



Inside this issue

President's Message1
News from the Regions2
Upcoming Events9
Section Business9
Section Officers 11
Editor's Ramblings 11

41st Annual Larval Fish Conference

Last Call for the Lone Star State

Hi all – or “all y’all” as it is said in Texas! We have a great 41st annual Larval Fish Conference planned for you during July 12-16, 2017 (see page 4 for listing of theme sessions, contributed talks and posters). We’ll be meeting in Austin with the Joint Meeting of Ichthyologists and Herpetologists (JMIH), which always provides a diversity of talks and good socials. Regarding the LFC, all the usuals – talks, posters, networking, ELHS business meeting, student awards, ELHS booth (bring Sally Richardson Award auction items!), early-career events, socials, good friends, and colleagues. For more details, visit the JMIH meeting website (<http://conferences.k-state.edu/JMIH-Austin-2017/>), the ELHS website (<http://earlylifehistory.fisheries.org/conferences/larval-fish-conference-2017/>), and/or see our broadly distributed email (from Lee Fuiman, 4/25/17, subject: 2017 Larval Fish Conference update). Sound like a good time to us! See y’all there!



Chris Chambers and Lee Fuiman

...continued on p. 4

ELHS Back Then

5 years ago: Centenary of US joining ICES (1912).

15 years ago: Bob Hoyt steps down after 9 years as ELHS Historian/Archivist.

Centenary of ICES establishment (1902).

25 years ago: Lesson to be learned: President Nancy Auer proposes dissolving the ELHS and instituting a Board of Governors to administer the Annual Larval Fish Conference; thankfully for us, the proposal fails.

30 years ago: Bob Hoyt publishes his 2-volume Bibliography on early life stages of fishes. It goes out of print very quickly.

President's Message



Dear friends and colleagues,

I hope this message finds you well. In my corner of the world, things are already getting balmy on the northern Gulf of Mexico coast, where according the U.S. National Weather Service's Climate Prediction Center, we can expect “above-normal temperatures” this summer. I suppose this is not surprising, since the 2016-2017 winter period was 0.89°C (1.60°F) above the 20th century average, making last winter the second warmest on record (<https://www.ncdc.noaa.gov/sotc/global/201702>).

What does this mean? Well, several things come to mind.

First, as a research community, it means we need to stay focused and pursue science that will help us understand how a changing climate will impact our planet, and in particular for the ELHS, our fisheries resources. Here I will note a timely session at this summer's Larval Fish Conference titled “The Effects of Climate Change on Marine Fish Early Life Stages: Which Stressors are Most Important and How Do They Interact?” I'm sure our colleagues at the Joint Meeting of Ichthyologists and Herpetologists may have similar themes among their presentations.

...continued on p. 10

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

**September 15,
2017**

News from the Regions



Pacific Rim Region

Akinori Takasuka

Early life history at the Small Pelagic Fish symposium (Victoria, March 2017)

The “*Drivers of Dynamics of Small Pelagic Fish Resources*” symposium was held in Victoria, Canada, during March 6–11, 2017. The symposium was primarily sponsored by PICES and ICES and organized by Jürgen Alheit (ICES, Germany) and Yoshioki Oozeki (PICES, Japan). The goal of the symposium was to revitalize global international cooperation on investigations of small pelagic fish and to identify, discuss and develop a framework to address unanswered questions such as the impact of climate and/or fishing pressure on the resilience of small pelagic populations using a comparative approach. One of the topic sessions, “External Drivers of Change in Early Life History, Growth and Recruitment Processes of Small Pelagic Fish”, focused on early life history stages, from eggs through to recruitment, as well as growth before and after recruitment. The 3-day session was co-convened by David Checkley (USA), Susana Garrido (Portugal), Pierre Petitgas (France), and Akinori

Takasuka (Japan). Susana presented a summary at the closing session on the last day of the symposium (Fig. 1), and we (the co-conveners) are happy to share our experiences with the ELHS, based on her presentation slides.

Stylianos Somarakis (Greece) spoke in the symposium plenary session, and reviewed recruitment mechanisms throughout the life cycle of small pelagic fish, which served as overarching factors affecting vital parameters including density-dependent and density-independent processes. Dominique Robert (Canada), as the invited speaker for the ELH session, reviewed the links between prey availability during the early life stages and recruitment success. His talk set the stage for the 40 oral and 14 poster presentations, covering field, laboratory, and modelling studies. Several studies used a combined approach. The major topics encompassed (1) correlation of distribution, abundance, and recruitment with environmental factors, (2) growth and physiological condition, (3) trophic interactions and prey availability,

(4) reproductive traits and energy allocation strategy, and (5) diseases. Although there were presentations on numerous small pelagic fish species, the most frequently studied species were herring, sardine, and anchovy: *Clupea harengus*, *Engraulis ringens*, *Sardina pilchardus*, *Engraulis encrasicolus*, *Engraulis mordax*, etc. Overall, most studies focused on mechanistic aspects and hypothesis testing rather than describing correlations among indices. A number of studies paid attention to multiple environmental factors. The session



Susana Garrido (Portugal) presenting the summary of the “early life biology” session during the closing session.

covered a variety of topics which linked very well to the workshops held on the day following the symposium. For example, the workshops on “Modeling ...continued on p. 9

Section Officers

President

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

President-Elect

Pierre Pepin
Fisheries and Oceans Canada
St, John's, NL, Canada
Pierre.pepin@dfo-mpo.gc.ca

Secretary

Dominique Robert
Université du Québec à Rimouski
Rimouski, QC, Canada
Dominique_Robert@uqar.ca

Secretary-Elect

Hannes Baumann
Department of Marine Sciences
University of Connecticut
hannes.baumann@uconn.edu

Treasurer

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

**HELP KEEP
STAGES INTERESTING...**
Send us a report of your
research activities.



North East Region

Katey Marancik

Ichthyoplankton research at the Northeast Fisheries Science Center highlighted in recent publications

Larval fish data from the Ecosystem Monitoring (EcoMon) program of the Oceans and Climate Branch at NOAA's Northeast Fisheries Science Center contributed to the understanding of reproductive biology of goosefish (monkfish), *Lophius americanus*. Fecundity, spawning frequency, and spawning seasonality of goosefish were examined on the northeast US shelf using adult female ovaries and larval distribution and abundance patterns. Goosefish spawn eggs in masses, called egg veils, which can be up to 12m long and 1.5m wide. Larvae develop in chambers in the veil over a period of weeks and are released into the water column when the veil breaks up. Adult females were collected by commercial gillnetters and

trawling during Cooperative Monkfish Surveys. Fecundity analysis of ovaries confirmed *L. americanus* as serial batch spawners, spawning up to three times per year. Seasonality of spawning was described from whole oocytes and gonad histology, and from larval fish surveys. Spawning activity occurred nearly year-round on the northeast US shelf, but was most common from March to October, progressing south to north on the shelf, from spring to autumn.

Menhaden, *Brevoortia tyrannus*, larval data from the EcoMon program was also used to examine the spawning location and larval dispersal on the northeast US shelf over the past 36 years. Menhaden is a coastal-spawning species with seasonal migrations along the North American coast and supports one of the oldest and largest commercial fisheries on the US east coast. Previous research had shown that larval menhaden abundance increased since the late 1970s, and the observed increase was comparable to the increase in the population's estimated egg production. No major directional spatial shift in spawning or larval dispersal was found in the new research using a stochastic partial differential equation model.

However, estimated spawning activity has increased near Delaware Bay and evidence for an increase in spring spawning during the more recent period was also found.

Simpson, C.A., H. Bi, D. Liang, M.J. Wilberg, A.M. Schueller, G.M. Nessler, and H.J. Walsh. 2017. Spawning Locations and Larval Dispersal of Atlantic Menhaden during 1977-2013. *ICES Journal of Marine Science*. doi.org/10.1093/icesjms/fsx030

McBride, R.S., A.K. Johnson, E.K. Lindsay, H.J. Walsh, and R.A. Richards. 2017. Goosefish *Lophius americanus* fecundity and spawning frequency, with implications for population reproductive potential. *Journal of Fish Biology*. doi.org/10.1111/jfb.13272

-- Harvey Walsh

Response of estuarine juveniles to climate change

Katherine (Katie) Nickerson of the Northeast Section is closing in on her Master's thesis under the oversight of advisers Tom Grothues and Ken Able at the Rutgers University Marine Field Station in New Jersey. Her first data chapter, now also in review as a manuscript for peer-reviewed publication, examines the response of juvenile fishes from throughout an estuary (inlet to fresh water) for trends related to climate change. Katie looked at both environmental and juvenile fish assemblages independently to best utilize the entire time series, then combined the data sets where they matched for direct analysis.



Aerial drone captures sampling in the Mullica River-Great Bay Estuary.

Her analysis shows that between 1997 and 2013 in the Mullica River-Great Bay estuary, in southern New Jersey, the composition of fish assemblages in the estuary has changed. Freshwater or freshwater-spawning species such as white perch, white catfish, and alewife have gained importance within the assemblage overall, and Atlantic silverside and northern pipefish declined in importance. Analysis of environmental data over a shorter, decade-long period determined that average summer temperatures explained the greatest variation in changing fish assemblages, with standard deviation of summer temperatures also important. This initial study on response to climate change in the system is exploratory, and lays the groundwork for future

...continued on p.6



Lophius americanus egg veil caught in a research trawl during a cruise in the Gulf of Maine (photo credit: NOAA Fisheries/Heidi Marotta).

Oral Presentations

Theme session: Assessing and Evaluating Phenotypic Variation in Fish Early Life History Stages: Field Studies, Experiments, and Modeling
- **Conveners: Klaus Huebert, Tom Miller, and Chris Chambers**

Feeding patterns in larval fish: How taxonomy, behaviour and morphology affect differences among individuals and species. - *Pierre Pepin*

Does variation in larval growth rate affect the recruitment of freshwater fishes? A case study with Lake Erie Yellow Perch. - *Stuart Ludsin, Kevin Pangle, Lucia Carreon-Martinez, Alison Drelich, Brian Fryer, Daniel Heath, Timothy Johnson, Julie Reichert, Jeffrey Tyson, Kyle Wellband*

Quantifying offspring CO₂-sensitivity in a fish: A meta-analysis of experimental variability. - *Hannes Baumann, Jacob Snyder, Christopher Murray*

Sources of variation in early life traits of Atlantic silverside, *Menidia menidia*. - *M.C. Raven Benko, R. Christopher Chambers*

Thermal reaction norms of early life stages of mid-Atlantic estuarine fishes. - *R Christopher Chambers*

Theme session: Nutrition and Feeding of Fish Early Life Stages.
Convener: Kenneth A. Webb

Our inner oceans: Understanding the origins of the gut microbiome and how probiotics may help maintain health in early stages of fishes under chronic stress. - *Ione Hunt von Herbing, Wren Busby, Mike Anderson*

Multi-strain probiotic effects on growth, mortality, food conversion ratios (FCRs), and behavior in red drum (*Sciaenops ocellatus*). - *Wren Busby, Ione Hunt von Herbing*

Understanding the role of rotifer in micro-element nutrition to marine fish larvae. - *Jian Wang, Wen-Xiong Wang*

Nutritional programming in red drum: The ecological context. - *Lee A. Fuiman*

Tissue DHA content of red drum (*Sciaenops ocellatus*) larvae is affected by factors other than maternal egg

DHA concentration. - *Ken Webb, Lee Fuiman*

What your momma gave you: Importance of maternally invested nutrients for larval performance of southern flounder. - *Corinne Burns, Lee Fuiman*

Theme session: The Effects of Climate Change on Marine Fish Early Life Stages: Which Stressors are Most Important and How Do They Interact? Conveners: Hannes Baumann, and Marta Moyano

Climate change impacting recruitment in upwelling areas: Can we save the small pelagics' stocks from extinction? - *Werner Ekau, Simon Geist*

Combined effects of ocean acidification and warming on the swimming capacity of European sea bass larvae. - *Louise Cominassi, Marta Moyano, Guy Claireaux, Patrcik Quazuguel, Sarah Howald, Felix Christopher Mark, José-luis Zambonino, Myron Peck*

A multi-factorial evaluation of temperature dependent CO₂-effects in a coastal forage fish. - *Christopher Murray, Jacob Snyder, Hannes Baumann*

Physiological effects of increased temperature and carbon dioxide on Atlantic silverside early life stages. - *Janet Nye, Hannes Baumann, Teresa Schwemmer*

New metrics for measuring behavioural response to chemical cues: Application to two juvenile temperate species. - *Carlos Diaz-Gil, Adam Gouraguine, Miquel Palmer, Ignacio A. Catalán*

Maternal effects on offspring CO₂ sensitivity in a coastal marine fish. - *Jacob Snyder, Christopher Murray, Hannes Baumann*

The role of intermittent, short-range acoustic cues on larval fish settlement. - *Andria K. Salas, Preston S. Wilson, Megan S. Ballard, Andrew H. Altieri, Timothy H. Keitt*

Theme session: Complexity and Performance Change During Physiological Development of Larval Fishes.
Conveners: Warren W. Burggren, and Prescilla Perrichon

The integrative physiology and comparative genomics of osmotic diversification in *Fundulus* species. - *Fernando Galvez*

Digestive physiology in fish larvae. - *Carlos Alfonso Alvarez-González*

Growth, development, and the measure of cardiovascular physiology in embryonic and larval teleost fish. - *Benjamin Dubansky, Warren Burggren*

Evolutionary toxicology: Genetic adaptation in Gulf killifish (*Fundulus grandis*) populations chronically exposed to environmental contaminants. - *Elias Oziolor, Cole Matson*

Gulf of Mexico oil pollution and larval fish physiology. - *Edward Mager*

Exposure of fathead minnows (*Pimephales promelas*) to narcotic chemicals alters energy metabolism and growth. - *Nancy Denslow, Erchao Li, Derek Bolser, Kevin Kroll, David Dreier, Erica Brockmeier, Francesco Falciani*

Physiology of larval air breathing fish. - *Jose Fernando Mendez Sanchez*

Physiological and morphological phenotypic plasticity of larval fish. - *Monica Vanessa Garduño Paz*

Behavioral tools for assessing neurophysiological performances in fish early life stages. - *Prescilla Perrichon*

Contributed papers

Invasion of the Canadian Arctic archipelago by Pacific sand lance detected by an ichthyoplankton survey. - *Marianne Falardeau, Caroline Bouchard, Dominique Robert, Louis Fortier*

Improving larvae survey indices: A case study of North Sea Herring. - *Cindy van Damme, Niels Hintzen, Frank Kleissen, Loes Bolle, Matthias Kloppmann, Richard Nash*

Discovery of a Slope Sea spawning ground for Atlantic bluefin tuna (*Thunnus thynnus*). - *Katrin Marancik, David Richardson, Jeffrey Guyon, Molly Lutcavage, Benjamin Galuardi, Chi Hin Lam, Harvey Walsh, Sharon Wildes, Douglas Yates, Jonathan Hare*

...continued on p. 6



North Central Region

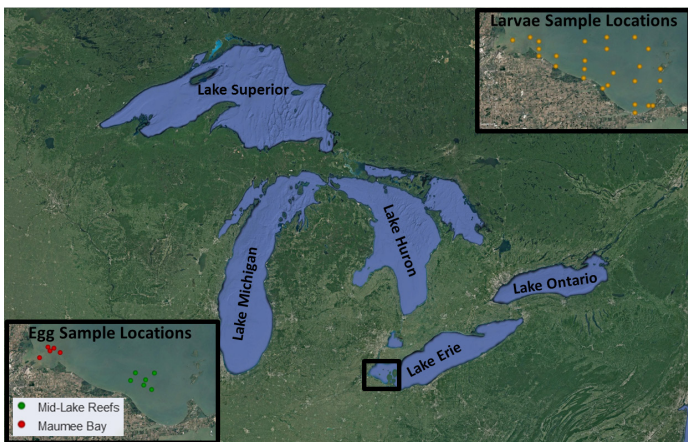
Ed Roseman

Lake Whitefish Early Life History in Western Lake Erie

Lake Whitefish are recognized as an indicator of ecosystem health, and have historically supported a valuable commercial fishery in Lake Erie. Unfortunately, Lake Erie has not produced a strong cohort since 2003 which has resulted in diminishing commercial catches.

Whitefish eggs and larvae in Lake Erie we used a benthic pump to sample for eggs at five locations in Maumee Bay and on six mid-lake reefs during the fall 2016 spawn and again in 2017 before the spring hatch. After Lake Whitefish began to hatch, we used bongo nets to collect weekly larvae samples at 27 locations in the western basin. In the fall, viable eggs were collected in large numbers at all sample locations. Spring egg sampling produced very few eggs on the mid-lake reefs and no viable eggs from Maumee Bay, indicating poor overwinter egg survival. Spring bongo net samples produced Lake Whitefish larvae at 26 out of 27 sample locations with highest densities near the southern shoreline. These results suggest that Lake Erie's Western Basin is an important spawning and nursery habitat for Lake Whitefish and provide crucial information to assist resource managers in devising management strategies aimed at the recovery of sustainable Lake Whitefish stocks in Lake Erie.

-- Zach Amidon & Robin DeBruyne, University of Toledo & Ed Roseman, USGS Great Lakes Science Center



The observed population trend suggests that low survival in Lake Whitefish early life history is likely responsible for low cohort populations. Despite the importance of Lake Whitefish, factors affecting the success of their early life history remain largely unknown. Our most recent work targets this issue. We suspect that the distribution, growth, and survival of Lake Whitefish eggs and larvae play a major role in determining year class strength in this system. To assess the distribution, growth, and survival of Lake



Fluvial Egg Drift Simulator model (FluEgg)

At the U.S. Geological Survey Columbia Environmental Research Center and Illinois-Iowa Water Science Center, scientists are continuing to improve the Fluvial Egg Drift Simulator model (FluEgg) to better track the dispersal of larval Asian carp and assess risk that individual waterways could be successfully used by Asian carp for spawning. While FluEgg has been used for predicting transport of embryonic Asian carp, research into survival, swimming capabilities, ontogeny and behavior of Asian carp larvae will improve the utility of the model. Currently, active research continues on swimming capabilities and potential attractants to nursery habitats. In addition, to improve the efficiency and interpretation of light trapping grass carp larvae, a study of the relative attractiveness of different light wavelengths to grass carp will occur this spring. Recently finished work includes a study on the physical characteristics of Asian carp eggs that are incorporated into the FluEgg model.

A.E. George, T. Garcia, and D.C. Chapman, *In press*. Comparison of size, terminal fall velocity, and density of bighead carp, silver carp, and grass carp eggs for use in drift modeling. Transactions of the American Fisheries Society.

-- Amy George §



Fall 2016 egg pumping



Spring 2017 Bongo net tows



Fall 2016 egg pump sample



Lake Whitefish in bongo net sample

41st LFC ...cont'd from p. 4

Contrasting Flathead Sole (*Hippoglossoides elassodon*) spawning in the southeastern Bering Sea during warm and cold periods. - Steven Porter, Lorenzo Ciannelli

Guide to larval and early juvenile cyprinids of the middle and lower Pecos River (New Mexico and Texas). - W. Howard Brandenburg, Darrel E. Snyder, Steven P. Platania

Internet-based larval fish and egg taxonomic keys for North American freshwater and marine fishes. - Nate Jacobson, Kathy Koch, Chris Cieciek, Doug Bradley, Doug Dixon

DNA metabarcoding of fish larvae for detection of non-native fishes. - Joel Hoffman, Christy Meredith, Anett Trebitz, Greg Peterson, Julie Lietz, Chelsea Hatzenbuehler, Erik Pilgrim, Sara Okum, John Martinson

Comparative assessment of morphological and pigmentation characters during larval development of species of 10 genera of F. Gobiidae and two genera of F. Eleotridae. - Tony Miskiewicz

Larval and juvenile population dynamics of families Lutjanidae and Serranidae in the Gulf of Mexico, with respect to the Loop Current and other hydrographic features. - Sebastian Velez, Jon Moore

Spatial and temporal variation of summer ichthyoplankton assemblages in the northeast Chukchi Sea 2010 – 2015. - Jessica Randall, Morgan Busby, Adam Spear, Kathy Mier

Spatial variation in larval gulf menhaden (*Brevoortia patronus*) growth and condition during a high freshwater discharge event. - Angie Hoover, Luciano Chiaverano, Alison Deary, Frank Hernandez

Abundance and distribution of larval snapper assemblages (*Lutjanidae*) in the northern Gulf of Mexico from 1982-2014. - Denice Drass, Glenn Zapfe, David Hanisko, Pamela Bond

Ontogenetic vertical distribution of mesopelagic fishes and the development of diel migration. - Noelle Bowlin, Andrew Thompson, William Watson, Philip Hastings

Development of a population wide index of spawning stock biomass for Atlantic mackerel. - Lauren E. Carter, David E. Richardson, Kiersten L. Curti

Bottom-up and top-down processes impacting early life stages of herring (*Clupea harengus*) in the southwest Baltic: A synthesis of recent laboratory, field and modelling studies. - Myron Peck, Catriona Clemmesen, Marc Hufnagl, Björn Illing, Paul Kotterba, Marta Moyano, Matthias Paulsen, Patrick Polte

Larval recruitment in a large river: The role of time, habitat structure and individual constraints. - Hubert Keckeis

Poster presentations

Comparing the ichthyoplanktonic food web near three coastal inlets in the Texas Coastal Bend. - Michelle Bromschwig, Polly Hajovsky, Simon Geist

Development and phenotypic variation in first feeding larvae of sablefish (*Anoplopoma fimbria*). - Alison Deary, Annette Dougherty, Steve Porter, Janet Duffy-Anderson

Plasticity of responses to high CO₂ in early life stages of Atlantic silverside, *Menidia menidia*. - Melissa Drown, Delan J. Boyce, Ehren A. Habeck, Matthew Poach, R. Christopher Chambers

Influence of oceanographic processes in the spatial distribution of fish larvae in the deepwater region of the Gulf of Mexico. - Laura Echeverri-García, Sharon Herzka, Patricia Jiménez-Rosenberg, Paula Pérez-Brunius, Vicente Ferreira-Bartrina, Jesús Cano-Compairé

Fish larvae distribution in Campeche Bay, Mexico. - Cesar Flores-Coto, Faustino Zavala-Garcia

Comparison of swimming speeds in larval bighead, silver, and grass carp. - Amy George, Tatiana Garcia, Benjamin Stahlschmidt, Duane Chapman

Evaluation of microplastic pollution in Texas' Coastal Bays and influence on larval food web. - Polly Hajovsky, Michelle Bromschwig, Simon Geist

Modeling cumulative effects of ocean acidification and warming on winter flounder populations. - Klaus Huebert,

R. Christopher Chambers, Kenneth A. Rose

New developments in temperature-dependent incubation in pacific sardine eggs compared with historical estimates. - Megan Human, Noelle Bowlin, Andrew Thompson, William Watson, Ed Weber

Spatial distribution of tuna larvae in the Tunisian waters in relation with environmental parameters. - Wael Kouched, Abdallah Hattour

Linking rates of metabolism and growth in marine fish larvae. - Marta Moyano, Björn Illing, Lars Christiansen, Myron A. Peck

Thermal impacts on the ontogeny of routine swimming and foraging behavior in Atlantic herring larvae. - Marta Moyano, Joan Martorell, Katrin Engler, Myron A. Peck

Temperature influence upon cardiotoxicity of deepwater horizon in larval mahi-mahi (*Coryphaena hippurus*). - Prescilla Perrichon, Edward Mager, Christina Pasparkis, John Stieglitz, Daniel Benetti, Martin Grosell, Warren Burggren

Larvae and early juveniles of Rio Grande chub and Rio Grande sucker. - Darrel Snyder, C. Lynn Bjork

Morphological changes of olfactory structures in the ontogeny of European weatherfish *Misgurnus fossilis* (Teleostei: *Cobitidae*). - Olha Tytiuk, Yaroslav Stepanyuk

§

North East Region ...cont'd from p. 3

mechanistic examination of species response to climate change in this and other mid-Atlantic estuaries. This study was supported by a grant from the New Jersey Sea Grant Consortium.

-- Katherine Nickerson, Rutgers, State University of New Jersey §



Southern Region

Trika Gerard

Larval fish studies approach to restore the Gulf of Mexico post Deep Water Horizon Oil Spill

The Fisheries Oceanography for Recruitment, Climate and Ecosystem Studies (FORCES) lab at National Oceanic and Atmospheric Administration (NOAA) Southeast Fisheries Science Center is funded by the Gulf of Mexico (GOM) RESTORE ACT Science Research Program to evaluate the effects of nitrogen sources and plankton food-web dynamics on habitat quality for the larvae of Atlantic Bluefin Tuna in the Gulf of Mexico. The collaborative effort with Florida State University, Scripps Institute of Oceanography, and University of Hawaii recognized that effective management of western Atlantic bluefin tuna (ABT) depends on understanding larval survival rates and the stock-recruitment relationship (SRR) in their spawning grounds in the Gulf of Mexico (GoM). In the most recent ICCAT assessment (NMFS 2014b), however, uncertainties in environmental constraints on the SRR for ABT have led to differing "low" and "high" recruitment scenarios, with highly divergent implications for setting goals in fishing pressure and stock recovery potential. Next generation stock assessment models critically require a broadened consideration of environmental factors that impact recruitment, and the SRR for western ABT is among the highest priorities for NMFS management-based research. The objective of this work is to improve western ABT stock assessment by elucidating the mechanisms that link variability in nitrogen sources and food-web dynamics in the GoM to habitat quality, feeding, growth and survival for ABT larvae. Specific hypotheses will be evaluated to test the boundaries of anticyclonic (retentive)

eddies as a mesoscale habitat that enhances growth and survival of ABT larvae and to assess relationships to new production nitrogen sources, food-web interactions that lead to preferred ABT prey, and variability of larval trophic position. The sampling design will involve sampling surveys across mesoscale features and adjacent waters, combined with Lagrangian-based experimental studies. Surveys will focus on environmental conditions and larval fish in near-surface waters (0-20 m) where ABT larvae reside, using onboard identification to locate larvae patches. Experimental process studies will be organized around water parcels/larvae patches marked by drogued, satellite-tracked drift arrays, which serve as moving frames-of-references for repeat sampling and platforms for *in situ* incubations. The sampling plan will use an ecosystem nitrogen focus to link biogeochemistry (^{15}N of nitrate and exported material; nutrient uptake rates), phytoplankton (biomass, composition, taxon-specific growth and grazing rates), zooplankton (biomass, composition and grazing rates; trophic position by Compound-Specific Isotopic Analysis

of Amino Acids, CSIAAA), and larval tuna abundance, size, growth rate, gut contents, and trophic position by CSIAAA. Inverse modeling and CSIAAA will complement field process experiments by revealing resource connections to larval tuna at different temporal scales and by providing frameworks for testing hypotheses regarding system linkages and functions. While this study applies a holistic "nitrogen to fish" approach with a regional focus, it also address questions of broad oceanographic relevance to ABT and other tuna larvae in the Atlantic Ocean and Mediterranean Sea. Results from this project will be communicated directly to NOAA, and the bluefin tuna ICCAT Species Working Group Chair and the stock assessment team.

The Gulf of Mexico ecosystem has experienced loss of critical wetland habitats, erosion of barrier islands, overfished fish stocks, water quality degradation, significant coastal land loss, and, in 2010, the Deepwater Horizon oil spill, the largest spill in our nation's history. To help the region recover, Congress passed the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act), which included authorization and funding for a Gulf Coast Ecosystem Restoration Science, Observation, Monitoring, and Technology Program to be administered by the National Oceanic and Atmospheric Administration (NOAA) in consultation with the U.S. Fish and Wildlife Service (USFWS). The mission of NOAA's RESTORE Act Science Program is to carry out research, observation, and monitoring to support, to the maximum extent practicable, the long-term sustainability of the ecosystem, fish stocks, fish habitat, and the recreational, commercial, and charter-fishing industry in the Gulf of Mexico.

-- Trika Gerard §

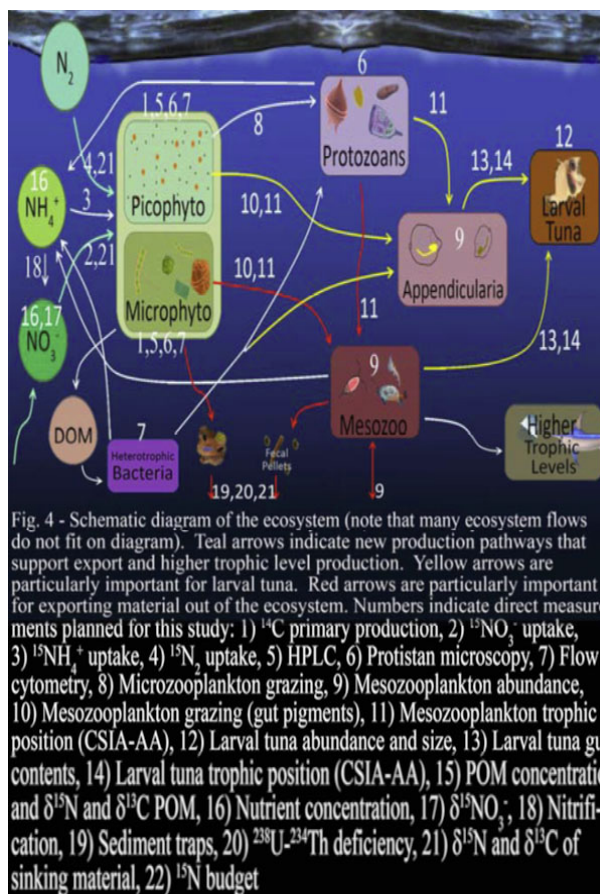


Fig. 4 - Schematic diagram of the ecosystem (note that many ecosystem flows do not fit on diagram). Teal arrows indicate new production pathways that support export and higher trophic level production. Yellow arrows are particularly important for larval tuna. Red arrows are particularly important for exporting material out of the ecosystem. Numbers indicate direct measurements planned for this study: 1) ^{14}C primary production, 2) $^{15}\text{NO}_3^-$ uptake, 3) $^{15}\text{NH}_4^+$ uptake, 4) ^{15}N uptake, 5) HPLC, 6) Protistan microscopy, 7) Flow cytometry, 8) Microzooplankton grazing, 9) Mesozooplankton abundance, 10) Mesozooplankton grazing (gut pigments), 11) Mesozooplankton trophic position (CSIA-AA), 12) Larval tuna abundance and size, 13) Larval tuna gut contents, 14) Larval tuna trophic position (CSIA-AA), 15) POM concentration and $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ POM, 16) Nutrient concentration, 17) $\delta^{15}\text{NO}_3^-$, 18) Nitrification, 19) Sediment traps, 20) ^{238}U - ^{234}Th deficiency, 21) $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ of sinking material, 22) ^{15}N budget



Europe

Hubert Keckeis

Fish eggs and larvae taxonomy course held in Norway

The Institute of Marine Research (IMR) in Bergen, Norway, is constantly looking to maintain and improve the skills needed by its scientists and technicians in their research and monitoring activities. When several of his Plankton Research Group members reached the tender age of retirement last year, Kjell Gundersen realized that the group needed to expand its knowledge base on fish eggs and larval taxonomy in order to cope with an increasing demand in their ocean monitoring activities.



Course participants in Bergen.

(IMR-Academy), a subsidiary of IMR. They contacted Cindy van Damme (Wageningen University & Research, the Netherlands), and asked if she would be willing to repeat the successful course she ran with Nalani Schnell (Muséum national d'Histoire naturelle, Paris) last November in

larger classroom than originally planned, Audrey Geffen offered to host the course at the Department of Biology, University of Bergen (UiB) allowing her students access to the course as well.

So, in late February 2017 the course "Species identification of fish eggs and larvae", was convened first in Bergen, and then in the following week at the Flødevigen Biological Station an integrated part of the IMR located outside Arendal in southern Norway. Alina Rey and Jan Henrik Simonsen (Plankton Research Group, IMR) assisted with the courses. During four very busy days, the students honed their skills in recognizing species of fish larvae and fish eggs, aided by current literature, identification keys and state of the art image analysis.



Cindy van Damme explains the details of larval fish ID.

Kjell Gundersen's solution was to collaborate with Kjell Nedreaas in IMR's Marine Research Academy

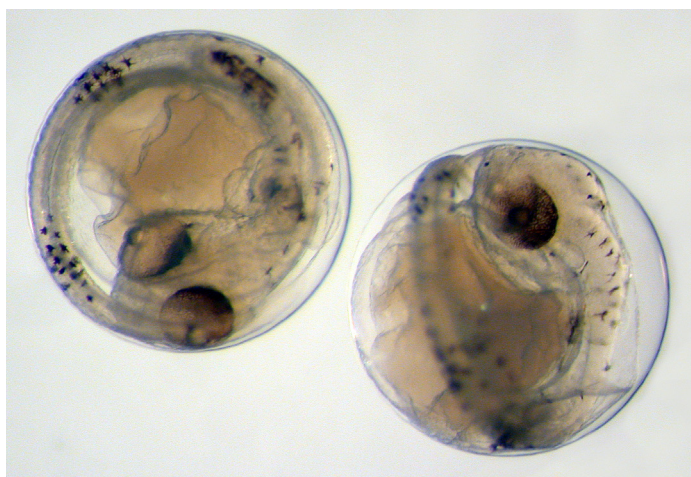
Plymouth UK (Stages, vol 37 (2)). The result was a course that would



Course at Flødevigen.

improve each candidate's ability to identify fish larvae and fish eggs, with special emphasis on species from the North Sea and coastal waters of Norway. The course also attracted outside interest from other institutions. Due to the increased interest, and a desperate need for a much

-- Kjell Gundersen, Kjell Nedreaas & Audrey Geffen §



Cod *Gadus morhua*, photo by Monica Martinussen.

Call for Stages new feature series:

Send us your stories of your larval fish collections.



EARLY CAREER EVENT: HOW TO FIND THE RIGHT SCIENTIFIC CAREER FOR YOU?

Larval Fish Conference 2017

13-16 July · Renaissance Hotel · Austin, Texas, USA

◆◆◆
JOIN US

and ask your questions to our mentors from
Academia/Government, Industry or NGOs at the
speed networking event

Questions?

marta.moyano@uni-hamburg.de
alison.deary@noaa.gov



@earlylifehistory



@AFS_ELHS

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

Migratory Fish Behavior and Distribution" convened by Shin-ichi Ito (Japan) and Enrique Curchitser (USA) and "Recent Advances in the Life Stage Ecophysiology of Small Pelagic fish: Linking Laboratory, Field and Modeling Studies" convened by Myron Peck (Germany), Kirstin Holsman (USA), Shin-ichi Ito (Japan), and Laure Pecquerie (France).

For future perspectives, our main conclusions were summarized, as follows. (1) Some factors (e.g. diseases) have received little attention and thus may deserve more study efforts. (2) Ecosystem-wide surveys may be required to generate realistic scenarios of change in distribution, abundance, and recruitment. (3) Prey preferences, prey size spectrum, and prey quality need to be studied more to consider trophic interactions. Further, these efforts would help in constructing time-series of relevant parameters which would be useful in hypothesis tests in the future.

We deeply appreciate the contributions of ELH scientists from various countries to this session and thank all the participants for stimulating discussion. The book of abstracts and presentation PDFs (including the session summaries) are available on the symposium website: <http://meetings.pices.int/meetings/international/2017/pelagic/scope>

-- Akinori Takasuka §

Upcoming events

Ten International Flatfish Symposia and 30+ Years of Advanced Research:

Flatfish Ecology in 2017

The abstract submission of oral and poster communication for the 10th International Flatfish Symposium (11 to 16 November 2017 in Saint-Malo, France) is now open.

This will be the next in the Flatfish Symposium series, convened every 3 years. The objectives this year are to present emerging research on the biology and ecology of flatfish species across the globe, quantify linkages between flatfishes, atmospheric, oceanographic, and other abiotic and biotic components of the ecosystem,

and explore management tools for assessing and improving the sustainability of flatfish populations and related human activities (fisheries and aquaculture).

Themes and Keynote Speakers: Ecology (spatio-temporal connectivity along the life cycle, essential flatfish habitats, and understanding short to long-term changes). Keynote: Ewan Hunter (UK), Bruno Ernande (France)

- Interspecies comparisons and interactions (flatfish versus flatfish; flatfish versus other species). Keynote: Ken Andersen (Denmark)

- Experimental ecology and evolution (observations in the field, common garden, caging, etc.),

biotechnology, and other research technologies, including aquaculture and other applications. Keynote: Manuel Machado (Spain), Josianne Støttrup (Denmark)

- Anthropogenic pressures (multi-stressor, e.g., global change, eutrophication and pollution) in addition to (or excluding) fisheries. Keynote speakers: Xavier Cousin (France), William Cheung (Canada).-

From local- to global- scale issues in research and ecosystem-based management. Keynote: Mark Dickey-Collas (Denmark).

Visit the website: <http://www.flatfishsymposium.com/international-flatfish-symposium-2017> §

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

Second, I'm glad (and somewhat surprised) that the U.S. still has a Climate Prediction Center! The reality is that this may not be the case when I pen this message a year from now. It appears that U.S. scientists and advocates for their research are under siege. If you think peer review is difficult, try getting your results through U.S. state and federal bureaucracies, where political speak has converted "sea level rise" into "nuisance flooding" (which sounds about as ridiculous as "nuisance earthquakes").

Why is this such an uphill battle? Science is cool, right? Well, it depends on where you work. According to a recent Congressional Research Service Report, out of 535 members in the current U.S. Congress, only 11 were scientists or engineers in their previous life (most are former lawyers and businessmen). This is in spite of the fact that future job projections suggest a major increase in STEM (science, technology, engineering, and mathematics) occupations. So it's not too surprising, perhaps, that we hear about "nuisance flooding" rather than real discussions about underlying causes.

Several solutions to this issue come to mind. First, perhaps some of us should seriously think about running for public office. This is not for the faint-hearted. But, given the statistics above, it is clear that one way to steer the conversation in a productive direction is to have representative bodies of government that are more proportionate to the populace they represent (i.e., more scientists). Not exactly what I had in mind for my retirement, but I do think about it every now and then.

If running for political office is out of your comfort zone (as it may be for me), there are other, less terrifying prospects. A simple option is a quick call or email to your senators and representatives. Not many people do this these days, so a few voices can make a difference. Make your voice one of them. A second option unique to us is to lend your expertise and make your voice heard through your professional societies. For example, our parent organization, the American

Fisheries Society, has a Resource Policy Committee, which aims to "evaluate, develop, and maintain fisheries policy by assessing concerns of the membership, advising the AFS President and Executive Director about aquatic resource issues, producing or coordinating proposed resource policy actions for Society approval, and reviewing approved actions to ensure usefulness." The new AFS guidelines ask that each division and section (including the ELHS) provide one delegate to this committee. These appointments are reviewed annually, and I have volunteered to serve in this capacity for the ELHS. In this role, I will serve as the liaison between the Resource Policy Committee and the ELHS membership, and may call on you for advice as issues are presented. So please, feel free to contribute your expertise.

Lastly, I think about my own career training. I'm practiced at giving talks at scientific conferences, and eventually, I became comfortable communicating science to the public via numerous outreach events. But, communicating with politicians -- not so much. I recall a visit to my lab a few years ago by one high-profile state leader. He was ushered into the plankton lab by his "handlers", and we told him about our research, why it was important, etc. From time to time he would nod his head and say "fascinating". Not in that really cool Mr. Spock way of saying "fascinating" (where he seemed not interested, but really was). This was an even more disengaged way of saying "fascinating" that made me realize I lost him from the beginning.

For me, this was a lost opportunity that I've since thought about a lot. Maybe there are other researchers like me out there that could benefit from some type of training in this respect? Going forward, it certainly seems like it would be an important skill to address with the ELHS early career scientist group. I would be interested in hearing from others about their experiences along these lines.

Stepping off my soapbox now, what else do "above-normal temperatures" this summer mean? On a more personal level, it means I can expect little relief from the heat as I lead my summer class into the marshes and coastal waters of Mississippi this summer. It will be another scorcher. And for all of us attending the Larval Fish Conference in July in Austin, Texas (just a few months away!), it means we can travel light. Very light. Expect daytime temperatures in the neighborhood of 95°F (35°C), and "cooler" night temperatures around 75°F (24°C). I hope to see everyone there!

Best regards,

-- Frank Hernandez, President (and involuntary thermophile) §



Follow us!



<http://earlylifehistory.fisheries.org/>



@earlylifehistory



@AFS_ELHS

Newsletter Production Team

Stages is published in February, June, and October each year. It is assembled by the Newsletter Editors with contributions from 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 Editors.

Newsletter Editor

Audrey J. Geffen
Department of Biology
University of Bergen
Norway
Audrey.Geffen@uib.no

Northeast Region

Katey Marancik
NMFS, Northeast Fisheries Science Center
Narragansett, Rhode Island
katey.marancik@noaa.gov

Western Region

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

Newsletter Editor

Cindy J.G. van Damme
IMARES
The Netherlands
Cindy.vandamme@wur.nl

Southern Region

Trika Gerard
NMFS, Southeast Fisheries
Science Center
Miami, Florida
trika.gerard@noaa.gov

European Region

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

North Central Region

Ed Roseman
USGS Great Lakes Science Center,
Ann Arbor Michigan
eroseman@usgs.gov

Pacific Rim Region

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

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: <http://earlylifehistory.fisheries.org/how-to-join/> 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."

Editor's Ramblings



This is certainly a busy time of the year, with university exams, field sampling, and all that fine weather out there calling to enjoy the fresh air. And doubtless, everyone is busy putting together their slides, blocking out their posters, and checking their TripAdvisor for the 41st Annual Larval Fish Conference. The sessions are wonderfully diverse and exciting, and this promises to be an excellent meeting. Remember to bring out the Fishy Shirts to expand our gallery in the next issue. Many things have changed over the past year, and the future for younger ELH researchers may be very different to what they expected. However, the networks we are building through the Early Life History Section are important for all career stages, and we are pleased to see so many contributions to STAGES displaying the variety of work being done around the world. Remember that we also have social media outlets – the section's facebook page: @earlylifehistory <https://www.facebook.com/earlylifehistory/>, and Twitter feed: @AFS_ELHS, in addition to the section website <http://earlylifehistory.fisheries.org/>. Don't be shy! Use these to promote your work, job and internship opportunities, and field (and lab) work stories.

Contact Todd Clardy (tclardy@kfupm.edu.sa) if you have material to post to facebook or twitter, and Klaus Huebert (khuebert@umces.edu) if you have news for the section webpage.

Cindy and Audrey §