

# THE COMPOSITION AND SIGNFICANCE OF A DEEP-WATER FAUNA OF FOSSIL SHELLS FROM THE ORDOVICIAN PERIOD

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#### **1. ABSTRACT**

- The Foliomena fauna consists of shelled animals known as brachiopods, which lived in the Ordovician Period and became extinct around 446 million years ago.
- Past collecting from Oriel Brook in eastern Ireland has resulted in a sparse Foliomena fauna being described. Further examination of this material will provide a fuller census of the brachiopod genera present.
- The palaeogeographic significance of the Oriel Brook fauna is determined by a statistical comparison with other Foliomena faunas from around the world. The assessment of its relative water depth is achieved through the analysis of fossil brachiopods and trilobites occurring in the same samples.
- This provides an indication that the Oriel Brook fauna lies in the mid-deep end of the relative water depth spectrum, (BA5-6) and also correlates with similar faunas of the lapetus region.

### 2. RESEARCH QUESTION

Where was the Oriel Brook brachiopod fauna situated in the relative water depth spectrum and does it show the strongest similarity to the Foliomena faunas in the lapetus region?



- This present study focuses particularly on the Katian stage of the Upper Ordovician, 453.0 ±0.7 -445.2 ±1.4 million years ago, (Cohen et al. 2013; updated by The International Commission on Stratigraphy).
- This was the time of 'The Great Ordovician Biodiversification Event' (GOBE), which was one of most vital periods of change seen in marine organisms in the planet's history, were their diversity increased threefold in just 25 million years (Webby et al. 2004; Harper 2006, cited in Servais et al. 2009). The greatest diversity peak of the GOBE, occurred in the late Katian (Webby, 2000; Webby et al., 2004, cited in Zhan et al. 2014). This was the time, in which the Oriel Brook brachiopod fauna lived.

Brachiopods and trilobites are two main groups of animals that dominated the upper Ordovician seas at this time (Harper & Owen 1996). Both are important as they can be used in determining "palaeobathymetry", which is a measurement of ancient relative water depth.

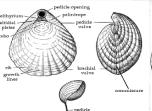
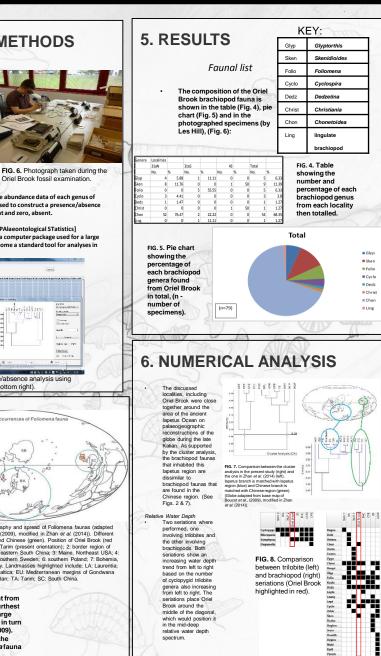


FIG. 1. General morphology of a brachiopod Clarkson (1986) cited in Wells Jr (1998).

In the Ordovician, the position of the Earth's continents was very different from those of today. The period saw the separation of the continents at their furthes (Servais et al. 2009). Some of today's continents came together to form large landmasses, whereas others were scattered throughout the oceans. This in turn resulted in different faunas living on different continents (Servais et al. 2009). For example, the Chinese region is placed far from the lapetus region to the east during the late Katian, and so was inhabited by a different Foliomena fauna (Fig. 2).







Brook (photographed by Les Hill), (A) ?Glyptorthis from 31aN29. (B) Foliomen from 31aS17. (C) Dedzetina from 31aN21 (D) Cyclospira from 31aN27. (E) Glyptorthis from 31aN27, (F) Chonetoidea from 31aS22. (G) Christiania from 43S. (H Skenidioides from 31aN20. (I) lingulate brachiopod from 31aS22

## 7. CONCLUSIONS

- Four genera are previously undocumented from Oriel Brook are; a lingulate brachiopod, Foliomena, Dedzetina and Cyclospira.
- The Oriel Brook brachiopod fauna lay in the deeper end of the relative water depth spectrum, BA5-6 (Benthic Assemblage).
- More accurately in both seriations, which place this brachiopod fauna mid to deep in the relative water spectrum.
- In relation to their palaeogeographical setting, the Oriel Brook fauna was most comparable to the Polish and Southern Swedish faunas with a strong correlation existing with lapetus region faunas.
- This evidence now confirms that the Oriel Brook brachiopod fauna is a deep water fauna. like most Foliomena faunas and shares the closest similarity to these faunas that inhabited the lapetus region of the globe during the late Katian.
- Future research, may include;
- The analysis of more brachiopod faunas.
- More sample collecting from Oriel Brook.
- A re-examination of Irish museum specimens.

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FIG. 3. Screen-print of the presence/absence analysis using

PAST and produced dendrogram (bottom right).

4. MATERIALS AND METHODS

Having undertaken some prachiopod familiarisation

exercises, notes were carefully

number of each sample and the

number of rock fragments presen

in decreasing order of size. Each

piece of rock was then thoroughly examined using a binocular microscope and a brief

description made. Sketches of

well-preserved fossils were made

in order to enable identification of

each fossil brachiopod to a particular genus if at all possible.

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Data compilation and analysi

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matrix, where the number one means present and zero, absent.

This data matrix was then copied into PAST [PAlaeontological STatistics] (http://folk.uio.no/ohammer/past/). This is a computer package used for a large

Microsoft Excel 2010 was used to compile the abundance data of each genus of

brachiopod collected from Oriel Brook and used to construct a presence/absence

number of numerical techniques and has become a standard tool for analyses in

taken documenting the field

FIG. 2. Late Katian palaeogeography and spread of Foliomena faunas (adapted from base map of Boucot et al., (2009), modified in Zhan et al. (2014)). Different regions circled; lapetus (blue) and Chinese (green). Position of Oriel Brook (red star). 1: Kuruktag, northeastern Tarim (present orientation); 2: border region of Zhejiang and Jiangxi provinces, eastern South China; 3: Maine, Northeast USA; 4: central and northern Wales; 5: southern Sweden; 6: southern Poland; 7: Bohemia, Czech Republic; 8: Sardinia, Italy. Landmasses highlighted include; LA: Laurentia; AV: Avalonia; SB: Siberia; BA: Baltica; EU: Mediterranean margins of Gondwana (southern Europe); KZ: Kazakhstan; TA: Tarim; SC: South China.