

Amphibian Monitoring in the Atchafalaya Basin

Introduction

Amphibians are a diverse group of animals that includes frogs, toads, and salamanders. They are adapted to living in a variety of habitats, but most require water for at least one life stage. Amphibians have recently become a worldwide conservation concern because of declines and extinctions even in remote protected areas previously thought to be safe from the pressures of habitat loss and degradation (Lannoo, 2005). Amphibians are an important part of ecosystem dynamics because they can be quite abundant and serve both as a predator of smaller organisms and as prey to a suite of vertebrate predators. Their permeable skin and aquatic life history also make them useful as indicators of ecosystem health. Since 2002, the U.S. Geological Survey (USGS) has been studying the frog and toad species inhabiting the Atchafalaya Basin to monitor for population declines and to better understand how the species are potentially affected by disease, environmental contaminants, and climate change.

The Atchafalaya Basin

The Atchafalaya Basin in southern Louisiana is the flood plain of the Atchafalaya River (fig. 1). The Atchafalaya River is a distributary of the Mississippi and Red Rivers; it begins at their confluence near Simmesport, La. The Old River Control Structure, maintained by the U.S. Army Corps of Engineers, regulates the flow of water from the Mississippi River so that the Atchafalaya River receives about 30 percent of the volume. Because of this management, the Atchafalaya Basin retains the seasonal flood pulse cycle that naturally occurred in the Lower Mississippi River. The Atchafalaya River Delta is the only part of coastal Louisiana where land is expanding, not shrinking.



Calling male Gulf Coast Toad

The Atchafalaya Basin is about 20 miles wide by 150 miles long, and at over 590,000 acres it is considered to be the largest swamp (forested wetland) in the United States. The habitats of the basin include bayous, cypress swamps, bottomland hardwood forests, and marshes.

The basin is a vital resource for Louisiana (Scott, 2010). Aside from being a source of water for drinking and for agriculture, it supports major commercial and sport fisheries. With more than 300 active oil and gas wells, the basin is also important to the petroleum industry. Further, it is economically important because it produces \$123 million annually from recreational activities (Scott, 2010).

Methods for Monitoring

Although amphibians are abundant in the Atchafalaya Basin, it is nonetheless challenging to sample them in a way that will allow us to infer the status and trends of their populations. One of the main challenges is accounting for the natural variation in detectability of these species. Factors like time of year, weather conditions, and random variation can



Figure 1. Location of the Atchafalaya Basin in southern Louisiana.

Frogs and Toads of the Atchafalaya Basin

True Toads



Fowler's Toad
(*Anaxyrus fowleri*)



Gulf Coast Toad
(*Incilius nebulifer*)

True Toads (Family Bufonidae)

Two true toads occur in the Atchafalaya Basin: Fowler's Toad and the Gulf Coast Toad. Both of these species are moderately sized and have dry, warty skin. They have short hind limbs and do not leap like other frogs, but rather they make short hops to get around. They are active primarily at night and use their short hind limbs for burrowing into sandy soils during the day. They are the only two frogs in the basin that lay long strings of eggs, as opposed to clumps laid by other frog species. Both of these toad species possess enlarged glands at the back of the head that secrete a white poison when attacked by a predator. When handling these toads, one should avoid putting their hands near their mouths or eyes, as these secretions may be irritating. Contrary to widespread belief, toads do not cause warts.

Treefrogs and Their Allies



Blanchard's Cricket Frog
(*Acris blanchardi*)



Cajun Chorus Frog
(*Pseudacris fouquettei*)



Spring Peeper
(*Pseudacris crucifer*)

True Frogs



American Bullfrog
(*Lithobates catesbeianus*)



Bronze Frog
(*Lithobates clamitans*)



Pig Frog
(*Lithobates grylio*)

Microhylid Frogs and Toads (Family Microhylidae)

The Eastern Narrow-Mouthed Toad is the only representative in the Atchafalaya Basin of this family. It is a plump frog with smooth skin, a pointed snout, and short limbs. There is a fold of skin across the back of the head that can be moved forward to clear the eyes. They use this fold of skin especially when preying upon ants, a favorite food, to remove any attackers. Because of its plump body and short limbs the male must secrete a sticky substance from a gland on its stomach to stay attached to a female for successful mating; in most other frogs, the limbs are long enough to grasp around the female. The Eastern Narrow-Mouthed Toad usually stays out of sight during the day under moist cover, usually near water.

Microhylid Frogs and Toads



Eastern Narrow-Mouthed Toad
(*Gastrophryne carolinensis*)



Green Treefrog
(*Hyla cinerea*)



Cope's Gray Treefrog
(*Hyla chrysoscelis*)



Squirrel Treefrog
(*Hyla squirella*)



Southern Leopard Frog
(*Lithobates sphenocephalus*)

Treefrogs and Their Allies (Family Hylidae)

This large family of frogs is represented in the Atchafalaya Basin by six species. Blanchard's Cricket Frog is a small semiaquatic species most frequently found at the water's edge or on top of vegetation in the water. The Cajun Chorus Frog and Spring Peeper are slightly larger than Blanchard's Cricket Frog and are usually among the first species heard calling in winter and spring. These two species can and do climb vegetation but to a lesser degree than the generally larger Hyla species—Green, Cope's Gray, and Squirrel Treefrogs—in the basin, which have enlarged toe pads used for climbing. Green Treefrogs and Squirrel Treefrogs are the species most commonly seen attached to the doors, windows, and siding of buildings.

True Frogs (Family Ranidae)

Four species of true frogs can be found in the Atchafalaya Basin (American Bullfrog, Bronze Frog, Pig Frog, and Southern Leopard Frog). These semiaquatic frogs are all moderate to large in size, with long legs and narrow waists. They have webbing between the toes of the rear feet and smooth skin. Of the four species, the Pig Frog is the most aquatic, whereas the Southern Leopard Frog is nomadic and can sometimes be found far from water. American Bullfrogs and Bronze Frogs can typically be found at the water's edge. The American Bullfrog and Pig Frog are game species in Louisiana, and adults may be harvested for human consumption by approved methods in all months except April and May.

alter the proportion of the population that we observe during any of our surveys. These challenges make counts of individuals difficult to interpret since they represent some unknown proportion of the population. To address this issue we use repeat visits to sites, which allows us to use statistical models to estimate the detectability of the various species.

Our primary sampling technique is a combination of nighttime searches for frogs and toads along with listening for their calls. When we sample, we use high-power flashlights to search a predefined area at each site (fig. 2). The frog and toad species that live in the Atchafalaya Basin each make distinct vocalizations. Usually these vocalizations are for the purpose of males attracting female mates or for defining territory. We can use the calls as a method for detecting species that we do not detect visually and use that information to adjust the population estimates.

The Amphibians of the Atchafalaya Basin

The majority of the amphibian species in the Atchafalaya Basin are frogs and toads. We have detected 13 frog and toad species during our surveys, representing four families (see pages 2–3 for photographs and names of all



Figure 2. A U.S. Geological Survey scientist working with the Amphibian Research and Monitoring Initiative (ARMI) program searches for amphibians active at night in the Atchafalaya Basin.

of the species and short descriptions of the four families).

Outcome of Monitoring Efforts

Monitoring of the Atchafalaya Basin under the Amphibian Research and Monitoring Initiative (ARMI) program (see fig. 3) began in 2002. During 2002–7, only frog call surveys were conducted. These surveys were done on multiple rainy nights each year. A detailed analysis of those surveys revealed that the occupancy rate of sites declined during that period (Walls and others, in press). Because these surveys were based on only frog calls, it is impossible to know if amphibian species were disappearing from the sites or if it was simply that calling had declined. In 2008 we began monitoring with other methods, and since that time we have seen no evidence of species decline. Fluctuations in the abundance of amphibian populations are normal, so long-term monitoring is necessary to determine if populations are truly declining or simply fluctuating as would be expected.

Other Lines of Research

In addition to monitoring amphibian populations, the ARMI program is actively engaged in research on amphibians in the Atchafalaya Basin. We are especially interested in processes that might be responsible for the pattern of distribution of amphibians we observe on the landscape. One important question is the role of pesticides and other water-quality parameters on the distribution of frogs in the Atchafalaya Basin. Research is underway to determine if exposure to atrazine, a commonly used herbicide found in abundance in the water flowing from the Mississippi River, can impact the occurrence or health of frogs. We are also interested in how the hydrology of the basin (timing and amount of inundation) affects the occurrence of different amphibian species. Changes in hydrology, whether from alterations of water management or from the potential effects of global climate change, are important to study because even small



Figure 3. As a response to extinctions and population declines of amphibians around the world, Congress designated funding to the Department of the Interior in 2000 to begin research and monitoring of amphibians. This program became known as the Amphibian Research and Monitoring Initiative (ARMI). The goals of the ARMI program are to monitor amphibian species in the United States to determine if populations are declining, to research the causes of any declines, and to assist other Federal agencies in managing species in decline.

hydrological changes might impact the diversity of amphibians in the Atchafalaya Basin.

References

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