Invasive and Introduced Species Section

April 2020 Volume 23: Issue 1

https://introducedfish.fisheries.org

Inside this Issue

President's Vector

Hi all, I hope today finds you well. Strange times, fighting COVID -19. Hunkering down in the home office for most is not typical for fisheries scientists in the Spring, right? In my case, virtual meetings and endless phone calls curse me but I also see opportunities such as our AFS Facebook site with dialogue and links to seminars and information sharing. Opportunities for online learning (if your internet from a rural location supports it, sigh) are available!!

With that we are also looking to the future. Our long awaited for 150th is fast approaching, however there is uncertainty. Will this stay at home order be lifted by then? Will agencies allow, or will it even be prudent to travel in August-September? With these things we will plan for our meeting but keep an eye on efficiency and opportunity. For instance, have you heard that our Invasive and Introduced Species Section is putting a booth together? WE NEED YOU! You can contribute in putting a history of invasive and introduced species over the past 150 years, help assemble some communication strategies, or just volunteer to spend time at the booth, please see the call for assistance below and let Marybeth Brey know of your interest. As a contingency, we are throwing thoughts together on how to do this virtually for web content in case we have a modified event this fall. Still, let MB know (see **page 17** for more information and Marybeth's contact information)!!

I would also like to draw your attention to online content to the AFS Virtual Spring Conference, see information later in the newsletter. (**page 3**). These types of events may be a new or temporary normal but can stimulate some mental capacity and minimally connect you with your peers.

IISS is also working on an exciting symposium. We are expecting 15 authors to present in the symposium entitled "Tails from the Anthropocene–stories and lessons from 150 years of aquatic introductions and their impacts on fisheries." See the symposium abstract and contact information on **page 6**. It should be an exciting meeting, please keep checking the www.fisheries.org website or the Facebook site for updates on the meeting and deadlines. I hope to see all of you in Columbus!

It is my hope to have a members call this summer in July prior to the 150th to talk more amongst the group and lead to a most efficient time in Columbus, until then, perhaps sharing a post on the IISS Facebook site of your research or findings will keep us all motivated?

Cheers!

Kevin Irons

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Editor's Note

Hello everyone! I hope this newsletter finds everyone well and healthy. This issue is jam packed full of great information. We have a recap of the IISS' symposium at the AFS-TWS Meeting in Reno, an insightful range expansion update on the Round Goby, multiple AFS Division updates, and a few other odds and ends. Please also take note of a few items that the section needs help with (most notably our booth at the National AFS meeting). I want to thank all of the contributors because without their help, every page would be blank. If you have any information you'd like to have included in the newsletter, please don't hesitate to reach out.

Good Reading,

Seth Love
Newsletter Editor

Upcoming Events

What: First Session of the AFS Virtual Spring Conference
When: Thursday, April 16th from 1:00 PM to 4:00 PM (EDT)

This first session will feature abstracts from the Alaska Chapter. The opening presentation is entitled "Thoughts on Virtual Worlds" by Don Orth of Virginia Tech.

Abstract submission for the April 21—May 7 sessions is April 17th

There are seven total sessions scheduled between April and May

Visit https://fisheries.org/events-page/virtual-spring-conference/ for more information

Mid Year Governing Board Meeting

The Mid-Year governing board meeting of the American Fisheries Society was held on February 23 and 24th in Little Rock, Arkansas. The Invasive and Introduced Species Section was represented by Nathan Lederman serving as Proxy for Kevin Irons. The 2-day meeting covered a wide array of topics, included numerous discussions, involved several breakout sessions and had a few motions voted on. Below is a summarization of the major take home points and discussions of the meeting.

- **Presidential Charge to take action**
  - Communicate with 10 (or more!) people who are either neutral or disagree with you on the climate issue
  - Look at Scott Bonar's President's Hooks or watch www.fisheries.org/verbaljudo for ideas about conversing with others about Climate Change
- **Vice President Brian R. Murphy presented his plan of work with the high priority areas of**
  - Increasing public visibility and trust in the work of our profession and of our Society
  - Helping AFS members further their careers by: a) developing or enhancing critical professional skills; and b) enhancing the benefits of professional certification
  - Continuing and expanding efforts to increase diversity within our profession and our Society
  - Moving forward from research to planning and action related to rebranding needs for AFS as we celebrate our 150th anniversary
- **Need to integrate the Society's strategic plan into our work**
  - Different parts of AFS will have different intersections with the strategic plans – implementation is will not be evenly distributed.
  - Groups will have different areas of focus and levels of engagement. But everyone should have some engagement.
  - The society is requesting we provide actionable items that the sections is taking or will be taking to help in AFS achieve the strategic plan
- **Establish Society-wide ownership of the President's Plan of Work**
  - Section should take ownership of the President's Plan of Work and share with membership
  - Sections should identify specific actionable items they can engage in to assist the president's plan of work
- **AFS Special Committee on Books Action items**
  - AFS Past President Jesse Trushenski tasked a special committee to analyze the current state of the AFS books program and make recommendations for its improvement to the AFS Governing Board. Below are the results of that committee
    - AFS will be applying DOI for AFS books
    - AFS will not seek partnership with commercial publishers due to lack of benefits to the overall program
    - Motion was passed that **"**Each AFS Section will engage in an assessment of book subject needs and opportunities including the identification of possible authors. Sections will provide a report on their findings to the AFS Publications Director no later than August 1, 2020, and a full report will be presented to the Governing Board at the Columbus AFS meeting
    - Publications Staff will work to transitioning future AFS e-books to an Open Access publishing model
    - Books titles directed towards lay audiences and educational outlets outside of university-level learning will be pursued

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        - A tailored survey to identify subjects of interest; survey purchasers of AFS titles to determine how purchaser characteristics and needs affect which titles are purchased and why; and survey AFS book editors/authors to determine why they chose to publish with AFS and their experiences publishing with AFS will be created.
    - Consider using the Publications Endowment Fund if creating a book
        - The purpose of this fund is to support the publication of Society and unit publications for which outside support is not available.
        - That fund has been relatively unused historically and has something like $900,000 dollars in it.
- **Formation of a new Section—Cooperative Research with Stakeholders**
    - The society is considering forming a new section aimed encouraging and increasing involvement among scientists, stakeholder and resources users
    - Additional information needs to be collected and the constitutional consultant needs to review the proposed bylaws

Encourage affiliate members to become full members

- Jeff Kopaska presented on membership status
    - 6,108 people identified as AFS members, 5,221 identified a chapter but were are 7,594 individuals who identified as a chapter member
        - Some chapters have more members being AFS members than chapter members, while some chapters had much lower AFS membership compared to the chapter membership
            - Trying to understand why?
- The society is wanting to limit the number of affiliate members and encourage all to become full society members
- A motion was passed that "All chapters will create an annual meeting registration rate differential that encourages AFS membership." And "Chapters will submit to AFS by August 1 of every year their list of chapter affiliate members. If not submitted their dues rebate will be withheld. "

- **Dissolution of the Mexico Chapter**
    - The western division of AFS proposed to dissolve the Mexico Chapter
        - Lack of active involvement for the chapter is apparent
        - Failed communication attempts common
        - Chapter is not operating consistent with Bylaws or the Society Constitution, Rules, and Procedures
    - A new "Latin American Chapter" is now being considered
- **Plans are being made to 'rebrand' AFS**
    - AFS has a large extent of AFS membership: 8,000 members, 600 from Canada and 250 from other countries
    - Potomac Communications Group (PCG) evaluated AFS's brand in 2018
        - Results showed that AFS members and stakeholders feel that the mission and values of AFS are not always clearly identified, particularly to outside groups
        - Members recognize the limitations created by the current name, and the dissatisfaction by other members
    - Actions including changing the name of the "American Fisheries Society" to something else, adding a tag line, or more clearly define our mission to outside groups

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Mid Year Governing Board Meeting

- **Each unit should be having their president write plan of work yearly**
  - It was mentioned that failing to plan to is planning to fail
  - A request was made that presidents write plan of work to provide structure and remain focused on specific goals
    - These should be actionable items that align with the president's line of work and helps the organization achieve its strategic plan
- **Yearly actions should be reported in the governing board reporting tool**
  - The Governing Board Reporting Tool was designed to help track accomplishments
  - AFS units has been far less than desired if this tool is to be fully utilized
  - More use of the tool would allow for better tracking of achievement and progress toward goals
- **A statement of World Aquatic Societies on Human-Caused Climate Change is being created**
  - Will be sent around to other societies looking for support of the statement
- **Keep AFS up to date on any Committee Chairs and Liaisons changes**
  - Keep websites up to date with relevant information
  - Inform home office of any changes to officers

Each of the topics had supporting information provided at the meeting. If you would like access to those materials reach out to Nathan Lederman (Nathan.lederman@illinois.gov)

150th Annual Meeting of the American Fisheries Society Symposium

Tails from the Anthropocene–stories and lessons from 150 years of aquatic introductions and their impacts on fisheries

Nathan J. Lederman, Wesley M. Daniel, Kevin S. Irons, Gregory W. Whitledge, Matt E. Neilson

Since establishment of the American Fisheries Society in 1870, the management of nonindigenous introductions has been a priority. North American freshwater fisheries have been impacted by the release of invasive and introduced species, accidentally, intentional, sanctioned, and unauthorized over the past 150 years. Impacts range in size and scope from small-scale and localized to wholesale shifts in ecosystem function impacting fisheries-important species and those of conservation concern alike. The Invasive and Introduced Fish Section is currently developing a symposium that will bring together biologists, managers, and researchers to describe invasion histories of various species within each decade of the American Fisheries Society's 150-year existence for the annual meeting in Columbus, Ohio. The lessons learned through the history of aquatic introductions across North America, the impacts associated with introduced species, and future approaches for managing nonindigenous species introductions management will be examined. Proceedings of this symposium will be aggregated into a manuscript developed for the Society's journals.

The 150th celebration is being held on August 30th to September 3rd, 2020. If you have interest in becoming involved with the coordination of this symposium, have suggestions for potential presenters to the symposium, or have additional ideas, please contact ***Wesley M. Daniel*** *at wdaniel@usgs.gov or* ***Nathan Lederman*** *at nathan.lederman@illinois.gov. Participation in symposium development is a simple, and a minimally time-consuming avenue for increasing involvement and role within the section.*

Introduction of two Goby species (Gobiidae) into the Great Lakes of North America

It is well-documented that the Great Lakes of North America have been a home for introduced fish species dating back to the 1800s. Intercontinental examples of introductions include the Brown Trout *Salmo trutta*, Common Carp *Cyprinus carpio*, Grass Carp *Ctenopharyngodon idella*, Goldfish *Carassius auratus*, Oriental Weatherfish *Misgurnis anguillicaudatus*, and Ruffe *Gymnocephalus cernuus*. Since 1990, when the first collections were made in the St. Clair River north of Detroit, Michigan, the Great Lakes have provided a novel environment for two additional species -- Round Goby *Neogobius melanostomus* and Tubenose Goby *Proterorhinus semilunaris*. These two species are native to inshore waters of the Black and Caspian seas in the temperate region of eastern Europe and western Asia, respectively, and are believed to have arrived in North America in the ballast tanks of ocean-going ships.

There are many goby species around the world that live their entire lives in marine environments, some of which are native to the Atlantic and Pacific coasts of North America. Both goby species now present in the Great Lakes differ in salinity preferences with Round Goby preferring brackish water while Tubenose Goby prefers fresh water. They are both benthic in nature and have been found inhabiting rocky substrates as well as open sandy areas and dense aquatic macrophyte beds. The Round Goby can reach 30 cm in its native range while the Tubenose Goby is usually less than 12 cm. The colorations of both species are a mottled mixture of grey, green, brown, and white and superficially resembles our native sculpins, *Cottus* spp. However, these gobies are uniquely identified by fused pelvic fins that form what resembles a suction cup and can be used to anchor themselves to solid substrates. The Tubenose Goby is distinguished from both the Round Goby and native sculpins by the elongated nostrils protruding beyond the mouth. Individuals of both gobies can live to five years. The female Round Goby can lay several thousands of eggs in a spawning season while the males of both species are nest guarders and suffer high mortality after spawning. The Round Goby has a broad diet consisting of benthic organisms including bivalve mollusks, snails, aquatic insects, crustacean (e.g. cladocerans, crayfish) but also small fish, mostly young-of-the-year. Round Gobies may have benefitted greatly in the Great Lakes by the presence of large numbers of another invader – the zebra mussel *(Dreissena polymorpha)* which has shown to be a diet item. Tubenose Goby feed on benthic organisms as well, however, they have not been known to consume zebra mussels.

Likely spread through human-mediated vectors within the Great Lakes, the dispersal of each goby species is similar in some respects yet different in others. From the initial discovery location in 1990 of both species in waters just north of the Detroit area, they dispersed downstream into the Detroit River and Lake Erie. By 1993 Round Goby were found both downstream as far as eastern Lake Erie and upstream as far as southern Lake Michigan followed by Lake Huron in 1994. In 1995 it was found as far west as possible in the Great Lakes – Duluth-Superior Harbor of Lake Superior and also was found leaving the Great Lakes through the Calumet River in Illinois, the passageway to the Mississippi River basin. Just two years later, in 1997, a single specimen was collected near the mouth of the St. Lawrence River at Quebec City, Canada. Because of the potential threat of these fish dispersing widely, an electric barrier on the Chicago Sanitary and Ship Canal in Illinois was proposed in the early 1990s to help stop the downstream dispersal of Round Gobies from the Great Lakes to the Mississippi River basin. However, by the time the demonstration barrier was ready for testing in 2002, Round Goby had been found downriver of the barrier location. An updated version of the barrier is still in place. Its current primary purpose is to prevent Asian carp *(Hypophthalmichthys* spp.*)* passage from the Mississippi River basin into Lake Michigan and their spread to the other Great Lakes. The Calumet River collection in Illinois was soon followed by others downstream in the Cal-Sag Channel in 1996, Des Plaines River in 1999, Illinois River in 2004, and eventually the Mississippi River in 2018.

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Introduction of two Goby species (Gobiidae) into the Great Lakes of North America

The dispersal of the Tubenose Goby has been much slower. While the Round Goby was found across the full extent of the Great Lakes by 1997, the Tubenose Goby had yet to be collected outside the range of the St. Clair River and downstream in the western basin of Lake Erie. Then in 2001, a collection was made in Duluth-Superior Harbor of Lake Superior, the same location as the Round Goby had been found in 1995. It was not until 2011 when Tubenose Goby was found in two other Great Lakes -- Lake Huron in Georgian Bay and Lake Ontario at the eastern end where it flows into St. Lawrence River. Although the collection locations coincide with the Round Goby, the number of collection locations of Tubenose Goby is much sparser. No collections have been reported for Lake Michigan.

The Round Goby quickly became the dominant benthic fish in many locations in the Great Lakes. With that, grew the concern of potential harm which could follow such an invasion. It has been shown that Round Gobies compete with native fish species, interrupt food webs, and alter nutrient cycling. Where the Round Goby's presence became very dominant, impacts on native fish species have occurred through direct competition. The most affected has been the Mottled Sculpin *(Cottus bairdi)* which suffered declining populations and local extirpations, and to a lesser degree so has the Logperch *(Percina caprodes)* and other darters. In addition to direct competition Round Gobies are known to prey on native fish eggs including those of the Lake Sturgeon *(Acipenser fulvescens)*. They have also been found to prey on juvenile unionid mussels, a highly imperiled group of organisms in this country. Yet another negative impact is that the Round Goby has been linked to disease -- avian botulism. In the Great Lakes there have been outbreaks of this disease causing high mortalities of many water birds especially of those feeding on the Round Goby. On the positive side, gobies have become a dominant prey for a number of ecologically and economically important fish species including Walleye *Sander vitreus*, Rainbow Smelt *Alosa pseudoharengus*, Smallmouth Bass *Micropterus dolomieu*, Rock Bass *Ambloplites rupestris*, White Bass *Morone chrysops*, Yellow Perch *Perca flavescens*, and Burbot *Lota lota*. Another species which benefitted from the presence of the Round Goby is the federally threatened Lake Erie Watersnake *(Nerodia sipedon insularum)*. The goby also became a dominant food item for this species and was believed to be, in part, responsible for the snake's recovery and delisting.

Looking forward on two invasion fronts, it is doubtful that either goby species has reached its maximum potential for dispersal and survival in an expanded range, and at the same time advances in ballast water regulation and technologies are being made in hopes of preventing further introductions into the Great Lakes.

Amy J. Benson
Nonindigenous Aquatic Species Database Program
U.S. Geological Survey
Gainesville, Florida

What did we do?! The Biologists' Role in the Management and Spread of Invasive Species Symposium

The Invasive and Introduced Species Section collaborated with the Invasive Species Working Group of the Wildlife Society, working with Dr. Andrea Darracq, to put together a symposium at the Joint Meeting between the American Fisheries Society and The Wildlife Society in Reno, NV on September 29 through Oct 3, 2019. The Oct 3rd symposium consisted of various presentations (Table 1), each drawing a relatively large audience (mean±SE 25±1.6).

Presentation title	Presenter	Affiliation	Presenter contact information
The Biologists' Role in the Management and Spread of Invasive Species	Dr. Andrea Darracq	TWS	adarracq@murraystate.edu
Agency Use of Asian Carps to Solve Problems and Create More Problems.	Kevin Irons	AFS	Kevin.Irons@illinois.gov
Evaluating the Potential Effects of Invasive Aquatic Species Management on Native Fishes	Steve Pescitelli	AFS	steve.pescitelli@illinois.gov
Invasive Carp for Dinner and the Lobsters in Maine Are Hungry	Nick Popoff	AFS	nicholas.popoff@maine.gov
Determinants of Invasive Species Policy: Print Media and Agriculture Determine U.S. Invasive Wild Pig Policy	Dr. Ryan Miller	TWS	ryan.s.miller@usda.gov
Managing Invasive Wild Pigs in North America	Dr. James Beasley	TWS	beasley@srel.uga.edu
Lake Davis, a Northern Pike Eradication Success	Amber Mouser	AFS	amber.mouser@wildlife.ca.gov
Actions Taken and Lessons Learned Along the Journey: Six Decades of Sea Lamprey Control	Dale Burkett	AFS	dburkett@glfc.org
Weed or Wonder Plant? the Complexities of Non-Native Hydrilla Management in Florida	Dr. Jeff Hill	AFS	jeffhill@ufl.edu
Genetic Insights on Invasive Black Bass in Southern Africa	John Hargrove	AFS	john.hargrove@idfg.idaho.gov
Understanding Anglers Is Essential for Managing Invasive Alien Fishes in South Africa	Dr. Olaf Weyl	AFS	o.weyl@saiab.ac.za
The Outsized Role of Domestic Cats in the Transmission of Toxoplasma Gondii	Grant Sizemore	TWS	gsizemore@abcbirds.org
Trophic Ecology and Demographics of Flathead Catfish in the Lower Cape Fear River Ecosystem	David Belkoski	AFS	djb5568@uncw.edu
The Efficacy and Ecological Consequences of Using Triploidy for Aquatic Invasive Species Management	Jenna Keeton	AFS	jenna.keeton@aggiemail.usu.edu
The Success of Injurious Wildlife Listing Under the Lacey Act	Susan Jewell	AFS	susan_jewell@fws.gov

Table 1. List of presenters, paper title, membership affiliation, and contact information from presentation. Abstracts of presentations can be acquired by contacting nathan.lederman@illinois.gov. Additional information about the presentation can be obtained by directly contacting the presenter.

The symposium facilitated insightful and thought-provoking discussions between aquatic and terrestrial invasive species managers on the role biologists have had in intentionally or unintentionally introducing species into naïve habitats, the impacts those species have had on that environment, the various management strategies preventing or mitigating the spread of invasive species, and the philosophy behind what makes a species invasive or not. Throughout this session, it became apparent that invasive species management is time consuming and costly, but proper management can have positive impacts. Attendees also became aware of the

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What did we do?! The Biologists' Role in the Management and Spread of Invasive Species Symposium

similarities in invasive species management strategies and protocols between aquatic and terrestrial landscapes. As such, similar management strategies lends nicely towards cross disciplinary collaborations, management, and outreach providing a potentially united front. Thus, increasing the utility and impact of invasive species management and prevention when collaborative efforts are used.

The Invasive and Introduced Fish Section is currently developing a symposium for the 150th Annual Meeting of the American Fisheries Society in Columbus, Ohio. The celebration is being held on August 30th to September 3rd, 2020. The 2020 symposium is leaning towards a decadal focus with presentations on major species introductions that have occurred during each one of the 15 decades that the American Fisheries Society has been in existence, what circumstances or events led to those introductions, the impacts of those introduction (whether positive or negative responses were elicited), and how the species were/are being managed. Cumulatively, presentations should inform attendees how introduced species management strategies, techniques, and philosophies has evolved throughout the existence of the American Fisher Society.

If you have interest in becoming involved with the coordination of this symposium, have suggestions for potential presenters to the symposium, or have additional ideas, please contact nathan.lederman@illinois.gov. Participation in symposium development is a simple, minimally time-consuming avenue for increasing your involvement and role within the section.

2019 IISS' Annual Meeting: A Photographic Review

President Kevin Irons Addressing the Members (both those attending in person and those attending remotely)

Kevin Irons (L) presenting student travel award checks to Dominique Turney (C) and Noland Michels (R).

Student Award Recipient Essay: Dominique Turney

The environmental challenges we face are becoming more complex and contentious in nature. Contemporary threats to our environment include pollution, diseases, invasive species, and a warming climate among many other pressures. Our wildlife populations are at risk due to these threats, and it is more pertinent than ever that humanity works together to research and find solutions to these anthropogenic issues. Fortunately, the American Fisheries Society and The Wildlife Society have recognized the need for collegial relationships among natural resource professionals by hosting one of the largest gatherings of fisheries and wildlife professionals in history! The 2019 Joint Annual Conference was held in Reno, Nevada and was attended by over 5,000 scientists that came together to find solutions for today's environmental challenges.

I was fortunate enough to be one of the many scientists present at the 2019 Joint Annual Conference. This was my third national conference attendance and by far my favorite! I attended this conference as a second-year M.S. student in Biological Sciences from Western Illinois University. My research interests focus on large river ecology, invasive species management, and integrating technology advancement into natural resources. I presented two presentations from my research done at Western Illinois University. My podium presentation was entitled "Paddlefish Dam Passage Efficiency and Habitat Use in the Upper Mississippi River (Pools 14-19)". Findings from our study will provide preliminary data that will inform river managers on the effect of navigational dams on native migratory species as well as play an important role in determining potential effects of fish deterrent technology at navigational dams. My second presentation was entitled "Assessing Spatial Overlap Among Two Asian Carp and One Native Planktivorous Species in the Upper Mississippi River". Our study aims to quantify the degree at which invasive bigheaded carp compete with native planktivores in the Upper Mississippi River by assessing their spatiotemporal overlap. I hope my presentations provoked interest in Asian carp research and paddlefish conservation efforts to an audience that may not be exposed to these species.

I believe the allure of attending a national conference is the science sharing and networking opportunities from scientists of many different backgrounds and geological regions. Throughout the conference, I took advantage of the fantastic diversity of presentation topics provided at this conference. I think we can all agree that regional meetings can become redundant as we see familiar faces and presentations. I like that national conferences allow you to branch out and explore different people with varying perspectives, research topics, and strategies. Since there is not a cookie-cutter method of managing invasive species, it was important to me that I attended a variety of presentations that may inspire adaptations to my current and future research endeavors. Seeing an assortment of natural resource professionals sitting together during presentations was the most impactful experience of my conference attendance. Bringing scientists together into a room to discuss and work together about environmental concerns is how we are going to make the biggest impact. Interested and passionate scientists from all different disciplines trying to learn and tackle environmental concerns together is what gives me hope in a better and brighter future for our environment.

The 2019 Joint Annual Conference left me starstruck at the greatness and the sheer number of individuals invested in providing a better future for our environment. I would strongly recommend that every student attend a national conference at least once. If you want to become a better scientist, you should surround yourself with better scientists—and there's not a shortage of phenomenal researchers between the American Fisheries Society and The Wildlife Society. I would like to thank the Invasive and Introduced Fish Section of the American Fisheries Society for your financial support and assistance in my academic travel to the 2019 Joint Annual Conference. Without organizations like yours, I believe many students would suffer from a missed opportunity to attend such an impactful event. Thanks for believing in my research and for the privilege of being a recipient for the 2019 IISS Student Award!

Student Award Recipient Essay: Noland Michels

I am a master's student at the University of Minnesota Duluth and my work focuses on the predator avoidance behaviors of the invasive round goby and the native mottled sculpin. Mottled sculpin population declines have been observed in the St. Louis River and throughout the Great Lakes watershed and competition with round gobies has been the dominant hypothesis for why these declines occurred. Native populations often make a recovery, albeit never to their previous abundances, once invasive prey are incorporated into native predator diets, but this has not been observed in the St. Louis River watershed. My project focuses on the predator avoidance behaviors of both prey species under predation risk by multiple predators at multiple ecologically relevant light intensities. We hypothesized that round gobies have an inherent advantage escaping predators, which contributes to the suppression of mottled sculpin populations via increased predation on sculpin. Briefly summarizing the results, increased flight initiation distances (distance when prey flee from predators) paired with increased maneuverability (number of turns in a flee response) and greater escape angles (fleeing less often in front of or towards the predator) greatly reduce the number of round gobies consumed by predators compared to mottled sculpin.

While attending the American Fisheries Society's annual conference in Reno to present this work, I gained a lot of valuable information on aquatic nuisance species (ANS), especially on their contradicting nature. By this, I mean I have studied and have known the multitude of negative impacts ANS cause, but gained more knowledge on some species (such as the round goby) which also provide indirect benefits to the ecosystem by decreasing certain mercury levels in gamefish and supporting greater populations of predators due to the greater abundances they can reach compared to past native prey abundances. However, the later point also described the decline of the native macroinvertebrate populations based on increased round goby foraging which makes this such an entangled, complex issue. To increase complexity, many fisheries managers are now looking for information to decide on if/how they incorporate ANS into their management plans, to which we rarely have a solid answer. On one hand, the conservation of native species has always been rooted in saving our ecosystems, but at what economic and ecological cost? If eradication of ANS did occur, it would most likely take generations to reestablish the native prey and they most likely went through a genetic bottleneck, so how stable would the ecosystem remain? What would the native predators consume? What shocked me was the number of projects still looking to decrease or eradicate populations of ANS that have long been established even though many eradication attempts have only resulted in artificial selection pressures creating more resilient strains of ANS, which worries me. Through the conference, I have come to terms with the idea that unfortunately for the native species, ANS must be managed as a food source for native predators but minor control efforts could still be needed to not exceed the carrying capacity of the system. However, we must still continue monitoring as many uninvaded water bodies as possible to contain ANS to limit the number of ecosystems that undergo these rapid cascading changes caused by ANS introduction

I have attended multiple regional AFS meetings, but this was my first attendance at the national meeting. As a master's student, this was a great meeting to attend as it had a wide breadth of topics for a general audience, but also specific sessions with a very in depth look at certain fisheries-related problems. I would certainly recommend this conference for students, especially those who are looking to network with other professionals and looking for graduate school or job opportunities. Overall, I had a wonderful experience at the national conference and I cannot wait to see what is in store for the 2020 meeting!

Divisional Update: North Central Division

The Water Resources Reform and Development Act (WRRDA) of 2014 authorized the Director of the U.S. Fish and Wildlife Service (USFWS) to coordinate with the Secretary of the Army (through the U.S. Army Corps of Engineers (USACE)), the Director of the National Park Service (NPS), and the Director of the U.S. Geological Survey (USGS) to lead a multiagency effort to address the spread of Asian carp in the Upper Mississippi River Basin (UMRB) and the Ohio River Basin (ORB). Staff from Federal and State agencies and universities comprise the coordinating committees for the UMRB (i.e., states of Illinois, Iowa, Minnesota, Missouri, Wisconsin) and ORB (i.e., states of Alabama, Illinois, Indiana, Kentucky, Mississippi, Ohio, Pennsylvania, Tennessee, West Virginia). With the Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States (National Plan) as guidance, the UMRB and ORB coordinating committees developed supplementary action plans (Control Strategy Frameworks) to guide specific work in each respective basin.

Projects have been funded, in whole or in part, through USFWS funds provided for Asian carp prevention since 2015. Activities conducted within the main stem rivers and tributaries of the UMRB and ORB to protect those river basins from Asian carp fall within the following general categories: interagency coordination (e.g. strategy development, partnership operations); monitoring, early detection and rapid response; active prevention/control (e.g. physical removal of Asian carp, implementation/operation of barriers); research and development; outreach with industry, stakeholders, and the public; law enforcement/regulatory actions.

Projects selected for funding in FY20 for the UMRB include: 1) early detection of Asian carp on the invasion front in the Upper Mississippi River, 2) evaluation of controls, impacts and behavior of Asian carp in the lower Upper Mississippi River, 3) contract fishing for Asian carp detection and removal, 4) evaluation of fish passage for assessment of Asian carp deterrents at multiple locks in the Upper Mississippi River, 5) conceptual framework development to integrate Asian carp management with USACE activities.

Projects selected for funding in FY20 for the ORB include: 1) early detection and evaluation of Asian carp removal in the Ohio River, 2) abundance and distribution of early life stages of Asian carp in the Ohio River, 3) control and containment of Asian carp in the Ohio River, 4) deterrent planning for Asian carp in the ORB, 5) quantifying lock and dam passage, habitat use, and survival rates of Asian carp in the Ohio River, 6) evaluation and removal of Asian Carp in the Tennessee and Cumberland River Basins, 7) relative population densities and movement of Asian Carp in the Tennessee and Cumberland Rivers.

More information on Asian carp activities in the UMRB and ORB along with their action plans, monitoring response plans, contingency plans, interim summary reports, and WRRDA reports can be found on AsianCarp.us at http://www.asiancarp.us/PlansReports.html.

Kim Bogenschutz
Aquatic Invasive Species Program Coordinator
Iowa DNR

Divisional Update: Southern Division

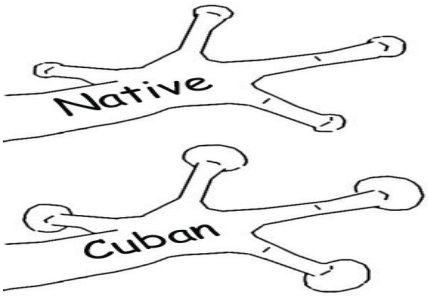
A lot is happening in the world of aquatic invasive species, and the Southern region of the US faces a plethora of challenges from hundreds of species. This has a lot to with how the climate of the southeast matches the climates of the invading species that often outcompete our native wildlife and plant species. Many people are familiar with the expansion of Asian carp in the Mississippi, Ohio, and Tennessee River basins, and impacts of large constrictor snakes in the Everglades region of Florida. The state of Florida has its hands full trying to manage, contain, and prevent further expansion to neighboring states. As an example, let's take a closer look at the Cuban treefrog.

The Cuban treefrog is a large, primarily mesophytic forest-dwelling hylid of the West Indies. It was first recorded in Miami in 1952 (Schwartz 1952) but had dispersed northward to central Florida by the mid-1970s (Meshaka 1996). This West Indian species is easily dispersed in plant shipments, especially in the leaf axils of cultivated palm trees (Meshaka 1996). Females may attain a body length of 12.7 cm (5 in), but males are smaller and shorter lived. This species has much larger toepads and a wartier skin than our native treefrog species. The ground color may be tan, gray, brown, or olive green, and there may or may not be a pattern present. https://myfwc.com/wildlifehabitats/nonnatives/amphibians/frogs-and-toads/cuban-treefrog/

Unfortunately, nothing was done at the time to eradicate or contain these frogs in Florida, and now are common all over Florida, have expanded into Georgia (2018 & 2019), Louisiana (2016), and South Carolina (2019). The Cuban treefrog was reported in the Audubon Zoo elephant enclosure in New Orleans in 2016, and in the Charleston, SC area, likely transplanted in palm trees imported from Florida.

So what's the big deal about another tree frog species? "Homeowners may be familiar with the nuisance species as they have noxious skin secretions, lay their eggs in bird baths and fish ponds, and they can clog plumbing and cause power outages by short-circuiting utility switches where they seek refuge," said USGS Research Ecologist Brad Glorioso, the lead author of the study (in *Biological Invasions*, accessed online at https://rdcu.be/Meqv). https://www.usgs.gov/news/invasive-cuban-treefrogs-leap-out-florida-establish-first-known-population-louisiana. Cuban treefrogs are known to consume insects, crickets, cockroaches, smaller frogs, lizards, hatching birds and small snakes. The impact to our native frogs has not yet been determined, but given they grow much larger than native treefrogs, displace native treefrogs, and eat other frogs, including their own species, chances are our native frogs are in trouble. "A decline in native treefrogs could have consequences, since frogs act as both predator and prey in food webs." (B. Glorioso).

Cuban treefrog. Credit: Brad Glorioso, USGS. Public domain.



https://ufwildlife.ifas.ufl.edu/frogs/cubantreefrog.shtml

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Divisional Update: Southern Division

So how do you know if there are Cuban treefrogs in your area? By their call (please visit https://www.usgs.gov/news/invasive-cuban-treefrogs-leap-out-florida-establish-first-known-population-louisiana for frog call audio). Cuban treefrogs' call is distinctive (USGS 2018). Green treefrogs call from their favorite habitat, rivers and lakes (USGS 2018). They're native to Louisiana and to Florida. Squirrel treefrogs are also native to Florida and Louisiana (USGS 2018). Hear them calling from ditches, puddles and other ephemeral pools of water.

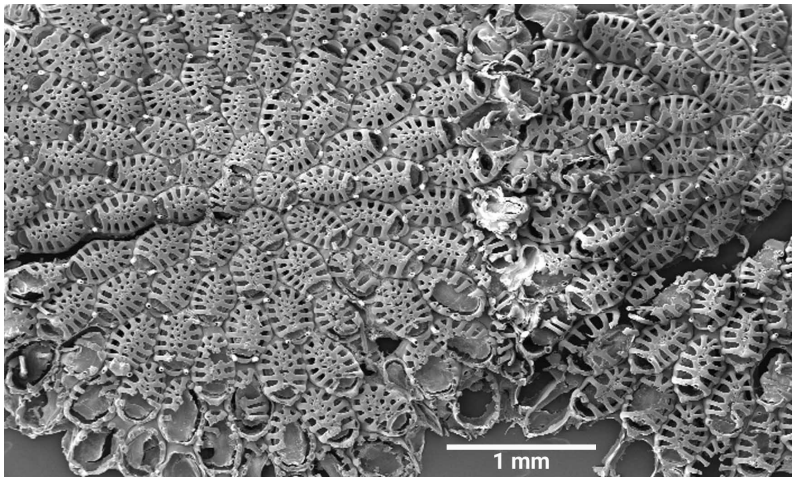
For more information on the Cuban treefrog or any other aquatic invasive species, you can sign up for notifications on the USGS website: https://www.usgs.gov/ecosystems/invasive-species-program

In addition, USGS has developed a number of tools to model potential expansions from floods and other natural disasters which can be found at: https://nas.er.usgs.gov/

Cindy Williams

Divisional Update: Northeastern Division

The cribrimorph bryozoan *Cribrilina* (*Juxtacribrilina*) *mutabilis* (Ito, Onishi and Dick, 2015), originally described from Hokkaido, Japan, is reported for the first time in the Gulf of Maine and the whole of the Northwest Atlantic coast. In September 2018, numerous colonies of *C. mutabilis* were collected from eelgrass (*Zostera marina* Linnaeus, 1753) beds near Clapboard and Mackworth Islands, and Hog Island Ledge, all located within inner Casco Bay, Maine. Bryozoan colonies encrusted eelgrass, rockweed (*Ascophyllum nodosum* (Linnaeus) LeJolis, 1863), and laminarian drift algae. Situated near the discovery location, the city of Portland (Maine, USA) is an active seaport, suggesting introduction through shipping as a likely introduction mechanism. The North Sea is hypothesized to be the most probable area for the source population. Since *C. mutabilis* appears to have high potential for introduction, it likely occurs on other parts of the Northwest Atlantic coast where it has yet to be identified and recorded.



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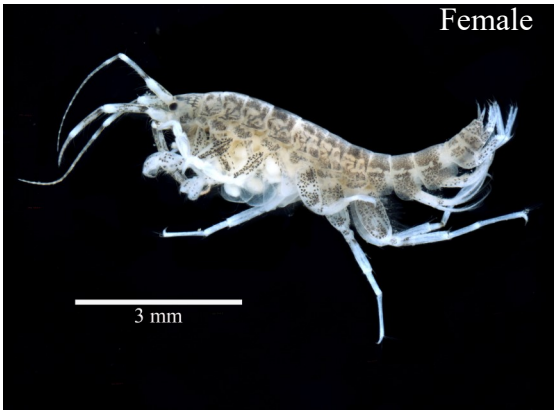
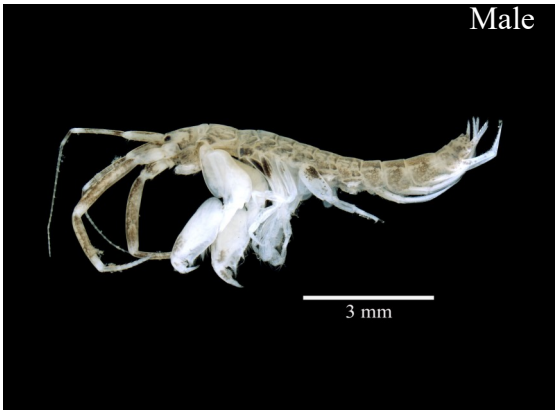
Divisional Update: Northeastern Division

The aorid amphipod *Grandidierella japonica* Stephenson 1938, originally described from northern Japan, is reported for the first time from the Gulf of Maine and Long Island Sound in the Northwest Atlantic Ocean. It was discovered among grab samples of eelgrass (*Zostera marina* Linnaeus 1753) beds taken in Casco Bay, Maine in summer 2018 and has been found intertidally in Long Island Sound since 2013 along Connecticut shores. It occurs in habitats like its native range but also in rocky areas and tidepools in bedrock. The presence of adults of both sexes, ovigerous females, and immature stages in all collections indicates the species is established. Among males, some morphological characteristics of gnathopod 1 vary with increasing total body length: the number of accessory carpal teeth increase, the carpus shape (length/width ratio) changes, and number of stridulating ridges increase. Maine and Connecticut specimens are distinguished from each other by the shape of male gnathopod 1 basis. Morphological variation, temporal differences in discovery, and separation by the biogeographic barrier Cape Cod suggests Maine and Connecticut populations originate from separate introductions.





Thomas Trott - Department of Marine Resources (Maine Coastal Program)
Claire Enterline - Department of Marine Resources (Maine Coastal Program)
Eric Lazo-Wasem - Yale University (Peabody Museum of Natural History)

2020 National AFS Meeting

Call for assistance:

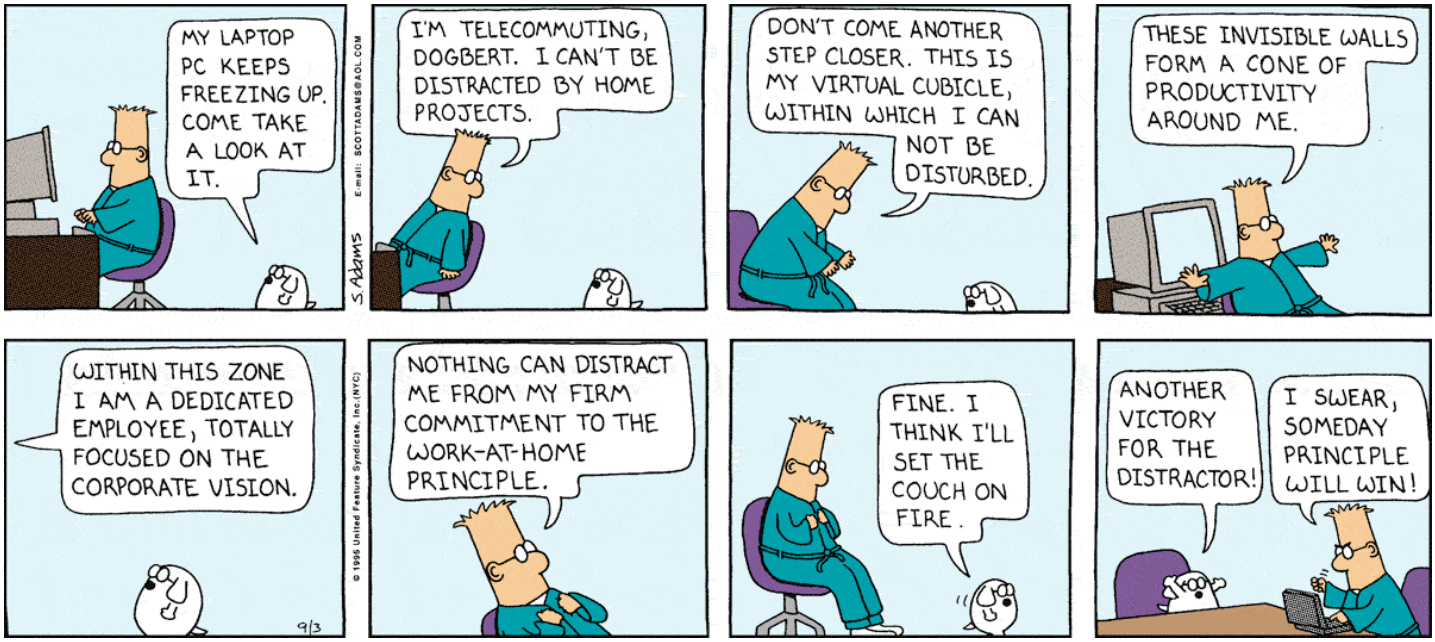
The Invasive and Introduced Species Section (IISS) of the American Fisheries Society will be hosting a booth at the trade show for the 150th Annual Meeting in Columbus, OH. The booth will be focused around 150 years of aquatic species introductions. We are seeking assistance to develop the booth, create visuals, and sit at the booth during the meeting. Assistance from students and young professionals is particularly useful (some funding support may be available for students), but all help is appreciated. For additional details please contact Marybeth Brey at mbrey@usgs.gov.

Student Travel Award Announcement:

The Invasive and Introduced Species Section (IISS) is offering up to two $500 awards to support student travel to the American Fisheries Society Annual Meeting in Columbus, OH, August 30 – September 3, 2020. Any student receiving funds must be a member (or become a member) of the IISS, give an oral or poster presentation on research involving introduced aquatic species, and attend the IFS Business Meeting. All eligible students (PhD, MS, or undergraduate) are encouraged to apply. The application will be reviewed by the Selection Committee made up of members of the IISS.

A form (available at: https://introducedfish.fisheries.org/ifs-student-travel-award/) plus a brief Curriculum Vitae (an additional max. 3 pages) outlining research experience, publications (including in prep), presentations, and professional involvement, must be returned by email no later than May 1, 2020. Be concise with your answers. Applications that do not follow these guidelines will not be considered. Email completed forms to the Chair of the Selection Committee (Marybeth Brey; mbrey@usgs.gov) with the subject heading "**IISS Travel Award Application**".

Lighter Side



"Dilbert" funny from Sunday, September 3rd 1995

Section Objectives

The *Invasive and Introduced Species Section* (hereafter referred to as Section) was organized as a subunit of the American Fisheries Society under bylaws approved on August 26, 1990. In 2019, members voted to change the name from *Introduced Fish Section* to *Invasive and Introduced Species Section* in order to more accurately reflect the Section's interests and focus. The Section has six major objectives:

1) To develop and maintain and association of persons interested and involved in the use of introduced and other aquatic organisms,

2) To coordinate and develop programs to advance the knowledge and concerns related to introduced species,

3) To provide a forum for identifying and bringing attention to bear on the beneficial and potentially harmful impacts of introduced species,

4) To encourage communication among scientists, administrators, managers, educators, aqua- culturists, and others interested in introduces species,

5) To assist federal, state, and private groups in making informed decisions on introduction of species, and

6) To advise private industry in developing procedures for the safe handling of introduced species intended for closed system maintenance and culture.

Call for Newsletter Articles

Pathways is always looking for new information and articles to include in future issues. Articles may include ongoing research, notable governmental policy and program changes, stories of successful or unsuccessful invasive and introduced aquatic species management, or artistic renderings of these organisms (e.g., poetry, pictures, and paintings). Additionally, *Pathways* would like to provide readers a list of recently published journal articles in order to help communicate information amongst Section members. If interested in submitting an article to *Pathways* or providing a citation for a recent publication, please contact Seth Love at: Seth.Love@Illinois.Gov