

**RANA (AMPHIBIA: RANIDAE) FROM THE UPPER EOCENE  
(MPI7a) HORDLE CLIFF LOCALITY, HAMPSHIRE, ENGLAND**

by

**J. Alan HOLMAN\* and David L. HARRISON\*\***

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\* Michigan State University Museum, East Lansing, Michigan, USA, 48824-1045. E-mail: holman@pilot.msu.edu

\*\* Harrison Zoological Museum, Bowerwood House, St. Botolph's Road, Sevenoaks, Kent, England, TN13 3AQ. E-mail: hzm@btinternet.com

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## ABSTRACT

An ilium from the Upper Eocene (MPI7a) of Hordle, England, represents the first report of *Rana* from the Eocene of Britain. The ilium is similar to those of the water frog (*Rana [ridibunda]*) species group.

## RESUME

Un ilion de l'Eocène supérieur (MPI7a) de Hordle, Angleterre, représente le premier registre de *Rana* de l'Eocène de Grande-Bretagne. L'ilion est similaire à celui de *Rana (ridibunda)* sp. "water frog" Groupe.

## INTRODUCTION

Rage (1984) reported ranid fossils from several localities in the Eocene of France. Among other fossils, two right ilia (figs. 1d, p. 284 and 2e, p. 286) resemble the genus *Rana* very closely. Moreover, Rage (1984) suggested that a large coracoid (fig. 2e, p. 286) from the Eocene of Lavergne, France, represented a green frog (=water frog) based on the broadly expanded epicoracoidal extremity that is somewhat lengthened anteriorly.

The present paper reports an ilium of *Rana* from the Upper Eocene (MPI7a) of the Hordle locality in England. This is the first record of the genus from the Eocene of Britain. It is suggested that the Hordle *Rana* has its closest affinities with the water frog group. Water frogs have recently been referred to as the *Rana (ridibunda)* species group which we use here, or as the subgenus *Pelophylax* of the genus *Rana* (Sanchiz, 1998, p. 92). The subgenus *Pelophylax* is not often used. Dubois and Günther (1982) attempted to formalize this group as "synklepton *Rana esculenta*", a term that is also sometimes used.

Several authors have discussed the identification of the European *Rana* on the basis of the ilium (e.g. Böhme, 1977; Böhme and Günther, 1979; Holman, 1998; Rage, 1974, 1984; Sanchiz *et al.*, 1993). Holman (1998) and Sanchiz *et al.* (1993) discussed specific osteological characters of the ilia of the water frog group of *Rana*.

## REMARKS

### The Locality

The British Upper Eocene *Rana* fossil (Fig. 1) comes from the Hordle Cliff locality (MPI7a) near Milford on Sea, Hampshire, England, in a layer called the

Mammal Bed (Milner *et al.*, 1982). The Hordle locality represents the Totland Bay Member of the Upper Eocene Headon Hill Formation (Insole and Daley, 1985) and has previously produced a rich mammalian fauna (Cray, 1973). It has also yielded four frogs including two discoglossids, a palaeobatrachid, and the pelobatid *Eopelobates*, as well as three salamandrid salamanders, eight lizards, and eight snakes (Milner *et al.*, 1982). Recently, Holman (1996) added a new genus of boid snake to the Hordle Cliff fauna. The Upper Eocene *Rana* fossil was collected by a field party from the Harrison Zoological Museum, Sevenoaks, Kent, England, on July 29, 1992, and was donated to the Michigan State University Museum.

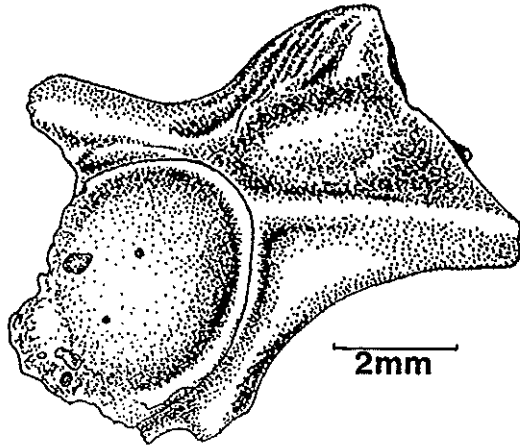


Figure 1.— Right ilium of *Rana* sp. (Michigan State University Museum Vertebrate Paleontology No. 1476) from the Mammal Bed of the Upper Eocene Hordle Cliff Locality, Hampshire, England.

### The Fossil

The Upper Eocene *Rana* fossil (Michigan State University Museum Vertebrate Paleontology No. 1476, Fig. 1) consists of the posterior portion of a right ilium including part of the dorsal acetabular expansion, most of the acetabular fossa, a portion of the ventral acetabular expansion, the dorsal protuberance (tuber superior), and a posterior portion of the ilial shaft. Terminology is from Holman (1998).

### Brown Frogs and water Frogs, genus *Rana*

Modern representatives of the brown frog group of species (*Rana [temporaria]* species group) are smaller, browner in coloration, and less aquatic than the water frog (*Rana [ridibunda]* species group) which tend to be larger, greener in coloration, and more aquatic. The European water frog group has been extensively studied because of its hybridogenetic relationships (e.g. Dubois and Günther, 1982; Günther, 1990). Hybrid species have not been reported in the brown frog group.

### Affinities of the British Eocene *Rana*

Holman (1998) has illustrated ilia of various modern European water frog and brown frog species and has shown that the posterior portion of the crista dorsalis (dorsal

ilial crest) in the water frog group usually slopes more precipitously into the dorsal acetabular expansion than in the brown frog group. The ilial slope in the Hordle Eocene fossil is steeper than in most modern species of brown frogs (compare Fig. 1 with figures of brown frog ilia in Holman, 1998).

Of the two Eocene ranid ilia from France figured by Rage (1984), the Hordle ilium differs from the right ilium from Lavergne (fig. 2a, p. 286) in having the posterior portion of the crista dorsalis (dorsal ilial crest) sloping less precipitously into the dorsal acetabular expansion. It is more similar to the right ilium from Grissoles (fig. 1d, p. 284) in this character.

The Hordle ilium also has the crista dorsalis sloping somewhat less precipitously into the dorsal acetabular expansion than in a *Rana* ilium from the Lower Oligocene of the Mören 13 Site near Treuchtingen, southern Germany. The German ilium is considered by Sanchiz *et al.* (1993) to be a water frog (compare Fig. 1 here with fig. 2c in Sanchiz *et al.*, 1993).

Sanchiz *et al.* (1993) show that the crista dorsalis itself is higher in the water frog group than in the brown frog group. The CDH value (crista dorsalis height) of Sanchiz *et al.* (1993, Table 1) in the Hordle Eocene specimen is 3.90 mm and compares well with the mean CDH values in water frogs, especially *Rana ridibunda* which has a mean CDH value of 3.99 mm. This value, however, has a positive correlation with the total ilial length (Sanchiz *et al.*, 1993).

On the other hand, a value called ANG which reflects the orientation angle of the tuber superior (dorsal protuberance) is not significantly correlated with ilial length. This ANG value in the Hordle Eocene *Rana* is 30.00 which differs from a mean ANG value of 19.89 in 22 *Rana temporaria*, the only brown frog species measured by Sanchiz *et al.* (1993). The five green frog species measured had mean ANG values ranging from 36.25 to 52.0 (Sanchiz *et al.*, 1993, Table 1).

Three subjective characters considered to be diagnostic of water frog ilia by Sanchiz *et al.* (1993) are (1) a well-developed pyriform (pipe-shaped) tuber superior, (2) a well-developed dorsal preacetabular fossa, and (3) a small preacetabular zone. The Hordle *Rana* fossil has a well-developed tuber superior, a well-developed preacetabular fossa, and a small preacetabular zone.

Although the Hordle Eocene fossil *Rana* may not be quite as similar to modern water frogs as the German Lower Oligocene *Rana* of Sanchiz *et al.* (1993), it is certainly more similar to modern European water frogs than it is to modern European brown frogs.

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