

COMPARISON AND ANALYSIS OF *ICHTHYOSAURUS BREVICEPS* AND *ICHTHYOSAURUS COMMUNIS* TO NEW THREE-DIMENSIONAL JURASSIC-AGED ICHTHYOSAURUS SKULL FOSSIL, FOUND ON THE DORSET COAST, UK

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ABSTRACT

In this study, a three-dimensional Ichthyosaur skull fossil was analyzed to determine whether it belonged to the relatively common *Ichthyosaurus communis* species or the rare *Ichthyosaurus breviceps* species. The three-dimensional preservation of the fossil is unique because deformation occurred in the dorsal-ventral direction, preserving the detailed anatomy of the skull roof. Measurements of the skull such as the length of the snout and the diameter of the orbit were taken for species comparison. The Ichthyosaur specimen matches closely to *I. breviceps* because it has a shorter snout and larger eyes, which are diagnostic traits of the species. The length of the snout to length of the jaw has a ratio of 0.449 on the study specimen

compared to a ratio of 0.57-0.69 for *I. communis* and <0.57 for *I. breviceps*. The diameter of the orbit to the length of the jaw has a ratio of 0.327 for the study specimen compared to a ratio of 0.20-0.28 for *I. communis* and >0.25 for *I. breviceps*. Diagenetic crushing of the skull during fossilization has restricted the accuracy of certain measurements, limiting the ability to determine the precise identification of the species. Bone texture was used to determine the maturity level of the specimen. The nasal and frontal bones contain long-grained texture indicative of a juvenile. However, a comprehensive study of Ichthyosaur bone texture is needed to determine the ontogenetic significance of these data.

Methodology

- Each bone of the skull was described, starting from the rostral end to the caudal end
- Took identifying measurements established by Christopher McGowan (1974a)
- Measurements used to create ratios for comparison of new Ichthyosaur specimen to *I. communis* and *I. breviceps*
- Bone texture was observed using a hand lens

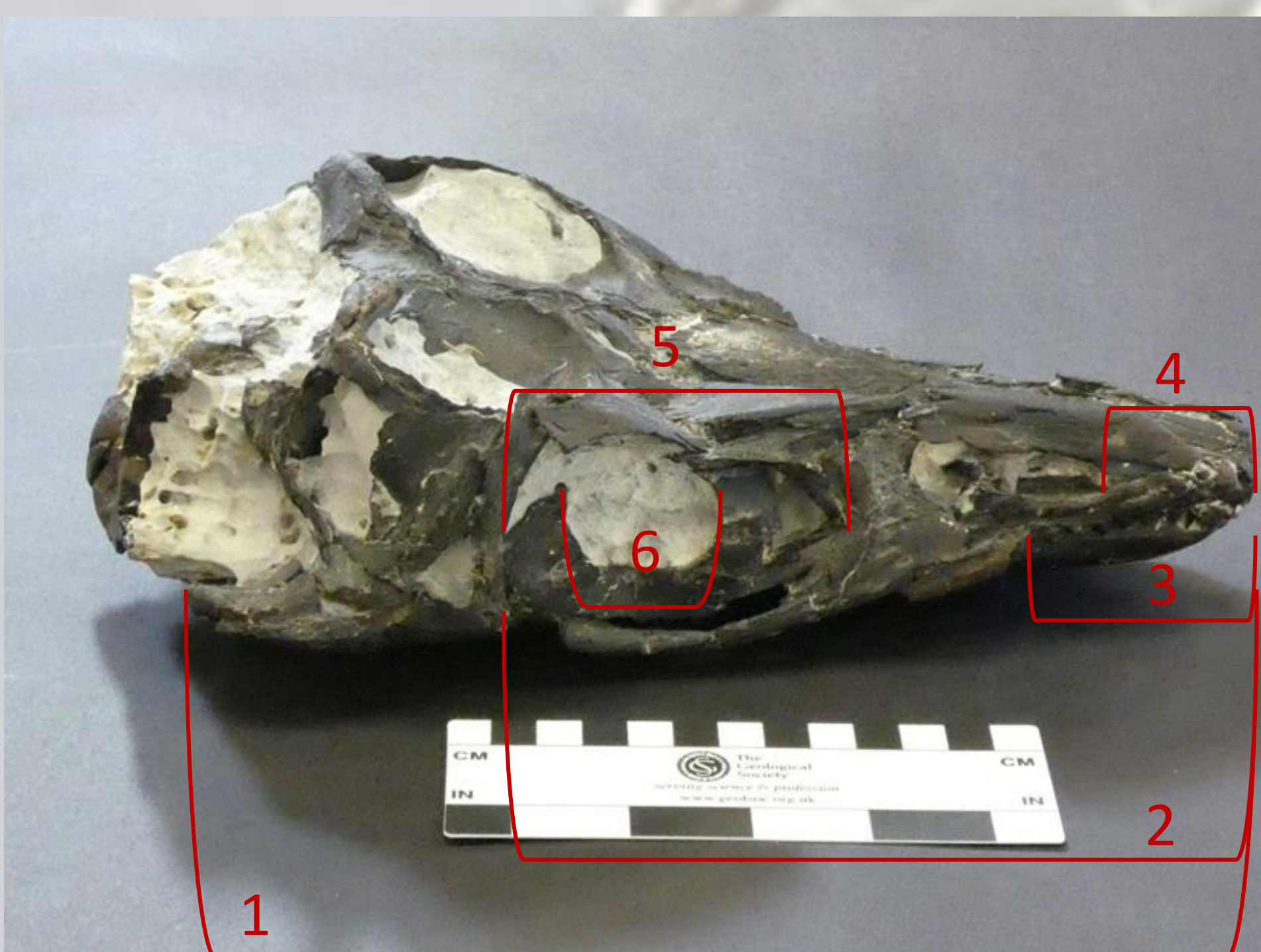


Figure 1: Measurements taken for ratio diagnoses: length of jaw (1), length of snout (2), length of premaxillary segment (3), length of prenarial segment (4), diameter of orbit (5), internal diameter of sclerotic ring (6) (Photo by Author).

Table 1: Ratios of WESM-BD-167 and Ichthyosaur Standards

Ratio	<i>I. breviceps</i> standard	<i>I. communis</i> standard	WESM-BD-167 ratios
Diameter of orbit to length of jaw	>0.25	0.20-0.28 but usually <0.25	0.33
Length of snout to length of jaw	<0.57	0.57-0.69	0.45
Length of premaxillary segment to length of jaw	0.33-0.44 but frequently <0.40	0.38-0.48 usually exceeding 0.40	0.23
Length of prenarial segment to length of jaw	<0.43	0.40-0.56 usually exceeding 0.43	0.14
Internal diameter of sclerotic ring to diameter of orbit	>0.35	>0.35	0.44
Maxillary teeth	>=10	14+/- 4	8

Table 2: Skull Measurements of WESM-BD-167

Skull feature	Left-Lateral (cm)	Right-Lateral (cm)
Length of jaw	23	24.5
Length of snout	10.5	11
Length of premaxillary segment	5	5
Length of prenarial segment	3.5	3
Diameter of orbit (height)	5	4.6
Diameter of orbit (width)	8	8
Internal diameter of sclerotic ring (height)	1.2	2.5
Internal diameter of sclerotic ring (width)	2.5	3.5
Maxillary teeth	8	4

Special thanks to the Weis Earth Science Museum for supplying the specimen, and to Dr. Joseph Peterson for providing a 3-D scan and print of the Ichthyosaur fossil.

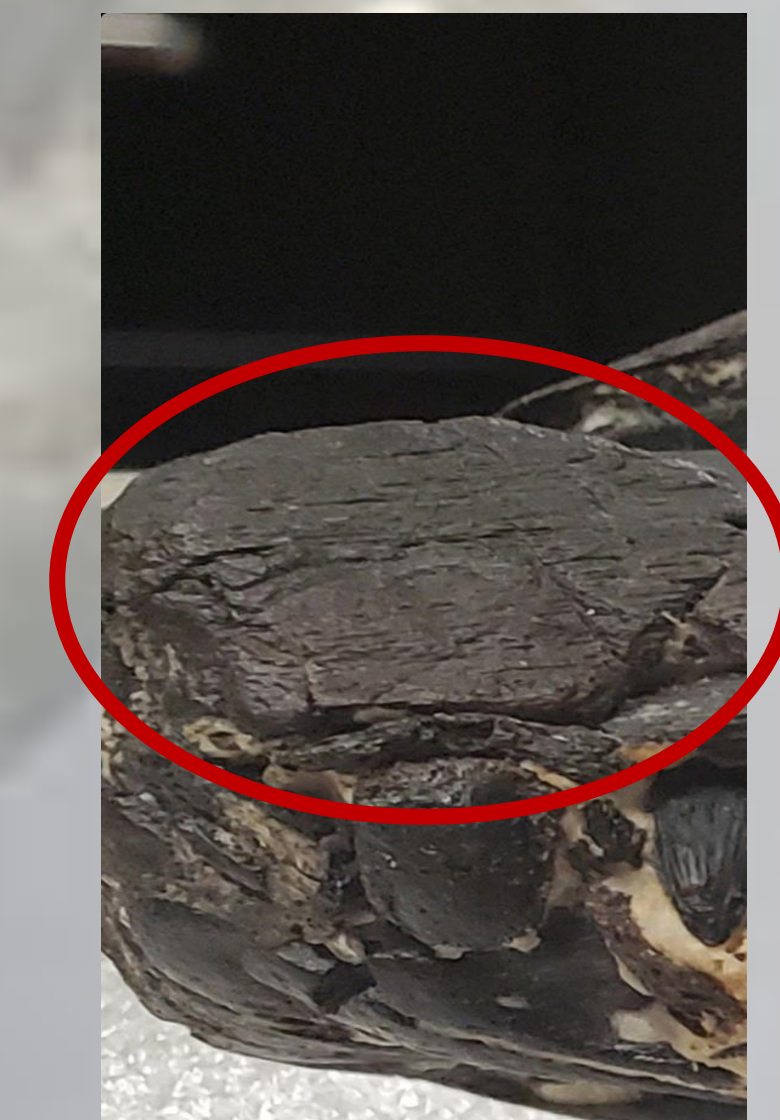


Figure 2: Example of long-grained bone texture on the left-lateral nasal (Photo by Author).

Results

The WESM-BD-167 Ichthyosaur specimen was crushed dorsally in fossilization. Because of this, the species cannot be definitively identified. However, the specimen matches closely with the *I. breviceps* orbit ratios and maxillary teeth count, indicating that the specimen is an *I. breviceps*.

The identifying features for the *I. breviceps* species may not be helpful because they can be easily explained by the growth of a species. For example, juveniles tend to have larger eyes, more teeth, and smaller skulls, which are all identifying features for the *I. breviceps* species.

The long-grained texture of the bones as well as the defining characteristics of *I. breviceps* indicates that the specimen is a juvenile.

Works Cited

- McGowan, C. 1974a. A revision of the Longipinnate ichthyosaurs of the Lower Jurassic of England, with descriptions of two new species (Reptilia: Ichthyosauria). *Life Sciences Contributions, Royal Ontario Museum*, 97, p. 1–37.
- McGowan, C. 1974b. A revision of the Latipinnate ichthyosaurs of the Lower Jurassic of England (Reptilia: Ichthyosauria). *Life Sciences Contributions, Royal Ontario Museum*, 100, p. 1–30.