

# STAGES



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

Volume 34, Number 2

Lee A. Fuiman, Editor

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## ELHS Back Then

**10 years ago:** Former North Central Regional Representative (1981-1982) Carroll Norden passed away.

**20 years ago:** Papers from 16<sup>th</sup> LFC published as "Water Quality and the Early Life Stages of Fishes" in AFS Symposium series.

**25 years ago:** Section has 389 members plus 20 newsletter subscribers.

**30 years ago:** Ahlstrom Memorial Symposium "Ontogeny and Systematics of Fishes" was held in La Jolla, California, with 75 papers by 70 invited speakers.



## Students Win Top Awards

The Sally L. Richardson award for the best student paper and the John H. S. Blaxter award for the best student poster were presented on June 5 at the 37<sup>th</sup> annual Larval Fish Conference in Miami, Florida. The winner of the Richardson award was Sean Bignami of the Rosenstiel School of Marine and Atmospheric Science at the University of Miami for his presentation entitled "Ocean acidification alters the otoliths of a pantropical fish species with implications for sensory function," co-authored by I. Enochs, D. Manzello, S. Sponaugle, and R. Cowen. The winner of the Blaxter award was Igal Berenshtein of the Interuniversity Institute and Ben Gurion University for his poster entitled "The use of polarized light for orientation in coral reef fish larvae," co-authored by M. Kiflawi, N. Shashar, U. Wieler, H. Agiv, and C. Paris.

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## President's Message



Congratulations to Su Sponaugle, Bob Cowan and their team on having hosted a very well organized, scientifically very interesting and stimulating conference in Miami. Thank you so much for all the effort, energy, and heart you all have put into this. The meeting was very well attended with 150 people from over 20 countries, again indicating the importance of larval fish work all over the world.

I enjoyed lots of exchange with longtime participants, but also with the newcomers. The way the conferences are organized makes it easy for newcomers to feel part of a great family. Although a mentoring program might be a useful thing to follow up and was discussed during the meeting, my feeling is that mentoring already takes place without a formalized program behind it.

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

**September 6, 2013**

## News from the Regions



### Pacific Rim Region

**Akinori Takasuka**

#### Japanese Society of Fisheries Science Award of Merit

Dr. Ichiro Aoki, a former Professor of the Graduate School of Agricultural and Life Sciences, the University of Tokyo, and currently an Professor Emeritus of the University of Tokyo, received the Japanese Society of Fisheries Science Award of Merit based on his long-term achievements "Studies on mechanism, assessment and prediction of population dynamics of marine resources." The award ceremony was held in Tokyo on March 28, 2013, during the annual Meeting of the Japanese Society of Fisheries Science. This award is given to members who have made long-term contributions to the development and systematization of fisheries science. This event took place, following his receipt of the Uda Prize from the Japanese Society of Fisheries Oceanography in 2007. The Uda Prize is intended to award scientists who have made great contributions to fisheries oceanography.

Dr. Aoki has studied and achieved a lot of progress in studies on mechanisms, assessments, and predictions of fish population dynamics. In particular, his studies are characterized by

the approaches of exploiting and synthesizing boundary areas of the study field. For example, he adopted various approaches, such as acoustic assessment, neural network, quantitative sampling gear, and rearing experiments, and broadly contributed to topics such as reproductive biology and early life biology. In his works, early life biology has been well linked to relevant fields of study, in terms of fisheries oceanography, for example. As a part of his interdisciplinary activities, Dr. Aoki was influential in the early development of GLOBEC activities in Japan. At the same time, he has educated many young scientists in his fisheries biology laboratory. His contributions to academic societies (e.g., Vice-President of JSFS and Regional Editor of *Fisheries Oceanography*) were also highly evaluated in his award. He now

plans to complete an interdisciplinary textbook on fish stock dynamics.

*...continued on p. 7*



*Professor Ichiro Aoki at the award ceremony held in Tokyo on March 28, 2013.*

## Section Officers

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**HELP KEEP  
STAGES INTERESTING...**

Send us a report of your  
research activities.



## European Region

**Hubert Keckeis**

**from:** *Department of Limnology, University of Vienna*

**Linking behavior and hydraulics: Rheoreaction and movement patterns in larvae of a fluvial specialist**

Bernhard Zens<sup>1</sup>, Martin Glas<sup>2</sup>, Michael Tritthart<sup>2</sup>, Paul Humphries<sup>3</sup>, Hubert Keckeis<sup>1</sup>

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<sup>2</sup>Institute of Water Management, Hydrology and Hydraulic Engineering, University of Natural Resources and Life Sciences, Christian Doppler Laboratory for Advanced Methods in River Monitoring, Modelling and Engineering, Austria

<sup>3</sup>School of Environmental Sciences, Charles Sturt University, Albury, Australia

As part of an interdisciplinary research project with the final goal of modelling dispersal patterns of fish larvae in a large river (see the initial contribution on our project in STAGES 33(2), June 2012), we investigated behavioral aspects of movement patterns in different larval stages of the rheophilic cyprinid

*Chondrostoma nasus*. As conditions in the River Danube largely impede in-situ observations of fish larvae, we used an artificial flume mesocosm to study rheoreactive behavior and consequences for larval dispersion. Based on video recordings of individual larvae, Bernhard Zens investigated the orientation of larvae in relation to the current vector and movement rates under different hydraulic conditions. In order to resemble conditions of the nase-carp's natural habitat, our experimental mesocosm offered characteristic features of river-bed morphology as well as a velocity gradient. Experiments were carried out at three different velocity scenarios (representing sub-, near-, and supercritical mean-flow conditions with respect to swimming abilities) and were conducted by daylight and during night. In order to account for effects related to improvement in swimming abilities during larval ontogeny, we used larvae of three different developmental stages (L2, L3, and L4). Travel paths of fish larvae were analyzed by means of their exact ( $\pm 5$  cm) position, their swimming speed, as well as their orientation in the water column. Information on hydraulic parameters (i.e., current vectors, turbulent kinetic energy, and bottom shear stress in different water layers) at any position was obtained from a fine-scale, 3D numerical model. Focusing on fish movement in relation to flow velocity and the orientation of the fish against the current vector enables differentiation between

different modes of downstream movement as conceived by Pavlov et al. (2008). Active, active-passive, and passive patterns could be distinguished and were distinctly manifested with respect to flow conditions. Rates of downstream movement differed significantly between flow scenarios and developmental stages, with higher rates in early stages during near-critical and supercritical conditions. By contrast, no differences in upstream and lateral movements were observed. Our results further suggest that the active-passive pattern of

downstream movement (fish orientated with the head upstream, movement rate of fish less than current velocity) has a possible function in habitat selection and as a search strategy.

Pavlov, D. S., V. N. Mikheev, A. I. Lupandin, M. A. Skorobogatov. 2008. Ecological and behavioural influences on juvenile fish migrations in regulated rivers: A review of experimental and field studies. *Hydrobiologia* 609:125-138.

**from:** *Mediterranean Institute for Advanced Studies (IMEDEA), Mallorca, Spain*

### ELH research at IMEDEA

IMEDEA is the Joint Centre between the Spanish National Research Council (CSIC) and the University of the Balearic Islands (UIB).

The Fish Ecology group at IMEDEA ([www.imedea.uib.es](http://www.imedea.uib.es)) recruited Ignacio Catalán in 2009 to foster research on ELH of fishes. In a broad sense, ELH research in this group deals with Fisheries Oceanography issues at multiple scales of time and space, with a vision of transmitting the knowledge to societal actors at all levels.

One key focus of ELH research during the last couple of years has been the understanding of population dynamics of small pelagic fishes in a highly dynamic system such as the Gibraltar Strait, W Mediterranean, in collaboration with other CSIC members. These studies are being conducted in the frame of European projects such as SESAME (*Southern European Seas: Assessing and Modeling Ecosystem changes*) or MEDEX (*Inter-Basin exchange in the changing Mediterranean Sea*). In an initial paper, we adapted a high resolution hydrodynamic model (Regional Ocean Modeling System, ROMS) coupled to a low trophic level (LTL) module to set up the stage of pelagic LTL dynamics in the area and how they relate to the distribution of early life stages of European anchovy [ref. 1]. Subsequently, we used a coupled physical-biological individual-based model (IBM) to show that physics on its own, owing to the energetic Atlantic jet,

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*Model organism Chondrostoma nasus: We are using lab-reared larvae from wild parental fish obtained from a population native to the River Danube east of Vienna, Austria. This picture shows larvae of the 3<sup>rd</sup> developmental stage (approx. 15 mm TL) with filled posterior chamber of swim bladder.*



## Northeast Region

Dave Richardson

### Springtime North Atlantic Particle Size-spectrum and Mesopelagic Fish Distribution Patterns

Harvey Walsh from the Oceanography Branch of NOAA Fisheries, Northeast Fisheries Science Center, participated in a spring 2013 International BASIN (Basin-scale Analysis, Synthesis & INtegration) trans-Atlantic cruise. BASIN is a joint European Union and North American research program that supports the Global Earth Observation System of Systems (GEOSS) and examines climate variability and change on key species of plankton and fish of the North Atlantic.

EURO BASIN is conducting three trans-Atlantic cruises in 2013 on vessels from Norway, Germany, and Canada, and Harvey sailed on the German vessel *MS Merian*, cruise MSM 26. The vessel sailed from Cork, Ireland, on 20 March with 19 scientists aboard to conduct a broad scale survey of the North Atlantic pelagic ecosystem as well as targeted process studies in different habitats. Stations were sampled in the Icelandic, Irminger, and Labrador Basins before returning to port in St. John's, Canada (Fig. 1) on 16 April. The multi-disciplinary cruise sampled hydrography, phytoplankton, zooplankton, and mesopelagic fishes with a variety of gears.

One of the goals of EURO BASIN is to understand variability in production across the North Atlantic and the impact of this variability on higher trophic levels. Productivity levels, primarily measured using remote sensing, were used by Longhurst (2007) to describe four oceanic biomes and several regional provinces of each ocean. During MSM 26, mesopelagic fish and size-spectrum data were collected to test the province classifications of the North Atlantic. In most marine systems, the size-spectrum is a decay function with more, smaller organisms and fewer

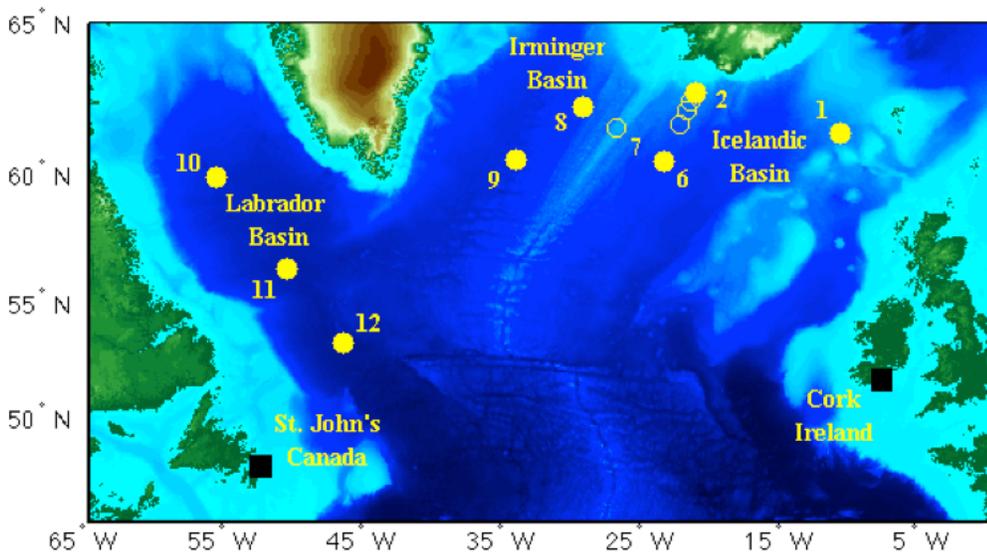


Figure 1. Map of stations sampled on ERUO BASIN trans-Atlantic cruise MSM 26 aboard *MS Merian* from 20 March to 16 April 2013.

larger organisms. The intercept of the size-spectrum has been linked to overall productivity while the slope represents the “rate of decay” of this productivity (Zhou 2006). A Laser In-Situ Scattering Transmissometer (LISST) and Laser Optical Plankton Counter (LOPC) were used to collect size-spectrum data (Fig. 2A), and double-Multiple Opening and Closing Net and Environmental Sensing System (MOCNESS) and Isaacs-Kidd midwater trawl (IKMT)

nets (Fig. 2B and C) were used to capture mesopelagic fishes. The relationship among the size and abundance distributions of mesopelagic fishes and the estimates of production from the size-spectrum data will be used to evaluate the province classification of the stations occupied during MSM 26.

A LISST-100X (Type C; Sequoia, USA) collected vertical distribution data of particles from

2.5 to 500  $\mu\text{m}$  in size. The LISST uses a multi-ring detector to measure scattering light of particles from a laser diode. Particles are classified into 32 log-spaced bins and the concentration of each bin is calculated as microliters per liter ( $\mu\text{l/l}$ ). The instrument is rated to a depth of 300 m, and records temperature and pressure. Fifteen LISST casts were made in conjunction with the LOPC at stations. Day and

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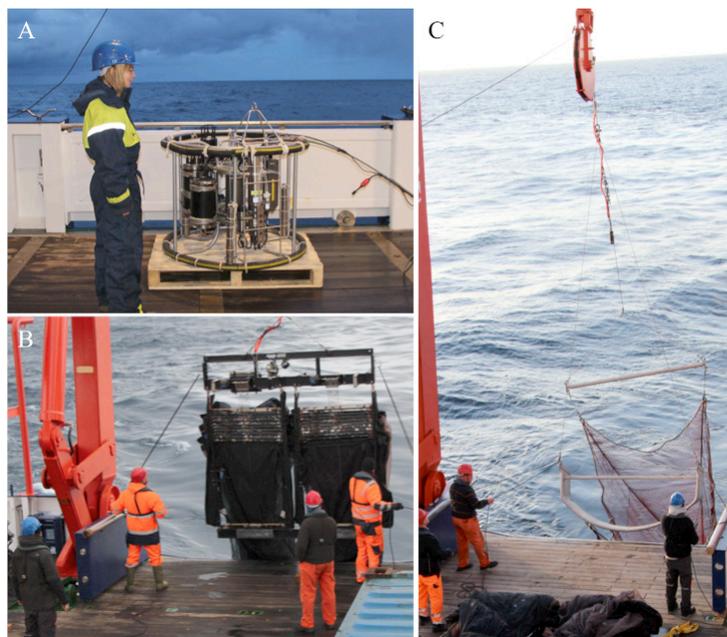


Figure 2. Sampling equipment used on ERUO BASIN research cruise MSM 26. A Laser In-Situ Scattering Transmissometer (LISST) and Laser Optical Plankton Counter (LOPC; A) were used to collect particle size-spectrum data, and double-Multiple Opening and Closing Net and Environmental Sensing System (MOCNESS; B) and Isaacs-Kidd midwater trawl (IKMT; C) were used to collect mesopelagic fish.

## 2013 Business Meeting Minutes

*Miami, Florida, June 4, 2013*

Catriona Clemmesen-Bockelmann (ELHS President) called the meeting to order and gave a brief introductory statement thanking Robert Cowen, Su Sponaule, and others on the local committee for hosting the meeting in Miami.

Nineteen full members were present, which exceeded the quorum necessary (18/173) to approve the minutes from the previous meeting. The minutes from the 2012 Business Meeting, which were posted in the October 2012 issue of STAGES, were approved (motion: L. Fuiman; second: D. Snyder; nays: zero).

### Elected Officers' Reports

Secretary's report (Frank Hernandez). The main duty of the Secretary continues to be the maintenance of the membership list, which is the basis for sending out STAGES. The process is cumbersome, but in general, the AFS membership office has been very responsive in providing updates upon request. As of 2013 business meeting, there were 173 full members paid through 2013 (for comparison, the reported full membership at the 2012 meeting was 182). The PayPal system (primarily used by affiliate members, particularly those outside of the United States) worked well during the past year, and as of the 2013 business meeting there were 20 affiliate members paid through 2013 (for comparison, the reported affiliate membership at the 2012 meeting was 43). The Secretary thanked Jeff Buckel for his continued efforts in keeping the PayPal system going and running smoothly. The Secretary's report was approved (motion: J. Hare; second: L. Fuiman; nays: zero).

Treasurer's report (J. Buckel by C. Clemmesen). All ELHS accounts are in good financial standing. The General

Fund balance as of June 1, 2013 was \$6,693.58, however this balance will increase to approximately \$12,000 by the end of Summer 2013 once LFC 2013 seed money (\$3,000) and AFS dues (~\$3,000) are received. For the Sally Richardson and Blaxter funds, the monies raised through raffles at LFC 2012 exceeded the annual award payments and both accounts increased over the last year. For the Blaxter fund, we are over halfway to the capital campaign goal of \$10,000. As of June 1, 2013, the balances for the Sally Richardson Fund and the John Blaxter Fund were \$14,614.80 and \$5,847.10, respectively. The Treasurer's report was approved (motion: G. Klein-MacPhee; second: K. Hubert; nays: zero).

Discussion after the Treasurer's report focused on the status of the student award funds, and the possibility of these funds being used to support travel to the LFC. No funds were available for student travel in 2013, yet both the Sally Richard and John Blaxter funds were in good financial standing, and both continually take in more funds each year through the raffle and auction than they pay out in award money. It was noted that the award amounts for best poster and oral presentation are static (i.e., \$300 and \$600, respectively). Several members suggested that an increase in the award amount should be considered. By rule, the Blaxter award is fixed at half the value of the Richardson award, and it has yet to reach its \$10,000 endowment. Further, it was noted that the original supporters of the Richardson award generally feel that the award should be more honorary than financial. Supporting student travel with Blaxter and Richardson funds, as well as sharing future fundraising dollars (e.g., from auctions and raffles), were among the several suggestions made at this time. The Executive Committee will solicit feedback on these suggestions and continue to engage members in this discussion in the hopes of supporting future travel for students.

Appointed Officers' Reports

Section newsletter (Lee Fuiman). Three issues of STAGES were published (June 2012, October 2012, and February 2013). This is the second year of delivering content electronically, which is convenient for ELHS members, but also has unintended benefits. For one, email contact information is immediately verified (relatively few bounces this year). Second, sending an email to the membership with STAGES attached provides the editor with an additional opportunity to remind members about renewing their membership. Two new Regional Representatives were appointed during the past year. Akinori Takasuka and Hubert Keckeis now serve as representatives for the Pacific Rim and European regions, respectively. It was noted that elections are needed for North Central and Southern representatives. According to the ELHS bylaws, these are elected offices and therefore these regional representatives serve as part of the ELHS's governance (2-year terms).

Section website (Jeff Buckel). Over the last year, activities of the ELHS website have included posting: issues of STAGES, announcements of meetings and short courses, job announcements, book publications, research initiatives, and Sally Richardson and John Blaxter award winners. Additional activities included adding updates to committee and EXCOM membership, updating Blaxter award page, and maintaining PayPal payment option for online membership renewal. Section members were reminded that the website is available for them to post job and meeting announcements, book publication announcements, links to their home website, etc. Also, members and future members were reminded that an online option is available for membership renewal (see "How to Join" link on section website).

Section Historian (Jeff Govoni). The paper archives of the ELHS are maintained at the home residence of ELHS Historian, Jeff Govoni. Relevant electronic files are either transmitted

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## Northeast Region...cont'd from p. 4

night casts were made at most stations in the three basins (stations 1-6 and 8-12; Fig. 1), while only a night cast was made at station 7 on the Mid-Atlantic Ridge. Future analyses will focus on combining LISST and LOPC data to estimate a larger range in the particle size-spectrum with which to evaluate the biome classifications for the different stations and basins.

The MOCNESS was equipped with 20 nets of 333  $\mu\text{m}$  mesh size; 10 nets per side. Samples were collected to a maximum depth of 1250 m. The first oblique nets sampled from the surface to the maximum depth, and the other nets sampled depth-discreet bins of the water column. MOCNESS hauls were performed during day and night to investigate diel vertical migrations. Oblique IKMT tows were made to a maximum depth of 500 m at a tow speed of 3.5 knots. The original cruise plan intended for nighttime IKMT tows, but tow times varied due to operational constraints.

Mesopelagic fishes were processed onboard. Fishes were picked from all IKMT nets, most oblique MOCNESS nets, and the left side nets of the depth-

discreet MOCNESS samples. The depth-discreet nets from the right side of the MOCNESS frame were preserved in 5% formalin for future quantitative analyses of the nekton. Fishes were identified to the lowest possible taxon using Whitehead et al. (1984) and Fahay (2007). Standard length (SL) of each fish was measured to the nearest 0.1 mm using digital calipers. Measured and identified fishes were frozen in an  $-80^{\circ}\text{C}$  freezer, and shipped to the University of Hamburg at the end of the cruise.

Estimates of catch-per-unit-effort (CPUE) were calculated for each net to estimate abundance of fishes. The IKMT tows were standardized to a CPUE of number of fish per 60-min tow. MOCNESS nets had estimates of volume of water filtered, thus CPUE was standardized to number of fish per 1000  $\text{m}^3$  of water filtered. Preliminary analysis of MOCNESS collections was conducted by station. Therefore, an estimate of abundance was calculated for each station by dividing the total number of fishes collected at a station by the total volume of all MOCNESS nets processed, and multiplying by 1000.

Seven IKMT and 15 MOCNESS hauls were performed from the 8 basin stations. IKMT tows were conducted during day, dusk, and night. Both day and night MOCNESS tows were completed at all stations except station 12. Only a night haul was completed at station 12 due to weather.

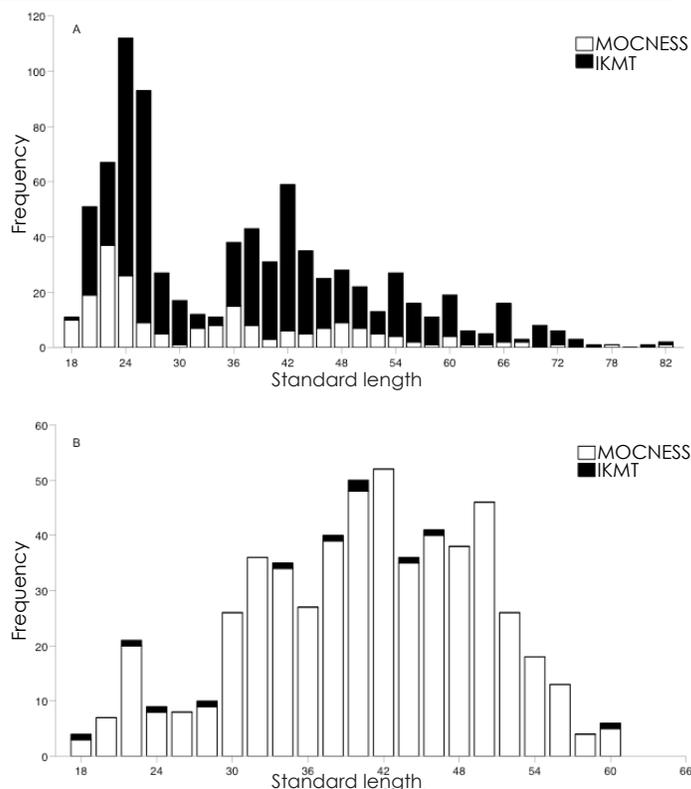


Figure 4. Frequency of 2-mm standard length bins for *Benthosema glaciale* (A) and *Cyclothone* spp. (B) collected with the MOCNESS and IKMT for all stations combined on ERUO BASIN research cruise MSM 26.

A total of 1,598 fishes were collected in the IKMT and MOCNESS tows. Seventeen taxa from eight mesopelagic or bathypelagic families were identified. IKMT collections were dominated by the myctophid *Benthosema glaciale* (Fig. 3A). MOCNESS collections were dominated by the gonostomatid taxon *Cyclothone* spp. (Fig. 3B). Both gears collected primarily juvenile and adult fishes. *Bathylagus euryops* was the only taxon collected at lengths less than the reported size at transformation from larval to juvenile stage (Fahay 2007). *Benthosema glaciale*, which reach sexual maturity at approximately 30 mm SL (Gjoseter 1981), was represented by equal numbers of juveniles (47 %) and adults (53 %; Fig. 4A). *Cyclothone* spp. reach sexual maturity around 25 mm SL and exhibit sexual dimorphism, males are smaller than females (McKelvie 1989). Collections were predominately adult fish (93 %; Fig. 4B).

*Benthosema glaciale* and *Cyclothone* spp. occurred in great enough numbers at all stations to examine cross-transect

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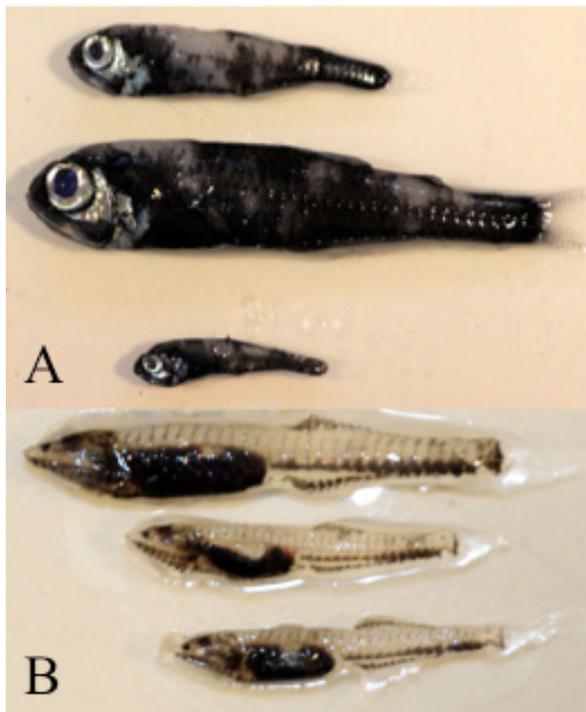


Figure 3. Dominant mesopelagic fishes collected on ERUO BASIN research cruise MSM 26: *Benthosema glaciale* (A) and *Cyclothone* spp. (B).

*Pacific Rim...cont'd from p. 2*

His award event was celebrated by many of his colleagues and students. Lastly, may I be indiscrete enough to say: I am proud that I was one of the students who received his education, as well as a lot of senior and junior colleagues graduating from his laboratory.

from: Michael J. Miller,  
Atmosphere and Ocean  
Research Institute, The  
University of Tokyo (miller@  
aori.u-tokyo.ac.jp)

**Unusual behavior of leptocephali found**

A new paper published in *Marine and Freshwater Behavior and Physiology* reports on video observations of leptocephali at Osprey Reef in the Coral Sea and suggests that leptocephali have distinct shape-change behaviors that result in mimicry of gelatinous zooplankton. Six of the 21 leptocephali recorded during dives in 3 different years showed shape-change behaviors by curling their bodies into fully or partially formed coil shapes. The transparency, body consistency, and shape of the coils appear to make them resemble the body forms of some jellyfish, ctenophores, salps, and siphonophores, which most fishes

avoid eating because of their stinging cells or low food value. The paper hypothesizes that these behaviors are performed in response to threatening situations, such as an approaching predator, and have been selected for because they reduce predation by fishes that avoid eating gelatinous zooplankton. If this is true, it represents a form of Batesian mimicry. Video clips of the curling behaviors can be viewed online, including a conger eel larva (see photos below) and chlopsid larva that made fully formed coils ([www.youtube.com/watch?v=ok8MW4pdPXI](http://www.youtube.com/watch?v=ok8MW4pdPXI)), two muraenid larvae that formed more fattened coils ([www.youtube.com/watch?v=UzHMghNIBIs](http://www.youtube.com/watch?v=UzHMghNIBIs)), and another congrid (*Ariosoma*) and a larger muraenid that formed partial coils ([www.youtube.com/watch?v=1WsHQZ3O2Wg](http://www.youtube.com/watch?v=1WsHQZ3O2Wg)). These videos were recorded by Dr. Julian Finn and Dr. Mark Norman of Museum Victoria in Australia.

Miller, M. J., M. D. Norman, K. Tsukamoto, J. K. Finn. 2013. Evidence of mimicry of gelatinous zooplankton by anguilliform leptocephali for predator avoidance. *Mar. Freshw. Behav. Physiol.* 45:375–384.

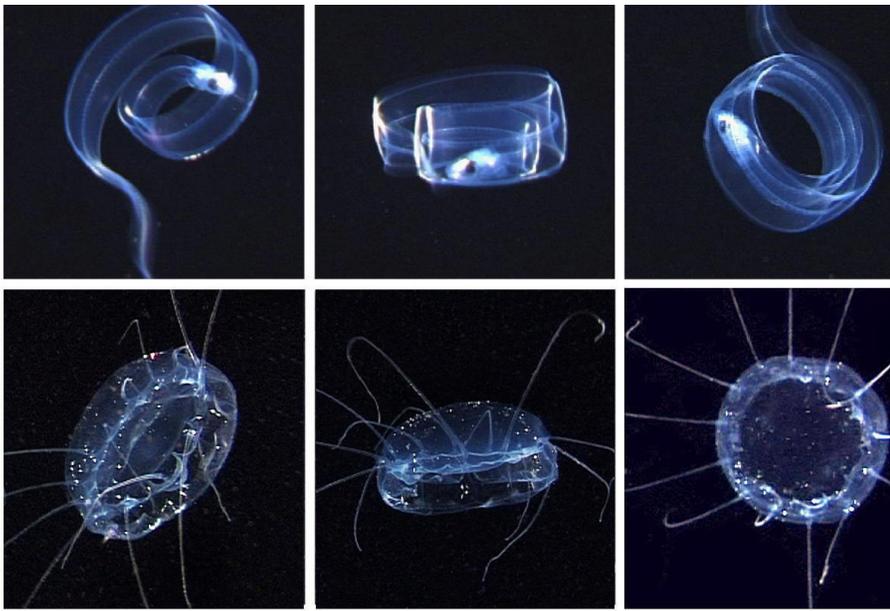
Fujikura, K., Lindsay, D., Kitazato, H., Nishida, S., Shirayama, Y. 2010. Marine biodiversity in Japanese waters. *PLoS ONE* 5:e11836. §

*European Region...cont'd from p. 3*

is able to explain the limited spawning and nursery area of anchovy in the South of Spain (North Alboran Sea) [2] (see figure on p. 8). In another work using kinetic energy (from altimetry data) as an indicator of the system's energy, we showed how the time series of anchovy CPUEs in that zone tend to be constantly depressed in relation to the high energy of the system, whereas the rare episodes of strong weakening of the Atlantic Jet (e.g. 2001) "release" the anchovy potential in the area [3]. Changes in the future climate may severely affect the pelagic dynamics in the western Mediterranean. In order to explore the potential effect of these changes in European anchovy, we have applied a bioeconomic model [4] to two possible climate-change scenarios (linked to the weakening or strengthening of the Atlantic Jet). We show that managers will likely have to face difficult decisions in the future.

The second main research line on ELH at IMEDEA is focused on links between functioning of Marine Protected areas (MPAs), coastal/recreational fisheries, and the spatial and temporal scales determining coastal fish recruitment. The Balearic Islands in the NW Mediterranean are a hotspot for biodiversity. The Archipelago hosts the highest percentage of marine protected areas in Spain and an increasing sector of recreational fishers, but little knowledge exists on recruitment processes and the role of MPAs on ELH dynamics. The research on ELH stages of fishes in such a system has plenty of opportunities to address socially-relevant questions. Nationally-funded projects such as TALACA (Transport and Accumulation of fish Larvae in the Cabrera Archipelago) and REC2 (Recruitment and settlement processes in recreational fish species) are gathering basic information on triggers of larval appearance in the plankton [5] and on their relationship with small and mesoscale structures [6]. We recently showed, through numerical simulations, high self-recruitment values (average of 30%, max >80%) and low distance dispersal processes (ca. 20 km) on typical summer-spawning species [7]. The implications of these results for

...continued on p. 8



Views of a conger leptocephalus and a jellyfish filmed at Osprey Reef, illustrating the possible body form resemblance of curling leptocephali and jellyfish. Images are adapted from Miller et al. (2013) and were recorded by Julian Finn.

### European Region...cont'd from p. 7

the population dynamics of coastal demersal species with small home-ranges are being currently investigated and were recently presented at the 37<sup>th</sup> annual Larval Fish Conference in Miami, Florida (Alós et al., LFC 2013). In particular, we showed how the studies of direct and indirect connectivity of coastal larval fishes can be used to understand the observed changes in adult life traits in the context of fisheries induced evolution. Further activities of the Fish Ecology group in the context of ELH studies deal with feeding ecology [8, 9] and behavioural studies of several species [10, 11], essential to parameterize individual-based models.

In the coming couple of years we will continue and expand the aforementioned two research avenues. On one hand, we will continue using IBMs to understand the dynamics of small pelagics, and we will expand its application to demersal taxa. On the

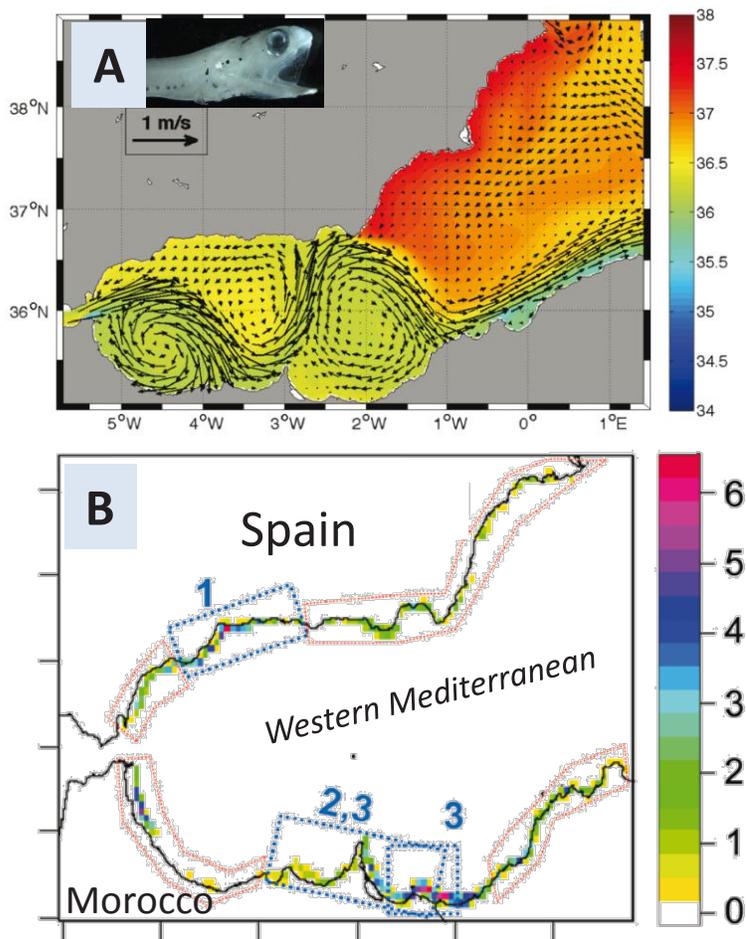
other hand, we are initiating a series of behavioural approaches (e.g., through choice chambers) and microchemistry analyses on larvae and juvenile fishes to shed light onto the recruitment drivers of Mediterranean coastal demersal fishes. Within this framework we look forward to collaborating with groups overseas.

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García-del-Hoyo, G. Navarro, I.A. Catalán, L. Renault, and J. Ruiz/ 2013. Consequences of a future climatic scenario for the anchovy fishery in the Alboran Sea (SW Mediterranean): A modeling study. *Journal of Marine Systems* 2013.

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10. Vollset, K.W., I.A. Catalán, Ø. Fiksen, and A. Folkvord. 2013. Effect of food deprivation on distribution of larval and early juvenile cod in experimental vertical temperature and light gradients. *Marine Ecology Progress Series* 475:191-201.
11. Catalán, I.A., K.W. Vollset, B. Morales-Nin, and A. Folkvord. 2012. The effect of temperature gradients and stomach fullness on the vertical distribution of larval herring in experimental columns. *Journal of Experimental Marine Biology and Ecology*. 420:99. §



A) Anchovy spawning season: output of an averaged current and salinity simulated field (ROMS) at 10 m in 2008. B) Average number of individuals per 25 km<sup>2</sup> ending at depths <50 m after 30 days of drift using a random spatial release scheme. Simulation based on a climatological run (details in Catalán et al. 2013). Blue boxes depict areas for which literature data show higher than average abundance of anchovy eggs, larvae, or adults (from acoustic estimates). Red polygons embrace the areas that were prospected through acoustics and showed no significant anchovy aggregations in several surveys, and relatively low larval concentration in other surveys. Numbers in B are references in Catalán et al. (2013).

Northeast Region...cont'd from p. 6

patterns of abundance. *Benthoosema glaciale* decreased in abundance from west to east, with higher abundances in the Icelandic and eastern Irminger Basins and lower abundances in the western Irminger Basin and Labrador Sea (Fig. 5). No clear pattern occurred in the abundance of *Cyclothone* spp. Future analyses will examine diel vertical distribution patterns and ultimately link distribution and abundance to station and basin biome classifications.

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Zhou, M., 2006. What determines the slope of a plankton biomass spectrum? *J. Plank. Res.* 28, 437-448. §

Student awards...cont'd from p. 1

Two honorable mentions were made for the Richardson award. These were: (1) Alison Deary, Virginia Institute of Marine Science, for her presentation entitled "Comparison of the development and ossification of the cranium in two species of South African drum (Sciaenidae), *Argyrosomus japonicus* and *A. thorpei*," co-authored by P. Patrick and N. Strydom; and (2) Jason Boucher, University of Massachusetts Dartmouth, for his presentation entitled "Modeling interannual variability in larval survival of Georges Bank haddock, *Melanogrammus aeglefinus*, with focus on the unusual 2003 recruitment event," co-authored by C. Chen, Y. Sun, and R. Beardsley.

Congratulations to the winners, and hearty thanks to all the students who competed and to the judges. Grace Klein-MacPhee and Elaine Calderone, co-Chairs of the Sally Richardson Award Committee, organized the judging for the Richardson award. Frank Hernandez and Jon Hare organized the judging for the Blaxter award. Thanks to them for their work on behalf of the ELHS. §

President's Message...cont'd from p. 1

The business meeting and the brainstorming meeting were well attended and we had good discussions concerning our future. Frank Hernandez has done an excellent job in updating and organizing the membership lists and serving as secretary. Thank you very much, Frank, for all your support for our section. We were able to increase the number of affiliate members right at the meeting, since they recognized that they could benefit by being part of this interesting group. The involvement of students into our section is something I will be taking up in the near future by appointing a student representative. We are in contact with members of the section to continue or take up the jobs of Regional Representatives. These are the people who communicate the scientific work we are doing in the USA, Canada, and throughout the world to our members. These regional representatives are part of our governing board and therefore need to be elected. There will be an online ballot, like the one we used to vote for President-elect and Secretary-elect, and you will be contacted in the near future to vote for our Regional Representatives.

I'm happy to report that besides our new President-elect Myron Peck from Hamburg, Germany, and our Secretary-elect Fred Scharf from Wilmington, North Carolina, we were able to find additional new members for the Alhstrom Lifetime Award, the Sally Richardson Award and the John Blaxter Award committees, and they will be appointed soon.

Pascal Sirois and his colleagues will host a Larval Fish Conference in Quebec City, Quebec, Canada, jointly with AFS in August 2014. Offers from Vienna, Austria, and Mallorca, Spain, to host the Larval Fish Conferences in the future were presented at the business meeting in Miami. This is a reflection of the internationality our section has gained in recent years. Financial constraints and travel regulations make it more difficult for our American colleagues to get to meetings outside of the USA. I'm aware of that and can see the dilemma. But I'm also in a dilemma. To be able to host our conference at a

...continued on p. 12

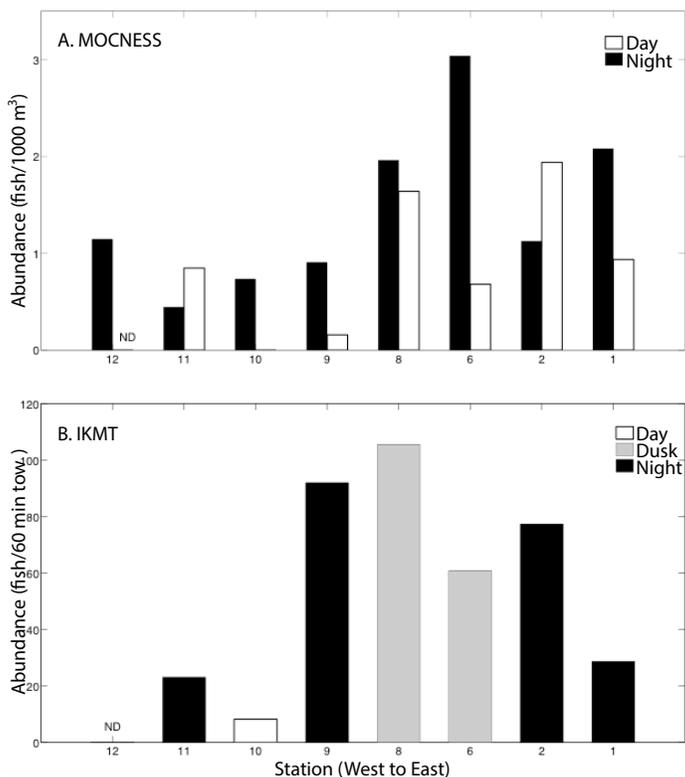


Figure 5. Abundance of *Benthoosema glaciale* collected in the MOCNESS (A) and IKMT (B) on a west to east transect sampled on ERUO BASIN research cruise MSM 26. ND = no data.

## Publications

### Recent Series of ELH Guides

Darrel Snyder advises that the following publications are available online at [www.usbr.gov/pmts/tech\\_services/tracy\\_research/tracyreports](http://www.usbr.gov/pmts/tech_services/tracy_research/tracyreports):

Reyes, R. C. 2008. Embryogenesis and Ammocoete Morphological Development of the Pacific Lamprey (*Entosphenus tridentatus*) from the American River, California. Tracy Fish Facilities Studies Technical Bulletin 2008-3. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Reyes, R. C. 2010. Descriptions of the Early Life Stages of Three Common Ictalurids from the Sacramento-San Joaquin River Delta, California. Tracy Fish Facilities Studies Technical Bulletin 2010-2. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Reyes, R. C. 2011. Dichotomous Key to Fish Eggs of the Sacramento-San Joaquin River Delta. Tracy Fish Collection Facility Studies. Tracy Technical Bulletin 2011-1. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center. 35 pp.

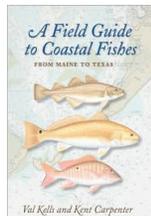
Wang, J. C. S. 2006. Early life history comparison of the green sturgeon, *Acipenser medirostris*, and white sturgeon, *Acipenser transmontanus*, of the Sacramento-San Joaquin River Delta, California. Tracy Fish Facilities Studies Technical Bulletin 2006-1. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Wang, J. C. S. 2007. Spawning, early life stages, and early life histories of the Osmerids found in the Sacramento-San Joaquin Delta of California. Tracy Fish Facilities Studies, Vol. 38. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Wang, J. C. S. 2011. Fishes of the Sacramento-San Joaquin River Delta and Adjacent Waters, California: A Guide to Early Life Histories. Tracy Fish Collection Facility Studies. Volume 44. U.S. Bureau of Reclamation, Mid Pacific Region and Denver Technical Service Center. 411 pp.

Wang, J. C. S., and R. C. Reyes. 2007. Early Life Stages and Life Histories of Cyprinid Fish in the Sacramento-San Joaquin Delta, California: with emphasis on spawning by splittail, *Pogonichthys macrolepidotus*. Tracy Fish Facilities Studies, Vol. 32. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.

Wang, J. C. S., and R. C. Reyes. 2008. Early Life Stages and Life Histories of Centrarchids, in the Sacramento-San Joaquin River Delta System, California. Tracy Fish Facilities Studies, Vol. 42. U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service. §



**Available now:** *A Field Guide to Coastal Fishes from Maine to Texas*

By Valerie A. Kells and Kent Carpenter

Published by Johns Hopkins University Press.  
ISBN: 978-0-8018-9838-9. 2011.

Comprehensive and compact, this 448-page guide includes 1,079 full color illustrations and descriptions of over 1,006 marine and brackish water species.

This is the first field guide of its kind to be entirely illustrated in full color. Illustrations are large, and meticulously researched. Descriptions are concise, accurate and provide information about features, habitat and biology. It is accurate and up-to-date, using the most recently accepted taxonomy and nomenclature.

ELHS member Ron Kernehan says “If you haven’t seen this publication, it is by far the best guide I’ve ever seen for fishes of this region with 100% original color illustrations which are large enough for easy comparison. In addition, the diagnostic characteristics are on the opposing page, not far away in the text.” §

### Other Publications

*Larval Fish Nutrition*. Edited by G. Joan Holt. Published by Wiley-Blackwell. ISBN-0813817927. 2011.

*Identification of Eggs and Larvae of Marine Fishes*. Edited by A.W. Kendall, Jr. Published by Tokai University Press. ISBN-978-4-486-03758-3. 2011.

*Ecology of Estuarine Fishes: Temperate Waters of the Western North Atlantic*. By Kenneth W. Able and Michael P. Fahay. Published by Johns Hopkins University Press. ISBN-0801894719. 2010.

*Early stages of marine fishes occurring in the Iberian Peninsula*. P. Ré and I. Meneses. Published by IPIMAR/IMAR. ISBN-978-972-9372-34-6.

*Ecology of Anguilliform Leptocephali: Remarkable Transparent Fish Larvae of the Ocean Surface Layer*. M.J. Miller. Published by Aqua-BioScience Monographs. TERRAPUB. 2009.

*Advances in Early Life History Study of Fish*. C. Clemmesen, A.M. Malzahn, M.A. Peck, and D. Schnack, eds. *Scientia Marina*, volume 73S1, Supplement 1. Consejo Superior de Investigaciones Cientificas. 2009.

*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.

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

Volume VI, Elasmobranchii and Centrarchidae. Edited by R. Wallus and T.P. Simon. Published by CRC Press. ISBN 978-0-8493-1923-8. 2008; 472 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 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 III, Ictaluridae – Catfish and Madtoms. T.P. Simon and R. Wallus. Published by CRC Press. ISBN 0849319196. 2003; 232 p.

*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.

*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](http://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.

§

## Scenes from the 37<sup>th</sup> annual Larval Fish Conference



Check out all the photos from the conference at [www.flickr.com/photos/96976613@N04/](http://www.flickr.com/photos/96976613@N04/)



*President's Message...cont'd from p. 9*  
location in the United States we need to receive an offer. And so far, this is not on the table. So talk to your colleagues, create consortia, and approach me with suggestions. Please do so very soon, since we have to make our discussion for future meeting venues as early as possible.

With this I wish you all a good summer, success with your research, and enjoyment with the interesting work you all are doing. §

— Catriona Clemmesen-Bockelmann,  
President

#### *Business meeting...cont'd from p. 5*

to the ELHS Webmaster for posting on the ELHS Website if appropriate, or maintained as electronic files by the Historian. The ELHS Historian has picked up the task of reviewing archived issues of STAGES, and providing input to the newsletter Editor, Lee Fuiman, for the "ELHS Back Then" column.

#### Standing Committee Reports

Nominations and mail ballot committee (Jon Hare). One election was run during the year (one year late). In the end we had two highly qualified candidates for President-Elect and Secretary. The election used a Google survey as part of a Google spreadsheet. The link was sent to the membership list provided by the Secretary. Respondents were required to include their email, so the vote could be verified against the current membership list. There were 78 votes cast. The President-elect is Myron Peck and the Secretary-elect is Fred Scharf. Myron and Fred will assume the positions of President and Secretary at the 2014 LFC. Election of Regional Representatives is in progress. There is one candidate for Southern Regional Representative. There are zero candidates for the North Central Regional Representative.

In addition, two questions were raised. 1) Do we run an election with one candidate? After some discussion, the general consensus was that if there was one candidate, the election can proceed with an option for a 'write in' candidate. 2) What do we do about the North Central Region? Repeated

attempts to contact the current representative for this region have been unsuccessful. Several suggestions were made to fill this position, and these colleagues will be contacted.

Time and Place Committee / Annual Conference Committee (Chris Chambers). An update and presentation on next year's meeting (with AFS) in Quebec City was provided by Pascal Sirois. Preliminary themes/symposia may include "Recruitment - 100 years after Hjort"; "Contributions of early life history to fisheries management"; "Larval fish physiology/aquaculture"; "Connectivity-dispersal"; "Contributed papers"; and others to be determined. The local committee is currently working on securing funds for plenary speakers, planning a separate ELHS banquet, and preparing promotional materials. Registration for the LFC will be through AFS. It was noted during the presentation that this meeting provides a great opportunity to reach out to ELH researchers working in freshwater systems, a demographic within the ELHS that is declining.

LFC 2015 - Offer from Vienna (Hubert Keckeis). An offer was made by Hubert Keckeis to host the 2015 LFC in Vienna. Hubert gave a short presentation and followed it with a question and answer period. If awarded, the meeting would likely occur during the July-August time frame, and a tentative overall theme may be "common hypotheses in marine and freshwater environments."

LFC 2016 - Offer from Mallorca (Ignacio Catalán). An offer was made by Ignacio Catalán to host the 2016 LFC in Mallorca (Balearic Islands, Spain). The meeting, if accepted, would be a joint effort between the Spanish Institute of Oceanography and the Mediterranean Institute for Advanced Studies. These colleagues and their organizations have extensive experience hosting large scientific conferences and would welcome the opportunity to host the LFC. A presentation was made and a question and answer period followed.

After the presentations, comments were solicited about the offers currently on the table to host future LFC meetings. Some members voiced a preference for retaining a U.S. presence in the meeting rotation as

much as possible (e.g., an alternating schedule of U.S.-international venues). In response to these concerns, both the Vienna and Mallorca hosts suggested their offers could be flexible, and therefore be pushed back a year or so to accommodate any U.S. offer. Frank Hernandez said he would investigate the possibility of a LFC along the U.S. Gulf coast and report back to the Executive Committee with a week or two, but no firm offer was made during the meeting. It was noted that many of the 2013 LFC attendees were international, and that the demographics of the membership change over time to reflect this. Ultimately, the goal of maintaining an alternating schedule of U.S. and international conferences hinges on offers to host the meeting, particularly (of late) by U.S. members. A suggestion was made that during years when the meeting is held abroad, a larval fish symposium may be offered at the AFS meeting to accommodate U.S. members with travel or budget limitations. Finally, it was noted that the role of the Time and Place Committee in the venue-selection process was to make recommendations, but that according to the bylaws, the decision rests with the Executive Committee. The Executive Committee will continue this discussion over the following weeks, as a decision must be made relatively soon for the 2015 LFC.

#### Sessional Committees

Sally L. Richardson Award Committee (Grace Klein-MacPhee). The 27<sup>th</sup> annual Sally Richardson award for the best student paper presented at the 36<sup>th</sup> annual Larval Fish Conference was given at Os, Norway July 2-6, 2012. Students representing 13 countries presented 27 student papers. The winner of the award for best student paper was Rebecca Asch, Scripps Institute of Oceanography, for her presentation entitled "Climate change and the seasonal occurrence of larval fish in the Southern California Current Ecosystem". Honorable Mentions went to Deena Anderson, University of North Carolina, for her presentation entitled "Experimental evaluation of patterns and mechanisms of juvenile red drum mortality due to acute cold stress during severe winters" (Frederick Scharf,

*...continued on p. 13*

*Business meeting...cont'd from p. 12*

co-Author), and Erika Staaterman, University of Miami, Rosenstiel School of Marine and Atmospheric Science, for her presentation entitled "Orientation behavior in fish larvae: A missing piece to Hjort's critical period hypothesis" (Claire Paris and Judith Helgers, co-Authors). The committee noted that its membership consisted of older members, many of which are retired. They request volunteers to join the committee to replace or assist current members.

John H. S. Blaxter Award Committee (Don Hoss, Lee Fuiman, Jon Hare). The award is continuing and in that sense the committee is doing well. However, the award is JUST continuing and in that sense the committee needs some new energy. Two to three new committee members should be appointed to the committee. Joel Llopiz has agreed to serve as the committee chair for the next year, including the 2014 LFC.

Elbert H. Ahlstrom Career Achievement Award Committee (Jeff Govoni). No new nominations were received for the award during the past year. Chris Chambers and Howard Browman have offered to join the committee, pending approval by the President.

Student Travel Grants Committee (Fred Scharf). No student travel awards were available for the 2013 LFC in Miami. The committee suggests that a 'steady' source of funding needs to be identified to support student travel. A further discussion was held concerning student travel, and whether funds can be used from existing accounts (e.g., General fund, award funds) to support student travel awards. The Executive Committee will consider options and solicit opinions from the membership in the hopes of providing travel support in the future.

Conference and Symposium Publications Editorial Committee (Jon Hare). There was no activity to report. Jon Hare would like to step down from this committee obligation, if possible. The Executive Committee will seek a volunteer to serve as his replacement.

Other Business

Conference website (Howard Browman by C. Clemmesen-Bockelmann). The LFC website is generally used for conference registration and abstract submission, and is maintained (and paid for) by H. Browman. There are instances, however, when the host either opts not to use the website for this purpose, either for convenience (e.g., the 2013 meeting), or when the meeting is held in conjunction with the parent organization (e.g., the 2014 meeting). Howard noted that the LFC website can serve as an archive of information for past meetings, and that there is the potential to lose information if the local hosts use a more 'ephemeral' website. There should be coordination among the local hosts and the LFC website manager to avoid any loss of information. Howard is willing to continue serving as the webmaster for the LFC website. There is a \$40/month charge to maintain the website, and therefore funds must be secured to continue hosting it

as is, or to find an alternative hosting service. The Executive Committee will be in touch with Howard to assume payment for the website hosting.

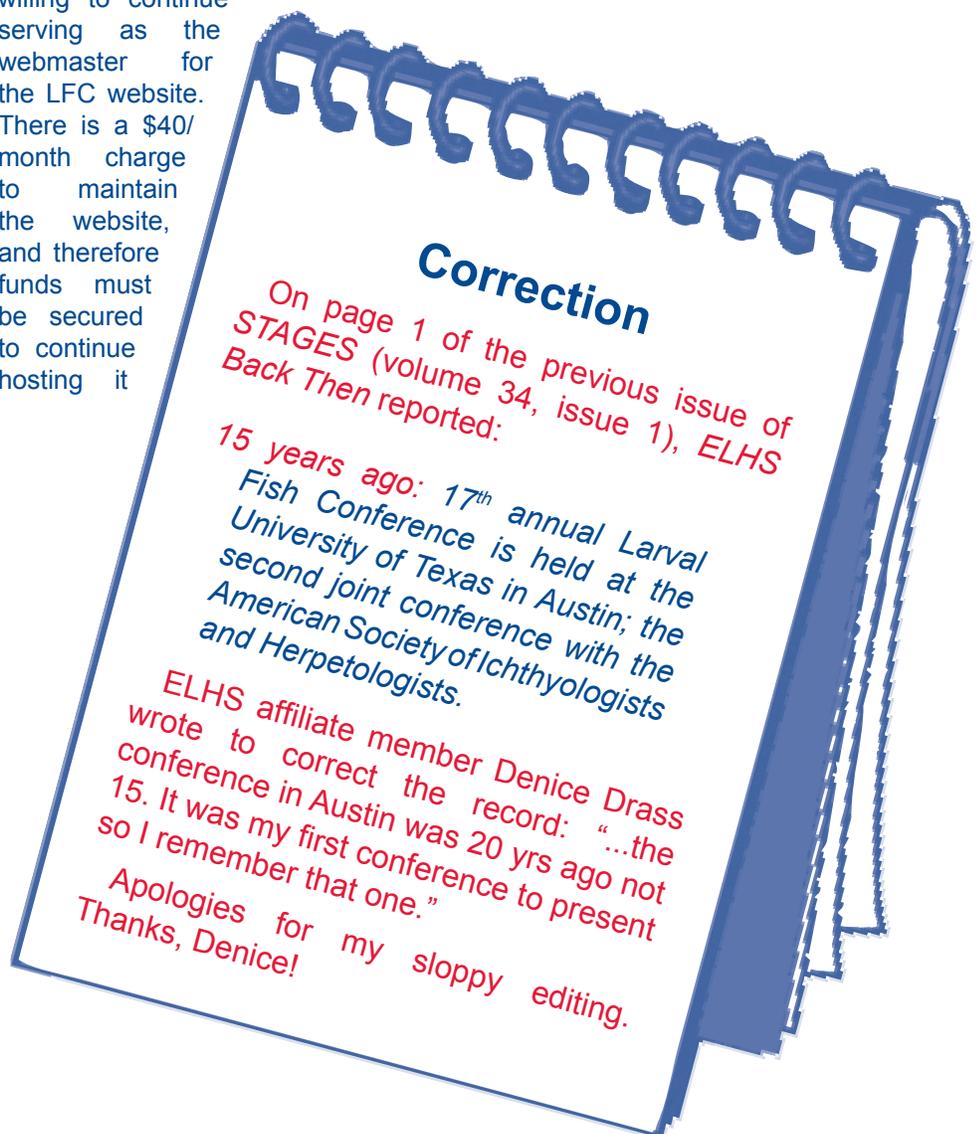
New Business

Chris Chambers encouraged those in attendance to participate in the ELHS brainstorming session the following day at 1100 a.m. to discuss section-related issues. Darrell Snyder commented that the web-based voting for officers worked very well. It was noted that this could be used for surveys and other needs throughout the year to engage the membership.

Adjournment

After all agenda items were discussed, the meeting was adjourned (motion: L. Fuiman; second: J. Hare). §

— Frank Hernandez, Secretary



## 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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## Editor's Ramblings

### Join ELHS

Membership in ELHS is open to all persons or organizations interested in furthering ELHS objectives, regardless of membership in the American Fisheries Society (AFS). If you are an AFS member, simply add ELHS membership when you pay your Society dues.

Affiliate membership is open to persons or organizations who are not members of AFS. Affiliate members are encouraged to participate in Section meetings, committee work, and other activities, but they cannot vote on official Section matters, run for or hold an elected office, or chair standing committees. All members receive **STAGES**.

ELHS has a PayPal account to receive affiliate membership dues. To join ELHS as an affiliate or to renew affiliate status online, go to: [www.elhs.cmast.ncsu.edu/index.php/how-to-join.html](http://www.elhs.cmast.ncsu.edu/index.php/how-to-join.html) or mail your name, institutional affiliation (if appropriate), mailing address, telephone and fax numbers, e-mail address, and dues (US \$15 per year) for the current and/or upcoming year(s) to the ELHS Treasurer (see page 2).

Please specify the membership year(s) for which you are paying dues. Make checks or money orders payable to "AFS-ELHS."



### Thanks to the Miami Crew!

The 37<sup>th</sup> annual Larval Fish Conference was a truly memorable one. On behalf of all those who attended (and those who wished they had), a heartfelt THANK YOU to Su Sponaugle, Bob Cowen, and the entire crew (some of whom are pictured below) who organized the wonderful event! §

