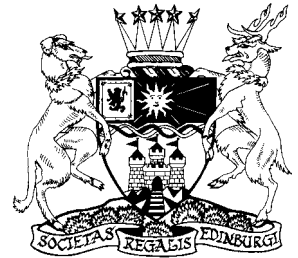


A revised reconstruction of the dermal skull roof of *Acanthostega gunnari*, an early tetrapod from the Late Devonian

J. A. Clack

ABSTRACT: A revised reconstruction of the dermal skull roof of *Acanthostega gunnari* from the Upper Devonian of East Greenland is provided, incorporating modifications consequent upon further study of the specimens and in the light of new information from the Upper Devonian genus *Ventastega* from Latvia. The new reconstruction features a midline gap between the frontal and nasal bones and median rostrals. A revised profile for the skull and a rendition of the dermal ornament is also provided.

KEY WORDS: *Acanthostega*, Devonian, revised skull roof reconstruction, tetrapod



This paper is an amendment of the reconstruction of the skull roof of *Acanthostega* published recently (Clack 2002). The discovery of an internasal fontanelle in new material of *Ventastega curonica* (April 2002, P. E. Ahlberg, pers. comm.; pers. obs.), has prompted a reinterpretation of the snout sutures of *Acanthostega*. It was previously assumed that *Acanthostega* had simple but conventional sutures at the nasal–nasal or nasal–median rostral junctions. However, no specimen shows a complete uncrushed snout in which these regions are well displayed. Re-examination of skull specimens in the light of the new *Ventastega* material, reveals that the nasal bones do not suture together in the midline and there is also a gap between the nasals and median rostrals.

1. Material and methods

Museum Geologicum Universitatis Hafniensis (MGUH = Geological Museum, University of Copenhagen): MGUH f.n. 1227 a and b, 1300a, 1305, 1400 and MGUH 6033, the holotype specimen (see Clack 2002 for further details). In MGUH f.n. 1227b, one of the best-preserved specimens (Clack 2002, figs 3B, 9C), an almost complete and scarcely distorted skull, neither the nasals nor the frontals meet in the midline but are separated by a gap of about 4 mm. This may represent the natural degree of separation of these bones. The smallest skull, MGUH f.n. 1400 (Clack 2002, figs 9D, 10) shows a hole in this region previously assumed to be damage, and in the holotype, the medial margin of the right nasal is not only offset from the midline, but has a slight embayment at its anterior end (Jarvik 1952, fig. 9D; Clack 2002, pl. 21). In MGUH 1227a, the left nasal is missing altogether (Clack 2002, fig. 5). Specimen MGUH 1305 shows the region in longitudinal section, where a gap between the right and left nasals can be seen. Specimen MGUH f.n. 1300a shows a gap between the nasals and median rostrals, and though the nasals touch, they do not suture in the midline, at least anteriorly.

2. Skull reconstruction

The revised skull roof reconstruction (Fig. 1A) shows the vacuity with its width conservatively restored. There are conse-

quent revisions to the width of the snout, which is greater than in the original reconstruction (Clack 2002, fig. 6A). The dermal ornament has been rendered schematically, but with regard to the size and orientation of the pits and grooves. In the lateral view (Fig. 1B), the profile has been slightly modified to include a greater upturn at the anterior of the snout, judged from the shape of the lower jaws. This also resulted from examination of the almost undistorted material of *Ventastega*, that suggests that the lower margin of the skull roof rises towards the midline. The skull has been shown in lateral view with the mouth open, and all tooth spaces have been shown as holding teeth. In life, there would have been a ‘twist’ to the lower jaw that brought the splenial medially so that it would hardly be visible in lateral view (c.f. Ahlberg & Clack 1998, figs 2C, 5C, which are more ventrolateral, and fig. 6B which shows sections through the anterior end of well-preserved lower jaws).

3. Discussion

This reinterpretation of the skull of *Acanthostega* is a text-book example of how what we see is conditioned by what we expect to see. Only further, better, specimens of a related taxon, *Ventastega*, alerted me to the possibility that the midline skull sutures in *Acanthostega* were unconventional. Re-examination of *Acanthostega* material showed that it, too, possessed the unusual feature of a fontanelle in the anterior midline, and that this explained the preservation of the numerous incomplete snouts discovered in the field. The gap would have exposed part of the, presumably cartilaginous, anterior ethmoid region of the braincase.

Examination of specimens of *Ichthyostega* show that this animal had the conventional feature of firm midline skull sutures, a character state also found in more derived taxa such as the whatcheeriids, baphetids, anthracosaurs and indeed most other tetrapods. However, *Crassigyrinus* notably has an oval interpremaxillary fontanelle (Clack 1998), and a similar vacuity appears in some temnospondyls such as *Acanthostomatops* (Boy 1989). Appearance in an eryopoid temnospondyl is almost certainly a homoplasy, but the feature in *Crassigyrinus* could emerge as a synapomorphy of certain stem tetrapods; only further phylogenetic analysis could confirm or refute this. The feature in *Crassigyrinus* shares with

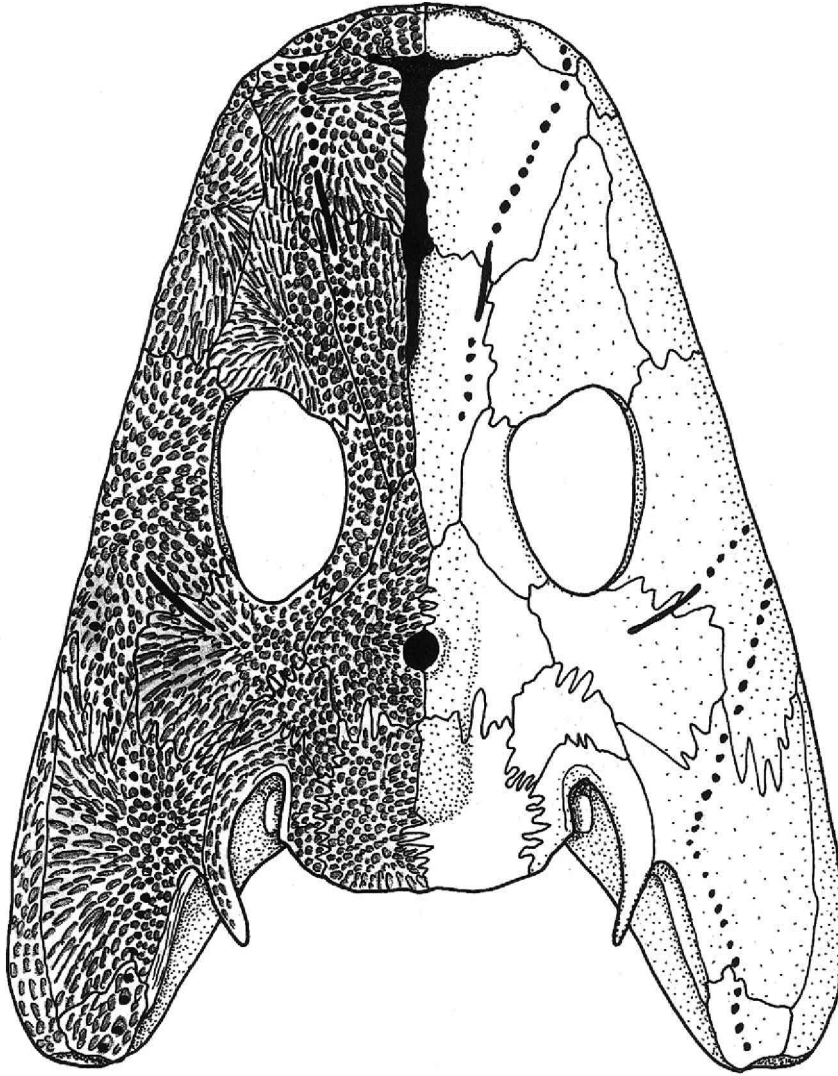
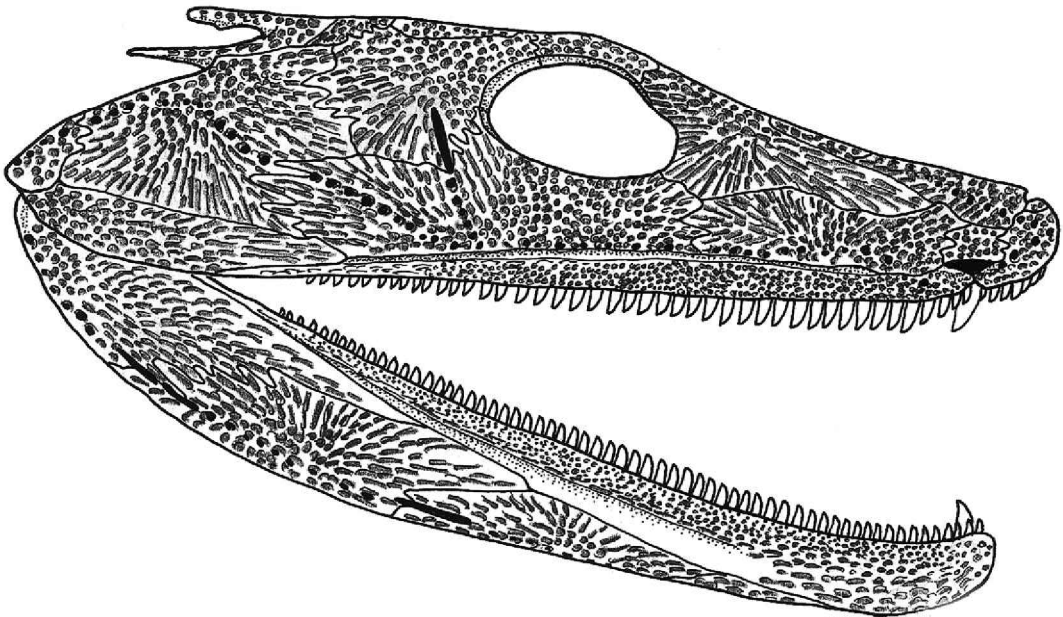
A**B**

Figure 1 *Acanthostega gunnari* skull roof reconstruction. A: dorsal view; B: lateral view.

Acanthostega and *Ventastega* the additional feature of a groove reaching up along the snout from the fontanelle. It now seems unlikely that the fontanelle in *Crassigyrinus* simply results from loss of the 'internasals' (i.e. median rostrals), as might plausibly have been suggested prior to this discovery. The function of the fontanelle and groove in any of these taxa remains obscure.

4. Acknowledgements

I acknowledge the contribution of Per Ahlberg (Natural History Museum, London) and Ervins Lukševičs (University of Latvia) who generously allowed me to examine the material of *Ventastega* in advance of the description and publication of their newly discovered material. Thanks are due also to Hannah Hellrung for pointing out to me the vacuity in *Acanthostomatops*.

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J. A. CLACK, University Museum of Zoology, Downing Str., Cambridge CB2 3EJ, UK.
email: j.a.clack@zoo.cam.ac.uk

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