1981 JOURNAL OF HERPETOLOGY 15(4):441–444

NOTES

Notes on *Hyla andersonii* in Florida and Alabama

Although previously known to occur in two widely disjunct areas, the New Jersey Pine Barrens and the upper coastal plain of the Carolinas, *Hyla andersonii* was not discovered in Florida until 1970 (Christman, 1970). In the eight years following its discovery in Florida, it was reported from only 12 localities in a relatively small area in northeast Okaloosa and northwest Walton counties (Means and Longden, 1976; Means pers. comm.). In November 1977, the U.S. Fish and Wildlife Service (1977) determined the Florida population to be Endangered in accordance with provisions of the Endangered Species Act of 1973. In May 1978 the Florida Game and Fresh Water Fish Commission initiated a survey to determine the status and distribution of *H. andersonii* in Florida.

County soil maps and USGS 7.5 minute series topographic maps were used to identify sites potentially supporting the acid seepage bog habitats required by this species (Means and Longden, 1976). Daylight hours were spent surveying these areas for bog habitats, which were then revisited at night. Although *H. andersonii* were sometimes found calling spontaneously, more often than not it was necessary to elicit calling by vocally imitating the call.

In 44 nights of field work in west Florida during spring and summer 1978–1980, *H. andersonii* was found at 107 new localities, including the first records for Santa Rosa and Holmes counties. An additional 4 localities were reported by personnel at Eglin Air Force Base (R. M. Crews pers. comm.). Incidental to survey work in Florida, *H. andersonii* was found at six localities in Covington and Escambia counties, Alabama. These constitute the first records of this species for Alabama (Mount, 1975). This brings to 128 (one site shared by both states) the number of localities now recorded for the Florida-Alabama popuation of *H. andersonii* (Figure 1). [Twenty-five localities recorded during 1978 have been previously reported (Means and Moler, 1978).]

In the early evening of 6 March 1980 several frogs were found calling spontaneously at a site in Santa Rosa County. Air temperature was 20°C, and there had been light scattered showers during the afternoon. L. A. Wilson (pers. comm.) reported calling males at several other Florida sites on 7–8 March 1980, following heavy rains on 7 March. The earliest date for which calling has been previously reported is 10 April (Means and Longden, 1976), and a roadkilled female found on 10 March (Christman, 1970) represents the earliest previously recorded seasonal activity.

Four *H. andersonii* tadpoles were collected from a sphagnaceous ditch on 22 May 1979. One individual had fully developed legs at the time of capture and had transformed by 25 May. The others all transformed by 30 May. This suggests that oviposition may take place as early as March or early April, although the overwintering of tadpoles (Means and Longden, 1976) cannot be ruled out. The earliest previous report of oviposition is Noble and Noble's (1923) record for 20–21 May at Lakehurst, New Jersey; the earliest Florida record is 17 June (Means and Longden, 1976).

Humidity and thundershower activity have been suggested as major factors influencing calling behavior in *H. andersonii* (Means and Longden, 1976; Noble and Noble, 1923), but Means and Longden (1976) and Means and Moler (1979) commented on the erratic caling behavior of local populations, noting that known breeding sites were sometimes silent on nights when frogs were calling elsewhere. A closer consideration of the breeding habitat may partially explain the seemingly erratic calling behavior of local populations. Acid hillside seepage bogs (Means and Longden, 1976) occur in areas of clay subsoil overlain by well drained to excessively drained sandy soils. Rain water percolating downward through the surface sand reaches the impervious clay subsoil and then moves laterally until seeping out along hillsides. The surface sands may thus be viewed as a reservoir soaking up rainwater and releasing it over a period of time at springs and seepage sites (Harper, 1906). Since the capacity of this reservoir is a function of both the depth of sand and the area of the involved upland, both of these are important factors in determining the volume and

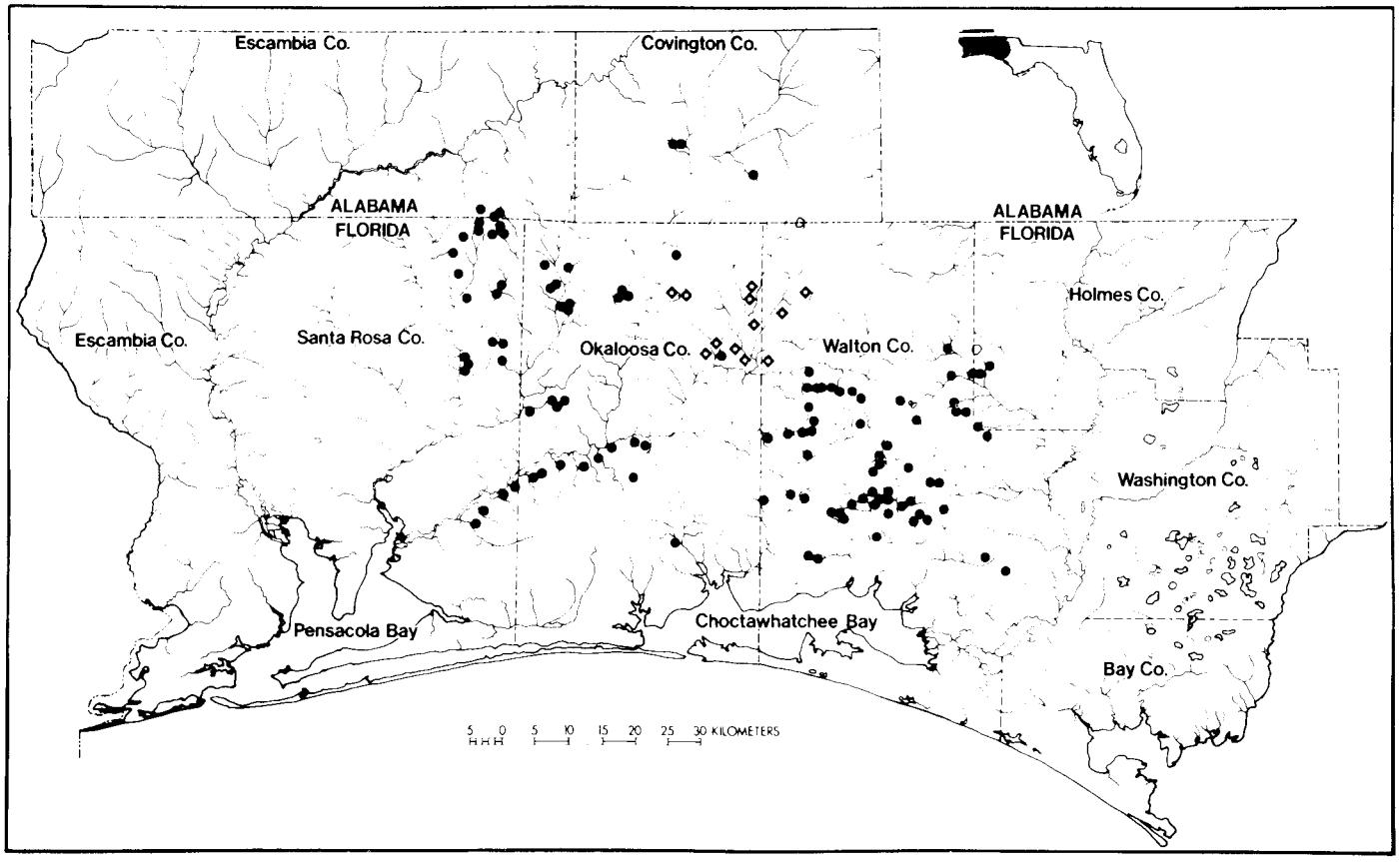

FIGURE 1. Distribution of the Pine Barrens treefrog, *Hylar andersonii* in Florida and Alabama. Closed circles depict localities identified in this study. Open diamonds depict localities known prior to 1978.

permanence of flows at seepage sites. Plummer (1963) observed that seepage into bogs was dependent upon internal drainage through the upland soils and that, consequently, occurrence of seepage might lag significantly behind periods of rainfall and could also continue through periods of drought. Considering the dependence of *H. andersonii* upon seepage flow at breeding sites and the variability of volume and permanence of local seepage, it is not surprising that the temporal distribution of calling activity might vary markedly between sites separated by relatively short distances. This is well illustrated by two sites only 7.25 km apart in northeast Santa Rosa County. One site is characterized by permanent seepage flow (this is also the site where calling was recorded on 6 March and where transforming tadpoles were collected on 22 May). Other conditions being right, many frogs were heard calling vigorously throughout May and June 1979, but activity had begun to diminish by mid-July. The other site is characterized by a much more ephemeral seepage flow and was essentially dry through May and June 1979. No frogs could be induced to call through May and June despite repeated efforts. However, when this site was revisited on 18 July, after a period of heavy rains, seepage flow was strong, and *H. andersonii* were calling vigorously. Thus, while temperature, humidity and thundershower activity may influence calling behavior, an equally important variable is the seepage status of the particular bog. In this study, recent thundershower activity was not found to be essential for locating choruses, although calling activity did decline during dry periods in excess of 7–10 days.

Small choruses of fewer than a dozen calling males seem to be the norm for this species (Noble and Noble, 1923; Wright, 1932; Bullard, 1965; Means and Longden, 1976; Garton and Sill, 1979; Means and Moler, 1979). As previously mentioned, calling in *H. andersonii* is erratic. Noble and Noble (1923) reported fluctuations in numbers of calling males within a one square mile study area in New Jersey from "a few" to as many as 250 between 14 May and 19 June. Means and Moler (1979) contended that estimates of population size based on numbers of calling males are unreliable if based on only a few visits to a site. Approximately 40% (46) of the sites reported here are based on fewer than six calling males, but most of these sites have been visited only a few times. There is currently no basis on which to estimate the number of individuals at any of the known Florida sites. At the time the Florida population of *Hyla andersonii* was listed as Endangered (U.S. Fish and Wildlife Service 1979) it was thought to occur in only seven small populations and to have been extirpated from four others. It is now obvious that it is considerably more widespread and common than was realized at the time it was listed. The only apparent significant threat to *H. andersonii* is loss of suitable habitat. This loss may occur very quickly, as in the case of siltation, impoundment or drainage, or may result from plant succession due to long periods of fire exclusion. Within its range in Florida and Alabama there are three major public land holdings—Eglin Air Force Base, Blackwater River State Forest (Florida) and Conecuh National Forest (Alabama)—comprising a total of 296,000 hectares. Eighty (62.5%) of the 128 localities now known for this population of *H. andersonii* occur within these public land holdings and consequently are protected from extensive residential or industrial development. Much of the public land, along with substantial tracts of private land, is managed for pine timber production. The extensive use of controlled burning in managing these lands coincidentally has tended to maintain the associated bog habitats required by *H. andersonii.*

Due to 1) the now considerably greater number of Florida localities recognized as supporting *H. andersonii,* 2) the large tracts of public lands presumably protected from extensive development and 3) the fortuitously appropriate land management practiced within much of its range, it is my conclusion that *H. andersonii* is neither Endangered nor Threatened in Florida.

ACKNOWLEDGEMENTS.—Many persons too numerous to name individually provided assistance with various aspects of this study. D. Bruce Means provided information on all *H. andersonii* localities known in Florida prior to this study. Kelly Thomas identified the localities in Covington County, Alabama. Particular thanks are due to Richard C. Crews and Sandra M. Lefstad for their considerable assistance with field work on Eglin Air Force Base. This is a contribution of the Federal Endangered Species Program, Florida Endangered Species Project E-1 and was

financed in part with grant-in-aid funds under Section 6 of the Endangered Species Act of 1973 (PL 93-205).

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Accepted 30 April 1981
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