Newsletter of the Early Life History Section of the American Fisheries Society

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# ELHS Back Then

- 5 years ago: 29th LFC held at University Pompeu Fabra in Barcelona.
- 10 years ago: Section approves its first subvention to support creation of a new book.
- 15 years ago: Tom Miller gives the ELHS newsletter a new look and a new name: STAGES
- 20 years ago: Section membership climbs to 39 countries on six continents.
- 25 years ago: ELHS newsletter publishes its very first photo, a shot of the Section's Executive Committee (Nancy Auer, Joan Holt, Bill Matthews, Bob Muth, Bob Hoyt, Neal Foster, and Fred Binkowski).
- 30 years ago: At the 4th annual Larval Fish Conference, Van Conner reported first evidence for natural reproduction of grass carp in US.

Deadline for material to be included in the next issue of **Stages**:

May 1, 2010

# "21st Century Larval Fish Biology: Responding to a Changing Environment"

is the theme of the 34th annual Larval Fish Conference to be held in Santa Fe, New Mexico, May 30 - June 3, 2010. This year's conference will be held at the Fort Marcy Hotel Suites in Santa Fe, New Mexico, USA. The hotel is located amidst nine acres of natural and landscaped grounds and gardens and is just a four-block walk from the historic downtown Santa Fe Plaza. Co-organizers for the conference are lone Hunt von Herbing, University of North Texas (vonherbing@unt.edu), and Joan Holt, Marine Science Institute, University of Texas at Austin (joanholt@mail.utexas.edu).

Early registration closes March 22<sup>nd</sup> and abstract submission closes on March 24<sup>th</sup>, 2010; late registration ends on May 15<sup>th</sup>. Please see the Larval Fish Conference website for more details (www.larvalfishcon.org).



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# **President's Message**



I am really looking forward to the Larval Fish Conference in May. First, the LFC is a great meeting: small enough to have a sense of community and to allow plenty of opportunity to meet and talk

with other scientists, but large enough to have a diverse array of interesting sessions and presentations. The LFC is so unlike those monstrous meetings where talks continue likes chocolates on an assembly line and you are lucky to see someone twice even if you are sharing a room with them.

Second, the focus of the LFC is unique - well almost unique. The meeting doesn't revolve around a discipline. Rather it centers on the unique challenges of studying the early life stages of fishes. The LFC encompasses much more than the name implies. It is not limited to larvae: reproduction, eggs, larvae

and juveniles are all fair game. The name Larval Fish Conference is just simpler than the Non-Adult Stage Fish Conference or the Early Life Stage Fish Conference. Also, the Fish in Larval Fish Conference is broadly defined. There have been sessions on larval cephalopods and talks on the early life stages of crabs and clams. Again, the LFC is just easier than the Larval Fish and Shellfish Conference or the Larval Living Aquatic Resources Conference. So for those of you who feel limited by the name, understand that the LFC is inclusive and covers a broad array of taxa, stages, and disciplines. That said, I have been hearing rumors of a future bid that hopes to organize a joint Larval Fish Conference / Larval Biology Meeting sometime this decade. Maybe we will find out more at the Early Life History Section Business Meeting.

# **News from the Regions**



# European Region

**Audrey Geffen** 

From: Francisco Alemany, Larval ecology and recruitment group, Centro Oceanográfico de Baleares del Instituto Español de Oceanografía, Spain

Our team works on ELH of a variety

of taxonomic groups; but at present is mainly focused on Atlantic Bluefin (ABT) and related species larval ecology. This line of research was initiated in 2001 by a multidisciplinary group of the Spanish Institute of Oceanography (IEO) (www. ieo.es), including ichthyoplanktologists, fisheries biologists, and chemical and physical oceanographers from several IEO labs. Within the framework of the TUNIBAL project, whose immediate general objectives were to determine the influence of environmental factors on the location of ABT spawning areas and to characterize the environmental scenarios favoring ABT larvae survival, five summer hydrographic-planktonic surveys were carried out off the Balearic Islands, one of the main spawning areas of the ABT eastern stock. Around 200 stations, located on the nodes of a 10 x 10 nautical mile regular grid, were sampled by year. At each station a hydrographic profile was performed by means of a Seabird



sensors, and water samples at different depth were obtained from a rosette of Niskin bottles for nutrients and chlorophylls determination. In addition, several plankton hauls were carried out: oblique tows with Bongo 60 nets fitted with 200 and 333 µm meshes; Bongo 90 equipped with 500 µm meshes sub-surface horizontal tows and vertical micro-zooplankton tows by means of Calvet nets. Part of ABT and other tuna (albacore, bullet tuna) larvae were sorted on board and preserved in liquid nitrogen for nucleic acids and daily growth analysis to determine larval condition. Preliminary

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# Pacific Rim Region

**lain Suthers** 

# From: Lynnath Beckley, Murdoch University

At Murdoch University in Fremantle, Western Australia, work has continued on larval fish assemblages associated with the Leeuwin Current and its eddies. Lynnath Beckley and co-authors have recently reviewed what is known about larval fishes off Western Australia as part of the proceedings of the Leeuwin Current Symposium (*J Roy Soc WA* 92:101-109).

David Holliday has completed his PhD which examined the cross-shelf transport and incorporation of larval fishes into an evolving anticyclonic (warm-core) Leeuwin Current eddy. This research, supervised by Lynnath and Dr Ming Feng (a physical oceanographer from CSIRO), was part of a larger interdisciplinary biophysical investigation of Leeuwin Current eddies which covered everything from physics to fish! Larval fish assemblages from shelf and offshore waters within the eddy field were sampled using neuston, bongo, and depth-stratified EZ nets, and these data were supported by concurrent oceanographic measurements (CTD, ADCP, etc). The dynamic oceanography, particularly large-scale mixing, reflected in the waters of the eddy as well as the larval fish assemblages. The onshore-offshore distributions of mesopelagic and neritic fishes highlighted

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# **Section Officers**

911 CTD, equipped with turbidity,

fluorimetry and dissolved oxygen

# President

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Pilar Olivar from Barcelona visiting the Murdoch Fremantle lab to assist with identification of larval myctophids from the Leeuwin Current. Left to right David Holliday, Pilar Olivar, Lynnath Beckley and Natalie Millar.

vigorous cross-shelf transport processes. The occurrence of the larvae of near-shore fishes such as Gobiidae and Tripterygiidae, in the eddy (200 nm offshore) indicated their incorporation into the poleward flowing Leeuwin Current from lower latitudes north of the eddy field. Examination of the vertical distributions of larval fishes and current vectors gave insights into this transport process. It was concluded that, although neritic fish larvae were incorporated into the eddy, the prevalence of these eddies in the austral autumn does not coincide with the summer peak in spawning of most inshore fish species, thereby preventing loss of their larvae to "predatory" eddies.

Larval fish material from a research cruise covering most of the latitudinal range

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David Holliday and Lynnath Beckley with the multiple opening and closing EZ net they used off the RV Southern Surveyor to examine vertical distribution of fish larvae in the Leeuwin Current eddy field.



# Western Region

**Dan Margulies** 

# From: Hatfield Marine Science Center

A substantial amount of early life history research had been conducted in the northern California Current (NCC) in the 1970s by Sally Richardson and her collaborators and again in the 1980s by Miriam Doyle and colleagues at the Alaska Fisheries Science Center (AFSC). After a lengthy hiatus, interest in early life history has been renewed under a cooperative research program between the Northwest Fisheries Science Center and Oregon State University researchers based at the Hatfield Marine Science Center in Newport, Oregon. Below are some examples of the work in progress that has built on the results of the earlier successful programs.

1) We conducted a statistical analysis to characterize the influence of large-scale and local environmental factors on the presenceabsence, concentration, and community structure of the larval fish population within the NCC ecosystem, based on samples collected at two nearshore stations along the Newport Hydrographic line (NH, 44° 39' N) off the central Oregon coast. Data from 1996-2005 were compared with historical data from the 1970s and 1980s to evaluate pseudo-decadal, annual, and seasonal variability. Our results indicate that the most abundant taxa from 1996-2005 differ from those of earlier decades. Concentrations of the dominant taxa and total larvae were generally greater in the winter/spring than summer/fall season. Using generalized additive modeling, variations in presenceabsence and concentration of taxa were compared to climate indices such as the Pacific Decadal Oscillation. Northern Oscillation Index, and the Multivariate ENSO Index and local environmental factors, such as upwelling. Ekman transport, and wind stress curl. Significant relationships were found for various combinations of environmental variables with lag periods ranging from zero to seven months. We found that the large-scale climate indices explained more of the variance in larval fish concentration and diversity than did the more local factors. Our results indicate that readily-available oceanographic and climate indices can explain variations in the dominant ichthyoplankton taxa in the NCC. Results from this work were presented at the 2009 Larval Fish Conference in

Oregon, and will be presented again at the 2010 PICES Climate Change symposium in Japan in April. A manuscript has also been submitted to Fisheries Oceanography: Auth, T.D., Brodeur, R.D., Soulen, H.L., Ciannelli, L., and Peterson, W.T. (Submitted). An investigation of the response of fish larvae to decadal changes in environmental forcing factors off the Oregon coast.

2) We have conducted monthly ichthyoplankton sampling along four transects in the NCC from May to September from 2004 to the present as part of the Stock Assessment Improvement Plan (SAIP) project. The 489 ichthyoplankton samples collected from 28 monthly cruises between May and October/November during the six study years yielded 16,524 fish larvae comprising 60 taxa in 30 families. The dominant taxa, comprising 94% of the total larvae collected, were: Engraulis mordax (northern anchovy), Sebastes spp. (rockfishes), Stenobrachius leucopsarus (northern lanternfish), Tarletonbeania crenularis (blue lanternfish), and Lyopsetta exilis (slender sole). Total larval concentration dramatically decreased from 328.0 per 1000 m3 in 2005 to 92.0 per 1000 m<sup>3</sup> in 2006, before steadily increasing each year to a high of 337.4 per 1000 m<sup>3</sup> in 2009. Seasonal concentrations were highest for S. leucopsarus and L. exilis larvae in May and June and for E. mordax and Sebastes spp. larvae in June and July, while concentrations of T. crenularis larvae showed little seasonal fluctuation. Larval diversity was highest in September and lowest in June and July. Larvae generally were evenly distributed between northern and southern stations, except for Sebastes spp. and L. exilis larvae that were found in significantly higher concentrations in southern than northern stations, and S. leucopsarus larvae that exhibited the opposite distribution pattern. Ordination and multidimensional scaling analysis revealed the presence of three distinct cross-shelf assemblages: coastal (6-39 km from shore), offshore (46-102 km), and faroffshore (115-238 km). Concentrations of all of the dominant species and total larvae were higher in the offshore and far-offshore regions than in the coastal region, while larval diversity was highest in the coastal region. A multi-response permutation procedure showed that annual, seasonal, latitudinal, and cross-shelf gradients of taxonomic associations existed, while an indicator species analysis identified significant indicator taxa for most years (i.e., 2004, 2005, 2006, 2008), months (i.e., May, June. July). latitudinal transects (i.e., two north, one south), and all three cross-shelf regions. A BIO-ENV multivariate procedure revealed that distance from shore, surface



# North Central Region

Jim Garvey

# From: U. S. Fish and Wildlife Service. South Dakota

Spatial and temporal patterns of larval fish in the lower Niobrara River – Greg A. Wanner, Kristen L. Grohs, and R. A. Klumb, U. S. Fish and Wildlife Service, Great Plains Fish and Wildlife Conservation Office, Pierre, South Dakota.

The Niobrara River is a large tributary that provides important seasonal increases in discharge, temperature, sediments, and nutrients to an inter-reservoir reach of the Missouri River between Fort Randall and Gavins Point dams. There is substantial evidence of the importance of the Niobrara River to native species in the Missouri River such as pallid sturgeon, shovelnose sturgeon, paddlefish, and sauger. However, knowledge was lacking on the fish community in the Niobrara River and no information was available on which fish were successfully spawning in the Niobrara River. Our objectives were to examine the spatial and temporal patterns of larval fish drift in relation to discharge and temperature in the lower Niobrara River.

Sampling for larval fish occurred weekly from May to August in 2008 and 2009 at two sites that included the mouth of the Niobrara River and 63 kilometers upstream directly below Spencer Dam, Nebraska. Samples were collected in the morning and the afternoon at each site to address diel

occurrence of larval fish. Larval nets were 50 cm high, 100 cm wide, 500 cm long, with 500  $\mu$ m mesh and fished on the bottom the river.

In each year, larval fish began to appear in the drift during the first week of May and ended the third week of August when mean daily temperatures began to decrease. Larval river carpsucker were the most abundant species in the drift during early-June and Notropis spp. (red shiner and sand shiner) from mid-June to mid-August, with many Lepomis spp. appearing during early-July. Few differences in larval fish drift were found between diel sampling periods likely due to the naturally high turbidity (mean NTU > 74) of the Niobrara River.

Larval fish abundances were generally higher at the mouth for most fish species, but only after a peak in abundance at the Spencer Dam site. A protracted spawning period was observed for many fish species with bimodal peaks in larval fish relative abundance. Water temperature appeared to influence the timing and numbers of larval fish drift while discharge had less of an effect.

# From: Southern Illinois University- Carbondale

From the U.S. Department of Agriculture's mid-south Agricultural Research Service in Stoneville, Mississippi, Dr. Brian Small Joins the faculty of the Fisheries and Illinois Aquaculture Center. "Dr. Small is quite a catch for SIUC," said Center Director James Garvey. Small's research is at the forefront of fish physiology and production. He spends a lot of time identifying the physiological mechanisms that regulate growth and reproduction and identifying specific genes that allow certain fish to grow faster and ultimately produce more offspring. At Southern Illinois University, one aspect of Small's research will focus on developing techniques to raise shovelnose sturgeon in captivity, both to boost species numbers and to meet the demand for caviar. His research includes efforts to determine the mechanisms of germ cell migration in sturgeon, as well as in channel catfish, and efforts to determine the effects of environment and nutrition on early development and survival. The overreaching goal of Small's research is to improve fish culture productivity, and as such, he places an emphasis understanding the mechanisms regulating development at all life stages. §



spp. appearing during early-July. In the wet lab at Southern Illinois University Carbondale, Few differences in larval fish fish physiologist Brian C. Small shows four shovelnose drift were found between diel sturgeon. Small, newly arrived at SIUC, is at work on sampling periods likely due to ways to raise this species in captivity. Success would rethe naturally high turbidity (mean lieve fishing pressure on dwindling numbers of wild fish NTU > 74) of the Niobrara River. while providing a new option for fish farmers.



# Northeast Region

## **Mark Wuenschel**

Rich McBride of the Woods Hole Lab, Northeast Fisheries Science Center provided the following update on the description of a new species of ladyfish.

McBride, R.S., C.R. Roche, R. Ruiz-Carus, and B.W. Bowen. 2010. A new species of ladyfish, of the genus Elops (Elopiformes: Elopidae), from the western Atlantic Ocean. *Zootaxa* 2346:29-41.

Richard McBride and colleagues published this paper based originally on the recognition of two morphs of ladyfish among several ichthyoplankton collections. In a 1989 book (Memoir Sears Foundation for Marine Research. Number 1. Fishes of the Western North Atlantic. Part Nine. Volume Two: Leptocephali), David G. Smith of the Smithsonian, National Museum of Natural History, examined over 400 larvae and found that the myomere counts fell into two distinct groups. He sorted the low-count and high-count larvae by sampling location and further postulated that there were two allopatric species of ladyfish in the western Atlantic Ocean.

He was right. You can read where these findings led McBride et al. in their open access publication: www.mapress.com/zootaxa/2010/f/zt02346p041.pdf §

#### Pacific Rim...cont'd from p. 3

of the Leeuwin Current (22° - 34° S) during the austral autumn of 2007 has now been processed and identified as part of David's PhD and Natalie Millar's Honours project. Analysis is almost complete, and interesting long-shelf and cross-shelf distribution patterns are being revealed which appear to be linked to meso-scale processes of this anomalous boundary current. Other macro-zooplankton in these samples, such as lobster phyllosoma larvae and krill, are also being investigated.

On a more local scale, Honours student Nick Breheny, has examined the ichthyoplankton assemblages associated with the annual summer spawning aggregation of the sparid *Pagrus auratus* in the few embayments that occur along the otherwise linear and lengthy Western Australian coastline. He found a range of other coastal fishes to be spawning at this time and one embayment, in particular, was dominated by anchovy larvae. Local-scale

# **Upcoming Events**

Larval Fish Conference...cont'd from p. 1

# 34th Annual Larval Fish Conference

#### **Call for Oral and Poster Papers**

Persons interested in participating in any of the various theme sessions listed below or contributing papers on other early life history topics are invited to submit abstracts through the conference website by March 24<sup>th</sup>. If the paper is appropriate to a particular theme session, please also contact the associated session organizer(s) as soon as possible.

#### **Planned Theme Sessions**

Integrative Developmental Systems: Where Developmental Biology, Physiology and Ecology Meet organized by Ione Hunt von Herbing, Warren Burggren, and Pam Padilla, University of Northern Texas (vonherbing@unt.edu, burggren@unt.edu, ppadilla@unt.edu).

**Developmental Programming and Ontogeny in Fish** organized by Elin Kjorsvik, Norwegian University of Science and Technology (elin.kjorsvik@bio.ntnu.no).

Reproductive and Early Life History Consequences of a Changing Environment organized by Chris Chambers, NOAA-NMFS James J. Howard Marine Sciences Laboratory (chris. chambers@noaa.gov). This theme session will include oral and poster presentations that address how a changing environment, particularly with respect to climate change, is affecting or is expected to affect the reproductive ecology and early life stages of fish species. Areas of emphasis include direct and indirect effects of changes in the thermal environment, ocean acidification, and u-v intensity on species distribution, life history, ecology, and population / community phenology.

Larval Fish Ecology and Conservation of Native Fishes in the American Southwest organized by Kevin Bestgen, Colorado State University Larval Fish Laboratory (kevin.bestgen@colostate.edu). The session will focus on the substantive contributions that fish early life history investigations have played in understanding the ecology and conservation of native fishes in aquatic ecosystems of the American Southwest.

Larval Fish Ecology and Recovery of Missouri-Mississippi 'Big River' Fishes organized by David Galat, USGS Missouri Cooperative Unit, University of Missouri (galatd@missouri.edu). Papers and posters in this session will consider early life history of fishes in the Missouri-Mississippi Rivers and their major tributaries

### Pacific Rim...cont'd from p. 4

circulation gyres set up by the prevalent sea breezes appear to retain larvae in these embayments.

In 2010, a major multidisciplinary research cruise will be conducted to the remote Kimberley region of northern Australia to examine productivity in the region. Large river systems are responsible for very turbid inshore water and, offshore along the edge of the shelf, there are remarkable coral atolls. Massive tides (10+ m) and internal waves are also features of the region. We will investigate the larval fish and macro-zooplankton assemblages as well as contribute to a food web study investigating influence of fluvial drainage and sources of nitrogen. This cruise will be followed by

with special emphasis on conservation and recovery of imperiled 'big river' fishes (e.g., *Scaphirhynchus* sturgeons, *Macrhybopsis* chubs) and impacts of invasive Asian carps on native fishes. Contributions in the following general areas are particularly encouraged: (1) ecology and habitat use, (2) environmental factors affecting growth and survival, and (3) propagation of *Scaphirhynchus* sturgeons.

**Freshwater Larval Fish Ecology** organized by Nancy Auer, Michigan Technological University, (naauer@mtu.edu); Ed Rutherford, University of Michigan (ed.rutherford@noaa.gov); and Ed Roseman, USGS Great Lakes Science Center (eroseman@usgs.gov).

**Descriptions and Identification** organized by Darrel Snyder, Colorado State University Larval Fish Laboratory (darrel. snyder@colostate.edu). Depending on abstracts received, this session is intended to include: (1) overviews of the state of the art (what taxa we know and what gaps remain); (2) new morphological descriptions, guides, keys (traditional and computer-interactive), taxonomic databases, and computerimage recognition programs; (3) traditional and 21st Century techniques for illustration, measurement, and presentation of descriptive and taxonomic information; and (4) techniques and criteria for genetic identification. General Contributed Paper Session (for papers that do not fit into any of the above) §

# **Workshop Announcement**

The "Workshop on understanding and quantifying mortality in pelagic, early life stages of marine organisms: Experiments, observations and models" (WKMOR) will be held in Aberdeen, Scotland on March 22-24, 2010 and will be co-chaired by Alejandro Gallego, Edward Houde, and Elizabeth North. The objectives of WKMOR are to:

- a) Review current and emerging laboratory, mesocosm, field and modelling methodology aimed at understanding the underlying mechanisms that control mortality during fish and shellfish early life stages;
- b) Summarize the state of our understanding of the mechanisms that control mortality of eggs, larvae and juveniles, identify information gaps, and list future research directions as proceedings from the workshop:
- c) Develop recommended techniques to quantify mortality in the field and model its impact on subsequent recruitment.

More information on the workshop can be found at northweb.hpl. umces.edu/WKMOR/WKMOR-home.htm. The workshop will be held under the auspices of International Council for the Exploration of the Sea Working Group on Modelling Physical-Biological Interactions and Working Group on Recruitment Processes.

This workshop is the follow-up of research priorities identified by the participant of the previous WKAMF workshop on advances in modelling physical-biological in fish early life history (published in a series of contributed papers to MEPS Theme Section Volume 347, October 11, 2007), as well as of the successful theme session on "Death at sea - Mortality in the zooplankton and early-life stages of marine fish (estimates, processes and outcomes)" held at the 2009 ICES Annual Science Conference in Berlin, Germany, 21-25 September and convened by Alejandro Gallego (UK), Edward D. Houde (USA), and Elizabeth W. North (USA). §

# **People**

# **Scott Holt Retires**



On May 3, 2009, Scott A. Holt retired from the research staff of The University of Texas Maine Science Institute. Scott and his wife, Joan, have brought acclaim to the Institute and the City of Port Aransas through their fish research, fishing tournament judging, development of birding as focal point for ecotourism in South Texas, and a variety of other activities.

A life-long resident of Texas, Scott received his Bachelor of Science and Master of Science degrees in Wildlife and Fisheries Science from Texas A&M University, the latter under the supervision of Kirk Strawn. Scott immediately moved to the small fishing community of Port Aransas and took a job as Research Scientist Assistant at the University of Texas Marine Science Institute. Over the next 35 years, Scott progressed through the ranks, established his own research program, and developed strong ties to other researchers at the Institute, throughout the State of Texas, and many institutions outside of Texas.

Within the community of larval fish researchers, Scott is known for his work on ichthyoplankton, especially the abundance and distribution of eggs, larvae, and juveniles and their relationship to tides, season, and habitats. He and Joan have been regular participants at the Larval Fish Conferences since the fifth conference in Baton Rouge (1981). Scott's research has also included anthropogenic effects on fish populations, fish reproduction, and food web dynamics. His publication record includes at least 35 papers in the primary literature, several book chapters, and many technical reports. In addition to his own research, Scott has been an essential asset to many graduate students at The University of Texas and at nearby Texas A&M University – Corpus Christi. He has also served as instructor for a graduate course in larval fish ecology.

Scott is a long-time member of the American Fisheries Society (AFS) and its Early Life History Section (ELHS), as well as the Estuarine Research Federation and the Society of Conservation Biology. He served as President of the Texas A&M Chapter of AFS. Many people and organizations have benefitted from Scott's facility with technology and his organizational skills. Those skills were essential to his 6-year term as Chairman of the ELHS Nominations and Elections

Committee (1990-1996). He also served as Program Chairman for the Gulf Estuarine Research Federation meeting in 1992 and the 17th annual Larval Fish Conference in 1993. That latter meeting was a real test because the meeting was in conjunction with the annual meeting of the American Society of Ichthyologists and Hepetologists (ASIH), for which I served as Program Chairman. We decided to make electronic submission mandatory, for the first time at either of these meetings and the joint program book contained more than 750 abstracts which we managed entirely in WordPerfect using very complicated macros. This seems trivial today, but in 1993 desktop computing hardware and software and email/internet were far less sophisticated than they are today. Charting new territory for a meeting of this size was not easy, but the combination of Scott's electronic acumen and his trademark steady personality saw the project through successfully. We were recognized at the ASIH banquet as having brought the society into the 20th Century, kicking and screaming all the way.

Outside of work, Scott has brought a lot to the community of Port Aransas, which is now much more than a sleepy fishing village thanks to his and Joan's efforts. The oldest fishing tournament in Texas is the Port Aransas Deep Sea Round-Up. For decades, Scott has provided his organizational and technological skills to this major event, making sure that records for every fish were recorded into a database so that any piece of information could be retrieved and any kind of report could be created. Likewise, he has organized the Audubon Society's annual Christmas Bird Count in Port Aransas, once again brining his talent for organization to the benefit of others. He has also served on the Harbor Advisory Board, the Parks and Recreation Board, and the Beach Maintenance Committee for Port Aransas. To recognize their contributions to the community, the City of Port Aransas named its premier birding site "The Scott and Joan Holt Paradise Pond" in their honor.

At the time of his retirement last May, Scott's thinking was that retirement would give him more time for fishing. In fact, he did disappear from the lab for about a month. But, it's hard to break long-standing habits. Scott returned to part-time employment to "finish up ongoing projects." It's really nice to have him around.

In 2009, the Texas House of Representatives adopted a resolution to honor the career of Scott Holt (www.legis.state.tx.us/tlodocs/81R/billtext/html/HR02674F.htm). That resolution recognized that Scott's "dedication, expertise, and intellectual curiosity have led to a deeper understanding of the fish populations and habitats of the Gulf Coast region of Texas, and he may indeed reflect with pride on a career well-spent as he embarks on the next exciting chapter of his life." §

- Lee A. Fuiman

# In Memoriam — John E. Olney



E. John passed away January 11. 2010 at his home in Gloucester, VA, after a year-long battle with cancer. The battle was brutal, yet courageously fought. Through it all John never lost his love of young fishes and his passion for teaching, which among so many special qualities, made him a unique unforgettable person. A

long term member of the AFS Early Life History Section, his loss will be felt by many.

John received a BS in Biology from The College of William and Mary in 1971. He developed a Master's thesis and received his MA from the Virginia Institute of Marine Science (VIMS), College of William and Mary in 1978. While working at VIMS, John went on a one year detail to pursue his Ph.D. at the University of Maryland. John received his Ph.D. in 1996. The imprints of John's two major professors, George Grant for his Master's degree and Ed Houde for his Ph.D., on his analytical thinking was evident; John readily recognized and acknowledged these influences.

John's interest in early histories of fishes began with larval fish taxonomy, an interest that carried over to his teaching. This interest in taxonomy evolved into the application of the unique characters of fish eggs and larvae to the understanding of systematic relationships. John was a gifted speaker with a smooth baritone delivery, even tempo, and superb articulation. This gift served John well. John's teaching began, though only briefly engaged, as a public school teacher, where once his colorful description of the modes of avian reproduction was called into question. John joined the faculty at the School of Marine Science of the College of William and Mary as an instructor in 1979. He taught a course in the early life history of fishes that evolved to a team-taught, summertime offering at the University of New England. This comprehensive and well attended course was one of John's career triumphs and a source of great gratification and pride for John. The course was jointly taught with Ed Houde; Ed taught ecology and John taught taxonomy and systematics. So comprehensive and rigorous was this course that many students came to reference it as the boot camp of ichthyoplankton. John was a respected graduate student advisor, serving as major professor to 22 graduate students. He offered his knowledge and expertise to many students at VIMS and other institutions.

During his 36-year career at VIMS that began in 1972, John developed proficiency in zooplankton ecology, fisheries science, and ichthyology. He published 75 papers and several book chapters. John's expertise in the taxonomy of larval fishes and was internationally recognized. His particular specialty was the development, anatomy, and evolution of two groups of fishes, the oarfishes and the pearlfishes. The taxonomic identifications and classifications that resulted from this specialty are now widely used in ichthyology. John believed that an appreciation for, and knowledge of, the evolution of fishes is fundamental to many applied aspects of fish biology and fisheries science, and he carried this torch throughout his career. Late in his life he developed an interest in the evolution of anadromy among the diversity of fishes; he discussed this interest with many of his colleagues, but never published his thoughts.

In the later part of his career, John headed the VIMS Anadromous Fishes Research Program and was an expert on the biology and conservation of American shad. He was principal advisor to the Virginia Marine Resources Commission and the Atlantic States Marine Fisheries Commission on decisions related to shad management in Virginia. John always emphasized the importance of reproduction and early life history in debates and warned of potential impacts of the water diversion and reservoir management projects to shad reproduction and early life history.

His service to the College of William and Mary and the School of Marine Science at VIMS was extensive and included appointments to the Academic Affairs, Planning and Resources, and Executive Committees of the William & Mary Faculty Assembly. Within the School of Marine Science, John served as Chair of both the Academic Council and Educational Policy Committee, and was a member of the Academic Status and Degrees, Library Advisory, and Admissions Committees. John was also Chair of the Department of Fisheries Science from 2006 to 2009.

John was an affiliate member of the Early Life History Section and attended many Annual Larval Fish Conferences, most recently the 30th Annual Larval Fish Conference, convened jointly with AFS in Lake Placid, in 2006. There he spoke about rare young stages representing three families of marine fishes. John shared the first Sally Leonard Richardson award with Doug Markle (the inaugural year before the Richardson Award became a student award) at the 10th annual Larval Fish Conference in Miami, 1986. John spoke on the ontogeny and systematics of the pearlfishes. He was scheduled to speak at the 33rd annual Larval Fish Conference in Portland, OR, in 2009, a meeting held in conjunction with the American Society of Ichthyologists and Herperologists, but his illness prevented his appearance.

The study of the early life history of fishes, has lost one of its most energetic, consistent, and persistent contributors. §

— Jeff Govoni, ELHS Historian

# **Publications**

Available now: Ecology of Anguilliform Leptocephali: Remarkable Transparent Fish Larvae of the Ocean Surface Layer

By Michael J. Miller

Published in Aqua-BioScience Monographs. TERRAPUB. 2009.

This review examines the present state of knowledge about the ecology of anguilliform leptocephali, which are the unique but poorly understood larvae of eels. All eels spawn in the ocean and their leptocephali live in the ocean surface layer. Their presence worldwide and basic biology have not been extensively studied due to their strong ability to avoid standard plankton nets and their fragile transparent bodies. Leptocephali have laterally compressed bodies and contain a high proportion of transparent energy storage compounds. They have diverse morphological features, but appear to feed only on particulate material, such as marine snow or discarded larvacean houses. Some information on their chemical composition, respiration, growth rates, depth distributions, swimming ability, metamorphosis, and recruitment patterns has been reported, which highlights the interesting and unique aspects of leptocephalus larvae. Regional zoogeography and reproductive ecology of adults and ocean currents affect the spatial and temporal distribution patterns of leptocephali, which have long larval durations, but most life histories and larval recruitment behaviors remain undocumented. Their transparency, feeding strategy, and large size seem to be a unique and successful larval strategy, but the abundance and ecological significance of leptocephali in the ocean appear to have been underestimated.

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# Available now: Advances in Early Life History Study of Fish

Edited by Catriona Clemmesen, Arne M. Malzahn, Myron A. Peck, and Dietrich Schnack

Published in *Scientia Marina*, Volume 73S1, Supplement 1. Consejo Superior de Investigaciones Cientificas. 2009.

This volume includes 19 contribution presented at the 32nd annual Larval Fish

Conference held in Kiel, Germany, 4-7 August 2008. The first seven papers included in this book represent a variety of small-scale spatial distributions, seasonal variation in larval fish assemblages and vital rates in fish eggs and larvae, as well as reserach utilizing biophysical, individual-based modelling. The following two papers summarize the challenges and opportunities related to the study of developmental physiology and the effect of acclimiation processes on gene expression. Eight papers then deal with life history strategies. Topice include exploring repeated measurements of cumulative length frequencies of developing cohorts, patterns of growth and condition, methods for defining growth and condition, triphic flexibility, interactions between species and aspects of recolonization. The final two papers of this book deal with aquaculture aspects. §

# **Other Recent Publications**

Reproductive Biology and Early Life History of Fishes in the Ohio River Drainage

- Volume III, Ictaluridae Catfish and Madtoms. T.P. Simon and R. Wallus. Published by CRC Press. ISBN 0849319196. 2003; 232 p.
- Volume IV, Percidae Perch, Pikeperch, and Darters. T.P.
   Simon and R. Wallus. Published by CRC Press. ISBN 978-0-8493-1920-4. 2006; 648 p.
- Volume V, Aphredoderidae through Cottidae, Moronidae, and Sciaenidae. Edited by R. Wallus and T.P. Simon. Published by CRC Press. ISBN 978-0-8493-1921-1, 2006; 360 p.
- Volume VI, Elassomidae and Centrarchidae. Edited by R.
   Wallus and T.P. Simon. Published by CRC Press. ISBN 978-0-8493-1923-8. 2008; 472 p.

**Plankton. A Guide to Their Ecology and Monitoring for Water Quality.** I.M. Suthers & D. Rissik. Published by CSIRO Publishing, 272 pp. 2009. ISBN: 9780643090583.

Manual of recommended practices for modelling physical – biological interactions during fish early life. E.W. North, A. Gallego, and P. Petitgas, Jr., eds. ICES Cooperative Research Report No. 295. 111 pp. 2009. ISBN: 978–87–7482–060–4.

**Early Life History of Marine Fishes.** B.S. Miller and A.W. Kendall, Jr. Published by University of California Press. ISBN: 978-0-520-24972-1, 2009.

Fish Larval Physiology. R.N. Finn and B.G. Kapoor. Published by Science Publishers. ISBN: 1578083885. 2008.

Early Stages of Fishes in the Western North Atlantic Ocean: Davis Strait, Southern Greenland and Flemish Cap to Cape Hatteras. Michael P. Fahay. Published by North Atlantic Fisheries Organization.

Recent publications...cont'd from p. 2

Early Development of Four Cyprinids Native to the Yangtze River, China. Edited by D.C. Chapman. U.S. Geological Survey Data Series 239. 2006. accessible online at pubs.usgs.gov/ds/2006/239

Recent Advances in the Study of Fish Eggs and Larvae. Edited by M.P. Olivar and J.J. Govoni. Published in Scientia Marina, Volume 70S2 Supplement 2. ISSN: 0214-8358. 2006.

Eggs and Larvae of North Sea Fishes. P. Munk and J.G. Nielsen. Published by Biofolia Press. ISBN 0849319161. 2005.

Early Stages of Atlantic Fishes: An Identification Guide for the Western Central North Atlantic. Edited by W.J. Richards. Published by CRC Press. ISBN 0849319161. 2005.

Developmental Biology of Teleost Fishes. Y.W. Kunz. Published by Springer Press. ISBN 1-4020-2996-9. 2004.

Early Life History of Fishes in the San Francisco Estuary and Watershed. Edited by F. Feyrer, L.R. Brown, R.L. Brown, and J.J. Orsi. Published by the American Fisheries Society. ISBN 1-888569-59-X. 2004.

Freshwater Fishes of the Northeastern United States - A Field Guide. R.G. Werner. Published by Syracuse University Press. ISBN 0815630204. 2004.

The Development of Form and Function in Fishes and the Question of Larval Adaptation. Edited by J.J. Govoni. Published by the American Fisheries Society. ISBN 1-888569-58-1. 2004.

The Larvae of Indo-Pacific Coastal Fishes: An Identification Guide to Marine Fish Larvae. (2<sup>nd</sup> edition). J.M. Leis and B.M. Carson-Ewart. Published by Brill Academic Publishers. ISBN 90-04-13650-9. 2004.

The Big Fish Bang. Proceedings of the 26<sup>th</sup> Annual Larval Fish Conference. Edited by H.I. Browman and A.B. Skiftesvik. Published by the Institute of Marine Research, Bergen, Norway. ISBN 82-7461-059-8. 2004.

Fishery Science: The Unique Contributions of Early Life Stages.

Edited by Lee A. Fuiman and Robert G. Werner. Published by Blackwell Publishing. ISBN 0-632-05661-4. 2002.

## European Region...cont'd from p. 2

results about tuna larval distribution in relation to meso-scale hydrographic features and tuna larvae biology and ecology have been presented to several scientific congresses CIESM (Cortés et al., 2004; García et al., 2007), LFC (Alemany et al., 2002, 2005), GLOBEC/CLIOTOP (García et al., 2007 a, 2007b; Cortés et al., 2007; Alemany et al., 2007) and ICCAT (e.g. García et al., 2005), and first synthesis results will be published shortly in the next Progress in Oceanography Special Number (Alemany et al., in press). From 2006 onwards, further yearly ichthyoplankton smaller scale surveys are being conducted, using new sampling methodologies as stratified hauls by means of Multinet-midi Hydrobios net or double-oblique tows through surface mixed layer with Bongo 90 nets. Moreover, complementary works on tuna larvae, as trophic ecology studies based on stomach contents (Catalán et al., 2007) and isotope analysis, or larval physiology



studies applying inmunocitochemical techniques. have beeninitiated.Results these studies will be provided to the COM/IEO lab in Mazarrón, whose researchers successfully working on ABT aquaculture. in order to improve larval feeding. and hence larval survivorship, under rearing conditions.

Taking advantage available information and the samples, expertise gained and incorporation on our team of new researchers previous experience in modeling, a new project named **BALEARES** has been set up for

2009-2012. The main specific objectives of this ongoing project, related to tuna larval ecology are:

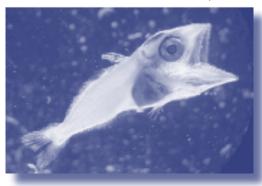
- To define and simulate the abundance and distribution of spawning and nurseries of the target species (*Thunnus thynnus, Thunnus alalunga, Auxis rochei*) in relation to the different environmental scenarios.
- To simulate the spatial distribution and larval survival rates of *Thynnus thynnus, Thynnus alalunga* and *Auxis rochei* in relation to variables such as temperature, food availability and inter- and intra-specific competition by means of Individual Based Models (IBMs).
- To simulate the passive transport of planktonic larvae in the area during the study periods by means of a Lagrangian transport model. This model, to be developed, will use the three-dimensional currents calculated by the ROMS model.

Some **IBMs** have been already developed as a result of the close collaboration between IFO and University of Bergen researchers. and preliminary results have been recently presented to the

scientific community (Urtizberea, 2009; Reglero et al., 2009).

The ultimate goal of our research line is the implementation of near real time forecast models of ABT potential spawning habitat and larval survival based on satellite data and 3-D hydrodynamic models, developed taking into account the relationships among larval behavior, distribution and condition and abiotic and biotic environmental factors determined within the framework of the aforementioned projects. If we succeed the next step should be to nest these models into climatic models in order to obtain long term forecasts of the evolution of tuna populations under different environmental and fishing scenarios. In order to do that, a new ambitious project, which will use the facilities provided by OCEANBIT ICTS (http://oceanbit.org/), is being designed.

Moreover, we have recently strengthened collaboration with the USA research team that is carrying out the project "Improving the NOAA/NMFS and ICCAT Management Decision Support System" under the framework of the NASA's Earth Science and Biodiversity and Ecological Forecasting Program. They are also working on ABT spawning habitat characterization and on the use of satellite imagery to both determine optimal spawning habitat location and improve ABT larvae sampling, with the aim of increase the reliability of the larval indices used by ICCAT to calibrate the estimations of ABT western stock biomass provided by indirect methods. The synergies between the projects developed in the Mediterranean and the Gulf of Mexico



#### Pacific Rim...cont'd from p. 5

one off the Ningaloo region, North-Western Australia, which will be largely focussed on the headwaters of the Leeuwin Current. So, a busy year lined up for the larval fish lab in Fremantle!

# From: Jeff Leis, Australian Museum, Sydney

Recent larval fish publications from the past year from the Leis lab:

Leis, J.M., R.F. Piola, A.C. Hay, C. Wen and K.-P. Kan. 2009. Ontogeny of behaviour relevant to dispersal and connectivity in larvae of two non-reef demersal, tropical

fish species. *Marine and Freshwater* Research 60:211-223.

Leis, J.M., A.C. Hay and G.J. Howarth. 2009. Ontogeny of *in situ* behaviours relevant to dispersal and population connectivity in larvae of coral-reef fishes. *Marine Ecology Progress Series* 379:163-179

Fisher, R. and J.M. Leis. 2009 . Swimming performance in larval fishes: From escaping predators to the potential for long distance migration. In P. Domenici and B. G. Kapoor (eds) Fish locomotion: An etho-ecological approach. Science Publishers, Enfield, New Hampshire, USA, p 333-373.

Munday, P.L., J.M. Leis, J.M. Lough, C.B. Paris, M.J. Kingsford, M.L. Berumen and

predominantly late larval and early juvenile

J. Lambrechts 2009. Climate change and coral reef connectivity. *Coral Reefs* 28:379-395.

McCook, L.J., G.R. Almany, M.L. Berumen, J.C. Day, A.L.Green, G.P. Jones, J.M. Leis, S. Planes, G.R. Russ, P.F. Sale and S.R. Thorrold. 2009. Management under uncertainty: Guide-lines for incorporating connectivity into the protection of coral reefs. *Coral Reefs* 28:353-366

Irisson, J.-O., J.M. Leis, C. Paris, H. Browman. 2009. Biological Processes: Behavior and Settlement. in North, E. W., A. Gallego and P. Petitgas (eds) Manual of Recommended Practices for Modelling Physical-Biological Interactions During Fish Early Life. *International Council for the Exploration of the Sea Cooperative Research Report* 295:42-60.

Paris, C., J.-O. Irisson, G. Lacroix, Ø. Fiksen, J.M. Leis, & C. Mullon. 2009. Connectivity. in North, E. W., A. Gallego and P. Petitgas (eds) Manual of Recommended Practices for Modelling Physical-Biological Interactions During Fish Early Life. International Council for the Exploration of the Sea Cooperative Research Report 295:63-77.

Paris, C., J.M. Leis & J.-O. Irisson. 2009. Biological Processes: Pelagic larval duration. in North, E. W., A. Gallego and P. Petitgas (eds) Manual of Recommended Practices for Modelling Physical-Biological Interactions During Fish Early Life. International Council for the Exploration of the Sea Cooperative Research Report 295:23-24.

Wright, K.J., D.M. Higgs, D.H. Cato and J.M. Leis. 2010. Auditory sensitivity in settlement-stage larvae of coral-reef fishes. *Coral Reefs* 29: 235-243. DOI 10.1007/s00338-009-0572-y.

The ICES report, Manual of Recommended Practices for Modelling Physical-Biological Interactions During Fish Early Life, is available for free download at www.ices.dk/products/cooperative.asp. §

## Western Region...cont'd from p. 3

temperature, and surface salinity were the three environmental variables that explained the most variability (0.36) in larval fish concentrations. Larval concentrations were generally positively correlated with surface temperature and negatively correlated with surface salinity, density, fluorescence, turbidity, and dissolved oxygen. Results from this work will be presented at the 2010 Larval Fish Conference in New Mexico. A manuscript is also in progress to be submitted to Progress in Oceanography: Auth, T.D. (In prep) Analysis of the springfall epipelagic ichthyoplankton community in the northern California Current in 2004-2009.

3) A total of 645 larval Sebastes spp. from the 2009 SAIP samples have been sorted, measured, and preserved for genetic analysis. Although one of the dominant larval taxa found in the NCC, Sebastes spp. larvae are not identifiable below the generic level based on meristics and pigmentation patterns, so no species-specific inferences can be made for this important taxon. This work will hopefully enable us to make species-level identification of the larval rockfishes in our collections based on mitochondrial markers, which should enable us to discern specific patterns in larval rockfish distribution and abundance in the NCC. We hope to compare these larvae with juvenile specimens collected in trawls several months later (already identified genetically and presented at the 2009 LFC) along with eventual recruitment time series to examine when year class strength is established for the first time for many members of this diverse group.

4) We examined winter (January-March) ichthyoplankton abundance estimates from the NH line from 1997-2008 as a potential indicator of future feeding conditions for young salmon in the marine environment. Juvenile salmon in May and June eat

fishes which are difficult to quantitatively sample with conventional plankton gear. Annual winter larval fish composition and juvenile salmon summer diets show relatively high overlap in taxonomic composition. The relationship between the abundance of fish larvae in winter and subsequent coho salmon survival based on the Oregon production index (OPI) was found to be highly significant ( $r^2 = 69.5$ , p = 0.0027). This relationship was not significant for Chinook salmon, but we are investigating other prev taxa and months for this species. Larval fishes have been shown to be a good indicator of ocean conditions and we believe they can be a useful and costeffective performance indicator of future fish prey dynamics for juvenile salmon, and can provide an early warning of major shifts in the availability of food resources and subsequent effects on survival and returns of adult salmon. We are currently seeking funding to continue this research for several more years. Results from this work were presented at the 2009 Larval Fish Conference in Oregon: Daly, E.A., Auth, T.D., Brodeur, R.D., and Peterson, W.T. Winter Ichthyoplankton abundance: predictor of summer prey fields and ultimate survival of juvenile salmon?

Future research will include collaboration with Dr. Lorenzo Ciannelli from Oregon State University's College of Oceanic and Atmospheric Sciences on issues related to the effect of hypoxia in near-shore waters on ichthyoplankton distributions and life history parameters. We also plan to conduct more detailed and region-wide analyses of the response of fish larvae to both regional-and basin-scale environmental forcing factors, and compare larval and lagged-juvenile distributions and abundances in an effort to define recruitment relationships of important fish species in the NCC. §

#### European Region...cont'd from p. 9

are obvious, since the comparison of the results obtained, as well as the sharing of expertise, will undoubtedly help in the achievement of the stated objectives.

Our hope is that all these research efforts will contribute to the design and implementation of ABT management plans which guarantee the rational sustainable exploitation of this important resource. §

#### President's message...cont'd from p. 1

Third, I know I have said this before, but I love Santa Fe: the wide open vistas of the southwest; the color palette of browns, reds, tans, and turquoises; the pozole, green and red chile, and sopaipillas; the art and culture of Santa Fe itself. I still regret not buying a piece of art in one of my previous visits to Santa Fe; the painting was a collaboration between traditional Native American and Aboriginal Australian styles. I did have plenty of green chile though, which was much more in line with my budget.

Fourth, any place on the beach sounds good right now. A group of us are in the midst of our winter plankton survey on the northeast U.S. shelf. The water is 3°C, the air is less, a storm just passed and another one is on the

way. Santa Fe with its quiet nights and firm ground, its warm fires, and its cool margaritas is something to look forward to.

One thing is clear on this cruise: the northeast U.S. shelf is changing and I imagine all the ecosystems we work in are changing to some degree. Atlantic herring larvae, which used to dominate the winter ichthyoplankton, are greatly reduced. We will have additional confirmation when (if) we reach Georges Bank, the historical area of peak abundance. Similarly last spring, we almost couldn't collect Atlantic mackerel larvae, which used to be the dominant springtime species. We are only beginning to document these changes let alone understand their causes and consequences. This year's LFC is an important venue for reporting our results - the theme is "Larval Fish Biology in the 21st Century: Responding to a Changing Environment." There are a lot of interesting sessions from developmental biology, to native fishes of the American southwest, to consequences of a changing environment. Check it out: www.larvalfishcon.org/Conf\_home.asp?ConferenceCode=34th.

I apologize for keeping this short, but we are coming up on our next sampling station and I need to put on a couple of extra layers before we get there. It is going to be a long, cold night but the thoughts of Santa Fe in the spring will keep me going. The LFC is a great meeting, there is more to it than the name implies, join me for some green chile, and I hope you get your abstract submitted.

- Jon Hare, President

# THIS WILL BE YOUR \(^\) LAST ISSUE OF STAGES...

unless you've paid your 2009 dues. Check the expiration date on the mailing label of this issue.

# **Editor's Ramblings**



# Another Tough One

The photo of John Olney on page 7 of this issue of STAGES is a terrific reminder of this wonderful man. For me, it perfectly captures his eternally happy and confident personality. Or, so that is how he always seemed to me. John was one of the first "larval fish people" I can remember meeting, back in 1975. Over the years I always enjoyed catching up with him at Larval Fish Conferences, Ichs and Herps meetings, and other fishy events, especially in the years when we were both actively engaged in larval fish taxonomy. My interests drifted, but John's managed to expand, rather than drift. Although I never had the pleasure of working with him, we did have a few fun exchanges over the years. If memory serves me, he read the "resolutions" at the banquet of the Ichs and Herps meetings in 1993, a year in which

the Larval Fish Conference met with ASIH. Among his humorous "Whereas'es" and "Be it resolved's..." he acknowledged the work Scott Holt and I did to "bring the society into the 20th Century, kicking and screaming all the way," (see page 6) and in doing so mis-pronounced my surname. Now, that's not entirely uncommon, but I razzed him by email anyway because we'd known each other for almost 20 years. He took it in good humor and countered with some humorous twisted logic to explain his error. Just a couple of years ago, we enjoyed another fun email exchange when he felt I'd denigrated larval fish taxonomy in one of my Editor's Ramblings. I owed him a beer for that one and planned to pay up at the 2009 Larval Fish Conference. I am very disappointed that I'll never settle that account. John's loss is another tough one.

P.S. - Have you noticed more white space in this issue of STAGES than usual? No, this is not a tribute to colleauges in north-eastern North America who have experienced record snowfall this year. Even though I reversed the tricks we use to get around limits on the length of proposals by INCREASING the font size in places, there is still too much white space in this issue. That, of course, is because our Regional Representatives are not getting enough material from you. Please send a note to your representative about your work. We'll all enjoy reading about it.

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# **Newsletter Production Team**

**Stages** is published in February, June, and October each year. It is assembled by the Newsletter Editor with contributions from several Regional Representatives and other individuals. Please send any articles, announcements, or information of interest to Early Life History Section members or affiliates to your local Regional Representative or to the Editor.

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