STAGES

VOLUME 43 (3) December

INSIDE THE ISSUE

ELHS Back in the Days

10 years ago: After 44 years in federal service, former ELH President Don Hoss retired

30 years ago: President Nancy Auer proposed dissolving the ELHS and instituting a Board of Governors to administer the Annual Larval Fish Conference; the proposal failed!

MESSAGE FROM THE PRESIDENT

Dear ELHS friends and colleagues:

Happy New Year! I hope that you all had a wonderful end of 2022, a relaxing and fun holiday season, and a fantastic start to the new year. I have been on sabbatical since the summer but got tangled up in too much work last semester – the downside of having two teenaged kids who did not want to leave town! But I am optimistic that I will avoid all unnecessary responsibilities and make the time to do the "more enjoyable" parts of my job like reading papers, authoring my own papers (instead of editing everyone else's), and simply thinking about new research avenues to pursue. (I will also be sure to golf, exercise again, and hang with my family and friends). My fingers are crossed all of these things will happen!

To begin, I want to welcome three new members of Executive Committee of the Early Life History Section (ELHS). With the conclusion of the 45th Larval Fish Conference (LFC) in San Diego this past summer, Dominique Robert became the new President-Elect, Hannah Murphy became the new Secretary, and Marta Moyano became the new Secretary-Elect. I also officially became the Section's new President. Thanks to Claire Paris-Limouzy (past President) and Alison Deary (past Secretary) for your hard work and dedication to the Section. And thanks to Jeff Buckel for his continued dedication to the ELHS as its Treasurer.

I want to also let you know about some changes to the STAGES editorial team. With Simon Geist stepping down as a co-editor, Pete Konstantinidis (the other co-editor) recruited Alison Deary and Nalani Schnell to join the editorial team. Thanks, Simon, for your past service, and thank you Peter, Alison, and Nalani for your help and leadership with this newsletter. I am looking forward to seeing the frequency of newsletters increase, with COVID-19 hopefully less of a nuisance than in the past.

I want to offer Noelle Bowlin and her team a huge "THANK YOU" for hosting LFC 45 in San Diego this past summer. I cannot understate how great it was to attend the LFC in person, and how much I enjoyed the program your team organized (and the impressively calm and warm weather you arranged for us… nicely done)! Additionally, your help in resurrecting and updating the standard operating protocol for hosting LFC meetings will be invaluable to future organizers.

Additional thanks need to be given to Chris Chambers and Hannes Baumann. Chris has been instrumental in recruiting LFC organizers and helping them organize meetings, including helping Ana Faria and Susana Garrido navigate the planning of the upcoming LFC in Lisbon. Similarly, he has been working with me to plan the 47th LFC, which will be held in Ohio during May 2024. Hannes will take over Chris' duties sometime this year, which is great, given his past LFC hosting experience and knowledge of the ELHS.

For those who have not attended an LFC meeting, you are missing out. I am so looking forward to the 46th LFC, which will occur in Lisbon, Portugal during 8-11 May 2023. I know that Ana and Susana have been working hard to plan that meeting, and it is progressing nicely. The website is up and running and you can be able to submit abstracts and register here: https://larvalfishconference.com/.

I really hope that all of the ELHS membership can find the time to attend this meeting, as there will not be a virtual element to it; only the plenaries and posters are likely to be recorded and made available after the meeting. While I know this decision might reduce overall attendance, practical constraints associated with the Lisbon meeting venue and the desire encour-

age in-person attendance to promote face-to-face interactions led us to not have a virtual component.
The LFC is my all-time favorite scientific meeting to attend. First, there are no concurrent sessions, which means you never have to miss a talk. Second, the level of research presented is on par with other scientific meetings. Thus, you are sure to learning something that hopefully sparks new research ideas. Third, LFC attendees are enthusiastic, friendly, collegial, and collaborative. This is a great venue to make new friendships and develop research collaborations. And finally, these meetings tend to simply be a ton of fun, owing to the laid-back nature of the participants and the many opportunities to interact and laugh (e.g., a banquet with an exciting flag auction and raffle). I assure you that Ana and Susana are working hard to try and outdo last year's great LFC in San Diego, which will not be easy to do. So please try to attend!
To conclude, I want to let everyone know that the ELHS Executive Committee has been discussing ways to enhance diversity in the ELHS's demographics and research foci, as well as identify ways to improve learning opportunities for our membership. Many of these ideas were discussed at the conclusion of the past LFC's business meeting and will be the subject of future meetings and STAGES articles. If you have any thoughts on how to improve the ELHS section, please feel free to reach out to me (ludsin.1@osu.edu).

Sincerely,

Stu Ludsin

A RETROSPECT: THE 2022 JOINT LARVAL FISH CONFERENCE - LARVAL BIOLOGY SYMPOSYUM

By Lysel Garavelli

The 2022 Joint Larval Fish Conference-Larval Biology Symposium Committee solicited broad feedback from the conference attendees through an online survey. A total of 20 responses were collected. Of all the respondents, 94.1% were associated with the Early Life History Section, with 36.8% being full members and 31.6% affiliate members. 5.9% of the respondents were associated with the Larval Biology Symposium. Most respondents were affiliated with a university (65%), followed by a governmental institution (30%), and 5% were retired. Students (undergraduate, graduate, and postdoc) represented 50% of the respondents. Respondents mainly traveled to the conference from the US (75%) but also from Canada, Europe, and Australia/New Zealand. The overall satisfaction with this year's meeting was high with most of the respondents satisfied by the day-of logistics, the scientific quality of the talks, and the overall meeting - good job everyone!

Although all the respondents were able to fund their travel through grants, projects, or personal funds, the highest obstacle for most of the respondents to attend the annual meeting was finances (60%), followed by work constraints (55%), and travel regulations (20%). This year's meeting was in-person and 85% of the respondents expressed that they would have attended the meeting in-person even if a virtual option was offered. Several topics were proposed as a theme session for next year's meeting, such as innovative approaches and technologies to study early life stages, trophic ecology, and larval physiology. The highest ranked topic for a future professional skills workshop was "Scientific communication to a general audience" (73.7%), followed by "Tips to avoid scientific burnout" (63.2%) and "Paper reviewing skills and strategies" (42.1%).

Fig. 1: Attendees of the 45th annual Larval Fish Conference in San Diego.

GRACE KLEIN-MACPHEE STUDENT TRAVEL GRANTS

2022 Cohort of Grace Klein-MacPhee Student Travel Grants

By Alison Deary, former Secretary

2022 was an exciting year for the American Fisheries Society's Early Life History Section because we had our first in person conference since 2019! After two years of virtual sessions organized by Hannes Baumann (UCONN) and his dedicated organizing committee, which kept members of the session in touch scientifically, it was exciting to get back to "normal". It also meant that this year, for the first time since 2019, we offered student travel grants through the Grace Klein-MacPhee student travel grant program. The student travel grants were established at the 38th Annual Larval Fish Conference in Quebec City, Quebec (Canada; 2014) to honor Grace Klein-MacPhee. Grace was extremely supportive of early career researchers and demonstrated her commitment to students and the Section over many years by organizing the judges and presenting the Sally L. Richardson Award for best student oral presentation. I had the pleasure of meeting Grace at my first larval fish conference in 2011 in Wilmington, NC (USA) and as a past winner of the Sally L. Richardson Award and the Grace Klein-MacPhee Student Travel Grant, I felt honored to continue Grace's legacy by leading the travel grant program in my role as Secretary this year.

In 2022, we had eight applicants who were awarded a student travel grant. Six students were able to attend the conference contributing 4 oral and 2 poster presentations (Fig. 2). Unfortunately, two of the applicants were unable to attend the conference. The contributed presentations covered topics from assessing oxygen supply in larval fishes, the impact of ocean acidification on metabolism, capelin spawning, public aquaria as sustainable sources for ornamental fishes, light trap design, and larval fish ingress. This year, I asked winners of the Grace Klein-MacPhee student travel awards to provide statements about their experience at the conference and I wanted to share the impact that the student travel grants had on these early researchers. Olivia Robson shares that "everyone who attended was very supportive and knowledgeable, it created a great environment for presenting my master's research for the first time." Jessie Castanier "appreciated the sense of comradery and the connections made with larval fish legends and greenhorns, alike" and Emma Siegfried found "everyone incredibly welcoming but also the research was all very interesting" with the conference being "the highlight of my summer!"

Congratulations to the winners of this year's Grace Klein-MacPhee Student Travel Grant! We look forward to seeing you at next year's Larval Fish Conference and recognizing another great cohort of student travel award winners!

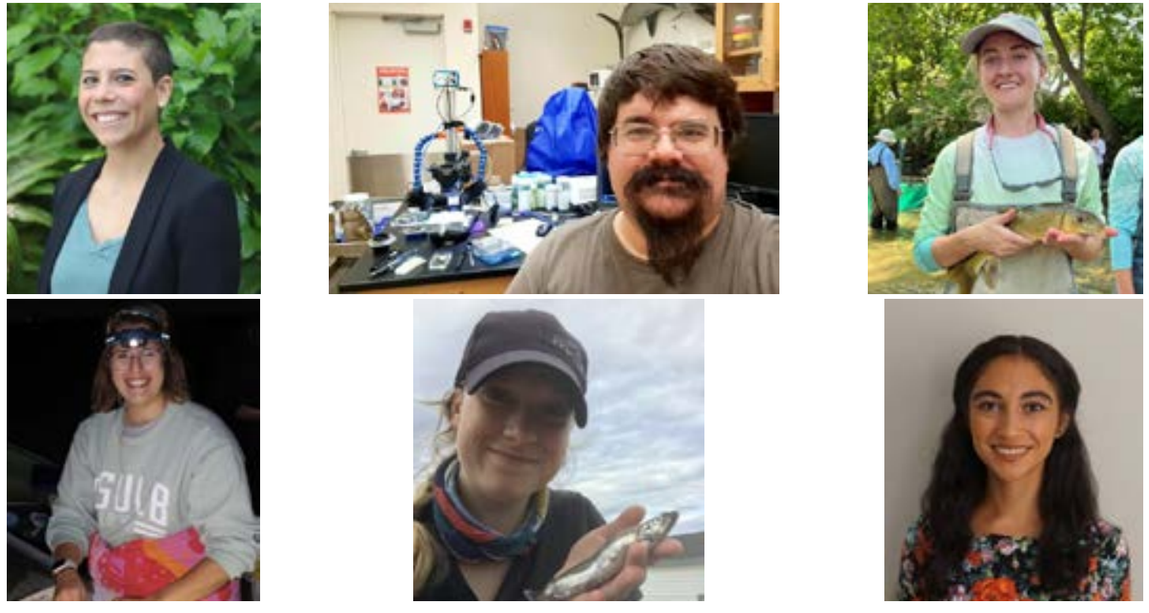

Fig. 2: Figure caption- Headshots and affiliations of the six Grace Klein-MacPhee Student Travel Grant awardees who were able to attend the 45th annual Larval Fish Conference/13th Larval Biology Symposium. **From left to right top row:** Jessie Castanier, MSc, Texas A&M Corpus Christi; Alton Livingstone, PSM, Oregon State University; Olivia Robson, MSc, Texas A&M corpus Christi. **From left to right bottom row:** Emma Siegfried, MSc, California State University, Long Beach; Ashley Tripp, PhD, University of Manitoba; Christina Welsh, PhD, University of South Florida.

NEWS FROM THE REGIONS

EUROPEAN REGION
CATRIONA CLEMMESEN

Juvenile Atlantic herring *(Clupea harengus*) use a time- compensated sun compass for orientation

Lisa Spiecker and Malien Laurien, Carl-von-Ossietzky University Oldenburg (Germany)

We are Lisa Spiecker and Malien Laurien, a Postdoc and a PhD Student in the working group of Gabriele Gerlach "Animal Biodiversity and Evolutionary Biology" at the University of Oldenburg. Normally we work on larval dispersal and sensory basis of orientation behaviour in coral reef fish. Due to travel restrictions and the university's strict lockdown guidelines, we got pulled into herring field research and started an exciting and fruitful collaboration with Andrea Franke (Helmholtz Institute for Functional Marine Biodiversity, HIFMB) and Catriona Clemmesen at the GEOMAR Helmholtz Centre for Ocean Research in Kiel.

Atlantic herring (*Clupea harengus*), an ecologically and economically important species in the northern hemisphere, shows pronounced seasonal migratory behaviour. Western Baltic spring-spawning herring (WBSSH) migrate from their overwintering grounds to their coastal spawning grounds to lay benthic eggs in shallow, low-saline areas such as Greifswald Bay and Kiel Canal mainly between February and May (Fig. 3A). After spawning, adult herring leave the area. It is assumed that juveniles initially stay near the coast and only start migrating to offshore nursery areas between Germany and Denmark in July/August (e.g. Polte et al., 2017). However, the exact path during the first migration of juvenile herring is unknown. To follow these migration patterns over hundreds of kilometers they are guided by orientation mechanisms.

In general, navigation and orientation in fish depend upon distinct sensory cues such as sound, olfaction as well as omnipresent cues like the Earth's magnetic field or celestial cues, e.g. the sun (reviewed in Spiecker et al. 2021).

In our study published in August 2022, we tested whether juvenile spring-spawning Atlantic herring, caught in the western Baltic, use a sun compass for orientation just before they start leaving their hatching area (Spiecker et al. 2022). Fish were randomly divided into two groups, one of them clock-shifted 6 h backwards, to investigate whether they misinterpreted the sun's actual position and shift their orientation direction accordingly. This way it is possible to observe whether fish use the sun as a primary orientational cue. Individual fish were placed in a circular bowl and their orientation was tested multiple times with the sun as a sole visual cue (see Fig. 3B). Herring expressed a significant sun compass orientation towards east-southeast (ESE) with a mean vector of 108 degree (see Fig. 3C). A 6 h clock-shift where the animals are tested before noon, when they think it is afternoon, should lead to a change in orientation when using a sun compass. Indeed, when clock-shifted 6 h backwards, fish showed a significant group orientation towards north-northeast (NNE), with a mean vector of 33 degree (see Fig. 3C). Comparison of these two datasets by performing a Mardia–Watson–Wheeler test showed a statistical difference. To understand whether herring changed their directional swimming according to the time-shift, the data were corrected by adding 90 degrees (assuming a 15 degree change in sun azimuth per hour). After repeating the Mardia–Watson–Wheeler test, the 2 data sets showed no statistical difference any more indicating that the deviance in orientation was caused by the 6 h time-shift.

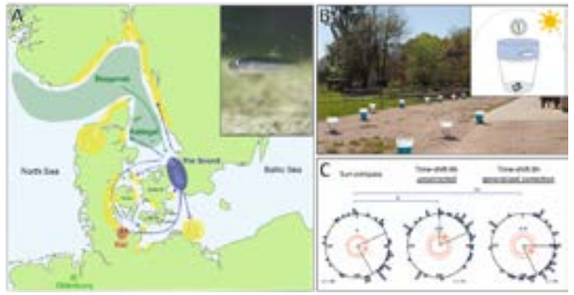

Fig. 3: A. Map showing the suggested seasonal migrations of adult western Baltic spring-spawning herring (WBSSH) and the orientation of juveniles. **B.** Experimental setup for testing sun compass orientation and sun azimuth curve. **C:** Results give proof for time-compensated sun compass; normal sun compass orientation vs. sun compass orientation of clock shifted group and corrected clock-shift data.

These results show for the first time that juvenile Atlantic herring use a time-compensated sun compass during their migration. In addition, orientation was more precise under sunny conditions than when clouds prevented the direct view of the sun. Their swimming direction was impaired, but still present, indicating additional orientation capabilities. In future experiments, we plan to investigate additional compass- and map-based orientation mechanisms, like e.g. the use of the Earth magnetic field, to further characterize the sensory orientation capabilities of Atlantic herring.

Since shoals of juvenile herring mix with sprat shoals in the Kiel Bay, we also analysed orientation in sprats. In a soon to be published study we found out that not only do they use a time-compensated sun compass, but also show a different orientation (northeast) direction than the herring. Furthermore, two groups of sprats were tested (beginning and end of August) revealing for the first time the onset of migratory readiness in juvenile sprat.

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Larval Fish Course at the Marine Station of the Muséum National d'Histoire Naturelle (MNHN)

The 2022 Larval Fish Course was held from 19th-30th September at the marine station of the Muséum national d'Histoire naturelle in Concarneau, France. The very international group consisted of 14 participants from Brazil, the US, Scotland, Portugal, Germany, France and New Caledonia. The course included lectures on topics such as "What do larvae feed on, and how do they feed, match-mismatch theory", "Physical processes, environmental factors", "Age and growth", "Cohorts, recruitment", "Climate change", "Sampling and preservation methods", "Fish egg identification, key identification features, relevant literature and available resources", and, of course, lectures and labs on larval fish identification of more than 50 marine fish families. In the first week we provided preidentified larval samples from the Eastern North Atlantic in order to train the identification on a species level. During the second week we sorted and identified parts of the huge larval fish collection from the Pacific. We aimed for a family level identification for this collection, but in many cases the participant were even able to identify to genus or species level. Once identified, the specimen/s received a MNHN collection number. In total the larval fish collection received about 750 new collection entries! At the same time we are still left with thousands of unsorted and unidentified samples that can be used in many, many future courses. The next course is planned for September 2024, so watch out, when we will announce it again! For more pictures and info visit our website: https://sites.google.com/view/larval-fish-course/home

Fig 4. The larval fish class of 2022. Participants came from all over the globe.

The course was spearheaded by the collection curator of the MNHN Nalani Schnell and featured by three experts in larval fish taxonomy and ecology from across the globe: Catriona Clemmesen (GEOMAR, Germany), Cindy van Damme (Wageningen Marine Research, Netherlands), Peter Konstantinidis (Oregon State University, USA).

Fig 5. Catriona Clemmessen is giving a morning lecture and two participants of the larval fish course.

The 50th Anniversary of the Rutgers University Marine Field Station

In 1972 Rutgers University purchased the abandoned U.S. Coast Guard Station just inside Little Egg Inlet in South Jersey. This dynamic location is influenced daily and with every change in the tides between the Atlantic Ocean and the relatively unaltered Great Bay – Mullica River estuary. This, in combination with the low human population density in the area, makes it possible to do research, teach and provide community outreach for this representative, natural system at several temporal and spatial scales. Over the last 50 years at this location several central themes have emerged while expanding the technical capabilities at RUMFS. These included the challenges and policies for managing common pool resources such as fish and shellfish, offshore energy and the intersections of ecology, community, and social institutions of science, law and property. Particular insights over the last five decades include the role of early life history stages of fishes for fishery research and sustainable management, and understanding the role of climate change and sea level rise on coastal ecology.

Recent Publications

More than a decade ago, four senior estuarine ichthyologists, Alan Whitfield (South Africa), Ken Able (USA), Steve Blaber (Australia) and Mike Elliott (UK), all of whom had written or edited major books/monographs on fish in estuaries, got together to begin compiling a major review on fish and fisheries. The previous volumes that had been published on this topic all focused on particular coastal regions in the world. The objective of this new book was to be global, both in terms of geographical coverage and content. To facilitate those objectives, more than 50 authors/co-authors from around the world were invited to review the state of our knowledge on fish and fisheries in estuaries. The end result is a two volume book (Fish and Fisheries in Estuaries: A Global Perspective. 2022. John Wiley and Sons, A. Whitfield et al.), that is designed for use by university undergraduate and postgraduate students studying or involved in courses on fishes in estuaries, as well as academic professionals, practitioners in statuary bodies, and consultants in the ichthyological and/or estuarine ecological disciplines.

Other Publications

Able, K. W., T. M. Grothues, M. J. Shaw, S. M. VanMorter, M. C. Sullivan, and D. D. Ambrose. 2020. Alewife (*Alosa pseudoharengus*) spawning and nursery areas in a sentinel estuary: Spatial and temporal patterns. Environmental Biology of Fishes 103(11):1419-1436; DOI 10.1007/s10641-020-01032-0.

Grothues, T. M., and K. W. Able. 2020. Shoreline infrastructure degradation and increasing littoral naturalization accommodates juvenile fish and crab assemblages in heavily urbanized Upper New York Harbor. Restoration Ecology 28(4):947-959.

Hoey, J. A., F. J. Fodrie, Q. A. Walker, E. J. Hilton, G. T. Kellison, T. E. Targett, J. C. Taylor, K. W. Able, and M. L. Pinksy. 2020. Using multiple natural tags provides evidence for extensive larval dispersal across space and through time in summer flounder. Molecular Ecology 29:1421-1435.

Valenti, J. L., T. M. Grothues, K. W. Able. 2020. Juvenile fish assemblage recruitment dynamics in a mid-Atlantic estuary: Before and after Hurricane Sandy. Marine Ecology Progress Series 641:177-193.

Continuing Data Collection

Despite the problems associated with the Covid experience we have continued our weekly (night flood tides) ichthyoplankton sampling at our long term (34 years) inside Little Egg Inlet in southern New Jersey. Other long-term sampling for juvenile fishes include twice a year (33 years), except during 2021, (July and September) sampling along the salinity gradient in the Mullica River-Great Bay estuary and twice a week (34 years) in the Rutgers University Marine Field Station boat basin as the ichthyoplankton sampling site.

Greetings STAGES community!

Sarah Weisberg

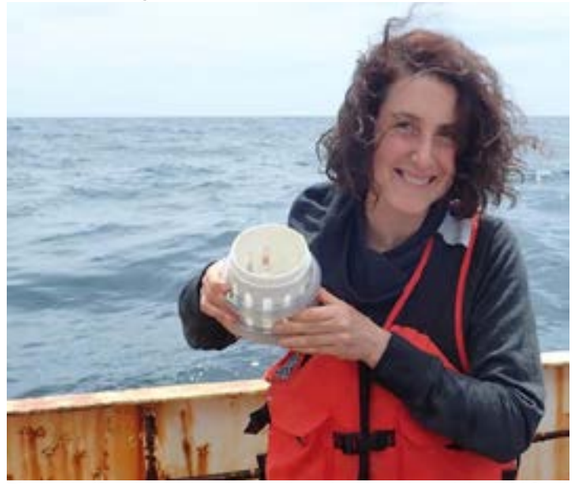

Fig 6. Me (Sarah Weisberg) sampling plankton aboard the R/V Seawolf.

I am a NMFS-Sea Grant Population & Ecosystem Dynamics fellow and a PhD candidate in Dr. Janet Nye's lab (Fig. 6). Our lab, along with two others at Stony Brook University, are partnering with the New York State Department of Environmental Conservation to conduct regular monitoring surveys of the New York Bight. The New York Offshore survey (Fig. 7) began in 2018 and will continue through at least 2025. The design of this survey takes a holistic approach, describing the region's physics, carbonate chemistry, and biology across trophic levels. One of our many objectives is to add to our understanding of fish abundance, distribution and population dynamics, with species-level resolution. Prior to 2021, ichthyoplankton samples were collected in vertical plankton tows but most individuals were not identified to species. This was especially true for fish eggs. Inspired by the work of Leah Lewis, David Richardson, and others at the Northeast Fisheries Science Center, I proposed adding DNA barcoding to survey protocols. Initial pilots have already yielded promising results: we isolated over 400 eggs and larvae from a single cruise, DNA barcoding success rate has so far exceeded 95%, and 16 unique species have been identified from this cruise alone.

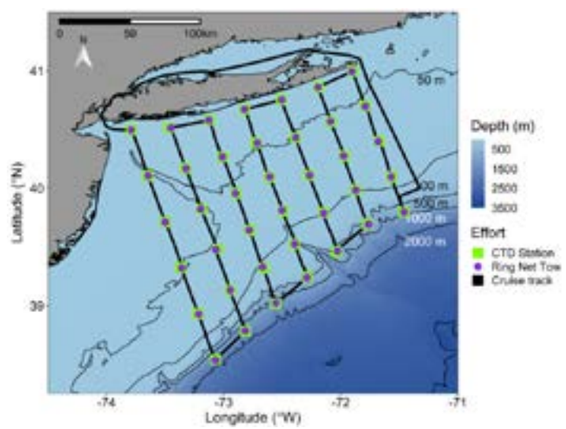

Fig 7. Cruise track of New York Offshore Survey, completed by R/V Seawolf, May 2021.

Fig 8. Research Assistant Brianna Brookes isolating a fish egg for DNA barcoding analysis.

In addition, plankton sorting and DNA barcoding are highly effective tools for inviting diverse and broad participation in the process of science. I know this firsthand, as I joined the Nye Lab after spending nearly a decade as co-founder of BioBus, a science outreach non-profit best known for operating mobile labs that visit NYC public schools. Of the many different topics covered and samples I have used in BioBus programs, plankton consistently generate the highest level of engagement. In addition, DNA barcoding is a robust platform used in many science outreach contexts to introduce concepts of molecular biology, evolutionary relationships, and biodiversity. I am thrilled that, to date, I have been able to provide paid research assistantships to two high school and two undergraduate students who work with me on this project. Working together, spending hours at the microscope (Fig. 8), we collectively have become even more fascinated by fish early life history.

PACIFIC RIM REGION
AKINORI TAKASUKA

Report from the Pacific Rim includes a summary of the recent paper on growth autocorrelation in small pelagic fish larvae. Dr. Dominique Robert (Université du Québec à Rimouski, Canada) is now on his sabbatical, staying in my laboratory at the Department of Aquatic Bioscience, Graduate School of Agricultural and Life Sciences, The University of Tokyo, from September 2022 to May 2023. This is a product of the collaboration project, in which Dominique co-supervises our students. The paper will be a part of the MS thesis by the first author, Shota Tanaka.

Growth autocorrelation in clupeoid species larvae in the Kuroshio Current system: Do early growth rates influence later growth rates?

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Johan Hjort's "critical period" hypothesis, which postulates that year-class strength is determined in the short period following the onset of exogenous feeding (Hjort, 1914), has rarely been supported by empirical data. Instead, the current understanding is that recruitment is determined by cumulative mortality throughout early life (Houde, 2008; Leggett & Deblois, 1994). Regarding survival to recruitment, the "growth–survival" paradigm posits that larger and/or faster growing individuals will have a higher probability of survival (Anderson, 1988; Chambers & Leggett, 1987; Houde, 1987; Miller et al., 1988: Takasuka et al., 2003, 2007). Thus, the growth rate throughout the larval stage can potentially influence survival potential and drive subsequent recruitment.

Recent studies relied on the measure of growth autocorrelation derived from otolith daily increment widths to test the link between growth rate achieved during the post-hatch period and during subsequent phases of the larval stage (Burns et al., 2021; Pepin et al., 2015; Primo et al., 2021; Robert et al., 2014). Based on this approach, we revisited the role of larval growth in driving survival potential in three clupeoid species: Japanese sardine *Sardinops melanostictus*, Japanese anchovy *Engraulis japonicus*, and Pacific round herring *Etrumeus micropus* throughout the larval stage, using a combination of published datasets of otolith increment widths (Tanaka et al., 2022). As these samples consist mainly of late larvae, the analysis of daily increment width data allows us to examine the effects of early growth rates over the entire larval period. As a result, strong growth autocorrelation was detected for all three species throughout the larval stage, suggesting that initial growth determines to some extent growth rates achieved later in life (Fig. 9; Tanaka et al., 2022). The extent of autocorrelation was reduced in sardine relative to anchovy and round herring at older ages. This interspecific difference could be attributed to differences in sensitivity to variability of environmental factors such as water temperature and food availability.

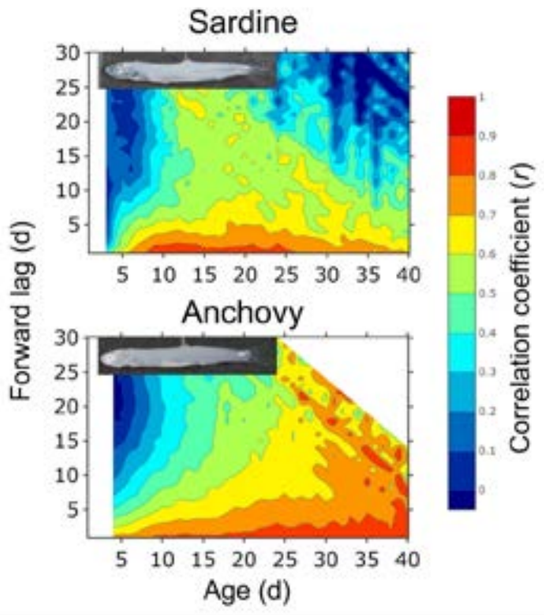

Fig. 9. Contour image of the autocorrelation of otolith increment widths in Japanese sardine *Sardinops melanostictus* and Japanese anchovy *Engraulis japonicus* based on the combined published datasets. Autocorrelation is expressed as a correlation coefficient between the otolith increment width at a certain age and at any later age with the number of daily increments between those ages as forward lag. If the duration of forward lag where otolith growth remained highly correlated is long, then growth rates at a given age have an effect over a long period thereafter. The data are shown for all combinations of ages where the increment width data were available for ≥20 individuals. Redrawn from Tanaka et al. (2022).

The present findings suggest that the effect of early growth rate persists throughout the entire larval period and drives survival potential, which could reconcile the classic concept of "critical period" and the current "growth–survival" paradigm.

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NEWS FROM SOUTH AFRICA
NADINE STRYDOM

News from South Africa is that the larval guide to temperate coastal fishes of South Africa is taking shape. Species from 42 families have been documented so far with illustrations as attached. The decision not to draw using the traditional camera lucida was a difficult one. Those who have illustrated fish larvae know that this is an accurate method but requires multiple tracings post original drawing to refine lines, pigment and features. One drawing can take up to two days to complete to final stage using multiple pen nib sizes and a light table. After experimenting with numerous software packages and using a photograph as a base, a simple App called Trace and Sketch in conjunction with an Apple Pencil is working well. Advantages are that drawings are quicker but do require looking at features on the original specimen to enhance the drawing and larval features. Photographs alone are difficult to use in identification guides as clarity remains at fixed focal points unless image stacking techniques are used. If photographs are taken by the illustrator, this helps in aligning features on the larvae both internally and externally with traced photo details. Larvae are best illustrated by those studying fish larvae and have a working knowledge of larval fish characters at the species, family and order level. Photography of larvae takes lots of practice with light orientation and the use of transmitted light is essential. Drawing from these photos also requires patience and practice.

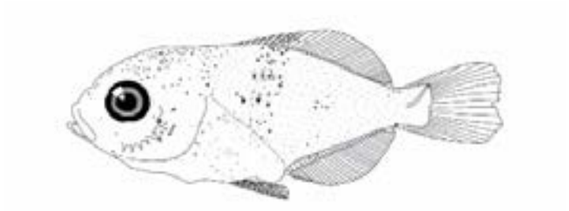

Fig. 10: *Monodactylus falciformis,* 6.8mm SL.

Images included are (Fig. 10) *Monodactylus falciformis* 6.8 mm SL and (Fig. 11) *Leiognathus equula* 7.1 mm SL. Using Trace and Sketch in conjunction with fixed specimens is a good alternative to traditional camera lucida tracing. The latter however renders more options with pen nib sizes and all layers of the image can be incorporated into a single drawing. The app option has only a single nib size available, requires additional details to be added especially in species with head spination but renders faster output and remains accurate for identification by others in conjunction with morphometric and meristic information. Those wanting to draw larvae are welcome to email me for advice.

nadine.strydom@mandela.ac.za

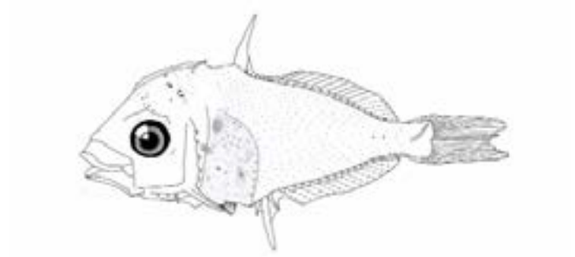

Fig. 11: *Leiognathus equula,* 7.1mm SL.

NEWS FROM THE MIDDLE EAST
ROMMEL MANEJA

Ichthyoplankton surveys in the Saudi waters of the Arabian Gulf in 2014 and 2015

Rommel H. Maneja, Ph.D., Applied Research Center for Environment and Marine Studies of King Fahd University of Petroleum and Minerals

Two research cruises were carried out in the Saudi waters of the Arabian Gulf onboard the R/V Al Bahith II in July 2014 and May 2015 for the FISHERIES Program (Fig. 12), which was carried out by the Applied Research Center for Environment and Marine Studies of King Fahd University of Petroleum and Minerals. The first survey was divided into two legs: the first started on the 9th of July and ended on the 13th of July and the second started on the 24th of July and ended on the 27th of July 2014. The second cruise started on the 8th of May and finished on the 21st of May 2015. The surveys were successful in covering the whole of Saudi waters of the Arabian Gulf with a total of 73 stations (33 in 2014 and 40 in 2015) in offshore waters from Khafji in the north to Tarut in the south.

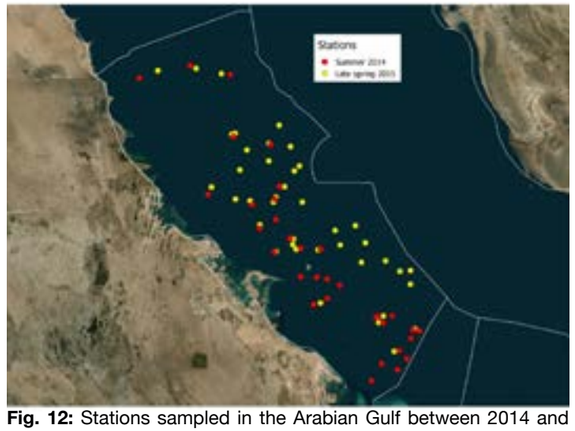

Fig. 12: Stations sampled in the Arabian Gulf between 2014 and 2015.

Ichthyoplankton was captured using 50 cm Bongo nets, furnished with 300 µm mesh size. The Bongo net was lowered into the water at 45º angle with the winch down to a depth of 5 m above the bottom. Wire angle was measured with the use of a handheld inclinometer. The net was deployed at a rate of 40 m min-1 and recovered at a speed of 20 m min-1. The ship speed during the haul was 2-2.5 knots. The Bongo nets were fitted with flow meters, the readings from which were used to calculate the volume of water passing through the net. Once brought aboard, the nets were gently washed with a hose so that the specimens in the net could be collected in the cod end. CTD profiles were employed to identify vertical hydrographical structure.

In all, 51,560 eggs comprising 20 identifiable taxa (from 18 families) and 403 eggs comprising 10 identifiable taxa (from 9 families) were recorded in spring and summer, respectively. In spring, anchovy eggs (*Stolephorus* spp.) were clearly dominant, accounted for 86% of the total number of fish while in summer the majority of eggs encountered corresponded to sardines (*Sardinella* spp.) and gobies (*Gobius* spp.). In relation to fish larvae, a total of 5,989 specimens of fish larvae comprising 21 identifiable taxa and 3,957 fish larvae comprising 16 identifiable taxa were identified from the Saudi Arabian coastal waters in spring and summer, respectively.

LARVA OF THE ISSUE

Fig 13. Postflexion larva of a Winter Flounder, *Pseudopleuronectes americanus*. Image by MIR

Winter Flounder, *Pseudopleuronectes americanus*, is a member of the commercially valuable Pleuronectidae family from the Northwest Atlantic. The postflexion specimen pictured has the characteristic scraggly appearance due both to net damage to the soft fins and the disorganized pigment along the tail. The Northeast Fisheries Science Center houses one of the largest archives of fish larvae from the western North Atlantic (continental shelf waters off the coasts of Florida through Maine). This image is part of a new project in partnership with the Morski Instytut Rybacki – Państwowy Instytut Badawczy to generate a digital microphotography database of larvae of the area. By Katey Marancik

LARVAL FISH COLLECTION OF THE ISSUE

The larval fish collection at the Natural History Museum of Los Angeles County

Todd Clardy, The Natural History Museum of Los Angeles County

The Natural History Museum of Los Angeles County (LACM) houses approximately 160,000 lots (sixth among US natural history museums) and three million specimens (fourth among US natural history museums) of marine and freshwater fishes from around the world (Singer et al. 2018). The collections cover a broad taxonomic and geographic range, although its strengths are coastal fishes of California, fishes of Pacific, and Antarctic fishes.

A major component of the LACM collections is its larval fish collection. The larval collection alone includes 177 families, ranging from protochordates (Amphioxiformes: Branchiostomidae) to molids (Tetraodontiformes: Molidae). The strengths of the larval collections mirror that of the overall Ichthyology Department holdings, with coastal California larvae as the largest group and central and western Pacific and Antarctic larvae well represented. As with many ichthyoplankton collections, the holdings include identified and catalogued specimens, identified and uncatalogued specimens, unidentified specimens, and unsorted whole and partial plankton samples.

Fig 14. A portion of the larval fish collection from King Harbor, Redondo Beach, California. Each wooden tray holds 400 samples.

A major component of the collections come from plankton surveys conducted in King Harbor off Redondo Beach, California in the mid-1970s. These surveys yielded thousands of samples of local ichthyofauna with around 1800 catalogued lots and a substantial amount of uncatalogued material (Fig. 14). These samples include a healthy allotment of coastal California fishes, such as Gobiidae, Blenniidae, Gobiesocidae, Clupeidae, Engraulidae, Clinidae, Paralichthyidae, and Sciaenidae, as well as the occasional pelagic taxa, such as Sphyraenidae, Carangidae, and Exocoetidae. These collections provide a valuable historic reference for current ichthyoplankton research and monitoring programs in southern California.

Fig 15. Six of the 108 boxes of unsorted plankton samples collected by the R/V Townsend Cromwell off Hawaii.

Another keystone of the LACM larval fish collection comes from samples collected by the *R/V Townsend Cromwell*, a US Fish and Wildlife and National Oceanographic and Atmospheric Administration vessel that operated from 1964-2002 in the central and western Pacific, primarily around the Hawaiian Islands. These samples provide a broad diversity of ichthyofauna from the Pacific, covering the time period 1964-1979. For certain families, these larval samples account for the bulk of LACM specimens. For example, 25% of the LACMs Caristiidae and 33% of Carapidae are larval specimens from the *R/V Townsend Cromwell*. Most of the samples are at least coarsely identified to the family level. However, 108 samples remain unsorted (Figure 15). Lots of work remains to sort and fully identify these samples. There are likely many more hidden treasures contained within these samples.

The final major ichthyofaunal collection of the LACM comes from the *Eltanin*, the first research vessel dedicated to surveying Antarctic waters. The *Eltanin* conducted a total of 52 Antarctic research cruises from 1962-1972. The LACM is home to thousands of *Eltanin* samples, a good portion of which include larval specimens. Some of these taxa are rare in collections worldwide, such as Bathydraconidae, Harpagiferidae, and Artedidraconidae.

Additional, smaller components of the larval collection include freshwater fishes from North America, marine fishes from the Gulf of California, and a few other random collections from different regions around the world. While these smaller collections may not provide high numbers of larvae, they do contribute to high diversity in the LACM larval fish collection.

Efforts are underway to improve the accessibility and use of the LACM larval fish collection. A full inventory of larval material currently is underway, with the aim of determining what proportion of larval samples are catalogued vs uncatalogued. As part of this process, uncatalogued lots will be catalogued in our database with any available information on collection location, date, specimen size and number, and other data from the collecting event. The LACM Ichthyology database is also under revision with the goal of clearly identifying material as larval, juvenile, and adult specimens. Currently, the life history stage of specimens is not always clearly defined in common online biodiversity databases used by LACM, such as Vertnet, Fishnet2, and GBIF. These changes should make it easier for researchers to determine exactly the type of material the LACM has available. Museum staff are also developing research projects with collaborators, using the LACM ichthyology collection as a primary source of research material. The hope is that making these improvements will increase awareness of available material for researchers looking for early life history stages of fishes. The LACM larval fish collection is a valuable resource for ichthyologists worldwide, and we want to see it used as such.

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ANNOUNCEMENT

The 46th Annual Larval Fish Conference will be held in Lisbon, Portugal, in May 8-11th 2023.

This year's conference is organized by local members from ISPA University and IPMA. Steering Committee:
Ana Faria, ISPA Instituto Universitário
Susana Garrido, IPMA
Details on the venue, registration, dates for abstract submission and others will be regularly updated on:
www.larvalfishconference.com
Do not miss the opportunity to attend this great conference!

WORKSHOP
ICHTHYOPLANKTON IDENTIFICATION

When: March 27th – 31st, 2023

Where: MEDAS SZN and the Bibliotheca Antoniana on the Island of Ischia

Course Fees: € 550*

Application Deadline: January 20th, 2023

How to Apply: Please fill out the Application Form

Instructors: Nalani Schnell-Aurahs (the Muséum national d'Histoire naturelle, France)

Peter Konstantinidis (Oregon State University, USA)

Lorenzo Ciannelli, (Oregon State University, USA; Stazione Zoologica Anton Dohrn, Italy)

The 5-day intensive course is dedicated to the taxonomy and identification of early life stages of fishes. The goal is to equip participants of the course with a skill set that allows to identify larval fishes to the family level. The course will include daily lectures on taxonomic groups of marine fishes, with an emphasis on Mediterranean and Nort-Eastern Atlantic taxa, curation of larval fishes, and guest lectures on ichthyoplankton related topics.
Information on "how to get there", accommodation, and how to register will follow after a successful application.

Oregon State University

MUSÉUM NAT HIST NATURELLE

*(fees do not cover room and board)

RAMBLE ON

Today it is us (Alison Deary and Nalani Schnell) to ramble on and to introduce ourselves. We wish Simon Geist well on his new adventures as we join Peter on the editorial board of STAGES. Peter convinced us to join the team with the words "it actually is fun". We weren't so sure initially as between our fieldwork, teaching assignments, research projects, collection work, and administrative tasks an editorial job can quickly develop into an after-work hours activity. BUT after being involved in this issue, we actually have to completely agree with Peter **IT IS FUN**. Reaching out to you, fellow larval fish enthusiasts, to assemble contributions from around the globe on extraordinary larval fish projects is a great way to stay connected and keep you informed about the activities in our larval fish community in between annual conferences. Many, many thanks to all of you who have sent contributions and are willing to share insights on their larval fish work!

And why are we where we are today? Well, because we think, larval fishes are great fun. Alison Deary is a research fisheries biologist with the National Oceanic and Atmospheric Organization at the Alaska Fisheries Science Center based in Seattle, Washington (USA). Her main research interests are climate-driven recruitment mechanisms and the links between skeletal development and habitat use in early life history stage fishes. On the weekends, you can find her skiing, hiking, and very slowly strolling with her 14-year-old corgi (who joined for some of the festivities at the 2018 meeting!).

Nalani Schnell is a researcher and curator at the Muséum national d'Histoire naturelle (Paris, France), and based at the Museums marine station in Concarneau. Her main research interests are the comparative anatomy during ontogeny, systematics, and effects of climate change on the development of the larva's skeleton. On the weekends, you can find her either hiking or collecting demersal fish eggs in tidal pools.

Fig 16. Alison, Nalani and Peter during their shared time at the Virginia Instiute of Marine Science, College of William & Mary, VA.

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