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Palynology of the interval 1335.47 to 1353.04 m of well 205/21-1A, Faroe-Shetland Basin

ENERGY SYSTEMS AND BASIN ANALYSIS PROGRAMME
Commissioned Report CR/17/136

BRITISH GEOLOGICAL SURVEY

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Keywords

Palynology, Cretaceous, Jurassic, Faroe-Shetland Basin, Dinocysts.

Bibliographical reference

THOMAS, J E. 2018. Palynology of the interval 1335.47 to 1353.04 m of well 205/21-1A, Faroe-Shetland Basin. British Geological Survey Commissioned Report, CR/17/136. 9pp.

Keyworth, Nottingham British Geological Survey 2018

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Summary

As part of Phase 3 of the BGS Faroe-Shetland Consortium project on the Jurassic of the UK sector of the Faroe-Shetland Basin, detailed logging of core from well 205/21-1A was undertaken and samples were taken for palynology in order to provide additional facies information and age determinations.

A Cretaceous age is indicated for sample 1 (1335.47 m) and a Late Jurassic to Cretaceous age is assigned to sample 3. The dinoflagellate assemblage from sample 4 indicates a late Albian to Cenomanian age (mid to Late Cretaceous) (Costa and Davey, 1992, Williams et al., 2017). However, this age is anomalous when viewed in the context of the overlying and underlying samples and the wireline logs. The sample was obtained from bagged rubbly core so 'core jumbling' on the rig or during curation is a likely source of the anomaly.

The lowest six samples from this well – samples 5 to 10 (1344.19 to 1353.04 m) – did not yield any age-diagnostic palynomorphs.

1 Introduction and method

As part of Phase 3 of the BGS Faroe-Shetland Consortium project on the Jurassic of the UK sector of the Faroe-Shetland Basin, detailed logging of core from well 205/21-1A was undertaken and samples were taken for palynology in order to provide additional facies information and age determinations. The samples were prepared using standard acid maceration techniques. The residues were mounted onto glass slides for microscopic examination. The samples, aqueous residues and microscope slides are held in the BGS collections at Keyworth, Nottingham. Counts of kerogen types were carried out on unoxidised residues. Palynological analysis was carried out on oxidised material.

Sample details are given in Appendix 1.

2 Palynology

Summary descriptions follow. Detailed data is set out in Appendix 2.

2.1 SAMPLES 1 TO 2 (1335.47 TO 1338.04 M) – CRETACEOUS

The kerogen assemblages from this interval are dominated by brown wood and plant material. The palynomorph assemblage from sample 1 is 97% marine and includes indeterminate chorate dinoflagellate cysts along with *Oligosphaeridium complex* and specimens questionably assigned to *Systematophora sylibum*. These long-ranging taxa indicate a Cretaceous age (Costa and Davey, 1992). Dinoflagellate cysts are absent from sample 2. The spore and pollen assemblages are moderately diverse from in Sample 1 but not age diagnostic.

2.2 SAMPLES 3 TO 4 (1339.9 TO 1343.56 M) – LATE JURASSIC TO CRETACEOUS

The spore and pollen assemblages are moderately diverse, but none of the taxa are age diagnostic apart from having a general Mesozoic aspect. In sample 3**,** the kerogen assemblage is dominated by amorphous organic material. The assemblage from is 14% marine and includes indeterminate chorate dinoflagellate cysts along with *Cribroperidinium* sp., *Endoscrinium* sp. *Oligosphaeridium* sp. and *Sirmiodinium grossii*. These long-ranging taxa indicate a Late Jurassic to Cretaceous age (Costa and Davey, 1992; Riding and Thomas, 1992).

Marine palynomorphs make up 51% of the palynomorph assemblage from sample 4. A very rich and diverse dinoflagellate cyst assemblage is present including common indeterminate chorate dinoflagellate cysts, *Achomosphaera ramulifera*, *Chatangiella* spp., *Oligosphaeridium complex, Spiniferites ramosus,* and specimens questionably assigned to *Systematophora sylibum.* Certain dinoflagellate cysts including *Epelidosphaeridia spinosum, Isabellidinium gallium, Palaeoperidinium cretaceum, Palaeoperidinium pyrophorum* and *Xenascus ceratiodes* together indicate a late Albian to Cenomanian age (mid to Late Cretaceous) (Costa and Davey, 1992, Williams et al., 2017). The presence in sample 4 of the distinctive Late Cretaceous pollen genus *Aquilapollenites* is noteworthy. Srivastava (1994) described a phytogeoprovince characterised by this genus that occupied boreal regions during the Turonian to Maastrichtian.

The age determination indicated by the palynological assemblage in sample 4 is anomalous when viewed in the context of the overlying and underlying samples and the wireline logs. The sample was obtained from bagged rubbly core so ‘core jumbling’ on the rig or during curation is a likely source of the anomaly.

2.3 SAMPLES 5 TO 10 (1344.17 TO 1353.04 M) – INDETERMINATE

These six samples yielded very poor organic residues dominated by amorphous organic material or black woody material (sample 9, 1351.96 m). Palynomorphs are largely absent and where present are not age-diagnostic apart from having a general Mesozoic aspect.

3 Conclusions

A Cretaceous age is indicated for sample 1 (1335.47 m) and a Late Jurassic to Cretaceous age is assigned to sample 3. The dinoflagellate assemblage from sample 4 indicates a late Albian to Cenomanian age (mid to Late Cretaceous) (Costa and Davey, 1992, Williams et al., 2017). However, this age is anomalous when viewed in the context of the overlying and underlying samples and the wireline logs. The sample was obtained from bagged rubbly core so 'core jumbling' on the rig or during curation is a likely source of the anomaly. The lowest six samples from this well – samples 5 to 10 (1344.19 to 1353.04 m) – did not yield any age-diagnostic palynomorphs.

4 References

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Appendix 1 - Sample details (measured depths).

BGS MPA No.	BGS MPA No.	DEPTH (m)	SSK No.
1	67642	1335.47	65008
2	67641	1338.04	65007
3	67640	1339.90	65022
4	67639	1343.56	65021
5	67638	1344.17	65020
6	67637	1345.81	65019
7	67636	1348.13	65018
8	67635	1349.77	65017
9	67634	1351.96	65016
10	67633	1353.04	65015

Appendix 2 - Palynology data.

Well 205/21-1a										
Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
MPA Number	67642	67641	67640	67639	67638	67637	67636	67635	67634	67633
Depth	1335.47	1338.04	1339.9	1343.56	1344.17	1345.81	1348.13	1349.77	1351.96	1353.04
Age interpretation	**Cret.**	**Indet.**	**Late Jurassic/ Cret.**	**CORE OUT OF PLACE Mid to Late Cret.**	**Indeterminate**					
Palaeoenvironment	**Marine**	**Terrest. taxa only**	**Marine**		**Indet.**	**Terrest. taxa only**	**Indet.**	**?Marine**	**Indet.**	**Terrest. taxa only**
PTERIDOPHYTE SPORES										
Baculatisporites sp.	X			X						
Cyathidites minor			X	X						
Gleicheniidites minor			X							
Gleicheniidites sp.			X							
Neoraistrickia sp.			X	X						
Retitriletes austroclavatidites			X							
Spore - indeterminate			X	X						
Staplinisporites caminus						X				
GYMNOSPERM POLLEN										
Aquilapollenites sp.				X						
Araucariacites australis			X	X						
Bisaccate pollen undiff.	X	X	X	X						
Callialasporites spp		?		X						
Cerebropllenites macroverrucosus			X							
Classopollis classoides			X							
Exesipollenites scabratus			X	X						
Perinopollenites elatoides	X	X	X	X						X
Vitreisporites pallidus			X							
DINOFLAGELLATE CYSTS										
Achomosphaera ramulifera				X						
Chatangiella spp.				X						
Chorate dinocyst indet.	X		X	X						
Cleistosphaeridium huguonoti				?						
Cleistosphaeridium sp.A				X						
Cribroperidinium sp.			X							
Dingodinium sp.								X		
Endoscrinium sp.			X							
Epelidosphaeridia spinosum				X						
?Epelidosphaeridia sp.				X						
Isabellidinium gallium				?						
Laciniadinium sp.				X						
Oligosphaeridium complex	X			X						
Oligosphaeridium sp.			X	X						
Palaeoperidinium cretaceum				X						
Palaeoperidinum pyrophorum				X						
Senegalinium sp.				X						
Sirmiodinium grossii			X							
Spiniferites ramosus				X						
Systematophora ?silybum	X			X						
Xenascus ceratioides				X						
MISCELLANEOUS										
Foraminiferal test lining			X							
Micrhystridium spp.				X						
KEROGEN TYPE PERCENTAGES										
Wood	14	11	1	52	2	0	25	6	53	
Plant fragments	64	71	3	22	6	3	4	6	27	
Palynomorphs	13	0	16	17	0	0	0	0	0	
Amorph. organic material (AOM)	9	18	80	9	92	97	71	88	20	