

# CALLING SITE CHARACTERISTICS OF THE ILLINOIS CHORUS FROG (*PSEUDACRIS STRECKERI* *ILLINOENSIS*) IN NORTHEASTERN ARKANSAS

Malcolm L. McCallum<sup>1,2</sup>

Environmental Sciences Ph.D. Program, Arkansas State University,  
PO Box 847, State University, Arkansas 72467, USA

Stanley E. Trauth, Charles McDowell, Robert G. Neal, and Tracey L. Klotz

Department of Biological Sciences, Arkansas State University,  
PO Box 599, State University, Arkansas 72467, USA

Proper management of wildlife populations requires an in-depth knowledge of habitat requirements for each species (Anderson 1985). Microhabitat use has been largely uninvestigated in amphibians and reptiles. Without knowing how species utilize the unique matrices of microhabitats within a general habitat, a species numbers could easily decline for seemingly unknown reasons. This may be especially true if the microhabitat structure is involved in reproduction.

*Pseudacris streckeri illinoensis* is a highly fossorial (Brown 1978; Brown et al. 1972) hylid frog endemic to sand areas from extreme northeastern Arkansas and southeastern Missouri to the Mississippi and Illinois rivers in central and southern Illinois (Smith 1966). The secretive nature of this frog makes study of its natural history problematic (Brown 1978; Brown et al. 1972; Smith 1961; Tucker 2000a). The calling season of *P. s. illinoensis* in Arkansas begins anywhere from mid-January to late-February and can continue through late April (Butterfield 1988).

Fecundity estimates were reported by Butterfield et al. (1989), Smith (1961), and Tucker (1997). Breeding occurs in flooded fields, ditches, and other temporary bodies of water in Missouri (Johnson 2000). Microhabitat use and calling site selection within the breeding chorus is unexplored.

We here characterize the calling perch selection by male *P. s. illinoensis* as applied to the conservation and management of this subspecies.

## MATERIALS AND METHODS

We visited breeding choruses of *P. s. illinoensis* located in Clay County, Arkansas on 18, 28 February and 4 March 2000; 13, 15, 24 February 2001; 14, 19, 23 February and 1, 8, 15 March 2002. We counted calling males at selected ponds, and recorded abnormalities as observed. We noted amplexant and calling behaviors in 2001.

### Calling Sites

We characterized calling sites in 2002 based on their distance from shore, type of calling perch, and depth of water at the calling site. We estimated each male's distance from shore and placed it one of three categories: (1) 0–10 m from shore, (2) 11–20 m from shore, and (3) 21–30 m from shore. The water depth at each calling site was measured with a meter stick.

### Perch Types

Perch types were classified as follows: (1) calling on the ground out of the water, (2) calling with feet on the bottom of the pond without vegetation, and (3) calling while floating and grasping a piece of vegetation such as a bean or cotton plant.

### Satellite Males

We also documented the presence and number of satellite males and other miscellaneous observa-

<sup>1</sup>Please use for correspondence.

<sup>2</sup>Present address: Department of Biological Sciences, Louisiana State University at Shreveport, One University Place, Shreveport, Louisiana 71115, USA. Email: mmc-callu@pilot.lsu.edu.

tions. We categorized males as satellites if no signs of calling were observed for at least 5 min within these individuals despite active calling by a neighboring male within that aggregation of frogs.

## RESULTS

Frogs called on 28 February and 4 March 2000; 15, 24 February 2001; 19 February and 8, 15 March 2002. A few males called faintly on 23 February 2002. None called on 18 February 2000, 13 February 2001, 14 February, and 1 March 2002. Frogs did not call at wind speeds  $> 4.8$  km/h and with clear to foggy skies. Frogs called at temperatures  $> 14^{\circ}\text{C}$  and wind speeds  $< 1.6$  km/h. On only one occasion (8 March 2002) males called at a temperature  $< 14^{\circ}\text{C}$ .

Males called at different frequencies from the three perch types ( $r^2 = 16.83$ ,  $df = 2$ ,  $P < 0.001$ ). Three males (7.9%) called on the ground above the water, and two (5.3%) called while partly submerged in shallow water on the bottom of the pond. Nearly all males (33/38, 86.8%) called while grasping a piece of vegetation and allowing their body to freely float in the water at a  $45\text{--}60^{\circ}$  angle to the water surface. In 2001, males also called from floating mats of decaying crop debris, but we did not quantify these data. Typically, calling males grasped the vegetation above the water line so that their vocal sac remained above water.

Nonterrestrial calling sites were in water 1–28 cm deep (mean depth = 16.9 cm,  $s = 6.67$ ). Water depth and distance from shore were highly correlated ( $r^2 = 0.632$ ,  $df = 37$ ,  $P < 0.000$ ). We limited our analyses to relationships regarding distance from shore because of the high degree of multicollinearity present between these two variables.

Calling males were equally distributed among the three distance categories ( $r^2 = 0.83$ ,  $df = 2$ ,  $P > 0.50$ ). Fifteen calling males (41.6%) were within 10 m of the shore, ten (26.3%) called from 11–20 m from shore and 11 (28.9%) called between 21 and 30 m from shore.

Total males (calling + noncalling) increased with distance from shore ( $r^2 = 7.66$ ,  $df = 2$ ,  $P < 0.025$ ). Fifteen males (24.2%) were within 10 m of the shoreline, 16 (25.8%) were 11–20 m from shore and 31 (50%) were  $> 20$  m from shore. The higher numbers of total males resulted from increased numbers of satellite males as distance from shore increased ( $r^2 = 20.0$ ,  $df = 2$ ,  $P < 0.001$ ). No satellites

occurred  $< 10$  m from the shoreline, whereas four (16.7%) were 11–20 m from shore, and 20 (83.3%) were  $> 20$  m from shore. Emergent plants (perch sites) were estimated around  $10/\text{m}^2$  within 10 m of shore and about  $0.1/\text{m}^2$  in areas  $> 20$  m from shore. The middle range was transitional in vegetation availability between the high and low region.

We observed six amplexant pairs, all  $> 20$  m from shore. Amplexed females grasped emergent stems with only her nostrils above water as described by Johnson (2000) and Tucker (1997). When approached, the pair released the vegetation and swam to the pond bottom where it remained motionless. On two occasions, amplexant pairs buried into the sandy pond bottom during escape. No amplexus was observed during the 2002 choruses, although tadpoles were observed on 8 March 2002.

We observed 30 males among 40 *P. s. illinoensis* on 15 February 2002. Ten of these had apparent frostbite scars (Tucker 2000b), two possessed red inguinal pustules, one had localized lymphadema, and another individual had a dysfunctional vocal sac. A single male with a missing arm was observed during spring 2000. No abnormalities were observed in 2002.

Males did not call when the temperature was  $< 14^{\circ}\text{C}$  except on 8 March 2002, when the temperature dropped late in the evening from about  $21^{\circ}\text{C}$  earlier in the day. Males stopped calling around midnight, possibly in response to the sudden cold snap.

## DISCUSSION

Tucker (1997) suggested the presence of inundated emergent vegetation was essential for oviposition. His comments combined with our observations suggest that males may select calling sites based on their suitability for oviposition.

Calling males appeared to be equally distributed among distance categories, whereas satellite males congregated far from shore. Although absolute numbers of males were evenly distributed among distances, the number of available perch sites near shore was much higher than away from shore. It appears that calling males prefer calling perches far from shore.

Selection of distant calling sites may have consequences to fitness. The only amplexant pairs were observed far from shore suggesting this is the best place to breed. It seems unlikely that females selected their mates at the shoreline then swam to

the center of the pond to breed. Eggs laid near shore are probably more susceptible to desiccation if water levels drop prior to hatching. The sand ponds where these frogs live are susceptible to rapid drying as daytime temperatures rise (pers. observ.) Male *P. s. illinoensis* appear to select calling sites located in deeper water far from shore where they are likely more successful at procuring mates and may experience higher offspring survivorship.

Our observations suggest that emergent vegetation in the center of temporary sand ponds is an important component of the microhabitat for *P. s. illinoensis*. Realizing this, management of this potentially declining species (Tucker 1998) is recommended to include manipulation of vegetation to increase the amount of emergent vegetation present in breeding ponds. This kind of habitat manipulation could reduce competition for calling perches and increase the number of calling males present in the center of the pond potentially increasing survivorship of resulting egg clutches. Consequently, this type of habitat management is recommended and expected to be of high conservation value for *P. s. illinoensis* throughout its range.

#### ACKNOWLEDGMENTS

We thank the Arkansas Game and Fish Commission for permits and funding of this study, Kelly Irwin for his personal interest, special efforts and kind support, the Arkansas State University Environmental Sciences PhD Program and Department of Biological Sciences for use of their equipment facilities, and the many unnamed people who, during discussions, provided input and advice for this study. We especially thank Bobby Samples, Jeremy Jackson, Jimmy Gore, and Jamie Varner who accompanied us to Clay County on several occasions.

#### LITERATURE CITED

- Anderson, S.H. 1985. *Managing Our Wildlife Resources*. Merrill Publishing Co., Columbus, Ohio, USA.
- Brown, L.E. 1978. Subterranean feeding by the chorus frog *Pseudacris streckeri* (Anura: Hylidae). *Herpetologica* 34:212–216.
- Brown, L.E., H.O. Jackson, and J.R. Brown. 1972. Burrowing of the chorus frog, *Pseudacris streckeri*. *Herpetologica* 28:325–328.
- Butterfield, B.P. 1988. Age structure and reproductive biology of the Illinois chorus frog (*Pseudacris streckeri illinoensis*) from northeastern Arkansas. Unpubl. MS Thesis, Department of Biological Sciences, Arkansas State University, Jonesboro, Arkansas, USA.
- Butterfield, B.P., W.E. Meshaka, and S.E. Trauth. 1989. Fecundity and egg mass size of the Illinois chorus frog, *Pseudacris streckeri illinoensis* (Hylidae), from Northeastern Arkansas. *Southwestern Naturalist* 34:556–557.
- Johnson, T.R. 2000. *The Amphibians and Reptiles of Missouri*. Missouri Department of Conservation, Jefferson City, Missouri, USA.
- Smith, P.W. 1961. The Amphibians and Reptiles of Illinois. *Bulletin of the Illinois Natural History Survey* 28:1–298.
- Smith, P.W. 1966. *Pseudacris streckeri*. *Catalogue of American Amphibians and Reptiles* 27:1–2.
- Tucker, J.K. 1997. Fecundity in the Illinois chorus frog (*Pseudacris streckeri illinoensis*) from Madison County, Illinois. *Transactions of the Illinois State Academy of Science* 90:167–170.
- Tucker, J.K. 1998. Status of the Illinois chorus frog in Madison County, Illinois. In: M.J. Lannoo (ed.), *Status and Conservation of Midwestern Amphibians*, pp. 94–112. University of Iowa Press, Ames, Iowa, USA.
- Tucker, J.K. 2000a. Growth and survivorship in the Illinois chorus frog (*Pseudacris streckeri illinoensis*). *Transactions of the Illinois State Academy of Science* 93:63–68.
- Tucker, J.K. 2000b. *Pseudacris streckeri illinoensis* (Illinois Chorus Frog). Frost Injuries. *Herpetological Review* 31:41–42.

