Expansion of the Range of the Introduced Greenhouse Frog, *Eleutherodactylus planirostris*, in Coastal Alabama

Author(s): Diane M. Alix, Craig Guyer and Christopher J. Anderson
Source: Southeastern Naturalist, 13(4):N59-N62.
Published By: Eagle Hill Institute
DOI: http://dx.doi.org/10.1656/058.013.0409
URL: http://www.bioone.org/doi/full/10.1656/058.013.0409

Notes of the *Southeastern Naturalist*, Issue 13/4, 2014

Expansion of the Range of the Introduced Greenhouse Frog, *Eleutherodactylus planirostris*, in Coastal Alabama

Diane M. Alix[1,3,*], Craig Guyer[2], and Christopher J. Anderson[1]

Abstract - *Eleutherodactylus planirostris* (Greenhouse Frog), originally from Cuba, the Bahamas, and the Florida Keys, has been introduced to mainland Florida and has spread across the southeastern US. We used automated recording devices to determine the distribution and activity patterns of Greenhouse Frogs at 15 headwater-slope wetlands in Baldwin County, AL, during 2011 and 2012. We detected this species at 5 widely distributed wetlands confirming that the Greenhouse Frog has spread since its initial introduction to Alabama.

Native to Cuba, the Bahamas, and the Florida Keys, *Eleutherodactylus planirostris* Cope (Greenhouse Frog) has been introduced to other locations including mainland Florida, Louisiana, Hawaii, Grenada, and Mexico (Heinicke et al. 2011). The first US population of Greenhouse Frogs likely came from direct dispersal to the Florida Keys 400–70,000 years ago (Heinicke et al. 2011). These small, cryptic frogs are known to stow away in nursery material that is transported among greenhouses (Krauss et al. 1999). Unlike most North American frog species, the Greenhouse Frog reproduces through direct development and does not require a source of water for a tadpole stage (Kraus et al. 1999). Records of these frogs in Florida were reported as early as the mid-1800s in the Florida Keys and the early 1900s in other parts of the state (Heinicke et al. 2011). Genetic evidence indicates that other Greenhouse Frog populations in the US have originated from their introduction in Florida (Heinicke et al. 2011). The Greenhouse Frog was first documented in Alabama in 1982 under debris at the Marietta Johnson School of Organic Education in Fairhope, west Baldwin County (Carey 1982; Fig. 1). However, published accounts of its status in Alabama since this discovery have not emerged. Here, we provide evidence based on recent surveys of headwater wetlands across Baldwin County, AL, that Greenhouse Frogs have spread into natural areas in other portions of the county.

The study sites were headwater-slope wetlands—a type of freshwater, forested wetland primarily driven by groundwater (Noble et al. 2007)—chosen as part of a larger study on the effects of land use on wetland function (Alix 2013, Alix et al. 2014, Barksdale et al. 2013). We deployed automated recording devices (model SM1, Wildlife Acoustics, Inc., Concord, MA) in 15 headwater wetlands across Baldwin County, AL, in May 2011 and January, March, and May 2012 (Fig. 1). For each deployment, we set the device to record for 1 min at the beginning of every hour from 1600 to 0300 for 5 consecutive nights. We listened to tapes to identify all species of calling frogs, and classified the intensity of the call on a scale from 1–3 (per protocol reported in Mossman and Hine [1984]). The call of Greenhouse Frogs has been described as a series of irregular bird-like chirps (Jensen and Knapp 2003).

We recorded a Greenhouse Frog calling on 3 nights at 1 site (site 102) in March 2012 and multiple frogs at 5 sites (sites 40, 67, 71, 100, and 102) on numerous occasions in May 2012 (Tables 1, 2). We did not detect any Greenhouse Frog calls in January or February in 2012

[1]School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849. [2]Department of Biological Sciences, 331 Funchess Hall, Auburn University, Auburn, AL 36849. [3]Current address - Florida Fish and Wildlife Conservation Commission, Tate's Hell State Forest Office, 290 Airport Road, Carrabelle, FL 32322. Corresponding author - diane.m.alix@gmail.com.

Manuscript Editor: Joseph Pechmann

(Table 1). There was no obvious temporal pattern of call intensity, however, the sampling period was likely not extensive enough to detect patterns.

Our detections of Greenhouse Frog calls at 5 separate sites provide evidence that these

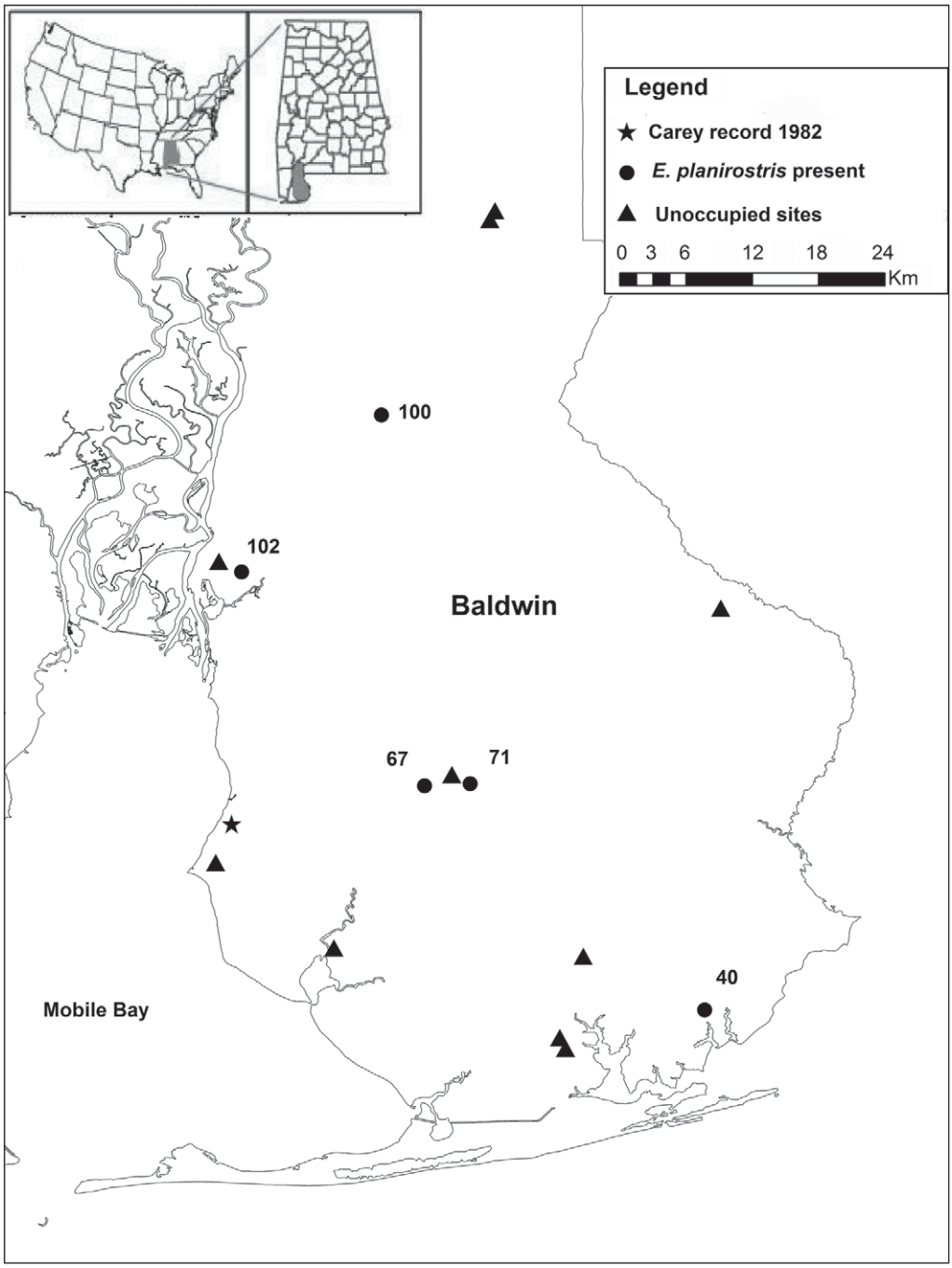

Figure 1. Map of Baldwin County, AL. The star indicates the original record of Greenhouse Frog in Fairhope, AL. Circles = sites where Greenhouse Frog was detected; triangles = sites that were surveyed but Greenhouse Frog was not detected during the sampling period (May 2011–May 2012).

frogs are now widespread in Baldwin County, AL. This expanded distribution could have resulted from eastward movement from an initial introduction to Fairhope, AL, from westward movement of populations from the Florida Panhandle (Meshaka 2011), both processes, or new introductions. To our knowledge, no studies have been conducted to determine the degree to which Greenhouse Frogs will persist at the Alabama sites. Louisiana populations were established when frogs were inadvertently transported from Florida's nurseries in ornamental plants (Meshaka et al. 2009); a similar mechanism of spread to the sites where we detected Greenhouse Frogs in Alabama is possible due to increased human development in the region. All of the wetlands sampled are located near residential or commercial areas where the use of plants obtained from nurseries is common and potentially provides a source of dispersing frogs. In 2012, we also captured 2 Greenhouse Frogs at 2 locations in Fairhope, AL (the same town as the initial record), not included in the study.

Until our study, which documented the non-native Greenhouse Frog throughout Baldwin County, AL, the species had only been recorded in the western side of the county. Persistence of this non-native frog in the headwater-slope wetland habitats we studied, though likely, can only be determined by repeated sampling in this region.

Acknowledgments. Funding for this survey came from an Alabama Agricultural Experiment Station Hatch Grant. Recording equipment was made available by Dr. James B. Grand, Amy Silvano, and the USGS Alabama Cooperative Fish and Wildlife Research Unit, Au-

Table 1. Dates on which Greenhouse Frogs were calling at 5 sites where they were detected. S = single individual, M = multiple individuals, NS = not sampled, 0 = sampled but no calling frogs detected. Entire sampling period included: Site 40: 5/13–18/2011, 1/21–26/2012, 3/9–14/2012, and 5/6–11/2012; Site 67: 5/12–17/2011, 1/21–26/2012, 3/10–15/2012, and 5/6–11/2012; Site 71: 5/10–15/2011, 1/21–26/2012, 3/10–15/2012, and 5/6–11/2012; Site 100: 2/4–9/2012, 3/10–15/2012, 5/6–11/2012; and Site 102: 2/4–9/2012, 3/10–15/2012, and 5/7–12/2012.

	Site				
Date	40	67	71	100	102
3/13/12	0	0	0	0	S
3/14/12	0	0	0	0	S
3/15/12	NS	0	0	0	S
5/6/12	S	0	M	0	NS
5/7/12	S	0	M	S	0
5/8/12	S	S	M	S	S
5/9/12	S	S	M	S	M
5/10/12	S	S	S	S	S
5/11/12	0	0	M	0	S
5/12/12	NS	NS	NS	NS	S

Table 2. Sound files in the Auburn Museum of Natural History.

Site	Sound files
102	AHAP-C 0021, AHAP-C 0022, AHAP-C 0023, AHAP-C 0024, AHAP-C 0025, AHAP-C 0026, AHAP-C 0027
100	AHAP-C 0028, AHAP-C 0029, AHAP-C 0030
71	AHAP-C 0031, AHAP-C 0032, AHAP-C 0033
67	AHAP-C 0034, AHAP-C 0035, AHAP-C 0036
40	AHAP-C 0037, AHAP-C 0038, AHAP-C 0039

burn, AL. Field help was provided by Flynt Barksdale, Madeline Wedge, Tom Hess, Heather Hughes, Cody Cox, Mignon Denton, Amber Dunn, and Elizabeth Battistella.

Literature Cited

Alix, D.M. 2013. Influence of land-use change on amphibian-species assemblage and larval development. M.Sc. Thesis. Auburn University, Auburn, AL. 146 pp.

Alix, D.M., C.J. Anderson, J.B. Grand, and C. Guyer. 2014. Evaluating the effects of land use on headwater wetlands in coastal Alabama. Wetlands 34:917–926.

Barksdale, W.F., C.J. Anderson, and L. Kalin. 2013. The influence of watershed run-off on the hydrology, forest floor litter, and soil carbon of headwater wetlands. Ecohydrology 7:803–814.

Carey, S.D. 1982. Geographic distribution: *Eleutherodactylus planirostris planirostris*. Herpetological Review 13:130.

Heinicke, M.P., L.M. Diaz, and S.B. Hedges. 2011. Origin of invasive Florida frogs traced to Cuba. Biology Letters 7:407–410.

Kraus, F., E.W. Campbell, A. Allison, and T. Pratt. 1999. *Eleutherodactylus* frog introductions to Hawaii. Herpetological Review 30:21–25.

Jensen, J.B., and W.W. Knapp. 2003. Calls of the wild: Vocalizations of Georgia's frogs. Georgia Department of Natural Resources, Wildlife Resources Division, Social Circle, GA. 15 pp.

Meshaka, W.E. 2011. A runaway train in the making: The exotic amphibians, reptiles, turtles, and crocodilians of Florida. Monograph 1. Herpetological Conservation and Biology 6:1–101.

Meshaka, W.E., Jr., J. Boundy, and A.A. Williams. 2009. The dispersal of the Greenhouse Frog, *Eleutherodactylus planirostris* (Anura: Eleutherodactylidae), in Louisiana, with preliminary observations on several potential exotic colonizing species. Journal of Kansas Herpetology 32:13–16.

Mossman, M.J., and R. Hine. 1984. The Wisconsin frog and toad survey: Establishing a long-term monitoring program. Wisconsin Endangered Species Report 9. Wisconsin Department of Natural Resources, Madison, WI. 24 pp.

Noble, C.V., J.S. Wakeley, T.H. Roberts, and C. Henderson. 2007. Regional guidebook for applying the hydrogeomorphic approach to assessing the functions of headwater-slope wetlands on the Mississippi and Alabama Coastal Plains. US Army Corps of Engineers. Engineer Research and Development Center, Vicksburg, MS. 109 pp.