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"Problem Species" of the Savannah River Site, Such as Brimley's Chorus Frog (*Pseudacris brimleyi*), Demonstrate the Hidden Biodiversity Concept on an Intensively Studied Government Reserve

Thomas M. Luhring*

Abstract - After more than five decades of intensive research on a wide variety of reptiles and amphibians at the Savannah River Site, the known occurrence of some members of the herpetofauna remains unresolved. One such "problem species," *Pseudacris brimleyi* (Brimley's Chorus Frog), was recently found for the first time in over 50 years. The rediscovery of this cryptic species shows how the concept of hidden biodiversity not only applies to the general public, but to the scientific community as well.

In a comprehensive review of herpetofaunal distribution on the 80,267-ha Savannah River Site (SRS), Gibbons and Semlitsch (1991) listed 20 species as "problem species" for which presence or absence was questionable due to similarity of appearance to other species, unresolved records, or lack of a recent verification. *Pseudacris brimleyi* Brandt and Walker (Brimley's Chorus Frog), is listed as one of these "unresolved records" since no records were reported after it was originally listed as occurring along the northern perimeter of the SRS in the early 1950s (Freeman 1956). Despite many intensive site-wide herpetological surveys on the SRS and a number of on-going long-term studies over the last several decades, no further *P. brimleyi* were detected.

On 5 February 2007, at around 2200 hrs, I recorded multiple calls of *P. brimleyi* from one of a series of seasonal sloughs located along Risher Pond Road in the southwest corner of the SRS. Identification of the calls was verified by M.E. Dorcas (Davidson College, Davidson, NC) and J.W. Gibbons (Savannah River Ecology Laboratory, Aiken, SC) as being those of *P. brimleyi*. Recordings were deposited at the Smithsonian Institution (USNM recording 331, cuts 1–4). I heard but did not record additional calls on the following night in a river swamp south of the first site. All observations were made on general field excursions that were not purposely aimed at detecting this species.

Numerous studies have taken place in the same aquatic system (e.g., Willson et al. 2005) where *P. brimleyi* was eventually rediscovered, and more than 70 publications have been associated with research on Risher Pond, a nearby Department of Energy Set-aside Area, (see Davis and Janecek 1997 for a partial list). While a large volume of research was conducted in the immediate area, most of the studies there were not specifically designed to detect frogs and were biased toward warmer-month sampling or sampling for other taxonomic groups (e.g., using minnow traps to catch aquatic snakes and salamanders, using hoop nets to catch turtles). Devices specially created to detect anuran species called "frog-loggers" or automated recording systems (e.g., Bridges and Dorcas 2000) were deployed at six wetlands for over a year across the SRS (M.E. Dorcas, pers. comm.) without a single record of *P. brimleyi*. While frog-loggers easily detect cosmopolitan species and the dominant group of vocalizing anurans in a wetland, they may be unable to reliably verify the presence of anurans that call less frequently or with less volume. In fact, I had been at the first wetland for nearly an hour before I was able to hear the call of *P. brimleyi* during a lull in the calling activity of *Pseudacris crucifer* Wied-NeuWied (Spring Peeper).

Short-term survey and passive survey efforts for reptiles and amphibians may fail to detect species that are less obvious. Another limitation inherent in finite surveys is that as habitat and vegetative communities change, species presence may shift and abundance may change. Surveys that incorporate a variety of techniques, including opportunistic captures/sightings, are better at detecting a higher diversity of species (Luhring 2007, Ryan et al. 2002). While there were no opportunistic sightings from researchers working in the area, they were most likely not present in the area at the right time or using the most efficient methods to detect their presence. In this case, *P. brimleyi* had a limited detection capability as their calls were heard from only two locations for a couple of days after rainfall in early February. Other anuran species present at the same two wetlands called for a month or longer after *P. brimleyi* stopped calling (T.M. Luhring, unpubl. data) and are listed as occurring in the area in most surveys. Seasonally cryptic (only detectable during brief periods) species and species that are generally harder to detect should receive special attention (targeted surveys) in inventory efforts.

Amphibians can also colonize previously unsuitable areas when suitable habitat and breeding locations, notably fishless wetlands, become available (Dodd and Barichivich 2007). While the initial record of P. *brimleyi* was from the northern perimeter of the SRS, this subsequent record is from the southern perimeter. Many factors, such as timber harvest and natural habitat succession, may have affected the suitability of habitat at the original site and the site of most recent capture. Also, these may be smaller populations located along the periphery of the species range and more vulnerable to stochastic population changes. Land managers and management agencies should regularly repeat inventories because species presence/absence is seldom static. Regular inventories would be especially important for intensively managed areas or habitats undergoing major changes.

"Hidden biodiversity" (flora and fauna that, despite being present and often prevalent in an area, go undetected or unnoticed) was originally used to refer to local animals that were unknown to the general public (Gibbons 2003). Whether it is their secretive nature, similarity of appearance to more cosmopolitan species, or actual rareness along the periphery of their ranges, some species seem relatively difficult to detect even for subject-matter experts. In this case, *P. brimleyi* have eluded detection for more than 50 years despite intensive sampling efforts by many scientists on the SRS. One possible explanation is that *P. brimleyi* were absent from the SRS for 50 years and recently recolonized suitable habitat. However, it is equally plausible and my personal opinion that viable reservoirs of the population remained in the relatively undisturbed and less intensively studied river swamp to the south of the slough. This distribution made the detection of an already aurally and visually cryptic species even more unlikely. The difficulty of documenting *P. brimleyi* on the SRS demonstrates that especially cryptic species may persist undetected in suitable habitat for decades or longer even when those areas have been extensively studied. Management decisions dependent on the perceived absence of a cryptic species should be made with the utmost caution, a high volume of targeted survey effort, and long-term data sets because hidden biodiversity can remain hidden to the most qualified of experts.

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*Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29803; luhring@srel.edu.