# The Northeast Fish Rapper

Newsletter of the Northeastern Division of the American Fisheries Society

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In This Issue




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# President's Message

***NED President John Magee***

A lot has happened since I became President of the NED in August 2018 – immediately there was a lot of planning for the joint New York Chapter / NED meeting in February 2019. The group of NY Chapter members who planned the meeting did an excellent job. I think the attendees were thoroughly impressed with the way the meeting was run, the plenary speakers, the presentations and posters, and the food. And, Chris Bowser of New York State Department of Environmental Conservation led everyone in singing "This Eel", about this amazing creature, and done to the tune of Woody Guthrie's "This Land". I would like to formally thank everyone that made the meeting of about 360 attendees such a success.

The NED has been involved with a discussion about how AFS Meeting revenue is distributed among the Divisions and Chapters. This is still in process, but there may be a shift towards the annual meeting revenues being split among Divisions such that each Division receives a proportion of the revenue even if the meeting is not in that Division's region. More on that this summer or fall.

In 2016, the NED Executive Committee decided to have a joint annual meeting with the Southern New England Chapter, and that meeting was in February 2017 in Mystic, CT. By all accounts, it was a success, and this has led to the discussion of having all annual NED meetings be joint ones with the Chapters. The Executive Committee is considering a rotation that would repeat about every 5 years. Some things to consider are where in the Chapters' areas those meetings would be, and the timing of them including the timing of future AFS meetings in the NED area. We are planning to develop a

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# President's Message

list of those meetings out till about 2026. The next joint meeting will be with the Atlantic International Chapter in September 2020 in Maine. In 2021, the Annual AFS meeting will be in Baltimore, and may be a joint meeting with the Mid-Atlantic Chapter, Tidewater Chapter and Southern Division of AFS.

## URGENT

The NED is in need of one or more hard-working folks to put up their name for First Vice President of the NED. Being an elected official for the NED is a four year commitment, but the first and fourth years require little time. It is the second (President-Elect) and third (President) years that require more attention. I have found my time as an elected NED official to be particularly rewarding, and I have gained a lot of working knowledge and made strong relationships during my time here. And, I will be blatantly honest: it's a great resume builder! Additionally, the NED has a responsibility to help fund the President and President-Elect attend the Annual AFS meeting, the Annual NED meeting, and a winter Governing Board meeting. Another great resume builder and opportunity to attend professional meetings. If you are interested (or if you know of someone who may be interested), please contact me at 603-271-2744 or john.magee@wildlife.nh.gov. We need to start the NED elections (done electronically) in June, so we are getting very near the last minute on this.

## UPCOMING MEETINGS

2019 Annual Meeting

The 2019 AFS Annual Meeting will be in Reno, NV September 29 – October 3 (https://afstws2019.org/). It is being held with the Annual Meeting of The Wildlife Society, so it's going to be a very big meeting.

2019 Chapter Meetings

**Atlantic International:** (https://aic.fisheries.org/) September 22-24, 2019 at the Rodd Brudenell River Resort – Prince Edward Island, Canada.

**Mid-Atlantic:** The tentative plan is for a meeting from November 14-15 in Lewes, DE. (https://mid-atlantic.fisheries.org/).

**New York:** (https://newyork.fisheries.org/) Annual Meeting will be in ~February 2020.

**Pennsylvania:** (https://pa.fisheries.org/).

**Southern New England:** 26-27 June at the USFWS facility in Hadley MA. (https://snec.fisheries.org/).

*John Magee, President of the Northeastern Division of AFS*

# CHAPTER AND SUBUNIT UPDATES

## New York Chapter

*Susan F Cushman*

The New York Chapter held its annual meeting in conjunction with the Northeastern Division of AFS in Poughkeepsie, NY from February 6-8th, 2019. The conference theme was "Fish on the Move", focusing on new understandings of "traditional" movement ecology, climate change-induced shifts in species ranges, as well as movements of invasive species, drawing a large crowd of fish biologists from the US, First Nations (St Regis Mohawk Tribe), and France. Within the US, registrants came from New York, Vermont, Connecticut, Massachusetts, and Pennsylvania, representing much of the Northeastern Division. The NY Chapter reached an all-time meeting record attendance of 355 people, which included 73 students! We were fortunate to also have members of the AFS Governing Board, Jesse Trushenski (AFS President) and AFS Staff, Dan Cassidy (Deputy Executive Director), as well as NED Executive Committee members, John Magee (NED President), Jud Kratzer (NED President-Elect), and Owen Nichols (Southern New England Chapter President) and Peter Rawinski (SUNY ESF Chapter President) at the meeting as well. Past NED Presidents Donna Parrish, Margaret Murphy, and Randy Jackson attended as well.

While the pre-conference workshop was cancelled at the last minute due to government shutdown-related complications, the two-day conference consisted of a half day of plenary talks followed by 55 oral presentations and 38 posters. The five plenary speakers included: David Secor (University of Maryland, Center for Environmental Sciences, Chesapeake Biological Lab), Janet Nye (Stonybrook University, School of Marine and Atmospheric Sciences), Katherine Mills (Gulf of Maine Research Institute), John Maniscalo (NY DEC), and Chris Bowser (NY DEC). Their presentation topics ranged from migration ecology to vulnerability and adaptations related to harvest management and climate change. John Waldman (Queens College) moderated a panel discussion among all of the speakers prior to lunch. It was an excellent line up!

Karin Limburg of SUNY ESF (now past-president of NY Chapter) organized two symposia to highlight locally relevant research. The Hudson River and Marine Symposium gathered biologists interested in research and management of fishes and blue crabs in the Hudson River and near shore ocean. The Shad Symposium invited presentations on the science and management of East Coast shads, including American shad, hickory shad, and river herring. Both were a great success.

The NY Chapter celebrated and recognized many amazing accomplishments among our members. The 2019 Conservationist of the Year was awarded to Riverkeeper, previously founded and known as the Hudson River Fishermen's Association, for its important work to protect the environmental, recreational, and commercial integrity of the Hudson River and its tributaries. The chapter recognized Jim Haynes, Professor at The College at Brockport with the Professional

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*Karin Limburg (SUNY ESF, Past-president of NY AFS) earned the Dwight A Webster Award, the most prestigious NED award, which is for, among other things, "Lifelong contriubtuions to fisheries science... Meritorious/ prestigious service to the profession and fisheries...Significant academic or technical accomplishments".*

Achievement Award. Tom Hughes, Scott Wells, and Doug Carlson helped to present the award with personal stories of Jim's guidance as their mentor and excellence in fisheries. The Best Student Poster was awarded to Dan Sinopoli (SUNY ESF), and the Best Student Oral Presentation was awarded to Kathrine Littrell (Yale University). Finally, the Chapter gave Klumb-Spindler Travel scholarships to Cara Ewell Hodkin (SUNY ESF), Thomas Bianchi (The College of Brockport), Benjamin Block (University of Vermont), and Colleen Schmid (Ossining High School). Sonia Limaye was awarded with the Diversity Travel Award.

*Prof. Jim Haynes (The College of Brockport) was awarded the Professional Achievement Award. Also pictured is Doug Carlson, Scott Wells, and Tom Hughes*

*Klumb-Spindler Travel Scholarships were given to five students*

*Katherine Littrell (Yale University) was awarded the Best Student Oral Presentation.*

*Best Student Poster Award was given to Dan Sinopoi (SUNY ESF).*

The NED celebrated and recognized Karin Limburg (then President of NY Chapter) with a certificate of appreciation. Ben Marcy-Quay (Cornell University) received the Best Paper award, and Candace Schermerhorn was awarded for the Best Poster (USGS – Tunison Laboratory). Three students were awarded with a travel grant to the meeting - Cara Ewell Hodkin, Jacob Kasper, and Hannah Lachance.

Overall, the Joint New York Chapter/ Northeastern Division meeting was a huge success! It was wonderful to meet AFS members from other parts of the NED and for their insight and perspective on our meeting. Special thanks to Tim McNamara (NY DEC) who organized on-site arrangements at the Poughkeepsie Grand Hotel and Melissa Cohen (NY DEC) who organized the conference program.

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*The Conservationist Award was given to RiverKeeper*

*Hannah Lachance (above) and Jacob Kasper (below) were awarded a travel grants from the NED.*

*Susan Cushman is the President of the New York Chapter of the American Fisheries Society. She can be reached at reached at cushman@hws.edu.*

# Mid Atlantic Chapter

*Michael Greco*

The Mid-Atlantic Chapter had a busy year in 2018 that culminated with hosting the 2018 International AFS meeting in Atlantic City, New Jersey. Several of our members served as chairs on many of the committees to ensure that the meeting went off without a hitch. In lieu of holding our annual meeting in 2018, the Executive Committee opted to shift all efforts to the National meeting. Several members and students presented at the national meeting. As such, the Chapter awarded student awards to Jessica Valenti (Rutgers Univ.) and Emily Ruhl (Univ. of Delaware). With guidance from the parent society, the Chapter worked to revamp our Constitution and Bylaws which were adopted in 2018. Plans are currently underway to put together our 2019 annual meeting which is going to be held in the fall in Lewes, Delaware.

*Michael Greco is the President of the Mid-Atlantic Chapter and a Fisheries Biologist with the Delaware Division of Fish and Wildlife. He can be reached at Michael.greco@delaware.gov.*

# Rutgers Subunit

*Jessica Valenti*

Students at Rutgers University created a subunit within the Mid-Atlantic Chapter (MAC) of the American Fisheries Society (AFS) in the fall of 2017. Fisheries graduate and undergraduate students at Rutgers are based out of various locations throughout New Jersey, so the Subunit will help foster interactions between students with a common interest in fisheries science while also providing an avenue for students to discuss important fisheries topics and participate in professional development activities.

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*Rutgers Subunit Vice President, Sarah Borsetti (left), and Subunit member, Mike Acquafredda (right), accepting the "Best Student Poster" and "Best Student Oral Presentation" awards, respectively, from Awards Committee Chair, Jim Vasslides (center), at the 2017 Mid-Atlantic Chapter Annual Meeting in Dover, DE.*

Since the inception of the Rutgers Subunit members have represented the Subunit at various professional meetings and been involved in various activities. At the 2017 Annual Meeting of the MAC of AFS held in Dover, Delaware, Rutgers Subunit Vice President, Sarah Borsetti, and Subunit member, Mike Acquafredda, won awards for the best student poster and oral presentations, respectively.

The 148th Annual Meeting of AFS took place in Atlantic City, New Jersey this past August. It isn't often a meeting with international reach visits your home turf and the Rutgers Subunit took advantage of this opportunity to get involved with meeting planning and execution.

Over 1,800 participants attended the Annual Meeting in Atlantic City and roughly 490 were students, surpassing the previous record for most students attending an Annual Meeting. Subunit President, Jessica Valenti, led the charge for the student events at the meeting with the assistance of Subunit Vice President, Sarah Borsetti, and Associate Professor of Biology at Rider University, Paul Jivoff, while Rutgers Subunit Advisor, Daphne Munroe, organized the phenomenal meeting program.

Subunit Treasurer, Laura Wiltsee, along with many other Subunit members volunteered their time to ensure the meeting ran smoothly by assisting at the registration and information booth and moderating sessions. Additionally, Subunit member, Joe Caracappa, helped to lead a workshop which introduced fisheries scientists to the basics of the R programming language and Sarah Borsetti co-taught a crash course in ageing and age validation of finfish and shellfish. Both workshops were well attended and participants rated the overall quality of the workshops very highly.


*Joe Caracappa leading a workshop on the R programming language at the 2018 AFS Annual Meeting in Atlantic City, New Jersey.*

*Introduction to R course participants after the successful completion of the workshop.*

Of course, one of the most important parts of these meetings is sharing your research with other fisheries professionals from across the U.S. (and even other countries) and Subunit members certainly didn't fall flat in this category. Seven Subunit members gave at least one oral presentation at the meeting and many other Subunit members were listed as authors on talks and posters. Overall, there was a combined total of 21 oral presentations and posters that had Subunit members listed as authors!

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Subunit members were also the recipients of various travel and presentation awards. Emily Slesinger, Subunit Secretary, received an Honorable Mention for the John E. Skinner Memorial Award and Jessica Valenti was awarded "Best Student Presentation" by the Mid-Atlantic Chapter of AFS.

The Subunit has also hosted various activities and workshops. In April 2018, The Subunit planned the first ever joint meeting of the Rutgers University, Stockton University, and The Marine Academy of Technology and Environmental Science (MATES) Subunits. At this meeting, each of the Subunits had one or two students speak about their fisheries research. Additionally, the group was given a tour of the MATES facility and made pins which were worn on their meeting lanyards this summer at the AFS National Meeting in Atlantic City to represent their Subunit pride!

More recently, in December 2018, 33 attendees (18 undergraduate students and 15 graduate students) from four universities (Rutgers, Rider, Stockton, and Monmouth) attended the Subunit sponsored 'Introduction to R' course taught by Joe Caracappa at Rutgers University. This 5-hour course was aimed to introduce students to a new programming language and gain the necessary tools to independently use this software. Additionally, there was an hour long mentoring match-up over lunch where graduate and undergraduate students were paired up.

The Subunit will be hosting a fish printing table at Rutgers Day at the end of April and is currently looking for creative ways to fundraise to support our activities. We look forward to continuing to have a strong presence at professional meetings and planning activities that benefit both Subunit and MAC members. For more information on the Subunit's upcoming and past events check out our website: https://rutgersafs.marine.rutgers.edu/ or email us at rutgersafs@gmail.com.

*Jessica Valenti is a Ph.D. Candidate at Rutgers University and the President of the Rutgers Student Subunit. She can be reached at valenti@marine.rutgers.edu.*

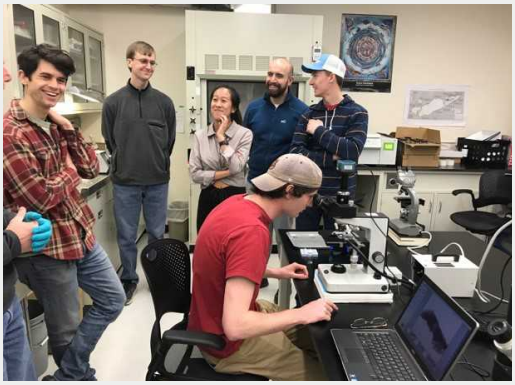



*Top: Pins created by Rutgers Subunit members at the first ever joint meeting of the Rutgers University, Stockton University, and The Marine Academy of Technology and Environmental Science (MATES) Subunits.*

*Top Left:Jessica Valenti (2nd from left), Sarah Borsetti (1st from right), and Daphne Munroe (2nd from right) receive certificates of apperciation from AFS President, Steve McMullin (5th from left), for their roles in the planning and execution of the 148th Annual Meeting of AFS.*

*Bottom Left: Emily Slesinger (2nd from right) receiving her Honorable Mention for the John E. Skinner Memorial Award at the 2018 AFS Annual Meeting in Atlantic City, New Jersey.*

# Cornell Subunit



The Cornell student subunit has been busy since we all convened at the national meeting in Atlantic City in August. The subunit has organized several symposia and workshops and we have plans for one last big meeting for the spring semester. Fall 2018, the subunit hosted a "Lightning Talk Series" in which professors across the departments of Animal Science, Ecology and Evolutionary Biology, Microbiology, and Natural Resources came together to give short talks on their research and provided opportunities for students to get involved with fisheries-related projects at Cornell. Talk topics included "Working with the Northeast Fisheries Science Center," "Sustainable Aquaculture," "Acid Deposition and Thiamin Deficiency," "Genomics for Fisheries Management," "Local to Global Perspectives on Fish Diversity," and "Working at the Cornell Biological Field Station." The lightning talks had over 60 students, faculty, and staff in attendance, and it was a great chance to bring people together across many different fields to discuss tackling questions in fisheries science. Cornell was well represented at the joint New York and Northeast division annual meeting in Poughkeepsie in February. For the subunit's February meeting, the graduate students in Natural Resources and Ecology and Evolutionary Biology provided advice to the undergraduates on applying to graduate programs and shared their research and work experiences. In March, the subunit held an otolith extraction and aging workshop, where students learned to extract otoliths from lake trout (locally caught and donated), process and age otoliths, and learn about their uses for ecological and microchemical analyses. In May, the AFS subunit is planning a "Reno Preview," a joint meeting with Cornell's chapter of The Wildlife Society, featuring talks from students of both chapters followed by a networking social to get to know the members of the respective students.

# SUNY-ESF Student Chapter

*Peter Rawinski*

The SUNY-ESF Student Chapter of the American Fisheries Society started this academic year with one strong goal in mind. To provide the chapter's undergraduate members with enough information on the many different aspects of what a career in fisheries science and conservation can entail, so that they would then be able to make their own decisions as to what they

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might like to focus on in their own careers. As early as the second week of the semester, the ESF student chapter began its meetings by presenting overviews of the seasonal positions held by the officers during the summer prior. The first presentation was given by myself, on my own experiences working as Seasonal Fisheries Technician for the Massachusetts Division of Fisheries and Wildlife. Subsequent presentations aimed at illustrating the experience of having a seasonal fisheries position were given Dan Sinopoli and Tyler Field. The chapter's Vice President and Treasurer respectively. Dan's presentation summarized his experiences as Creel Survey Technician working on Oneida Lake, out of the Cornel research facility at Shackleton Point. While Tyler's presentation gave a synopsis of what it was like working as an Aquatic and Fisheries Technician for ESF's own Thousand Island Biological Station, where he assisted many ESF faculty members and graduate students on current research in the St. Lawrence River.

Our chapter also established the belief that it was critically important to facilitate the exchange of information between students and professionals within the field of fisheries. This was accomplished by hosting several professional fisheries scientists and conservationists throughout the course of the fall semester. The first professional speaker hosted by the ESF chapter was Jesse Lepak, from the New York Sea Grant. Jesse's current work focuses on education and outreach related to the ecological challenges facing New York State's fisheries, with specific attention given to those of Lake Ontario and Lake Erie. Jesse's incredibly relevant work, combined with his easy-going and relaxed nature made him a perfect fit to kick off the professional speaker lineup for the fall semester.

The next professional speakers to present at chapter meetings, were ESF Aquatic and Fisheries faculty members John Farrell and Karin Limburg. John gave an exceptionally in-depth and informative presentation of proper electro-fishing techniques, which drew an impressive crowd of students who were intrigued by the idea of potentially sampling some of the local creeks. Karin's presentation focused on some of the highlights from her research studying hypoxia in the Baltic Sea and how the local cod populations are being affected. This presentation perfectly illustrated Karin's vast wealth of knowledge regarding issues of environmental degradation and conservation. We also thought it was a good idea to illustrate some of the research going on at ESF from the perspective of some of our graduate student members. Graduate student speakers included Cara Ewell Hodkin, the chapter's President Elect, Melvin Sampson, and once again our Vice President, Dan Sinopoli.

At our final meeting of the fall semester we hosted Adam Kautza, the Coldwater Fisheries Resource Project Leader for the Massachusetts Division of Fisheries and Wildlife. I had worked with Adam the previous summer and was immediately drawn to his passion for conservation. His position with Mass Wildlife is not simply a day job. Adam's work is clearly his life's passion. As an avid fly-fisher as well as scientist, Adam is the perfect medium to appeal to the many stakeholder groups concerned with the well-being of coldwater fisheries. Adam's ability to effectively communicate with an audience of people was immediately evident as he explained the path he took on his way to becoming a fisheries professional, on that cold December afternoon.

The return from winter break and the start of the spring semester found the ESF Student Chapter in a slight panic with the impending NY/NED Joint Annual Meeting in Poughkeepsie, NY. Karin Limburg, who at that time, also happened to wear the hat of New York State Chapter President, recommended that our student chapter pick up some of the slack left by the New York Chapter and work on printing some t-shirts with the 2019 meeting logo on them. We were a little late to the game on this request, as we were not able to get the shirts physically printed in time for meeting. However, post meeting, after setting up a table in a high traffic hallway in the Poughkeepsie Grand Hotel and collecting names and money from interested parties, we were able to ship out an order of t-shirts to their recipients. This worked out be extremely beneficially for our chapter, as we were able to gross all the profits from the t-shirt sales. Which were sold at a fairly considerable mark-up price.

The annual meeting in Poughkeepsie was much more than just a place for us to make a profit though. In total, we had seventeen chapter members attend the meeting, the largest number ever to attend from

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ESF. A large percentage of whom were undergrads that had never attended a professional conference before. Out of our group of seventeen, we were incredibly well represented. Our President Elect Cara, won the student travel award, and our current Vice President Dan won the award for best student poster. All in all, the annual meeting was a rousing success for our chapter.

Still riding off the momentum from the annual meeting, our chapter set to work organizing a beginner's R-workshop that would be held on our campus. We decided to peruse this goal mostly due to the lack of experience most undergraduates have with using R. Plus, many of the grad students in the chapter mentioned that they could also use a refresher with the software. On April 13th, we hosted Tom Evans, a post-doc at Cornell who recently received his PhD from ESF, working under Karin, and Dan Stich, an assistant professor of biology and statistical modeler from SUNY Oneonta. The two taught in tandem brilliantly and were able to convey vast amounts of information in a way that was accessible and relatively easy to follow for everyone. All who attended left the workshop having acquired some new skills regarding their ability to use R, whether that was having learned how to conduct a new type of statistical test, or simply input data.

The final event the SUNY-ESF Student Chapter of the American Fisheries Society did as a group this year was a backpack electro-fishing trip to nearby Ninemile Creek, which flows into Onondaga Lake. This seemed to be the event that many of our chapter members had been waiting for, as more than half our chapter showed up to the creek on that cold dreary Saturday morning. We were able to sample four different sections of stream, which allowed members to cycle through turns using the backpack shocker. The species we encountered that day were bluntnose minnow, brown trout, eastern brook trout, Northern hog sucker, smallmouth bass, tessellated darter, and white sucker. All fish were identified, shown around the crew, and then quickly released, after every shocking run. Getting out and doing some real field-work felt like a great way to send off the academic year for the student chapter and I think all of our members would agree.

*Peter Rawinski is the President of the SUNY-ESF Student Chapter of the American Fisheries Society*

# UMaine Subunit

*Sarah Vogel*

The AFS Student Subunit at the University of Maine has had a fun and active academic year. From regularly scheduled meetings to professional development workshops, we kept our members busy! Fortunately, we have a great group of inquisitive people who enjoy staying busy and trying new things.

We kicked off the 2018 Fall Semester with a Gyotaku, fish printing meeting to welcome new members to the subunit. Gyotaku is a Japanese method of printing fish that was traditionally used by fishermen to record their catches, but has become an art form in its own right. Another art-based meeting we hosted, was a well-attended fly tying workshop. Representing both form and function, our members learned how to tie wooly buggers and other popular files. They learned about Maine's strong fishing and guiding traditions and about the native fisheries in the area.

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*Subunit members Erin Peterson (L) and Matt Mensinger (top) teach middle school students about stomach content analysis and aging fish scales at the Northern Maine Children's Water Fesitval.*

Our interest in fishing extended into the winter months with our annual ice fishing trip which coincided with Maine's Free Fishing Weekend. We packed everyone out to Hermon Pond for instruction on ice safety, drilling holes, setting tip-ups, and reeling in the big one. With over 60 people, it was our biggest fishing event to date and a great way to introduce beginners to winter outdoor activities!

Although the 2019 Spring Semester brought harsh weather, it allowed us to move activities indoors and focus on numerous professional development workshops and seminars. We were fortunate to have Justin Stevens of NMFS give a presentation outlining historic and current efforts to assess fish populations in the Penobscot River. Dylan Whitaker of Maine Department of Inland Fisheries and Wildlife also stopped by to give a presentation focusing on the declining state of the Northern Maine Lake Whitefish. In addition to these seminars, we hosted a How To: Grad School meeting, Resume Workshop, and Fisheries Gear Demo just in time for senior undergraduate students to begin looking for summer jobs and graduate positions.

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***May the fourth be with you!*** *Thanks to everyone who came out to participate in our 2019 Spawning Run 5K held on May 4th with proceeds going toward our Education and Outreach Fund.*

**The team's all here!** *Over 60 people (and animals) were in attendance for this year's 2019 Ice Fishing Trip!*

Throughout the academic year, we remained committed to furthering our Education and Outreach Program. We led middle school salmon releases that included stream-side instruction in aquatic invertebrates and migratory fish. We participated in the Northern Maine Children's Water Festival and taught children about stomach content analysis and aging fish using scales. We also joined local clean up efforts such as Take Pride in Acadia Day and reached out to local salmon clubs to present on the current research of our members. Several of our members when above and beyond in an effort to mentor students such as joining the 4-H STEM Ambassador Program. To bring the year to a close, we hosted our Annual Spawning Run 5K to raise money for continued Education and Outreach efforts.

Currently, we are gearing up for the 2019 Fall Semester with a changing of the guard with new subunit officers. Our future goals include expanding our Education and Outreach Program and encouraging undergraduate participation in the group. We're ready to meet any challenges that come our way head-on and we're so excited about the coming year!

*Sarah Vogel is a MS student in the Wildlife, Fisheries, and Conservation Biology Dept. and President of the AFS Student Subunit at the UMaine. She can be reached at sarah.vogel@maine.edu*

# California University of PA Subunit

The California University of PA Subunit (of the PA Chapter) has had a busy year. Plagued by heavy rains in the fall, repeated attempts at planning a canoe trip were finally abandoned. Instead members of the group assisted with fish and macroinvertebrate sampling on a few local restoration sites. A bit later in the fall, they helped the PA Fish and Boat Commission with their annual collection of steelhead trout from Lake Erie. The collected fish were taken to the Reynoldsdale State Fish Hatchery and spawned. In February members

*Above: Hatchery Manager, Jared Sayers and Kierstin Blackburn (CalU) sorting walleye.*

*Below: Taylor Krucher (CalU) spawning a male walleye at Pymatuning Hatchery.*

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f the group participated in the joint meeting of the PA Wildlife Society and PA Fisheries Society Chapters in State College, PA. Two presentations were made by members of the Subunit – Katie Gallmeyer and Travis Tacelosky. In addition members toured the Bellefonte Fish Hatchery.

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In mid-March, the CalU chapter traveled to Linesville, to help the PA Fish and Boat Commission with their annual walleye collection (we will be returning in a few weeks to help with their muskellunge program). Here members got first-hand experience netting fish out of trap nets, sorting ripe from green fish, and most importantly spawning fish! The personnel at the hatchery were very patient with us and incredibly helpful. We returned a few weeks (April 6) later to volunteer for the Open House at the hatchery. Some of the members arrived early to help collect walleye again. Later in the day, several member stuck around and made Gyotaku tee shirts for the attendees. Fantastic event! We estimate there were nearly 3,000 attendees....and over 300 tees made. To wrap up the year we are planning a float trip down the Youghiogheny River the first week of May.

*CalU alumni Nick Nelson cleaning Crappie along side Brian Ensign at the Pymatuning Open House.*

*Jackie Stevenson and Julie Leiendecker printing t-shirts at the Pymatining Open House.*

# UMass Amherst Subunit

*Matt Devine*

The UMass Amherst Subunit has enjoyed success this past year. Students have presented their scientific work at regional and national meetings, participated in education and outreach events, and gained traction for future events coming this spring! In August, 13 students represented the subunit at the annual AFS meeting in Atlantic City and all 13 students presented portions of their research in either oral or poster presentations! Presentation topics included predicting the movements of Permit and Barracuda in tropical reefs, conservation strategies for Atlantic Tarpon, investigating the effects of winter water level drawdowns on lake fishes, testing the effect of changing water temperatures on juvenile river herring, improving fish consumption advisories for data-poor species, evaluating fine-scale movement of reef fishes, exploring network complexity of Caribbean sharks, Alosine recovery in the Gulf of Maine, and recruitment dynamics for anadromous river herring. Phew…that's a mouthful of work! Well done everyone.

The UMass Amherst Subunit has also spent considerable time and effort engaging the local communities and generating interest in fisheries conservation. Several student members participated in the Massachusetts Envirothon (MA Envirothon) in December, held at UMass Amherst. This event brings together high school students from around the state that are interested in environmental conservation. In a dedicated symposium entitled "What do wildlife ecologists do and how do I become one?", subunit members reflected on their journeys from high school to environmental scientists and offered tips for success. And in another education/outreach event, graduate students from the subunit participated in a grad/undergrad career paths mixer. Graduate students sat on a panel designed to provide resources for undergraduates interested in fish and wildlife career paths.

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*UMass Amherst subunit group photo on the shores of Atlantic City*

Undergraduates heard from graduate students about where they've been, their most valuable and formative experiences, and how they've been successful in fish and wildlife ecology. This work is important to members of the UMass Student Subunit and we will continue to look for opportunities to engage and support the next generation of fisheries scientists.

*Otolith demonstration at the Cambridge Science Festival. Can you estimate how old these juvenile herring are?!*

Currently we are prepping and excited for upcoming river cleanups, a professional development workshop for undergraduates that includes mock interviews and feedback on cover letters and CV's, and our annual "Day in the life of a fisheries biologist" event. Additionally, we will be participating in the Cambridge Science Festival in celebration of World Fish Migration Day where we will showcase river herring aging techniques, highlight the journey migratory fish make from source to sea, and help inspire the next generation of scientists.

*Matt Devine can be reached at*
*mtdevine@eco.umass.edu*

# Southern New England Chapter

## *Involving Commercial Fishermen in AFS Chapter Meetings*

*Owen C. Nichols, SNEC President*

The 2018 national meeting of the American Fisheries Society in Atlantic City was special for a variety of reasons, not the least of which was the dedicated effort by the organizers to create a stakeholder engagement day, during which commercial fishermen and other stakeholders were able to engage in panel discussions and attend presentations on the latest fisheries science and management issues. In the wake of the successful day in Atlantic City, we at the Southern New England Chapter made a concerted effort to encourage commercial fishermen to attend and participate in our winter 2019 meeting, held on January 16 at the University of Connecticut. In my case, encouragement included picking up two Cape Cod fishermen well before sunrise (normal business hours for them) and driving them to Connecticut. Caffeine-fueled discussion of fisheries management issues in the cab of the work truck ensued, a good prelude to a day of scientific presentations. Several fishermen and industry representatives from Rhode Island and Massachusetts attended the winter meeting, and the program featured multiple presentations of collaborative research involving commercial fishing industry partners. Fishermen had the opportunity to ask questions, share observations, and engage with scientists and students. Conversations that evolve into collaborations are a hallmark of our Chapter meetings, and I was delighted to see the fishermen I rode in with actively engaged from morning coffee all the way to the closing poster session. Developing a mutual trust and understanding among, fishermen, scientists, and natural resource managers is invaluable, and we hope to continue to make the Southern New England Chapter a venue for that to happen. As an early-career graduate student and researcher, I found AFS and especially chapter meetings a great way to network and meet senior colleagues and professionals, and I hope our students can continue to learn from fishermen as well. Despite the long truck ride home, discussion of the day's events was as lively as the morning's conversation, and I think we will be seeing more participation from fishermen and other stakeholders at future meetings. Hope to see you there!

** The SNEC summer 2019 meeting will be 26-27 June at the USFWS facility in Hadley MA. The 27 June scientific program will be preceded by a workshop (tentative topic: Introduction to R) on 26 June. Stay tuned!*

*Aubrey Ellertson (Commercial Fisheries Research Foundation) delivers her presentation, "Fishery Characteristics, Population Trends, and Environmental Linkages of American Lobster (Homarus americanus) as Revealed from an Industry-Based Sampling Program."*

*Commercial fishermen engaged in lively lunchtime discussion with students, scientists, and resource managers, fueled by a feast put on by our hosts at the University of Connecticut.*

# FISHERIES NEWS

## Eels in the Classroom

### *Susquehanna River Basin Commission includes students in hands-on restoration program*

*Aaron Henning*

As the temperature slowly begins to warm, millions of juvenile American eels, known as elvers will continue to migrate upstream into freshwater systems along the Atlantic seaboard. The Susquehanna River will be no different except that these eels will make it deep into Pennsylvania & New York, a feat unheard of just 10 years ago. Our watershed was once formerly rich with eels but as dams were constructed across the river the eels disappeared, unable to access the freshwater needed to complete their life cycle.

Aaron Henning, The Susquehanna River Basin Commission's representative on the basin's interagency migratory fish restoration cooperative has championed the return of the American eel by working closely with The Pennsylvania Fish and Boat Commission, The Pennsylvania Department of Environmental Protection and the US Fish & Wildlife Service. And through his involvement in the re-licensing of hydroelectric projects one-million American eels have been recovered and stocked upstream of Conowingo Dam. The potential ecological benefits of migratory fish restoration have been known for years, but only now are their value beginning to be realized.

Eels serve as an intermediate host species for some freshwater mussels, another imperiled group of animals. In streams where they now co-exist, the mussels are now successfully reproducing thanks in part to the return of the eel.

"We're bringing back a species that's been absent for multiple generations. People are going to be curious and have questions. The goal is to have the next generation develop a greater appreciation and understanding of natural resources than the one that came before it." ~ Aaron Henning

*Elvers in Collection Tank at Conowingo Dam*

This is where 'Eels in the Classroom' comes in. Through an internal funding award received directly from SRBC, seven Pennsylvania School Districts and the Bradford County Conservation District will each receive 15 juvenile eels to raise in their classrooms in 2019.

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Eels will be collected from 'elver ramps' located on Octoraro Creek and the Susquehanna River at Conowingo Dam and given to the young educators, our future hydrologists, biologists, scientists!

While raising the eels in their classrooms, the students will learn about water quality, ecology and migratory fishes. At the end of the program the eels will ultimately be returned to the Susquehanna to complete their life cycle.

*Elver ramp located on Octoraro Creek*

**2019 Participants**

Lewisburg Area High School
Bradford County Conservation District
Mifflin County Junior High School
Valley View High School
Abington Heights School District
Milton Area School District
Loyalsock Township School District
East Pennsboro High School

*If your school district has an interest in participating in the future please contact Aaron Henning at ahenning@srbc.net*

# Recovery plan slow for Otsego's native Lake Whitefish

*Scott Wells, DEC Region 4 Fisheries*
*Ostego County, NY*

NYSDEC Region 4 Fisheries began a restoration plan for lake whitefish, Coregonus clupeaformis (aka LW) in Otsego Lake in cooperation with local state universities back in 2015, but so far results have been limited. Extensive sampling, experimental propagation, and spawning habitat improvements are the main components of the coldwater (fisheries) action plan for Otsego Lake, a popular headwater of the East Brach Susquehanna River where LW are on the southern edge of their native range in North America.

*Adult gravid lake whitefish from Otsego Lake. Photos by S.Wells, DEC Fisheries (Dec 2015).*

Extensive sampling for lake whitefish has been the most productive component of the restoration plan. Late autumn sampling in 2015-16 was a novel effort by DEC and the State University of New York (SUNY) at Cobleskill and Oneonta. Much was revealed about LW in Otsego Lake such as new spawning locations, relative timing of first spawn, sex ratios on spawning sites, and various ages on adult spawners (Thomas et al. 2016). Early use of bulky trap nets in the frigid waters soon gave way to boat shocking at night (2016-17), where only a few ripe females were needed and eventually captured among the slough of active males to accomplish the annual egg take and artificial spawning for hatchery rearing (2016-18). Emergent larval fish traps were

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also deployed in the early spring between 2013-2017 by SUNY Cobleskill. Even though LW fry were only collected at one site in the spring of 2014, valuable knowledge was gathered on when and where they hatch and emerge from the lake bottom (Shafer et al. 2017).

One highlight of the plan was the first stocking of LW by the state in 77 years. On January 17, 2019 a total of 164 lake whitefish raised at the SUNY Cobleskill's new fish hatchery were released into Otsego Lake through the ice off Three Mile Point near Cooperstown, NY. The fingerlings ranged from 100-125 mm in total length and were marked with calcein, a dye that stains hard body parts (i.e., fin rays, otoliths) for future identification via blacklight. These fish were the offspring of adult LW captured and spawned by SUNY Cobleskill in December 2017 (age 1+). This marks the first official stocking of LW into Otsego Lake since 1942, after many lake invasions by non-native organisms and a more recent promising recovery of the lake ecosystem (Wells et al. 2015)

*Lake whitefish stocking in Otsego Lake. Photos by B. Lehman, SUNY Cobleskill (Jan 2019).*

Propagating these relatively fragile Coregonids has proven challenging (Shafer et al. 2017), as most LW offspring spawned and raised between 2015-2018 perished before they could be tested disease-free, marked/tagged, and stocked. Nevertheless, SUNY Cobleskill made a valiant effort and learned much in trying to raise this important native species. Other species of Coregonids are being raised and stocked back into their native waters around NYS, but LW is not one of them (yet). Currently, fall collecting of LW brood stock lake is on hold because of the 'relic' status of their population in Otsego Lake. Despite the apparent resurgence in long-term gill netting by DEC (1969-2018), the LW population is likely still only a fraction of historic numbers (Wells et al. 2015). Cooperators are now searching for an alternate egg source from a more robust population of LW.

The third part of the restoration plan is improving fish habitat by constructing artificial spawning reefs at the north end of the lake. However, DEC currently lacks proper funding to lure in larger marine contractors that could move enough stone to build multiple reefs. Furthermore, no deepwater access for a crane/barge operation exists on the lakeshore. DEC is now searching for more support (i.e., NGOs) to assist with this important project by applying for the various grants that specifically fund fish habitat restoration projects

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*Lake whitefish sampling on Otsego Lake. Photos by M. Cornwell, SUNY Cobleskill (Dec 2017, 2018).*

*Otsego Lake whitefish rearing at SUNY Cobleskill. Photos by S. Wells (Dec 2015, Mar 2018).*

like this one.

SUNY Oneonta's Biological Field Station plays an integral part in monitoring the lake's dynamic and changing limnology. Since 2015, DEC has returned to managing the native fish fauna in Otsego Lake. The LW is unique in that it can serve as both a forage base (juveniles) for predators and popular sportfish when mature but only if recovery is successful. This work could not have been achieved without dedicated local collaboration. For more information on the LW restoration plan or to get involved, please contact DEC Fisheries in Stamford at 607-652-7366 or email scott.wells@dec.ny.gov

*References*

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*Lake whitefish sampling on Otsego Lake. Photo by S.Wells, DEC Fisheries (Dec 2015).*

# The Lost City of Atlantics:

## *Using a Slocum Glider to Track Atlantic Sturgeon off Mid-Coast Maine*

*Catlin Ames*

Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) are listed as federally threatened in the Gulf of Maine (GOM) under the Endangered Species Act. A stock status review by the Atlantic States Marine Fisheries Commission in 2017 stated research needs for the species included more information of marine habitat use, migratory pathways, and better understanding of anthropogenic interactions via bycatch and ship strikes. Detections from individuals acoustically tagged from four major river systems in the GOM, show that adults and sub-adults spend about six months at sea during winter before returning to rivers in late spring. Incidental coastal telemetry detections suggest that these fish may aggregate in winter near the mouths of seasonally used rivers. Potential aggregation sites warrant investigation to better understand what habitats Atlantic Sturgeon use in winter, and as coastal areas are prone to high rates of vessel traffic and fishing. Active acoustic tracking in boats for sturgeon over a large area is costly, and dependent on fair weather. Current technological advances of autonomous underwater vehicles (gliders) retrofitted with acoustic receivers show promise as a method to scan large spaces for tagged fish while simultaneously collecting environmental data. To test the hypothesis that Atlantic Sturgeon spend the winter in coastal regions near river outlets, over 100 fish were gill netted from the Penobscot, Kennebec, Saco and Merrimack Rivers and surgically implanted with acoustic transmitters over a ten year period (Figure 1). In conjunction with the Physical Oceanography Group at the University of Maine, a Vemco VR2 acoustic receiver was attached to a glider programmed to collect dissolved oxygen, salinity, density, and depth

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data (Figure 2). The glider was deployed on a pilot run on 12 April 2018 and preprogrammed to follow a route across Penobscot Bay. Before retrieval of the glider, detection efficiency was evaluated by positioning a V10 acoustic transmitter at the surface and seafloor attached to a stationary vessel. The glider then approached the vessel in 200m increments from a 1km distance starting point. Detection efficiency was assessed by binning positive detections by glider distance in relation to the vessel, position in water column, glider roll and pitch. The glider was retrieved on 23 April 2018, and travelled over 170km. No Atlantic Sturgeon were detected during the pilot study. Analysis of detection efficiency revealed that the glider could detect tags up to 1km, but that detection was greatest at 200m (10% and 80% respectively). Roll and depth did not have an effect on detection, but while diving efficiency dropped greatly (85% to 15%). The lack of fish detections during the pilot study could be caused by multiple factors: Atlantic Sturgeon may have already began dispersing to rivers or they do not occur in the areas surveyed. Results of the detection efficiency study are promising, as tags can be detected from over 1km away. Even at 10% efficiency, sturgeon would likely be detected as they are thought to be slow moving and tag pings occur at least once every two minutes. The effect of diving on efficiency needs further investigation as this could be caused by ambient noise, placement of the receiver on the glider, or a combination. Glider missions are currently underway in 2019, and glider routes were modified to include local knowledge and bycatch information to better understand the marine behavior of this historic resource.

*Figure 1. Surgical implantation of a Vemco V10 acoustic telemetry tag into an Atlantic Sturgeon. Photo credit: Kevin Lachapelle*

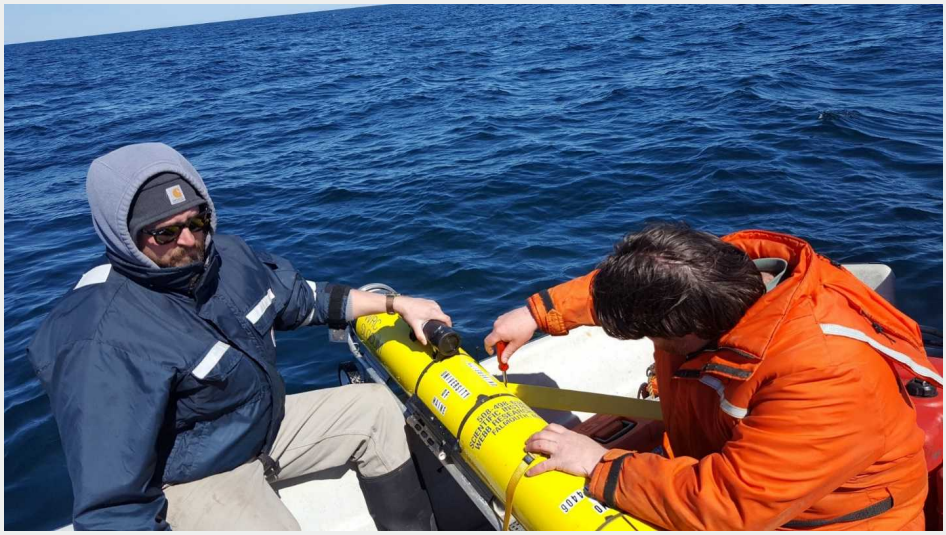


*Figure 2. Researchers Chris Tremblay and Mark Neary (left to right) preparing a Webb Slocum glider for deployment in Penobscot Bay.*

*Photo credit: Catlin Ames*

*Catlin Ames is a PhD candidate in the School of Marine Sciences and Vice President of the AFS Student Subunit at the University of Maine.*

*Also contributing to this article are Mark Neary & Neal Pettigrew (Maine Center for Autonomous Marine Surveys), Michael Kinnison (UMaine - School of Biology and Ecology), Joseph Zydlewski (USGS Maine Coop Unit, UMaine - Department of Wildlife, Fisheries, and Conservation Biology), and Gayle Zydlewski (UMaine - School of Marine Sciences).*

# Teaming Up to Recover North Atlantic Right Whales

*NMFS, GARFO*

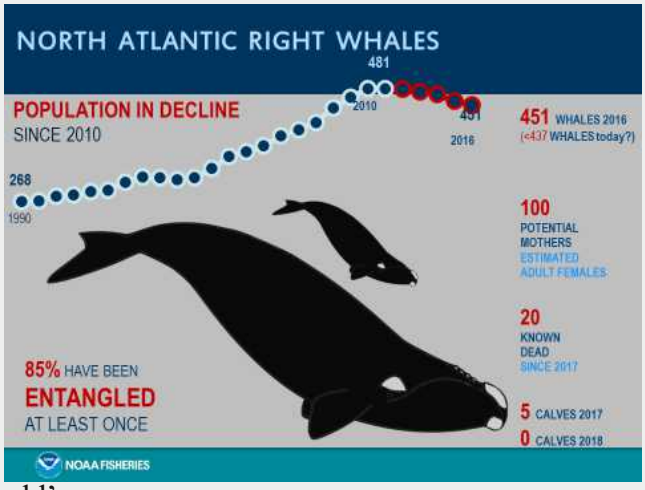
Between 1990 and 2010, the North Atlantic right whale population showed slow but steady growth due in part to seasonal fishing closures and gear modifications undertaken by US trap/pot and gillnet fishermen since 1997. However, after nearly two decades of slow recovery, the population is now in decline. The reasons are complex, but appear to be largely related to large ecosystem shifts currently occurring in the Northwest Atlantic.

## Why are Right Whales Dying?

Plainly evident to fishermen, the waters in the Gulf of Maine are among the fastest warming bodies of water within the world's oceans. This rapidly changing system is shifting life throughout the Gulf of Maine, including shifts in right whale prey distribution and abundance.

Calanoid copepods and other zooplankton form the basis of the right whale diet. As copepod availability changes, right whales spend more time and energy searching for food. Resulting right whale distribution changes have exposed them to interactions with fishing gear and vessels in areas where, until recently, protective measures were not in place.

Nowhere has this been more catastrophic than in the Gulf of St. Lawrence, Canada. In waters where previously there were no whale take reduction regulations in place, fishing and vessel traffic contributed to the death of 12 North Atlantic right whales in 2017. An additional eight right whales were found dead in US waters since the beginning of 2017, totaling 20 documented deaths in less than two years.




## Low Birth Rates and Reduced Fitness

During this period of increased deaths, only five right whale calves were born during the 2016/2017 calving season. No new calves were born in the 2018/2019 calving season - the first season since surveys of the calving grounds began in 1980 that this has happened. Further, the time between when a female gives birth has increased from having a calf every 4 to 5 years to having a calf every ten years.

Under normal conditions, a year of pregnancy would be followed by a year of calf rearing. An additional two years would be required for an adult female right whale to build up her body condition sufficiently to support another successful pregnancy. Scientists believe that entanglements, especially those that result in adult females dragging gear for an extended period of time, during periods of low food resources, interrupt and delay the right whale's breeding cycle leading to reduced calf production.

## Teamwork to Find a Solution

This grim story was delivered on the first day of the Atlantic Large Whale Take Reduction Team meeting in Providence, Rhode Island the week of October 12 through 15th. The 61-person Atlantic Large Whale Take Reduction Team includes members from a number of groups, including the fishing industry, federal and state managers, conservationists, and scientists. The Team meets when human caused deaths or injuries of marine mammals (in this case right whales) is so high that the population can't sustain itself.

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The Team works together to find solutions to decrease the deaths and injuries that result from interactions with fishing gear, particularly trap/pot and gillnet gear. When a whale population is declining, each significant incident has more serious consequences for that population.

**What's next for the Team?**

The Team discussed project proposals submitted by Take Reduction Team members or groups. The proposals examined potential modifications to the Take Reduction Plan, including ideas ranging from modifying or adding seasonal fishery closures, restricting line strength or diameter, to researching and phasing in ropeless fishing technology particularly for new fisheries that use vertical line.

At the last meeting, held in March 2019, the Team considered developing recommendations for changes to the Take Reduction Plan that will reduce the probability and severity of interactions with fixed gear fisheries on right whales, while still allowing the successful operation of these trap/pot and other fisheries important to the culture and economy of Atlantic fishing communities.

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*For more information, contact Colleen Coogan, Protected Resources Division, at 978-281-9181 or Colleen.Coogan@noaa.gov*

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MID-ATLANTIC CHAPTER

ATLANTIC INTERNATIONAL CHAPTER OF THE AMERICAN FISHERIES SOCIETY
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AMERICAN FISHERIES SOCIETY
PENNSYLVANIA CHAPTER

S N E C

# Recent Publications

## IT'S ABOUT TIME: A SYNTHESIS OF CHANGING PHENOLOGY IN THE GULF OF MAINE ECOSYSTEM

*Contributors: Michelle Staudinger (Northeast Climate Science Center), Katherine Mills (Gulf of Maine Research Institute (GMRI)), Karen Stamieszkin (Bigelow Laboratory for Ocean Sciences), Nicholas Record (Bigelow Laboratory for Ocean Sciences), Christine Hudak (Center for Coastal Studies), Andrew Allyn (GMRI), Antony Diamond (University of New Brunswick), Kevin Friedland (NOAA, Northeast Fisheries Science Center (NEFSC)), Walter Golet (GMRI, University of Maine), Meagan Henderson (Stony Brook University), Christina Hernandez (Woods Hole Oceanographic Institution (WHOI)), Thomas Huntington (USGS New England Water Science Center), Rubao Ji (WHOI), Catherine Johnson (Fisheries and Oceans Canada), David Johnson (Virginia Institute of Marine Science), Adrian Jordaan (University of Massachusetts Amherst), John Kocik (NOAA, NEFSC), Yun Li (WHOI, University of South Florida), Matthew Liebman (US EPA), Owen Nichols (Center for Coastal Studies), Daniel Pendleton (Anderson Cabot Center for Ocean Life, New England Aquarium), Anne Richards (NOAA, NEFSC), Tom Robben (Connecticut Ornithological Association), Andrew Thomas (University of Maine), Harvey Walsh (NOAA, NEFSC), Keenan Yakola (University of Massachusetts Amherst)*

**Background:** Changes in phenology, or the seasonal timing of recurring events such as breeding, feeding, and movements, have emerged as a primary indicator of species responses to climate change. In terrestrial environments, shifts in phenology have been well documented; for example, earlier onset of spring and advances in the timing of emergence, flowering, and arrival times of migratory organisms have all been observed. However, far fewer examples exist that provide direct evidence for climate-induced shifts in marine phenology. The Gulf of Maine ecosystem is experiencing rapid and intense changes in temperature during all seasons, leading to widespread concerns of possible phenological shifts in a variety of organisms of conservation and management concern. This study examines the impact climate change is having on marine and coastal species phenology in the Gulf of Maine

**Goals:** The primary goals of this study were to summarize the current knowledge in the Gulf of Maine on: 1) key seasonal ecological and environmental processes, patterns, and events; 2) direct evidence for shifts in timing across the ecosystem; 3) implications of phenological responses for linked ecological-human systems; and 4) potential phenology-focused adaptation strategies and actions. Results provide a comprehensive perspective on shifting phenology in the Gulf of Maine, with case studies that span from the bottom of the food chain to higher level consumers as well as human activities, including fishing and recreation.

**Key Findings:**

- Several animals, from anadromous fishes to Atlantic puffins, and have changed the timing and duration of life events. Ocean and coastal processes, including stratification and phytoplankton blooms, have shifted as well.
- Although earlier timing was most common, shifts vary widely in directionality and magnitude, including non-responses indicative of stable populations adapting in place.
- The efficacy of management and planning tools such as fishing seasons, catch limits, and time-area closures may be compromised when target species experience shifts in the timing of life history events.
- Managers and researchers can use certain adaptation strategies to monitor changes, determine vulnerability priorities, and to improve decision-making as phenological changes occur.

**Process and objectives**: This study synthesized contributions from the 2015 Regional Association for Research on the Gulf of Maine (RARGOM) Annual Science Meeting "How is the timing of all things changing in the Gulf of Maine?", outputs of an expert workshop held in 2016 at the Gulf of

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Maine Research Institute, results from a comprehensive literature review, and expert input from an international working group composed of 26 authors representing 17 organizations, including multiple federal agencies, non-profit organizations, and academic institutions.

**Summary of results:** A surprisingly small number of studies (N = 20) showed direct evidence of shifts in timing in biotic and abiotic events in the Gulf of Maine ecosystem. Similar to previous research in terrestrial systems, the most common phenological responses found in the Gulf of Maine were earlier timing of key events. These included earlier spring onset (the day of year when sea surface temperatures exceed a thermal threshold), earlier and higher spring river flows that deliver freshwater runoff to coastal habitats, earlier and higher peaks in abundance of zooplankton, earlier occurrence of larval stages of benthic fishes (haddock, winter flounder, wolffishes, rock gunnel), and anadromous fish migrations occurring earlier in the year. Later timing was observed in fall onset (the day of year when sea surface temperatures descend below a thermal threshold), spring and fall phytoplankton blooms, occurrence of several larval benthic and pelagic fishes (sand lance, pollock, offshore hake, Atlantic mackerel), as well as reproduction and fledging of Atlantic puffins. Changes in the duration of certain events generally increased, including longer abundance peaks in zooplankton, the spawning/early life history period of macro-invertebrates including Northern shrimp and an intertidal nudibranch, and the high-landings period in the Maine lobster fishery. Ice-affected streamflow was the only seasonal event exhibiting a reduction in duration. Few studies to date have focused on how the timing

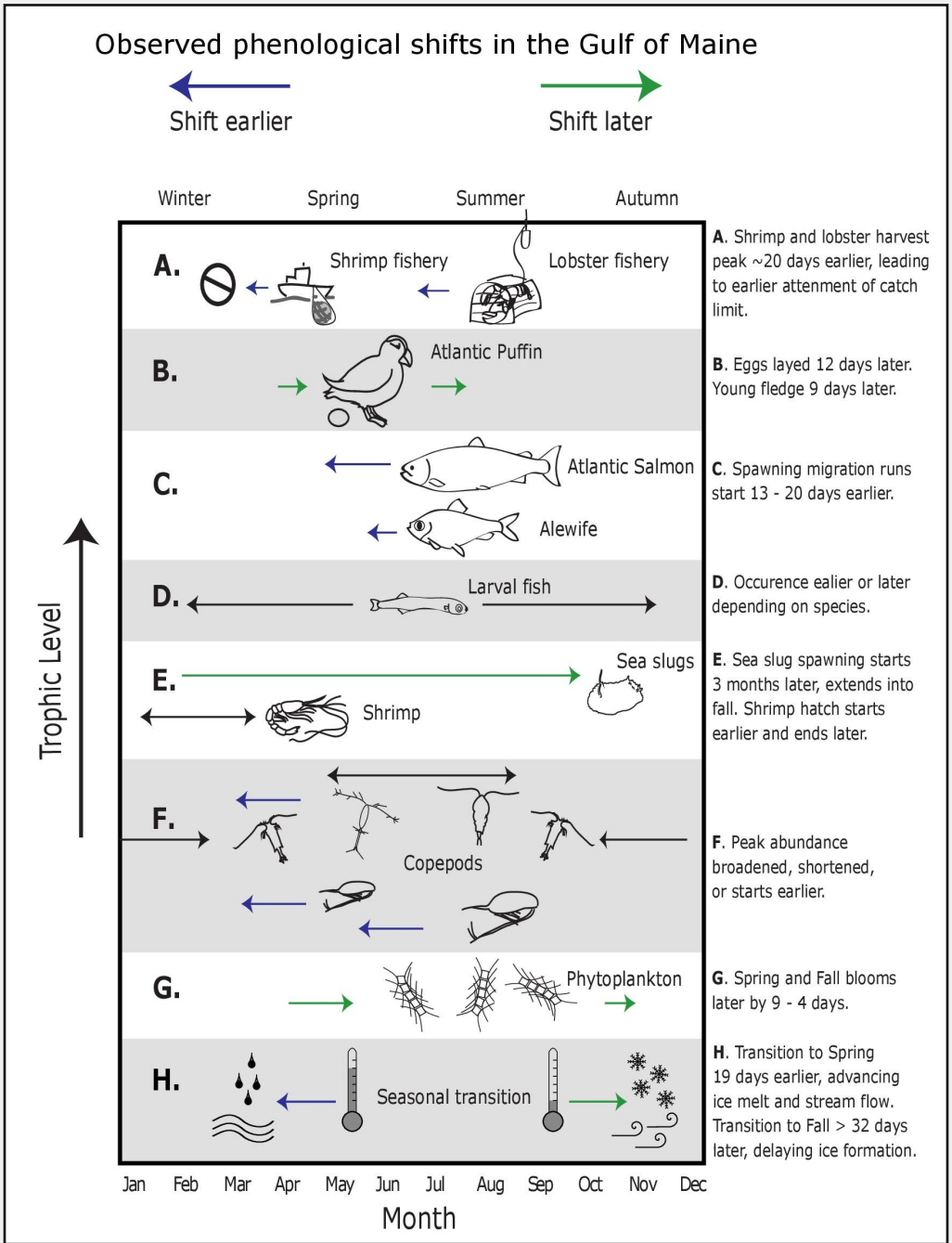


*Figure summarizes observed phenological shifts in the Gulf of Maine. Arrows indicate shift direction (blue = earlier, green = later) and magnitude (length) and corresponds to day of year and season.*

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of events may change in the future, but two studies projected decreased overwintering (diapause) duration for a key zooplankton species, Calanus finmarchicus.

Overall, rates of phenological shifts were species- and event-specific, and responses varied depending on the environmental driver and the spatial and temporal scales evaluated. Results reveal a need for increased emphasis on documenting and understanding phenological shifts in the region. The paper identifies opportunities for future research and consideration of phenological changes in adaptation efforts.

**Study implications**: Like other temperate marine ecosystems, the Gulf of Maine is characterized by a strong seasonal cycle, which drives the region's ecology. Changes in the timing of seasonal features have the potential to impact individual species, food webs, and overall ecosystem productivity through trophic mismatches and asynchronies in linked food and habitat resources. The efficacy of management and planning tools such as fishing seasons, catch limits, and time-area closures may be compromised when target resources shift in time. For example, spatiotemporal closures have been used to protect spawning aggregations of commercially-important fish; however, temporal closures are typically set to predetermined dates and may need to be adjusted if spawning times change.

**Adaptation efforts related to phenology**: Adaptation strategies could better account for phenological changes through expanded, coordinated, and high-resolution monitoring programs (to track changes), vulnerability assessments (to prioritize focus areas or species), as well as forecast models and dynamic management tools that consider ongoing and projected temporal system changes (to improve decision-making). These actions can help managers better prepare for phenological shifts that may impact resources of conservation concern or human activities dependent on the ocean. For example, earlier timing of the American lobster fishery landings in 2012 exceeded the capacity of the supply chain, resulting in a market glut and price collapse that substantially affected lobster fishermen. The industry has since been able to adapt to the possibility of such events in a variety of ways. Information that provides advanced warning of events that may disrupt other activities or industries may be needed if phenology shifts become more widespread in the region in the future.

Many gaps in knowledge remain in the Gulf of Maine. Additional research and monitoring that focuses specifically on temporal shifts is needed to improve understanding of the risks and opportunities in the region.

*Citation: Staudinger et al. 2019. It's about time: A synthesis of changing phenology in the Gulf of Maine ecosystem. Fisheries Oceanography, 1–34.*

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# Acknowledgments

The Northeast Fish Rapper is produced by volunteers. It would not be possible without contributed content from Northeast Division members. Our next edition will be published in Fall 2019. We are always looking for writers to contribute to our "Fisheries News" section. These news briefs can be based on original research, management actions, or articles published in other news outlets and should range from 350-750 words. If you have a particular interest you wish to write about, let us know! Additionally, we are always looking for photographs and artwork to include in the Rapper. If you have interesting pictures from field work, fishing trips, or anything else you'd care to share, send it along, no writing necessary. Please send any and all submissions to matthew.mensinger@maine.edu. A big thank you goes out to everyone who contributed to this edition of the Fish Rapper. We appreciate all of your effort!

Contributing Organizations:

California University of PA Student Subunit
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About the Editor

Matt Mensinger is a MS student in the Wildlife, Fisheries and Conservation Biology and an active member of the AFS Student Subunit at the University of Maine. His graduate research focuses on American eel migration, survival, and behavior.

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