



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

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Lee A. Fuiman, Editor

October 2012

Students Receive Awards for Research Presentations

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photos: Sara Gresbach

ELHS Back Then

5 years ago: 31st Larval Fish Conference held in St. John's, Newfoundland, at least one attendee mistakenly flew to St. John, New Brunswick.

15 years ago: 21st Larval Fish Conference held with ASIH at University of Washington with 188 LFC registrants, 90 papers, and 28 posters.

25 years ago: After 8 years as newsletter editor, Fred Binkowski suggests the Section might begin to groom his replacement.

30 years ago: Don Hoss organized the symposium "Dynamics of Larval Fish Food Webs" at the annual AFS meeting.

The Sally L. Richardson award for the best student paper and the John H. S. Blaxter award for the best student poster were awarded at the 36th annual Larval Fish Conference held near Bergen, Norway in July. The winner of the Richardson award was Rebecca Asch of Scripps Institution of Oceanography (pictured above left with Grace Klein-MacPhee), for her presentation entitled "Climate change and the seasonal occurrence of larval fish in the Southern California Current Ecosystem." An unbreakable tie resulted in two winners of the Blaxter award: Olivier Morissette and Alison Deary (pictured above right with Lee Fuiman). Olivier, from Université du Québec à Chicoutimi, presented a poster entitled "Long time no see: The onset of a natural dynamic for the re-introduced striped bass in the St. Lawrence Estuary (Canada)," co-authored by F. Lecomte, P. Sirois, M. Legault, and G. Verreault. Alison, from the Virginia Institute of Marine Science, presented the poster, "Development of the pharyngeal jaws in the drums (Sciaenidae) of the Chesapeake Bay with comparisons to other members of the family," which was co-authored by E. Hilton. *...continued on p. 7*

President's Message



I am delighted to take the position of the ELHS president, an organization which I have been connected to for a long time. I still remember my first conference, a joint meeting with the American Society of Ichthyologists & Herpetologists in Austin, Texas, in 1993. As a newcomer at that time, it was great to be able to put faces to names of all these important people. That was the 17th conference, now we have just been at the 36th in Bergen, Norway, which was perfectly organized by Howard Browman, Anne Berit Skiftesvik and their team. We all had a wonderful time at the Solstrand Hotel, enjoyed a great

scientific programme covering new and interesting fields; all went back with a few extra pounds due to the great food. A special thanks also for generous student travel support, which allowed a lot of young scientists to present their work and exchange ideas. Communication also took place in the wonderful spa area at the hotel. Even the cold water temperature in the fjord didn't keep people from jumping in. The auctioning of the flag again was a great

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

January 11, 2013

News from the Regions



European Region

Audrey Geffen

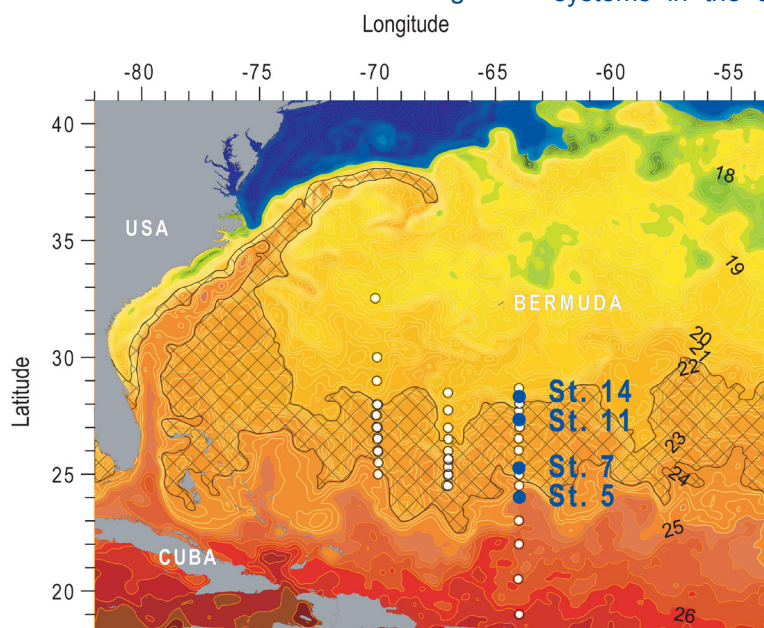
from: Daniel Ayala, Section for Ocean Ecology and Climate, Technical University of Denmark, Charlottenlund

I am an ichthyology researcher working with Denmark's Institute for Aquatic Resources. For the last year and a half, I have been investigating the larval fishes collected in the Sargasso

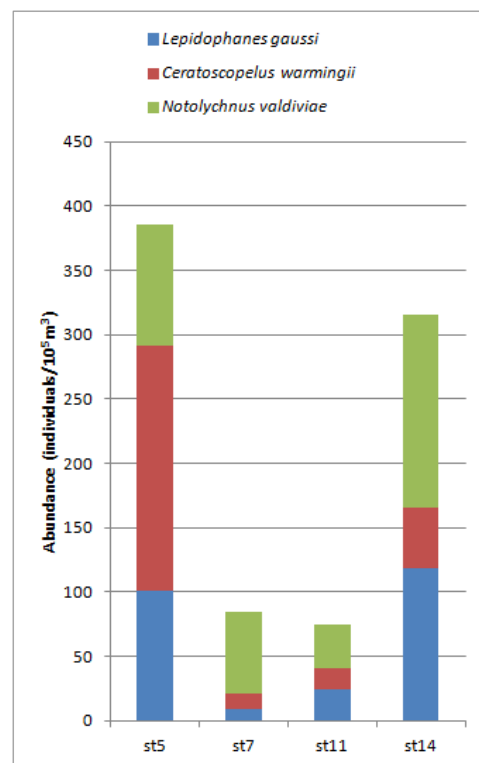
Sea during the Danish circumglobal Galathea III expedition, with the aim of an improved understanding of ichthyoplankton diversity in the area. To this end, I employed a combination of identification methods, complementing morphometrics with genetic identification of upwards of 600 larval specimens. This method was deemed vital, as numerous fish species from the Sargasso Sea still have no larval descriptions. In addition to describing the larval fishes found in the central Sargasso Sea, the project has so far revealed spatial variability information on larval occurrences relative to frontal systems in the area. Furthermore, I

hope to be able to quantitatively investigate how much higher species-level resolution and accuracy we can obtain by using a multidisciplinary identification approach

Our initial findings are still preliminary and will be published in the near future, but some things are already evident. So far, the investigated stations contain



Locations of Sargasso Sea stations sampled by Denmark's Galathea III expedition relative to temperature contours.



Abundances of larvae of three myctophid species at selected stations.

almost 120 species, composed of a complex mixture of myctophids, gonostomatids, stomiids, paralepidids, bothids, gempylids, numerous eel species, as well as epi-pelagic predators, to name the tip of the ichthyological iceberg. Simultaneously, characteristic patterns of the larval fish community were apparent. The family Myctophidae was, by far, the most species-rich, with over 30 species represented from a limited

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Section Officers

President

Catrina Clemmesen
Leibniz Institute of Marine Science
Kiel, Germany
cclemmesen@ifm-geomar.de

Secretary

Frank Hernandez
Department of Coastal Sciences
University of Southern Mississippi
frank.hernandez@usm.edu

Treasurer

Jeffrey Buckel
Center for Marine Sciences & Technology
North Carolina State University
jeffrey_buckel@ncsu.edu

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[vacant]

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Pacific Rim Region

Akinori Takasuka

Firstly, here is a report about recent progress on the big eel project from the Atmosphere and Ocean Research Institute of the University of Tokyo. I appreciate this exciting contribution from the authors.

Research progress on the early life history of the Japanese eel *Anguilla japonica*

Michael J. Miller (miller@aori.u-tokyo.ac.jp), Katsumi Tsukamoto (ktpc@aori.u-tokyo.ac.jp), and colleagues, Atmosphere and Ocean Research Institute, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa Chiba, 277-8564, Japan

The spawning of anguillid eels or their earliest life stages far out in the open sea have remained difficult to observe because of the vast scale of the areas where they may spawn. The major effort led by Katsumi Tsukamoto to study the life history of the Japanese eel in the last decade has made progress learning about their exact spawning sites and the characteristics of their early life-history stages through collections of their recently spawned eggs and newly hatched larvae during different years and in different locations. Preleptocephali, the recently hatched, non-feeding larvae before absorption of the oil globule, have been collected using a large, 3-m ring net in the spawning area to the west of the

seamount chain of the West Mariana Ridge in several years starting in 2005 (Tsukamoto, 2006), but eggs were not collected until 2009 (Tsukamoto et al., 2011). Adults in spawning condition were also recently caught using large midwater trawls in the upper 250 m (e.g. Tsukamoto et al., 2011).

The collection locations of the adults and preleptocephali indicated that the seamount ridge seems to act as a landmark of the eastern boundary of the spawning area, but a salinity front formed by tropical rainfall over the southern part of the North Equatorial Current appears to affect the latitude of spawning (Kimura and Tsukamoto, 2006; Tsukamoto et al., 2011). The surveys of the spawning area and otolith analyses of the larvae showed that spawning by *A. japonica* only occurs during the several days before the new moon of each month during their spawning season (Tsukamoto et al., 2003, 2011).

By finding out these three factors that seem to determine where *A. japonica* spawns, Katsumi's team was able to predict the likely location of spawning during a particular new moon based on where the salinity front crossed the West Mariana Ridge and then conduct a grid survey to collect eggs up to new moon and then recently hatched larvae shortly after new moon. This strategy was successful in May 2009 (Tsukamoto et al., 2011), June 2011, and May and June of 2012, when both eggs and preleptocephali were collected. This allowed the characteristics of different stages of naturally spawned anguillid eggs to be documented for the first time and compared to other types of eggs such as those of the closest



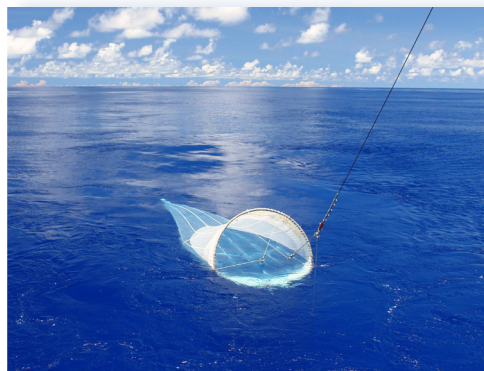
Live *Anguilla japonica* eggs (embryos) at various stages of development, a larva that hatched while being observed onboard, and an early-stage preleptocephalus that were collected in the spawning area in 2009, 2011 and 2012.

relatives of anguillid eels (Yoshinaga et al. 2011), the mesopelagic eels of the Serrivomeridae (Inoue et al., 2011).

Once a spawning site was located, the distribution of preleptocephali in that particular area and over a wider region was used to evaluate the areas where spawning occurred in those particular months. These collections showed that spawning occurred over deep water to the west of the ridge or over the deeper ridge in the south and that the spawning latitude would move depending on the latitude of the salinity front, with spawning occurring at various distances south of the front when it moved to the north.

The finding of spawning sites by collecting eggs allowed the depth distribution of preleptocephali (Tsukamoto et al., 2011) and eggs to be evaluated by horizontal tows made at different depth layers in those specific areas. This showed that both eggs and preleptocephali accumulated in a narrow depth layer at the bottom of the thermocline at around 150–170 m. This and the collections of spawning adults

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The large 3-m diameter plankton net used to collect eel eggs and recently hatched larvae.



Northeast Region

Dave Richardson

Grace Klein-MacPhee and Eric G. Schneider of the Rhode Island Department of Environmental Management, Division of Fish and Wildlife, Marine Fisheries, Coastal Fisheries Laboratory, and Valerie A. Cappola and Grace Bowles of the U.S. Army Corps of Engineers conducted an ichthyoplankton survey on Block Island, Rhode Island at eight stations, in Old Harbor and the Great Salt Pond from February through May 2012. The emphasis of this survey was on winter flounder, a species that has undergone considerable declines in southern New England over the past decades. Old Harbor and Great South Pond are dredged periodically, and it is important to know when and where winter flounder early life stages occur so that a dredging window can be established to minimize effects on this important commercial and recreational species. Prior to this study, there has been only minimal ichthyoplankton sampling on Block Island. The results of this work will be presented in an oral presentation at the Flatfish Biology Conference in Westbrook, Connecticut, December 4th and 5th.



Figure caption: Sampling location for winter flounder larvae in the Block Island Great Salt Pond.

Dr. Lisa Kerr (Gulf of Maine Research Institute) was awarded the American Institute of Fisheries Biologist's 2012 Best Student Paper Award for:

Kerr, L.A., S.X. Cadrin, and D.H. Secor. 2010. The role of spatial dynamics in the stability, resilience, and productivity of fish populations: An evaluation based on white perch in the Chesapeake Bay. *Ecological Applications* 20:497-507.



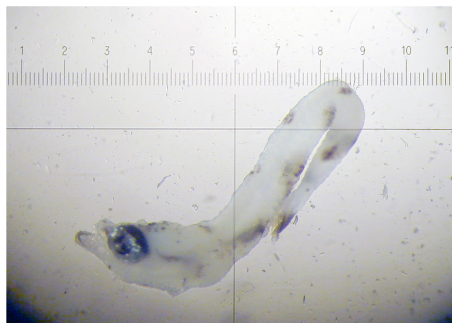
Dr. Lisa Kerr of the Gulf of Maine Research Institute.

The paper builds on a series studies demonstrating partial migration in Chesapeake Bay white perch, exploring how environmental forcing on different population contingents contributes to overall population yield, stability, and resilience. Lisa has continued to apply simulation models to explore the consequences of types of connectivity to Atlantic herring, cod, and bluefin tuna metapopulations. Related papers include:

Kerr, L.A., S.X. Cadrin, and D.H. Secor. 2010. Simulation modeling as a tool for examining the consequences of spatial structure and connectivity to local and regional population dynamics. *ICES Journal of Marine Science* 67:1631-1639.

Secor, D.H., Kerr, L.A. and Cadrin, S.X. 2009. Connectivity effects on productivity, stability, and persistence in an Atlantic herring metapopulation. *ICES Journal of Marine Science* 66:1726-1732.

Kerr, L.A., S.X. Cadrin, and D.H. Secor. 2012. Evaluating population effects and management implications of mixing between eastern and western Atlantic bluefin tunastocks. *ICES CM2012/N:13*. §



Nice pictures of some ugly larvae. Upper: Diretmidae, *Diretmus argenteus* (5.4 mm). Left: Chiasmodontidae sp. 'D' (4.8 mm). Right: Carapidae, *Carapus bermudensis* (83 mm).

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

number of investigated stations. This was not surprising, given the extent of prior midwater fish research in the area. Species diversity between our investigated stations revealed sharp variations in larval communities and diversity across frontal zones of the subtropical convergence zone (STCZ). Some of our common eel species were found concentrated in the STCZ's stratified waters, while the most common myctophids showed an opposite trend by being concentrated on the outer edges of the STCZ.

The combination of identification methods (morphometrics and genetics) has proven to be a powerful tool for biodiversity investigations; the combination methodology has so far allowed 80% more species to be discriminated in this study, and almost 100% more individuals could be identified to species level, than if we had resorted to 'only' the region-specific identification keys available for larvae from the area. Our findings indicate that prior ichthyodiversity surveys that did not use a modern multidisciplinary approach may have under-reported actual species diversity by 80%, obviously depending on the number of damaged, cryptic, or otherwise difficult to identify larvae in other studies. §



Pacific Region...cont'd from p. 3

suggest that spawning by anguillid eels occurs at night in relatively shallow layers, perhaps 250–150 m depending on the temperature structure of the water column.

The general early life history of this species seems typical for temperate anguillid eels (Shinoda et al., 2011), but some aspects of the spawning ecology of *A. japonica* appear to be different from the American and European eels (*A. rostrata*, *A. anguilla*) in the Sargasso Sea. The Atlantic eels are known to spawn south of distinct temperature fronts in cooler water temperatures than are present in the surface layer of the western Pacific, and there is no seamount ridge in the Sargasso Sea (Kleckner and McCleave, 1988; Miller et al., 2009). Although the major effort to study the spawning area of *A. japonica* is ending for now, future research on this and other anguillid species will likely reveal more about the spawning ecology and early life histories of these interesting catadromous fishes.

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Yoshinaga, T., et al. 2011. Genetic identification and morphology of naturally spawned eggs of the Japanese eel *Anguilla japonica* collected in the western North Pacific. *Fisheries Science* 77:983–992.

Now, I report two topics about recent activities from the Pacific Rim region. The first one reports a new tool for juvenile fish sampling; the second one reports a recently published paper on variability of anchovy egg size and mortality.

New autonomous multiple cod-end opening/closing control system for a frame trawl

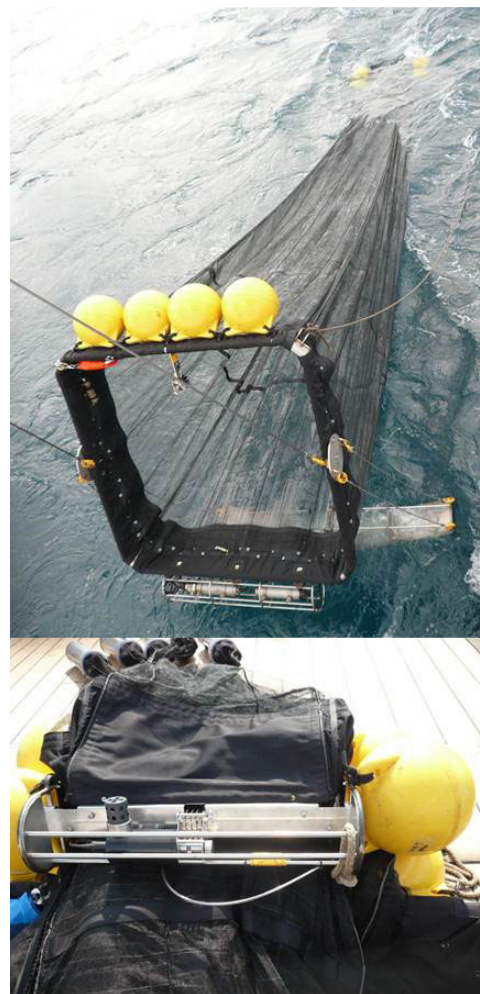
If you are looking for a quantitative multilayer sampling gear for larval and juvenile fishes, here is a newly developed one meeting your needs.

Quantitative sampling for late-larval to juvenile fishes is an essential issue in the field of early life ecology. Unlike eggs and early larvae, later stage fishes have greater potential for net avoidance. Hence, a sampling gear needs a wider frame width with a higher towing speed. Also, multilayer sampling is desired to understand vertical distributions and migrations of fish larvae and juveniles (e.g. Huebert et al. 2011).

A collaboration team led by Yoshioki Oozeki (National Research Institute of Fisheries Science, Fisheries Research Agency, Yokohama, Japan) and Fuxiang Hu (Tokyo University of Marine Science and Technology, Tokyo, Japan) developed the Matsuda–Oozeki–

Hu Trawl (MOHT) for late larval and juvenile fish sampling. The original MOHT was developed as a quantitative frame trawl for sampling early stage fishes and mesopelagic fishes (Oozeki et al. 2004). The MOHT has now been adopted in the California Current Ecosystem Long Term Ecological Research (CCE-LTER; cce.lternet.edu/data/methods/matsuda_oozeki_hu_trawl). Subsequently, the Multiple layer Opening/Closing MOHT (MOC-MOHT), which controlled the opening/closing of five nets at the net mouth area, was proposed for quantitative multilayer sampling (Oozeki et al. 2012). The MOC-MOHT inherited the high speed towing ability and the high filtering efficiency possessed by the MOHT. Now, a new autonomous multiple cod end opening/closing system has been constructed to be attached to the MOHT (COC-MOHT). At the same time, the net shape has also been modified to reduce contamination around the cod end. Although this system has been

...continued on p. 7



COC-MOHT (upper) and COC system (lower)

Recent Events

Report on the 36th Annual Larval Fish Conference

LFC2012 was a resounding success! The conference attracted 152 delegates from 33 countries. There were 150 oral and poster presentations. Overall, the quality of the talks was impressive. As has become tradition at LFCs, there was a strong competition for both the Richardson best student oral presentation award and the Blaxter best student poster award [see the story about the winners on page 1].

As expected, the venue – the Solstrand Hotel - was spectacular, particularly on the two sunny days at the end of the week! It was good to see so many relaxed and smiling colleagues. Delegates were treated to a wonderful and memorable mid-week evening of classical music by the well-know Norwegian composers Edward Grieg and Ole Bull. The mini-concert was held at the new OSEANA Performing Arts and Culture Centre in Os. The four-course conference banquet meal was special, particularly the lobster entree (which many people took photos of!). The French delegation



photo: Sara Griesbach

Steve Shema, Alison Deary, and Rebecca Asch draw winners for the Sally Richardson award fund raffle.

was also served a sea trout that they had caught - the hotel chef prepared it as sashimi.

The announcement of the Richardson raffle winners and the flag auction were hilarious, thanks to the well-researched performance of our auctioneer, Steven Shema! Steve has already received offers to emcee future LFC banquets! Each delegate sitting at the table with the highest diversity of nationalities won a special prize – a small troll holding a Norwegian flag! The winning table had eight nationalities (but only six people – some had dual citizenships!). In fact, there were two tables with eight nationalities so a tie-breaker was needed: the competing tables had to put forward a candidate to sing their national anthem.

Myron Peck's consortium won the auction for the LFC flag. Timothy Targett (one of the members of the winning consortium) has already been busy – several photos of the flag flying at the University of Delaware are now posted

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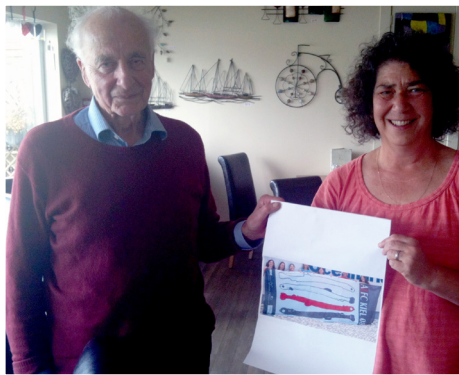


photo: Sara Griesbach

By pooling currencies using a matrix of exchange rates, this international consortium won the conference flag for the benefit of the Blaxter award fund.

Conference Flag Takes a Victory Tour

A special flag was made for the 32nd annual Larval Fish Conference and someone had the brilliant idea to raise funds for the J.H.S. Blaxter Award by auctioning the flag at each conference. Those auctions have done well to raise money for one or our top awards. The challenge to the winners each year is to take the flag to various locations and send photos as proof. This year's winning consortium (see photo on page 6) got off to a quick start. They've even set up a Google calendar to schedule opportunities to fly the flag. Photos of their efforts are scattered throughout this and future issues of STAGES. It seems appropriate, however, to begin with a photo of the flag (well, a replica) with John Blaxter, himself. §



John Blaxter and Audrey Geffen with the LFC "flag." Audrey reports that "John was very pleased to see the flag on its tour and to hear about the success of the fund." She admitted that a photocopy was cheating a bit, but we'll give her extra points for lateral thinking.

Pacific Region...cont'd from p. 5

tested for performance based on the MOHT series, it is also allowed to be attached to any larger mid-water trawl. The paper reporting the COC-MOHT is now in press for publication in *Methods in Oceanography* (Oozeki et al. in press). You may contact Yoshioki Oozeki (oozeki@affrc.go.jp) for details of the MOHT series.

By the way, *Methods in Oceanography* is a recently launched international journal (Publisher: Elsevier; Editor-in-Chief: Jules S. Jaffe, Scripps Institution of Oceanography, University of California, San Diego). The journal publishes original researches on new methods in all aspects of oceanographic research, such as fabrication and testing of new instruments and developments of new platforms and plans for ocean sampling (www.journals.elsevier.com/methods-in-oceanography). This new journal would serve as a suitable publication outlet for those who work on methodological aspects in early life ecology.

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A new study from China shows variability of anchovy egg size and mortality

A recently published paper by Ruijing Wan (wanrj@ysfri.ac.cn) and Xiaodong Bian (Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences) reported variability of egg size and mortality rate of anchovy *Engraulis japonicus* in Chinese waters (Wan & Bian 2012). The anchovy stocks have experienced high fishing pressure since the late 1990s. Under this fishing pressure, anchovy egg size decreased and mortality rate increased substantially. The authors attributed such trends to long-term adaptive responses of reproductive biology to high fishing pressure conditions.

During the last decades, maternal effects on offspring characteristics have received much attention in the field of early life ecology (Marteinsdottir

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

Two honorable mentions were made for the Richardson award. These were: (1) Deena Anderson of the University of North Carolina Wilmington, for her presentation "Experimental evaluation of patterns and mechanisms of juvenile red drum mortality due to acute cold stress during severe winters," which was co-authored by Fred Scharf; and (2) Erika Staatterman of the University of Miami, for her presentation "Orientation behavior in fish larvae: A missing piece to Hjort's critical period hypothesis," co-authored by Claire Paris and Judith Helgers.

Congratulations to the winners, and hearty thanks all the students who competed and the judges. Grace Klein-MacPhee, Chair of the Sally Richardson Award Committee, together with co-Chair Elaine Calderone of the NOAA NMFS Laboratory in Narragansett, organized the judging for the Richardson award with assistance from Eric Roseman on the first day of the meeting. Lee Fuiman organized the judging for the Blaxter award. Thanks to them for their work on behalf of the ELHS. §

& Steinarsson 1998, Lambert et al. 2003). Egg size also influences larval size at hatching, which consequently affects survival probability after hatching through size-selective mortality processes. Hence, this type of work would contribute to linking environmental and fishing pressure variability to long-term population dynamics in terms of early life ecology.

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Upcoming Events

37th Annual Larval Fish Conference



Dear Colleagues,

The Rosenstiel School of Marine and Atmospheric Science of the University of Miami and the Southeast Fisheries Science Center (NOAA) are delighted to invite participants to the 37th annual Larval Fish Conference in Miami, Florida. We are pleased the conference is returning to Miami after 27 years.

The conference poster, beautifully designed by artist and fellow larval fish scientist Akihiro

Shiroza, was conceived with digital renditions of fish larvae currently on show at the IGFA Fishing Hall of Fame and Museum in Dania Beach, Florida.

The conference will be hosted in the historic Miami neighborhood of Coconut Grove, known for its quaint charm and artsy vibe. The host hotel, the newly renovated and stylish boutique hotel, The Mayfair Hotel & Spa, is centrally located and just minutes from the Miami International Airport and many local attractions.

Please take a few minutes to visit the conference website www.larvalfishcon.org to learn about the conference's themes and other particulars including registration, schedule, venue, transportation, and your visit to Miami.

Additional details are forthcoming, but in the meantime, mark your calendars for:

2013 Miami LFC dates: **June 2-6, 2013**

Deadline for early registration and abstract submission: **April 1, 2013**

Please help us get the word out about the conference to your national or international network of colleagues and collaborators. If you would like to receive a copy of the conference poster (or postcards), please send your request via email to Trika Gerard (trika.gerard@noaa.gov).

We look forward to seeing you in Miami in 2013! §

— Su Sponaugle,
on behalf of the Local Organizing Committee

Forage Fish Symposium in Nantes, France, very soon

The ICES/PICES Symposium on "Forage Fish Interactions: Creating the tools for ecosystem based management of marine resources" will be held in Nantes, France, November 12–14, 2012. The symposium will be convened by Stefan Neuenfeldt (DK), Myron Peck (DE), Tim Essington (US), Niels Vestergaard (DK), and Vladimir Radchenko (RU). This event will be organized in close collaboration with the EU-FP7 project FACTS (Forage Fish Interactions: www.facts-project.eu).

The goal of the symposium is to review and discuss recent methods that enable us to quantify the links between forage fish and the other components of the ecosystem. The abstract submission and early registration are closed, but the registration itself is still open. For the last-minute registration or collecting information on what will be going on there, please check the symposium website (www.facts-project.eu/Symposium2012.aspx). The symposium would be of great interest to those who work on early life biology. §

People

Welcome Aboard and Thanks

You may have noticed already that we have a new regional representative for the Pacific Rim, Akinori Takasuka. He is off to a terrific start. His first contribution to STAGES in this new role (page 3) describes details from three projects in Japan and China and spans more than two and a half pages. Akinori is a fisheries biologist with expertise in early life biology of fishes at the National Research Institute of Fisheries Science, Fisheries Research Agency of Japan.



Akinori takes over from Iain Suthers, who has done a marvelous job for even longer than I have been editor of this newsletter (this issue completes my 9th year!). Iain has been one of the most reliable contributors. Until you have taken on this challenge, it is hard to appreciate how challenging it can be to gather information for our readers several times each year, but Iain has been outstanding.



Both Akinori and I would like to express our respect and sincere appreciation for Iain's wonderful work on STAGES. Thank you, Iain, and welcome aboard Akinori! §

— Lee Fuiman

Student Research Presented at the 36th Annual Larval Fish Conference

The organizers of the 36th annual Larval Fish Conference, led by Howard Browman, were able to provide support for several students to attend the meeting. In return, Howard asked each of them to send a brief account of their research. The following are their summaries.

from: Rebecca Asch, Scripps Institution of Oceanography, University of California San Diego

Climate Change and the Seasonal Occurrence of Larval Fishes in the Southern California Current Ecosystem

Global warming has prompted an earlier arrival of spring in numerous ecosystems. It is uncertain whether this is occurring in the California Current Ecosystem (CCE), because this region is strongly affected by decadal climate oscillations. Also, some regional climate models of the CCE predict delays in seasonal upwelling, a key influence on biological productivity. Such changes in seasonal ocean conditions are likely to affect the phenology of fishes. Phenology refers to the study of seasonal, biological cycles and their relationship to weather and climate. I investigated changes in larval phenology of 43 fish species sampled by California Cooperative Oceanic Fisheries Investigations from 1951-2008. Trends in monthly larval abundance were analyzed by decadal averaging data from quarterly surveys conducted in different months. Phenological shifts were quantified by anomalies in the central tendency of seasonal larval abundance. The first principal component of this dataset showed a progression towards the earlier appearance of larvae. 39% of species displayed increasingly early peaks in larval abundance, while 18% exhibited delayed phenology.

These changes are best explained by a secular trend towards earlier warming of surface waters rather than by decadal climate cycles, such as the Pacific Decadal Oscillation and the North Pacific Gyre Oscillation. Species displayed similar changes in phenology at both the decadal scale and the interannual scale associated with El Niño and La Niña events. Generally, species whose larvae are occurring earlier are characterized by an offshore, epipelagic distribution and a spring or summer peak in larval abundance. Conversely, species with delayed phenology are more likely to be coastal, demersal fishes that spawn in winter or fall. While earlier phenology was correlated solely with seasonal changes in sea surface temperature (SST), a combination of SST and upwelling were responsible for delays in phenology. When these empirical relationships were projected forward in time, all IPCC climate models predicted that earlier warming of the ocean would lead to a continued trend towards earlier spawning. However, predicted changes in upwelling seasonality varied greatly between IPCC models in the CCE. Since fish species with earlier phenology are not changing their seasonal abundance in sync with upwelling and zooplankton volume, they may be increasingly subject to mismatches with their prey in the future. Among species that have not adapted to climate change by altering their phenology, a contraction in the length of their spawning season was observed, which could lead to increased recruitment variability.

from: Swagat Ghosh, Centre of Advanced Study in Marine Biology, Annamalai University

Larval feeding strategy and survivability of *Amphiprion clarkii* at captivity

At present, the wholesale value of the global ornamental fish trade is estimated at around US \$6 billion. According to the Global Marine Aquarium Database (GMAD), annual global trade varies between 20 and 24 million fishes, and 9 and 10 million

for invertebrates. Marine ornamental fishes are one of the most popular attractions worldwide, due to their adaptability to live in confinement. The tropical ornamental fish has increased a thrust among aquarists due to their multitudinal colour and gorgeousness. In the last two decades, the marine aquarium fish trade has been witnessing continuous steady growth, involving major movements of wild reef fishes all over the world. As many as 400 species of marine ornamental fishes belonging to 175 genera coming under 50 reef families are known to occur in the Indian waters. More than 84 species of marine ornamental fishes, which come under groups such as clowns, damsels, gobiids, cardinals and pseudochromids can be reared in captivity. Of these, breeding has been reported only for 26 pomacentrids. Clownfishes belong to the diverse and well-distributed family Pomacentridae. There are 29 known species belonging to two genera: *Amphiprion* and *Premnas*. Usually, *A. clarkii* has black colour with variable amounts of orange on head, ventral parts and fins and three milky white bars on head, body and base of caudal fin. *A. clarkii* has the symbiotic relationship with ten types of sea anemones. This species is a popular aquarium fish and can be bred and reared in captivity.

Broodstock were fed thrice a day with different feed combinations such as prawn, mussel, squid meat and live *Acetes* at 5% body weight. Algal accumulation and excess feed were siphoned out to avoid water spoilage. A spawning tank of 750 l water holding capacity was used. The bottom of the tank was provided with broken coral pieces, dead shells and live rocks to imitate the natural environment. A locally made, low-cost underwater filtration setup using activated carbon, ceramic rings and coral sand was also kept in the tank. Because this spawning tank was kept in a closed system, artificial light was fixed at the top of the tank to maintain the light intensity of 2500–3000 lux for 12 h per day.

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Special Report...cont'd from p. 9

Stock cultures of marine microalgal species such as *Chlorella marina* and the rotifer *Brachionus rotundiformis* were obtained from the live feed culture laboratories and mass cultured by using agricultural fertilizers.

Artemia cysts were allowed to hatch in FRP (fibreglass reinforced plastic) container with vigorous aeration and artificial light for 24 h. The rotifers and *Artemia* nauplii were enriched with microalgae and used as larval feed. After 4-6 h of hatching, the floating larvae of *A. clarkii* were transferred to 250-l larval rearing tank. The tank was provided with mild aeration and 10–15% water exchange was made daily along with bottom cleaning to avoid excessive build up of organic load. Water quality parameters such as temperature, salinity, pH and dissolved oxygen were maintained at optimum levels (28°C, 22–24‰, 7.5–8.1 and 4.5–5 mg l⁻¹). The larvae were fed with rotifer, *B. rotundiformis* from the 2nd day after hatching (dph) till the 10th dph at a density of 5–10 ml⁻¹. From the 11th dph onwards, the larvae were weaned on newly hatched *Artemia* nauplii enriched with *Chlorella* at the rate of 6–8 ml⁻¹. Density of rotifers and *Artemia* was periodically measured and supplemented, when needed. After laying eggs, during incubation, the eggs underwent several distinct colour changes orange on first day, blackish from third day onwards and then silvery just prior to hatching. The silvery colouration with distinct eyes is usually a good indication that the eggs will hatch within a night. Hatching took place during dusk between 19.00 and 21.00 hours at 25–32°C. On an average, 90–95% of the fertilized eggs were hatched for each spawning, indicating the suitability of rearing facility. The newly hatched larvae measured 3–3.5 mm in size and had a transparent body, large eyes, open mouth and a small yolk sac. Immediately after hatching, the larvae were found floating on the surface vertically. After 3–5 h, the larvae were transferred to larval rearing tanks (250 l, FRP) and from the second dph onwards, they were fed with algal enriched rotifer *B. rotundiformis* up to the 10th dph. The larvae grew to an apparent size at the

end of the 10th dph. From the 11th dph onwards, they were weaned on newly hatched *Artemia* nauplii. A low intensity light was provided in the larval tank for 12 h. Black colour pigmentation started appearing on the 16th dph and on the 21st dph, metamorphosis occurred in the entire batch of larvae and almost all the fry attained full colouration pattern of adult fish. Juveniles started to shift from pelagic to epibenthic mode of life. On the 25th dph, all the juveniles were transferred to 500 l FRP tank containing sea anemone, *Heteractis magnifica*. Within a day, the juveniles got acclimatized with the anemone and were accepting minced shrimp, mussel meat and frozen *Artemia*. With this feeding regime, the survival and growth of larvae were hastened and about 65% of juvenile survival was obtained for each spawning. The young ones attained the marketable size (3 cm) after 3 months period.

In this context, water quality, suitable diet and lighting cycle are indispensable for successful rearing and development of potential breeding pair in short-term period, which is quicker than the previous report on clownfish breeding. The newly hatched larvae were fed with algae as first feed and later with rotifers and finally *Artemia* nauplii. Algal enriched rotifers and *Artemia* nutrition represents the underlying foundation for successful larval rearing. This feed composition provides fatty acids such as PUFA, HUFA and EPA along with the regular diet. Higher mortality of larvae was noticed on the 2nd day throughout the study period when the larvae were fed with rotifers. This indicates that initially the larvae were unable to ingest the rotifers but slowly adapted to the supplement feed and stabilized. To reduce the harmful bacterial growth and organic load of decayed materials of feed supplied, 40% water exchange was performed in the larval tank. This study demonstrates the successful hatchery production and feeding management protocol for the clown fish, *A. clarkii* under captive conditions using estuarine water in all the stages.

from: Carolina Giraldo L.,
Laboratoire d'Océanographie de
Villefranche sur mer, Université
Pierre et Marie Curie

Trophic ecology of the pelagic fish *P. antarcticum* in East Antarctica

The East Antarctic pelagic ecosystem is dominated by the pelagic fish *Pleuragramma antarcticum*, which represents up to 90% of the fish biomass. *P. antarcticum* is the only species of the Nototheniidae family to have an entire pelagic life cycle. This species is characterized by a particularly long larval stage that lasts over a year and a vertical distribution with larvae in the surface layer and the older individuals in deeper layers. *P. antarcticum* is planktivorous at all stages of development and is the main prey of numbers of top predators. Thus, *P. antarcticum* appears as an important species in the ecosystem that links phytoplankton/zooplankton with higher trophic levels.

In my thesis we studied the trophic ecology of this species. In the first part of this study we studied fish larvae abundances and the vertical distribution of all developmental stages. We determined what parameters influenced the individual larval's condition and whether *P. antarcticum* can be considered as a good indicator of environmental changes. The second part of this thesis intended to clarify trophic relationships of *P. antarcticum* and its role in the ecosystem. We used different methods which allowed us to analyze the immediate diet (gut contents), the diet from a period of few weeks earlier (fatty acids), and finally the integrated diet over a period of a month (stable isotopes). *P. antarcticum* emerges as a key species in a "wasp waist" ecosystem. As a result, changes in this species could have a significant impact on lower and upper trophic levels.

from: Rita Pereira, Centre of
Marine Sciences, University of
Algarve

Experimental approach of the impact of a resident jellyfish species (*Aurelia aurita*) on the ichthyoplankton of the Guadiana estuary (South Iberia), a nursery area for sardines and anchovies

The Guadiana estuary is a nursery for some economically important small

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Special Report...cont'd from p. 10

pelagic fish species such as sardines (*Sardina pilchardus*) and anchovies (*Engraulis encrasicolus*). The jellyfish *Aurelia aurita* is a resident species, with occasionally high abundances in the system and recently an invasive species was registered, the *Leptomedusa blackfordia virginica*. Laboratory experiments were performed to determine the impact of *Aurelia aurita* in the ichthyoplankton, particularly of pelagic fishes – and for the first time in sardine eggs and larvae. In the first set of experiments, the *Aurelia aurita* specimens were given brine shrimp nauplii (*Artemia salina*), sardine eggs and larvae as single prey. Brine shrimp nauplii were used to determine the species' functional response at the average temperature at which sardines and anchovies are found in the estuary. The ingestion of *A. aurita* rates increased with increasing prey concentration and the clearance rates increased with prey availability at lower food concentration and then decreased sharply (type II functional response). A second set of experiments was conducted to determine the feeding selectivity of *A. aurita* when offered a mixture of sardine eggs and larvae and a natural plankton assemblage dominated by copepods and there was no clear selection of sardine eggs and larvae while other prey types are available. The initial concentration of a prey did not determine the rate of consumption by the jellyfish, but on the other side the ingestion was influenced by the prey sizes, since larger prey were preferentially selected. These results suggest that in spawning and nursery

areas, such as the Guadiana estuary, jellyfish may have a significant impact in the ichthyoplankton communities, by selecting fish eggs as prey with very high ingestion rates. Although indirectly, jellyfish may also have an impact by competition with small pelagic fishes, by selectively feeding on the same prey as juvenile fishes and fish larvae, such as copepods.

from: L. Silva, University of Algarve

Swimming behaviour and nutritional condition of sardine larvae

The swimming abilities of the larvae of small pelagic fishes are poorly studied and little is known of their potential to influence survival and dispersal. For the first time, we studied the swimming capacity of sardine larvae under laboratory conditions from hatching to 75 dph (days posthatching), reared under four different feeding treatments. Recently hatched larvae spent most time inactive and the time spent swimming increased with age until a plateau was reached at 30 dph, when all larvae spent all the time swimming. At 15 dph, the larvae started to resist currents of 1.5 cm s^{-1} for short periods. The critical swimming speed (U_{crit}) increased significantly during ontogeny, with a maximum U_{crit} of 9.47 cm s^{-1} at 19.1 mm TL and 55 dph. Feeding treatment also influenced significantly the swimming speed. Larval attacks on prey and capture success increased with age; larval attacks were less than 2 attacks min^{-1} at 25 dph and around 5 attacks min^{-1} at 60 dph. The condition of the larvae, estimated by the ratio RNA/DNA, varied significantly

during the first days of endogenous feeding but was fairly similar within experiments for larvae of the same age during the exogenous feeding. Besides better swimming capacities, the larvae of higher food concentration treatment had also better nutritional condition. Our results suggest that early stages of sardine larvae are not able to avoid predation and disperse, but close to the metamorphosis, especially from 45 dph onwards, the larvae are able to resist the average current velocities of their natural environment. The ability to actively swim and perform vertical migrations is useful information that can be used as parameters for future efforts to model the dispersal and survival of sardine larvae.

from: Erica Staaterman, Rosenstiel School of Marine & Atmospheric Science, University of Miami

Recent studies have shown that larval reef fish may be capable of detecting and orienting towards reef soundscapes. For my dissertation research, I am further exploring this hypothesis, while also examining the spatial and temporal patterns of reef sounds through long-term recordings of coral reefs in Florida. I will also measure the propagation of reef sounds and, using a specialized behavioral chamber, examine whether larval reef fish demonstrate orientation behavior in response sounds from different distances. Finally, using an individual-based biophysical model, I will examine the consequences of this orientation behavior to the settlement patterns and connectivity of coral reef fish in the Florida Keys. §

Recent Events...cont'd from p. 6

on the LFC2012 photo gallery (www.larvalfishcon.org) as are many photos from the conference. In the coming weeks, I will create a new menu item on the LFC website: "Follow the travels of the LFC flag." Stay tuned!

During the summer the LFC website will be upgraded so that PDF versions of the Powerpoint presentations and posters can be uploaded and associated with their abstracts (with the author's permission).

A selection of papers presented at the conference will be published as themed article sets in the *ICES Journal of Marine Science*.

Thanks to one and all for making LFC2012 a success. We hope to see many of you in Miami!

— Team LFC2012



§ Team LFC2012: (left to right) Howard Browman, Anne Berit Skiftesvik, Ingegerd Opstad, Caroline Durif, Yuichi Fukunishi, Steven Shema, and Reidun Bjelland.

photo: Sara Griesbach

Section Business

2012 Business Meeting Minutes

Bergen, Norway, July 2nd 2012

Catriona Clemmesen-Bockelmann called the meeting to order for Sue Sogard who was unable to attend.

There was a short address by Catriona Clemmesen-B. (in place of Sue Sogard)

Determination of quorum: 16 full members and a number of pending members were present. With the members, who had just signed up for membership the quorum was reached (19/182)

Minutes, which were posted in the October 2011 issue of STAGES, were approved.

Elected Officers reports

Secretary's report. There were issues with the membership list that appear to be solved. These lists are the basis for sending out STAGES and are constantly updated. The installation of a PayPal system has made the membership fee payment much easier, especially for the members outside of the USA. The Secretary thanked Jeff Buckel for the addition of PayPal. There are 182 full members and 43 affiliate members. The Secretary's report was approved.

Treasurer's Report (J. Buckel by C. Clemmesen-B.). All accounts increased. General fund ending balance is 9,148,96 USD as of June 12th, 2012. Sally Richardson fund balance is \$14,294.80. Blaxter Fund now is \$5,147.10 of the 10,000 USD goal. Fund for PayPal Fund is \$338.94. The Treasurer's report was approved by the membership.

Appointed officers reports

Newsletter Editor (Lee Fuiman). Two issues of STAGES were published (Oct 2011 and Feb 2012). The next issue is under development. Too little content was available for the June 2011 issue. Regional Representatives are not providing content at the deadline. Oct

2011 was the first electronic issue. Printing and mailing costs are saved (time is not saved). Membership list has improved (only one bounce). One Regional Representative is looking for a replacement. Perhaps a more rigid structure is needed. Ideas: perhaps PhD student reports could be utilized. New grant executive summaries are good (things that are already written). Software to produce STAGES has been used since 2004. It was proposed and members agreed that a new software update should be purchased for STAGES.

Webmaster (Jeff Buckel). Section members were reminded to use the website to post information (job announcements, etc). It is easy to find the option to join the society online. A new webmaster is needed.

Historian (Jeff Govoni). Paper archives are maintained at Jeff's home residence. Relevant electronic files have been transferred to webmaster. Please contact the Historian for items to be considered.

Standing Committee reports

Nominations and Mail Ballot Committee (Jon Hare). Jon Hare will step down, someone is needed to fill this position.

Open positions:

A new webmaster and Ahlstrom Award Committee members are needed. New officer nominations Secretary-Elect and President-Elect are needed. Sally Richardson Award Committee additional personal support is needed. Approach President Catriona Clemmesen-Bockelmann with nominations.

Time and Place Committee Chair (Chris Chambers) provided an update. Next Larval Fish Conference will be hosted in Miami, Florida, 2-6th June 2013. Miami meeting slide presentation was provided. John Lamkin (Su Sponaugle, Bob Cowen, Claire Paris) and a number of folks from Southeast Fisheries Science Lab NOAA have agreed to sponsor this. Meeting

venue is at the Mayfair Hotel and Spa, downtown near restaurants and bars.

Quebec City, Canada – proposed a joint meeting with AFS (17–21 August 2014). Pascal Sirois and others (Dominique Robert, John Dower, Marc Mingelbier, Patrick Oullet, Martin Castonguay) will attempt to offer a good mix of options for the scientific programs. Breakout rooms would be included as part of the AFS meeting. An ELHS banquet can be included but the details need to be explored after voting. The members agreed with this proposal and voted to hold the meeting in Quebec City.

Joint meetings with the Larval Biology symposium and the Larvi conference (aquaculture oriented) were discussed. Larvi is every four years, 2017 is the next possibility. Larval Biology is every 2 years, option could be 2016. An offer from the US west coast would be welcome to follow the idealized 4-year pattern of a) USA East coast, b) USA interior states, c) USA west coast, d) international location. For 2015 interest has been expressed by Port Elizabeth, South Africa and Vienna, Austria. Hong Kong and Kyoto, Japan were also mentioned. The assembly was happy about the wide support and interest to host conferences in the future. It was decided that meeting options should be available two business meetings ahead and a presentation should be sent/given (a formal offer with venue, dates). Guidelines are available for information on hosting meetings. Jon Hare has put these together and they have been updated by recent conference organisers.

Sessional Committees

Awards Committees (Grace Klein-MacPhee). The winner of the Sally Richardson Award in 2011 in Wilmington was Jennifer Martin from Virginia Institute of Marine Science. Honourable mention went to Allison Deary from the same institute and David Stormer from the University of Massachusetts, Amherst. The Blaxter award for best student poster in 2011 went to Timo Arula. The Sally

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Post Doctoral Scientist Fisheries Oceanography

The Fisheries Oceanography Laboratory in the Department of Coastal Sciences at the University of Southern Mississippi seeks applications for a postdoctoral position from candidates interested in fisheries oceanography and ecology. The postdoc will lead a research effort examining the impacts of the Deepwater Horizon oil spill on larval fish feeding, growth and condition. Research activities will include (1) field sampling in the northern Gulf of Mexico; (2) identification of ichthyoplankton and zooplankton; (3) laboratory analysis of otoliths; and (4) gut content analysis. Funding is available for two years, with the possibility of renewal.

Qualifications: PhD with fisheries research experience; preferred qualifications include experience in one or more of the following: ichthyoplankton field surveys; zooplankton and ichthyoplankton taxonomy and identification; larval fish otolith increment analysis; fisheries statistical methods, including multivariate analysis.

The research will involve both field and laboratory research activities. The successful candidate will be expected to interact with a diverse team of faculty, research technicians, graduate students and undergraduate interns. The anticipated start date will be in January 2013 (although this can be flexible).

Please apply through the jobs.usm.edu website to reference job #0002390. For more information, contact Frank Hernandez at frank.hernandez@usm.edu. §

Minutes...cont'd from p. 12

Richardson Award committee needs additional personal support, Grace will supply information on how the awards committee operates. Send names and suggestions to Catriona.

Jeff Govoni (E. H. Ahlstrom Award). No new nominations were provided. Please check the website for information on the potential nominations. The committee should have three members. At the moment there is only one, Jeff Govoni who is continuing his service. New Members are free to volunteer.

Student travel (Fred Scharf). A great deal of money was generated for student travel and accommodation. Awards for travel support were between 300 USD (for near) to 450 USD (for further away). 12 students received 450 USD and 9 students received 300 USD. Thanks to Howard Browman

and his co-organizers for their effort in securing this very generous level of support. 2012 was the first year since 2008 that the Section was able to provide student travel awards. It is unknown whether the organisers for the 2013 meeting in Miami will be able to secure funding for student travel.

Other business

Conference website: Report from the webmaster (Howard Browman). SimboliQ – has a fee of 40 USD per month for the website. The website for Miami is already established. It was discussed whether the content can be mirrored on the existing webpage. There does not appear to be an advantage of having a separate website, there seems to be a lack of communication. Notes on how to use/include the conference webpage

M.S. Assistantship Fisheries Oceanography/Ecology

I am seeking a motivated student to fill a graduate assistantship (M.S. level) in the Department of Coastal Sciences at the University of Southern Mississippi. The position is available beginning Summer or Fall 2013. Funding for the assistantship is provided by a Gulf of Mexico Research Initiative (GoMRI) award for a project which will examine the impacts of the Deepwater Horizon oil spill on the feeding ecology, growth and condition of marine fish early life history stages. The student will develop a thesis project from one or more of the scientific objectives within this larger research effort, and will be expected to work with a diverse team of faculty, postdocs, technicians, and graduate students in both field and laboratory settings. All work will be conducted at the Gulf Coast Research Laboratory in Ocean Springs, Mississippi (www.usm.edu/gcrl).

Interested students should hold a B.S. degree in ecology, marine science/oceanography, biology or a related field, and possess strong quantitative, writing and presentation skills. The successful applicant will be provided a full-time Research Assistantship with a tuition waiver.

To be considered for the position, please email me (Dr. Frank Hernandez) at frank.hernandez@usm.edu, and include a letter of interest, current C.V., unofficial transcripts, GRE/TOEFL scores, and contact information for three references. For more information on my laboratory and research interests, please visit my faculty page at the Department of Coastal Sciences website (www.usm.edu/gcrl/coastal_sciences). Screening of applications will begin November 2, 2012 and continue as soon as a qualified applicant is identified. §

should be included in the guidelines on how to host a conference. It was decided that the costs (\$40 per month) to maintain the Larval Fish Conference website have to be paid by the Section.

New business

Installation of new officers: President Catriona Clemmesen-Bockelmann, Secretary Frank Hernandez

The meeting was adjourned. §



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

success also due to the expert auctioneer, Steven Shema, who managed to raise the price to really high levels. The flag ultimately went to an international consortium and it will now be travelling around the world before arriving in Miami next year.

The larval fish conferences are my favorite meetings with excellent science, great personal exchange (you actually are able to meet a person more than once, which hardly happens at other monstrous meetings) and a perfect organisation. This wouldn't be possible without the dedicated support from a lot of people. Therefore, my special thanks go to our past President Susan Sogard for her dedicated service for our community. She worked on the challenge of updating the membership list and convincing people to sign up for membership again. At the moment the section is in good financial shape. I would like to thank our Treasurer Jeff Buckel for his dedicated work.

Where are we heading in the future? First, we all are invited to Miami in June 2013 to participate in the 37th annual Larval Fish Conference. Su Sponaugle and her group are planning a very interesting scientific programme and have included topics which are of high relevance. Research on tropical reef fishes, effects of ocean acidification, larval food webs and predator prey field interactions are keys for the understanding of effects of climate change on the early life stages and will help in estimating the socio-economic consequences that climate change might have. This will match well with research on advances and applications of new methods. So, we hope to see many of you there. Thanks Su and colleagues for all your work in organizing this meeting!

Regarding future meetings we are in good shape. Pascal Sirois and his colleagues will host a Larval Fish Conference in Quebec City, Quebec, Canada jointly with AFS in August 2014. Thanks Pascal for your initiative and support for our section.

We have received offers to host conferences in South Africa, Austria, and Portugal, so there are exiting venues ahead of us. Time and Place Committee Chair, Chris Chambers, is negotiating with the Larval Biology conference to host a joint meeting in 2016. So, things are interesting. Join the future business meetings and discuss these offers with us!

We still need to work hard on recruiting new members and finding new dedicated people to fill our positions. I know that pressure on the young scientist is high, job situations are and remain difficult, and everyone is concerned about scientific output, high ranking journals, etc. One might fear that taking on a responsibility within our Section doesn't give enough "brownie points." I want to argue that one wins by getting involved and new opportunities might come up. You will be part of a dedicated, widely distributed network of colleagues all over the world, working on all different issues of early life stages of fishes both freshwater and marine – and not just fishes, we are expanding and have taken up cephalopods.

Another issue is our newsletter STAGES, which lives from the reports you send to your Regional Representative.

I want to thank Iain Suthers for serving us for a long time as a Regional Representative for the Pacific Rim region and reporting fascinating work from that area to STAGES. Iain asked to be replaced, and we are very happy that we could convince Akinori Takasuka from Japan to take over. Thanks, Akinori, for joining the team, we are looking forward to your reports. This leads me to the fact that we urgently need new members for our team. The positions of President-Elect, Secretary-Elect and webmaster are vacant. We need applicants for the Nominations and Mail Ballot committee, Ahlstrom Award Committee, and additional support for the Sally Richardson Award Committee. Please contact me with suggestions to fill these positions.

Finally I want to tell you that I'm looking forward to working together with you to strengthen our Section and keeping an open mind for new ideas and areas to expand. Suggestions, ideas and, if needed, criticism are always welcome. §

— Catriona Clemmesen-Bockelmann,
President

Don't miss the next issue. Pay your 2013 dues today!

Please help your society maintain its fiscal health by renewing your membership!

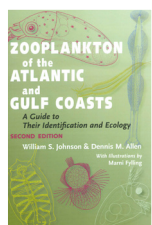
If you have already paid your 2013 dues, thank you for your support. If not, you have several options for renewal. If you are an active member of AFS wishing to add (or renew) ELHS membership beginning with the next calendar year, simply check the box for the Early Life History Section on your annual fall AFS dues/subscription statement for the upcoming year and add the \$15 annual ELHS dues to your annual AFS dues and other payments. You can also renew online at the AFS website: www.fisheries.org/afs/membership.html. Be sure to add the section dues to your membership fees.

You can also join the ELHS as an affiliate member. You can join online at the website: <https://www.larvalfishcon.org/ELHSAffiliate/affiliate-triage.asp>. Or you can send \$15 along with your name, institutional affiliation (if appropriate), mailing address, telephone and fax numbers, and e-mail address to:

Jeff Buckel, Treasurer
ELHS - AFS,
NCSU-CMAST,
303 College Circle,
Morehead City, NC 28557
USA

Affiliate members of the Section 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, the official ELHS newsletter.

Please take a moment today to join or renew your membership.



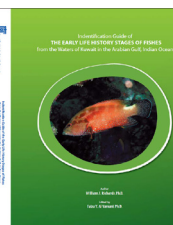
Available now: *Zooplankton of the Atlantic and Gulf Coasts: A Guide to Their Identification and Ecology. 2nd edition.*

By William S. Johnson and Dennis M. Allen

Published by Johns Hopkins University Press.
ISBN-13: 978-1421406183. 2012.

This book details the behavior, morphology, and coloration of zooplankton of the Atlantic and Gulf Coasts of the United States, including early developmental stages of shrimps, crabs, and fishes. Precise descriptions and labeled illustrations of hundreds of the most commonly encountered species are provided for identifying zooplankton.

This second edition includes an updated introduction that orients readers to the diversity, habitats, environmental responses, collection, history, and ecological roles of zooplankton; descriptions of life cycles; illustrations (including 88 new drawings) that identify 340+ taxa and life stages; range, habits, and ecology for each entry located directly opposite the illustration; appendices with information on collection and observation techniques; and citations of more than 1,300 scientific articles and books. §



Available now: *Identification Guide of The Early Life History Stages of Fishes from the Waters of Kuwait in the Arabian Gulf, Indian Ocean.*

By William J. Richards

Published by Kuwait Institute for Scientific Research. ISBN-978-99906-41-94-3. 2008.

This identification book for fish larvae from Kuwait's waters is the first guide of its kind for the region, with updated and descriptive information and detailed illustrations for most of the larval fish of the Arabian Gulf. The Gulf is located in a semi-tropical and arid region. Nearly all marine bony fishes, have a pelagic larval stage which is morphologically very different from the adult stage. The aim of this guide is to aid researchers to identify larvae of the marine fishes of the Arabian Gulf.

Available for download as PDF file from: www.kisr.edu.kw/Data/Site1/images/kisr_publications/978-99906-41-94-3.pdf §

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:

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.

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LFC flag flies on University of Delaware's RV Sharp

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LFC flag at the Lisbon Aquarium (Oceanário de Lisboa, ODL). People holding the flag are staff of the aquarium and grant holders of projects at the University of Lisbon.

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.

Newsletter Editor

Lee A. Fuiman
Marine Science Institute
University of Texas at Austin
lee.fuiman@utexas.edu

Northeast Region

David Richardson
NMFS, Northeast Fisheries Science Center
Narragansett, Rhode Island
David.Richardson@noaa.gov

Southeast Region

Claire Paris
Rosenstiel School for Marine and
Atmospheric Sciences
University of Miami
cparis@rsmas.miami.edu

North Central Region

James E. Garvey
Fisheries & Illinois Aquaculture Cntr.
Southern Illinois University
jgarvey@siu.edu

Western Region

Daniel Margulies
Inter-American Tropical Tuna Commission
LaJolla, California
dmargulies@iattc.ucsd.edu

European Region

Audrey Geffen
Department of Biology
University of Bergen
Audrey.Geffen@bio.uib.no

Pacific Rim Region

Akinori Takasuka
National Research Institute of
Fisheries Science
Yokohama, Japan
takasuka@affrc.go.jp

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Special thanks to Tim Targett, Susana Garrido, and Audrey Geffen for sending photos of the LFC flag on its Victory Tour.

— Lee Fuiman

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LFC flag makes appearances at the International Congress on the Biology of Fishes (above), the Larval Biology Symposium (left), and the Sharp Campus of the University of Delaware (below).