

Locality Records of the Northern Leopard Frog, *Rana pipiens*, in Central and Southwestern Illinois

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ABSTRACT

Three new localities for *Rana pipiens* in central and southwestern Illinois are reported, and several explanations are proposed for these records. Previous records of *R. pipiens* were limited primarily to the northern third of Illinois. *Rana pipiens*, and the southern leopard frog, *R. sphenoccephala*, previously were believed to be allopatric in Illinois. However, parapatric populations of *R. pipiens* and the plains leopard frog, *R. blairi* have been reported from several northcentral and northeastern Illinois counties.

INTRODUCTION

The taxonomy of North American leopard frogs has been subject of study throughout much of the 20th century. Results of morphological studies and hybridization experiments led Moore (1944, 1946) to conclude that "*Rana pipiens*" was a single wide-ranging species. In his work on the amphibians and reptiles of Illinois, Smith (1961) recognized "*Rana pipiens*" as the only leopard frog species in Illinois. Smith recognized two subspecies of *R. pipiens* in Illinois: *R. p. pipiens* (northern leopard frog), and *R. p. sphenoccephala* (southern leopard frog), and depicted a wide zone of intergradation across the middle of the state. Brown and Brown (1972) later showed that at least three call types existed within the *R. pipiens* complex in Illinois. In addition, several significant morphological characters were recognized, and now three leopard frog species (*R. pipiens*, *R. sphenoccephala*, and the plains leopard frog, *R. blairi*) are known to occur in Illinois (Mecham, et al., 1973; Brown and Morris, 1990).

Rana pipiens, sensu stricto, can be distinguished from *R. blairi* by continuous dorsolateral folds (one or both of which are broken posteriorly and medially displaced on *R. blairi*). Male *R. pipiens* possess Müllerian ducts (vestigial oviducts), a feature not shared with either *R. blairi* or *R. sphenoccephala* (Mecham, et al. 1973; Brown and Morris, 1990). The range maps of Pace (1974) and Morris (1994; Fig. 1) show records of *R. pipiens* from the northern one-third of Illinois, as far south as Kankakee County on the east, and Henderson County on the west. The maps also showed an isolated record from McLean County, in central Illinois, which may represent an introduced locality or misidentification. The distributions of *R. pipiens* and *R. blairi* overlap in several northern counties in which *R. blairi* occurs (Brown and Morris, 1990). Previously, *R. pipiens* and *R. sphenoccephala* were not reported together in any county in the state.

The pickerel frog, *Rana palustris*, has been confused with *R. pipiens* in some Illinois collections (Redmer and Mierzwa, 1994). *Rana palustris* differs from *R. pipiens* by possessing the following characters (which *R. pipiens* lacks): a) usually square spots arranged in parallel rows between wide dorsolateral folds, b) rounder snouts, and c) yellow-gold flash coloration on the thighs and groin in life; and d) lack of male Müllerian ducts.

Recently, five *R. pipiens* specimens identified as *R. palustris* were found in the herpetology research collection of the Department of Biological Sciences, Southern Illinois University at Edwardsville (SIUE). These specimens bear field tags which indicate the frogs were collected outside of the previously known Illinois range of *R. pipiens*. The objective of this paper is to report these specimens.

MATERIAL AND METHODS

While examining preserved specimens in the SIUE collection, (in a jar labeled "*Rana palustris*") five specimens not identifiable as that species were found. The collection data attached to these specimens are as follows:

Madison County: SIUE 1588 and 1589. Elevation 540' [166 m] in grassy pond area 89°59'30"N, 3847'. 28 April 1964. W. A. Armistead. SIUE 1590. Bank of Indian Creek 3 miles [4.9 km] SE of Roxana. 17 April 1963. J. Lynch.

Sangamon County: SIUE 1616. Springfield, 6.0 miles [9.8 km] due S on Route 66. Alt. 600+ [=elevation 185 m], along Lake Springfield shoreline. 28 April 1963. L. Fencel. SIUE 1617. Six miles [9.8 km] S of Springfield, Route 66. Found under highway bridge. Elevation 600' [185 m]. 28 April 1963. J. and L. Leitner.

The specimens were dissected and examined to determine sex and the presence or absence of Müllerian ducts. The general external appearance of each specimen (especially dorsolateral folds, spot pattern, and external secondary sex characters such as vocal sacks and articular nuptial pads) were noted. All other preserved leopard frogs in the SIUE collection were examined in a similar fashion.

RESULTS AND DISCUSSION

All five specimens were male, and had dorsolateral folds continuous to the thigh. All possessed Müllerian ducts, and lacked external vocal sacks. Dorsal spots are round or oblong, and randomly distributed between the dorsolateral folds. This character combination supports the identity of each specimen as *R. pipiens*, thus possibly extending considerably the range of this species in the state (Fig 1). However, this small sample does not necessarily indicate that populations of *R. pipiens* occur in Madison and Sangamon counties. There are three possible explanations for these records:

1) Intentional or accidental release of captive specimens of unknown origin. Live individuals of the *R. pipiens* complex have for many years been commercially available through the biological supply industry. Pentecost and Vogt (1976) reported that, in

Wisconsin, approximately 160,000 *Rana pipiens* were harvested annually by biological supply houses. Two Madison County specimens (SIUE 1588-1589) were collected on the campus of SIUE, and may have been former captives that were released or that escaped. *Rana pipiens*, and other frog species, are sometimes used as fishing bait and tadpoles may be translocated as a by-product of fish stocking operations. Both Sangamon County specimens were collected in the vicinity of Lake Springfield, and may have been released or escaped bait animals. Although ranid frogs are not usually considered popular pet species, it is possible that any or all of the examined specimens were released or escaped pets.

2) Erroneous locality data or errors in cataloging. It is possible that any or all of the specimens were collected or obtained somewhere other than the locations indicated on the field tags, and that errors were made on the field tags, and/or during the process of cataloging them into the SIUE collection.

3) Possibility of disjunct populations. It is possible that these specimens represent disjunct and/or relict populations. Elsewhere in the midwest (e.g., Indiana and Ohio), *R. pipiens* occurs at latitudes as far south as Madison County (Conant and Collins, 1991). Also, in Illinois, four snake species (fox snake, *Elaphe vulpina*; smooth green snake, *Opheodrys vernalis*; bull snake, *Pituophis melanoleucus*; plains garter snake, *Thamnophis radix*) known primarily from the northern half of the state also occur in disjunct populations along the Illinois River drainage, or in counties on the east side of the Mississippi River crescent north and east of St. Louis, Missouri (Smith, 1961; McNaughton, 1976; Tucker, 1994 a, b). Blanding's turtle, *Emydoidea blandingii*, has a mostly northern distribution in Illinois and Missouri, but recently it has been documented from St. Charles County, Missouri (Powell, et al., 1993). The Madison and Sangamon county *Rana pipiens* specimens may represent similar relicts.

Both *Rana blairi* and *Rana sphenoccephala* previously have been reported from Madison County (Axtell, 1976; Brown and Morris, 1990). Only *R. sphenoccephala* has been reported previously from Sangamon County (Pace, 1974). If the *R. pipiens* specimens reported in this paper represent natural populations, these records are the first to document the occurrence of this species in Illinois counties where *R. sphenoccephala* also occurs, and Madison County would be the first Illinois County in which all three leopard frogs are known to occur.

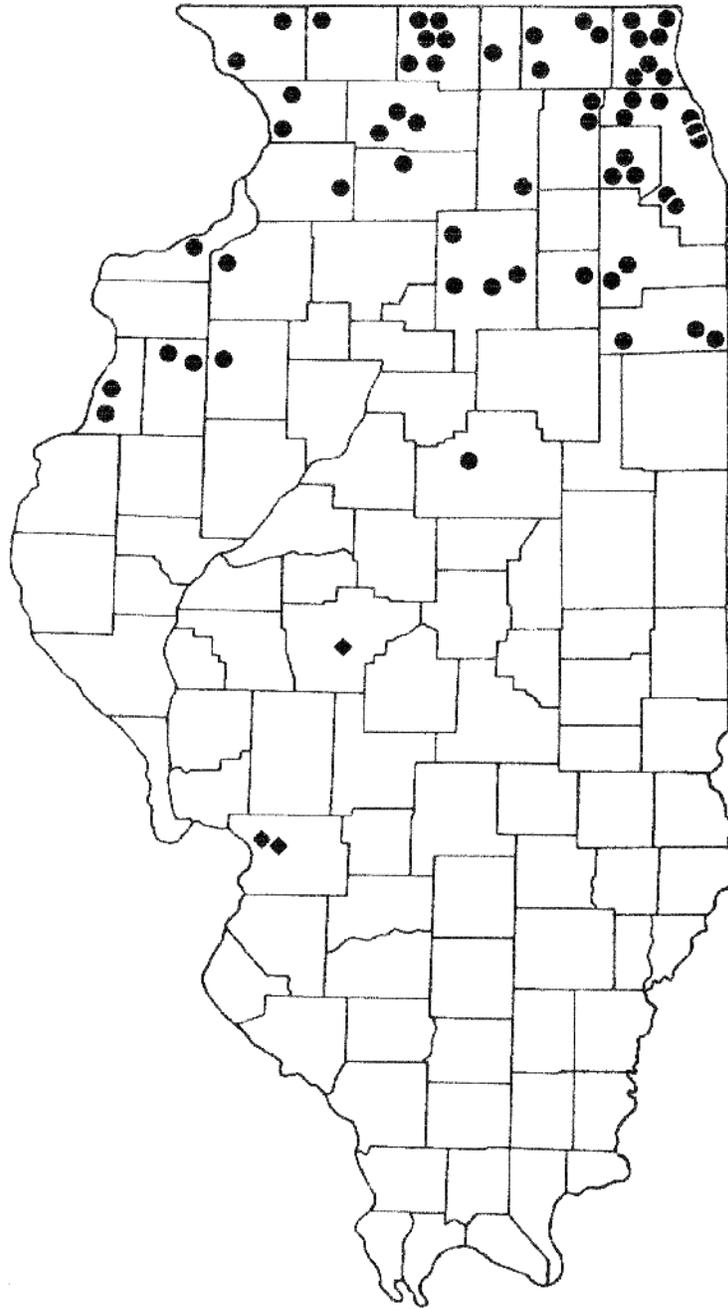
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Figure 1. The distribution of *Rana pipiens* in Illinois, based on maps by Pace (1974), and Morris (1994). Diamonds indicate localities reported herein. Circles indicate previous records.



Behavioral observations of frogs feeding on 1.5 cm long crickets reveal a high degree of variability in eye retraction and swallowing. Eye retraction can occur bilaterally or unilaterally, and both swallowing movements and eye retraction can occur separately as well as together. After bilateral denervation of the retractor bulbi, frogs maintain the ability to swallow but show a 74% increase in the number of swallows required per cricket (from a mean of 2.3 swallows to a mean of 4.0 swallows per cricket). Our results indicate that, in *Rana pipiens* feeding on medium-sized crickets, eye retraction is an accessory swallowing mechanism that assists the primary tongue-based swallowing mechanism. PMID: 15010487. Locality records of the northern Leopard frog, *Rana pipiens*, in central and southwestern Illinois. Trans. Illinois Acad. Sci. 89:215-219) examined specimens from Sangamon and Madison counties, and found them to be *pipiens* by the presence of Mullerian ducts and the lack of external vocal sacs and discussed possible explanations for these records. Original Name: *Rana pipiens* Schreber, 1782. Nomenclatural History: The taxonomic history of the Northern Leopard Frog is quite complicated. For details, see Brown, Smith, and Funk (1977, Bull. Zool. Nomencl., 33: 195-203). Until 1973, at least, *R. sphenoccephala* and *R. blairi* were not distinguished from *R. pipiens*, so many references to *R. pipiens* may, in fact, refer to any of these species. See Brown (1973. The security of the northern leopard frog (*Rana pipiens*) varies spatially with populations east and west of North Dakota considered as secure and at risk, respectively. We used genetic markers to... We used genetic markers to characterize the conservation status of northern leopard frog populations across North Dakota. We used multiple regression analyses and model selection to evaluate correlations of expected heterozygosity (H_E) with the direct and additive effects of: i) geographic location, ii) wetland density and iii) average annual precipitation. There was lower genetic diversity in the western portion of the state due to lower levels of diversity for populations southwest of the Missouri River.