projects follow.

**University of Michigan  
Center for Great Lakes & Aquatic Sciences**

David Jude has been involved with research to determine the densities of larval yellow perch in Lake Michigan and to compare these data with historical information and data from other lakes to ascertain whether densities have changed recently and whether there are lakewide differences in densities. Preliminary findings indicate that densities of yellow perch larvae on the Michigan side of the lake seem to be similar to densities during peak recruitment years and prior to the colonization of the lake by zebra mussels around 1989. This suggests that high mortality occurs between hatching and the benthic juvenile stage when yellow perch become susceptible to trawls and seines. However, Jude and his colleagues have had difficulty capturing this "terrestrial" phase (between 10 and 30 mm) so have been unable to track when this apparent high mortality event occurs. Efforts have now been directed at the influence of currents and upwellings on the distribution of hatchlings in the lake. Jude noted that John Janssen (Univ of Milwaukee) thinks that spawning may be concentrated in rocky areas on the Wisconsin side and over the few rocky reefs on the eastern side of the lake, with larvae being advected from these areas to other areas in the lake depending on currents. Jude will be testing these hypotheses this summer by doing more offshore work. In addition, he is working with otoliths to determine birth dates of juvenile yellow perch in an effort to ascertain whether juveniles captured in southern Lake Michigan in fact originated from eastern Lake Michigan. The estimates of larval yellow perch densities showed that densities were much lower in Illinois and Wisconsin than in Michigan, which may be related to the commercial fishery in Illinois and Wisconsin which was selectively removing large females which grow faster than males. There is only a sport fishery in Michigan, so the decreased impact on

spawning adults may explain the higher densities of larvae. This suggests that any recovery may originate in eastern lake Michigan. Estimates of year class strength based on seine index catches showed that 1998 was a good year and happened to also be an el niño year, which also favored alewife survival. However, that year class has not grown well and appears now not to be contributing much to the adult recruitment hoped for in the lake.

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Current research being conducted by Matthew Balge (Michigan State University) and Doran Mason (NOAA Great Lakes Environmental Research Laboratory, and Michigan State University) is aimed at gaining a better understanding of the mechanisms affecting early life-history survival of yellow perch in Lake Michigan. In this regard, estimates of abundance and spatial distribution for larvae, food resources and potential predators are often critical. In general, net sampling to estimate larval densities often includes biases due to gear avoidance, with gear avoidance increasing with larval growth and development. To help alleviate these biases, Matt and Doran are applying mobile side-looking and down-looking hydroacoustics techniques for simultaneous measures of density and spatial distribution of larval fishes and their pelagic predators. To determine the feasibility of this method, hydroacoustics data were collected in conjunction with neuston net data on Lake Michigan near Waukegan Harbor, IL in June-July 2000. Preliminary analysis showed that hydroacoustics estimates of larval fish density, collected shortly after larval emergence, compared favorably with neuston net estimates. Hydroacoustics estimates from the side-looking application were extremely sensitive to sea-state, with best estimates occurring on calm nights. Continued field effort is scheduled for the spring and summer of 2001 and 2002. In addition, laboratory hydroacoustics measures of yellow perch larvae at

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various sizes and developmental stages are planned in order to construct target strength to larval size relationships. Funding for this project comes from the Great Lakes Fishery Trust.

**Aquatic Ecology Laboratory, Department of Evolution, Ecology and Organismal Biology  
Ohio State University**

Although the species receiving the most attention in the north central region is the yellow perch, many other species are also being studied. Kristin Arend, a graduate research assistant, is studying the influence of turbidity and zooplankton size on the recruitment and depth distribution of larval bluegill and larval gizzard shad. Working with Kristin are Chad Doherty, Roy Stein and Mary Bremigan. This research, which Kristin is conducting for her Master's thesis, is part of a larger NSF-funded collaborative project, "Impacts of a strong regulator along a productivity gradient: linking watersheds with reservoir food webs." It explores the individual and interactive effects of turbidity, light intensity, and zooplankton size structure and depth distribution as potential mechanisms driving the differential year class strength of larval bluegill and gizzard shad among Ohio reservoirs spanning a productivity gradient. Field work was conducted to examine how these factors affect the depth distribution and foraging success of bluegill and gizzard shad larvae, and thus influence their growth and survival. It was hypothesized that larval bluegill may be at a greater foraging disadvantage than larval gizzard shad under highly turbid conditions in which visual conditions are reduced and only small zooplankton are available. Furthermore, it was hypothesized that increased turbidity may alter larval distribution within the water column by reducing the optimal foraging area to the top meter of highly productive reservoirs. This could yield two possible outcomes: (1) both gizzard shad and bluegill larvae concentrate in the top meter of the water column, where they may experience increased competition for food resources; (2) high densities of gizzard shad larvae concentrate in the top meter of the water column and restrict bluegill larvae to deeper water, where sub-optimal visual con-

ditions likely reduce foraging success.

Weekly field sampling was conducted from May through July 2000, in the upstream and downstream regions of one mesotrophic and two eutrophic reservoirs. Reservoirs were selected to encompass a broad range of turbidity and productivity levels, with some overlap among systems. Turbidity, light intensity, dissolved oxygen, and temperature were measured at 0.5- and 1.0-meter (m) intervals to assess the physical environment. Zooplankton were collected at 1.0-m intervals to compare species composition, size structure, and depth distribution within and between reservoirs and, thus, assess larval food availability. Larval bluegill and gizzard shad were collected at 1.0-m intervals to a depth of 5 m using Miller high-speed fry samplers. Larval diets, growth, and relative abundance at each depth will be compared both within and among reservoirs. The range of physical conditions encountered both within and among reservoirs will enable a determination of how turbidity levels, light intensities, and zooplankton size structure and distribution independently and interactively affect larval depth distribution, growth, and survival. Multivariate analysis will be used to assess the likelihood that turbidity, light intensity and zooplankton size structure and depth distribution are important mechanisms influencing gizzard shad and bluegill year class strength in Ohio reservoirs.

**UPCOMING MEETINGS**

The 26th Annual Larval Fish Conference will be held in Bergen, Norway. Our goal is to attract the complete range of researchers working on the early life history of fishes: from embryologists through to fisheries ecologists.

Details about the meeting - including the venue (the beautiful Solstrand Fjord Hotel), planned theme sessions, and tourist information --are already available on the LFC 2002 internet site:

[www.fishlarvae.com/lfc](http://www.fishlarvae.com/lfc)

You may express your interest in the Conference by adding your name to our mailing list (online), or by

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contacting the organizer at:

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We hope that you are as excited about this event as we are, and we look forward to seeing you in Bergen in July 2002!



View of the Hotel in Bergen which has been booked for the 2002 LFC Meeting.

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