



Invasive and Introduced Species Section

September 2020 Volume 23: Issue 2

<https://introducedfish.fisheries.org>

President's Vector

Invasive and Introduced Species Section members!

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This year has certainly been interesting, we have all felt it, but I wanted to let you know that your Executive Committee and the membership was busy throughout. We were working hard to present a symposia in Columbus “Tails from the Anthropocene—stories and lessons from 150 years of aquatic introductions and their impacts on fisheries”. With the cancellation of the in person meeting we decided that this would be best saved until 2021, if you are still interested in assisting with this project we still need your help to keep up interest, please reach out to ExCom members. We had a good virtual meeting this summer where we were able to settle on some basic editorial changes to our by-laws, we are in progress of getting the parent society review and Governing Board approvals of these edits. During this COVID crisis we continue to provide communications on the yahoo listserv, the webpage, and Facebook on topics important to us all. Do you have something the membership would like to hear about? We have these online forums and this newsletter, please share!

I want to make sure you are aware of two important dates. First, **and currently**, AFS is having a Virtual Annual Meeting, see flyers attached and message from Executive Director Doug Austen below. Most if not all content is recorded and can fit into your busy schedules. What a novel way to keep our Society moving, thanks to our leadership for thinking out of the

box! Second, we will be having our annual business meeting virtually as well (**October 1 at 4:00 PM Central time**; links following) and to be provided on AGENDA. Please also expect a Calendar invite soon, thanks Seth for all the great work on newsletter, website, and communications. During this meeting I will pass the gavel to president elect Marybeth Brey, and with a quorum we will receive recommendations for president elect, and other vacant positions (let excom know if you are interested in service of the Section!). I am excited for the changes for obvious reasons, but also to see what the next few years have in store for our Section.

The future is bright however, we are learning to support each other more and we should all be looking out how to support those that need it. We have a great group of leaders as we prepare the 2-year leadership transition. Let me encourage you that working with the Section and AFS Governing Board has been a great experience. There is a reason that AFS leads professional societies and that starts in these groups and our peers.

I want to thank the Section for the opportunity to represent you, we have had several great symposia and CHANGED OUR NAME during these past couple years. I have fostered great professional relationships further as well. I wish Marybeth all the best and will be supporting her work and the Section for the next 2-years. My final thoughts are to encourage others for various backgrounds and geographical reaches of the Section to contribute in leadership and engagement with the Section.

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President's Vector

This section is here to help respond to some of the aquatic environments challenges across all of our systems. WE NEED YOU!! - I know not original, but it is true, this is your section, our Society so please consider how you can best engage and support. This will not only help the management of these systems but I will challenge you that this will develop your skills to manage these better. Please see the list of Executive Committee contacts on page 3.

Enjoy the virtual meeting, and see or hear all you on Oct 1!

Kevin

Soon to be past-president, Invasive and Introduced Species Section - AFS

Message from Doug Austen, Executive Director AFS and see attached flyers!

Greeting AFS Leaders - Past and Present

Today starts our first ever AFS 2020 Virtual Annual Meeting. It promises to be an excellent event with the traditional AFS focus on science but also with plenty of new virtual events to address important and timely issues as well as fisheries around the world. We do need your help to make this a success by encouraging registration and to find additional auction donations .

The Silent (and Virtual) Auction - This is a fundraiser to support student travel and other AFS activities. It is also meant to be a fun way for members to share their love of the outdoors with others. Do you like to go fishing and can take someone with you? Have a cabin that you can share for a weekend? Know a guide or resort owner who would donate to help this important cause? Have a hobby that results in a product that can be donated? Please consider making a donation. I'll freely admit that I'm not the best angler on the Susquehanna River but I've donated a day in either my jet boat or kayaks to take people on the water. I know that I can provide a good lunch, the river is beautiful and maybe (I hope) the fish will cooperate. Jim Bowker and Jesse Trushenski are offering a raft and fly fishing trip on the spectacular Yellowstone River. Brian Murphy is offering a day on the amazing New River in Virginia. Certainly many of you could also make a donation!

Fliers are attached. Please pass on this request to your unit members and anyone you know that could make a donation. More information and the current list of items are found at: <https://afsannualmeeting.fisheries.org/silent-auction/>

If you have any questions, please contact Debby Lehman (dlehman@fisheries.org) or Laura Hendee (lhendee@fisheries.org)

Registrations needed - This morning we're at 1,132 registered for the annual meeting. This is far lower than what we expected and what we should get for this event. We need your help to push this out to your membership. The value for the content is simply amazing and people need to take advantage of this event. There is literally something for everyone. Please push registration out to all of your chapter and section memberships. An annual meeting flier is attached. If you haven't registered, please do so but, more importantly, encourage your unit members and non-members and colleagues to participate in these two weeks of annual meeting activities.

Best regards and I hope to see you online at the AFS 2020 Virtual Annual Meeting.

Doug

**Invasive and Introduced Species
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Editor's Note

Hi Everyone! I can't believe it's time yet again for another *Pathways* issue. I don't know about you, but it feels like Summer just started and yet it's already the second week in September. I do enjoy this time of year, when the temperature starts to drop. Brings back plenty of good camping and hunting memories, but I digress...As usual, I think we have a really good issue lined for your reading pleasure. Amy Benson (NAS USGS) wrote another great article on invasive species ranged expansions, this time focusing on the Oriental Weatherfish (*Misgurnus anguillicaudatus*). Additionally, the Weyl Lab kindly put together a pre-presentation summary of their research taking place at the South African Institute for Aquatic Biodiversity. This is only an appetizer, and you should still tune into their upcoming presentations that are part of the upcoming (Virtual) National AFS Meeting. Additionally, I want to express my deepest gratitude to Kevin Irons for his hard work as President of IISS these past few years. He has been instrumental in keeping this Section churning along. Fortunately, he'll be able to continue influencing and provide valuable guidance/insight to the Section as Past-President. That said, I also want to extend a very warm and sincere welcome to Marybeth Brey as she (shortly) takes the helm as the new President of the Section. I look forward to seeing what her Presidency has in store for the Section!

Good Reading,

Seth Love
Newsletter Editor

Upcoming Events

What: AFS Virtual Meeting

When: Monday, September 14th to Friday, September 25th

Visit <https://afsannualmeeting.fisheries.org> for more information

What: IISS (Virtual) Annual Business Meeting

When: Thursday, October 1st; 4:00-5:00 PM **CST** (5:00-6:00 PM **EST**)

Call In: 1-312-535-8110 (United States Toll)

1-415-655-0002 (US Toll)

Meeting number (access code): 133 390 6342

Notes: **Agenda soon to follow**

Introduction of the Oriental Weatherfish, *Misgurnus anguillicaudatus* (Cantor, 1842) in the United States

Although this fish had been present in the then United States (US) territory of Hawaii since the late 19th century, a growing number of collections in the contiguous US over a century later in the 2000s is noteworthy. The Oriental Weatherfish, also often referred to as the weather loach or dojo, is native to eastern Asia from Siberia to Vietnam thus covering a wide climatic range from temperate to subtropical. Primarily a freshwater species, it is typically found in cool, slow-moving streams with silty or muddy substrates. Individuals can reach 28 cm standard length but usually range from 10-20 cm with females generally larger than males. This species has a very slender body shape with a mottled coloration pattern of brown to green markings and a rounded caudal fin. Surrounding its small inferior mouth are 10 barbels and prey consists of small benthic invertebrates including aquatic insects. It is known to bury itself in the substrate to survive periods of drought as well as breathe air using its intestine as an accessory respiratory organ.

The occurrence of this species in Hawaii beginning in the late 1800s was likely due to Asian immigrants bringing it with them as a food source. *Misgurnus* was later used in the state as a baitfish. The introduction of this species in the contiguous US occurred in 1939 when it was imported into the state of Michigan from Japan for the aquarium trade. The first collection made in open waters was from the Shiawassee River, northwest of Detroit, in 1958 and they are believed to have escaped from a nearby aquaculture breeding facility. Based on the linear extent of captures in the Shiawassee River, the fish had likely been present for years prior to its discovery. By 1985, specimens had also been collected from waters of California, Idaho, Oregon, and Washington. Since then, collections have been made in 15 additional states, mostly in the Atlantic (including Gulf of Mexico) and Great Lakes drainages. Collections made from the Mississippi River basin have been limited to the upper Illinois River in Illinois, and the upper Ohio drainage in central Ohio and southwest New York. Overall, *M. anguillicaudatus* has been collected in the following states (with year of first collection): Hawaii (~1870), Michigan (1958), California (1963), Oregon (1977), Washington (1978), Idaho (1985), Illinois (1987), Florida (1988), Tennessee (1995), New York (2001), Indiana (2002), Louisiana (2005), Maryland (2007), Alabama (2009), North Carolina (2009), New Jersey (2007), Pennsylvania (2017), Ohio (2019), and Virginia (2019). An anecdotal report states that it may also be present in Utah. *Misgurnus anguillicaudatus* has been reported as established with stable populations in most of the locations in these states although some are small in the reported number of individuals or range extent. Exceptions may be Maryland, Tennessee, and Virginia where only a few specimens have been reported from each state. Three areas of the US in particular appear to be undergoing either substantial range expansions or further introductions. These areas include the upper Illinois River and various waters of both western peninsular Florida and southeastern New York. Because of the limited number of reports yet broad fragmented distribution of *M. anguillicaudatus* in the US, each population is likely the result of a separate introduction as opposed to dispersal from the earliest collection location. A majority of the collection locations are clustered in or near large metropolitan areas which reflects probable releases by aquarium hobbyists.

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Introduction of the Oriental Weatherfish, *Misgurnus anguillicaudatus* (Cantor, 1842) in the United States

Two related species from China have also been collected in the US. A single specimen of the congener, *Misgurnus mizolepis* Günther, 1888 Chinese Fine-Scale Loach, was collected in 1977 from an irrigation canal in the Powder River drainage, a part of the Snake River drainage in Oregon. It is not known to be established in Oregon or elsewhere in the US. The second species, *Paramisgurnus dabryanus* Dabry de Thiersant, 1872 Large-Scale Loach, was discovered in 2014 and is known to have a small established population in the San Joaquin River of California.

Misgurnus anguillicaudatus shares a number of characteristics with other successful invaders that allow it to adapt to wide environmental conditions when introduced into novel waters. Dietary studies have suggested that predation on native invertebrates leads to diet overlap with native species. However, there have been few studies on impacts to native fish and benthic communities in the United States other than inferred from predation on invertebrates, fish eggs, and tadpoles. We can expect natural dispersal of existing populations as well as additional introductions from aquarium and bait bucket releases and fish farm escapes. For more information: <https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=498>

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Invasions Research News from South Africa from the Weyl-Lab

In the context of inland fisheries and freshwater ecology, alien biota are a major consideration in southern Africa. In South Africa for example, alien Common Carp, Rainbow Trout and Largemouth Bass were stocked to enhance fisheries when native fish communities were perceived to contain few fish species with the fast growth rates and large size that is of interest to fisheries. Similarly, the freshwater aquaculture sector has relied heavily on the use of alien fishes and crayfishes. While the introduction of these species has resulted in economic benefits, their impact on indigenous biota have been severe. This has led to conflicts between interest groups and developing management strategies to limit impact on native biota while maximising economic and food security impacts poses a “wicked problem”. A key research area of the Weyl-Lab at the South African Institute for Aquatic Biodiversity is to contribute towards better understanding the role of alien fish introductions for fisheries, the risk of invasions, and subsequent ecological consequences. Here I would like to introduce some of my lab members who are presenting invasion-related research at this year’s virtual conference.



Olaf Weyl with a Largemouth Bass in South Africa. Largemouth Bass was introduced to

Most visitors come to Addo Elephant National Park, in the Eastern Cape of South Africa, hoping to see the big game. Few know that within the park, small streams are home to populations of native fishes including genetically unique populations of Eastern Cape redbfins (*Pseudobarbus afer*). Unfortunately, these small fish are at risk due to the presence of alien Largemouth Bass. For more than ten years the SAIAB team have been monitoring fish populations in these streams, including in 2019 after a period of extreme drought. Dr Josephine Pegg has been leading recent research efforts into investigating the combined risk of drought and invasive species to small stream communities in this park. She found large stretches of the stream dry, yet within the remaining wet refuges both Eastern Cape redbfins and Largemouth Bass persisted but never in the same pool. The combined threats of climate change and invasive species may seem catastrophic but this work highlights how healthy heterogeneous aquatic environments can aid the survival of threatened native species.



Josephine Pegg with a native Smallmouth Yellowfish



Surveying streams in the Addo Elephant National Park.

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Invasions Research News from South Africa from the Weyl-Lab

Casey Broom, a PhD candidate in the Weyl-Lab, is working on the Rondegat River, situated in the Cape Floristic Ecoregion biodiversity hotspot of South Africa. The Rondegat River is regarded as a keystone case study for the control of invasive alien fishes and recovery of an imperilled native fish community. This study looks at the recovery of the native fish community by monitoring fish abundance and their responses to degraded habitat for eight years after non-native fish were removed using piscicide in 2012. [He](#) used snorkel



The Eastern Cape Redfin is just one of the native species threatened by Largemouth Bass predation

surveys and underwater camera footage to assess changes over the monitoring period. The snorkel surveys demonstrated that no non-native smallmouth bass were detected following the intervention and that native fishes rapidly re-colonised the previously invaded river zone. In 2017 native fish densities in the treated area were similar to those in previously uninvaded environments. We initiated a more intensive underwater camera



Casey Broom with his underwater video setup on the Rondegat River

survey in April 2018 to assess the fish community's response to additional threats, such as a man-made fire and habitat degradation resulting from this. Surveys in 2019 and 2020 enhanced the ongoing monitoring programme by use of stereo remote underwater video (S-RUV) systems. He investigated fish community habitat use and population dynamics using data from these systems. These surveys indicated that the Rondegat fish assemblage shows signs of resilience to sedimentation, altered habitat and drought conditions.

To better understand the ecological interactions between alien and native species Lubabalo Mofu has been looking into the feeding ecology of fishes in irrigation ponds using gut content and stable isotope analyses to better understand the interactions between introduced Mosquitofish (*Gambusia affinis*) and Mozambique Tilapia and native River Goby and Estuarine Roundherring. Stable isotope and gut content analyses showed that while there is isotopic overlap in the diet of the four species, the prey of each species suggests more conservative competitive interactions between species. This suggests lower than expected competition between Mosquitofish and other fishes in these pond communities.



Lubabalo Mofu with a Common Carp. Common Carp have been in South Africa since the late 18th Century.

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Invasions Research News from South Africa from the Weyl-Lab

In Zambia, Post Doctoral Researcher Dr Josie South and PhD candidate Takudzwa Madzivanzira have been working on alien Australian Redclaw Crayfish in the Zambezi Basin. The Zambezi basin has been invaded by the Australian Redclaw Crayfish. The species was initially introduced both accidentally and intentionally for aquaculture purposes. Due to crayfish being omnivorous and consuming at every level of the food web, this invasion has a high likelihood of posing severe threats to the ecological and economical integrity of the invaded areas. Unfortunately, relatively little is known about what is one of the most biodiverse and over-exploited freshwater systems in the world. In an attempt to assess the extent of the invasion they completed field surveys in nine systems across three countries, deploying 982 traps. They found the invasion core and front to be on the Barotse floodplain in Zambia and there have been reports of individual crayfish being found 160km downstream and 125km upstream from here. A concern has been that the crayfish will compete with similar native species, such as freshwater crabs, for resources and that they may cause localised population declines. We compiled data on crab occurrence, abundance and



Takudzwa Madzivanzira holding a basin-full of Australian Redclaw Crayfish and Josie South attracts an audience while prepping traps on the Barotse Floodplain in Zambia.



In Africa native freshwater crabs are likely to be impacted by invasive crayfish

morphology during the crayfish surveys and found no evidence of differences in crab abundance or body condition when crayfish were present compared to the uninvaded systems. These are positive results as they suggest that the native crabs show some resistance towards the invasion. This evidence goes against the commonly accepted notion that species with no co-evolutionary history will usually be disproportionately affected by successful invasive species. Crayfish are opportunistic scavengers and tend to entangle themselves into fishing gears while feeding on caught fish. This destroys both fish and the nets, which can incur cost to the individual fisher. This is could be a particularly damaging phenomenon in areas with high abundances of crayfish. Unfortunately, crayfish are also able to catch and consume high numbers of juvenile fish and invertebrates which could be having knock on effects in terms of fish recruitment and consequently fishers catches. Understanding the trophic dynamics of the crayfish invasion in the Zambezi system remains key to determining what mitigation strategies may be effective, as well as understanding the interplay with socio-economic nuances across the region.

Invasions Research News from South Africa from the Weyl-Lab

For these and other contributions by the Weyl lab at AFS2020, make sure that you look out for the following talks:

*The Importance of Respecting Culture, Practicing Inclusivity, and Enabling Participation When Leading Diverse Teams in Southern Africa (Weyl #43876).

*The Combined Risk of Drought and Invasive Species to Small Stream Communities in a South African National Park (Pegg #43945).

*Feeding ecology of co-occurring fishes in the Sundays River valley irrigation ponds, assessed using stable isotope and gut content analysis (Mofu #44146).

*Native Fish Recovery, Habitat Associations and Management Following the Eradication of Invasive Predatory Fish from the Rondegat River, South Africa (Broom ID# 44078).

*Microhabitat Utilisation By Small Fish Communities in the Kabompo River, a Large Zambezi River Headwater Tributary in Zambia (Rennie #44094).

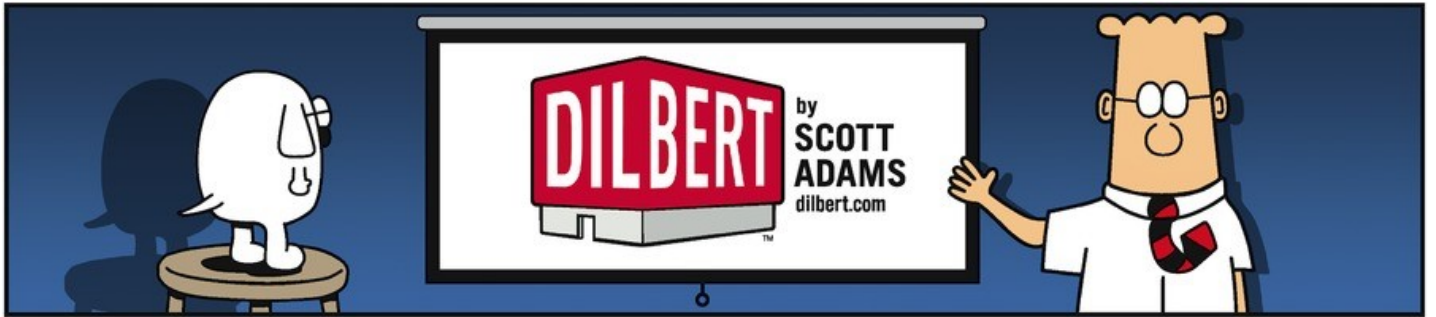
*Invasive Crayfish Have a Predatory Advantage over a Native African Freshwater Crab at Higher but Not Lower Temperatures" (Madzivanzira #44002)

*A Wild Combination: Fluoxetine and Microplastics Alter Strength of Invertebrate Foodweb Interactions" (South #44080)

*Australian Aliens in the Zambezi Basin: Ecological and Human Dynamics of Crayfish Invasions in Southern Africa" (South #44345)

*Evaluation of Two Mechanical Removal Methods for Invasive Australian Redclaw Crayfish (*Cherax quadricarinatus*) Populations in Southern Africa" (Madzivanzira #44014)

Lighter Side



"Dilbert" funny from Sunday, May 2nd 2010

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