STAGES

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

Volume 34, Number 1 | Lee A. Fuiman, Editor | February 2013

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Call for Abstracts
37th Annual Larval Fish Conference

The 37th annual Larval Fish Conference, organized by the Rosenstiel School of Marine & Atmospheric Science of the University of Miami and NOAA's Southeast Fisheries Science Center, invites submission of abstracts for its 2013 meeting to be held in Miami from 2 to 6 June, 2013.

The conference will feature eight theme sessions focusing on a broad range of topics of interest to larval fish scientists worldwide. This is the second time this annual international meeting has convened in Miami, and the city's proximity to the tropics offers a timely opportunity to examine current research into tropical reef fishes as model species in ecology and management. The conference also will contribute to the discussion of the effects of ocean acidification and environmental change on the early life history of fishes. In a third session, we plan to explore aspects of the reproduction and early life history of highly migratory species such as tunas, sharks, and billfishes; this session will have particular relevance to the CLIOTOP (Climate Impacts on Oceanic Top

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ELHS Back Then

10 years ago: Jeff Govoni is appointed as ELHS Historian/ and Archivist.

15 years ago: 17th annual Larval Fish Conference is held at the University of Texas in Austin; the second joint conference with the American Society of Ichthyologists and Herpetologists.

25 years ago: ELHS reaches 389 members plus 20 newsletter subscribers (affiliates).

30 years ago: Newly elected Secretay-Treasurer-Elect John Dorr III moves overseas and Perce Powles is appointed to the vacated position.

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

May 3, 2013

President's Message

A highlight in this year, which I am looking forward to, is the 37th annual Larval Fish Conference in Miami in June 2-6. Sue Sponaugle and her group are planning a very interesting scientific program and have included topics which are of high scientific relevance. Thanks Sue and colleagues, for all your work with organizing this meeting! 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 estimating socio-economic consequences climate change might have. How relevant these areas of research are can be seen when reading the letter from the President of the American Fisheries Society, John Boreman, written to President Obama on January 17, 2013 promoting the AFS policy on climate change, which was put together by the voting membership of the American Fisheries Society. "Members of the American Fisheries Society have been acutely aware of how climate change is already affecting our aquatic and marine ecosystem and our predictive modeling forecasts more serious threats." After the devastating destruction of the superstorm Sandy, which also destroyed the facilities and the work of many of our colleagues, it is even more important to stress the importance of climate change related research. This has always been a field of interest in the Early Life History Section and will gain more recognition in the years to come. So, come to Miami, present your results and continue discussion.

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News from the Regions

Western Region

Dan Margulies

from: Cathleen Vestfals, College of Oceanic and Atmospheric Sciences, Oregon State University

Characterizing interannual variability of dispersal pathways in slope-spawning flatfishes in the eastern Bering Sea

To understand how changes in circulation may influence recruitment and population dynamics in Greenland halibut (GH, *Reinhardtius hippoglossoides*) and Pacific halibut (PH, *Hippoglossus stenolepis*), two commercially important flatfish species in the eastern Bering Sea (EBS), Cathleen Vestfals, a PhD candidate from Oregon State University, is reconstructing their dispersal pathways from their source (e.g., spawning areas over the continental slope) to sink locations (e.g., juvenile settling locations over the continental shelf) using the Dispersal Model for Early Life Stages (DisMELS). Despite similarities in their spawning times, locations, and depths, GH and PH exhibit distinct differences in the distribution and abundance of their egg, larval, juvenile and adult stages, as well as their overall population dynamics. To help explain these differences, Cathleen's research attempts to resolve the physical mechanisms of delivery by determining where and when GH and PH larvae make the transition from the slope to the shelf region, and whether transit locations differ between species and change across years.

Methods

GH and PH eggs were released at 700 m and 500 m, respectively, on January 1st for all simulation years (1982-2003, excluding 1994 and 2001) from presumed spawning locations near Bering Canyon. Individual larvae were tracked throughout their development (270 days for GH and 200 days for PH) and all larvae 15 days post-transformation that intersected pre-defined settlement areas, based on catch of ≤ 100 mm FL (age-0) GH and PH in the AFSC EBS trawl survey, were classified as successful settlers. The location and date at which each successfully settling larva crossed the EBS shelf break, represented by a series of 12 transects along the 200 m isobath, was recorded. Transects 1-2, 4-6, and 10-12 represent Bering, Pribilof, and Zhemchug Canyons, respectively (Fig.1). Since the majority of larvae crossed the shelf break multiple times, the location and date of the final crossing before reaching the successful settlement area was used as the crossing location for the analysis. The total number of

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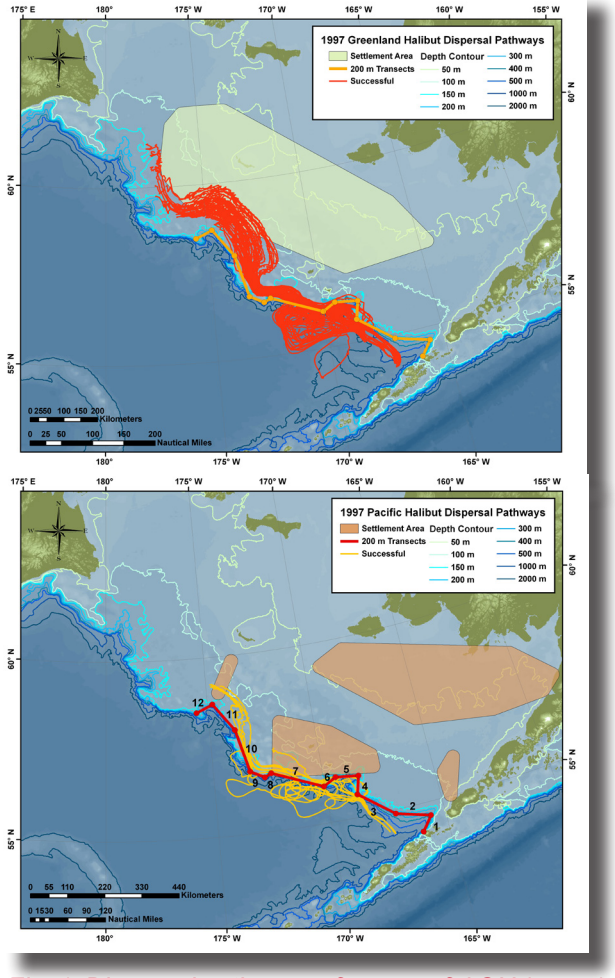

Fig. 1: Dispersal pathways of successful GH (upper) and PH (lower) settlers in 1997. Transect locations along the 200 m isobath are shown in the lower panel, with transects numbered from 1-12 starting at the southern end.

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HELP US UPDATE OUR RECORDS...

Verify your email with our ELHS Secretary.

European Region

Audrey Geffen

Many groups in the European Region have been busy over the past year with new projects, and happily, we've had a good response to the call for items to report to the ELHS community.

from Germany:

Myron Peck and Klaus Huebert (University of Hamburg) and Joel Llopiz (Woods Holed Oceanographic Institution) recently published a book chapter on "*Intrinsic and Extrinsic Factors Driving Match-mismatch Dynamics during the Early Life History of Marine Fishes*." The chapter appears in the latest volume of Advances in Ecological Research (volume 47). This article reviews various intrinsic traits of the early life stages of marine fishes to gain a better understanding of how climate-driven changes in abiotic (temperature) and biotic (match-mismatch dynamics with prey) factors may differ among taxonomic groups and/or habitats (from tropical to polar latitudes).

Intrinsic traits related to the thermal sensitivity of development of endogenously feeding life stages included the time required for eggs to hatch (58 species, 26 families), the size of larvae at hatch (31 species, 15 families) and the time required for young larvae to deplete energy reserves (48 species, 22 families). These intrinsic factors will influence spatio-temporal match-mismatch dynamics at first feeding, a critical period for growth and survival. In exogenously feeding larvae, key intrinsic traits reviewed included differences in early morphology and developmental trajectories (64 species, 20 families) and the foraging ability of marine fish larvae. Routine and critical swimming speeds were 5-10 times higher in the larvae of species from low (tropical) versus higher (temperate/polar) latitudes. Based solely on routine metabolic losses (26 species, 15 families), 7-fold increases in larval foraging requirements were estimated between 5 and 25°C to offset starvation. Finally, a thorough review of larval diets (57 species, 20 families) found clear differences (particularly at first feeding) by taxon and habitat.

The review and synthesis highlights gaps in knowledge and recommends future research directions to strengthen how larval development, feeding, and growth are depicted within individual-based models, which are useful tools for examining climate-driven processes affecting marine fishes and how intrinsic properties and extrinsic factors interact to influence survival. The authors argue that thorough, taxonomic and habitat-based comparisons of intrinsic properties of fish larvae are required to adequately project potential impacts of climate change on the distribution and productivity of marine fishes.

Myron, Klaus, and Joel hope that the community will find the chapter useful (particularly for teaching) and welcome collaboration with others to extend and fully mine the compiled datasets.

from The Netherlands:

Loes J. Bolle and her colleagues at IMARES (*www.wageningenur.nl/en/Expertise-Services/Research-Institutes/imares.htm*): Christ A. F. de Jong, Stijn Bierman, Pieter J.G. van Beek, Olvin A. van Keeken, Peter W. Wessels, René Dekeling, Cindy J.G. van Damme, Erwin Winter, Dick de Haan, have recently published the results of their studies on the effect of piling noise on the survival of common sole (*Solea solea*) larvae (Bolle LJ, de Jong CAF, Bierman SM, van Beek PJG, van Keeken OA, et al. 2012. Common sole larvae survive high levels of pile-driving sound in controlled exposure experiments. *PLoS ONE* 7:e33052. doi:10.1371/journal.pone.0033052).

The project has been very demanding in terms of development of testing equipment and supply of fish larvae. The driving force behind the work is the need to provide information on the potential impact of seabed construction. The rapid extension of offshore wind farms in the North Sea has led to an increased interest in the potential effects of pile driving noise on marine fauna. Although it is known that fishes can suffer lethal damage to their swim bladder or other organs due to loud impulse sounds, such as pile driving noise, knowledge on the sound levels at which mortality or injury will occur is limited for juvenile and adult fishes, and virtually non-existent for fish eggs and larvae. While juvenile and adult fish may actively swim away from a sound source, planktonic larvae are not capable of avoiding sound exposure and may therefore suffer more from underwater noise.

Loes and her team examined the effect of piling noise on the survival of fish larvae. The study was commissioned by the Dutch Ministry of Infrastructure and Environment and the Dutch Ministry of Economic Affairs, Agriculture & Innovation as part of their 'Shortlist Masterplan Wind' research programme.

Together with a team from TNO (*www.tno.nl*), a laboratory set-up was developed in which impulse sounds, representative of pile driving noise, can be generated. The device consists of a rigid-walled cylindrical chamber driven by an electro-dynamical sound projector (Fig. 1). Samples of up to 100 larvae can be exposed simultaneously to a homogeneously distributed sound pressure and particle velocity field, at a controllable static pressure up to 3 bar. Sound pressure is measured by 4 transducers mounted in the wall of the chamber and particle velocity is

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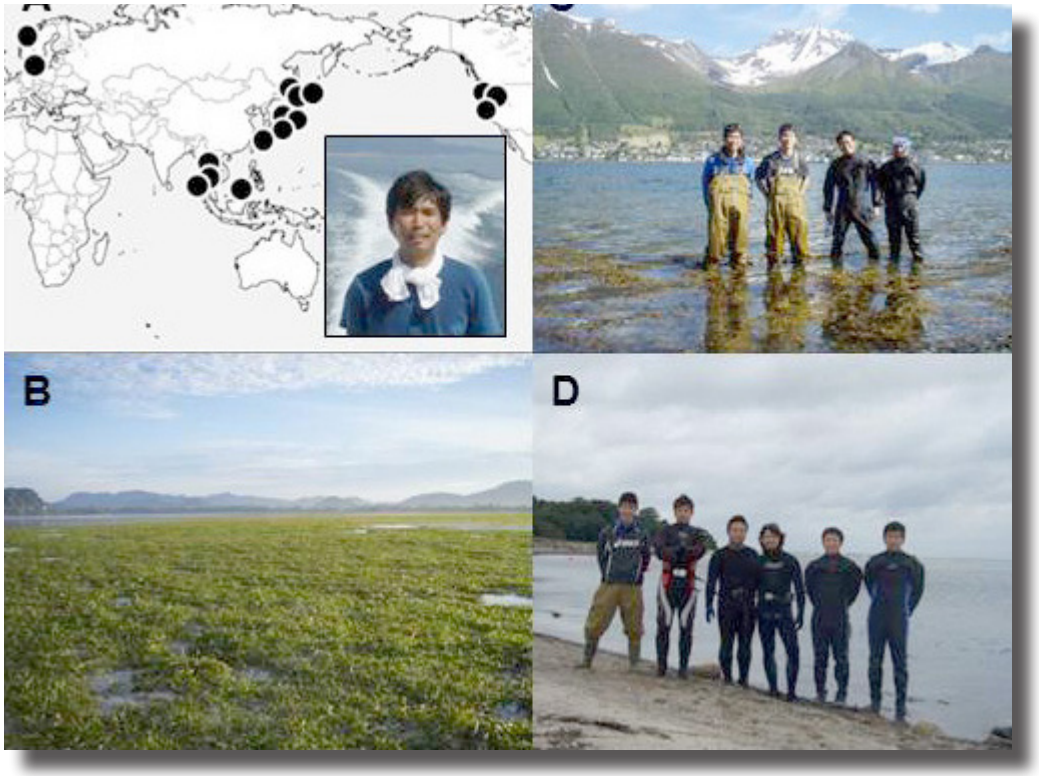
Fig. 1. The device which was developed to expose fish larvae to loud impulse sounds.

Pacific Rim Region

Akinori Takasuka

A world tour of fish nursery research

Typically, each study group has its target species and favorite study site in field works. However, a synthetic analysis on fish habitat biology, for example, needs enormous survey efforts across different ecosystems. Although a literature review or meta-analysis would be a possible approach, it is ideal to conduct extensive surveys through a uniform approach by the same study group. Here is such an example of global activity of field samplings toward a comparative synthesis of nursery grounds for early stage fishes.



A world tour of fish nursery research. A: Global map of sampling sites with Jun Shoji on board; B: Vast seagrass bed in Thailand; C: Seagrass bed sampling in Norway; D: Laboratory members on a survey in Kiel, Germany.

Jun Shoji, an Associate Professor at Hiroshima University, Japan, has been one of the most dedicated contributors to the annual Larval Fish Conferences from Japan. His study group has conducted extensive field samplings in seagrass bed ecosystems in various regions of the world. Their final objective is the comparative synthesis of ecosystem functions and biodiversity-sustaining systems of seagrass beds among different regions of the world. The water around Japan is regarded as one of the highest-biodiversity area in the world (Fujikura et al. 2010). Their surveys have already covered a total of 25 sites inside Japan. Concurrently, the survey target area has been extended to quite a broad coverage outside Japan. The Pan-Pacific region includes Thailand, Malaysia, and western coast of USA. The European region includes Germany and Norway. The latitude of the sites currently ranges from 6°N to 62°N. Their interest is still being expanded to other regions. Their field samplings are, of course, executed in close cooperation with his collaborators in different countries. His team is already achieving some results of latitudinal trend of species diversity in the seagrass beds across the regions, which will be presented at future Larval Fish Conferences.

I remember his statement "We will go anywhere in the world as long as there is seagrass bed for sampling" at the bar last week. So, I am sure that he will appreciate your information on seagrass sampling site in your neighborhood. Please contact Jun Shoji (*jshoji@hiroshima-u.ac.jp*) if you are interested in his activities.

References

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

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

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. Offers from different places in the world to host the Larval Fish Conferences in the future will be presented at the business meeting in Miami. So join the future business meetings and discuss these offers with us! If you can't come and would like to be involved in the discussion process, let me know, I will provide you with the information needed.

Recruiting new members and finding new dedicated people to work for our section is of importance. We are happy to announce that we will nominate candidates for the positions of President-Elect and Secretary-Elect. Jon Hare has distributed an electronic ballot to all members who are eligible to vote. But we still are searching for applicants for the position of Webmaster, 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.

This spring I will be part of a large mesocosm experiment in 50m³ large enclosures looking at the effect of ocean acidification on the plankton community including fish larvae in the Gulmar Fjord in Sweden. When being interviewed by the media about climate change effects on the marine environment we are often asked "What is it going to do to the fish?" If we look at what is known so far, the majority of the knowledge comes from colleagues working on the early life stages. Behavioural changes with potential detrimental effects, growth reductions,

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Other Regions

Catriona Clemmesen

Our President sent the following report after meeting up with other ELH researchers in South Africa.

Alison Deary, a PhD student at the Virginia Institute of Marine Science (VIMS), traveled to work with fellow PhD student Paula Pattrick and her advisor Dr. Nadine Strydom at the Nelson Mandela Metropolitan University following discussions at the 36th annual Larval Fish Conference in Norway 2012. The goal of the collaboration was to examine the development of feeding structures in early life history stage members of the family Sciaenidae from South Africa while sharing knowledge on laboratory and field techniques. During this collaboration, Catriona Clemmesen, President of the Early Life History Section, also visited South Africa. Together, we discussed larval fish research, sampling techniques, and methods.

South African sciaenid larvae were cleared and stained in the lab in order to examine internal structures (calcified structures stained red and cartilage stained blue) and trace the development of these structures. Two species of sciaenids, *Argyrosomus japonicus* and *A. thorpei*, were collected during Paula's dissertation sampling, providing enough material to examine the development of feeding structures in preflexion larvae.

Larval fish scientists from three continents meet in Port Elizabeth, South Africa. From left to right Paula Pattrick (South Africa), Nadine Strydom (South Africa), Alison Deary (USA) and Catriona Clemmesen (Germany).

Both species are recreationally and commercially important sciaenids and the South African stock of *A. japonicus* is considered collapsed due to high levels of fishing mortality in the estuarine nursery habitats where young fish can spend up to 5 years reaching sexual maturity (Cowley et al. 2008). The life history of *A. japonicus* is well understood (Cowley et al. 2008). However, the structural changes that enable these fishes to feed and settle are not well understood, especially in the early life history stages.

We are currently working on a paper describing the osteology, particularly focusing on the feeding structures, of early life history stage *A. thorpei* and *A. japonicus*. This study will help us understand the structural changes that occur while larvae are transitioning from non-feeding plankton to the more mobile, feeding stages. In addition to tracing the structural development in these two species, we will also look at the foraging ecology. From gut content analysis, feeding in these two species appears to begin around 4.0 mm TL and is exclusively on pelagic prey items (primarily calanoid copepods, gastropod veliger, and decapod larvae). Results of this work are being prepared for publication and will be presented at the 37th annual Larval Fish Conference.

Cowley, P.D., S.E. Kerwath, A.R. Childs, E.B. Thorstad, F Økland, and T.F. Næsje. 2008. Estuarine habitat use by juvenile dusky kob *Argyrosomus japonicus* (Sciaenidae), with implications for management. *African Journal of Marine Science* 30:247-253. §

President's Message...cont'd from p. 4

malformations, increase in otolith size, and severe tissue damages have been found. What this means for the adult fish populations and how this can be incorporated into management remains an enormous challenge.

I hope that we can discuss some first results from this year's mesocosm experiments in Sweden at the LFC meeting in Miami and talk about new ideas and plans for the Section's future. While writing this, I am sitting in my office in cold, windy, and rainy Kiel — the thought of meeting you all in sunny Miami makes me smile! §

— Catriona Clemmesen,
President

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

successful settlers was summed for each year and the percentage crossing in each transect was calculated for each species. Directional distributions of both successful and unsuccessful settlers were compared to evaluate differences in their directional trends, with a one standard deviation ellipse used to calculate the directional distribution of each group for each year.

Results

There was a total of 392 successfully settling GH larvae for all years of the DisMELS simulations based on the intersection of their drift pathways with the settlement area 15 days post-transformation, while for PH, there were 256 successful settling larvae. The mean percentage of GH successful settlers crossing at a given transect was 8.3 ± 10%, while for PH, the mean percentage was 7.5 ± 8.0%.

Successfully settling GH and PH larvae were found to use transects 5, 6, and 7 — those around Pribilof Canyon — most frequently to cross from the slope to the shelf region (Fig. 2 on p. 8), with GH often transiting to the shelf via transect 10. GH used more northern transects (i.e., those around Zhemchug Canyon) more often than southern ones (i.e., those around Bering Canyon). PH larvae crossed to the shelf region at all transects along the 200-m isobath, except for transect 12,

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

measured by an accelerometer mounted on the piston of the projector. Recorded piling noise can be reproduced accurately in the frequency range between 50 and 1000 Hz, at peak pressure levels up to 212 dB re 1 μPa^2 and single pulse Sound Exposure Levels (SELs) up to 187 dB re 1 μPa^2s.

The device was used to examine lethal effects of exposure to piling noise in common sole (*Solea solea*) *larvae.* Different developmental stages were exposed to various levels and durations of piling noise. Survival was monitored daily until 7-12 days after the experiment. An initial series of experiments was carried out to estimate random variance and the number of replicates required in the final series of experiments. The highest exposure level applied was 206 dB re 1 μPa^2s cumulative SEL, which corresponds to 100 strikes at a distance of 100 m from a typical North Sea piling site. No statistically significant differences in mean mortality rates were found between the control and exposure groups for any of the larval stages.

The results of this study were remarkable, given the US interim criterion for non-auditory tissue damage in small fish (<2 g) at a cumulative SEL of 183 dB re 1 μPa^2s. Although our findings cannot be extrapolated to fish larvae in general, as interspecific differences in vulnerability to sound exposure may occur, they do indicate that previous assumptions and criteria may need to be revised.

from ICES:

Mark Dickey-Collas, who moved to ICES headquarters in 2012, wants to advertise the new ICES open database on eggs and larvae abundance.

ICES has just launched an online database that provides access to most of the abundance data collected during of the ICES coordinated ichthyoplankton surveys (*eggsandlarvae.ices.dk*). Fish egg and fish larvae data have been collected in the ICES area for an extensive period for use in stock assessments and fisheries management. The collection of the data is usually organized by international survey expert groups organised by

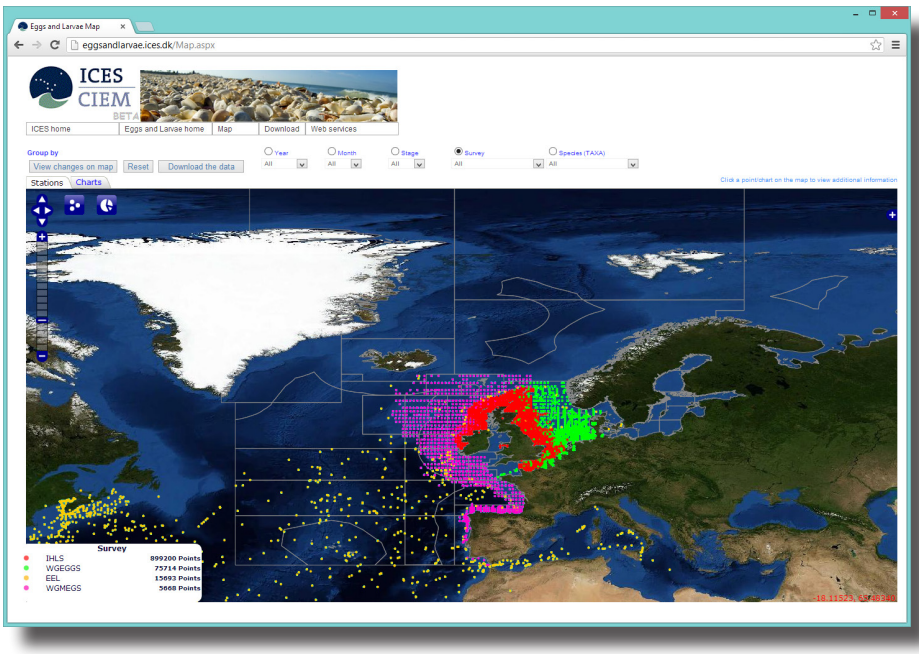

Fig 2. ICES egg and larvae database interactive map view of survey data.

ICES. The Eggs and Larvae database aims to store, and make available, data collected by ichthyoplankton surveys for use by ICES and the wider marine community. It provides an overview of available fish egg and larvae survey data collected (Fig. 2), and a unified portal for access to the ichthyoplankton survey data (Fig. 3).

The database contains various catch information from ichthyoplankton surveys with different target species, spatial and temporal coverage. The surveys currently included are:

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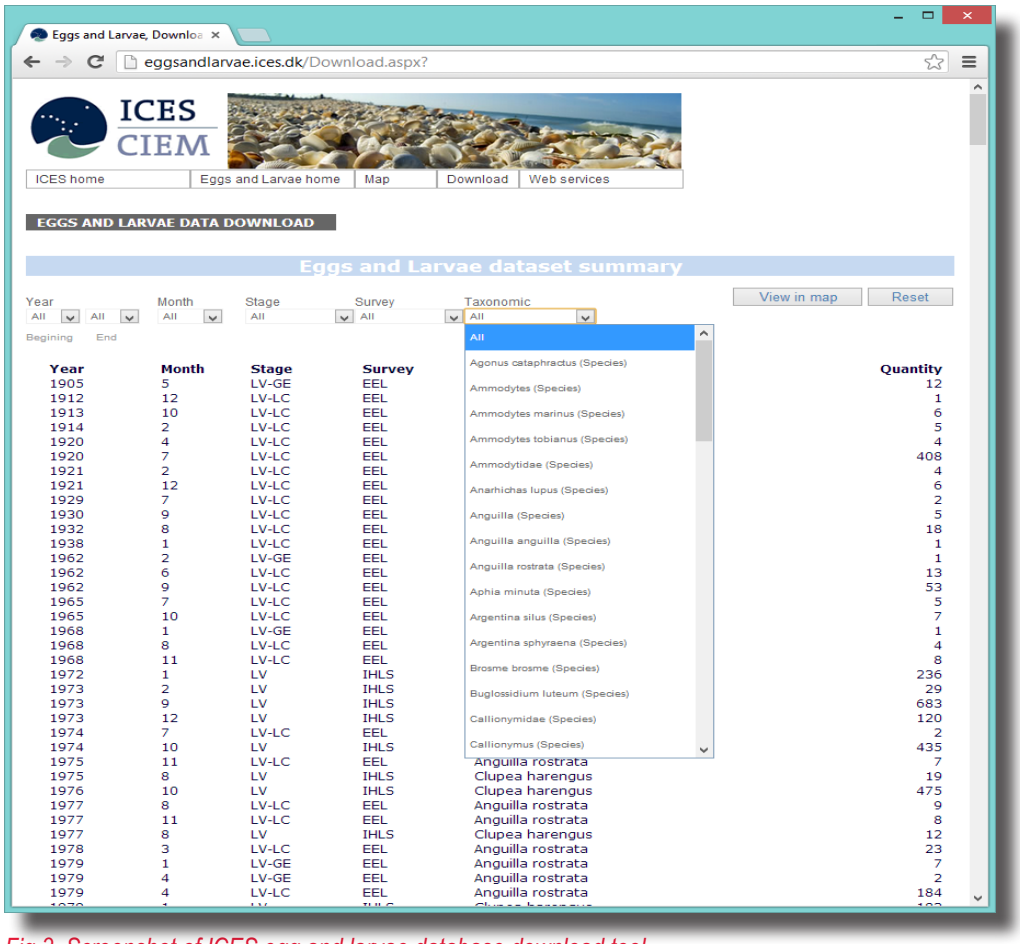


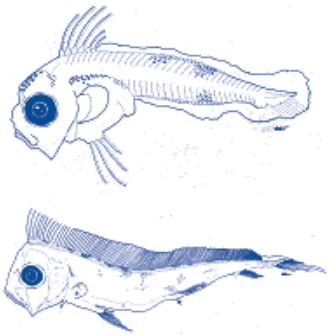
Fig 3. Screenshot of ICES egg and larvae database download tool.

Upcoming Events

Course Offering

Early Life History of Marine Fishes

A Graduate Course in Larval Fish Identification and Ecology



- Date: *10-28June 2013*
- 3 credits (600 level)
- Application deadline 15 April 2013
- Approxiate cost (tuition and lodging): $3,00
- Instructors: Professor Edward D. Houde (University of Maryland Center for Environmental Science), Dr. Nalani Schnell; Guest lecturers: Dr. Troy Tuckey (College of William and Mary), Dr. G. David Johnson (NMNH, Smithsonian Institution), Prof. John E. Graves (College of William and Mary), Dr. Jan McDowell (College of William and Mary)

A lecture and laboratory course offering a comprehensive view of the biology and taxonomy of early life stages of fishes. These stages, including pelagic eggs, larvae and newly-transformed juveniles, are abundant and diverse components of aquatic ecosystems. Their small size, dynamic growth and mortality rates, and dependence on ambient environmental factors, including ocean physics, make these stages vulnerable to variability in climate and to stresses of anthropogenic origin. Level of reproductive success in teleosts, termed recruitment, is highly variable and largely dependent on variability in survival of these early life stages. Knowledge of their morphological development contributes to studies of phylogenetic relationships. Ontogenetic data serve to clarify the complex systematics of teleost fishes, the most diverse and largest class of vertebrates. Early life stages often have specialized adaptations to insure survival in stressful habitats. In the laboratory, larvae of 190 families of teleostean fishes are examined and characters useful in identification are presented. Laboratory exercises on otolith preparation, otolith-aging, and on feeding by fish larvae will be included.

This is a graduate-level course for students with an interest in fish ecology, fisheries science, morphology and biological oceanography. It is presumed that students will have some experience and background in those disciplines. Prerequisites include an undergraduate degree in a biological discipline; permission of the instructors is required to be admitted to the course. No more than 12 students will be accepted. The lectures and laboratories will be held at the Virginia Institute of Marine Science, College of William & Mary. For further information, contact Dr. Schnell (*nschnell@vims.edu*) or Dr. Houde (*ehoude@cbl.umces.edu*) or see our website: *web.vims.edu/adv/657*. §

LFC37...cont'd from p. 1

Predators) program. Our knowledge of predator–prey interactions in the ocean has continued to expand, thus a fourth session will encompass research on the state of knowledge on the structure of larval fish food webs. A fifth session will discuss recent advances in methodology applied to the study of early life history of fishes. Session six will include presentations focusing on all aspects of the ecology of larval fishes. Finally, this year NOAA's FATE (Fisheries and the Environment) program will join the conference with two sessions: one focused on larval fish related FATE studies and the other encompassing FATE presentations on other topics.

Abstract submissions will be accepted through April 1, 2013. Please note that registration is required for abstract submission. Early registration ends on April 1, 2013.

To register and submit an abstract, or for additional information about the conference's themes, venue, transportation, and your visit to Miami please refer to the conference website (*www.rsmas.miami.edu/LFC2013*).

Please help us get the word out about the conference to your national or international network of colleagues and collaborators.

Best regards,

Miami LFC 2013 Steering Committee §

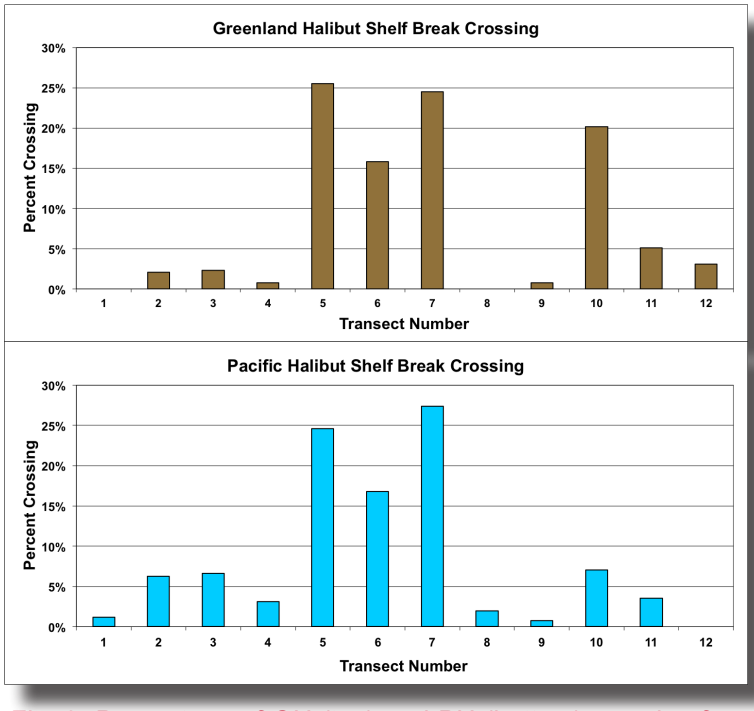


Fig. 2: Percentage of GH (top) and PH (bottom) crossing from the slope to the shelf at each of 12 transects across the 200-m isobath. Transect 1 is located to the south, while transect 12 is located to the north (refer to Fig.1 for transect locations).

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

and used southern transects (Bering Canyon) more frequently than GH.

GH and PH larvae crossed the 200-m isobath an average of 2.40 and 1.74 times, respectively. The average date of first and last crossing was 03/10-05/11 and 04/24-06/17 for GH, and 02/22-06/01 and 04/08-06/21, for PH, respectively. Timing and location of the slope-to-shelf transition changed between years, and differed for GH and PH, though similarities existed between the two species (Fig. 3). Simulated GH and PH larvae used both canyon and inter-canyon (slope) regions (3, 4, 7, and 9) to transition to the shelf, but were also found to cross at transects where flow has been characterized as being predominantly off-shelf (4, 7, 9, 10, and 11, Vestfals, unpublished data).

Examination of the directional distributions of both GH and PH successful and unsuccessful settlers revealed that trajectories of unsuccessful settlers moved mostly in an along-shelf direction, while successful settlers moved on-shelf (Fig.4). During a year with more PH successful settlers than GH settlers (1982), unsuccessfully settling GH were retained near southern canyons (Fig. 4), while in a year with more GH successful settlers than PH settlers (1997), larvae were directed away from southern canyons and moved more in the along-shelf direction (Fig. 4 on p. 9).

Conclusions

The results of this research support the hypothesis that successful GH and PH settlers cross the boundary between the slope and shelf region through canyons, however, slope regions were also shown to be important transition locations. Pribilof Canyon, in particular, appears to be an important crossing location for both GH and PH larvae, connecting offshore spawning grounds with important nursery areas over the continental shelf. The funneling effect of canyons is important for movement of nutrients and plankton from the basin and slope onto the shelf region, and both Bering and Pribilof Canyons are known to be important regions of slope-shelf exchange. Overall, GH larvae were found to cross to the shelf through more northern canyons, while PH transitioned through more southern ones. This is likely a result of GH's longer pelagic larval duration and extend-

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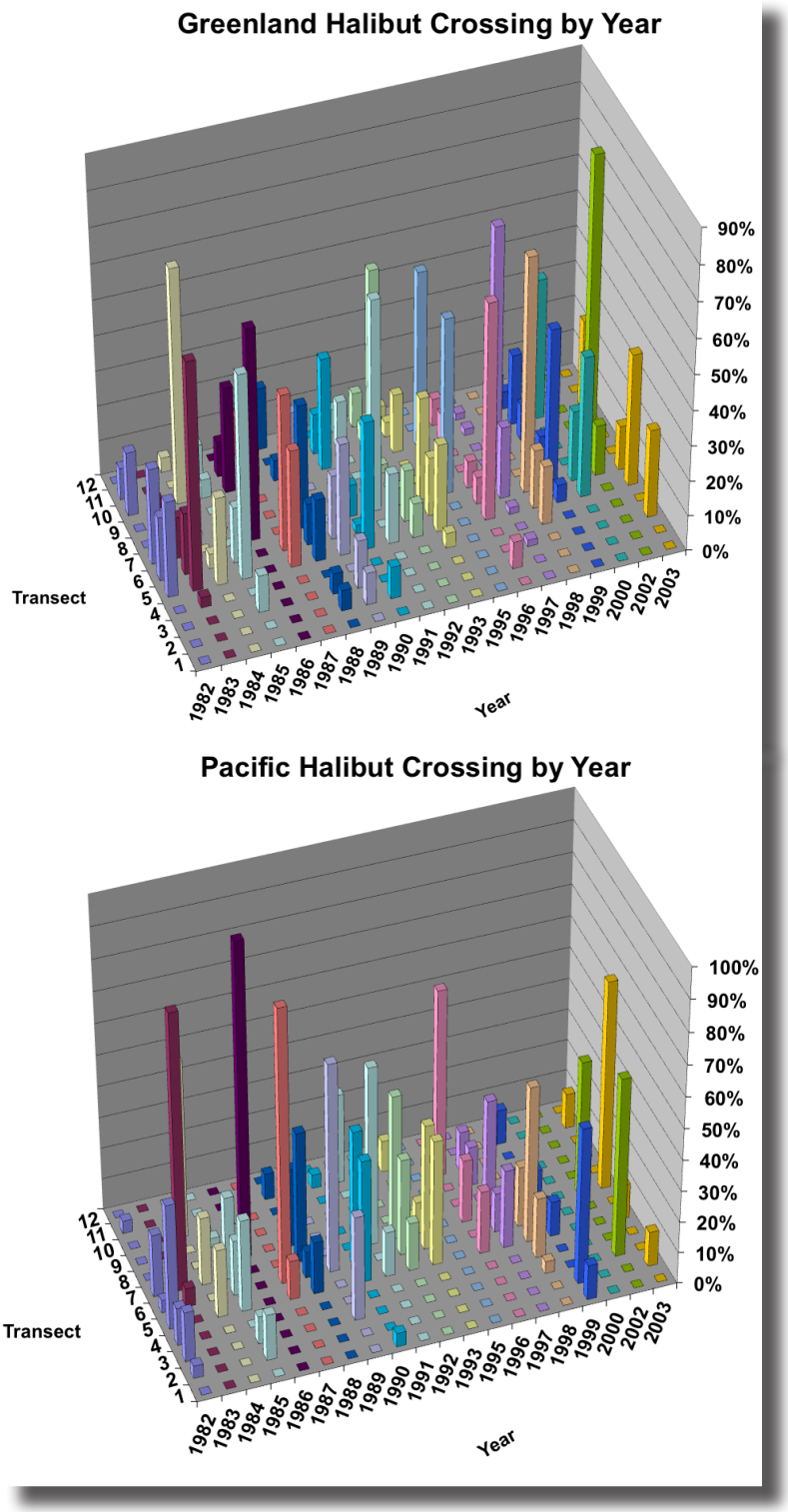


Fig. 3: Percentage of simulated GH (top) and PH (bottom) larvae crossing from the slope to the shelf at each transect along the 200-m isobath between 1982-2003 (1994 and 2001 data not included).

Western Region...cont'd from p. 8

ed time spent in the Bering Slope Current, while PH develops more quickly and becomes competent to settle earlier. Initial analysis of the two releases on January 1st found that the timing and location of the transition from the slope to the shelf changed between years, and differed for GH and PH, although in some years both species crossed the shelf break at the same locations. Future simulations, with releases from several spawning locations spanning the peak spawning season, will further resolve the timing and location of shelf break crossings for both species, while a comparison of GH and PH dispersal pathways with transport along and across the Bering Slope will help to evaluate the influence of larval advection on settlement, and potentially, recruitment success.

Cathleen is working in conjunction with fellow Ph.D. student D. Sohn and her advisor is Prof. L. Ciannelli. §

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

North Sea cod and plaice egg surveys (2004, 2009): egg and larval distributions in the winter in the North Sea, target species are cod and plaice.

Atlantic *Anguilla* surveys (1863-2007): data gathered from various surveys conducted in different times in North Atlantic. The surveys were focused on different stages of eel larvae.

The International Herring Larvae Surveys (1972-2012): the ICES programme of international herring larval surveys in the North Sea and adjacent areas (operating since 1967). The main purpose of this programme is to provide quantitative estimates of herring larval abundance, which are used as a relative index of changes of the herring spawning-stock biomass in the assessment.

Mackerel and horse mackerel eggs (1968-2012): a survey is carried out every 3 years in the north eastern Atlantic. The year after the Atlantic survey, a mackerel egg survey is conducted in the North Sea. The survey creates a basis for the stock assessment of Atlantic and North Sea mackerel and management plan for Atlantic horse mackerel.

Now there is no excuse not to explore the historical time series of ichthyoplankton held by ICES. Also ICES would be keen to include other data sets in the database. A summary factsheet about the dataset can be obtained at *eggsandlarvae.ices.dk/Download/EggsAndLarvaeDataset.pdf*. §

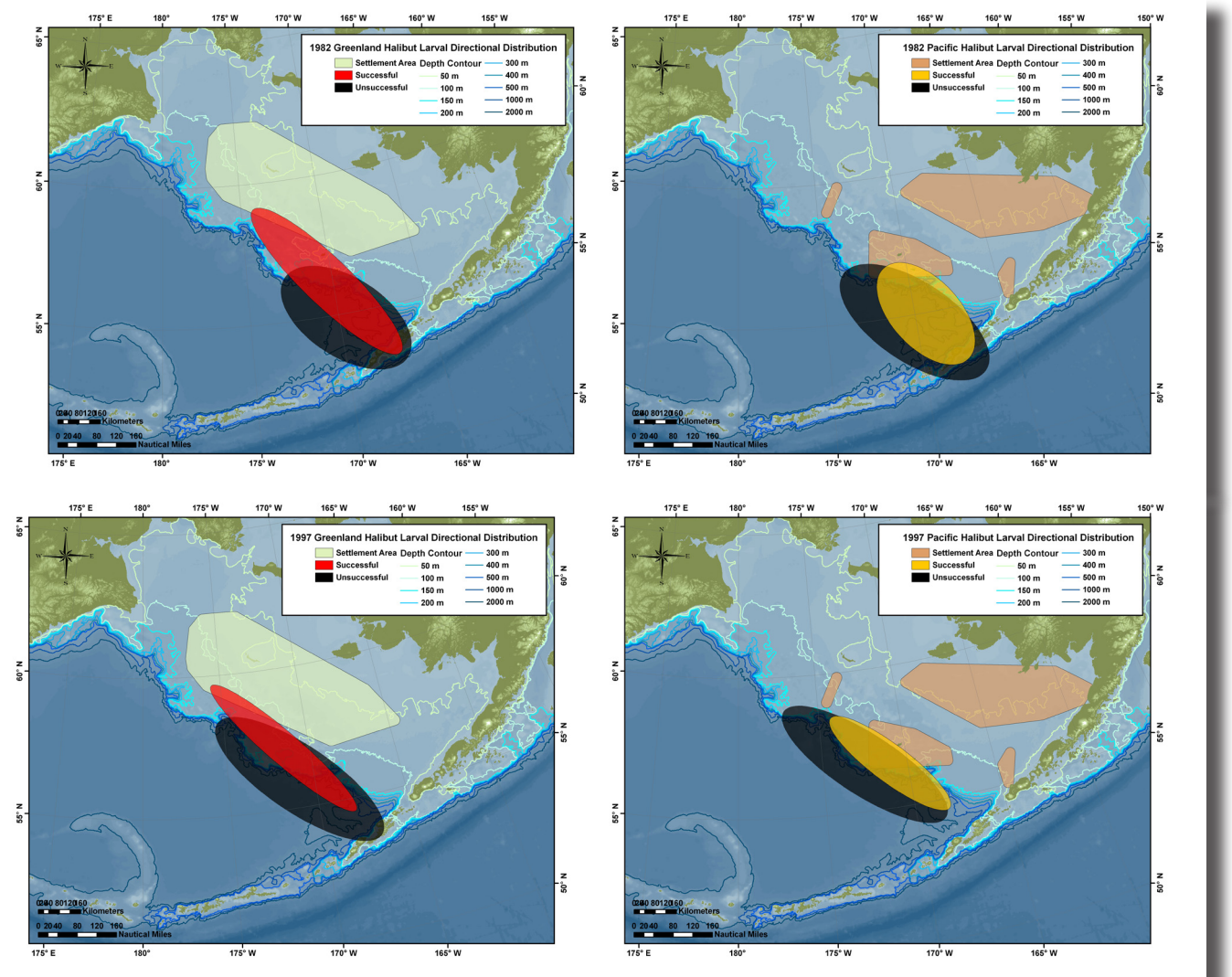
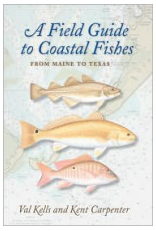


Fig. 4: Directional distributions for GH (left) and PH (right) in 1982 (top) and 1997 (bottom). Shaded areas represent the one standard deviation ellipsoid. Colored ellipses represent successful settlers while black ellipses are unsuccessful settlers.

Publications



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

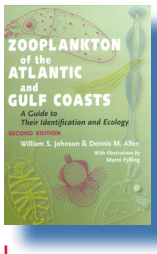
By Valerie A. Kells and Kent Carpenter

Published by Johns Hopkins University Press. IBSN: 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." §



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. §

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.

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. §

REMINDER

Deadline for sending contributions for the next issue of ***Stages****:*

May 3, 2013

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, Elassomidae 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*

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. (2nd 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 26th 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. §

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Stages

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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* 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."

Generations of ELHS Members

I attended the annual AFS meeting in St. Paul last August, fully expecting to run into some friends from long ago, when I worked in the Great Lakes Region. One of those I found was Fred Binkowski, the first editor of **Stages**. Fred served in that capacity for a remarkable 10 years! — an inspiration to me as I begin my 10th year as editor. Fred is one of the seven people who were appointed by the AFS President in 1979 to serve as the Section's provisional Executive Commitee. The others were Darrel Snyder, Ron Kernehan, John Dorr, Dan Faber, Bob Werner, and myself. Darrel and I still are regulars at the LFCs, but others have popped up from time to time. Remember Ron showing up at the Wilmington meeting? I think Dan appeared one time not too long ago. Bob retired to an idyllic spot in Upstate New York. John went overseas (see *ELHS Back Then*), and I haven't heard from him since.

That's the Old (very old) Guard, but there are other ELHS members who have come and gone, and it's fun to run into them from time to time. Last week, I attended the Aquaculture 2013 meeting in Nashville, where I saw Fred once again. Dave Bengtson, who chaired the organizing committee for the 16th annual Larval Fish Conference (in 1992) was there, too; he's a regular at those meetings. The big surprise for me was seeing Kathy Lang for the first time in many years. Kathy was a regular attendee of the LFCs for many years and served as ELHS Treasurer from 1996 until 2004, longer than anyone else.

It was great catching up individually with these friends from yesteryear and reminiscing about others (such as ELHS Past Presidents Bob Hoyt and Jeff Isely). But what was particularly interesting to me was that Fred, Dave, and Kathy did not know each other. That's when I realized that there are generations of ELHS members, and that can only happen in a long-established, successful organization. §