

THE TAXONOMIC STATUS OF THE UPPER LIASSIC ICHTHYOSAUR *EURHINOSAURUS LONGIROSTRIS*

by C. MCGOWAN

ABSTRACT. The swordfish-like ichthyosaur *Eurhinosaurus*, primarily from the German Upper Liassic, is generally considered to be monotypic. The authority of the type species, *E. longirostris*, has usually been given as Jaeger, 1856, but it is shown that Mantell, 1851 is the correct authority. The subject of Mantell's description (BMNH 14566) is from the Upper Liassic of Yorkshire. Recent preparation confirms the presence of an abbreviated mandible, confirming its eurhinosaurian status. *E. longirostris* (Mantell 1851) is thus unequivocally the type species of *Eurhinosaurus*, and BMNH 14566 is the holotype. *Eurhinosaurus huenei* Swinton, 1930, is shown to be a junior synonym of *E. longirostris*.

THE Upper Liassic (Toarcian) ichthyosaur *Eurhinosaurus* is unusual in having a mandible which is only about half the length of the skull. Like its living analogue, the swordfish (*Xiphias*), *Eurhinosaurus* is a monotypic genus (Huene 1931; McGowan 1979) and the type species is generally considered to be *E. longirostris*. However, there has been considerable confusion in the literature regarding the use of the specific name, the appropriate authority, and whether the original material was a eurhinosaur at all. Owen (1881, p. 124), for example, cited himself as author of the name, and included specimens from the lower and upper divisions of the English Liassic, one of which is probably referable to *Leptopterygius tenuirostris* (BMNH 36182, McGowan 1989). Most other sources (e.g. Huene 1922; Kuhn 1934) have cited Jaeger 1856 as the author, but this too is incorrect (McGowan 1974). The resolution of the problem hinges on a single specimen and the condition of its mandible, for which new information is now available. The purpose of the present paper is fourfold: to review the history of the specific name *E. longirostris*; to assess the status of the critical specimen; to discuss the monotypic status of the genus *Eurhinosaurus*; and to give a synonymy for the valid species.

MATERIALS AND METHODS

The institutional abbreviations used are: BMNH, the Natural History Museum, formerly called the British Museum (Natural History), London, UK; SMF, Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany; SMNS, Staatliches Museum für Naturkunde, Stuttgart, Germany.

Measurements in excess of 550 mm were made with a steel tape and recorded to the nearest millimetre. Large vernier callipers and small dial callipers were used for smaller measurements, recorded to the nearest 1 mm and 0.1 mm respectively. The measurements referred to in the text are defined in Table 1.

TAXONOMIC HISTORY OF *E. LONGIROSTRIS*

The name *Ichthyosaurus longirostris* was first published by Mantell (1851, p. 385) in a guide to the palaeontological galleries of the old British Museum, where one of the ichthyosaurian specimens on display was described as follows: 'ICHTHYOSAURUS LONGIROSTRIS – Wall-case E. – In the middle compartment of Case E there is part of the skeleton of an Ichthyosaurus from Whitby, about six feet in length. It is remarkable for the exceedingly slender and elongated muzzle; the skull is

TABLE 1. Characters recorded and ratios derived.

Character or ratio	Description
Vertebral count to pelvis	Number of vertebrae from atlas to level of pelvis
Vertebral count to tailbend	Number of vertebrae from atlas to level of tailbend
Skull length	Distance between tip of snout and posterior edge of quadrate
Snout length	Distance between tip of snout and anterior (internal) margin of orbit
Orbital diameter	Internal diameter of orbit measured along its longitudinal axis
Forefin length	Distance between distal end of humerus and most distal phalanx, measured between horizontals perpendicular to longitudinal axis of forefin
Forefin width	Maximum width measured between verticals, parallel to longitudinal axis of forefin
Forefin aspect ratio	Forefin length divided by forefin width

crushed; and with the exception of the chain of vertebrae which extends to the tail, and a few bones of one paddle, there are no characteristic parts preserved. The specific name, *longirostris*, is affixed to this specimen; but I cannot ascertain that it is figured or described.'

According to Article 12 of the ICZN (1985, third edition), names published before 1931 must have been accompanied by a description of the taxon. The above narrative, as noted elsewhere (McGowan 1974, p. 25), is sufficiently detailed to recognize the specimen, and therefore constitutes a description. Thus Lydekker (1889, p. 91), identified it as BMNH 14566, noting that it was figured by Owen (1881, pl. 32, fig. 8). *I. longirostris* therefore became available in 1851, with Mantell as the author and BMNH 14566 as the holotype.

BMNH 14566 is from the Upper Liassic of Whitby, Yorkshire, England, and comprises a dorsoventrally compressed skull, most of the vertebral column, and a partial forefin. The skull is remarkable for the extreme length and slenderness of the snout, as noted by Mantell, and is far more tenuous than in the common English long-snouted species, *Leptopterygius tenuirostris*. Since the skull was exposed from the dorsal aspect, Mantell would not have been able to determine whether the mandible was abbreviated. He would have had no reason to suspect that it might have been because no such ichthyosaur had ever been found.

Jaeger (1856) described three specimens from the Upper Liassic of Germany that he believed to belong to the same species as the Whitby specimen described by Mantell (1851). One of Jaeger's specimens clearly depicted a shortened mandible (1856, pl. 30, fig. 2), and he made the obvious comparison with the swordfish *Xiphias*. Jaeger referred his material to *I. longirostris*, but gave the authority as Owen and Jaeger rather than Mantell. This may have been because Mantell had not demonstrated the shortened mandible; Jaeger's reason for sharing the credit of authority with Owen was probably because of the correspondence he had with Owen prior to publishing the paper.

The genus *Eurhinosaurus* Abel, 1909 was erected, almost parenthetically, in a paper describing the Miocene cetacean *Eurhinodelphis cocheteuxi*. Abel noted that it was not certain whether the cetacean's mandible extended to the tip of the snout, or whether it was abbreviated as in the ichthyosaur which had been classified as *Ichthyosaurus longirostris*. He considered that the attenuated mandible of *I. longirostris*, together with numerous other distinguishing features, warranted erecting a separate genus, for which he proposed the name *Eurhinosaurus*. The type species, by monotypy, is *Eurhinosaurus longirostris* (Mantell).

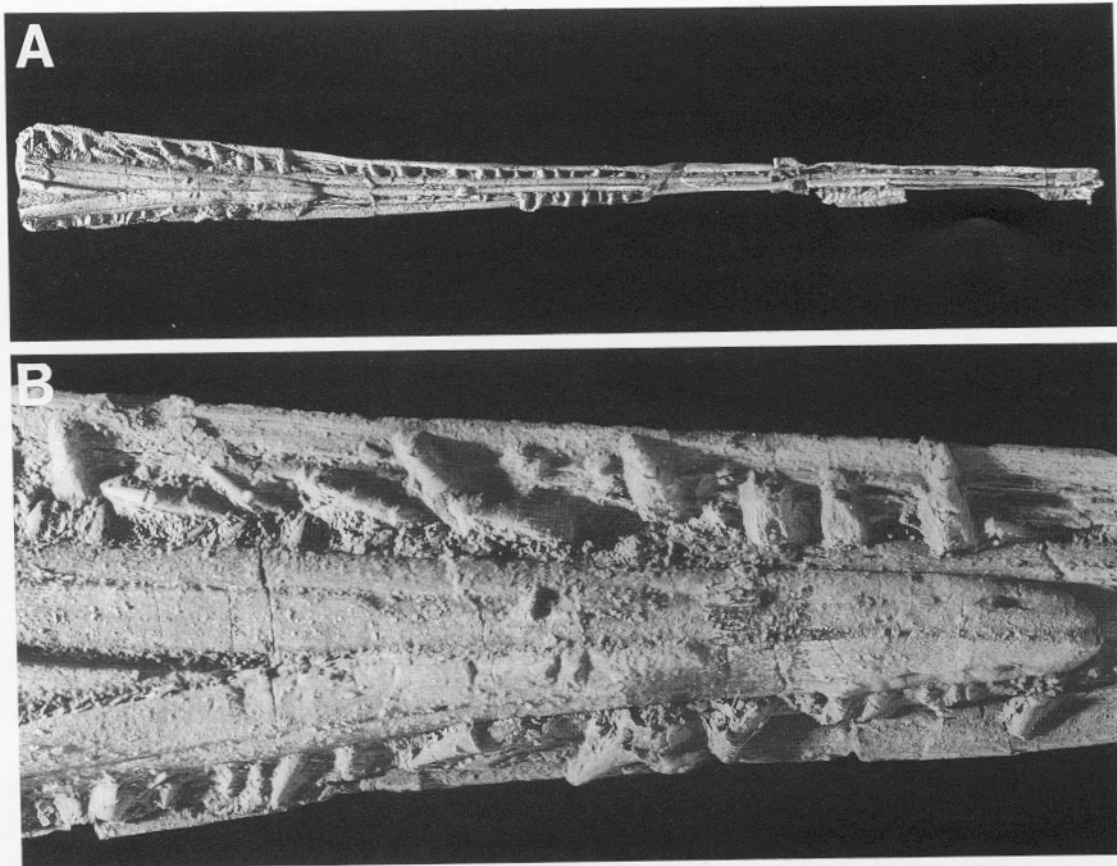
Huene (1922) referred Mantell's specimen (BMNH 14566) to the predominantly German species *E. longirostris*, but without giving any detailed reasons. Although the skull is dorsoventrally compressed, it is possible to obtain some approximate measurements. The skull and snout are

TABLE 2. Comparison of the skulls of BMNH 14566 and R5465. All measurements in millimetres.

Specimen	Locality	Skull length	Snout length	Orbital diameter
BMNH 14566	Whitby	≈ 860	≈ 680	≈ 100
BMNH R5465	Holzmaden	1035	870	125

approximately 860 mm and 680 mm long respectively, and the diameter of the orbit is approximately 100 mm. The snout measurement is not inconsistent with that of a specimen of *L. tenuirostris* of this size, but the orbit is relatively too small, comparable instead with that of *Eurhinosaurus*. When compared with a eurhinosaur skull (BMNH R5465) of similar size, the measurements were found to be proportionally similar (Table 2). From this evidence it was tentatively concluded that BMNH 14566 probably was referable to *Eurhinosaurus* (McGowan 1989), but confirmation was required.

Preparation now demonstrates that the specimen does have an abbreviated mandible, and it is therefore unquestionably referable to *Eurhinosaurus* (Text-fig. 1). This is fortunate for nomenclatural



TEXT-FIG. 1. *Eurhinosaurus longirostris* (Mantell). Holotype, BMNH 14566. A, the rostral portion, from about the level of the external nares to the tip of the snout, separated from the rest of the skull and shown from the ventral aspect; $\times 0.24$. B, closeup to show the abbreviated mandible; $\times 1.0$.

stability because it establishes the propriety of the name *Eurhinosaurus longirostris* (Mantell), with BMNH 14566 as the holotype.

The holotype comprises a partial vertebral column, part of a forefin, and a skull that is exposed from the dorsal aspect. Most of the bone appears to be embedded in original matrix, and the whole has been set in a plaster surround, encased in a wooden frame. The skull is about 860 mm long and has a long slender snout. Most of the rostral section of the skull, from a natural break just anterior of the external naris to its tip, was removed from the plaster prior to preparation. Removal of the adhering matrix and plaster revealed a much abbreviated mandibular section that is about 172 mm long (Text-fig. 1).

THE STATUS OF *EURHINOSAURUS HUENEI*

Huene (1928) described a new and complete skeleton of *Eurhinosaurus* that had just been purchased by the British Museum (Natural History) from Hauff's workshop in Holzmaden. At that time, only two other skeletons of *Eurhinosaurus* were known, one of which (SMNS 14931) was complete and quite well preserved. Huene noted that the new specimen (BMNH R5465), which was smaller than the other two, differed in the following regards.

1. In BMNH R5465, there were forty five presacral vertebrae and forty seven vertebrae between the sacrum and tailbend, compared with forty eight and forty in SMNS 14931. Thus the vertebral count to the tailbend in the BMNH R5465 and SMNS 14931 was ninety two and eighty eight respectively.

2. The coracoid of BMNH R5465 had a narrower (anterior) notch than in SMNS 14931.

3. The forefin was slender with three notched elements, whereas the fin was usually wider and without notching.

4. The ischium and pubis were wider medially than in some other specimens.

5. The hindfin had numerous notched elements, whereas there were only two or three in the other two specimens.

Huene concluded that BMNH R5465 probably represented a new species, but postponed formalizing this until more material became available. Drevermann (1930) reported that a complete skeleton of a large individual had been acquired by the Senckenberg Museum in Frankfurt (SMF 4155). Swinton (1930), impressed by the differences that Huene (1928) had enumerated, and by the fact that BMNH R5465 differed from SMF 4155 too, erected the new species, *E. huenei* with BMNH R5465 as the holotype. Huene's (1928) description was considered sufficiently detailed that a redescription was unnecessary, and Swinton's diagnosis was largely based on the features that Huene had described. Like Huene (1928), Swinton (1930) discussed the immaturity of BMNH R5465, but he did not think that the differences could be attributed to immaturity, nor did he consider sexual dimorphism to be a factor, although Huene (1928) had suggested that this may have been true for some of the features.

Huene (1931) described SMF 4155, together with several other specimens of *Eurhinosaurus*. He disagreed with Swinton's erection of a second species, believing that *Eurhinosaurus* was a monotypic genus comprising one markedly variable species. He held the same opinion twenty years later, after several additional specimens had been found (Huene 1951), and discussed the possibility that some of the variation may have been attributed to sexual dimorphism. I find this a persuasive argument because there is some evidence of a dichotomy in certain features that are not size-related and which cannot be attributed to growth (McGowan 1979).

The significance of the differences between BMNH R5465 and the other specimens can be considered by examining each of the five features enumerated above.

1. Swinton (1930) and Huene (1928) were in close agreement with the number of presacral vertebrae in BMNH R5465, namely 44 and 45 respectively, but I counted 50, which is close to the mean value of 48, the observed range for the species being 45–50 ($n = 7$). BMNH R5465 is therefore not atypical, but the observed range is wider than it is in other taxa. In *Stenopterygius quadricissus*, for example, it is 42–45 ($n = 13$), while in *Leptopterygius tenuirostris* and *Ichthyosaurus communis*,

the observed ranges are 45–47 ($n = 6$) and 42–44 ($n = 9$) respectively. The count of 92 vertebrae to the tailend is not atypical, the observed range being 91–95 and the mean being 92 ($n = 7$).

2. Notwithstanding the fact that notching in the coracoid tends to be variable and is therefore not a useful diagnostic character, Huene (1931) pointed out that the notch in BMNH R5465 was similar to that of SMF 4155.

3. The occurrence of notching in the fins, like the fin proportions themselves, is usually variable. For example, in *S. quadricissus* the number of notched elements in the forefin varies between two and six (McGowan 1979). The forefin of BMNH R5465 has three notched elements, whereas this varies between zero and one in the other specimens. Given the variability in this feature, this discrepancy is not considered significant. A measure of the relative slenderness of the forefin is given by the aspect ratio. BMNH R5465 is said to be more slender than the other specimens, and this is reflected in the high value of 4.03 for the aspect ratio. However, this falls within the observed range for the other material (2.68–4.09, $n = 6$). The extreme variability of this character is reflected in the discrepancy in values between left and right fins within the same individual. For example, in SMF 4155 the aspect ratio is 3.75 in one forefin and 2.94 in the other.

4. The ischium of BMNH R5465 is much wider medially (i.e. ventrally) than in the other specimens, but there is some variation in the proportions of the pelvic elements among the specimens. It is also possible that the ischium is abnormal because the pelvis is unusual for having a fused pubis and ischium on the right side, whereas the elements are unfused on the left side. The pubis is not wider than in the other material and, aside from the asymmetrical fusion with the ischium, it is unremarkable.

5. The hindfin has fourteen notched elements on the right side and sixteen on the left, compared with between two and five among the other specimens. This is a much wider discrepancy than in the forefin, and is the only significant difference among these five features.

Thus BMNH R5465, the holotype of *E. huenei*, differs from the other referred specimens only in having more notched elements in the hindfin. Given the variability in the occurrence of notching in ichthyosaurian fins, this is not considered sufficient grounds for the erection of a new species and *E. huenei* is considered to be a junior synonym of *Eurhinosaurus longirostris*.

SYSTEMATIC PALAEOLOGY

The taxonomy at the family level is in need of revision and, as this lies beyond the scope of the present work, no familial designation will be given here. For each reference in the synonymy the name is as attributed (wrongly) by that author.

Class REPTILIA

Order ICHTHYOSAURIA Blainville, 1835

Genus EURHINOSAURUS Abel, 1909

Locality and horizon Upper Liassic (Toarcian) of Whitby, Yorkshire, England, and of Holzmaden and surrounding areas of southern Germany.

Type species. *E. longirostris*.

Eurhinosaurus longirostris (Mantell)

- 1851 *Ichthyosaurus longirostris* Mantell, p. 385.
- 1856 *Ichthyosaurus longirostris* Owen and Jaeger; Jaeger, p. 948, pl. 30.
- 1881 *Ichthyosaurus longirostris* Owen [*partim*]; Owen, p. 124, pl. 32, fig. 8.
- 1889 *Ichthyosaurus latifrons* König [*partim*]; Lydekker, pp. 89, 91.
- 1891 *Ichthyosaurus longirostris* Jaeger; Fraas, p. 63, pl. 11, figs 2, 4; pl. 12, fig. 5; pl. 14, fig. 10.
- 1909 *Eurhinosaurus longirostris*; Abel, p. 245.

- 1922 *Ichthyosaurus longirostris* Jaeger; Huene, p. 32, pl. 5; pl. 9, figs 3–4; pl. 12, fig. 1.
 1928 *Eurhinosaurus* sp.; Huene, pl. 37.
 1930 *Eurhinosaurus huenei* Swinton; Swinton, p. 275.
 1931 *Eurhinosaurus longirostris*; Huene, p. 30, pl. 3, fig. 1.
 1951 *Eurhinosaurus longirostris* Jaeger; Huene, p. 277, fig. 1; pl. 18.
 1989 *Eurhinosaurus huenei* Swinton; McGowan, p. 116, figs 7–8; pl. 5, figs 2, 4.

Holotype. BMNH R5465.

Type locality and horizon. Whitby, Yorkshire, England. Upper Liassic (Toarcian); more precise stratigraphical data are wanting (see Lydekker 1889, p. 91).

Referred material. Specimens as listed by McGowan (1979, p. 116).

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C. McGOWAN

Department of Vertebrate Palaeontology
Royal Ontario Museum,
Toronto,
Canada, M5S 2CS
and
Department of Zoology
University of Toronto
Canada, M5S 1A1

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