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SCAPHIOPUS COUCHII (Couch's Spadefoot). **DEVELOPMENTAL MORPHOLOGY**

DANIEL R. BUCHHOLZ and **AMY R. HOLLAR**, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, USA (e-mail: buchhodr@ucmail.uc.edu); and **CRIS LEDON-RETIG**, Department of Biology, University North Carolina, Chapel Hill, North Carolina 27599, USA.



FIG. 1. *Scaphiopus couchii* within a day after hatching showing developing hind limb bud and external gill filaments on the right side of the body (gills and hind limb bud are present on left side also, but not visible here). This developmental stage is not compatible with the Gosner staging table.

limb buds became visible prior to operculum formation on either side of the body (Fig. 1). This developmental situation does not occur in the spadefoot relatives, *Spea multiplicata* or *Pelobates cultripes*, which follow the typical Gosner stages. Other species of *Scaphiopus* should be examined. We did not observe any instance in *S. couchii* where neither the right and left nor just the right gill filaments were covered by the operculum in the absence of hind limb buds. However, G23 individuals were observed, where right and left external gills were visible in the absence of hind limb buds. Interestingly, *S. couchii* still has G26, indicating a lag in hind limb growth after its first appearance at G23. This lack of limb bud growth during operculum formation may correspond to the time lag in stage advancement during G26 in *S. multiplicata* (Buchholz and Hayes 2002. *Copeia* 2002:180–189). It appears that hind limb development in *S. couchii* has been heterochronically shifted to initiate at an earlier stage (from G26 to G23). The elimination of developmental stages may enable *S. couchii* to achieve subsequent stages at earlier time points, contributing to its extremely short larval periods. This divergence of *S. couchii* from the typical developmental sequence found in anuran tadpoles precludes comparing *S. couchii* to other species at these developmental stages. The developmental modification reported here accompanies two other evolutionary modifications underlying the short larval periods in *S. couchii*. First, *S. couchii* has extremely rapid cell division cycles during the embryonic period (Zweifel 1968. *Bull. Am. Mus. Nat. Hist.* 140:3–64), perhaps due to their relatively small genome size (www.genomesize.com). Second, increased levels of thyroid hormone tissue content and heightened sensitivity and responsivity to thyroid hormone contribute to their accelerated metamorphic period (Buchholz and Hayes 2005. *Evol. Develop.* 7:458–467).

Submitted by **DANIEL R. BUCHHOLZ** and **AMY R. HOLLAR**, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221, USA (e-mail: buchhodr@ucmail.uc.edu); and **CRIS LEDON-RETIG**, Department of Biology, University North Carolina, Chapel Hill, North Carolina 27599, USA.

SCAPHIOPUS COUCHII (Couch's Spadefoot). **DEVELOPMENTAL MORPHOLOGY.** *Scaphiopus couchii* from the deserts of the American southwest exhibit the shortest larval period duration known among amphibians, developing from hatching to forelimb emergence in as little as 8 days (Newman 1987. *Oecologia* 71:301–307). Here, we report a morphological observation representing a contributing mechanism to achieve short larval periods, namely the elimination from its ontogeny of Gosner developmental stages 24 and 25 (Fig. 1; Gosner 1960. *Herpetologica* 16:183–190). Gosner Stage 23 (G23) is defined by the presence of external gill filaments on both sides of the body. At G24, the operculum (skin covering) covers the right gill filaments. At G25, the operculum covers the gill filaments on both sides. At G26, the hind limb buds appear. In *S. couchii* (two-day-old embryos from adults collected in Cochise Co., Arizona USA), the hind