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Abstract

The type species of the trilobite Hadrohybus Raymond 1925, H. dunbari from the Cow Head Group of western Newfoundland, is redescribed here. It has been regarded as a cheirurid, but analysis of its cranidial characters show that it is a bathyurid closely related to the well-known Early Ordovician genus Bolbocephalus, and it is considered to be a subgenus of that form. It is probably of early Middle Ordovician age. A second Hadrohybus species occurs in the late Early Ordovician of Vermont.

Key Words

Hadrohybus, Bolbocephalus, Bathyuridae, trilobite, Ordovician.

Introduction

Raymond (1925) described the type, and only named species of Hadrohybus, from the Ordovician, Cow Head Group of western Newfoundland. On the basis of these cranidia, Raymond considered that the genus was a cheirurid related to Nieszkowskia, and this placement has remained, although Hadrohybus was only placed with question in Cheiruridae by Henningsmoen (in Moore, 1959) in the Treatise on Invertebrate Paleontology. Raymond’s original illustrations were somewhat perfunctory, and a reconsideration of this peculiar trilobite is overdue. This paper reviews the family relationships of Hadrohybus.

Age of Hadrohybus dunbari Occurrence

The Cow Head Group of western Newfoundland consists of a series of conglomerates with interbedded shales and sandstone, which accumulated off the shelf-edge of the Laurentian continent during the Cambrian to Ordovician. The conglomerates were mostly derived from shallow water environments, and from one boulder of this type the specimens of Hadrohybus were recovered. James and Stevens (1986, fig. 40) record a succession on the type locality, Stearing Island, ranging through Early Ordovician to Early Whiterockian. Only two conglomerates yield pebbles large enough to have furnished the large Hadrohybus specimens. One of these is of Arenig age and is high in the Lower Ordovician. The other, of possible late Arenig age, may be the equivalent of the massive conglomerate bed of nearby Lower Head, and may be regarded as Whiterockian (Whittington 1963). On my visit to Stearing Island I was unable to find further specimens of Hadrohybus and direct evidence of its age is so far lacking. Raymond (1925) lists "Eoharpes fragilis, Homotelus catactus, Ilaenus sp. and Pliomerops"
Ordovician Trilobite *Hadrohybus*

**Fig. 1**

*Hadrohybus dunbari* Raymond. *a–c*, holotype cranidium YPM 13031, ×1.5 in dorsal, anterior and lateral views; *d, e*, paratype, large incomplete cranidium, but showing postocular cheek, ×1, YPM 13030, in anterior and dorsal views. Photographs of replicas supplied to the author by the Peabody Museum of Natural History (YPM), Yale University.
“barrandei” as associated species with Hadrohybus. This assemblage appears most comparable with that described from the Lower Head boulder by Whittington (1963), and if this is the case it seems likely that the boulder yielding Hadrohybus is of Whiterockian age.

Systematic Note

Genus Bolbocephalus Whitfield, 1890
Subgenus Hadrohybus Raymond 1925

Type Species

(Original designation) H. dunbari Raymond 1925
Bolbocephalus (Hadrohybus) dunbari
Raymond 1925 (Fig. 1a–e)
Hadrohybus dunbari sp. nov.: Raymond, 1925, p. 147–48, pl. 9, figs. 5, 6.
Hadrohybus dunbari Raymond:

Type Material

Holotype, cranidium, YPM 13031; paratype, cranidium, YPM 13030.

Type Locality and Horizon

Stearing Island, Cow Head, western Newfoundland, pebble in probably early Middle Ordovician conglomerates.

Description

Cranidium is large and highly convex (sagittal, transverse), with glabella highly vaulted and curving downward anteriorly, so that in dorsal view it overhangs cranidial margin. Maximum cranidial width at posterior margin; postocular cheek gently declined downwards. Glabella tapers forward initially, but expands in width at level of palpebral lobes to achieve maximum width at their anterior ends; anterior outline broadly rounded, but anterior view shows tendency toward an obtuse anteromedian acumination. Occipital ring not seen on type material. Glabellar furrows effaced, but oval areas adjacent to the shallow axial furrows opposite posterior parts of palpebral lobes presumably represent muscle insertion areas. At a point opposite the palpebral lobes the glabella is elevated into a prominent, slightly backward-turned knob, forming the conspicuous high point of the cranidium. Preglabellar area short, vertical to reclined, but cranidial anterior border apparently lacking. Palpebral lobes highly curved, and approximately medially placed in dorsal view forming semicircles, anterior ends closer to glabella than posterior ends, and with clearly defined palpebral rims. Sutures do not diverge in front of palpebral lobes, thereby defining narrow (transverse), downsloping preocular cheeks. Area inside palpebral lobes gently inflated. Postocular suture describes a sigmoidal curve, in the midpart running more or less transversely, the postocular cheeks evidently wide (transverse) and showing at least the proximal part of a moderately defined posterior border furrow. The cranidium carries a distinctive surface sculpture best shown on the smaller example. Fine tubercles cover the glabella, and these are joined by raised lines on the glabellar flanks. The raised lines are most prominent on the front of the glabella, as they are on the preglabellar area. The interocular fixed cheeks are rugose.

Discussion

Only the cranidium of H. dunbari is known and comparative remarks are accordingly limited. However, a second species which can be attributed to Hadrohybus was described by Whittington (1953) as Bolbocephalus? species indeterminate. This species is from the Fort Cassin Formation of Vermont, which is of late Early Ordovician age. Again, only the cranidium is known, and this is clearly like that of H. dunbari, although much smaller than either of the types of this species. The glabellar boss is prominent on the Vermont form, but further forward on the glabella (Whittington 1953, pl. 66, fig. 15), and directed somewhat forward. The surface sculpture apparently consists of much finer, concentric
Fig. 2.
Competing hypotheses of relationships of
Hadrohybus. A, Cheirurid relationships; B, Bathyurid
relationships. A greater number of cranial
synapomorphic characters favor B, which is
adopted in this paper. Characters are: 1, waisted
glabella; 2, opisthoparian sutures; 3, glabellar
effacement; 4, terrace ridges present; 5, glabellar
boss. Under hypothesis B the glabellar boss is a
parallelism.

to the bathyurid Bolbocephalus Whitfield 1890,
a well-known genus from the early Ordovician
of North America. Because of its previous
assignment to Cheiruridae, Hadrohybus was
not considered in the revision of Bathyuridae
by Whittington (1953) or Fortey (1979).

Certain characters shown on Hadrohybus
are present on representatives of both
bathyurids and cheirurids and hence are not
relevant to deciding familial relationships.
These include the presence of tuberculate
surface sculpture, the deeply incised
cornebral furrow and the anteriorly rounded
glabella. However, the ridgelike sculpture of
the anterior border is not present on any
cheirurid of which we are aware.

The type species of Bolbocephalus is B.
seelyi (Whitfield 1886) from Vermont which
was redescribed by Whittington (1953). Fortey
(1979) recently redescribed B. convexus

Family Assignment of Hadrohybus

Raymond (1925) compared the morphology of
Hadrohybus with that of the cheirurid
Nieszkowskia, a family into which it was
placed with question by Henningsmoen (in
Moore 1959). This assignment appears to rest
mainly on the presence of the curious
glabellar boss in both genera. This
resemblance is misleading as far as family
relationships are concerned (Fig. 2). Here it is
considered that Hadrohybus is closely related

lines on the glabella. These differences are
sufficient to indicate that the Vermont form is
a separate species from H. dunbari. The
single specimen of a cranidium, however, is
not considered an adequate basis for formally
naming it.
(Billings 1865) from the Catoche Formation of western Newfoundland; this species offers a particularly close comparison with *Hadrohybus*. Neglecting the glabellar boss, the outline and forward protrusion of the glabella in both cases is identical, as is the absence of defined glabellar furrows. So is the position and curved form of the palpebral lobe, and the long (transverse) postocular cheek. There is no evidence that the facial suture of *Hadrohybus* is proparian, which of course it would have to be were *Hadrohybus* a cheirurid; the preservation of the only type specimen which shows the postocular cheek is admittedly imperfect.

Surface sculpture on *Bolbocephalus* species consists of terrace ridges, or it is smooth, but the related bathyurid *Petigurus* has very coarse tuberculation and the sculptural difference is probably not important. Additionally, the following cheirurid characters are absent on *Hadrohybus*: 1) Incised posterior glabellar furrow. Even on relatively effaced cheirurids the basal glabellar furrow is well-defined and backward curved, and there is no sign of this furrow on *Hadrohybus*. 2) Anterior cranidial border. A narrow (sagittal) anterior cranidial border which does not continue the downward slope of the frontal glabellar lobe is typical of cheirurids. When the border is encroached upon by the glabella, as in sphaerexochinids, it becomes almost obsolete, but in no cheirurid is there the flat, downsloping preglabellar area shown on *Hadrohybus*. 3) Genal sculpture. The usual sculptural type on the genal areas of cheirurids included a honeycomblike arrangement of pits as well as tuberculation, which is not present on *Hadrohybus*.

In summary, very little evidence supports the hypothesis that *Hadrohybus* is a cheirurid, and many facts suggest that it is not. It is closely comparable to a known bathyurid of similar age and provenance. The discovery of the free cheek and pygidium of *Hadrohybus* can be expected to confirm this family assignment. The resemblance between the glabellar boss of *Hadrohybus* and the cheirurid *Nieszkowskia* is regarded as the result of probable convergence.

**Position of *Hadrohybus* within the Bathyuridae**

The close comparison between *Hadrohybus* and *Bolbocephalus* has been discussed above. There remains the question of whether *Hadrohybus* should be accorded separate generic status or subgeneric status within an enlarged concept of *Bolbocephalus*. *Petigurus* is the most closely related bathyurid to *Bolbocephalus* (Fortey 1979) and is the sister group to *Bolbocephalus* and *Hadrohybus*. Figure 3 shows the distribution of characters of the cranidia of these genera, together with *Bathyurus* as the typical bathyurine. This shows there are really no characters which can be regarded as autapomorphic for *Hadrohybus* cranidia apart from the glabellar boss, whereas *Bolbocephalus* and *Hadrohybus* have several additional autapomorphies, about the same number as *Petigurus*. All these taxa form a compact subgroup within Bathyurinae. The best recourse for the moment is to regard *Hadrohybus* as a subgenus of *Bolbocephalus*, based on the glabellar boss, because there are two species showing this distinctive character. Discovery of the free cheek and pygidium of *Hadrohybus* may add additional characters.
Fig. 3.
Cladogram of relationships of Hadrohybus within Bathyruridae, based on cranial characters.
Bathyurus, shown as the sister group of Petigurus + Bolbocephalus, does not have cranial autapomorphies and its recognition depends on the pygidium. Derived characters are: 1, glabellar boss; 2, sculpture of terrace ridges; 3, waisted glabella; 4, loss of typical bathyurid tuberculation; 5, exceptionally thick cuticle; 6, very coarse glabellar tuberculation; 7, large size; 8, glabella protrudes over cranial margin; 9, deep palpebral furrows; 10, loss of horizontal anterior cranial border; 11, rounded and tumid frontal glabellar lobe; 12, tuberculate sculpture.
Literature Cited


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