Cranial Anatomy and Systematics of Lower Jurassic Pliosaurs

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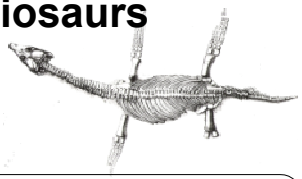


Rhomaleosaurid plesiosaurs, a group of Mesozoic aquatic reptiles, are known from a number of well preserved skeletons. The research outlined here seeks to update our understanding of pliosaur cranial anatomy, assess the status of the genus *Rhomaleosaurus*, and test the monophyly of the Rhomaleosauridae. Lower Jurassic pliosaurs may be subdivided by stage.

Hettangian fauna - *Rhomaleosaurus megacephalus* (Figs 1A, B, C and 3D, E), *Eurycleidus arcuatus* (Fig 3C), *Macroplata tenuiceps,* and *Archaeonectrus rostratus*. An additional taxon is recognised by a unique symphysis morphology (Fig 3F). A new reconstruction of the skull of *R. megacephalus* is presented here (Fig 1). Casts of the holotype, the original of which was destroyed in the Bristol Museum during an air raid, are also providing vital information.

Toarcian fauna - *Rhomaleosaurus cramptoni* (Figs 2A, B), *R. zetlandicus* (Fig 3B), *R. propinquus, R. thorntoni* (Fig 3A), *R. longirostris*, and *R. victor* (background image). The holotype of the genus (*R. cramptoni)* (Fig 2A) is currently under preparation and a thorough interpretation of the whole skull including the palate will follow.

There is a considerable diversity in skull anatomy between these forms (compare Fig 1B with 2B), and variation in symphysis morphology is equally great (Fig 3). Indeed, A review of pectoral girdle anatomy also reveals striking variation between species pertaining to *Rhomaleosaurus*. (Fig 4)

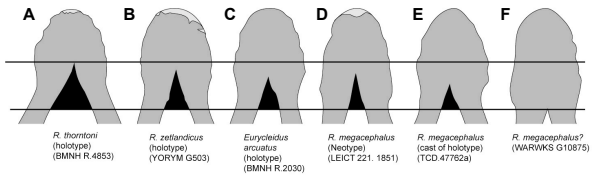
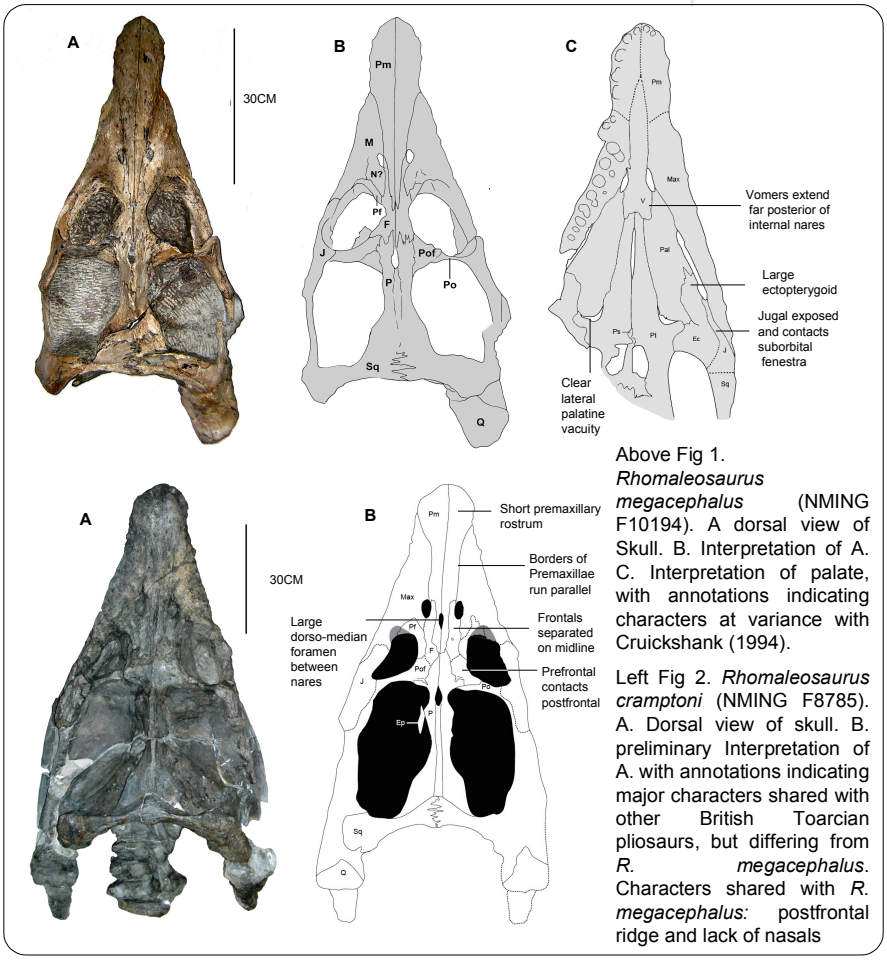


Fig. 3. Mandibular symphyses of various species currently pertaining to the genus *Rhomaleosaurus*, and the species *Eurycleidus arcuatus*. The width of each symphysis has been standardised to allow direct comparison between species (so not to scale). The top line represents the minimum symphysis length (*R.thorntoni*) and the bottom line represents the maximum (WARWKS G10875). Areas shaded black help visualise variation. Light grey shading = inferred missing bone.

Fig. 4. Reconstructed pectoral girdles of A. *R. thorntoni* (BMNH R4853) and B. one half of *R. megacephalus* (composite of left and right elements of NMING F10194). The girdle of *R. thorntoni* is much larger, broader and less elongate than *R. megacephalus*, the latter also has a clear 'V' shaped posterior median coracoid embayment.



Above Fig 1. *Rhomaleosaurus megacephalus* (NMING F10194). A dorsal view of Skull. B. Interpretation of A. C. Interpretation of palate, with annotations indicating characters at variance with Cruickshank (1994).

Left Fig 2. *Rhomaleosaurus cramptoni* (NMING F8785). A. Dorsal view of skull. B. preliminary Interpretation of A. with annotations indicating major characters shared with other British Toarcian pliosaurs, but differing from *R. megacephalus*. Characters shared with *R. megacephalus:* postfrontal ridge and lack of nasals

Preliminary morphometric analyses based on skull proportions (Fig 5) and a preliminary cladistic analysis (Fig 6) show morphological distinctions, notably between Toarcian and Hettangian taxa

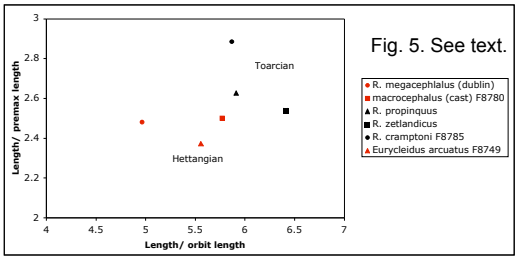


Fig. 5. See text.

Conclusions

R. propinquus, *R. zetlandicus, R. thorntoni* and *R. cramptoni.* are united via cladistic analysis and may be regarded *as Rhomaleosaurus sensu stricto*. Their interrelationships await the ongoing preparation of *R. cramptoni.*

R. megacephalus and *R. victor* differ significantly from *Rhomaleosaurus sensu stricto* and from each other (Fig 6). Lower Jurassic pliosaurs form a sister relationship with the Pliosauridae, however, a traditional Rhomaleosauridae is not supported due to the exclusion of *R. victor.* The genus name *'Thaumatosaurus'* is often applied to the holotype of *'R'. victor* and could be resurrected?

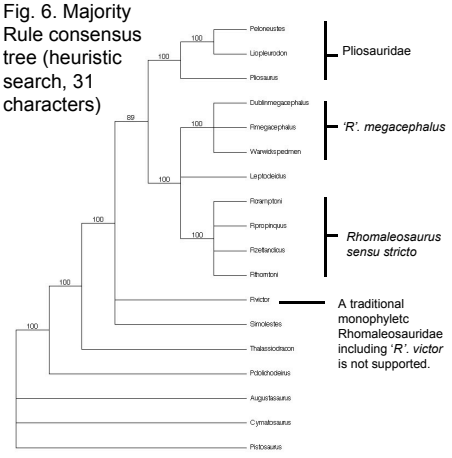


Fig. 6. Majority Rule consensus tree (heuristic search, 31 characters)

References

Cruickshank, A. R. I. 1994. Cranial anatomy of the Lower Jurassic pliosaur *Rhomaleosaurus megacephalus* (Stutchbury)(Reptilia: Plesiosauria). *Philosophical Transactions of the Royal Society of London, Series B*, **343**, 247-260.

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