Transactions of the Illinois State Academy of Science
(2021) Volume 114, pp. 23-26

received 12/30/20
accepted 4/22/21

New Records of Bird-voiced Treefrogs, *Hyla avivoca*, in Southern Illinois

John G. Palis
Palis Environmental Consulting, P.O. Box 387, Jonesboro, IL 62952 jpalis@yahoo.com

ABSTRACT

Since European settlement, southern Illinois has lost an estimated 95.9% of its bald cypress and mixed bald cypress-hardwood swamps. Bird-voiced Treefrogs (*Hyla avivoca*)—thought to be swamp obligates—were detected at only 24 southern Illinois remnant swamps in the 1990s and were subsequently listed as state-threatened. I conducted systematic acoustic surveys for vocalizing male Bird-voiced Treefrogs during May and June of 2019 and 2020, and accrued supplementary observations from 2008–2017. My efforts yielded 32 new detections of Bird-voiced Treefrogs in three southern Illinois watersheds, including 14 swamp remnants, a stream channel, and 17 human-made water bodies. As a result of habitat restoration, Bird-voiced Treefrogs appear to be recolonizing portions of their former Illinois range from which they were previously extirpated by forest clearing and wetland drainage.

INTRODUCTION

Bird-voiced Treefrogs (*Hyla avivoca*) are southern Coastal Plain anurans that reach their northern range limit in southern Illinois (Dodd 2013, Powell et al. 2016). Bird-voiced Treefrogs principally inhabit river floodplain forests and swamps (Dodd 2013). In Illinois, Bird-voiced Treefrogs were once thought to be restricted to remnant bald cypress (*Taxodium distichum*)-tupelo gum (*Nyssa aquatica*) swamps (Redmer et al. 1999a) but, in fact, they may also occur in other wetland types (Palis 2012). Because of the relative scarcity of suitable habitat, Bird-voiced Treefrogs are listed as threatened in Illinois (Phillips et al. 1999) as well as a Species in Greatest Need of Conservation in the Illinois Comprehensive Wildlife Conservation Plan and Strategy (Illinois Department of Natural Resources 2005).

The first reported occurrence of Bird-voiced Treefrogs in Illinois appears to be Viosca (1923). Viosca (1923) referred to a series of specimens in the Field Museum of Natural History that were taken at Olive Branch in Alexander County on 23 May 1907. Cagle (1942) reported a 1937 collection of a Bird-voiced Treefrog from Little Grand Canyon, Jackson County. Subsequent examination of this specimen amended the identification to a Copes Gray Treefrog, *Hyla chrysoscelis* (Redmer et al. 1999a). Smith (1953) referenced 31 Bird-voiced Treefrog specimens from Union County that he used during a comparative study of treefrogs. Summarizing the species' range in Illinois, Smith (1961:87) stated: "It is abundant in the floodplain swamps of Union and Alexander counties, but efforts to secure specimens in similar swamps in Massac, Johnson, and Pulaski counties have been unsuccessful." The range map in Smith (1961) includes records in extreme northwestern Union County, extreme southwestern Jackson County, and southern Alexander County.

Klimstra & Hutchison (1965) provided the first occurrence records for Johnson County at Heron Pond and Little Black Slough. The range map in Smith's (1966) Bird-voiced Treefrog account seems to reflect the Johnson County records. Additional novel Johnson County Bird-voiced Treefrog records were included in unpublished reports to the state of Illinois (Brandon and Morris 1987, Phillippi et al. 1986). Phillippi et al. (1986) also detected Bird-voiced Treefrogs in a floodplain swamp bordering the Cache River in Pulaski County. Subsequently, Bird-voiced Treefrogs were reported from a former channel of the Cache River in Massac County (Burbrink et al. 1998), but this channel is actually in Johnson County (see Palis 2008).

Redmer, et al. (1999a, 1999b) conducted a survey of Bird-voiced Treefrogs throughout their known range in southernmost Illinois and reported detections in Alexander, Johnson, Pope, Pulaski, and Union counties. Bird-voiced Treefrogs were mapped in these same counties by Phillips et al. (1999). Palis (2008) re-surveyed the Bird-voiced Treefrog sites identified by Redmer et al. (1999a, 1999b) and the two additional sites reported by Burbrink et al. (1998).

Since the Redmer et al. (1999a, 1999b) survey, portions of agricultural lands within the range of Bird-voiced Treefrogs in southernmost Illinois have been acquired by private conservation organizations and public agencies, followed by wetland creation and afforestation of adjoining uplands (Kruse and Groninger 2003, Groninger 2005, Palis 2007). Bird-voiced Treefrogs are capable of colonizing newly-created habitat relatively quickly (Palis 2012). The objective of the current survey was to survey for Bird-voiced Treefrogs in newly created wetlands and natural wetlands where the species was not previously detected by Redmer et al. (1999a, 1999b).

METHODS

I used United States Geological Survey topographic maps and Google Earth satellite imagery to locate wetlands that may serve as Bird-voiced Treefrog breeding sites in Alexander, Jackson, Johnson, Massac, Pope, Pulaski, and Union counties of Illinois. I searched for both natural wetlands (i.e., swamps) and constructed wetlands for which Bird-voiced Treefrog records do not exist. In unfamiliar areas, I conducted

diurnal pre-survey reconnaissance to determine strategic locations to which to return and listen at night. I visited pre-selected sites on rainless evenings (1755 h to 2350 h) in May and June 2019 and 2020. I also logged aural observations of Bird-voiced Treefrogs detected anecdotally between 2008 and 2017. I listened for the distinctive (Dodd 2013), high-pitched whistling vocalizations of the males for up to five minutes at each site. I ranked choruses using the North American amphibian monitoring program (NAAMP) protocol where 1 = individuals can be counted, space between calls; 2 = calls of individuals can be distinguished, some overlapping of calls; and 3 = full chorus, calls are constant, continuous, and overlapping (Weir and Mossman 2005). Using Google Earth, I determined latitude and longitude of each occurrence where Bird-voiced Treefrogs were detected.

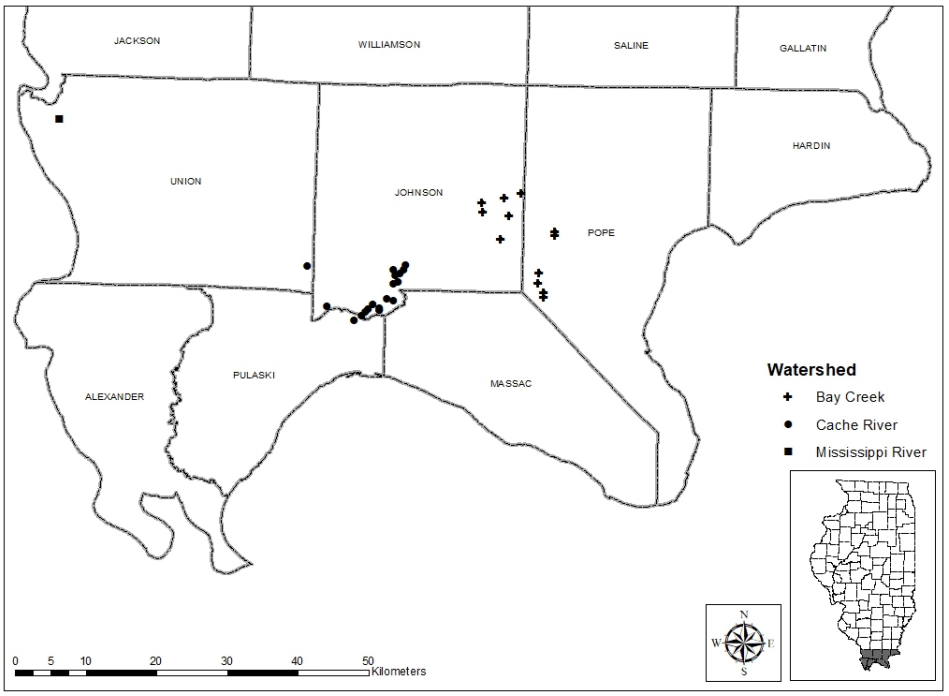

Figure 1. Auditory records of Bird-voiced Treefrogs (*Hyla avivoca*) in three watersheds in southern Illinois from 2008–2020.

RESULTS & DISCUSSION

I detected Bird-voiced Treefrogs at 32 previously undetected locations across three watersheds and four counties (Figure 1). In addition to 23 sites where I detected Bird-voiced Treefrogs during 2019-2020 surveys, I discovered nine other locations between 2008 and 2017 (Table 1). Fifteen (46.9%) sites are natural (14 forested wetlands and one tree-lined stream channel) and 17 (53.1%) are human-made (12 constructed wetlands, one borrow pit, one small pond, one roadside ditch, and two inlets on opposite shores of the same impoundment lake).

Palis (2008) detected Bird-voiced Treefrogs at 16 of 24 historical sites (Redmer et al. 1999a, 1999b, Burbrink et al. 1998). Combining the current survey with detections by Palis (2008) raises the total number of known extant Bird-voiced Treefrog occurrences in Illinois to at least 48, with locations in the watersheds of Bay Creek (N = 15), the Cache River (N = 31), and the Mississippi River (N = 2).

Bay Creek watershed Bird-voiced Treefrog occurrences extend from the vicinity of Simpson south-southeast to the vicinity of Renshaw, and include 12 newly-detected locations in Johnson and Pope counties. Newly-detected sites include five forested wetlands, three constructed wetlands, one roadside ditch, one human-made pond, and two inlets of an impoundment lake (Table 1). Site 6 may be an extension of a historical Bird-voiced Treefrog population, site 3 may represent a dispersing male, and sites 7 and 8 may comprise a single population.

Extant Bird-voiced Treefrog occurrences in the Cache River watershed extend southward from Cypress Pond State Natural Area, near Mount Pleasant, to the Long Reach section of the Cache River near Perks. Historically, Bird-voiced Treefrog occurrences extended further southwest and downstream in the Cache River drainage, one near Tamms and the other at Horseshoe Lake (Redmer et al. 1999a, 1999b). The current status of the Tamms population is unknown, and the Horseshoe Lake population is thought to be extirpated (Redmer et al. 1999a, 1999b, Palis 2008).

The 19 newly-detected Bird-voiced Treefrog occurrences in the Cache River watershed are in Johnson, Pulaski, and Union counties. Ten of these occurrences are represented by human-made water bodies, including nine constructed wetlands and a borrow pit (a pit created by removal of soil, sand, or gravel to use as fill material elsewhere). Eight of the constructed wetlands occur on a recently-restored portion of Cache River State Natural Area (formerly Grassy Slough Preserve of the Nature Conservancy) near Belknap (Palis 2007). Colonization of three of the wetlands in this area by Bird-voiced Treefrogs was first reported by Palis (2012). Continued tree growth and greater canopy cover may have facilitated Bird-voiced Treefrog movement across the property. Among the nine newly-detected natural wetland sites, two (sites 24 and 29) may represent extensions of a historical population (Table 1).

The single known extant population within the Mississippi River watershed occurs at LaRue-Pine Hills/Otter Pond Research Natural Area LRPH/OP RNA) within Shawnee National Forest (SNF). Although isolated from the other known occurrences, large choruses over an extended area suggest a sizeable population (personal observations). I detected one male Bird-voiced Treefrog vocalizing from a tree-lined

stream channel passing through cropland, approximately 0.5 km west of the LRPH/OP RNA population, Union County (Table 1). Bird-voiced Treefrogs are historically known from Oakwood Bottoms Greentree Reservoir (OBGR), SNF, but I failed to detect their presence in this area. Redmer et al. (1999a, 1999b) suggested Bird-voiced Treefrogs may be extirpated from OBGR.

Prior to European settlement, southern Illinois bald cypress and mixed bald cypress-hardwood swamps comprised approximately 101,367 ha of the abandoned Ohio River valley and abandoned channels of the Mississippi and Ohio rivers (Telford 1926). These swamps were logged in the mid to late 1800s and drainage—followed by land clearing for agriculture—began in the early 1900s (Hutchison 1987). By 1926, the extent of bald cypress/mixed bald cypress-hardwood swamps had been reduced by 91.6% (Telford 1926). Recent estimates suggest that 4205 ha (4.1%) of swamp forest remain in southern Illinois (Illinois Geospatial Data Clearinghouse 2000).

Remnant swamps in the Bay Creek and Mississippi River watersheds that support Bird-voiced Treefrog populations have been safeguarded within SNF since its establishment in the 1930s. Remnant swamps in the Cache River watershed, however, remained in private ownership and were threatened by additional logging and by drainage until efforts to protect them began in the 1960s (Schwegman 1991). With assistance of the Natural Lands Institute and The Nature Conservancy, the State of Illinois began acquiring tracts of land in the Cache River watershed, including remnant swamps, in the 1970s. Purchase of agricultural lands by conservation groups and government agencies within the Cache River watershed followed. Restoration of these tracts began in the late 1980s and continues through present-day (Schwegman 1991, Palis 2007). These efforts are augmented by wetland creation on private lands in both the Bay Creek and Cache River watersheds.

Herpetofauna, including species of conservation concern, are capable of rapidly colonizing newly created and restored wetlands (Palis 2007, Brown et al. 2012). Wetland Reserve Program wetlands, in particular, can counteract habitat loss resulting from agricultural conversion (Balas et al. 2012, Waddle et al. 2013). Because treefrogs move among breeding wetlands (Ritke et al. 1991, Robertson et al. 2018), creation of wetlands between distant breeding sites may provide pathways for re-connection of previously isolated populations (Le Lay et al. 2015). Results of the present survey suggest Bird-voiced Treefrogs in southern Illinois readily colonize created wetlands. These wetlands may provide critical linkage between remnant breeding populations that were previously isolated by row-crop agriculture. These observations are encouraging and suggest that additional land acquisition and habitat restoration in southern Illinois watersheds might provide benefits to Bird-voiced Treefrogs in the future.

Table 1. Locations of 32 new records of Bird-voiced Treefrogs (*Hyla avivoca*) in three watersheds in southern Illinois, 2008–2020. Watersheds include: Bay Creek (BC), Cache River (CR), and Mississippi River (MR). Water bodies include: borrow pit (BP), constructed pond (CP), constructed wetland (CW), forested wetland (FW), impoundment lake (IL), roadside ditch (RD), and stream channel (SC). See Methods for explanation of Bird-voiced Treefrog chorus score.

Site	Watershed	County	Date	Latitude	Longitude	Water Body	Chorus Score
1	BC	Johnson	7-May-19	37°25'58.8"	88°44'01.4"	CP	1
2	BC	Johnson	7-May-19	37°27'19.3"	88°44'30.0"	FW	3
3	BC	Johnson	7-May-19	37°26'55.6"	88°46'34.4"	RD	1
4	BC	Johnson	7-May-19	37°26'16.0"	88°46'29.0"	FW	3
5	BC	Johnson	17-May-20	37°27'42.1"	88°42'49.2"	CW	3
6	BC	Johnson	22-May-20	37°24'10.6"	88°44'45.9"	FW	3
7	BC	Pope	18-Jun-17	37°24'33.5"	88°39'35.0"	IL	2
8	BC	Pope	18-Jun-17	37°24'50.0"	88°39'33.0"	IL	2
9	BC	Pope	7-May-19	37°21'39.3"	88°40'59.5"	FW	3
10	BC	Pope	22-May-20	37°20'08.5"	88°40'30.1"	CW	3
11	BC	Pope	22-May-20	37°19'47.8"	88°40'30.0"	FW	3
12	BC	Pope	6-Jun-20	37°20'51.5"	88°41'07.15"	CW	3
13	CR	Johnson	28-May-19	37°18'41.8"	88°56'16.0"	CW	2
14	CR	Johnson	28-May-19	37°18'34.0"	88°56'17.0"	CW	2
15	CR	Johnson	28-May-19	37°18'34.0"	88°56'18.6"	CW	2
16	CR	Johnson	28-May-19	37°19'26.8"	88°55'32.7"	CW	3
17	CR	Johnson	28-May-19	37°19'16.4"	88°54'56.6"	CW	2
18	CR	Johnson	27-May-20	37°18'36.5"	88°57'20.2"	CW	2
19	CR	Johnson	27-May-20	37°18'23.5"	88°57'34.5"	CW	3
20	CR	Johnson	28-May-19	37°18'58.3"	88°56'52.2"	CW	2
21	CR	Johnson	28-May-19	37°18'48.0"	89°01'17.0"	CW	2
22	CR	Union	28-May-19	37°21'50.5"	89°03'18.0"	FW	3
23	CR	Johnson	27-May-20	37°18'08.2"	88°57'58.7"	FW	2
24	CR	Johnson	2-Jun-20	37°21'15.8"	88°54'51.7"	FW	3
25	CR	Johnson	1-May-15	37°21'23.7"	88°54'21.2"	FW	2
26	CR	Johnson	1-May-15	37°21'41.9"	88°53'59.0"	FW	2
27	CR	Johnson	30-Mar-12	37°22'00.6"	88°53'51.7"	FW	3
28	CR	Johnson	30-May-16	37°20'45.6"	88°54'34.5"	FW	2
29	CR	Johnson	23-Jun-08	37°21'38.15"	88°55'00.9"	FW	2
30	CR	Johnson	9-Jun-11	37°20'33.95"	88°54'59.0"	BP	1
31	CR	Pulaski	27-May-20	37°17'42.3"	88°58'42.3"	FW	3
32	MR	Union	20-Jun-08	37°32'37.3"	89°27'23.8"	SC	1

ACKNOWLEDGEMENTS

Gas money provided by a grant from the Chicago Herpetological Society is gratefully acknowledged. Erin Palmer, Mary Boehler, Hugh Gilbert, and Jean Sellar accompanied me on one or more field trips; Jean Sellar lent me topographic maps; Jody Shimp alerted me to Bird-voiced Treefrogs at Lake Glendale; Mike Redmer shared relevant publications; Bob Bluett, Brooks Burr, and Chris Phillips provided unpublished reports; Jim Herkert granted site access; Chris Benda made the map; and

two anonymous reviewers provided constructive comments. I dedicate this work to Erin Palmer whose encouragement and frequent companionship during nocturnal forays is greatly appreciated.

LITERATURE CITED

Balas, C.J., N.H. Euliss, Jr., and D.M. Mushet. 2012. Influence of conservation programs on amphibians using seasonal wetlands in the Prairie Pothole Region. Wetlands 32:333–345.

Brandon, R.A. and M.A. Morris. 1987. Distribution, abundance, and status of the Broad-banded Water Snake, *Nerodia fasciata confluens*, in Illinois. Report to the Illinois Endangered Species Protection Board, Springfield.

Brown, D.J., G.M. Street, R.W. Nairn, and M.R.J. Forstner. 2012. A place to call home: amphibian use of created and restored wetlands. International Journal of Ecology 2012:e989872.

Burbrink, F.T., C.A. Phillips, and E.J. Heske. 1998. A riparian zone in southern Illinois as a potential dispersal corridor for reptiles and amphibians. Biological Conservation 86:107–115.

Cagle, F.R. 1942. Herpetological fauna of Jackson and Union counties, Illinois. American Midland Naturalist 28:164–200.

Dodd, C.K., Jr. 2013. Frogs of the United States and Canada. The Johns Hopkins University Press, Baltimore, Maryland.

Groninger, J.W. 2005. Increasing the impact of bottomland hardwood afforestation. Journal of Forestry 103:184–188.

Hutchison, M. 1987. The lower Cache River basin of southern Illinois. Erigenia 8:1–54.

Illinois Department of Natural Resources. 2005. Illinois comprehensive wildlife conservation plan and strategy (Version 1.0). Illinois Department of Natural Resources, Springfield.

Illinois Geospatial Data Clearinghouse. 2000. Statistical summary: land cover of Illinois 1999–2000. https://clearinghouse.isgs.illinois.edu/webdocs/landcover/stats.html.

Klimstra, W.D. and M. Hutchison. 1965. A collection of amphibians and reptiles in southern Illinois. Transactions of the Illinois State Academy of Science 58:151–156.

Kruse, B.S. and J.W. Groninger. 2003. Vegetative characteristics of recently reforested bottomlands in the lower Cache River watershed, Illinois, USA. Restoration Ecology 11:273–280.

Le Lay, G., S. Angelone, R. Holderegger, C. Flory, and J. Bolliger. 2015. Increasing pond density to maintain a patchy habitat network of the European Treefrog (*Hyla arborea*). Journal of Herpetology 49:217–221.

Palis, J.G. 2007. If you build it they will come: herpetofaunal colonization of constructed wetlands and adjacent terrestrial habitat in the Cache River drainage of southern Illinois. Transactions of the Illinois State Academy of Science 100:177–189.

Palis, J.G. 2008. Population trends of the Bird-voiced Treefrog (*Hyla avivoca*) in southern Illinois. Report to the Illinois Endangered Species Protection Board, Springfield.

Palis, J.G. 2012. Natural history notes. *Hyla avivoca*. Constructed wetland colonization. Herpetological Review 43(1):119–120.

Phillippi, M.A., B.M. Burr, and R.A. Brandon. 1986. A preliminary survey of the aquatic fauna of the Cache River in Johnson and Union Counties, Illinois. Final Report to Illinois Department of Conservation, Division of Natural Heritage, Springfield.

Phillips, C.A., R.A. Brandon, and E.O. Moll. 1999. Field Guide to Amphibians and Reptiles of Illinois. Illinois Natural History Survey Manual 8, Champaign, Illinois.

Powell, R., R. Conant, and J.T. Collins. 2016. Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Harcourt Publishing Company, Boston, Massachusetts.

Redmer, M., L.E. Brown, and R.A. Brandon. 1999a. Natural history of the Bird-voiced Treefrog (*Hyla avivoca*) and Green Treefrog (*Hyla cinerea*) in southern Illinois. Illinois Natural History Survey Bulletin 36: 37–66.

Redmer, M., L.E. Brown, and R.A. Brandon. 1999b. Distribution of the Bird-voiced Treefrog (*Hyla avivoca*) in Illinois with suggestions for future research. Report to the Illinois Endangered Species Protection Board, Springfield.

Ritke, M.E., J.G. Babb, and M.K. Ritke. 1991. Breeding-site specificity in the Gray Treefrog (*Hyla chrysoscelis*). Journal of Herpetology 25:123–125.

Robertson, J.M., S.W. Fitzpatrick, B.B. Rothermel, and L.M. Chan. 2018. Fire does not strongly affect genetic diversity or structure of a common treefrog in the endangered Florida scrub. Journal of Heredity 2018:243–252.

Schwegman, J. 1991. Saving the Cache. Outdoor Highlights 19:3–11.

Smith, P.W. 1953. A reconsideration of the status of *Hyla phaeocrypta*. Herpetologica 9:169–173.

Smith, P.W. 1961. The amphibians and reptiles of Illinois. Illinois Natural History Survey Bulletin 28:1–298.

Smith, P.W. 1966. *Hyla avivoca* Viosca. Catalogue of American amphibians and reptiles 18.1–28.2.

Telford, C.J. 1926. Third report on a forest survey of Illinois. Illinois Natural History Survey Bulletin 16:1–102.

Viosca, P., Jr. 1923. Notes on the status of *Hyla phaeocrypta* Cope. Copeia 122:96–99.

Waddle, J.H., B.M. Glorioso, and S.P. Faulkner. 2013. A quantitative assessment of the conservation benefit of the Wetlands Reserve Program to amphibians. Restoration Ecology 21:200–206.

Weir, L.A. and M.J. Mossman. 2005. North American amphibian monitoring program (MAAMP). Pages 307–313 In M.J. Lannoo (ed.) Amphibian Declines: the Conservation Status of United States Species. University of California Press, Berkeley.