

# **Foraminifer faunas in the Arklow Bank, Southeast Ireland**

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10 samples from the borehole BH 4,  
Offshore Windfarm Development,  
Arklow Bank, Irish Sea

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# 1. Introduction

At present work is being carried out to investigate the possibilities for constructing a wind-farm at Arklow Bank, Irish Sea.

A main concern is the stability of the bank, and dtillings have been made to investigate the sediments. As part of the analysis of the genesis of the sediment it was decided to analyse the content of foraminifers in a set of samples from one of the boreholes.

## 1.1 The data set

The borehole BH 4 was conducted by FUGRO at 3.80 m water depth slightly to the east of the crest of the ridge. Rotary Geobor was used with wash sampling and testing every meter and with "in situ" hammer sampling every second meter.

The samples made available to GEUS are indicated in the table below:

Sample i.d. no.	Depth, m
2	1.00
3	2.00
5	4.00
H6	5.0-5.4
S7	6.00-6.45
8	7.00
H10	9.0-9.4
H14	13.0-13.4
18	17.00
22	22.00

**Table 1.** *Table of samples analysed by GEUS.*

*Sample i.d. and depth are according to the label on the sample bags.*

## 2. Foraminifer analysis

Foraminifers are unicelled microfossils living in the marine environment, either as planktic or as benthic organisms. Fauna assemblages are often grouped according to environmental parameters.

A part of all the samples mentioned above has been analysed for its content of foraminifers.

### 2.1 Method

About 100 g dry weight of the samples were prepared according to standard procedures (Knudsen 1998). The foraminifers in the 1.0 – 0.1 mm fraction are concentrated using heavy liquid flotation ( $\rho = 1.8 \text{ g/cm}^3$ ). In each sample some 200 to 300 specimens are counted if possible.

Arklow Bank																				
Borehole 4		Number of counted specimens in the samples																		
number	depth, m	Species														Sum of counted specimens				
		Quiqueloculina seminula	Quiqueloculina bicornis	Miliolinella subrotunda	Triloculina trihedra	Ammonia batavus	Elphidium excavatum	Elphidium gerthi	Elphidium macellum	Haynesina cf. depressula	Haynesina cf. orbiculare	Bulimina gibba/marginata	Cibicides lobatulus	Planorbulina mediterranensis	Rosalina globularis		Rosalina mamilla	Rosalina williamsoni	Lenticulina sp.	Marginulinopsis sp.
2	1.00	36	2	1	1	42	3		2	1	29			1	3			6	4	131
3	2.00	43	2	1		124	2	3		1	24			2				6		208
5	4.00	61	2			121	7	3	2	2	5	52		2		2	1	1		261
H6	5.0-5.4	44	9	2		89	1	3			2	48		2	1	1	2	11	4	219
S7	6.00-6.45	53	2	3		67	7	1	4	1	4	92		3	3	5		11	5	261
8	7.00	27				82	20	4	5	2	2	11	130	1	3	8	6	9	6	316
H10	9.0-9.4	55	4	10	1	101	10		7	2	5	125	1	5	4	3		13	3	349
H14	13.0-13.4	49	1	2	1	114	11		3	2	1	4	85		7	3	2	11	1	297
18	17.00	44				73	6		3		2	114		13	6			19	2	282
22	22.00	38		2		95	5		2		3	43		17	3			5	2	215

Figure 1. Number of counted specimens in the samples in BH4.

### 2.2 Results

The results of the foraminifer analyses are indicated in figure 1, where the actual numbers

of counted foraminifers in the investigated samples is given.

The percentage distribution of the foraminifers in the samples is indicated in figure 2.

Arklow Bank																						
Borehole 4		Percentage distribution of counted specimens in the samples														Sum of counted specimens						
number	depth, m	Species																				
		<i>Quinqueloculina seminula</i>	<i>Quinqueloculina bicornis</i>	<i>Miliolinella subrotunda</i>	<i>Triloculina trihedra</i>	<i>Ammonia batavus</i>	<i>Elphidium excavatum</i>	<i>Elphidium gerthi</i>	<i>Elphidium macellum</i>	<i>Haynesina cf. depressula</i>	<i>Haynesina cf. orbiculare</i>	<i>Bulimina gibba/marginata</i>	<i>Cibicides lobatulus</i>	<i>Planorbulina mediterraneensis</i>	<i>Rosalina globularis</i>		<i>Rosalina mamilla</i>	<i>Rosalina williamsoni</i>	<i>Lenticulina sp.</i>	<i>Marginulinopsis sp.</i>	<i>Textularia sp.</i>	<i>Indeterminata</i>
2	1.00	27	2	1	1	32	2		2		1	22			1	2			5	3	131	
3	2.00	21	1	0		60	1	1		0		12			1					3		208
5	4.00	23	1			46	3	1	1	1	2	20			1		1	0	0	0		261
H6	5.0-5.4	20	4	1		41	0		1		1	22			1	0	0	1	5	2	219	
S7	6.00-6.45	20	1	1		26	3	0	2		0	2	35		1	1	2			4	2	261
8	7.00	9				26	6	1	2	1	1	3	41	0	1	3	2			3	2	316
H10	9.0-9.4	16	1	3	0	29	3		2		1	1	36	0	1	1	1			4	1	349
H14	13.0-13.4	16	0	1	0	38	4		1	1	0	1	29		2	1	1			4	0	297
18	17.00	16				26	2		1			1	40		5	2				7	1	282
22	22.00	18		1		44	2		1			1	20		8	1				2	1	215

Figure 2. Percentage distribution of specimens in the samples from BH4.

In figure 3 the percentage distribution is illustrated in a range chart for a general view.

In all the investigated samples from this borehole the foraminifer assemblages are dominated by the three benthic species: *Quinqueloculina seminula*, *Ammonia batavus* and *Cibicides lobatulus*.

In cores from the North Sea the two first species characterise a sediment with redeposited coastal sand (Uffenorde 1982). The latter species is a typical sessile species clinging to the substrate, either sand or seaweed (Murray 1971). It is found as the dominating species in shore sand at Dogs Head, western Ireland, and also occur in shore sand of Kvalba Fjord, Faeroe Islands, where the species is washed ashore (Konradi, unpublished data). Both areas are wave-dominated coasts.

The rest of the species found in the samples are species typical for the inner shelf (e.g. Murray 1979).

### 2.3 Interpretations

The species *Quinqueloculina seminula*, *Ammonia batavus* and *Cibicides lobatulus* indicate deposition in a high-energy environment.

The fauna in the samples is a Holocene fauna.

The fauna is expected to have been deposited within the sediment of the samples.

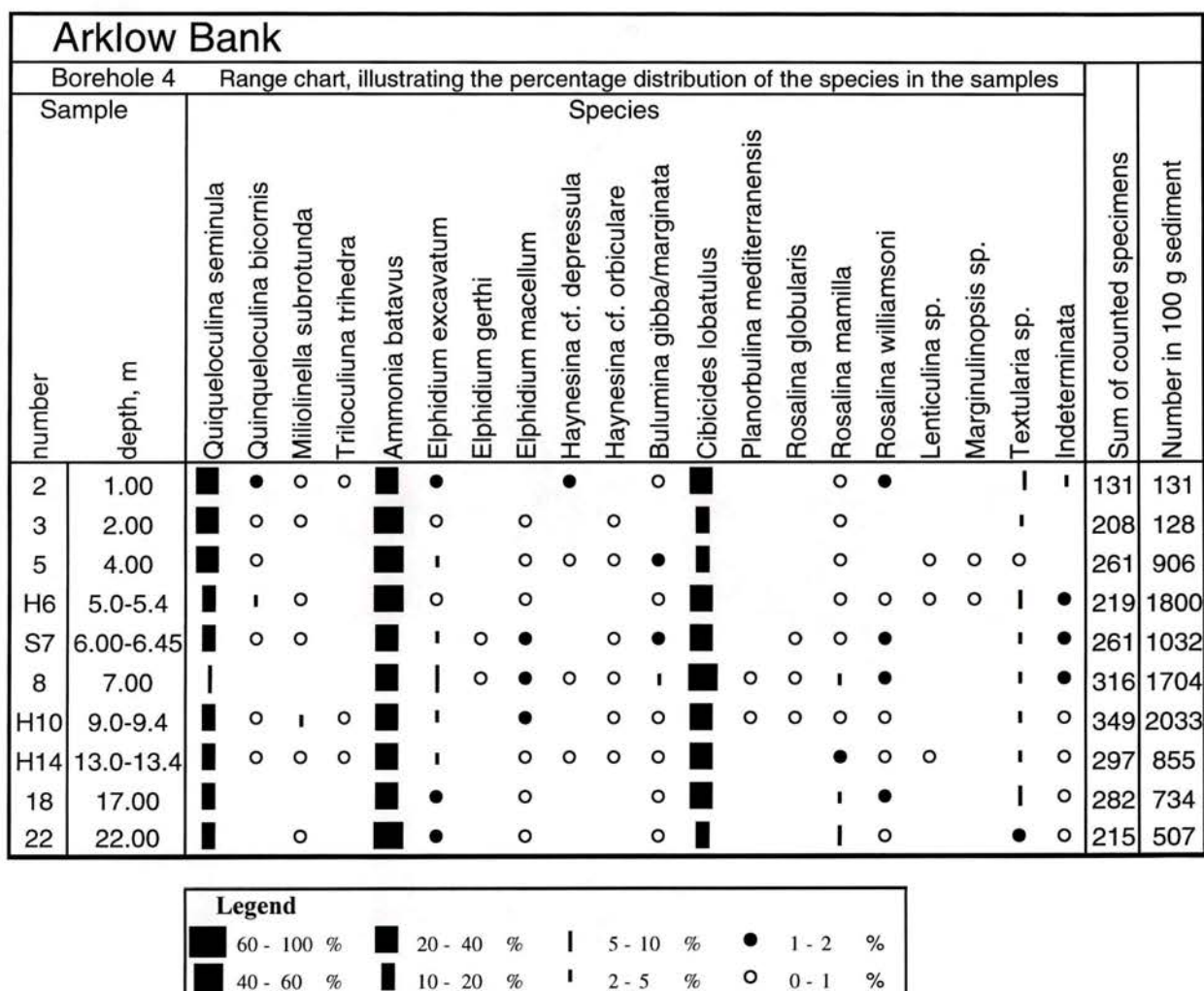


Figure 3. Range chart of the foraminiferas in BH4.

It is not clear whether the fauna lived in the actual sediment or it has been transported as sediment grains with (tidal) currents or waves from the surrounding sea floor and subsequently deposited on the bank. A combination of both scenarios is also a possibility.

There is a change in the fauna between the samples S7 and H6. In the lower part of the core the fauna is primarily dominated by *Cibicides lobatulus*. Also several species of the sessile genus *Rosalina* are seen. In the upper part of the core the species *Ammonia batavus* dominates the fauna and there is a slight increase in the frequency of *Quinqueloculina seminula*. This change in the fauna is thought to indicate a change in the sedimentation regime, possibly caused by a change in the hydrographic environment.

In the uppermost two samples, no. 2 & no. 3, the number of foraminifera in 100 g of sediment is much lower than in the rest of the samples. This is also thought to have been caused by a (subrecent?) change in the hydrographic regime.



### **3. Dating**

Based on the foraminifers it is not possible to date the formation of the Arklow Bank, except that it is a Holocene sediment sequence.

There is no evident indication of a fauna reworked from older interglacial deposits.



## **4. Recommendation**

It is recommended that the results of the foraminifer analyses should be correlated to the PSD analysis of the sediment.

### **4.1 Comment**

Shell fragments are found in several of the samples. Even though the shells, either all or part of them, also can have been reworked, a radiocarbon dating of a carefully selected non-abraded shell fragment could possibly render a reliable answer to the age of a specific level of the bank.

## 5. References

- Knudsen, K.L. (1998). "Foraminiferer i Kvartær stratigrafi: Laboratorie- og fremstillingsteknik samt udvalgte eksempler." *Geologisk tidsskift*, 1998, 3, 1-25.
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