

MALFORMED SOUTHERN LEOPARD FROGS (*RANA SPHENOCEPHALA UTRICULARIUS*) DISCOVERED IN NORTH-CENTRAL TENNESSEE

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ABSTRACT—Two specimens of the Southern Leopard Frog (*Rana sphenoccephala utricularius*) from Tennessee in Austin Peay State University's Museum of Zoology exhibit noteworthy morphological malformations. A six-legged specimen from Montgomery County has an extra set of hind limbs and what appears to be an extra pelvic girdle. A three-legged individual from Stewart County is missing its right hind limb. Prior to this report, only two cases of malformed amphibians in Tennessee were known. Based on the ratio of normal to abnormal specimens observed in the region and the nature of the malformations involved, the specimens described in this paper are considered the result of infrequent and spontaneous breakdowns in the normal developmental process, not evidence of some pervasive environmental problem facing amphibians in the region.

Accounts of malformed amphibians abound in the literature (dating to the 1700s) and represent collections and observations of 33 species in eight countries from North America to Australia (Reaser and Johnson, 1997). Suggested causes for these abnormalities include chemical pollution, ultraviolet-B radiation, trematode parasites, or some combination of these (Schmidt, 1997).

In North America, morphological deformities (e.g. extra limbs, malformed limbs, missing limbs, missing eyes, deformed jaws, extraneous webbing about legs, and abnormal or lacking internal organs) have been reported among nine species of frogs and toads and three species of salamanders from 41 states in the United States and four Canadian provinces (Northern Prairie

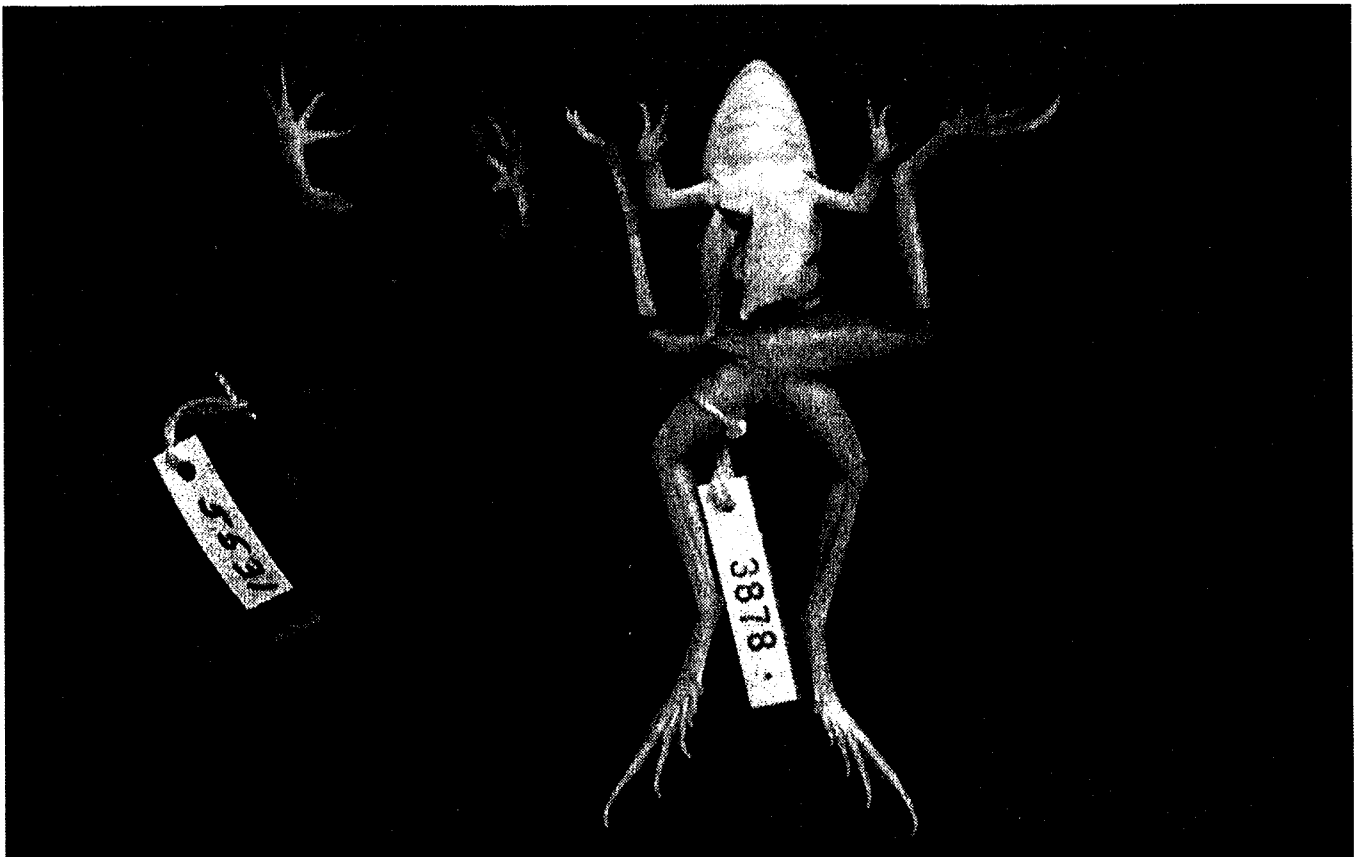


FIG. 1. Malformed specimens of *Rana sphenoccephala utricularius* from Tennessee in Austin Peay State University's Museum of Zoology: APSU 5531, Stewart County; APSU 3878, Montgomery County.

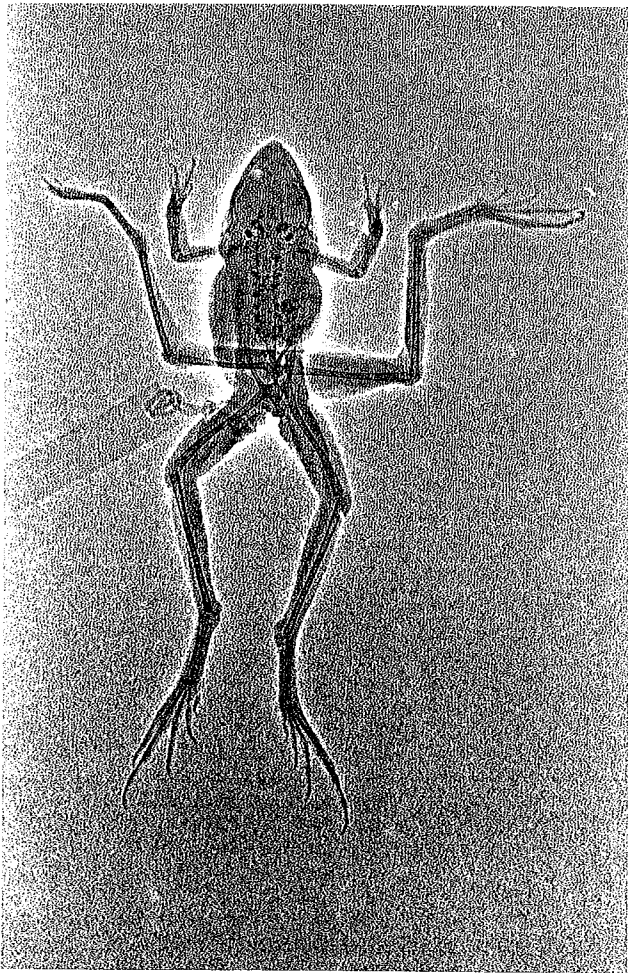


FIG. 2. X-ray image of six-legged *Rana sphenocephala* from Montgomery County, Tennessee (APSU 3878).

Wildlife Research Center, 1997). Many of these reports followed a flurry of attention brought about by the 1995 discovery (by a group of middle school students) of excessive numbers of deformed frogs in a Minnesota pond (Schmidt, 1997). Despite the widespread occurrence of the phenomenon in North America, levels of deformities above what is considered normal have been restricted to eight states (California, Iowa, Minnesota, Missouri, South Dakota, Texas, Vermont, and Wisconsin) and two provinces (Ontario and Quebec) (La Clair et al., 1998).

In Tennessee, only two written accounts (one in a popular journal, the other on the Internet) cite examples of malformed amphibians. One depicts (in a black and white photograph) and briefly describes an unidentified frog (appears to be *Rana catesbeiana*) from near Erin in Houston County, Tennessee, with four complete hind limbs and two normal forelimbs (Anonymous, 1950). The other (Northern Prairie Wildlife Research Center, 1997) lists five (of 55 individuals examined) malformed *Rana clamitans* from Shelby County, Tennessee, with an assortment of abnormalities (extra forelimbs, an extra hind limb, an extra hind digit, and an abnormal forelimb). The present report describes two specimens of *Rana sphenocephala utricularius* that represent additional cases of malformations among amphibians in Tennessee and the first known instances of the phenomenon in Montgomery and Stewart counties.

METHODS

Both specimens were captured during herpetofaunal surveys at sites in the northwestern portion of the Highland Rim Section of the Interior Low Plateaus Province, as described and mapped by Quarterman and Powell (1978). The Montgomery County specimen was captured alive by hand on 22 August 1985 at Barnett Woods Natural Area (36°31'05"N, 87°33'30"W). This specimen was the only abnormal individual collected among 12 Leopard Frogs taken during the 1982-85 Barnett Woods survey (Scott, 1991). The Stewart County specimen was found alive in a pit trap on 30 July, 1993 at a woodland pond (36°35'48"N, 87°55'44"W) in Land Between The Lakes. It was the only malformed individual observed out of nearly 4000 captures recorded at the site between 1987 and 1998. Both specimens were deposited in Austin Peay State University's Museum of Zoology, Nos. 3878 and 5531).

DESCRIPTION OF SPECIMENS

The Montgomery County specimen (Fig. 1) is a juvenile male (snout-vent length; SVL = 34 mm) that appears normal in all respects except for a duplicate set of hind limbs originating ventrally just anterior to the normal pair. Of the two extra limbs, the left one appears fully developed, whereas the right one is reduced and lacks digits. An X-ray image (Fig. 2) reveals what appears to be a malformed and abnormally oriented extra pelvic girdle associated with the extra limbs. The Stewart County specimen (Fig. 1) also is a juvenile male (SVL = 42 mm) with normal features except for the complete absence of a right hind limb. Skin over the point where the limb should originate appears smooth, unscarred and healthy, but the stump of a femur remains beneath. This suggests the limb was lost early in the frog's life, possibly from predation or disease.

DISCUSSION

The abnormalities described in this paper are comparable to those depicted in photographs of *Rana pipiens* collected in Minnesota in 1996 (Minnesota Pollution Control Agency, 1998). Neither seem outside the range of abnormalities described over the past two centuries in the scientific literature for an assortment of frog and toad species (Van Valen, 1974; and Reaser and Johnson, 1997).

Although the specimens described herein document the first malformations among amphibians in Montgomery and Stewart counties, Tennessee, they should not be considered reason for alarm. With the frequency of occurrence in the region appearing so low, one might accept these anomalies as the result of spontaneous breakdowns in the developmental process, not some widespread environmental hazard. However, monitoring programs of amphibian populations in the region should continue to look for elevated levels of abnormalities that might signal problems, anthropogenic or not, in the environment.

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