UF UNIVERSITY of FLORIDA IFAS Extension

The Invader Updater

Invasive species news for busy Extension professionals

Volume 4, Issue 3 Fall 2012

Highlights:

- Learn about one of the world's "100 worst" invaders
- Are invaders driving evolution?
- Can eDNA sampling replace intensive field work for early detection?
- Troubling invasion pathway revealed
- Get the new Lionfish management guide!

In this Issue:

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Focal Species: American Bullfrog

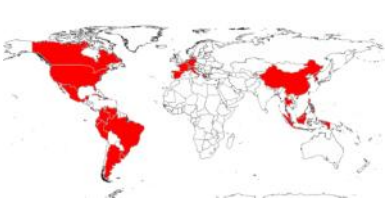
Scientific name:
Lithobates catesbeianus

Size:
Up to 8 in. (nose-rump)

Native range:
Eastern North America

Notes:
Listed among "100 of the World's Worst Invasive Alien Species"

(Photo by Dr. Steve A. Johnson, world map based on ISSG, U.S. map by USGS)



The American Bullfrog is native to eastern North America but has been introduced in the western U.S. and around the world to 40+ countries on four continents (see maps). Bullfrogs were introduced in many countries, such as China, as a food source; individuals escaped from bullfrog farms and established invasive populations. These large frogs are voracious predators with mouths nearly the width of their bodies--they will attempt to consume any prey item that fits into their giant mouths. In addition to preying on native wildlife, bullfrogs can also harbor diseases that spread to native amphibians. Introduced bullfrog populations have caused outbreaks of the infamous chytrid fungus that is contributing to global amphibian declines. Although bullfrogs may prefer permanent, artificial ponds such as livestock ponds and reservoirs, they are known to inhabit a wide variety of aquatic habitats including lakes, ponds, swamps, bogs, marshes, streams, and ditches. In the western U.S., bullfrogs negatively impact numerous species of amphibians. In addition, they prey on at least five endangered amphibian species. Bullfrog tadpoles can be considered "ecosystem engineers" because they have huge impacts on the algae communities that form the base of the wetland ecosystem. Currently, management efforts are limited to education and hunting bullfrogs at sensitive sites. Learn More...

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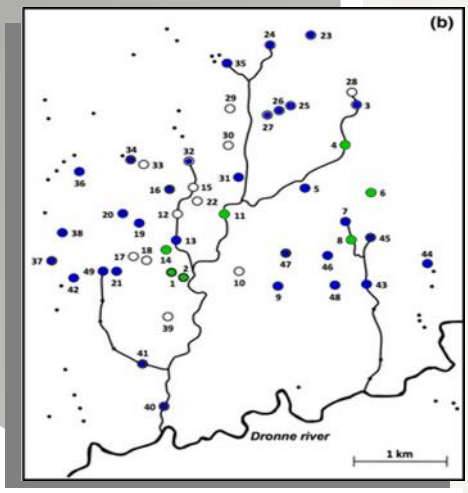
Science: Invaders Driving Evolution

(Photo by Steve A. Johnson)

Species invasions can drive evolutionary change not only in native species in the invaded area but also in the invading species. Understanding the evolution of the invading species and the trade-offs involve can help us to manage invader populations. Big changes can happen rapidly early in the invasion process as a species adapts to new challenges. Because invader populations are often growing and populations of native species are stable (or declining), the invaders are more likely to adapt and evolve. Recently, Shine (2012) examined the topic of invasive species as drivers of evolutionary change, using invasive cane toads in Australia as a case study. Cane toads in Australia are spreading so quickly that there is an "invasion front" at the edge of their range expansion. Cane toads on the frontlines have evolved longer legs, higher activity levels, and greater stamina and now disperse about five times faster than they did 75 years ago--and 10 times faster than cane toads from long-colonized areas far from the front. Trade-offs for these rapid dispersers at the front seem to include arthritis and weaker immune systems. Native snakes are also evolving in response to the spread of these toxic toads--one species has evolved behavioral avoidance, another has evolved a smaller head that prevents consumption of toads large enough to kill the snake, and yet another has evolved more tolerance to toad toxins. Understanding the evolution and trade-offs of invasive toads can suggest control strategies such as exploiting low immune competence. Understanding the evolution of native species can help to predict how they will be impacted by the invader. Learn More...

Innovation: Detecting Invader eDNA



At ponds shown in green, bullfrogs were detected by both traditional methods and eDNA; at ponds shown in blue, bullfrogs were detected only by eDNA. At ponds shown in white, neither method detected bullfrogs' presence.
(Map modified from Dejean et al., 2012)

Early detection of aquatic invasive species can greatly improve the success of eradication efforts and reduce impacts on native ecosystems. However, there is a detection threshold and traditional survey methods are unlikely to detect the presence of low numbers of the invasive species. In a recent study, Dejean et al. (2012) compared the effectiveness of environmental DNA (eDNA) and traditional survey methods for detecting invasive American bullfrogs in ponds in France. There is an ongoing eradication program at many of these ponds and enhanced detection could reduce the cost of control efforts. Dejean et al. (2012) used visual encounter surveys and calling surveys to search for bullfrogs and also collected three, 15-ml water samples from areas of the pond likely to be used by bullfrogs. They then extracted and amplified DNA for detection, running each water sample in triplicate for added accuracy. They also processed negative (i.e., ultrapure water) and positive (i.e., DNA from bullfrog tissue) control samples for confirmation. Traditional methods detected bullfrogs at only seven of the 49 ponds, whereas eDNA detected bullfrog presence at 38 ponds. Although the eDNA method can sometimes yield false positives and false negatives, eDNA methods show remarkable promise for use in early detection. Similar methods are being used to monitor the spread of Asian Carp. Learn More...

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News Updates: Teachers An Invasion Pathway?

In August, researchers from Oregon State University presented results of a troubling new study to the Ecological Society of America. They surveyed nearly 2,000 teachers in the U.S. and two provinces in Canada and found that they purchase more than 1,000 different species of live organisms to enhance learning in their classrooms. One in four of these teachers released these live plants and animals into the wild. Unfortunately, many were aquatic invasive species including amphibians, mosquito fish, and red-eared slider turtles. The teachers were simply trying to avoid euthanatizing the animals—teachers were evenly split on the idea of euthanasia as a solution for disposing of the animals they used for teaching.

Approximately half of the animals used in the classroom came from biological supply houses, some of which indicated that educating the teachers about proper disposal was not their problem. However, others were willing to work to try to make local organisms more available. This study highlights the need for conscientious use of live organisms in classrooms and a concerted effort to provide better options for teachers.

More Invader Updater News

"Many of the teachers were mortified when we pointed out they may be exacerbating the invasive species problem..."

Legislation: Swine ISO Constitutional?

Feral swine are a growing problem in Michigan--and in many other states in the U.S. They damage important habitats as they root for food and consume native species and harbor parasites and diseases that can harm livestock and even humans. Michigan's 2010 Invasive Species Order (ISO) prohibits Russian Boar--a specific species of swine. The Michigan Department of Natural Resources (DNR) has begun enforcing this order by inspecting farms reported to possess the prohibited swine. However, five sporting swine farmers have filed suit against the DNR order, saying that it is unconstitutional and vague. Each of the plaintiffs has admitted to owning the clearly prohibited Russian Boars. Michigan is currently awaiting a judge's decision, which is expected in November. If the order is found unconstitutional it will be unenforceable.

See 'Resources' on Pg 4.

Noteworthy: Lionfish Management Guide

Scientists with the National Oceanic and Atmospheric Administration's (NOAA) National Centres for Coastal Ocean Science and partner organizations have recently released a comprehensive, 127 page manual that will be an invaluable resource for coastal managers wherever lionfish are found. As the first chapter of "Invasive Lionfish: A Guide to Control and Management" discusses, the extent of the lionfish invasion is dramatic and this guide is already relevant for coastal managers from the eastern seaboard of the U.S. to the Gulf Coast, as well as in the Bahamas and throughout the Caribbean. Subsequent chapters summarize lionfish research and discuss strategies for education and outreach, control, and monitoring. Lastly, this comprehensive guide covers legal and regulatory considerations and suggests resources, partnerships, and sustainable funding available to coastal managers. The guide is available free of charge online and is a "must read" not only for resource managers but also for anyone following the saga of the lionfish invasion.. Learn More...

(Wikimedia Commons Photo)

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Do you have questions, comments, suggestions, or an In Focus photo? Want to be added to the mailing list? Email monicaem@ufl.edu

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In Focus...

The New York Times Science section online solicits photos of surprising wildlife close to home and recently posted this image illustrating the need for invasive species outreach. The photo of invasive Cuban Treefrogs was labeled "Every morning ...we see many frogs using our wind chimes as housing! We love having them here, plus they eat the mosquitoes! It's a win-win situation for all.." [Note: *they don't eat many mosquitoes, if any – they prefer cockroaches, spiders, beetles, and native frogs…*]

(Photo submitted to NYT by Dorinda Frye)

The Invader Updater is a quarterly newsletter focused primarily on providing information on invasive vertebrate animals in Florida and the southeastern U.S. and was first published in Fall 2009.

Resources

- Global Invasive Species Database: *Lithobates catesbeianus (=Rana catesbeiana)*
- Snow & Witmer (2010) American bullfrogs as invasive species: A review of the introduction, subsequent problems, management options, and future directions. Proc. 24th Vertebr. Pest Conf.
- Dejean et al. (2012) Improved detection of an alien invasive species through environmental DNA barcoding: the example of the American bullfrog *Lithobates catesbeianus.* Journal of Applied Ecology 49(4): 953-959
- Shine (2012) Invasive species as drivers of evolutionary change: cane toads in tropical Australia. Evolutionary Applications 5(2):107-116.
- New Pathway for Invasive Species: Science Teachers—Science Daily
- Michigan Department of Natural Resources:: Feral Swine
- Upper Michigan's Source: Battle over Sporting Swine Continues
- Invasive Lionfish: A Guide to Control and Management – http://lionfish.gcfi.org/manual/
- The Invasion of Exotic Reptiles and Amphibians in Florida - UF/IFAS EDIS Fact Sheet **(NEW!)**
- Know of an important resource not listed here or in our archives? Let us know—email a description and URL to monicaem@ufl.edu.