A NEW FOSSIL DISCOGLOSSID FROG FROM MONTANA AND WYOMING

Richard Estes

ABSTRACT. Scotiophryne pustulosa, n. gen., n. sp., is a small discoglossid frog from the late Cretaceous Hell Creek Formation of Montana and the late Cretaceous Lance Formation of Wyoming. It is probably also represented in the middle Paleocene Tongue River Formation of Montana. Scotiophryne has a distinctive pustular dermal skull, but its postcranial remains show resemblances to the Recent Eurasian discoglossid Bombina.

INTRODUCTION

Fossil frogs of Mesozoic age are rare; Hecht (1963) has summarized most of the occurrences. North American Mesozoic records, so far, are based on disarticulated remains, which are difficult to interpret.

Recent study of late Cretaceous and Paleocene samples of vertebrate fossils has revealed the presence of several different kinds of frogs. Lance Creek (Wyoming) and Bug Creek local faunas (Montana) are rich samples of a once widespread late Mesozoic vertebrate fauna that lived on floodplains of North American Cretaceous epicontinental seas (Estes, 1964). The Bug Creek material is from the Hell Creek Formation of Montana (Sloan and Van Valen, 1965) and is part of a Bug Creek collection in the Museum of Comparative Zoology (MCZ), Harvard University. An American Museum of Natural History (AMNH) collection from the Lance Formation of Wyoming is also utilized here. The Paleocene specimens are from Princeton University (PU) collections from the Tongue River Formation of Montana, and are part of a fauna presently being studied in collaboration with Glenn Jepsen and Marshall Lambert.

1 Fossil Vertebrates from the Hell Creek Formation, Montana: Contribution No. 4.
ORDER SALIENTIA
Family Discoglossidae
Scotiophryne pustulosa, n. gen., n. sp.

Holotype. MCZ 3623, left ilium.

Etymology. Greek, skotios, dark (referring to the darkness of the fossil bones); phryne, toad; pustulosa, referring to the distinctive pustulose sculpture of the referred skull elements.

Paratypes. MCZ 3624, four left and two right ilia; MCZ 3625, 11 distal ends of humeri; MCZ 3626, 14 anterior and posterior fragments of maxillae. All specimens collected by A. D. Lewis and party.

Locality. Bug Creek Anthills, SW ¼ Section 9, T 22 N, R 43 E, Mecone County, Montana.

Horizon. Hell Creek Formation, Upper Cretaceous.

Other referred specimens. AMNH 8102, right squamosal; AMNH 8132, left maxilla; AMNH 8137, right ilium; Lance Formation, Wyoming. University of California, Museum of Paleontology (UCMP) 55703, left ilium, Lance Formation, Wyoming. PU 17037, left ilium; 16784, 16827-28, humeri; Tongue River Formation, Montana.


Diagnosis. A discoglossid frog with ilia most similar, among modern discoglossids, to those of Bombina, differing from the latter in having a relatively thicker ilial shaft, slightly more expanded subacetabular expansion, and in lacking a dorsal protuberance. Differs from all recent discoglossids and most fossil forms in having a sculptured dermal skull casque. Humeri like those of Bombina but relatively more robust.

Description. Ilium (Fig. 1) with robust shaft having a deeply-marked groove dorsally that extends onto the dorsomedial side of the shaft, this groove well defined on the type but less strongly marked on other specimens; acetabular fossa (terminology follows Estes and Tihen, 1964) relatively large, its anteroventral border strongly produced; no dorsal protuberance as such, but dorsal prominence showing irregularities of muscle attachment; subacetabular expansion large, markedly set off from acetabular fossa and directed somewhat mediad; medially a tiny raised area on midpoint of the suture of ilium with other pelvic bones.
Referred humeri (Fig. 3) with oblique olecranon scar (terminology as in Hecht and Estes, 1960), small but deep fossa cubitus ventralis; well-developed medial epicondyle and small, bi-tuberular lateral epicondyle; well-developed humeral ball, flanked by prominent lateral crest leading from shaft to proximal tubercle on lateral epicondyle, and by stronger crista medialis leading to medial epicondyle. Variable development of flattened area for muscular attachment on crista medialis probably reflects a sexually dimorphic feature not uncommon in frogs.

Maxilla (Fig. 2c-f) with broadly-expanded anterior end and prominent nasal process; posterior end expanded, pointed at its ventral tip and with notch medially for quadratojugal; dorsally an
expansion and notch for squamosal; strong pterygoid process medi-ally; teeth numerous, small, probably pedicellate; tooth row extending posterior to pterygoid process, external surface covered with relatively fine pustular sculpture.

Fig. 2. Scotiophryne pustulosa, n. g., n. sp.: a, lateral, and b, medial views of right squamosal, AMNH 8102; c, medial, and d, lateral views of posterior part of left maxilla; e, lateral, and f, medial views of anterior part of left maxilla, MCZ 3626; a - d from loc. V5620, Lance Formation, Wyoming; e - f from Bug Creek Anthills, Hell Creek Formation, Montana; all × 6.

Squamosal (Fig. 2a-b) compact; tympanic process expanded, rounded. with angle at ventroposterior corner; pustular sculpture as on maxillae; prominent pterygoid-paroccipital crest medially; maxillary process with medial flange.

Discussion. Ilia of discoglossids are quite distinctive, and the family reference of Scotiophryne is based on the similarity of the
ilium to that of Recent Eurasian Bombina. The relatively large, protuberant acetabulum and weak enlargement of the iliac symphysis region also resemble the relatively better developed, similar features of the Recent Philippine genus Barbourula (Estes, 1964; Hecht and Hoffstetter, 1962). The humeri also show general similarity to Bombina in shape of ball, epicondyles, oblique olecranon scar, and dimorphism of crest development. The texture of the sculptured skull elements is distinctive, but dermal sculpture is also known in fossil discoglossids from the mid-Cenozoic of Europe (Latonia, Zaphrissa; Friant, 1960).

The ilium was chosen as the type specimen because it is more often recovered than the relatively more delicate skull elements.

![Diagram](image-url)

Fig. 3. Scotiophryne pustulosa, n. g., n. sp.: above, dorsal, and below, ventral views of distal end of three humeri, MCZ 3625; a - b, right; c - f left; a - d male?, e - f female?; all × 6; Bug Creek Anthills, Hell Creek Formation, Montana. Medial condyle of e - f broken, cf. Fig. 4 b - c.
The cranial, girdle, and limb parts referred to *Scotiophryne* are the most frequently-occurring frog elements in the Bug Creek sample. Three other types of frogs are also present, but are relatively rare in comparison; the *Scotiophryne* assemblage is probably a natural one based both on numerical and morphological factors.

The Princeton University specimens from the Middle Paleocene Tongue River Formation are very similar to those of *Scotiophryne*, and although worn and broken, are probably referable to this genus (Fig. 4). The other lower vertebrates from this locality closely resemble those of Bug Creek and Lance local faunas, and represent a similar flood-plain ecological association. A dimorphism (probably sexual) similar to that in the Bug Creek specimens is also shown by the Tongue River humeri.

![Fig. 4. cf. Scotiophryne pustulosa: a, lateral view of left ilium, PU 17037; b, ventral, and c, dorsal views of left humerus (female?), PU 16827; Tongue River Formation, Montana; all × 6.](image)

Lance Formation specimens of this small, distinctive frog appear in material collected by the American Museum of Natural History and Museum of Paleontology, University of California, Berkeley. Frog remains from the Lance are more rare than from Bug Creek, but elements referred to *Scotiophryne* are also the most frequent in the Lance sample; this provides additional evidence that the association made here is the correct one. The only known squamosal referable to this species is AMNH 8102, which I figured and described as "near Leptodactylidae?" in 1964 (p. 61, fig. 32). The additional specimens described here indicate that such an identification is no longer possible. The ilium questionably referred to Ascaphidae by me (1964, p. 55, fig. 32) is probably from a small individual of *Scotiophryne*.

*Scotiophryne* is the second North American fossil discoglossid to be reported (the first was *cf. Barbourula*, Estes, 1964).
resembles the Recent Eurasian discoglossid Bombina in some girdle and limb features, but has a distinctive sculpture of the dermal head casque. In having a broad, expanded squamosal with a tympanic process that has a ventroposterior angle, Scotiophryne resembles Zaphrissa (Friant, 1960) from the Oligocene of Germany, but the sculpture type of the latter is not pustular. The evolutionary history of Scotiophryne is unknown, and further comment is postponed pending more detailed studies of other fossil discoglossids.

ACKNOWLEDGMENTS

I thank Drs. Zdeněk Špinar and Max Hecht for comments. The drawings are by Mr. Laszlo Meszoly, except for Figure 4, which is by Mr. Howard Hamman. This research was supported in part by National Science Foundation Grant GB-7176.

LITERATURE CITED

Estes, R.

Estes, R., and J. Tihen

Friant, M.

Hecht, M.

Hecht, M., and R. Estes

Hecht, M., and R. Hoffstetter

Sloan, R., and L. Van Valen

(Received 8 May 1969.)