The Call of the Crawfish Frog

Introduction

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On 1 April, 2010, Jen Heemeyer[[1]](#footnote-1) was radiotracking Crawfish Frogs exiting wetlands following their spring breeding efforts. Around mid-morning, she called MJL’s cell: “Frog 160 returned to her burrow, the same one she occupied all last summer.” With these two facts—that Crawfish Frogs will not only occupy a single crayfish burrow throughout the year but return to the very same burrow after leaving it to breed during the following year—Heemeyer had learned that Crawfish Frogs have a “home,” a place of their own. She realized these frogs don’t simply occupy any old nook or cranny, or abandoned crayfish burrow; instead, there is something more behind their habitation of these old crayfish burrows. Following up on Jen’s breakthrough, we have now observed post-breeding Crawfish Frogs returning to their burrows for as many as five years in a row, a degree of site fidelity not usually seen in amphibians. Equally improbable, some of these home burrows are located over a kilometer from breeding wetlands. That’s a long trek for a frog that is 10 centimeters (4 inches) long (1.1Figure 1.1).

Crawfish Frogs (*Rana areolata*) acquired their common name from their tendency to inhabit crayfish-dug burrows. Before Heemeyer’s work, the scientific literature had provided a handful of often-contradictory observations and lightly informed speculation about the nature of Crawfish Frog burrows and how they use them. Only in the past couple of decades has technology advanced enough to enable researchers to readily address such questions, and only recently has the future of Crawfish Frogs been uncertain enough to require answers.

Crawfish Frogs are “true frogs,” members of the Ranidae family. This group has a widespread, global distribution, which includes temperate, tropical, and some polar regions. In North America, Crawfish Frogs are distantly related to the common and familiar Leopard Frogs,[[2]](#footnote-2) Bullfrogs,[[3]](#footnote-3) Green Frogs,[[4]](#footnote-4) and Wood Frogs.[[5]](#footnote-5) Their closest relatives—so much so that as recently as 2001 they were thought to be the same species (6Altig and Lohoefener 1983; 208Young et al. 2001)—are Dusky Gopher Frogs[[6]](#footnote-6) and Carolina Gopher Frogs.[[7]](#footnote-7)

This is a group in trouble. Dusky Gopher Frogs were granted federal endangered species status in 2001, and if not for captive rearing programs at several dedicated zoos around the United States would now be extinct. In 2014, Carolina Gopher Frogs were petitioned for federal listing and, adding urgency to the petition, in 2014, there was evidence of a severe reduction in breeding activity. Similar in trajectory but not yet in extent, Crawfish Frogs are of conservation concern in every state where they occur. They were last seen in Iowa in 1942, and last seen in Louisiana during the 1970s until a bird-watcher photographed a single breeding male in February 2010 (Boundy, pers. comm.). In Indiana, where we work, Crawfish Frogs are listed as state endangered (1.2Figure 1.2).

Despite following Gopher Frogs on the road to near-extinction, or at least toward costly recovery efforts, Crawfish Frogs offer optimism. They currently have a wider distribution than either Gopher Frog species and still have pockets of abundance, especially in eastern Kansas and Oklahoma. If their declines can be halted, or perhaps reversed (which, as we will see is not a difficult thing to do), the expensive and uncertain process of recovery can be avoided.

Perhaps the biggest challenge in determining the conservation status of Crawfish Frogs is they are difficult to find—they inhabit abandoned crayfish burrows in tallgrass prairie, and therefore are not easily detected. In 1927, the herpetologists Herman Wright and George Myers wrote, “Probably no North American *Rana* is so little known, both to its habits and its distribution” (206Wright and Myers 1927). In the early 1950s, Arthur Bragg (221953) wrote, “For each of the past four years [1945–1948 inclusive] I have spent two or more months in field study of amphibians … without once observing these frogs in nature, despite being constantly on the alert for them.” This begged the question, first asked over 90 years ago, whether Crawfish Frogs were truly rare and needed conservation protection and survival assistance, or instead were abundant but perceived by humans to be rare because they can be so frustratingly difficult to detect. Howard Gloyd thought he knew the answer: “This species [is] more common than is ordinarily supposed” (66Gloyd 1928) (1.3Figure 1.3).

In 2008, non-game biologists at the Indiana Department of Natural Resources approached MJL and asked if he would work through the life history and natural history of their state endangered Crawfish Frog, and offer management recommendations in order to conserve them. MJL had just moved to Terre Haute, and was the only research-oriented academic herpetologist in Indiana living within the historical range of Crawfish Frogs. He was also the United States’ Chair of the International Union for Conservation of Nature’s (IUCN’s) Amphibian Specialist Group, and in that capacity had just edited a large volume on the conservation status of all ~300 species of United States’ amphibians (104Lannoo 2005). He had the literature on Crawfish Frogs at his disposal, and had enough field experience to know which techniques would get definitive answers quickly. He agreed.

Our funding came from the U.S. Fish and Wildlife Service’s State Wildlife Grant (SWG) program, which provides federal money for activities that benefit all forms of wildlife and their habitats. SWG priorities are based in part on State Wildlife Action Plans (SWAPs), which each state is required to assemble if they wish to receive federal wildlife funds. SWG projects are designed to address and solve smaller state wildlife problems before they become big, expensive, federal endangered species problems.

Our first field season began in early 2009, and as we write this in the fall of 2016 most aspects of this project have been completed. As George Schaller quipped, “If you have a long-term dataset you find out what actually happens” (148Quammen 2013). While we did not work with Crawfish Frogs as long as we would have liked, eight consecutive field seasons of intensive study is lengthier than most field projects. We received two SWG grants. The first, for three-and-a-half years plus a one-year extension, was devised to establish a basic life history and natural history database for this species. The second, for three more years, was designed to develop management techniques to maintain or augment existing populations, and to create protocols for re-establishing populations in regions where they had been extirpated.

What follows is the Crawfish Frog story, and, maybe more than a little bit, our story: How a small mom-and-pop lab stocked with gifted graduate students and networked to exceptional professionals willing to assist came to understand the critical, linchpin, aspects of the lives of these frogs—the factors that determine whether they live or die. We understand that knowing these facts will not inevitably pull Crawfish Frogs back from the brink, but they do provide American citizens with the knowledge to do so, should they decide this species has a right to exist.

As you read through the following stories, you may wonder about the names or designations we assign to frogs. There was little rhyme or reason to our nomenclature except for ease of communication. Most frogs were anonymous, known to us only by their cohort toe clip markings (e.g., Nate’s Pond, 2009) or their pit tag numbers (4b08253605), which we never memorized but could look up. The subset of frogs we specifically refer to below are, in all but one case, animals that had radio-transmitters in them. Jen had two designations for these frogs. One was simply a sequential number based on their surgical order. For example, Frog 26 was the 26th frog Jen operated on to implant a transmitter. Most often, we began referring to these frogs by the frequency of their implanted radio-transmitter. For example, we started calling Frog 6, 139 (based on its radiofrequency of 150.139), Frog 3 became 060, Frog 5 become 080, Frog 8 was 160, and so on. When we replaced the radio-transmitters, we usually continued to call the frog by its original frequency number. When 139’s original radio died and was swapped out for a radio with the frequency 150.660, we continued to call him 139. There were two reasons for this. First, we had come to know the frog by its original number, and when we mentioned the number everybody knew which frog we were referencing. Second, we recycled transmitters with dead batteries, sending them back to Holohil to be refurbished. Holohil replaced the batteries but they did not change the frequency of the transmitter. Because each of our transmitters had a unique frequency, when we swapped out transmitters in the frogs the replacement transmitter had to have a different frequency than the original transmitter. If we had always referred to each frog by its current frequency, Frog 139 in 2009 would have become Frog 660 in 2010, and we would have had to distinguish Frog 660 in 2009 from Frog 660 in 2010, which were different frogs. This would have become a nightmare. By keeping the original designation, Frog 139 was always Frog 139 to us, no matter the frequency of his current transmitter.

A small subset of Jen’s numbered frogs then acquired a more descriptive name, for example, instead of being identified by his radio frequency, 279, Frog 26 became Romeo; Frog 33 became Juliet; we called Frog 53, the big female from Nate’s Pond who had survived the big 2009 prescribed prairie burn, Corner Burn Chick; Frog 65, living in a neighbor’s pasture, became Private; and Frog 47, near the hunting sign-in kiosk, somehow became Sugar Shack. Romeo and Juliet acquired their names from their habit of burrow sharing (twice, for two days each in 2010). Corner Burn Chick, Private, and Sugar Shack were named for the locations of the first primary burrows we found them inhabiting.

1.1Figure 1.1. Jen Heemeyer, displaying the energy and personality she brought into our lab.

1.2Figure 1.2. The historical distribution of Crawfish Frogs, Carolina Gopher Frogs, and Dusky Gopher Frogs. Note that the historical distribution of both Gopher Frog species followed the Gulf and Atlantic Coastal Plains. In contrast, the historical distribution of Crawfish Frogs tracked north from eastern Texas through Oklahoma and Kansas to form a large continuous distribution, then followed rivers and grasslands east and north across Louisiana, Mississippi, Alabama, Arkansas, and Missouri to form a second continuous distribution in the southern portion of Illinois and Indiana, and the western portions of Kentucky and Tennessee.

1.3Figure 1.3. A Crawfish Frog in its primary crayfish burrow. Note the tight fit of the frog to the burrow, and how the circular jawline of the Crawfish Frog matches the size and shape of the burrow. (Photo by Nate Engbrecht and used with permission.)

1. Jen has since gotten married to Dr. Andrew Beck and taken his last name. We will use her maiden name here, because that’s how we came to know her, and she used her maiden name when publishing her Crawfish Frog work. [↑](#footnote-ref-1)
2. Northern and Southern Leopard Frogs (*Rana pipiens* and *R. sphenocephala*, respectively). [↑](#footnote-ref-2)
3. *Rana catesbeiana*. [↑](#footnote-ref-3)
4. *Rana clamitans*. [↑](#footnote-ref-4)
5. *Rana sylvatica*. [↑](#footnote-ref-5)
6. *Rana sevosa*. [↑](#footnote-ref-6)
7. *Rana capito*. [↑](#footnote-ref-7)