



Invasive and Introduced Species Section

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<https://introducedfish.fisheries.org>

Editor's Note

Inside this Issue

Contact List: pg. 2

Symposia: pg. 3—4

ANS News: pg. 5 - 9

Newsletter Note: pg. 10

New ANS Book: pg. 11

Hello Everyone!! My sincere apologies this is so late. Once again, I have another issue of *Pathways* for your reading pleasure! We have some fantastic research/management updates as well as some information about a new ANS book that has recently been published. **Also, please check out the symposium that our section is sponsoring as well as a very relevant symposium sponsored by the AFS Fish Management Chemicals Committee and Central Life Sciences.**

As always, if you have anything you'd like to include in the newsletter, please don't hesitate to send it to my email address on the following page.

Good Reading,

Seth Love
Newsletter Editor

Upcoming Events

What: 154th AFS Annual Meeting

When: September 14th - 19th

Where: Honolulu, Hawaii

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

What: IISS Annual Business Meeting

When: TBD

Where: TBD

Call In Option: TBD

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SYMPOSIA FYI

Symposium: Versatile Rotenone: Managing Fisheries, Recovering Species, and Eliminating AIS

Organizers:

Brian Finlayson, California Dept. Fish and Game (Retired)
(briankarefinlayson@att.net)

Don Skaar, Montana Fish, Wildlife, and Parks (Retired)
(skaar.fcs@gmail.com)

Supported By: AFS Fish Management Chemicals Committee and Central Life Sciences

Abstract: Fish management in North America has long relied on the rotenone. Despite being one of the most versatile, well-studied, safe, cost-effective, and valuable tools available, challenges remain. Regulatory agencies continue to question rotenone’s safety, while the public is often misinformed and leery of the need for rotenone. More work is required to overcome these hurdles. The symposium focuses on messaging for engaging the public, using fish and wildlife coalitions to build project support, and using standardized methodologies that focus on environmental stewardship to achieve the desired outcome while minimizing impacts. We welcome presentations on rotenone’s role in sports fisheries, AIS control, conservation of native fishes and amphibians, and restoration of native wetlands. The symposium will start with a summary of current constraints and end with a discussion on various viewpoints and corrective actions. Limited financial assistance is available for travel (contact one of the symposium organizers for information).

When: Wednesday, September 18th
8:00 AM—5:30 PM

Where: 301A

SYMPOSIA FYI

Symposium: Adapting Introduced and Invasive Species Management Under Shifting Environments

Organizers:

Alison Coulter, South Dakota State University, Alison.Coulter@sdstate.edu

Hannah Mulligan, South Dakota State University

Wesley Daniel, U.S. Geological Survey

Marybeth Brey, U.S. Geological Survey

Nathaniel Lederman, Wisconsin DNR

Seth Love, Illinois DNR

Supported By: Introduced and Invasive Species Section

Abstract: Anthropogenic changes to the landscape and climate require fisheries managers to employ flexible and adaptive management strategies ensuring continued resource availability. Introduced and invasive species management has embraced flexibility, adaptation, and innovation out of necessity as new species of concern emerge, novel technologies are developed, and habitat is modified. Introduced and invasive species management can offer a wealth of examples and strategies for how other fisheries managers can ensure resilience in their systems in the face of changing climatic conditions. The Introduced and Invasive Species Section invites submissions to this symposium that highlight how introduced and invasive species management is adapting to climate change with the use of novel management strategies, models, innovations, and collaborations.

When: Thursday, September 19th
8:00 AM to 5:30 PM

Where: 301A

Risk of Aquatic Invasive Species Spread through the Live Bait Trade

Angler disposal of live baitfish into waterbodies from which they were not originally harvested remains a high-risk pathway for the introduction of invasive species. We assessed the role of bait retailers and anglers in aquatic invasive species (AIS) risk through three collaborative projects that 1) assessed the presence of Silver Carp and/or Bighead Carp (collectively known as bigheaded carp) environmental DNA (eDNA) in bait retailers and risk factors that may influence its presence, 2) surveyed anglers to determine AIS awareness and compliance with bait use regulations, and 3) conducted a telephone survey of bait retailers to assess how business practices influence AIS risk and willingness to display educational signage, if provided

For the first project, we purchased baitfish and collected water samples from 112 bait retailers in North Dakota, South Dakota, Nebraska, Kansas, and Iowa in 2022. We initially sampled 100 bait retailers (20/state; 2x water samples per bait shop apart from one bait shop). Later in the year, we sampled an additional 30 bait retailers in South Dakota, 18 of which were sampled initially and 12 of which were new bait retailers. Bigheaded carp DNA was present in 15 of the 259 (~6%) water samples collected (North Dakota = 1; South Dakota = 9; Kansas = 1; Iowa = 4; Nebraska = 0). For educational signage, 13 of the 112 bait retailers (12%) displayed educational signage regarding baitfish release and/or invasive species. Additionally, 17 out of the 112 bait retailers (15%) had non-advertised species present within purchased baitfish. Most positive detections were recorded within the current range of bigheaded carp; however, there were two positive detections in South Dakota outside their current range. Distance was the best predictor of positive eDNA detections and likelihood of eDNA detection increased with as distance to recorded bigheaded carp observations decreased.



We then assessed anglers' (103 respondents) live bait regulation knowledge and awareness of bigheaded carp upstream (bigheaded carp absent) and downstream (bigheaded carp present) of Gavins Point Dam near Yankton, South Dakota. Responses were not significantly different for anglers that participated in recreational fishing above, below, or both above and below Gavins Point Dam in 2022, so we averaged the percentages across locations and calculated standard error (\pm SE). Most anglers (70%) used live baitfish and 57% (\pm 3.14) participated in 'high risk' baitfish practices including giving bait to another angler, releasing into the waterbody, retaining, or using in another waterbody. 6.85% of anglers reported directly releasing baitfish into a waterbody. Additionally, 40% (\pm 3.34) of anglers had not received any information on bigheaded carp, only 2% (\pm 1.31) were able to solely identify both juvenile bigheaded carp on an image collage of bigheaded carp and native species, and 48% (\pm 4.48) correctly identified that carp were present below the dam and not above the dam. We found that physical boundaries (Gavins Point Dam) may not influence variation in baitfish use or invasive species knowledge. Alternatively, demographic characteristics, such as age and distance traveled to fishing location, may have a larger influence on invasive species risk. For instance, age appeared to influence information source and knowledge as older anglers (54+) had not received any information while younger anglers (<54) primarily received information from electronic media sources.

Risk of Aquatic Invasive Species Spread through the Live Bait Trade

Finally, we conducted phone surveys of 66 bait retailers across eastern South Dakota to collect information on bait retailer characteristics that could influence AIS risk and AIS prevention efforts. Most bait retailers used water for their baitfish tank from a potable source or tap water (97%) which reduced the risk of invasive species presence since raw water may contain microscopic AIS (e.g., Zebra Mussel veligers). Bait retailers sold Fathead Minnows (96%) and obtained baitfish from wholesale retailers (74%) or local harvesters (24%), which could influence risk depending on where baitfish is harvested. Regular inspections for species not advertised for sale were conducted by 74% of retailers, and 35% had observed fish species they did not purchase. However, bait retailers only encountered fish species they did not order ~1% of the time. Bait retailers were interested in displaying provided educational materials (80%), especially posters and pamphlets (59%).

Our cumulative results found that baitfish harvest is likely occurring in waters with bigheaded carp and additional outreach and education is needed to reduce knowledge gaps and increase personal responsibility. Outreach and inspection efforts should be conducted near invasion fronts to limit AIS spread. State and federal agencies could provide signage to various actors in this pathway, especially bait retailers, as education is vital for increasing AIS awareness and personal responsibility to limit the spread of AIS.

Authors: Hannah Mulligan, Alison Coulter, BJ Schall, Tanner Davis, Alexis Gerber, Mark Kaemingk, Rachel K. Johnson, Cheyanne Masterson, Sarah Hayden, Logan Feuerbach, Peter Nester, Shaylee Shea, and Dave Lucchesi

Holding the Door: Southern Illinois University's Current Research Projects on the Movement of Bigheaded Carp

The Center for Fisheries, Aquaculture and Aquatic Sciences (CFAAS) at Southern Illinois University – Carbondale has several research projects with the invasive bigheaded carp at their focal point. Silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*H. nobilis*; collectively bigheaded carp) are two invasive species commonly found within Midwest rivers that have decreased the availability of phytoplankton and zooplankton, consequently leading to the decline of native planktivores and sportfish. These negative associations and their proximity to the Laurentian Great Lakes have raised concerns about prospective spread and successful establishment to the Great Lakes. CFAAS, through funding from the Illinois Department of Natural Resources and collaboration with the monitoring and response working group PIs, has prioritized research on the movement and dispersal potential of bigheaded carp.

With passive acoustic telemetry, bigheaded carp movement strategies have been analysed in the Illinois River and Lower Wabash River. Bigheaded carp exhibit two distinct movement strategies: mobile and resident. Mobile bigheaded carp have been found to move up to 170km, which is particularly alarming because some management practices, such as targeted harvest, rely on individuals aggregating. Furthermore, mobile individuals may have a higher body condition than residents, thus increasing the likelihood of dispersing and successfully establishing a population in a new river. Preliminary results show no correlation between body condition and distance travelled, but additional data is undergoing analysis.

Suppressing bigheaded carp through targeted harvest is a common management practice conducted to prevent their dispersal into the Great Lakes. Within the Illinois River, more bigheaded carp are being harvested each year, creating concern regarding its effectiveness at reducing the population. CFAAS evaluated harvest management response plans within the Grayville oxbow of the Wabash River using hydroacoustics in March 2023. Findings showed that harvest reduced invasive carp densities from 0.25 individuals per 1000m² to 0.04 individuals per 1000m². This prompted a follow-up project to determine the number of bigheaded carp entering the Illinois River from the Mississippi River which we anticipate will begin this fall.

Finally, CFAAS has two current modelling projects exploring suitable habitat for bigheaded carp across North America. Models can be particularly helpful, allowing researchers to use current in-situ data to predict current and future areas at high risk to invasion. The first project uses an individual based model to determine which large-ordered rivers across the United States are suitable for bigheaded carp. Preliminary results show bigheaded carp can survive and grow in the Red River of the North, which is currently uninvaded. The second project uses a MaxEnt model to predict current and future suitable freshwater habitats across North America. Preliminary results using bigheaded carp native range occurrence data show the Great Lakes are currently highly suitable for bigheaded carp.

Like Hodor from Game of Thrones prevented the White Walkers from leaving the area, researchers at CFAAS have worked hard to prevent the dispersal of bigheaded carp by conducting research that allows us to better understand the movement and dispersal potential of bigheaded carp, which is essential to effectively survey, prevent, and manage these invasive species.

Tanya Fendler
PhD Candidate
Southern Illinois University – Carbondale

Stock Assessment of Invasive Flathead Catfish in the Chipola River

Non-native Flathead Catfish were first documented in Florida Panhandle rivers in the early 1950s. The first record of Flathead Catfish in Florida was in the Apalachicola River, where they were intentionally stocked for sport. Since their introduction in the 1950s, Flatheads have been spread throughout Panhandle rivers by anglers and can now be found in every major Florida Panhandle river, including the Ochlockonee, Choctawhatchee, Yellow, and Escambia rivers. Catfish monitoring has been nearly non-existent within Florida over the years, with the most recent targeted Flathead Catfish sampling being conducted in 2012 in the Choctawhatchee River. Other rivers such as the Apalachicola and Ochlockonee have not been sampled since the late 2000s. The Chipola River is a tributary of the Apalachicola River. The first Flathead Catfish to be collected from the Chipola River was in 1989, but managers were not concerned about the population becoming an issue due to it being a low productivity, spring fed river with little suitable Flathead Catfish habitat. The Chipola River is home to Snail and Spotted Bullheads, which can be negatively affected by non-native Flathead Catfish populations (Dobbins et al 2012; Guier et al. 1984; Mickey & Simpson 1988; Thomas 1995; Moser & Roberts 1999). Spotted Bullheads are listed as a taxa of concern by the Florida Fish and Wildlife Conservation Commission (FWC). There has been limited targeted catfish sampling in the Chipola River, and no targeted Flathead Catfish sampling or removal efforts. Hurricane Michael made landfall in the Florida panhandle in October 2019 and caused significant devastation to the riparian area of the Chipola River. Habitat mapping pre and post hurricane suggest that there were major increases in large woody debris throughout the river due to downed trees. Following Hurricane Michael, FWC biologists began to observe an increase in the frequency of Flathead Catfish during long term monitoring (high frequency) sampling efforts. This led to concerns regarding the status of Flathead Catfish in the Chipola River. Our objective of this research was to assess the abundance, diet, and growth of Flathead Catfish within the Chipola River, as well as provide a baseline of abundance for native catfish species. We conducted standardized low-pulse electrofishing surveys with 2 boats side-by-side, targeting all catfish species in September 2023. The river was split into 3 reaches and the entire length of the Chipola River from Yancey Landing to Johnny Boy Landing was sampled (48-km in length). Each catfish was identified, measured (TL) and weighed. A subsample of 141 Flathead Catfish were kept for stomach content analysis, sex determination and aging. Lengths of sacrificed catfish ranged from 150-951 mm. Stomach contents were identified to the best of our abilities, with any contents unable to be fully identified being put in the closest category such as unidentified fish remains. All sacrificed fish were determined to be either male, female, or immature. Lapillar otoliths were removed from the sacrificed fish and will be aged in Winter of 2024. Relative abundance revealed that Flathead Catfish are the most abundant ictalurid species in the Chipola River (0.28 fish/min \pm 0.06), followed by Channel Catfish (0.16 fish/min \pm 0.08), Snail Bullhead (0.11 fish/min \pm 0.04), and Spotted Bullhead (0.03 fish/min \pm 0.01). Spotted Bullhead had the lowest abundance throughout the river and were not nearly as abundant as Snail Bullhead. The abundance of Flathead Catfish increased downstream, with Reach C having the highest abundance throughout the river. There are two possibilities to explain this increase in abundance downstream. One is the possibility that Flathead Catfish are still slowly making their way from the Apalachicola River up into the Chipola, therefore the higher densities are found further downstream. Another possibility is the increase of suitable habitat for Flathead Catfish. Reach C appears to have the largest amount of woody debris and has the most riparian damage in the river following Hurricane Michael.

Continued on next page

Stock Assessment of Invasive Flathead Catfish in the Chipola River

The results of our diet study showed that the most common food item found in Flathead stomachs was crayfish (40%). Thirty three percent of Flathead Catfish stomachs were empty, and 23% had fish, with 12% being unidentified fish remains, 6% ictalurids, and only 1% sunfish. Diets varied based on fish size. For Flathead Catfish in the 150-550 mm range, crayfish made up a majority of their diet (63%), whereas fish only made up a small portion of their diet (15%). Twenty-one percent of their stomachs were empty. In comparison, larger Flatheads in the 550-950 mm size range had a diet that consisted more of fish (31%) than crayfish (23%), and the majority of stomachs were empty (46%). Notable prey items found in Flathead Catfish stomachs were Bowfin and Shoal Bass. Of all 141 Flatheads sacrificed, 51% were female, 48% were male and 1% were unknown. Current plans are to finish processing the collected otoliths to determine age at length, which will provide information on how fast Flathead Catfish are currently growing in the Chipola River. Future research will focus on monitoring Flathead Catfish throughout the Chipola River as well as increasing the frequency of standardized targeted catfish sampling throughout Panhandle rivers. This will also provide insight on the effects of Flathead Catfish invasions over time within Florida.

Authors: Ryan Henry, Morgan Winstead, Andy Strickland (Florida Fish and Wildlife Conservation Commission)

Newsletter Note

Here is a newsletter note I received from Bob Summerfelt, Professor Emeritus at Iowa State University regarding the status of Koi Carp:

“Koi is a Carp: ‘Koi are colored varieties of carp (*Cyprinus* sp.) that are kept for decorative purposes in outdoor koi ponds or water gardens” (Wikipedia 2024, <https://en.wikipedia.org/wiki/Koi>).’ The present-day Koi represent hybrids of lineages that have never been identified genetically; no publication has established *C. rubrofasciatus*, as a valid species; therefore, the 8th edition of *Common and Scientific Names of Fishes from the United States, Canada, and Mexico* (Page et al. 2003) recognized only *Cyprinus carpio* as the species name for Koi (Larry Page, Florida Museum, Gainesville, FL, personal correspondence 2003). The joint committee of the American Fisheries Society and the American Society of Ichthyologists and Herpetologists assigns the scientific name of Koi Carp as *Cyprinus carpio*, an inbred color variant of the Common Carp. I think most AFS biologists would describe *C. carpio* an undesirable introduced and invasive species. Given the long history of environmental damage by Carp, it is surprising that some state fish hatcheries are transporting and stocking Koi, and many states have not prohibited either the production or commercial sale of Koi Carp. Carp are definitely damaging to the habitat of wildlife refuges for waterfowl as well as to littoral zone vegetation. The point of this note is to encourage the Introduced and Invasive Species to consider further investigation of this topic.”

References

Page, L. M., K. E. Bemis, T. E. Dowling, H. Espinosa-Pérez, L. T. Findley, C. R. Gilbert, K. E. Hartel, R. N. Lea, N. E. Mandrak, M. A. Neighbors, J. J. Schmitter-Soto, and H. J. Walker, Jr. 2023. *Common and scientific names of fishes from the United States, Canada, and Mexico*, 8th edition. American Fisheries Society, Special Publication 37, Bethesda, Maryland. The 8th edition of the AFS book *Common and Scientific Names of Fishes from the United States, Canada, and Mexico* (Page et al. 2023), which is a joint committee of the American Fisheries Society and the American Society of Ichthyologists and Herpetologists assigns the scientific name of Koi Carp as *Cyprinus carpio*, which is an inbred color variant of the Common Carp.

New AIS Book!

See below for a short “blurb” from Bruce Carlson, Professor Emeritus from the University of Michigan on a new AIS book he recently published. Sounds like a good resource for professionals and concerned landowners alike! - Seth Love

In northern Minnesota, at least, there is considerable interest and Angst among lake residents about AIS - starry stonewort being the most recent culprit. A couple years ago I realized that there was a dearth of accessible information on AIS written at the level of lake association AIS committee members, AIS inspectors, etc. To fill the gap, I wrote a book, Bruce M. Carlson "Understanding Midwestern Aquatic Invasives" (2024), The Woodtick Press (woodtickpress.com).

Covering over 30 of the most common plant and animal invasive species in the upper Midwest, the book provides a highly readable account of their introduction into American waters, their life history, their effects on the local ecological community and strategies to control them. For each invader, a summary box provides photos, identifying features, look-alikes and up-to-date USGS distribution maps showing their distribution across North America. A final chapter relates my recent experience with didymo in New Zealand.

The AIS book is now available on Amazon, as is another of my recent books, "A North Country Lake throughout the Seasons" (2023), The Woodtick Press. This heavily-illustrated book describes the changes in and around a typical northern lake from ice-out through the next winter and features ~80 underwater videos that are easily accessible through the eBook, which can be downloaded free by buyers of the paper copy.

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