

A new species of trigoniid bivalve from the Boreal Bathonian (Jurassic) of central East Greenland

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A brief description is given of *Vaugonia athena* sp. nov. from the Boreal Bathonian Ishmae Zone of Olympen, Jameson Land, one of the rare known representatives of the bivalve family Trigoniidae in the Boreal Realm of the Jurassic. Its affinities lie with Middle Jurassic species from western North America and with an early Bajocian species from northwestern Europe, but it differs from contemporaneous forms in the Bathonian of Britain.

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Our greatly increased knowledge of the Jurassic of the northern hemisphere deriving from the extensive exploration in the last 20 years, particularly in the circum-Arctic regions of America and Asia, has revived strong interest in the problems of Jurassic faunal provincialism. The emphasis has been above all on the ammonites, and many of the more general discussions tend to be centred on the facts of their distribution. This is, however, more because of their leading position as guide-fossils in the primary task of dating and correlating deposits rather than any special value that they may have as indicators of causal palaeophysical conditions to which biological provincialism may be attributed as an effect. To this end other groups might be more informative, particularly, perhaps, members of the shallow marine benthos such as bivalves; and amongst these the morphologically complex and varied family Trigoniidae seems particularly promising. Since the earliest differentiation of marine faunal realms in the Jurassic the bivalve family Trigoniidae was typically rare or absent in faunas of northern latitudes, characterized by boreal ammonites.

This paper describes a small collection of trigoniids made by the Geological Survey of Greenland to East Greenland in 1968 (Birkelund, Håkansson & Surlyk 1971, 245) and 1970 (T. Birkelund & J. H. Callomon). It comes from a section 9 km southeast of the summit of Olympen in Jameson Land (71° 24' north latitude, 23° 27' west

longitude; see maps in Birkelund et al., 1971, fig. 3, and Surlyk & Birkelund 1972, map 3) out of a layer of large sandstone concretions in the arenaceous Vardekløft Formation, Pelion Member (Surlyk et al. 1973, 33; MS section 60, bed 10). The age is Boreal Bathonian, Ishmae Zone and Subzone (olim Kochi Zone; *Arcticoceras kochi* Spath 1932 is now considered to be a junior synonym of *A. ishmae* (Keyserling 1846)).

The collection represents a new species with western North American and northwestern European affinities. The accompanying fauna consists of abundant *Arcticoceras ishmae*, including unusually common juveniles, rare *Oppelia* (*Oxyerites*) sp., *Camptonectes* sp., broken shells of *Inoceramus* (*Retroceramus*) sp., *Cylindroteuthis* sp. and fossil wood.

The age of the trigoniids makes them of particular palaeobiogeographic interest for, although the Boreal Ishmae Zone is probably broadly equivalent to part of the Middle Bathonian of northwestern Europe (Callomon 1959; 1976), the respective ammonite faunas continue to be so mutually exclusive that precise correlations still cannot be made, and any indications from faunas other than ammonites would be of the greatest value. To date however, no trigoniids closely resembling *Vaugonia athena* have been found in the Bathonian of northwestern Europe.

The occurrence in East Greenland was along what was probably one of the few narrow and shallow straits connecting the Arctic seas in

much of the Jurassic with the epeiric seas further south and thence the Tethyan and Pacific Oceans, and it could thus be explained perhaps in terms of temporary migration northward. During Bathonian time, however, the Viking Straits between Greenland and Norway were open to the north into the Arctic seas but were closed, at least to ammonites, at their southern end in the Viking Graben, in what is now the North Sea (Callomon 1976). The classical marine Bathonian of Britain and north-western Europe was separated from the Arctic seas by a region of deltaic sedimentation in brackish waters whose salinity varied from time to time and place to place. It seems likely that this represented an impenetrable barrier to stenohaline bivalves, such as the Trigoniidae are thought to have been, as well as to the ammonites. Certainly no Bathonian trigoniids closely resembling the Greenland forms have so far been described from Britain although there could of course be other reasons for this.

A second possible explanation may be that the trigoniids reached East Greenland from the north. A narrow strait which probably joined Arctic and western North American Jurassic seas in the area of Yukon Territory (see for example Imlay & Detterman 1973) may have provided a geographic link between the East Greenland species and a form ancestral to the rather similar western North American Middle Jurassic species *V. doroschini* (Eichwald). This hypothesis, which would appear to require temporary cessation of the faunal differentiation of the Arctic and the more southerly seas, is unlikely because of the distinctive boreal character of the Arctic Bathonian ammonites and because of the apparent absence of trigoniid bivalves elsewhere in the Arctic Bathonian.

Another explanation, involving endemic evolution of *V. athena*, is favoured because of the failure of the hypotheses mentioned above. No potential ancestral forms have been found to date in the North Atlantic area however. The closest morphologically similar species known is *V. fragilis* (Lebküchner) of the Lower Bajocian (Aalenian) of southern Germany.

Systematic description

Family Trigoniidae Lamarck, 1819.

Genus *Vaugonia* Crickmay, 1930.

Vaugonia athena sp. nov.

Figs 1-6.

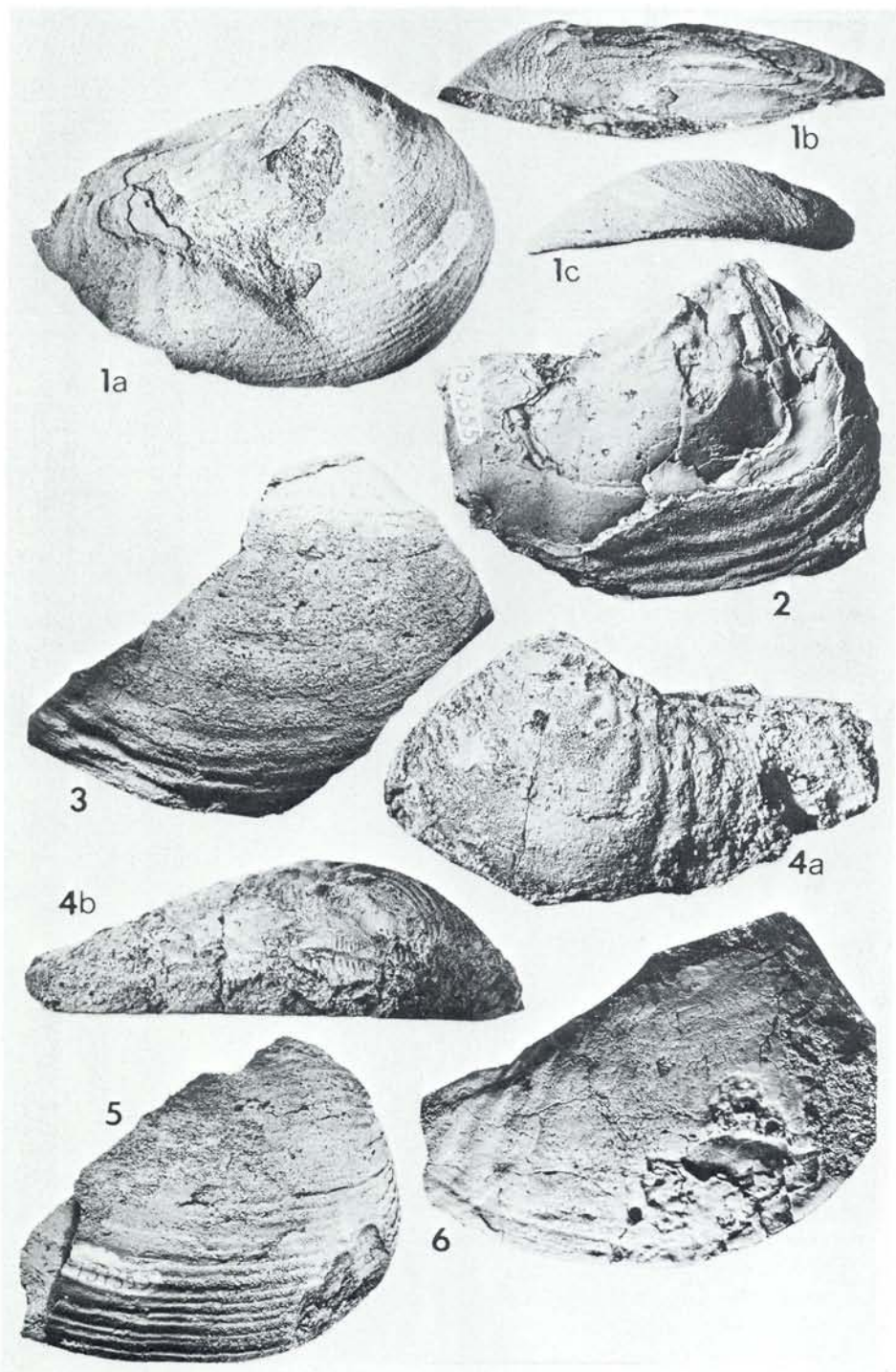
? 1932. *Trigonia* sp. ind. Spath. Meddr Grønland 87, p. 116.

Material: Ten more or less complete but only poorly to moderately wellpreserved specimens in the collection stored at present in the Geological Museum, University of Copenhagen, nos. MGUH 13978-83, having concurrently Geological Survey of Greenland nos. GGU 137355, 137380.

Description: This is based on all specimens available. A certain amount of infraspecific variation is present, which is recorded in the figured specimens. The specimens retain recrystallized test but are predepositionally abraded, weathered or broken. Nevertheless the composite character of the surface sculpture can be inferred with some confidence based on the fragments available.

The shell is of medium size, reaching 9 cm long. The outline is subtrigonal, with an elongated posterior end. The ventral and anterior margins are gently curved and meet at a rounded corner. The posterior margin is poorly known, apparently short, curved, and somewhat inclined toward the umbo, meeting the ventral margin in a rounded obtuse angle. The dorsal margin is short. The umbos are located one third to one quarter of the length of the shell from the anterior end, and are directed straight dorsally. The shell is thick and gently convex.

The ornament of the flank is subdued. It is dominated by fine growth lines, which vary to weak rugae, of somewhat irregular strength and spacing. The ventral part of the central region of the flank in some specimens develops weak, coarsely spaced, concentric costae that become broken up and stepped posteroventrally near their posterior ends. Weak subradial costae and intervening furrows extend ventrally, leaving the position of the marginal carina at regular intervals, the more posterior of them reaching the ventral margin.



Figs 1-6. (All figures natural size; all specimens stored at present in the collection of the Geological Museum, University of Copenhagen). *Vauçonia athena* sp. nov., Ishmae Zone, Boreal Bathonian, East Greenland. Fig. 1a, b, c. Lateral, dorsal, and anterior views of right valve (holotype, MGUH 13978, GGU 137355/1). Fig. 2. Lateral view of right valve (paratype,

MGUH 13979, GGU 137355/2). Fig. 3. Lateral view of right valve (paratype, MGUH 13980, GGU 137355/3). Fig. 4a, b. Lateral and dorsal views of left valve (paratype, MGUH 13981, GGU 137380/1). Fig. 5. Lateral view of right valve (paratype, MGUH 13982, GGU 137355/4). Fig. 6. Lateral view of right valve (paratype, MGUH 13983, GGU 137380/2).

The marginal carina at the posterior end of the adult shell is a gentle rounded edge across which the concentric growth lines of the flank extend uninterrupted onto the area. It appears to remain a simple, but somewhat sharper edge nearer the umbos but is poorly seen in the available material.

The area is narrow, apparently ornamented only with growth lines that are simple extensions of those of the flank, and which cross, without interruption, a gentle groove that is strongly offset dorsally from a median position.

The escutcheon carina appears to be a simple rounded edge. The escutcheon is narrow, and about $\frac{1}{2}$ of the total length of the shell. It is gently depressed, and ornamented only with growth lines.

Comparisons: *V. athena* n. sp. closely resembles *Vaugonia fragilis* (Lebküchner 1932, 74, pl. 8, figs 2-5; *pro Trigonina subglobosa* Morris & Lycett of Schmidtil 1925, pl. 6, figs 1-4) of the Aalenian Murchisonae Zone of southern Germany. However, the thin shell which characterizes the German species, the closer spaced and more numerous subradial costae, and the distinct marginal carina, differentiate it from the Greenland species as does the greater angle with which the subradial costae leave the marginal carina. Other European Jurassic *Vaugonia* differ from *V. athena* in their generally coarser sculpture and the V- or U-shaped junction of the subradial and concentric portions of their costae.

V. athena resembles *V. doroschini* (Eichwald 1871, 180-182, pl. 2, 3) which occurs in Lower and Middle Callovian rocks of southern Alaska (Martin 1926, Dettnerman & Hartsock 1966), and in Callovian and Lower Oxfordian rocks of western British Columbia. The umbo of *V. athena* is generally but not invariably more clearly centrally located than is that of *V. doroschini* and the anterior margin of the shell is therefore more strongly inclined toward it. Although they are poorly preserved on the available specimens of *V. athena*, the subradial ridges appear to be more widely spaced, and to leave the marginal carina at a higher angle than in *V. doroschini*. The shell of the Greenland species is much less strongly concave than that of the other, and its area is narrower and more simply ornamented, as is its marginal carina.

Poorly known *Vaugonia obliqua* (Hyatt 1892, 407; Packard 1921, 16, pl. 3, figs 5, 6) from the Callovian of California differs from *V. athena* in the same ways as does *V. doroschini*.

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Dansk sammendrag

En ny art musling, *Vaugonia athenae* sp. nov.- beskrives fra det boreale Bathonien (Jura), Øst Grønland. Arten tilhører Trigoniidae, en familie med ganske få repræsentanter i den boreale (nordlige) jurassiske faunaprovinc. Da såvel faunaprovincer som stratigrafi i Jura ganske overvejende er baseret på ammoniter er det af speciel interesse at få inddraget andre dyregrupper, især da ammoniternes provinsielle isolation vanskeliggør tidskorrelationer fra en provins til en anden. Det må også forventes, at de bundlevende muslinger i højere grad end ammoniterne er anvendelige som basis for en tolkning af miljømæssige forskelle mellem provinserne. Trigoniider af lignende form som *Vaugonia athenae* sp. nov. er fundet i det nordamerikanske Bathonien, men derimod ikke i det Engelske. Efter en diskussion af mulige migrationsruter for jurassiske trigoniider konkluderes det at *Vaugonia athenae* er opstået som endemisk art i det Øst Grønlandske område.

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