

Note

The brachiopod *Heterorthis* from the Caradoc of the Oslo Region – a Gondwanan immigrant?

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The Ordovician enteletacean brachiopod *Heterorthis* is documented from the Baltic province for the first time. The occurrence, within the lower Caradoc Arnestad Formation, is earlier than its appearance in the North American province, but later than the acme of the heterorthisids around the margins of Gondwana.

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While discussing the similarity of many North American and British species of Upper Ordovician brachiopods, Macomber (1972) alluded to the widespread distribution of *Heterorthis*; but although the genus is common in a number of circum-Iapetus faunas it has yet to be documented from the Baltic province. The distinctive punctate

orthide *Heterorthis* apparently originated around the margins of Gondwana during the Middle Ordovician (Havlíček 1989); it was probably derived from the heterorthisid *Tafilitia* (Havlíček 1977).

The genus is represented by at least six separate forms in the Mediterranean province; *H. alternata*

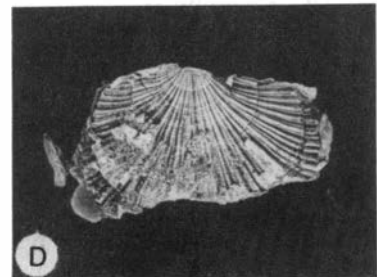
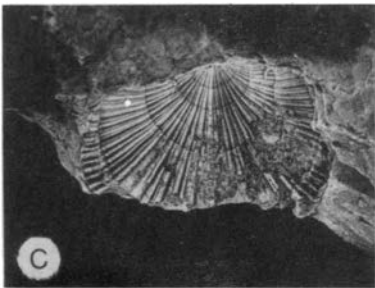
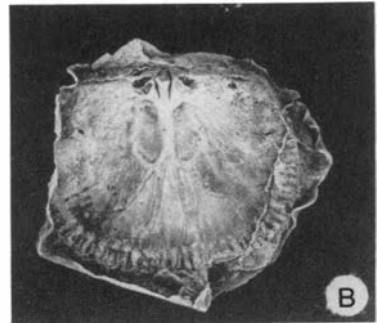


Fig. 1. *Heterorthis* sp. from the Arnestad Formation (low Caradoc), quarry at Ringsås, Ringerike (Kiær collection). □ A, B. Internal mould and latex cast of dorsal interior, PM08189, both X2. □ C, D. External mould and latex cast of dorsal exterior. PM08192, both X2. All specimens are reposited in the Paleontologisk museum, Oslo.

		Gondwana	Avalonia	Baltica	Laurentia
CARADOC	Onnian				
	Actonian	—			
	Marshbrookian	—			
	Woolstonian	—			
	Longvillian	—			
	Soudleyan	—			
	Harnagian	—			
	Costonian	—			

Fig. 2. Approximate stratigraphical distributions of *Heterorthis* in Avalonia, Baltica, Gondwana and Laurentia.

(J. de C. Sowerby), *H. planelliptica* Havlíček, *H. retrorsistria* (M'Coy) and *H. sp. cf. H. retrorsistria* have been reported from the Caradoc rocks of Morocco (Havlíček 1970), whereas *H. quaerenda* (Barrande) and *H. sosia* (Barrande) occur in the Caradoc rocks of Bohemia (Havlíček 1977). Moreover, Mitchell (1974) has recorded *Heterorthis* sp. from the Costonian–Harnagian Porto de Santa Anna Ash Formation in Central Portugal and *Heterorthis* sp. cf. *H. alternata* is known from the upper Caradoc of the Montagne Noire (Havlíček 1981). In Avalonia *H. alternata* dominates the Woolstonian Alternata Limestone of south Shropshire (Hurst 1978) but also occurs sporadically in Marshbrookian, Actonian and Onnian strata (Harper 1978). Although a number of authors have referred *Orthis patera* Davidson from the Coston Beds to *Heterorthis*, Schuchert & Cooper (1932) rejected that assignment. The stratigraphically older *H. retrorsistria* occurs in the Soudleyan rocks of north Wales (Williams 1963), whereas Williams (1974) has described an unnamed species of *Heterorthis* from the Spy Wood Grit (Costonian) and Aldress Shale (Harnagian) in the Shelve inlier.

In North America *H. clytie* (Hall) occurs in the Logana Limestone and its equivalents in Kentucky and Tennessee; this unit is of early Trenton age and probably correlates with the Longvillian Stage of the Caradoc Series (Macomber 1972).

The specimens of *Heterorthis* sp., figured here (Fig. 1), were discovered by the author during a recent examination of the substantial collections of brachiopods from the Oslo Region within the Paleontologisk Museum, Oslo. They represent the first records of that genus from the Baltic province. The specimens are from the Arnestad Formation [Lower Chasmops Shale] from a

quarry at Ringsås, Ringerike and were collected by J. Kiær in 1923. Other elements of the fauna include the trilobite *Flexicalymene* sp. cf. *F. (F.) caratachi* Salter (in Siveter 1976). Significantly, the new occurrence in the Baltic province, during an interval of intense faunal interchange (Harper 1986), post-dates the first appearance of *Heterorthis* in Avalonia and Gondwana and pre-dates its apparent arrival in North America (Fig. 2). Thus the available evidence, though incomplete, suggests *Heterorthis* was a transient migrant from mid to low latitudes during the early Caradoc; it apparently preferred, however, the cooler waters around Gondwana and Avalonia where it thrived sporadically throughout the Caradoc.

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