Thirteen years of aquatic nuisance species research at SCDNR: 2013 – 2026

Michael Kendrick, PhD
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Non-native molluscs in SC

Charrua mussel

FY2016

- Surveys for the charrua mussel, *Mytella strigata*: Present at 3 out of 10

Island Apple Snails

FY2015, 2016, 2017

- Monitored for Island apple snails, *Pomacea maculata*, in residential stormwater ponds

- Concerns over impacts to natural systems and possible presence of the rat lungworm (*Angiostrongylus cantonensis*) parasite

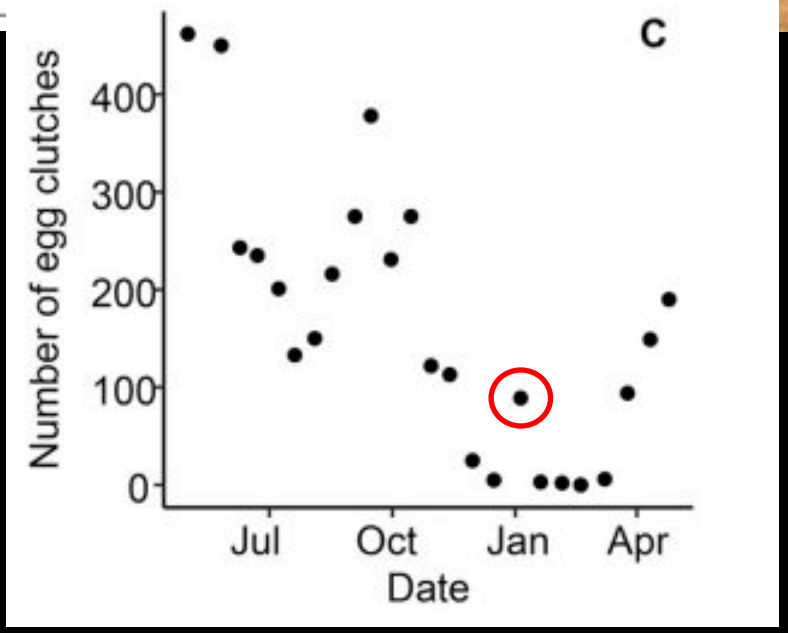
Island Apple Snails

FY2018

Life History and Phenological Characteristics of the Invasive Island Apple Snail *Pomacea maculata* (Perry, 1810) in Stormwater Retention Ponds in Coastal South Carolina, USA

Author(s): Elizabeth L. Gooding, Amy E. Fowler, David Knott, Robert T. Dillon, Jr., Tiffany Brown, Michael R. Kendrick and Peter R. Kingsley-Smith

Source: Journal of Shellfish Research, 37(1):229-238.
Published By: National Shellfisheries Association
https://doi.org/10.2983/035.037.0121
URL: http://www.bioone.org/doi/full/10.2983/035.037.0121



Egg production in winter in SC; not seen in other states

Island Apple Snails

FY2018

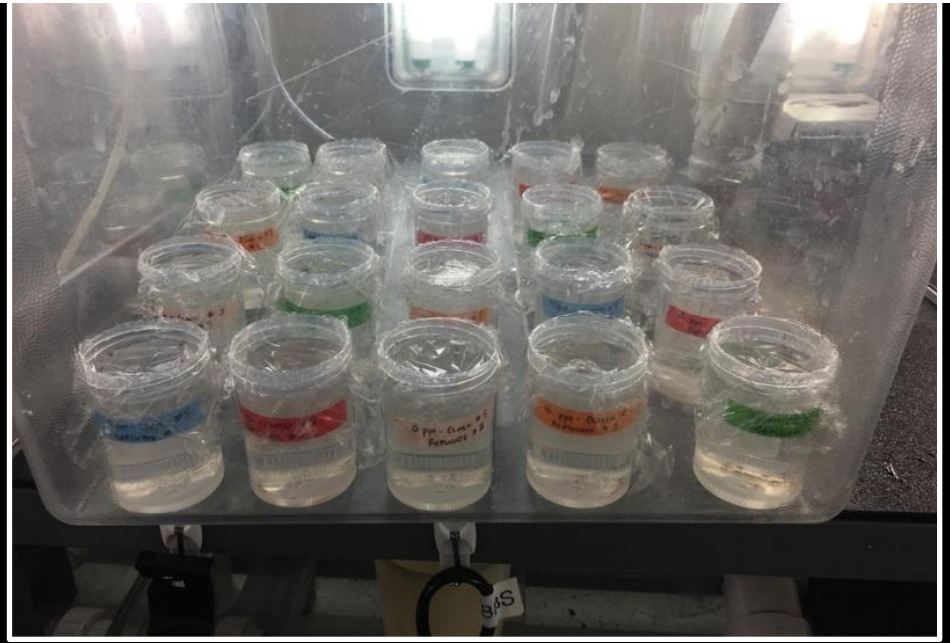
Determining the Salinity Tolerance of Invasive Island Apple Snail Pomacea maculata (Perry, 1810) Hatchlings to Assess the Invasion Probability in Estuarine Habitats in South Carolina, USA

Authors: Elizabeth B. Underwood, Tanya L. Darden, David M. Knott, and Peter R. K Smith

Source: Journal of Shellfish Research, 38(1) : 177-182

Published By: National Shellfisheries Association

URL: https://doi.org/10.2983/035.038.0116



Survival up to 8 psu in the lab

- Similar conditions only a few kms away from an established population.

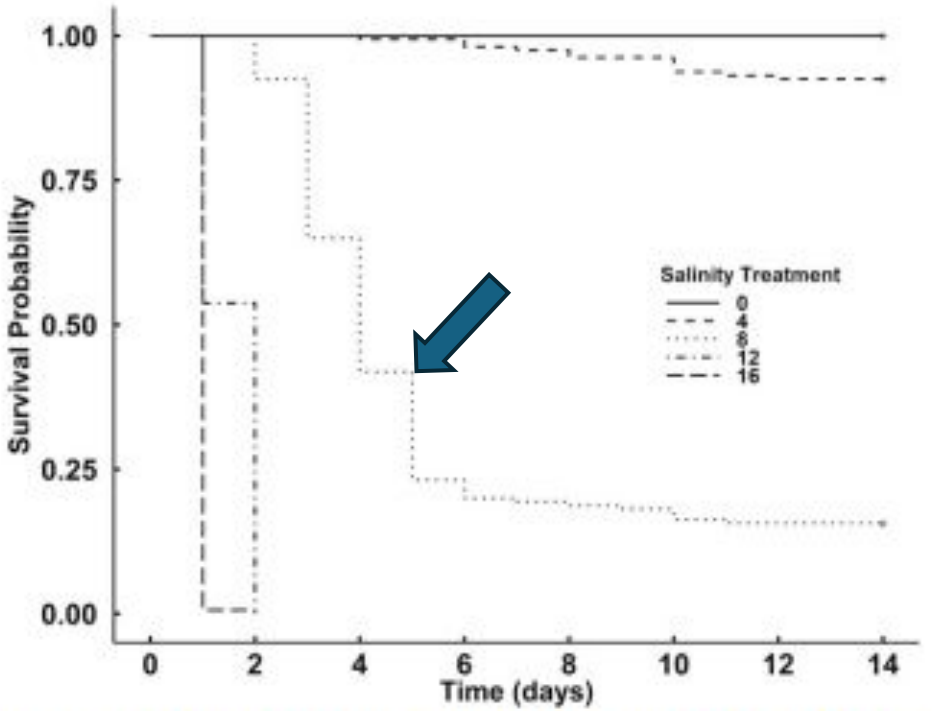


Figure 2. Kaplan–Meier survival curves for *Pomacea maculata* hatchlings (n = 160 per salinity treatment) exposed to five constant salinity treatments for a duration of 14 days. All survival curves were significantly different from each other ($P \leq 0.004$).

Island Apple Snails

FY2018

Population Genetic Structure and Diversity of the Invasive Island Apple Snail Pomacea maculata (Perry, 1810) in South Carolina and Georgia

Authors: Elizabeth B. Underwood, Tanya L. Darden, Timothy P. O'Donnell, and Peter R. Kingsley-Smith

Source: Journal of Shellfish Research, 38(1) : 163-175

Published By: National Shellfisheries Association

URL: https://doi.org/10.2983/035.038.0115

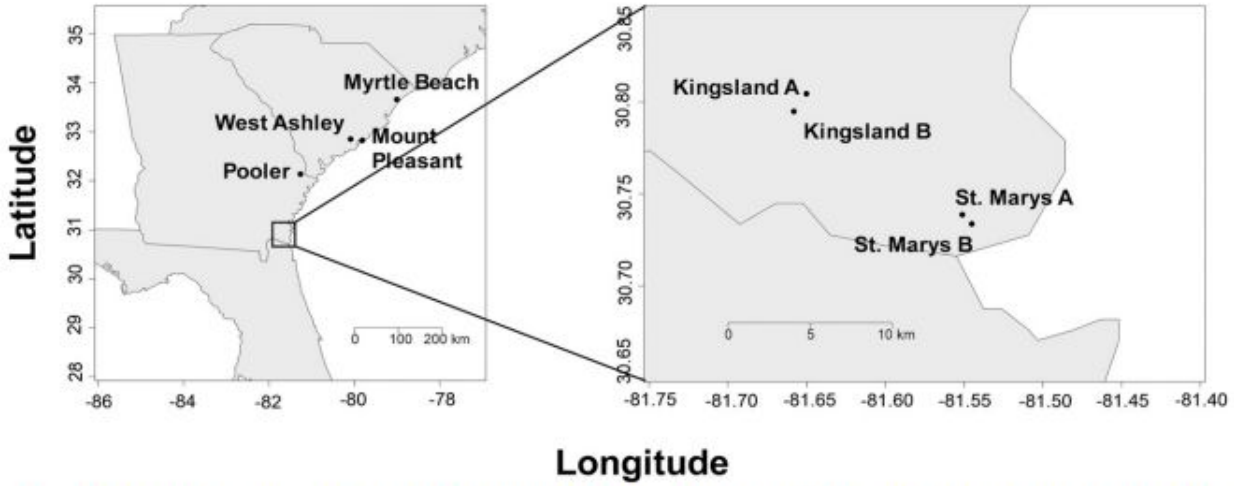


Figure 1. Locations of *Pomacea maculata* sampling ponds in Myrtle Beach, SC; Mount Pleasant, SC; West Ashley, SC; Pooler, GA; Kingsland sites A and B, GA (inset); and St. Marys sites A and B, GA (inset).

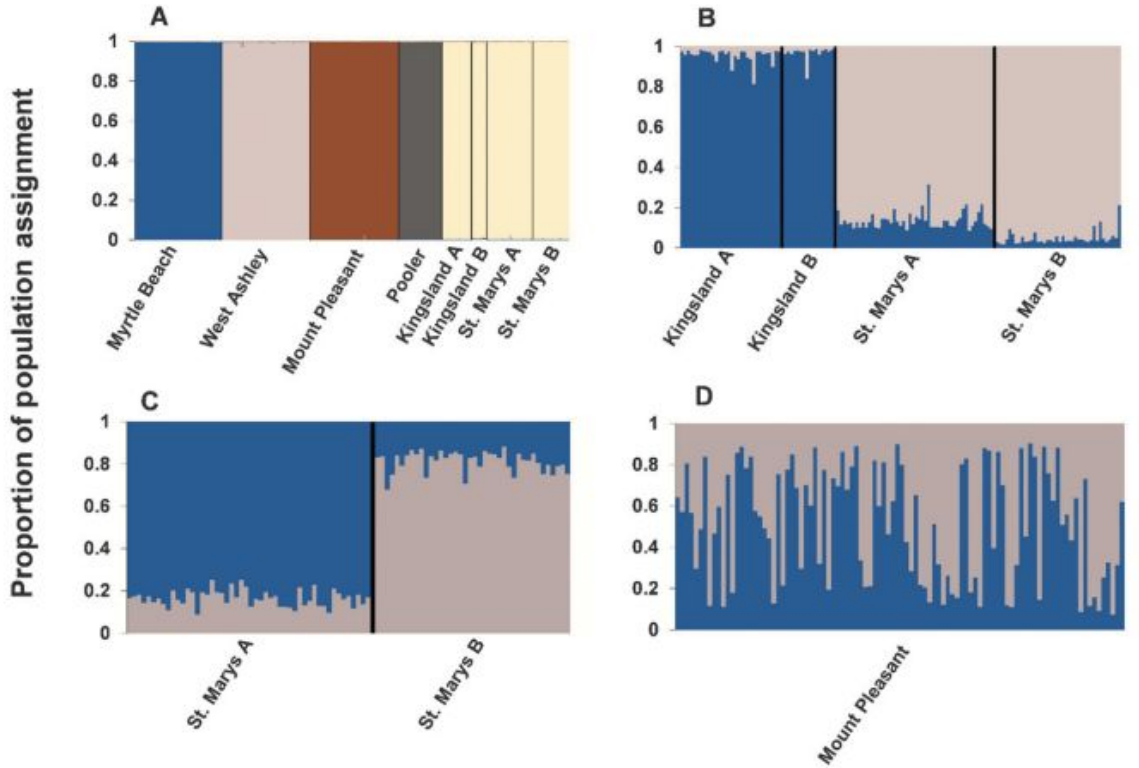


Figure 3. STRUCTURE bar plot for *Pomacea maculata* collected in (A) three locations in South Carolina and five locations in Georgia ($K = 5$); (B) four sites in Georgia ($K = 2$); (C) two sites in Georgia ($K = 2$); and (D) one site in Mount Pleasant ($K = 2$). Each vertical line represents an individual *P. maculata* with its ancestry probabilistically assigned to K populations. Dark vertical bars separate individuals in each sampling location. Y axis indicates the proportion of population assignment.

Island Apple Snails

FY2018

Journal of Aquatic Animal Health

ISSN: 0899-7659 print / 1548-8667 online
DOI: 10.1002/aah.10063

COMMUNICATION

Frequency of Occurrence of the Rat Lungworm Parasite in the Invasive Island Apple Snail in South Carolina, USA

Elizabeth B. Underwood,* Matt J. Walker, Tanya L. Darden, and Peter R. Kingsley-Smith
South Carolina Department of Natural Resources, Marine Resources Research Institute, 217 Fort Johnson Road, Charleston, South Carolina 29412, USA

TABLE 1. Sampling locations, collection months, sample sizes, and size ranges of island apple snails analyzed from South Carolina ponds to determine the occurrence of rat lungworm *Angiostrongylus cantonensis*.

Location	Latitude; longitude	Collection month(s) and year	Sample size	Shell height range (mm)
Mount Pleasant	32°49′37.21″N; 79°48′40.43″W	Jul–Dec 2016	100	27.8–76.5
Myrtle Beach[a]	33°39′36.75″N; 79°0′17.60″W	Oct 2015	100	24.4–74.3
West Ashley[a]	32°51′1.33″N; 80°5′12.5″W	Jun–Oct 2015	100	38.9–89.5

[a]Individuals from the West Ashley and Myrtle Beach samples were collected as part of the research on island apple snails described by Gooding et al. (2018).

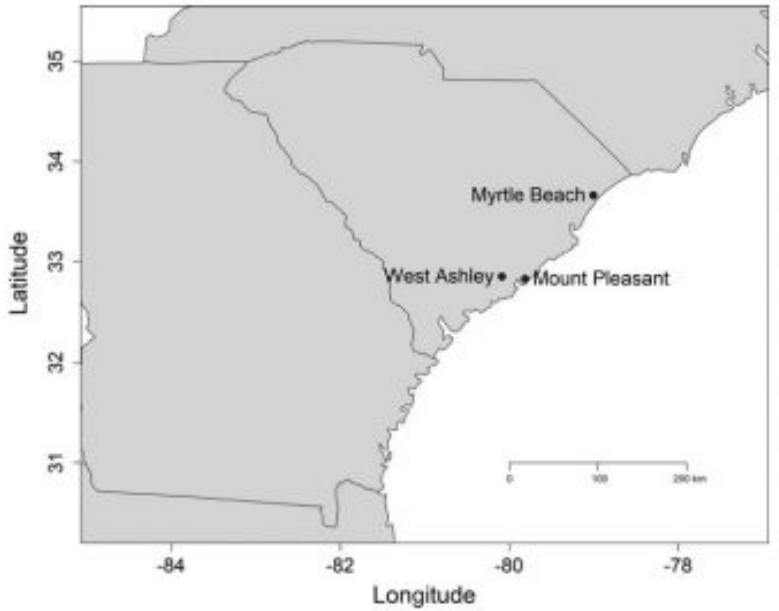


FIGURE 1. Sampling locations in Myrtle Beach, Mount Pleasant, and West Ashley, South Carolina, where island apple snails were collected to determine the occurrence of rat lungworm *Angiostrongylus cantonensis*.

All 300 snails tested negative for *Angiostrongylus cantonensis*… but we are concerned about recent reports from Georgia.
Should we re-sample in SC?

Zebra mussel

FY2021

- eDNA zebra mussel (*Dreissena polymorpha*) tool optimization and testing
- eDNA screening of blackwater systems

Non-native crustaceans in SC

Indo-pacific swimming crab
Charybdis hellerii

Bocourt's swimming crab
Callinectes bocourti

Louisiana Red Swamp Crayfish
Procambarus clarkii

Tiger shrimp
Penaeus monodon

Tiger shrimp
Penaeus monodon

FY2014

- SCDNR led the coordination, collection, and collation of both reports and tissue samples.
- USGS lab conducted genetic analyses to explore the geographic origin of this invasive species.

Aquatic Invasions (2014) Volume 9, Issue 1: 59–70
doi: http://dx.doi.org/10.3391/ai.2014.9.1.05

Open Access

Research Article

Invasion of Asian tiger shrimp, *Penaeus monodon* Fabricius, 1798, in the western north Atlantic and Gulf of Mexico

Pam L. Fuller[1]*, David M. Knott[2], Peter R. Kingsley-Smith[3], James A. Morris[4], Christine A. Buckel[4], Margaret E. Hunter[1] and Leslie D. Hartman

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[2]*Poseidon Taxonomic Services, LLC, 1942 Ivy Hall Road, Charleston, SC 29407, USA*
[3]*Marine Resources Research Institute, South Carolina Department of Natural Resources, 217 Fort Johnson Road, Charleston, SC 29422, USA*
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**Corresponding author*

Received: 28 August 2013 / Accepted: 20 February 2014 / Published online: 7 March 2014

Handling editor: Amy Fowler

BioInvasions Records (2024) Volume 13, Issue 1: 121–140

Research Article

First detection of white spot syndrome virus (WSSV) and infectious hypodermal and hematopoietic necrosis virus (IHHNV) from wild-caught giant tiger prawn, *Penaeus monodon* Fabricius, 1798 (Penaeoidea: Penaeidae) from the Gulf of Mexico and Northwestern Atlantic Ocean

Justin D. Krol[1], Jennifer M. Hill[2], Peter R. Kingsley Smith[3], Michael R. Kendrick[3], Elizabeth L. Gooding[3], Corinne Fuchs[4], Nathan V. Whelan[1,5] and Stephen A. Bullard[1,6]

White spot syndrome virus

FY2019 - 2020

- Investigated vectors and pathways of the non-native white spot syndrome virus (WSSV)

Journal of Crustacean Biology, 2024, **44**, 1–6
https://doi.org/10.1093/jcbiol/ruae002
Advance access publication 23 January 2024
Research Article

The Crustacean Society

OXFORD

Prevalence of white spot syndrome virus (WSSV) in wild-caught and commodity decapod crustaceans in coastal South Carolina, USA

Daniel A. Sasson, Jacqueline M. Allen, Matt J. Walker, Jeanette H. Huber, Gregory K. Rothman, Peter R. Kingsley-Smith, Tanya L. Darden and Michael R. Kendrick

Marine Resources Research Institute, South Carolina Department of Natural Resources Charleston, South Carolina, 29412, USA

Correspondence: D. Sasson; e-mail: sassond@dnr.sc.gov

Blue land crabs

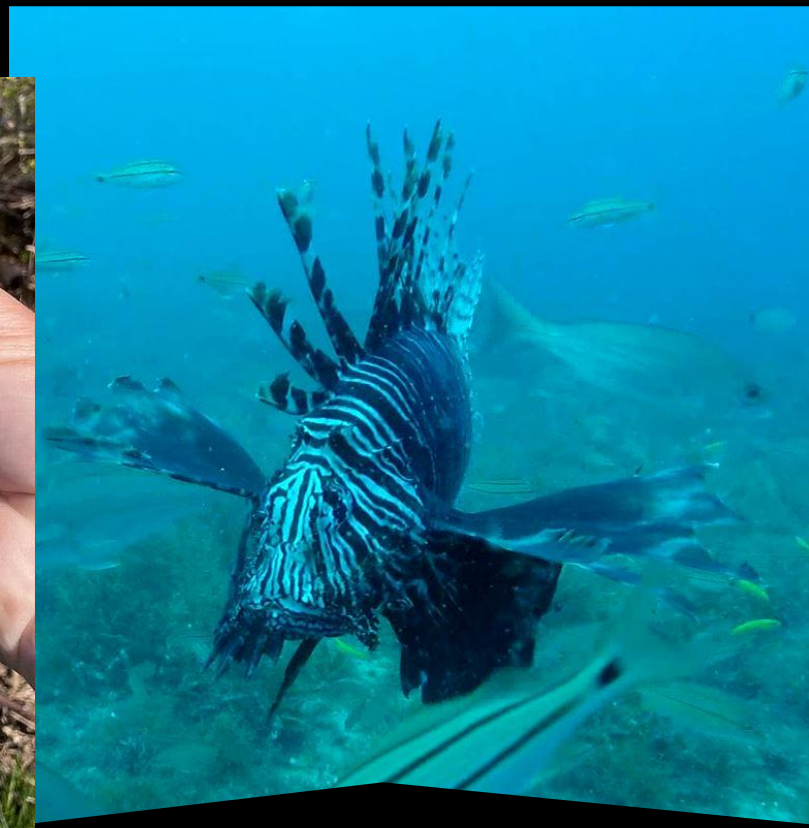
FY2022
See talk by Dr. Daniel Sasson

2023 SOUTHEASTERN NATURALIST 22(4):498–503

Using Public Sightings to Document the Widespread Distribution of the Non-Endemic Blue Land Crab, *Cardisoma guanhumi*, in South Carolina

Elizabeth Scott[1], Michael Kendrick[1], Peter Kingsley-Smith[1], Megan James[2], Joe Lemeris[2], Erin Weeks[3], and Daniel Sasson[1,*]

Non-native fishes in SC



Tracking an invasion: how the distribution and abundance of Lionfish (*Pterois* spp.) has changed along the U.S. Atlantic coast

Original Paper | Published: 16 March 2024

Volume 26, pages 1669–1683, (2024) Cite this article

Biological Invasions

Aims and scope →

Submit manuscript →

Margaret W. Finch ✉, Joseph C. Ballenger, Nathan M. Bacheler & Walter J. Bubley

The full story is coming this afternoon in the presentation by Margaret Walker Finch from SCDNR's Marine Resources Research Institute.

Invasive Alabama bass

FY2018

- Long-term collaboration between SCDNR, Clemson University & USDA Forest Service.
- Native bass – Alabama bass gene flow and hybridization studies.
- *Stay tuned for a presentation on this later this morning by SCDNR's Mark Scott.*

Snakehead (Not recorded from SC)

FY2020

- Optimized an eDNA tool for the detection of invasive northern snakehead (*Channa argus*) and bullseye snakehead (*Channa marulius*).

FY2021

- eDNA screening of blackwater systems

https://www.gameandfishmag.com/

Blue catfish

FY2023

Quantifying interactions between native blue crabs and non-native blue catfish

Invasive eel parasite

FY2014

- Nematode swimbladder parasite, *Anguillicola crassus* in American eels
- Inter-annual variation in parasite prevalence and intensity.
- Examination of infections and swimbladder damage in adult eels.

Vol. 107: 199–209, 2014
doi: 10.3354/dao02686

DISEASES OF AQUATIC ORGANISMS
Dis Aquat Org

Published January 16

Invasive swimbladder parasite *Anguillicoloides crassus*: infection status 15 years after discovery in wild populations of American eel *Anguilla rostrata*

Jennifer L. Hein[1,*], Stephen A. Arnott[1], William A. Roumillat[1], Dennis M. Allen[2], Isaure de Buron[3]

[1]Marine Resources Research Institute, SC Department of Natural Resources, 217 Fort Johnson Road, Charleston, South Carolina 29422, USA

[2]Baruch Marine Field Laboratory, University of South Carolina, Hobcaw Barony, Highway 17 North, Georgetown, South Carolina 29440, USA

[3]Department of Biology, College of Charleston, 58 Coming St, Charleston, South Carolina 29401, USA

38% to 52% prevalence of infection in adult eels collected from multiple waterbodies

ICES Journal of Marine Science (2016), 73(1), 14–21. doi:10.1093/icesjms/fsv097

Contribution to the Symposium: '*International Eel Symposium 2014*'

Original Article

Infection of newly recruited American eels (*Anguilla rostrata*) by the invasive swimbladder parasite *Anguillicoloides crassus* in a US Atlantic tidal creek

Jennifer L. Hein[1], Isaure de Buron[2], William A. Roumillat[1], William C. Post[1], Allan P. Hazel[1], and Stephen A. Arnott[1]*

[1]*South Carolina Department of Natural Resources, Marine Resources Research Institute, 217 Fort Johnson Road, Charleston, SC 29422, USA*
[2]*Department of Biology, College of Charleston, 58 Coming St, Charleston, SC 29401, USA*

**Corresponding author: tel: +1 843 953 9794; fax: +1 843 953 9820; e-mail: arnotts@dnr.sc.gov*

Hein, J. L., de Buron, I., Roumillat, W. A., Post, W. C., Hazel, A. P., and Arnott, S. A. Infection of newly recruited American eels (*Anguilla rostrata*) by the invasive swimbladder parasite *Anguillicoloides crassus* in a US Atlantic tidal creek. – ICES Journal of Marine Science, 73: 14–21.

Infection of newly recruited eels (late-stage pigmented elvers)

Invasive eel parasite

FY2015

- Developed qPCR assay for detecting *A. crassus* in the environment.

FY2024

- Comparison of sampling approaches for *A. crassus.* [See Jordan Parish's presentation]

FY2025

- *Seasonal sampling of zooplankton and glass eels*

Acknowledgements

Peter Kingsley-Smith
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Cindy Williams
James Ballard
GSARP
Many many more current and former staff at SCDNR

crustacean research & monitoring section