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Current Distribution of Crawfish Frogs in Southernmost Illinois

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ABSTRACT

Crawfish Frogs (*Rana areolata* [*Lithobates areolatus*]) are secretive, fossorial anurans that inhabit crawfish burrows in grass-dominated habitats. They are of conservation concern throughout their range, especially east of the Mississippi River. Crawfish Frogs occur throughout much of the southern half of Illinois where many county occurrence records are decades old and where their current conservation status requires confirmation. I surveyed for the presence of Crawfish Frogs from 2006-2017 to estimate their current distribution in the 11 southernmost counties of Illinois. I detected Crawfish Frogs at 187 locations in 10 counties. Despite extensive habitat loss, Crawfish Frogs are currently widely distributed across southernmost Illinois and appear to be secure at this time. However, ongoing habitat alterations threaten the future of Crawfish Frog populations in the region; therefore, I encourage prompt, proactive conservation efforts while Crawfish Frogs are still relatively common.

INTRODUCTION

Crawfish Frogs (*Rana areolata* [*Lithobates areolatus*])* are relatively large, secretive frogs that range across portions of the central and south-central United States (Parris and Redmer, 2005). They are fossorial, typically inhabiting crawfish burrows in mesic grasslands (Parmalee, 1954; Smith 1961; Hoffman et al., 2010; Heemeyer et al., 2012), and they breed in temporary and permanent lentic water bodies, usually those devoid of predatory fishes (Phillips et al., 1999).

Although once locally common (Cagle, 1942; Smith, et al. 1948), Crawfish Frogs are now of conservation concern throughout their range (Stuart et al., 2008; Stiles et al., 2017), including Illinois (Illinois Department of Natural Resources, 2005). Crawfish Frog population declines and extirpations are associated with conversion of natural and human-made grasslands for other purposes as well as destruction of breeding sites and introduction of predatory fishes into breeding sites (Thompson, 1915; Busby and Brecheisen, 1997; Parris and Redmer, 2005).

Crawfish Frogs range across the southern half of Illinois, south of the Shelbyville Moraine, from Adams County on the west to Edgar County on the east (Smith, 1961). Crawfish Frogs are characteristic of the outlier prairies of the Southern Till Plain (Smith, 1961), which includes much of southern Illinois. Crawfish Frog records for many counties are decades old (Phillips et al., 1999) and the current status and distribution of the species in each historically-occupied county is in need of verification.

The distribution of Crawfish Frogs in the 11 counties comprising southernmost Illinois prior to European settlement is unknown. The oldest specimen from the area was collected in Pulaski County in 1936 (Southern Illinois University at Carbondale specimen number 1862). Before settlement, southernmost Illinois was predominately forest (Anderson, 1970; Anderson, 1991; Leitner and Jackson, 1981) although grasslands, including mesic prairie and oak flatwoods, occurred on the Southern Till Plain in the four northernmost counties of the survey area (Engelmann, 1863; Wallace and Fehrenbacher, 1969; Anderson, 1970; Anderson and Anderson, 1975; Miles and Weiss, 1978). Less extensive inclusions of lowland and upland grasslands occurred in the forests to the south, in the unglaciated Shawnee Hills and the Coastal Plain Natural Divisions (Schwegman, 1973; Parks, 1975; Williams and Indorante, 2008; Williams et al., 2008).

The objective of my survey was to ascertain the current distribution of Crawfish Frogs in southernmost Illinois where some of the healthiest populations east of the Mississippi River are thought to occur (Engbrecht et al., 2012). I designed my survey to optimize Crawfish Frog detections – particularly in under-surveyed regions – and to motivate additional, more intensive survey efforts as well as the initiation of conservation actions.

*Due to the lack of consensus regarding the usage of Rana or Lithobates for this taxon, I have elected to use both (Pauly et al., 2009).

METHODS

I determined pre-survey distribution of Crawfish Frogs in southernmost Illinois by reviewing literature and museum collections, and by soliciting observations from Illinois Department of Natural Resources (IDNR) biologists and other knowledgeable individuals. Pre-survey Crawfish Frog observations were available for all southernmost Illinois counties except Gallatin. Pre-survey observations were unevenly distributed, ranging from 1–21 locations per county, with most (68%) occurring in Jackson and Williamson counties near Southern Illinois University (Table 1).

In Illinois, Crawfish Frogs have a brief late-winter/early spring breeding period beginning soon after the ground thaws and spring rains begin (Parmalee, 1954; Smith, 1961). I conducted Crawfish Frog auditory surveys during this period, the timing of which varied from year to year depending upon weather conditions (earliest start date was 6 March 2009; the latest completion date was 6 April 2013). I concentrated my initial efforts (2006–2012) near known localities in Jackson and Williamson counties. In addition to auditory surveys, I searched for egg masses in human-made ponds on Crab Orchard National Wildlife Refuge (CONWR), Williamson County. Although Crawfish Frog egg masses are globular like those of syntopic Southern Leopard Frogs (*Rana sphenocephala* [*Lithobates sphenocephalus*]), Crawfish Frog eggs and egg masses are distinguishable by their larger size (Wright and Wright, 1949).

Beginning in 2013, I expanded my survey

area using methodology described by Palis (2014). Briefly, this methodology was as follows. Prior to conducting nocturnal auditory surveys, I scrutinized Google Earth satellite imagery to locate potential Crawfish Frog breeding sites. I searched for ponds and wetlands that looked similar to known Crawfish Frog breeding sites and that occurred in agricultural settings or in rural human communities. I selected relatively small water bodies that appeared to be shallow and, therefore, less likely to contain predatory fishes. I selected potential breeding sites ≤0.5 km from a road from which I could listen for vocalizing male Crawfish Frogs.

I initiated nocturnal auditory surveys each year after first determining – via reconnaissance of known localities and communication with knowledgeable individuals – that Crawfish Frogs had begun vocalizing. I surveyed on rainless nights, travelling from one preselected location to the next, and listened for vocalizing frogs from 1–10 minutes. Stops were shortest at sites where no frog species were calling or when extraneous noises, such as the sound of traffic or nearby barking dogs, significantly interfered with my ability to hear frogs. I frequently exited my vehicle and cupped my ears forward with my hands to better detect and locate provenance of calling frogs. It was sometimes necessary to listen from multiple locations and from different directions to pinpoint a breeding site. When Crawfish Frogs were detected, I noted the location using road mileage from a landmark, such as a crossroad, and/or on field maps. I also recorded locations of frogs observed on roads and, if ≥1.5 km from the nearest known breeding site, I included the observation as representative of an undetected breeding site (Heemeyer and Lannoo, 2012). For the purpose of mapping, I determined latitude and longitude of each Crawfish Frog occurrence using Google Earth.

Table 1. Number of Crawfish Frog locations and number of private-land and public-land breeding sites for 11 southernmost Illinois counties. * = One record in Perry County at northern border of Jackson County.

County	Pre-2006 Locations	2006-2017 Locations	2006-2017 Private lands breeding sites	2006-2017 Public lands breeding sites
Alexander	1	0	0	0
Gallatin	0	1	1	0
Hardin	1	2	2	0
Jackson	15	5*	5	0
Johnson	2	48	45	1
Massac	4	30	29	0
Pope	3	11	11	0
Pulaski	1	13	11	1
Saline	3	15	15	0
Union	2	10	10	0
Williamson	21	52	29	23
Total	53	187	158	25

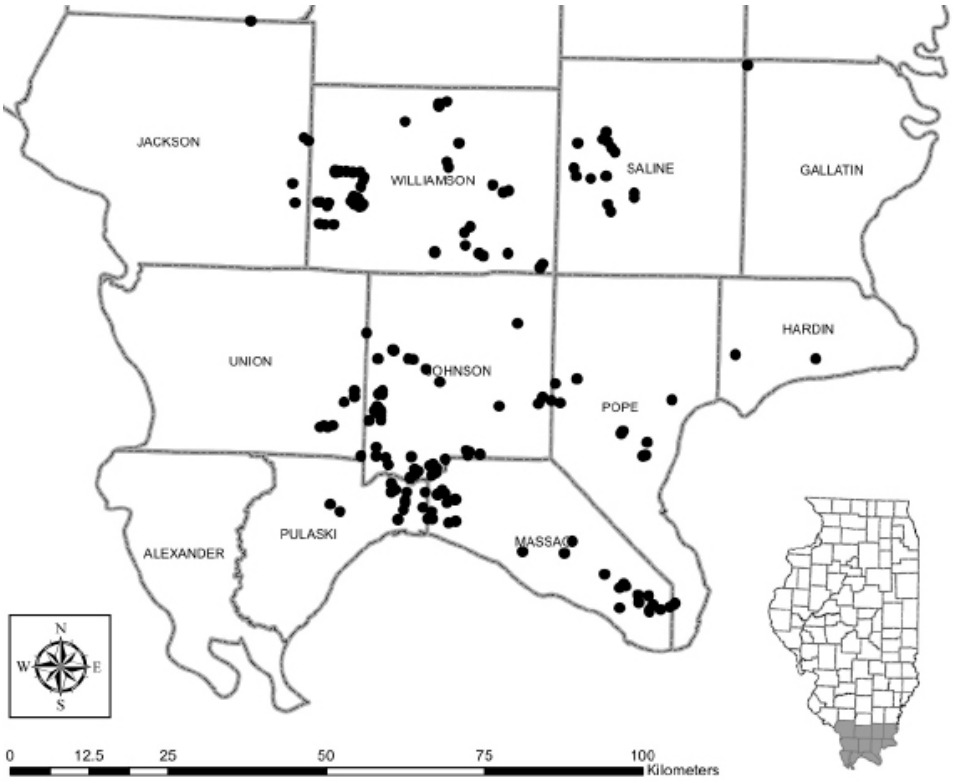

Figure 1. Detections of Crawfish Frogs in 11 southernmost Illinois counties from 2006-2017.

RESULTS

From 2006 through 2017, I detected Crawfish Frog egg masses and/or males vocalizing at 183 water bodies, and encountered individuals on roads at four additional locations thought to represent undetected breeding sites (Fig. 1, Table 1). With the exception of Alexander and Jackson counties, the number of Crawfish Frog locations detected per county increased from 1–46 between pre-2006 and 2006–2017 (Table 1). One hundred fifty-eight (86.3%) breeding sites occur on private lands and 25 (13.7%) occur on public lands (Table 1). Eight sites occur on private conservation land (The Nature Conservancy's Grassy Slough Preserve [GSP], Johnson County) that was under intensive agricultural use as recently as 1998).

DISCUSSION

Most Crawfish Frog breeding sites occur on agricultural lands that are used for purposes other than wildlife conservation; therefore, the future of Crawfish Frogs on these lands is uncertain. A worrisome trend in Illinois agriculture includes a decline in grassland (Zaya et al., 2017), the pace of destruction

of which has increased with conversion of grassland to cropland associated with biofuel production (Lark et al., 2015). In addition, ponds are being filled or are being replaced with grassed swales that, in conjunction with perforated vertical pipes connected to underground drainage tiles, carry water off the landscape rather than holding it in retention ponds (personal observations). Areas of relatively level topography, especially former prairie and flatwoods in the northern tier of the survey area, are now comprised principally of extensive, pond-free croplands. The best remaining Crawfish Frog habitat occurs in agricultural settings on gently rolling topography, areas that are better suited for cattle and hay production than row-crops.

Clearly, the future of most southern Illinois Crawfish Frog populations is in the hands of private landowners. Because croplands are generally managed to maximize yields, both larval and adult Crawfish Frog habitat has been, and continues to be, lost. One source of hope is enrollment of private farmland in programs such as the United States Department of Agriculture-Natural Resource Conservation Service's Conservation Reserve Program, Wetland Reserve Program (now Wetland Reserve Easement), Environmental Quality Incentives Program, and Agricultural Land Easements. These programs may offset habitat lost to increasingly intensive farming practices and pond loss or modification.

Portions of public and private conservation lands currently inhabited by Crawfish Frogs in southernmost Illinois provide upland habitat suitable for Crawfish Frogs. However, only CONWR contains actively managed grasslands (USFWS, 2007). Conservation lands within the Cache River watershed (Cache River State Natural Area, Cypress Creek National Wildlife Refuge, and GSP) are being retired from agriculture and reforested (Kruse and Groninger, 2003). As trees mature and the canopy closes, grassland habitat will diminish, rendering these tracts less suitable for Crawfish Frogs (Williams et al., 2012a, 2012b).

Despite the trend towards a loss of Crawfish Frog habitat, my observations suggest that Crawfish Frogs are currently widespread in southernmost Illinois. In addition to those detected during my survey, there are likely many undetected Crawfish Frog breeding sites in the region. I observed numerous potential Crawfish Frog breeding sites at Google Earth that I was unable to survey because they occur beyond the auditory range of a road. Furthermore, I was often unable to get close enough to distinguish Crawfish Frog vocalizations among several nearby water bodies, so a location mapped as a single site may actually represent several breeding sites. In other cases, I was unable to map locations because I could not determine the provenance of calling Crawfish Frogs. Finally, because I surveyed a large geographic area, my survey effort at most sites was limited to a single, brief visit. Positive determination of Crawfish Frog occupancy of a site sometimes requires multiple visits, both within and among years (personal observations).

I encourage additional Crawfish Frog presence-absence surveys, especially on public lands. Moreover, given the current distribution of Crawfish Frog populations in southernmost Illinois, I believe that this is an opportune time for conservation agencies and organizations to preserve Crawfish Frog habitat in the region while it still relatively abundant. Partnering with private landowners, state and federal agency personnel may be able to maintain, or even increase, amphibian-friendly, semi-natural habitats in agricultural settings for the benefit of Crawfish Frogs (Maes et al., 2008). Managing for grassland on conservation lands within the Cache River watershed will also benefit Crawfish Frogs. Proactive conservation efforts are considerably less expensive and are likely to be far more successful than implementing reactive conservation efforts (Fischer and Lindenmayer, 2000; Drechsler et al., 2011; Martin et al., 2012). This is especially relevant given that funds for amphibians listed as threatened or endangered are inadequate to achieve recovery goals (Gratwicke et al., 2012).

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