STAGES

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

Volume 34, Number 3 | Lee A. Fuiman, Editor | October 2013

Larval Fish Laboratory Celebrates 35 Years

Larval Fish Laboratory staff. Front Row (left to right): Darrel Snyder, C. Lynn Bjork, Koreen Zelasko, Sean Seal. Back row: Kevin Bestgen, Cameron Walford, John Hawkins. (Photo: B. Wardell).

In September 2013, the Larval Fish Laboratory celebrated its first 35 years of work in the Department of Fish, Wildlife, and Conservation Biology, Warner College of Natural Resources, at Colorado State University. The Lab was founded in 1978 by Darrel Snyder, longtime member and co-founder of the Early Life History Section of the American Fisheries Society, and Dr. Clarence Carlson, now Professor Emeritus at Colorado State University. The emphasis of the Lab at the outset was early life history of fishes, specializing in taxonomic guides for southwestern U.S. native and endangered fishes prepared by Darrel and capably

...continued on p. 7

Inside this issue

ELHS Back Then

10 years ago: Art Kendall organizes workshop on identification of larval fishes at the 27th LFC in Santa Cruz, California.

15 years ago: ELHS President Jim Cowan calls for drafting of Standing Rules to assist in Section governance.

20 years ago: Jeff Govoni is appointed to chair a committee to establish rules and procedures for the Sally L. Richardson award.

25 years ago: ELHS President Bob Werner calls for expansion of ELHS to include foreign members.

30 years ago: In only its third year in existence, ELHS membership stands at 360.

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

January 10, 2014

President's Message

What is new since our last meeting in Miami in June? Finding new regional officers is still ongoing; some success in appointing officers can be reported. Chris Chambers and Howard Browman have been appointed as members of the Alhstrom Lifetime Achievement Award Committee to support Jeff Govoni. After writing to all members and in consideration of their replies, The Executive Committee accepted the offer to host the 39th annual larval Fish Conference in Vienna, Austria in July 12 -17, 2015. My thanks go to Hubert Keckeis for making the offer. As we all know Pascal Sirois and his colleagues will host the larval fish conference in Quebec City, Quebec, Canada jointly with the American Fisheries Society annual meeting in August 2014. Since a lot of freshwater people will be in Quebec City, this would be our chance to get them interested in our 2015 meeting in Vienna, where a lot of European freshwater people will likely attend. We are still seeking for an offer from

...continued on p. 10

News from the Regions

European Region

Hubert Keckeis

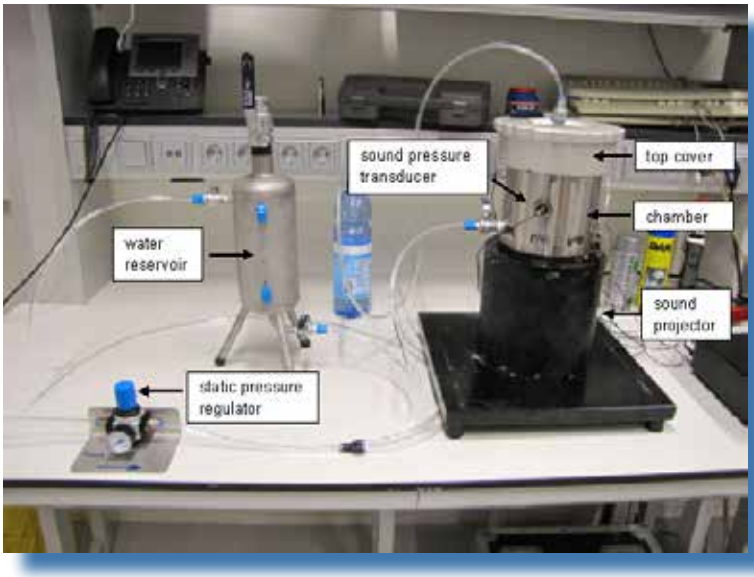
from: Cindy van Damme, IMARES, IJmuiden, The Netherlands

Effect of piling noise on the survival of common sole (*Solea solea*) larvae.

Loes J. Bolle, 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

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 fish 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 fishes 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.

A team of scientists from IMARES and TNO (The Netherlands) examined the effect of piling noise on the survival of fish larvae. This 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.



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

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 (see figure above). 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. Particle velocity is 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 $\mu Pa^2 s$.

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

...continued on p. 6

Section Officers

President
Catriona Clemmesen
GEOMAR - Helmholtz Centre for Ocean Research Kiel
Kiel, Germany
cclemmesen@geomar.de

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

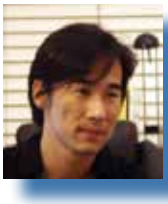
Treasurer
Jeffrey Buckel
Center for Marine Sciences & Technology
North Carolina State University
jeffrey_buckel@ncsu.edu

President-Elect
Myron Peck
University of Hamburg
myron.peck@uni-hamburg.de

Secretary-Elect
Fred Scharf
University of North Carolina, Wilmington
scharff@uncw.edu

HELP KEEP STAGES INTERESTING...

Send us a report of your research activities.



Pacific Rim Region

Akinori Takasuka

Quantifying the value of vegetated habitats for fish: Introduction of the PhD work of Yasuhiro Kamimura

Dr. Yasuhiro Kamimura, National Research Institute of Fisheries Science, Fisheries Research Agency.

Yasuhiro Kamimura, an active Japanese contributor to the annual Larval Fish Conferences, completed his PhD degree (Hiroshima University, Japan), in March 2013. His PhD supervisor was Dr. Jun Shoji, probably the most popular Japanese participant in recent annual Larval Fish Conferences. Jun's study group is very active in field surveys inside and outside Japan, as reported in a previous issue (STAGES 34(1), "A world tour of fish nursery research"). Dr. Kamimura has also been involved in such field activities. He has tackled a quantification of the economic value of vegetated habitats, including their role as nursery for fish.

The economic value of the ecosystem services of vegetated habitats, such as seagrass and macroalgal beds, has been estimated as one of the highest among the world's ecosystems. Production of fisheries resources has not been considered in the estimate, although vegetated habitats have been recognized as important nursery for a variety of fish species. To quantify the contribution of vegetated habitats as fish nursery, production and growth–survival mechanisms of a substrate-associated

Post-settlement juvenile black rockfish Sebastes cheni *(25 mm total length).*

Scorpaenidae fish, black rockfish ,*Sebastes cheni*, were examined in a macroalgal bed *Sargassum* spp. in the central Seto Inland Sea, Japan. Otolith microstructure analysis was adopted to estimate their mortality rate and to test growth-related survival mechanisms. Moreover, the annual production of *S. cheni* juveniles and their economic value were estimated for the macroalgal bed.

Seasonal changes in fish assemblages based on the quantitative fish samplings revealed that juvenile *S. cheni* dominated the fish community in the macroalgal bed in early summer (Kamimura & Shoji 2009). The cohort-specific mortality rate of the post-settlement juveniles was significantly higher in the later cohorts that underwent lower habitat complexity due to decrease in macroalgal coverage, although the cohort-specific growth rate was significantly higher in the later cohorts due to higher temperatures (Kamimura & Shoji 2013). Strong selection for fast-growing juveniles occurred in a cohort with a high mortality rate that underwent lower habitat complexity. The variability in habitat complexity affected survival and production mechanisms of juvenile *S. cheni*. The earlier cohorts with lower mortality rates were suggested to have highly contributed to *S. cheni* production in this habitat. The total economic value of the ecosystem services of vegetated habitats is suggested to be higher by at least 40–58% than the value estimated in a previous study, when the fish production estimated in the present study is included (Kamimura et al. 2011). For more details of his works, a list of representative publications is provided at the end of this article.

After his PhD course, Dr. Kamimura moved from Hiroshima to Kyoto to work in the Field Science Education and Research Center, Kyoto University (Kyoto) as a Research Fellow of the Japan Society for the Promotion of Science. Four months later, however, he got a new job and moved to Yokohama. On August 1, he recruited to the Research Center for Fisheries Management, National Research Institute of Fisheries Science, Fisheries Research Agency, in Yokohama. In his new place, he has also started to work on early life biology of small pelagic fishes. Lastly, I

...continued on p. 5

*Macroalgal bed (*Sargassum *spp.) in the central Seto Inland Sea, Japan.*

Other Regions: Southeastern Brazilian Coast

from: Jana Menegassi del Favero, PhD student at the Oceanographic Institute, University of São Paulo (IOUSP).

The first ichthyoplankton studies off the Brazilian coast were carried out in the early 1960's by Prof. Yasunobu Matsuura at the Oceanographic Institute of the University of São Paulo (Instituto Oceanográfico - Universidade de São Paulo, IOUSP). Until the early 1980's, studies were primarily related to the identification and description of stages of embryonic and larval development, assessment of fish stocks and spawning biomass, and distribution and abundance of eggs and larvae. After this period, there was a change in the principal research focus, which now seeks to understand the control exerted by environmental factors in fish larvae.

The Laboratory of Biology and Ecology of Marine Ichthyoplankton (Laboratório de Biologia e Ecologia do Ictioplâncton Marinho - LaBEIM), under the responsibility of Prof. Mario Katsuragawa since 1986, is currently developing several works on fish eggs and larvae:

1) Description of the early stages of larval development of some species, e.g., *Cynoscion microlepdotus* (Sciaenidae) and *Centropomus parallelus* (Centropomidae) (the *C. parallelus* description is in press: Itagaki, et al., 2013, *Zootaxa* 3669(1):065-075).

2) Occurrence, distribution and abundance of larvae in the Southeastern Brazilian Coast, e.g., Pleuronectiformes (some results presented at the 35th annual Larval Fish Conference by Camilla Nunes Garbini), Bregmacerotidae, Sciaenidae and Serranidae; and water mass influence on the horizontal and vertical distribution of Myctophidae (some results presented at the 35th Annual Larval Fish Conference by Cláudia Akemi Pereira Namiki).

3) Biological studies on the nutritional condition, growth and mortality of *Myctophum affine* - Myctophidae.

4) New methodology to identify Engraulidae eggs (as presented by myself in the annual Larval Fish Conference of this year).

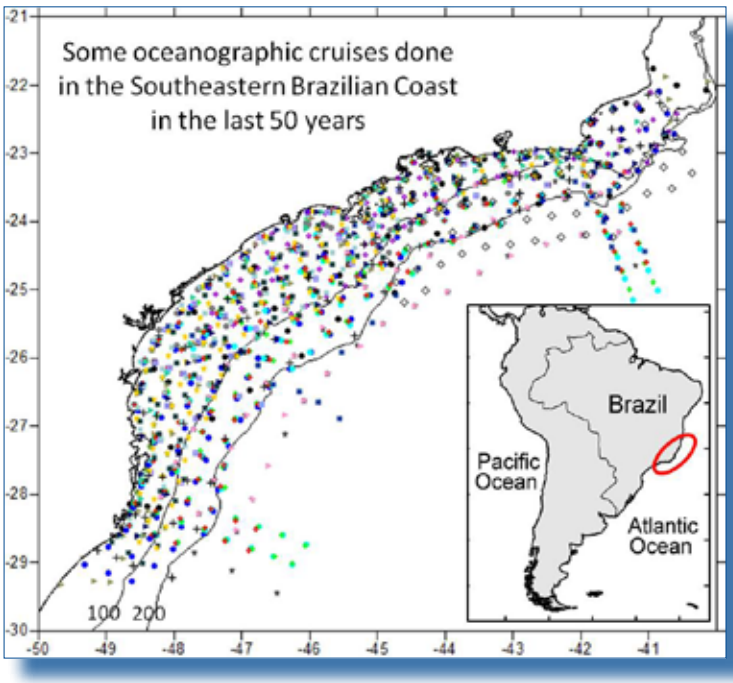
Besides the research developed at the LaBEIM, Prof. Mario Katsuragawa coordinated the creation of the "Biological Collection Prof. Edmund F. Nonato of the Oceanographic Institute" (ColBIO). Inaugurated in 2012, the main objective of the collection is to promote the permanent maintenance of the biological samples resulting from the various cruises carried along the Brazilian and Antarctic coasts in the last 50 years, making all the samples accessible and available to the scientific community.

At this writing, there are cataloged and deposited approximately 9,600 zooplankton samples, 30,700 fish larvae samples (most of them identified to the taxonomic level of family), 8,600 fish eggs samples, and 4,300 samples of whole organisms, gonads and otoliths of juvenile and adult fish. Soon the collection will be available through a web page that will allow access to the ColBIO database.

By maintaining these collections, the ColBIO has enabled studies

...continued on p. 9

Some of the biological diversity found at the Biological Collection Prof. Edmund F. Nonato of the Oceanographic Institute (ColBIO).



Plankton samples deposited at the Biological Collection Prof. Edmund F. Nonato of the Oceanographic Institute (ColBIO).

Opportunities

Assistant Professor, Fisheries Ecology

The University of Texas at Austin, Marine Science Institute, invites applications for a tenure track faculty position to begin as early as Fall 2014. We seek a quantitative fisheries ecologist who conducts field-based research in areas such as population dynamics, recruitment, connectivity, or marine-protected areas on fish species of commercial and recreational importance. All candidates must have a Ph.D. in Marine Science or a relevant field; postdoctoral research and teaching experience are strongly preferred. The position will be filled at the Assistant Professor level.

The position is located at the Marine Science Institute in Port Aransas, Texas, which offers excellent shoreside laboratory facilities in close proximity to a variety of unique estuarine and coastal habitats, including the 185,708-acre NOAA Mission-Aransas National Estuarine Research Reserve. The Institute also has well developed marine education and outreach infrastructure for disseminating research. The successful applicant will be expected to establish an externally funded independent research program, provide excellent training for graduate students and postdoctoral fellows, and contribute to undergraduate and graduate teaching in the department. Faculty members commit two-thirds time to research and one-third time to teaching.

Further information is available at www.utmsi.utexas.edu/facsearch or at *facsearch@utlists.utexas.edu*. To apply, submit a letter of interest, curriculum vitae, teaching statement, research statement, and arrange for three letters of reference to be sent electronically to *facsearch@utlists.utexas.edu* or via mail to: Faculty Search Committee, The University of Texas at Austin, Marine Science Institute, 750 Channel View Dr., Port Aransas, Texas 78373-5015. Review of applications will begin November 11, 2013.

The University of Texas Marine Science Institute is responsive to needs of dual career couples and committed to building a multi-cultural work force. We strongly encourage applications from women, minorities, veterans, and individuals with disabilities. Review of applications will begin November 11, 2013.

Learn more about the Institute at: *www.utmsi.utexas.edu*

The University of Texas at Austin is an Equal Opportunity Employer.

Background check conducted on applicant selected.

Request for Ichthyoplankton Data

I am looking for published reports or online data resources that provide egg production data for marine fish communities around the world. The specific questions I would like to address for any particular region are: (1) how many marine fish eggs are produced in that area each year? (2) how many marine fish eggs are produced in that area at different times of the year (e.g., month, quarter, season)? (3) how many marine fish eggs are produced in different subsections of the larger area per year, month, quarter, season, etc? The data do not need to be segregated by species, but species-specific data could be useful. The important point is that temporal and spatial variability in egg production can be characterized.

I found a terrific example of this kind of data in a report by Peter Berrien and Michael Sissenwine in Smith, W.G. ed. 1988. An analysis and evaluation of ichthyoplankton survey data from the northeast continental shelf ecosystem. NOAA Technical Memorandum NMFS-F/NEC-57. 145 pp. (*www.st.nmfs.noaa.gov/tm/nec/nec057.pdf*). This report shows marine fish egg production in the region from Cape Hatteras to Nova Scotia, divided into four subregions for the years 1979-1994.

If you know of other reports that contain these or similar kinds of information, please point me to them. Some colleagues and I are brainstorming about fish eggs. Thanks so much. §

— Lee Fuiman, *lee.fuiman@utexas.edu*

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

would like to express my congratulations: he was married in March 2013. I suppose that his family has been very busy since they had to move twice during the last 4 months.

Selected Publications

Kamimura, Y., and Shoji, J. (2009) Seasonal changes in the fish assemblage in a mixed vegetation area of seagrass and macroalgae in the Central Seto Inland Sea. *Aquaculture Science*, 57:233–241.

Kamimura, Y., Kasai, A., and Shoji, J. (2011) Production and prey source of juvenile black rockfish Sebastes cheni in a mixed vegetation area of seagrass and macroalgae off Aba Island, central Seto Inland Sea, Japan: An estimation of the economic value of a fish nursery. *Aquatic Ecology* 45:367–376.

Kamimura, Y., Mizuno, K., Noda, T., Hirakawa, K., Tamaki, H., and Shoji, J. (2012) Validation of daily periodicity of otolith increment formation and application for growth analysis of wild juvenile black rockfish *Sebastes cheni*. *Aquaculture Science* 60:413–416.

Kinosihita, H., Kamimura, Y., Hirai, K., Mizuno, K., Iwamoto, Y., and Shoji, J. (2012) Vulnerability of juvenile fish to piscivorous fish predators increases during nighttime in a seagrass bed in the central Seto Inland Sea, Japan. *Bulletin of the Japanese Society of Fisheries Oceanography* 76:24–30.

Kamimura, Y., Shoji, J. (2013) Does macroalgal vegetation cover influence post-settlement survival and recruitment potential of juvenile black rockfish *Sebastes cheni*? *Estuarine, Coastal and Shelf Science* 129:86–93.

Kinoshita, H., Kamimura, Y., Mizuno, K., Shoji, J. (in press) Nighttime predation on postsettlement Japanese black rockfish *Sebastes cheni* in a macroalgal bed: Effect of body length on predation rate. *ICES Journal of Marine Science*.

§

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

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 U.S. interim criterion for non-auditory tissue damage in small fishes (<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: Matthias Paulsen, Thünen-Institute of Baltic Sea Fisheries, Rostock, Germany.

Effects of food quality on larval fish growth in the field

It is well known that food quality, and especially the content of essential fatty acids (EFA), influences growth and survival of larval fishes. This knowledge is mainly based on aquaculture research and experimental ecology (St. John et al. 2001; Copeman et al. 2002; Sargent et al. 2002). However, this issue has been neglected in field studies until now. The basic fatty acid profile in the marine environment is laid down by primary producers and bacteria (Dalsgaard et al. 2003). Two of the most widely spread and abundant phytoplankton classes, diatoms and dinoflagellates, differ fundamentally in their content of two EFA, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). Diatoms contain high concentrations of EPA, while dinoflagellates are rich in DHA. Apart from taxonomic differences, the concentration of EFAs in the phytoplankton changes over the season, depending on the growth phase. All these factors influence and change the concentration of EFAs in the first consumers (e.g. copepods) (Malzahn et al. 2010; Schoo et al. 2013) within physiological possible or tolerable limits, and ultimately the availability of EFAs for larval fishes. Especially at very low food quantities, it is likely that food quality affects growth and survival of larval fishes. Because the demand for essential components in a larva of a given size is assumed to be constant, at low food quantities, the demand for essential components cannot be met due to an increased ingestion rate.

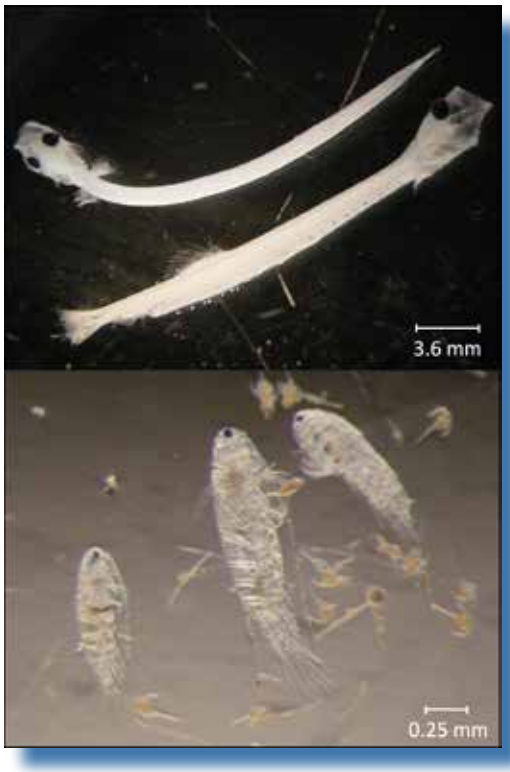
In two recent studies, we were able to show that food quality is able to affect larval fish growth in the field. In the first study (Paulsen et al. 2013a), growth and DHA concentration of larval Atlantic herring (*Clupea harengus* L.) was affected by the quality of the potential prey in Kiel Canal, Germany. When the ratio of high quality copepodids to low quality cirriped nauplii decreased, larval growth as well as larval DHA concentration decreased significantly, despite an increase in prey quantity by more than 80%. Similarly, larval growth increased significantly at comparable prey quantities, but increasing ratio of copepodids to cirriped nauplii and strongly increased DHA content in the copepods. In the second study (Paulsen et al. 2013b), we compared the nutritional situations of larval herring from Kiel Canal and the Greifswalder Bodden, Germany. Food quantity determined the general growth patterns over the season. However, in both areas there were periods when food quality was a significant factor influencing larval growth due to compensational effects. Differences in prey´s EFA concentrations up to a factor of 3 during the course of the season were observed.

In conclusion, in terms of larval nutrition both food quantity and food quality interact and influence growth of larval fish in the field.

Literature

Copeman, LA, Parrish, CC, Brown, JA, and Harel, M (2002) Effects of docosahexaenoic, eicosapentaenoic, and arachidonic acids on the early growth, survival, lipid composition and pigmentation of yellowtail flounder (*Limanda ferruginea*): A live food enrichment experiment. *Aquaculture* 210:285-304.

Dalsgaard, J, St John, M, Kattner, G, Muller-Navarra, D, and Hagen, W (2003) Fatty acid trophic markers in the pelagic marine environment. Advances in *Marine Biology* 46:225-340 doi 10.1016/s0065-2881(03)46005-7.



Larval herring (top) and their preferred prey, calanoid copepods (bottom). Recent studies show that not only the sheer amount, but also the quality of the prey affects growth of larval fish in the field.

Malzahn, AM, Hantzsche, FM, Schoo, KL, Boersma, M, and Aberle, N (2010) Differential effects of nutrient-limited primary production on primary, secondary or tertiary consumers. *Oecologia* 162:35-48.

Paulsen, M, Clemmesen, C, and Malzahn, AM (2013a) Essential fatty acid (docosahexaenoic acid, DHA) availability affects growth of larval herring in the field. *Marine Biology* doi 10.1007/s00227-013-2313-6.

Paulsen, M, Hammer, C, Malzahn, AM, Polte, P, von Dorrien, C, and Clemmesen, C (2013b) Nutritional situation for larval Atlantic herring (*Clupea harengus* L.) in two nursery areas in the western Baltic Sea. *ICES Journal of Marine Science* doi 10.1093/icesjms/fst168.

Sargent, JR, Tocher, D, and Bell, G (2002) The Lipids. In: Halver J (ed) *Fish Nutrition*, NY, pp 153–218.

Schoo, KL, Aberle, N, Malzahn, AM, Schmalenbach, I, and Boersma, M (2013) The reaction of European lobster larvae (*Homarus gammarus*) to different quality food: Effects of ontogenetic shifts and pre-feeding history. *Oecologia* doi 10.1007/s00442-013-2786-5.

St. John, MAS, Clemmesen, C, Lund,T, and Koester T (2001) Diatom production in the marine environment: implications for larval fish growth and condition. *ICES Journal of Marine Science* 58:1106-1113. §

Upcoming Events

38th Annual Larval Fish Conference

Dear Colleagues,

We are pleased to invite you to the 38th annual Larval Fish Conference, which will be held in conjunction with the 144th annual meeting of the American Fisheries Society in Québec City, Canada.

The conference will be hosted at the Québec City Convention Centre, known as one of Canada's top convention venues. The Centre is conveniently located in the heart of the town, just steps away from the city's fortifications built between 1608 and 1871, as well as numerous UNESCO World Heritage sites. The city is easily accessible and well connected and via Jean Lesage International Airport and its convenient highway network.

Even though the LFC is organized as a symposium of the American Fisheries Society meeting, we will collect abstracts as usual through the Larval Fish Conference website *www.larvalfishcon.org*. Information about the conference will become available on the LFC website by the end of November, so please stay tuned to learn about the conference's themes and scientific program. Details regarding venue and registration will soon be available through the AFS meeting website: *afs2014.org*. To plan your trip to Québec City, you can also look up the following website: *www.quebecregion.com/en*.

Here is a glimpse at the theme sessions as well as important dates:

Theme sessions:

Hjort 100th Anniversary Session on the contribution of mortality during early life in driving recruitment variability (organized by Dominique Robert)

Larval dispersal and population connectivity (organized by Pascal Sirois)

Contribution of early life history studies to the management of fish populations (organized by Marc Mingelbier)

Ecology, modeling, and emerging issues for fish early life history in the Laurentian Great Lakes (organized by Edward F. Roseman, Tomas Höök, and Edward S. Rutherford)

Larval development: how physiological tools can be used for studying global challenges? (organized by Céline Audet)

Contributed papers

Important dates:

Meeting dates: August 17-21, 2013

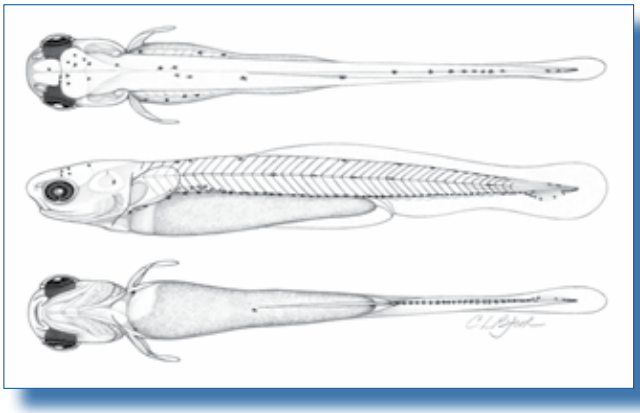
Abstract submission: February 1 to February 28, 2014

Please help us spread the word about the conference by forwarding this invitation to your collaborators. If you would like to receive a complimentary copy of the conference poster, please send a request ASAP to Pascal Sirois (*pascal_sirois@uqac.ca*) as they will be mailed in early December. §

— Dominique Robert and Pascal Sirois,
on behalf of the local organizing committee.

Larval Fish Lab at 35...cont'd from p. 1

illustrated by Lynn Bjork. Early life studies have remained an emphasis of the lab through the years under the Directorship of Dr. Robert Muth from 1987-1997 and under current Director Dr. Kevin Bestgen. In addition to ongoing taxonomic guide development in the Upper Colorado River and Rio Grande basins, and other morphological descriptions of fish larvae, the lab continues to provide sample identification and processing services (Sean Seal, Snyder, Diane Davis) for various cooperators and collaborators. Supporting much of this work, the lab also maintains an extensive fish collection that has grown to over 124,000 cataloged lots consisting of about 3.9 million specimens (mostly larvae, juveniles, and small adults) and representing more than 200 species.



Flathead chub Platygobio gracilis*, 7 mm TL, by Lynn Bjork.*

The scope of the lab has also expanded greatly over time, conducting both field and laboratory studies on native fish ecology throughout the West. Field studies include surveys of habitat and rare species in plains streams of Colorado and Wyoming (Tate Wilcox, Robert Compton, Matt Haworth, Bestgen), capture-recapture experiments using tagged fishes (Koreen Zelasko, Ryan Fitzpatrick, Bestgen, Dr. Gary White), and reproduction, drift, and dispersal of early life stages of fishes in large rivers of the Colorado River Basin, Colorado, Utah, and Wyoming (Zelasko, Wilcox, Seal, Angela Hill, Greg Fraser). Invasive fish investigations are a long-standing emphasis and include abundance and survival estimation and removal of large-bodied non-native piscivores and native fish response studies (John Hawkins, Cameron Walford, Dr. Andre Breton, Bestgen, Hill) in the Yampa and Green rivers, Colorado and Utah, and simulation modeling

...continued on p. 10

Publications

Available now: *A handbook to help identify Hudson River fish larvae.*

By L. G. Arvidson and J. B. Alber.

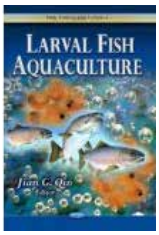
Published by the authors, Rosendale, New York. 2013.

With recent studies demonstrating an alarming decline in many species of fish living and breeding in the Hudson River, a new book by limnologists Larry G. Arvidson and James B. Alber offers professionals and laymen a view of the less seen aspect of the lives of fishes: A Handbook to Help Identify Hudson River Fish Larvae.

The Hudson is an unimpeded corridor from the Atlantic to ancestral spawning grounds and a nursery for many diadromous species as well as nonmigratory ones. Draining parts of the Adirondacks, Catskills and the Berkshires, the springtime runoff yields a rich broth of nutrients, minerals & plankton that sloshes back and forth on twicedaily tides nurturing the young fish. Its 13,500-square-mile watershed makes it one of the two principal spawning grounds of the east coast of North America.

Using a Nikon PFM system on a stereozoom microscope the authors photographed larvae as small as 2.5 millimeters in length on highspeed color film. Striped bass, bay anchovy, and sturgeon are among the more than twentyfive species pictured in full color detail. Simplified line drawings and a dichotomous key supplement the 52 photographs of fieldcollected specimens. A glossary and an extensive, detailed reference list may assist investigators in their task of evaluating the large variety of fish stocks living in the 315-mile-long river.

The authors believe their "Handbook..." to be the first of its kind for the Hudson River. Priced at $24.00, the book is available by mail from Larry Arvidson via *myxicola23@gmail.com*. §



Available now: Larval Fish Aquaculture.

Edited by Jian G. Quin.

Published by Nova Science Publishers, Inc.. ISBN:978-1-62417-899-3. 2013.

Aquaculture continues to grow more rapidly than all other animal food-producing sectors. The gap between seafood supply and market demand suggests a great potential for aquaculture development to meet the needs of seafood consumers. Larval fish rearing is a bottleneck to supply sufficient quantity and high quality of fingerlings for grow-out production. This book aims to provide comprehensive references on larval fish aquaculture. Specifically, it attempts to update the recent development in larval fish feed and feeding, environmental manipulation and hatchery management and to suggest future research needs for improvement of production efficiency in larval fish culture. Currently no book of this kind is available to cover major issues in larval fish aquaculture from an environmental, biological and managerial perspective. This book starts from environmental factors including temperature, salinity and light, and then extends to the major biological and managerial issues in larval fish rearing including live feed production, feeding and digestion, gas bladder development, metamorphosis, cannibalism control and weaning strategies. This book will become a useful reference text for researchers and hatchery managers advancing knowledge in larval fish rearing and a supplementary textbook for advanced courses in larval fish biology and aquaculture.

Eight chapters, 3 chapters authored by four U.S. contributors. §

Other Publications

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.

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.

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. Edited by E.W. North, A. Gallego, and P. Petitgas, Jr. ICES Cooperative

...continued on p. 9

continued from p. 9

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. §

Southeastern Brazil...cont'd from p. 4

evaluating long-term variation of biological communities, which has been largely unexamined so far along the Brazilian coast. Several examples from the Southeastern Brazilian Bight include: 1) the postdoctoral project of Miodeli Nogueira Jr., who evaluated inter-decadal fluctuations (1969-2003) in the structure and abundance of gelatinous zooplankton (Cnidaria and Thaliacea); 2) the master's dissertation of Carolina Costa Araújo, who studied the cephalopod paralarvae; and 3) my own PhD thesis about the inter-decadal fluctuations (1970-2010) in the distribution and abundance of larvae and eggs of *Engraulis anchoita* (Engraulidae). §

Step Up to the Plate

Do you enjoy reading *STAGES*? Do you find it interesting and informative? If so, that's because our Regional Representatives do a terrific job of gathering the news. They also represent their geographic region on the ELHS Executive Committee, helping to make decisions that help all of us.

We have two vacancies among the ranks of the Regional Representatives and are looking for members who will agree to be placed on a ballot. This is a great opportunity to get more invovled in the Section and a great starting place for students and early-career scientists to get involved. By reaching out to our members three times per year (you will be given a contact list for your region), you can develop your professional network while serving the Section.

If you are a member of AFS, reside in the Southern or North Central region, and interested in serving, please contact ELHS Secretary, Frank Hernandez (*frank.hernandez@usm.edu*). §

AFS North Central region.

AFS Southern region.

Sampling in the American West. Left: Vermillion Creek, Green River, Utah (photo: J. Hawkins). Right: Perly Creek, Colorado, a Purgatoire River slot canyon tributary

Larval Fish Lab at 35...cont'd from p. 7

of effects of those removals on predator population dynamics and recovery of native fishes (Breton, Hawkins, Dr. Dana Winkelman). We also conducted extensive laboratory studies on native and invasive species interactions and ecotoxicology investigations, including effects of selenium and other toxicants on endangered fish larvae (Dr. Dan Beyers), and swimming and passage studies conducted in field-scale structures (Walford, Bestgen, Seal).

Bear Creek cutthroat trout (photo: K. Rogers)

Our current staff includes 9 full-time personnel with a combined 164 years of service, in addition to 20 or more work-study, technician, graduate student, or post-doctoral researchers.

The September celebration featured an open house, attended by colleagues, former students and employees who traveled from Wisconsin, Montana, Utah, and New Mexico, as well as University colleagues. A seminar by Bestgen featured the history and contributions of the Lab and focused on studies of the native-fish-dominated Purgatoire River, taxonomy of cutthroat trout in the southern Rockies, and research and service activities associated with the Recovery Program for Endangered Fishes in the Upper Colorado River Basin. Recovery Program Director Tom Chart presented Lab staff with a plaque recognizing their long-standing service and role in the conservation and recovery of four federally listed endangered fishes in the Upper Basin. Former Director Muth and Dean of the Warner College of Natural Resources, Dr. Joyce Berry, also addressed the audience of about 125 people and spoke to the long-standing contributions of the lab. Finally, friends and associates adjourned to the home of Department Head, Dr. Ken Wilson for an evening social and some of Fort Collins finest microbrew, where new acquaintances were made and old ones renewed.

The LFL has built a reputation for excellence conducting a variety of research, education and outreach activities focused on early-life taxonomy, fish ecology, and native species conservation. We also provide educational workshops and resources for fisheries professionals across the country. The lab looks forward to another 35 years of success! For more information on the Larval Fish Laboratory go to *warnercnr.colostate.edu/fwcb-research-outreach/research-centers/lfl*. §

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

the USA for 2016. I'm aware of financial constraints and a difficult political situation, but I'm optimistic that we will find a host or a group of hosts. Please contact me, if you are interested.

I attended the "LARVI 2013" aquaculture conference in Ghent/Belgium in September, a meeting which attracts more than 400 people from aquacultural research and industry all dealing with issues of early life stages. The focus was on 1) broodstock management, maturation and spawning, 2) developmental biology and deformaties, 3) larval nutrition, 4) larviculture at a commercial scale and 5) microbial management for health. As you can see, at least three of the five themes were also relevant for our field of science, and I learned a lot of new things relevant for the work I do on effects of climate change on fish larvae. When listening to the presentations and talking to colleagues, we realized that there are a lot of possibilities for exchange between the "LARVI" and the "Larval Fish Conference." The bridges are there; we have to use them to get to the other side. I therefore would very much like to plan a joint meeting in the future. Since LARVI only meets every 4 years, their next meeting is scheduled for 2017. We could also think of organizing a theme session at our conferences, where we invite the "LARVI" people. They have already signaled interested in future collaborations. I am very interested to hear from you, our members, what you think about the idea. So, please contact me, I need your feedback.

Our membership data base is in an excellent state due to the great effort of our secretary Frank Hernandez. Unfortunately the membership numbers seem less than the interest we are receiving for our section at our annual meetings. I think it is mainly due to people forgetting to renew their membership. So keep renewing your membership, talk to your colleagues, encourage your students and ask them to join our section. They will definitely benefit from being a member.

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

– Catriona Clemmesen-Bockelmann, President

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

vacant

North Central Region

vacant

Western Region

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

European Region

Hubert Keckeis
Department of Limnology
University of Vienna
Vienna, Austria
hubert.keckeis@univie.ac.at

Pacific Rim Region

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

Don't miss the next issue.
Pay your 2014 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/membership*. 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: *www.elhs.cmast.ncsu.edu/index.php/how-tojoin.html*. 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.

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

vacant

North Central Region

vacant

Western Region

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

European Region

Hubert Keckeis
Department of Limnology
University of Vienna
Vienna, Austria
hubert.keckeis@univie.ac.at

Pacific Rim Region

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

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."

Thanks to the Miami Crew!

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