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The Irish Ordovician brachiopod fauna: A taxonomic renaissance

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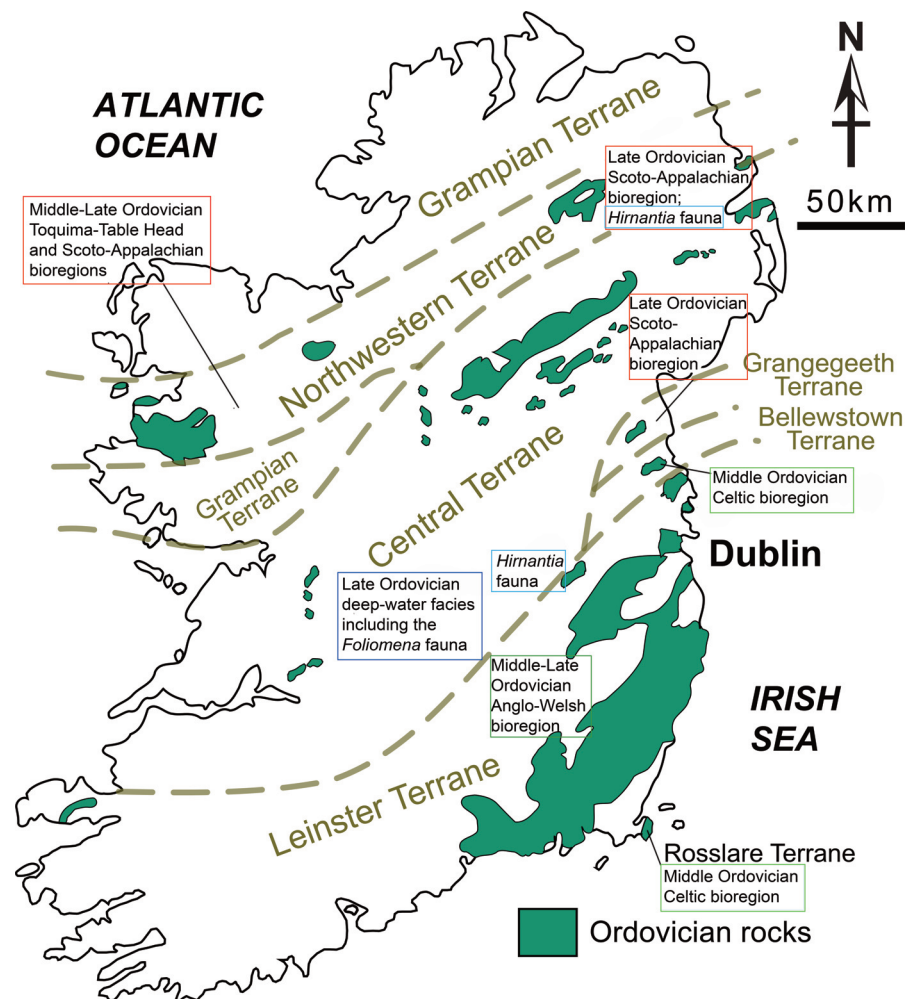
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ABSTRACT

Despite its small areal extent, the island of Ireland exposes eight Caledonian tectonic terranes; six of them contain Ordovician brachiopod assemblages. These terranes record the early phases and destruction of the Iapetus Ocean through the occurrence of latitude-sensitive brachiopod faunas during the Middle Ordovician and early Late Ordovician; more cosmopolitan faunas characterized the later Ordovician.

Introduction

The island of Ireland is relatively small, around 85 000 km², but has a unique position on the edge of the European continent, where it was an integral part of the Caledonian mountain chain. Ireland is composed of eight Precambrian and Early Paleozoic terranes (Murphy et al. 1991; Fig. 1), six of which contain key Ordovician brachiopod assemblages (Harper and Parkes 1989). Brachiopods are variably preserved; with the exception of the rich silicified faunas of the Tourmakeady and Portrane limestones, shells are preserved as moulds in siliciclastic facies.



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Fig. 1. The eight Irish palaeotectonic terranes, six of which have brachiopod faunas and the bioregionality of these faunas is indicated in boxes. Template courtesy of Annalise Ferretti.

Although brachiopods were collected during the initial geological surveys of the island in the 19th century, and some taxa were described by Thomas Davidson and Frederick M’Coy, the description of the Ordovician fauna was initiated by Alwyn Williams following his arrival as Professor of Geology at Queen’s University of Belfast in the mid-1950s. He and his students engaged in a vigorous programme, reviving the importance of the Irish Ordovician brachiopod fauna, specifically its taxonomy, biogeography and ecology. The Irish assemblages were a key part of early provincial studies of the phylum (Williams 1969, 1973). In addition to the taxonomic revisions of the faunas, the successions are now better constrained stratigraphically following the detailed reviews by Harper and Parkes (2000) and Molyneux et al. (2023); all the successions are now correlated with the global stages for the Ordovician System. This short contribution reviews the current knowledge of the Irish Ordovician brachiopod faunas.

Northwestern terrane

The mountainous terranes of northwest Ireland expose a succession of Ordovician brachiopod faunas ranging from the diverse silicified Dapingian faunas of the Tourmakeady Limestone (Williams and Curry 1985) through the three slate units in the Mweelrea Formation; the first of these, the Lough Shee Mudrocks (Harper et al. 1988) in the Partry Mountains, contains a sparse middle Darriwilian fauna, the second has a late Darriwilian assemblage dominated by *Rhysostrophia* and other Whiterock taxa (Williams 1972) near the mouth of Killary Harbour, and the top slate band contains Sandbian brachiopods on Mweelrea Mountain (Harper et al. 2010). All the faunas developed on the Laurentian margins in a variety of settings. Those associated with volcanic environments, such as the Dapingian carbonates of the Tourmakeady Limestone that capped rhyolitic edifices, are particularly diverse. Those from the lower slate bands belong to the low-latitude Toquima-Table Head realm, whereas those higher up in the top slate band have affinities with the Scoto-Appalachian assemblages.

Farther northeast along strike, the Pomeroy inlier records the later Ordovician faunal developments on the Northwestern terrane (Mitchell 1977). Diverse Katian (Caradoc–Ashgill) brachiopod faunas are similar to those in the classic Girvan succession east on the Scottish mainland. The Sandbian faunas have been revised in detail by Candela (2003), who established a series of ecological associations within the Bardahessiagh Formation (Candela 2001, 2006) evolving on the margins of Laurentia. The Katian faunas are diverse and a deep-water equivalent of the *Hirnantia* brachiopod fauna (Harper et al. 1994) marks the summit of the Ordovician.

Central terrane

The deep-water facies exposed in the Central Terrane contain few brachiopod assemblages, usually dominated by lingu-lates. Notable, however, is the *Foliomena* brachiopod fauna

in the Katian rocks of the Slieve Bernagh inlier (Harper 1980), which had a widespread distribution from the Darriwilian to the Katian (Rong et al. 1999).

Grangegeeth terrane

This is one of two small but distinctive terranes in eastern Ireland. The diverse Sandbian brachiopod faunas are dominated by Scoto-Appalachian taxa (Owen et al. 1992), although Williams (1956) noted the presence of the Baltic genus *Productorthis*, which also occurs in the Celtic bioregion (see below). Higher in the succession, a variant of the *Foliomena* fauna is recorded in middle Katian strata (Harper and Mitchell 1982).

Bellewstown terrane

The second of the small terranes exposes a brachiopod assemblage with affinities with the Celtic group of faunas (Harper et al. 1990). Its association with volcanogenic rocks suggests an intra-Iapetus insular origin. Younger faunas are not well documented but contain both Gondwanan and Anglo-Welsh taxa in ascending succession (Harper and Parkes 1989).

Leinster terrane

This large and diverse terrane dominates southeast Ireland and has been associated with the Ganderia Terrane. Parkes (1994) monographed Sandbian and Katian brachiopods from the central part of the Leinster Massif and related these to the evolving Iapetus Ocean (Parkes and Harper 1996). In the southern part of the terrane, the Dunbrattin and Tramore Limestone formations of the Duncannon Group, in Co. Waterford, have diverse faunas of late Darriwilian–early Sandbian age, associated with equivalents of the eastern part of the Ganderia Terrane. (Liljeroth et al. 2017). Higher in the succession, the Katian brachiopod fauna of Raheen, Co. Waterford (Harper et al. 2017), is a deep-water assemblage with much in common with the widespread *Onniella-Sericoidea* associations of the later Ordovician.

In the northern parts of the Leinster Massif, Sandbian brachiopods have been described from Herbertstown (Harper et al. 1985), whereas the younger and well-known silicified Katian brachiopod fauna from the Portrane Limestone includes about 100 taxa (Wright 1963, 1964; Wright et al. 2022), possibly a downslope equivalent of the Chair of Kildare Limestone, dominating the Kildare inlier (Parkes and Palmer 1994), where a typical member of the widespread terminal Ordovician *Hirnantia* brachiopod fauna also occurs (Wright 1968; Rong et al. 2020).

Rosslare terrane

The brachiopods from the hamlet of Tagoat in Co. Wexford (Harper and Bates 2023) and their counterparts on the island of Anglesey and southwest Wales formed the basis for Williams’s (1969) Celtic province. During the intervening years, the

concept of the province has been modified to be associated with a string of marginal and island terranes within the higher-latitude belts of the Iapetus Ocean (Harper et al. 2013). The Celtic assemblages, having many endemic taxa and a mixture of genera from the platform provinces, may have acted as both cradles and refugia during the Middle Ordovician.

Concluding remarks

The six Irish Caledonian terranes, containing brachiopod data, ranged across the Iapetus Ocean. Their faunas record the early phases and destruction of the Iapetus Ocean with contrasting assemblages from the margins of and within the Iapetus Ocean during the early Middle Ordovician. More cosmopolitan faunas such as the *Foliomena* associations populated Ireland during the Late Ordovician, culminating in varieties of the wide-spread *Hirnantia* brachiopod fauna on both Laurentia and Ganderia and associated terranes.

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