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PALEONTOLOGICAL STUDY OF THE STATOIL 34/10-7

OFFSHORE NORWAY WELL

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EPR-E.WA23.80 OCTOBER 1980

INTRODUCTION

Paleontological studies were carried out on the Statoil 34/10-7 well, from 1666m to 2250m, to verify and eventually polish up Paleoservices' interpretation.

We used slides borrowed from Paleoservices for the palynological studies and samples prepared at EPR-E for the nannofossil, foraminifer and ostracode studies. The list of the samples studied at EPR-E is given in the appendix.

Our studies support the following stratigraphic interpretation:

<u>TOP (m</u>)	AGE
1666	Late Maastrichtian
1702	Early Maastrichtian
1806	Early Toarcian
1834.6	Late Pliensbachian
1996	Lowermost Late Pliensbachian
2026	Early Pliensbachian
2062	Indeterminate
2250 (T.D.)	Indeterminate

STRATIGRAPHY

CRETACEOUS 1666m - 1804m

LATE MAASTRICHTIAN: 1666m - 1697m

Nannofossils:

The presence, at 1666m, of Nephrolithus frequens together with Arkhangelskiella cymbiformis indicates a Late Maastrichtian age. Eiffellithus turriseiffeli, Kamptnerius magnificus, Predicosphaera cretacea, Micula staurophora are the most important species present in this unit.

Foraminifera:

Pseudotextularia elegans, Heterohelix globulosa, H. striata and Globigerinelloides multispina are present at 1669m.

From 1678m, Abathomphalus mayaroensis, Globotruncana contusa, G. arca, G. cf. bolli, Rugoglobigerina ex. gr. rugosa are observed.

EARLY MAASTRICHTIAN: 1702m - 1804m

Nannofossils:

The presence of Arkhangelskiella cymbiformis without Nephrolithus frequens may suggest an Early Maastrichtian age.

From 1738m, the cuttings are poor or barren.

Foraminifera:

Globigerinelloides multispina, Rugoglobigerina ex. gr. rugosa, Globotruncana havanensis are the most important species present in this unit.

A single specimen of Abathomphalus cf. intermedius is observed at 1774m.

JURASSIC: 1806m - 2062m

EARLY TOARCIAN: 1806m - 1826.9m

The six sidewall core samples from the 1806 to 1818m interval are characterized by the presence of numerous small sphaeromorphs (*Inaperturopollenites* spp.). As noted in our report on the 34/10-5 well (EPR-E.NAI1.80) (p. 5), similar abundances of *Inaperturopollenites* spp. are known to occur in the Early Toarcian. *Nannoceratopsis senex* and *N. gracilis* sbsp. A are abundant in the sidewall cores from 1813.25m, 1815m and 1818m. *Mancodinium semitabulatum* is also present in several samples from this interval.

LATE PLIENSBACHIAN: 1834.6m - 1987m

The top of the Late Pliensbachian is placed at 1834.6m, where Luehndea spinosa has its top occurrence. From 1834.6m to 1890m, this dinoflagellate marker species occurs in each of the nine core or sidewall core samples available. In the upper part of the Late Pliensbachian interval, Nannoceratopsis senex is more abundant than N. gracilis. A similar relative dominance of Nannoceratopsis senex topsis senex over N. gracilis in the upper part of the Late Pliensbachian, has also been observed in the 34/10-4 and 34/10-5 wells. No representative of the genus Nannoceratopsis has been observed below 1986m. As observed in the 34/10-4 and 34/10-5 wells. As observed in the 34/10-5 wells, marine microplankton is relatively common in the upper part of the Late Pliensbachian, but relatively scarce in the lower part of this horizon.

Among the terrestrial palynomorphs, the upper part of the Late Pliensbachian is characterized by the common occurrence of *Chasmatosporites* spp.

Among the Late Pliensbachian ostracodes, *Ogmoconchella* ex. gr. *adenticulata* seems to have its top occurrence at 1882m, *O. aequalis* at 1912m, *Ogmoconcha* gr. *amalthei* at 1960m.

EARLIEST LATE PLIENSBACHIAN: 1996m - 2017m

The ostracode marker species *Whicherella semiora* occurs at 1996m. This species is known to be restricted to the lowermost part of the Late Pliensbachian (lower part of the *A. margaritatus* zone).

EARLY PLIENSBACHIAN - SINEMURIAN: 2026m - 2062m

The Early Pliensbachian age proposed for the upper part of this interval is based on the top occurrence of the ostracode marker *Gammacythere ubiquita* at 2026m and confirmed by the occurrence of the ostracode *Ogmoconchella* cf. *danica* at 2044m.

At 2062m, marine microplankton is completely lacking, but the terrestrial palynomorphs include *Cerebropollenites mesozoicus*, suggesting an age not older than Sinemurian. A specimen of *Ovalipollis ovalis* identified at 2050m is considered to be reworked.

Below 2062m, the three sidewall core samples available contain only a few nonsignificant palynomorphs, which, moreover, could be the result of mud contamination. The cutting samples seems to contain mainly, or exclusively, caved palynomorphs and must be considered as useless. Paleontological data do not permit, therefore, to date the interval between 2062m and 2250m (T.D.).

COMPARISONS BETWEEN EPR-E AND PALEOSERVICES

BIOSTRATIGRAPHIC INTERPRETATION ON STATOIL 34/10-7

(See attached paleolog)

CRETACEOUS

EPR-E agrees with Paleoservices in attributing the first sample we examined, at 1666m, to the Late Maastrichtian.

Paleoservices places the upper limit of its Maastrichtian - ?Campanian unit at 1693m, based on the first downhole occurrence of *Reussella szajnochae*. We prefer, however, to place the top of our Early Maastrichtian at 1702m, where *Arkhangelskiella cymbiformis* is present, but *Nephrolithus frequens* absent.

JURASSIC

We agree with Paleoservices in placing the top of the Jurassic at 1806m and attribute this first Jurassic horizon to the Early Toarcian.

There is also a good agreement on the top of the Late Pliensbachian, despite the different criteria used: our limit is based on the top occurrence of the dinoflagellate *Luehndea spinosa*, apparently not identified by Paleoservices, while Paleoservices uses the top occurrence of the ostracode genus Ogmoconchella. It should also be noted that Paleoservices does not recognize the dinoflagellate species *Nannoceratopsis senex*, probably including it within their *N. gracilis*. On the other hand, Paleoservices recognizes the ostracode marker *Whicherella semiora*, but does not use it to define a separate horizon.

Paleoservices and EPR-E both place the top of the Early Pliensbachian at the same depth based on the same criterium: the top occurrence of *Gammacythere ubiquita*; the three meters' difference is due to the sample selection. We identified *Ogmoconchella danica* at 2044m, whereas Paleoservices considered it to be absent.

We also support Paleoservices in attributing an age not older than Sinemurian to the sample at 2062m in which *Cerebropollenites mesozoicus* is present. We do not support, however, the very tentative identification of *Ovalipollis ovalis* at 2083m. We have observed *Ovalipollis ovalis* at 2250m, where it is obviously reworked.

APPENDIX

LIST OF SAMPLES STUDIED FOR PALYNOLOGY

(slides loaned by Paleoservices)

DEPTH (m)

<u>DEPTH (m</u>)

SWC	1806	SWC	1975
н	1808	44	1986
н	1810	Cutt.	2011-17
Core	1813.25	SWC	2021.5
11	1815	Ú.	2031
ц	1818	п	2041
41	1826.9	16	2050
П	1834.6	18	2053
11	1838.85	Cutt.	2050-56
,H	1844.50	SWC	2058
н	1857.25	ц	2062
,11	1860.9	Cutt.	2065-71
SWC	1870	SWC	2083
Core	1876.7	Cutt.	2080-86
SWC	1885	<u>, 11</u>	2098-104
14	1890	н	2110-16
11	1900	11	2125-31
ü	1910	11	2140-46
'n	1925	ш	2158-64
11	1930	SWC	2173.5
.11	1935	Cutt.	2170-76
Core	1942	SWC	2184.4
.11	1948	Cutt.	2185-91
SWC	1954	11	2200-06
11	1960	11	2215-21
-11	1965	л	2230-36
		. 11	2245-50

LIST OF SAMPLES STUDIED FOR MICROPALEONTOLOGY

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(Processed at EPR-E)

(M: Foraminifer and/or Ostracode, C: Coccolith)

	DEPTH (<u>m</u>)		DEPTH (n	<u>n</u>)
Cutt.	1666	M-C	Cutt.	1849	М
n	1669	MC	ŭ,	1864	М
11	1672	С	U	1873	М
11	1678	M-C	11	1882	М
<u>,11</u>	1687	M-C	й	1891	М
н	1697	С	н	1900	М
н	1702	С	II.	1912	М
16	1708	M-C	н	1921	М
-11	1717	C	11	1930	Μ
н	1726	M-C	11	1939	М
31	1738	С	u	1951	M
u	1747	M-C	n .	1960	М
11	1756	C	u	1969	М
11	1768	М-С	II.	1978	М
U	1774	M	11	1987	М
11	1777	С	н	1996	М
н	1789	M-C	11	2008	М
ų	1795	С	п	2017	М
-U	1804	M-C	11	2026	М
11	1810	Μ	11	2035	М
н	1819	М	ŋ	2044	М
ti.	1828	Μ	п	2053	M
15	1840	М	н	2062	М

STATOIL 34/10-7 LOG 1

SCALE : 1/2000

PREPARED BY M.E. MILLIOUD, J.P. COLIN, M. PONS EPR-E (BORDEAUX) october 1980

EPR-E PROPRIETARY

METERS	EPR - E	PALEOSERVICES	REMARKS
1700 —	EARLY	1666 LATE MAASTRICHTIAN 1693 MAASTRICHTIAN 	Nephrolithus frequens, Arkhangelskiella 1666 cymbiformis 1669 Pseudotextularia elegans, Heterohelix globulosa, H.striata 1702 Arkhangelskiella cymbiformis without Nephrolithus frequens
1800 -	MAASIRICHIIAN 1806	? CAMPANIAN	—1774 Abathomphalus cf. intermedius 1804 Globotruncana havanensis 1806 Nannoceratopsis gracilis
	· · · · -	EADLY TOADCIAN	



.

	2000 -	1900 -	1800-	1700 -	DEPTH (Meters)
2035 2044 2053 2062	1959 1960 1960 1969 1969 1978 1987 1987 1996 2017 2017 2017	1849 1864 1864 1873 1882 1882 1900 1912 1912 1921 1930	1756 1768 1774 1774 1775 1789 1795 1804 1810 1819 1819	1666 1666 1669 1672 1678 1687 1702 1708 1708 1717 1726	SAMPLES STUDIED SPE
					NANNOFOSSILSNephrolithus frequens Arkhangelskiella cymbiform Eiffellithus turriseiffeli Staurolithites bochotnicae Predicosphaera cretacea Kamptnerius magnificus Ahmuellerella octoradiata Zygodiscus spiralis Micula staurophora Eiffellithus sp. aff. E. a Markalius sp. Cribrosphaerella ehrenberg Chiastozygus litterarius Cretarhabdus crenulatus Braarudosphaera bigelowi Predicosphaera spinosa Biscutum testudinarium Watznaueria barnesae Biscutum sp. Zygodiscus sp. Gartnerago obliquum Glaukolithus sp.FORAMINIFERAPseudotextularia elegans Heterohelix striata Globigerinelloides multisp Abathomphalus mayaroensis Globotruncana cf. bollii Rugoglobigerina ex gr. rug Hedbergella spp. Heterohelix sp. Globigerinelloides sp. Globorotalites sp. Reussella szajnochae szajr Lenticulina sp. Lenticulina yarians
••••	· · · · · · · · · · · · · · · · · · ·	•			Lingulina tenera Haplophragmoides sp. Mesodentalina matutina Rectoglandulina vulgata Frondicularia bicostata

Prepared by J.P. COLIN and M.PONS EPR-E (Bordeaux)october 1980

Bairdia molesta Ogmoconchella gr. amalthei Pseudohealdia truncata Ogmoconchella transversa Ogmoconchella sp. indet. Ogmoconchella contractula Wicherella semiora Gammacythere ubiquita Ogmoconchella cf. pseudospina Ogmoconchella cf. danica
Isobythocypris unispinata Polycope sp. OTHER ORGANISMS Small gastropods Echinoderm fragments Fish teeths

STATOIL 34/10-7

JURASSIC MICROPLANKTON AND POLLEN - SPORES DISTRIBUTION CHART

Prepared by M.E. MILLIOUD EPR-E (Bordeaux) october 1980

			MARINE MICROP	LANKTON	POLLEN-SPORES
DEPTH (meters)	SAMPLES STUDIED	MARINE MICROPLANKTON / POLLEN - SPORIES RATIOS (Microplankton) (Microplankton)	Nannoceratopsis gracilis Nannoceratopsis gracilis sbsp. A Nannoceratopsis senex Nannoceratopsis cf. spiculata Leiofusa jurassica Micrhystridium spp. Veryhachium spp. Parvocysta barbata (N-101) Dino N-102 Nannoceratopsis ambonis Fromea elongata Dino tvpe 2 in Thusu	Moesiodinium raileanui Pterospermopsis spp. Nannoceratopsis triceras Mancodinium semitabulatum Luehndea spinosa Scriniocassis weberi Maturodinium inornatum Nannoceratopsis plegas	Alisporites spp. Classopollis spp. Deltoidospora spp. Deltoidospora spp. Osmundacidites wellmanii Cerebropollenites mesozoicus Vitreisporites pallidus Podocarpidites spp. Uycopodiumsporites spp. Lycopodiumsporites spp. Lycopodiumsporites spp. Tripartina variabilis Callialasporites dampieri Callialasporites dampieri Corrugatisporites thiergartii Neoraistrickia truncata Chomotriletes sp. Corrugatisporites reissingeri Taeniaesporites reissingeri Stereisporites aulosonensis Clavatisporites kughesii Stereisporites equatibossus Leptolepidites rotundus Leptolepidites rotundus Deltoidospora juncta Leptolepidites rotundus Inaperturopollenites spp. Microreticulatisporites fuscus Ovalipollis ovalis
1800 —	1806 1808 1810 181325 1815 1816 1826.9 1838.85 1844.5 1857.25 1860.9		$\begin{array}{c} \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet &$	* + + + + * + + * + + + * + * ▲ * ▲	$\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$
1900 —	1860.9	5	+ * A A * • + * * + A A + + + * * • A *	* * * A * A + * + *	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
0000	1910		$\begin{array}{cccccccccccccccccccccccccccccccccccc$	+ + A	• A A * * + * * • * * * + + + * + + + + + + + + + + + +
2000 -	2011-17 2021.5 2031 2041 2058 2062 206586 2083		+ • • + + ▲ • + ▲ • \$ \$ +	+	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
2100-	2 110-16 2 125-31 2 140-46 2 158-64 2 170-76				
2200	2173.5 2184.4 2185-91 2215-21 223036 2245-50		' q + < * 4 ▲ 11 • >	Present, no uantitative data <4 % - 10 % - 25 %	