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7/11-3X

OILFIELDS REPORT NO. 217

THE MICROPALAEONTOLOGY AND STRATIGRAPHY OF THE PHILLIPS (NORWAY) 7/11-3X NORTH SEA WELL

by

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Project No. ARP 689/526

Prepared for:

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8th January, 1969

C O N T E N T S

E N C L O S U R E S

Micropalaeontological Analysis Charts Nos. 1 - 10

Biostratigraphic Chart showing the distribution of the Diagnostic Caenozoic Foraminifera and Ostracoda in the Phillips (Norway) 7/11-3X North Sea Well. (2 sheets)

I

INTRODUCTION

This report summarises the results of the micropalaeontological and stratigraphical analyses which have been carried out under Project No. ARP 689/526 on material received from the interval 1800' - 10993' of the Phillips (Norway) 7/11-3X North Sea Well.

This exploration well was the third drilled in block 7/11 of the Norwegian North Sea Concession Area.

A relatively complete Tertiary sequence was encountered and the well reached T.D. in chalk of Danian age.

We wish to acknowledge the continued co-operation and assistance received from the various members of Phillips Petroleum Company with whom we have been associated during the course of this work.

A summary of the sequence penetrated in this well can be seen overleaf on Table I.

II

SUCCESSION

TABLE I

Unit	Interval	Thickness	Stage	System/Subsystem
A	1800' - 2610'	+ 810'	Scaldisian	Upper Pliocene
B	2650' - 2850'	± 200'	?Upper Diestian	?Lower Pliocene
C	2890' - 3050'	± 160'	Lower Diestian	Upper Miocene
D	3090' - 5250'	± 2160'	-	Middle Miocene
E	5300' - 5840'	± 540'	Burdigalian	Lower Miocene
F	5975' - 6720'	± 745	Aquitanian	
G	6750' - 8610'	± 1860'	-	Oligocene
H	8640' - 9790'	± 1150'	-	Eocene
I	9820' - 9942'	± 122'	-	?Lower Eocene - ?Palaeocene
J	9950' - 10940'	± 990'	-	Palaeocene
K	10950' - 10993'	+ 43'	Danian	Lower Palaeocene

III

MATERIALS AND METHODS

Under Project No. ARP 689/526 a total of 331 ditch cuttings was analysed utilising standard micropalaeontological techniques.

A summary of the information obtained from these samples was forwarded in a series of letters and telephone communications. These letters contain the framework of factual information on which this report is based. The prepared samples and recorded information are now filed and curated in the confidential records section of these laboratories.

The methods of treating and assessing the age of the samples were similar to those mentioned in our Oilfields Report No. 171.

IV

TERTIARY

(a) Pliocene

UNIT A, INTERVAL 1800' - 2610'; Scaldisian, Upper Pliocene

General Lithology

Pale olive green clays predominate in this unit, however, minor amounts of fine to medium-grained, subangular quartz sand and trace amounts of coarse-grained, rounded to subrounded sand are also present uniformly distributed throughout the sequence.

Fragments of thin-shelled lamellibranchs are first encountered at 1880' and thereafter appear periodically in the upper section. Below 2170', light green-grey, microcrystalline, and occasionally finely sucrosic dolomite is a minor constituent of the clay samples and is generally found associated with trace amounts of medium-grained, sub-rounded, quartz sand.

The base of the unit is marked by the incoming of fine-grained, pyritic sand within the clays. Cement caving is quite heavy in the upper part of this unit.

Micropalaeontology and Stratigraphical Conclusions

Moderate faunas are recorded from this interval with Cassidulina and Nonion being the predominant genera present. However, at several horizons within this unit frequent specimens of Cibicides, Elphidium, Uvigerina and miliolids are found.

The presence of Cassidulina laevigata pliocarinata, Cibicides lobatulus var. grossa, Cibicides scaldisiensis, Uvigerina asperula, Polymorphina charlottensis and Aurila convexa would indicate that this interval is of Scaldisian, Upper Pliocene, age.

UNIT B, INTERVAL 2650' - 2850'; ?Upper Diestian, ?Lower Pliocene

General Lithology

The pale olive green, locally sandy and pyritic clays of the overlying section continue into this unit without any major lithological change. The quartz sand is generally of subangular medium-sized grains. Trace amounts of shell fragments and green-grey microcrystalline dolomite are also present.

Micropalaeontology and Stratigraphical Conclusions

Moderate to rich faunas consisting predominantly of species of Nonion, Cassidulina and Cibicides are recorded within this unit. An increase in the number of planktonic species is noted at the base of the section.

The incoming of Bulimina elongata var. subulata, Elphidium antoninum and Cibicides refulgens at the top of this sequence may well indicate that the Lower Pliocene (Upper Diestian) has been encountered. However, because of the lack of any of the more characteristic forms only a questionable Lower Pliocene age has been assigned to this section.

(b) Miocene

UNIT C, INTERVAL 2890' - 3050'; Lower Diestian, Upper Miocene

General Lithology

Pale olive green clays again constitute the dominant lithotype of this unit, together with minor amounts of medium-grained quartz sand, pyrite and lamellibranch fragments.

Micropalaeontology and Stratigraphical Conclusions

The incoming of Cibicides peelensis and Cytheridea mülleri at the top of this interval closely followed by the occurrence of Pyrgo bulloides would indicate that the Lower Diestian, Upper Miocene has been encountered.

The uppermost samples contain impoverished microfaunas, however the assemblages gradually increase below 2970'. Species of Cassidulina, Nonion, Cibicides and Bulimina predominate throughout the interval with an increase in the planktonic species being noted at 3050'.

UNIT D, INTERVAL 3090' - 5250'; Middle Miocene

General Lithology

The upper part of the unit consists essentially of dark olive-green clays with trace amounts of pyrite; medium-grained, subangular quartz sand; tan microcrystalline dolomite and macrofossil remains. The shell debris consists predominantly of lamellibranchs but rare echinoid fragments are seen locally.

Below 3410' sand is rare, but shell fragments and pyrite occur periodically until 3690' where uniform clays predominate. From 3770' the clays have a dark green-grey colouration and contain occasional fragments of buff and grey-green microcrystalline dolomite; thereafter they persist to 4400' where pyrite recurs. Buff to brown, finely sucrosic and locally sideritic dolomite is occasionally present in the clays down to 5000', generally being found at the more pyritic horizons.

At 5025' the slightly pyritic clays become medium olive-grey in colour and at 5100' the incoming of minor amounts of light grey, slightly

micaceous, and slightly calcareous, friable shale is seen for the first time. Trace amounts of grey-green, finely sucrosic dolomite are present in this lower, shaly section.

Micropalaeontology and Stratigraphical Conclusions

Varied microfaunal assemblages are encountered within this unit, several horizons being extremely rich in species while others are almost barren. Essentially the interval can be subdivided into three sections which are outlined below:-

3090' - 3690'

Although the first Uvigerina hosiusi is not encountered until 3450' a marked change in the faunal content is noted at the top of this section. Diagnostic forms present include the following forms:-

Loxostomum sinuosum

Globigerina angustiumbilicata

"Cythere" latimarginata

Bolivina beyrichi

This faunal change would indicate that the Middle Miocene has been encountered. This belief is confirmed by the rare occurrence of Uvigerina hosiusi below 3450' and of Listerella communis below 3210'.

Moderate to rich faunal assemblages occur throughout this section, the main components of which are species of Nonion, Cassidulina, Cibicides together with miliolids. An increase in the numbers of planktonic species and of Uvigerina spp. is noted at the base of this section.

3730' - 4950'

Apart from the uppermost sample and that present at 4400' where moderate faunas exist, poor to very poor faunas are the general rule within this section. Uvigerina hosiusi shows a marked increase in numbers at the

top of this section and predominates at several horizons throughout. Arenaceous foraminifera begin to increase in numbers below 4600' until they dominate the samples in the lower part of this interval. Above 4600' planktonic foraminifera, species of miliolids and Uvigerina dominate in the assemblages found.

5000' - 5250'

The top of this lower section of the Middle Miocene unit is marked by the incoming of Radiolaria. Apart from the sample at 5025' where a rich fauna is noted, impoverished faunas are again found. Arenaceous foraminifera associated with small planktonic species are the dominant forms recorded from these samples.

All the forms present are still indicative of a Middle Miocene age for this interval.

UNIT E, INTERVAL 5300' - 5840'; Burdigalian, Lower Miocene

General Lithology

The unit is a shaly clay sequence, the upper and lower sections being the more shaly, with clay separating the two.

The shales of the upper section are initially light green-grey in colour, finely micaceous, slightly calcareous and friable, but become brownish from 5400'. They are found withamedium olive-grey clay. At 5560' a dark green-black clay is encountered which contains minor amounts of brown to buff, micaceous and friable shale. A recurrence of light green shale and dolomite is seen at 5640', where the clays become black to dark grey in colour. From 5740' the shales increase, being brown and light grey and they are found associated with light brown, microcrystalline and finely sucrosic dolomite.

Micropalaeontology and Stratigraphical Conclusions

Globorotalia fohsi barisanensis and Globorotalia scitula scitula are encountered at the top of this interval. These forms would indicate that the Burdigalian stage of the Lower Miocene has been penetrated.

The uppermost sample of this section contains a moderate to rich fauna with common specimens of Radiolaria. Poorer arenaceous faunas are recorded from the remainder of the interval. A useful marker fossil within this interval is marked by the incoming of Sphaeroidinellopsis seminulina seminulina below 5560'.

UNIT F, INTERVAL 5975' - 6720'; Aquitanian, Lower Miocene

General Lithology

The top of the unit is denoted by the incoming of the first major shale section encountered in this well. The shales are dark and medium brown in colour, finely micaceous, slightly calcareous and friable.

Below this prominant section the shale content fluctuates, and medium brown to black, shaly clay intercalations are present. Fragments of brown microcrystalline dolomite are seen at 6060' and 6180' but become common below 6330' where dark brown clays with minor amounts of brown and buff shale predominate.

Micropalaeontology and Stratigraphical Conclusions

Although no specimens of Globigerinoides bisphericus were noted, the occurrence of Globorotalia scitula praescitula at the top of this interval suggests that this section is equivalent to the Aquitanian stage of the Lower Miocene. Again poor to moderate arenaceous microfaunas are recorded from the samples of this interval.

(c) Oligocene

UNIT G, INTERVAL 6750' - 8610'; Oligocene

General Lithology

The lithotypes present in the overlying section continue into this unit without apparent change. Dark brown clays, brown micaceous and friable shales and tan to brown, occasionally sideritic, dolomites are also represented.

The sequence consists of alternating shales and clays but with three major sub-units. The uppermost section consists predominantly of clay, and this is underlain by a basically shale section. The lower division is again predominantly composed of clay. The dolomites are generally found associated with the more shaly horizons. Rare developments of tan and brown microcrystalline limestone are found with the dolomites and are common in the upper part of the predominantly shaly interval.

The clays are dark brown to 7600', thereafter they have a reddish-brown colouration, possibly due to drilling fluid properties, for the associated shales remain brown. In the lower clay interval a lithological change is evidenced by minor amounts of light grey, slightly micaceous shale, and fragments of buff,microcrystalline dolomite which are present from 8460' to the base of the unit.

Micropalaeontology and Stratigraphical Conclusions

The top of this interval is marked by a faunal change and an increase in the numbers of Eponides umbonatus is noted together with the incoming of Cancris turgidus, Globigerina cf. ampliapertura and Sphaeroidina variabilis. This change would signify that the Oligocene has been encountered. Confirmation of this determination is substantiated by the incoming of Catapsydrax unicavus at 6900', Siphonodosaria hirsuta at 6960' and Sigmomorphina regularis at 6990'.

Other marker horizons include the recurrence of Glomospira charoides below 7980' and the increase in numbers of Gyroidina girardana at 8580'.

The first specimens of Rotaliatina buliminoides are only found below this unit, the first being noted at 8640'.

Again very poor to moderate, predominantly arenaceous microfaunas are recorded from this interval.

(d) Eocene

UNIT H, INTERVAL 8640' - 9790'; Eocene

General Lithology

No lithological break occurs between this unit and the base of the overlying interval.

The sequence is again one of alternating beds of shale and clay. The boundaries between these two main lithotypes are more distinct in this section than in Unit G for the shales are predominantly light grey and grey-green in colour whilst the clays are reddish dark brown. Minor amounts of brown shales are present throughout the section, probably as intercalations in the clays, or in part caved from Unit G. Fragments of tan dolomite and dolomitic limestone occur periodically and are common in the clay between 9520' and 9625'.

The basal section from 9640' is predominantly of light grey-green and brown-grey, finely micaceous shales. A thin, light grey, calcareous and slightly pyritic clay occurs in this section at 9760', and thereafter to the base of the unit. The shales locally contain finely disseminated pyrite.

Micropalaeontology and Stratigraphical Conclusions

Although Oligocene forms are still very much in evidence, the top of the interval is marked by the incoming of Trochammina globigeriniformis var. altiformis, Trochammina globigeriniformis, Cribrostomoides sp. 2, and

Bathysiphon eocenicus. These forms are closely followed by the occurrence of Globigerina cf. linaperta linaperta and Globigerina barbosa. This assemblage would indicate that the Eocene has been penetrated. The faunas are again poor and essentially arenaceous in aspect. Green-stained foraminifera are first encountered at 9250' and are common below this depth.

(e) Eocene - Palaeocene

UNIT I, INTERVAL 9820' - 9942'; ?Lower Eocene - ?Palaeocene

General Lithology

The unit consists of a section of light grey, light green, and medium brown, slightly calcareous shales, the latter being micaceous. Local developments of light brown microcrystalline limestone and light brown finely sucrosic dolomite are present, the latter occasionally in the form of small, brown, radially structured sideritic spheres in a green microcrystalline matrix.

Light pink to purple shales are first seen in trace amounts at 9840', and increase slightly towards the base of the unit, where a grey, blocky claystone is in evidence. This is underlain by a thin clay containing nodular pyrite.

Micropalaeontology and Stratigraphical Conclusions

The top of this unit is marked by an influx of sideritic nodules which may signify a break in the sequence. At 9840' the incoming of Globigerina triangularis is noted and this planktonic foraminifera has a range of Lower Eocene to Palaeocene. A slight change is also noted in the arenaceous faunas present in that many of the forms have affinities

to those recorded by Haynes from the English Palaeocene deposits. The faunas are, however, very poor over this section and it has therefore only been possible to assign a ?Lower Eocene - ?Palaeocene age to this interval.

(f) Palaeocene

UNIT J, INTERVAL 9950' - 10940'; Palaeocene

General Lithology

The shales of the overlying section continue into this unit until 9970', where a non-calcareous, pyritic, dark-grey shale occurs finely interlaminated with a light grey variety. Trace amounts of red shale are also present, together with buff to brown, microcrystalline and sucrosic dolomite.

Sand was not present in the samples received over the interval 9970' to 9990', the first arenaceous horizon being encountered at 10,050'. Here, light brown, medium-grained, glauconitic and slightly micaceous sandstones occur with varying amounts of grey shale.

The remainder of the section consists essentially of an upper and lower sand formation separated by a shale.

The top of this upper arenaceous formation is marked by a sandstone which extends from 10130' to 10200' and is heavily contaminated with caved shale. Below 10220' a loose deposit of medium-grained, subangular, clear quartz sand occurs. Subordinate amounts of coarse, subrounded grains are present and increase in amount below 10260'. This unconsolidated deposit is very coarse at 10320', having well-rounded, subspherical to elongate

grains which locally have a frosted appearance. The sands become fine-grained again at the base of this formation, between 10340' and 10369', and consist locally of firm to hard sandstone which has a calcareous matrix or calcite cement.

The shales between 10430' and 10620' are grey, green and reddish brown in colour. They are found with minor amounts of clay and loose sand, the latter varying in grade from fine to coarse. The grey shales in this section display carbonaceous streaks at 10550' and thereafter become increasingly brown to buff in colour. Trace amounts of buff limestone are seen at 10620' and mark the base of this shale interval.

The lower part of the unit from 10640' is essentially a sand and sandstone sequence containing minor amounts of shale, the latter probably having caved. The sands are predominantly fine to medium-grained and consist of subangular to subrounded clear quartz grains which are locally cemented by calcite and are occasionally glauconitic. Rare, well rounded, sub-elongate, coarse grains are present at 10700' while below, the incoming of a medium brown, microcrystalline and granular dolomite is noted at 10740'. Fragments of dolomite are thereafter present to 10760' and are associated with a hard, calcareous, medium-grained sandstone.

The base of this interval is notable for the occurrence of a light grey, chalky limestone at 10870'. This limestone is present in decreasing amounts to the base of the unit where it becomes sandy and is found accompanied by light grey sandstone, fine sand, minor amounts of green and grey shale and trace amounts of purple shale.

Micropalaeontology and Stratigraphical Conclusions

The uppermost sample from this interval contains a moderately rich microfauna including several species of planktonic foraminifera. Diagnostic forms present include:-

Globigerina triloculinoides

Globigerina inaequispira

Globigerina cf. spiralis

These forms are usually indicative of the Palaeocene and therefore the top of the Palaeocene is placed at 9950'. An influx of Coscinodiscus sp. is noted at 9970' and 9990' while below this the faunas become impoverished and almost entirely of an arenaceous aspect.

The only features of interest in this section are the presence of several pyritic specimens of Cyclammina spp. at 10720', the occurrence of sideritic nodules in the samples below 10800', the incoming of Spiroplectammina spectabilis at 10870' and the presence of large green Radiolaria below 10910'.

UNIT K, INTERVAL 10950' - 10993'; Danian, Lower Palaeocene

General Lithology

The uppermost sample of this unit carries only trace amounts of limestone, but at 10960' buff and light grey, firm to hard, chalky limestone is found with medium grey shale and fragments of light brown, translucent chert. The chalk becomes increasingly light grey and white in colour towards the base of the unit where chert is again seen.

The minor amounts of sand,and part or all of the shale present, have probably caved.

Micropalaeontology and Stratigraphical Conclusions

The incoming of white coated foraminifera at the top of this section together with the presence of Globigerina pseudobulloides and Osangularia lens suggests that this deepest section of the well is of Danian age. Also present in these samples are several Upper Cretaceous foraminifera. However, these are considered to be reworked into the Tertiary sequence as they first appear at the same horizon as the first Danian forms.

V

BIBLIOGRAPHY

BARTENSTEIN, H. et al	1962	Leitfossilien der Mikropalöontologie Gebruder Borntraeger, Berlin.
BATJES, D.A.J.	1958	Foraminifera of the Oligocene of Belgium. Inst. Roy. des Sciences Nat. de Belgique, Mem. No. 143.
CHATWIN, C.P.	1961	East Anglia and adjoining areas. Handbook of British Regional Geology.
DAM, A.T.	1944	Die Strat-gliederung des Niederländischen Palaozäns und Eozäns nach Foraminifera. Med. Geol. Sticht. Ser. C-V-No. 3.
DAM, A.T. & RHEINHOLD, Th.	1941	Die Stratigraphische Gliederung des Niederländischen Plio-Pleistozäns nach Foraminiferen. Med. Geol. Sticht. Ser. C-V-No. 1.
DAM, A.T. & RHEINHOLD, Th.	1942	Die Stratigraphische Gliederung des Niederländischen Oligo-Miozäns nach Foraminifera. Med. Geol. Sticht. Ser. C-V-No. 2.
GROSSHEIDE, K. & TRUNKO, L.	1965	Die Foraminiferen des Doberges bei Bünde und von Astrup. Beih. geol. Jb. Vol. 60.
HAYNES, J.	1956	Certain smaller British Paleocene Foraminifera. Pt. 1. Cont. Cush. Found. For. Res. Vol. VII, Pt. 3.
HAYNES, J. & WOOD, A.	1957	Certain smaller British Paleocene Foraminifera. Pt. II: Cibicides and its allies. Cont. Cush. Found. For. Res. Vol. VIII, Pt. 2.
HAYNES, J.	1958	Certain smaller British Paleocene Foraminifera. Pt. III: Polymorphinidae. Cont. Cush. Found. For. Res. Vol. IX, Pt. 1.
HAYNES, J.	1958	Certain smaller British Paleocene Foraminifera. Pt. IV: Arenacea, Lagenidea, Buliminidea and Chilostomellidae. Cont. Cush. Found. For. Res. Vol. IX, Pt. 3.

HAYNES, J.	1958	Certain smaller British Paleocene Foraminifera. Pt. V: Distribution. Cont. Cush. Found. For. Res. Vol. IX, Pt. 4.
HOFKER, J.	1966	Maestrichtian, Danian and Paleocene Foraminifera. Palaeontographica Suppl. 10.
KAASSCHIETER, J.P.H.	1961	Foraminifera of the Eocene of Belgium. Inst. Roy. des Sciences Nat de Belgique, Mem. No. 147.
KEIJ, A.J.	1957	Eocene and Oligocene Ostracoda of Belgium. Inst. Roy. des. Sciences Nat. de Belgique, Mem. No. 136.
KEIZER, J. & LETSCH, W.J.	1963	Geology of the Tertiary of the Netherlands. Verhandelingen Vol. 2, Pt. 2 (Trans. Jubilee Convention Pt. 2).
SORGENFREI, Th. & BUCH, A.	1964	Deep tests in Denmark 1935 - 1959. Geol. Surv. of Denmark, III Series No. 36.
TROELSEN, J.C.	1957	Some planktonic foraminifera of the type Danian and their stratigraphic importance. Studies in Foraminifera. U.S. Nat. Mus. Bull. 215.
VOORTHUYSEN, J.H. van	1950	The quantitative distribution of the Plio-Pleistocene Foraminifera of a boring at the Hague (Netherlands). Med. Geol. Sticht. N.S. 4.
VOORTHUYSEN, J.H. van	1950	The quantitative distribution of the Pleistocene, Pliocene and Miocene Foraminifera of boring Zaandam (Netherlands). Med. Geol. Sticht. N.S. 4.
VOORTHUYSEN, J.H. van & PANNEKOEK, A.J.	1950	La distribution verticale quantitative des foraminifères du Diestien, du Scaldisien et du Poederlien au Kruisschans, près d'Anvers. Bull. de la Soc. Belge de Geol.

RWLO/WVJ.

BIOSTRATIGRAPHIC CHART SHOWING THE DISTRIBUTION OF THE DIAGNOSTIC CAENOZOIC FORAMINIFERA AND OSTRACODA IN THE PHILLIPS (NORWAY) 7/11 - 3X NORTH SEA WELL

SHEET 1 OF 2

by
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Drawing No. 595

Date 16-11-69


SYSTEM
MIOCENE
PLIOCENE
SYSTEM
SUB-SYSTEM
LOWER MIOCENE
MIDDLE MIOCENE
UPPER MIOCENE
? LOWER PLIOCENE
UPPER PLIOCENE
SUB-SYSTEM
STAGE
AQUITANIAN
BURDIGALIAN
LOWER DIESTIAN
? UPPER DIESTIAN
SCALDISIAN
STAGE
ZONE
ZONE
OSTRACODA
6000 5800 5600 5400 5200 5000 4800 4600 4400 4200 4000 3800 3600 3400 3200 3000 2800 2600 2400 2200 2000 1800 1600 1400 1200 1000
FORAMINIFERA
Elofsonella concinna
Carinocythereis carinatum
Aurila convexa
Cytheridea mülleri
"Cythere" latimarginata
Quadracythere macropora
Krithe cf. papillosa
Cytherella beyrichi
Carinocythereis aff. carinatum
Echinocythereis scabra
Cassidulina laevigata pliocarinata
Nonion barleeanum var. inflatum
Discorbis milletti
Elphidium advenum
Polymorphina charlottensis
Nonion affine
Uvigerina asperula
Cibicides lobatulus var. grossa
Cibicides scaldisiensis
Bulimina elongata
Globigerina bulloides
Bulimina elongata var. subulata
Elphidium antoninum
Nonion soldanii
Cibicides refulgens
Sigmoilina celata
Cibicides paelensis
Pyrgo bulloides
Rotalia beccarii var.
Bulimina elongata var. tenera
Cibicides aknerianus
Cibicides pseudoungerianus
Elphidium inflatum
Bolivina subspinescens
Loxostomum sinuosum
Globigerina angustiumbilicata
Bolivina beyrichi
Lenticulina grandis
Sphaeroidina bulloides
Karreriella siphonella
Nonion boueanum
Listerella communis
Haplophragmoides latidorsatus
Cancris auriculus
Cyclammina placenta
Globigerina praebulloides praebulloides
Trifarina bradyi
Uvigerina hosiusi
Siphotextularia labiata
Globorotalia mayeri
Globigerina cf. venezuelana
Bolivina cf. cookei
Globorotalia inflata
Orbulina universa
Sigmoilina miocenica
Globigerina venezuelana
Glomospira charoides
Epistomina elegans
Bathysiphon dubia
Ammodiscus incertus
Ammodiscus dominicensis
Globigerina foliata
Globigerina bradyi
Globorotaloides variabilis
Globigerina juvenilis
Gyroidina girardana
Uvigerina tenuipustulata
Globorotalia fohsi barisanensis
Globorotalia scitula scitula
Orbulina suturalis
Pseudoclavulina chitinosa
Angulogerina gracilis var. tenuistriata
Sphaeroidinellopsis seminulina seminulina
Frondicularia nysti
Haplophragmoides carinatum
Globigerinoides triloba immatura
Globigerinoides triloba triloba
Globorotalia scitula praescitula
Asterigerina staeschei

Drawing No. 596

BIOSTRATIGRAPHIC CHART SHOWING THE DISTRIBUTION OF THE DIAGNOSTIC CAENOZOIC FORAMINIFERA AND OSTRACODA IN THE PHILLIPS (NORWAY) 7/11 - 3X NORTH SEA WELL

SHEET 2 OF 2

by
ROBERTSON RESEARCH COMPANY LIMITED,
Llandudno, Abergele, Denbighshire.

Date 16.1.69

FORAMINIFERA AND OSTRACODA

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST	LOCATION
2.12.68	CWH. PR.	Norwegian North Sea Well 7/11-3X

FOR: Phillips Petroleum Company, Norway.

CHART NO. 1 — 1800' - 2000'

- LIMESTONE
- DOLOMITE
- OOLITIC LIMESTONE
- CLAY
- SHALE
- SILTY/SANDY SHALE
- SILTSTONE
- SANDSTONE
- CONGLOMERATE
- GYPSUM
- VOLCANICS
- INTRUSIVES
- S SALT
- COAL
- C CHERT
- F Fossil fragments

LITHOLOGY	DEPTH IN FEET	SYSTEM	STAGE	ZONE
	100	UPPER PLIOCENE	SCALDISIAN	
	200			
	300			
	400			
	500			
	600			
	700			
	800			
	900			
F	1000			
F				

MICROFOSSILS

Quinqueloculina seminulum	Cassidulina laevigata pliocarinata	Nonion barleeanum var. inflatum	Nonion granosum	Bulinina aculeata	Guttulina lactea	Discorbis milletti	Elphidium advenum	Polymorphina charlottensis	Cassidulina oblonga	Triloculina oblonga	Nonion affine	Uvigerina asperula	Cassidulina crassa	Marginulina sp.	Elofsonella concinna	Carinocythereis carinatum	Cassidulina laevigata	Elphidium sp.1	Cibicides lobatulus var. grossa
+	+	+	+	+	+	+	+	+											
+	+	+	+	+	+	+			+	+	+	+	+	+	+				
+	+	+	+		+				+		+	+				+	+		
	+	+	+				+				+				+		+	+	+
	+	+	+		+	+	+				+						+	+	+

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST	LOCATION	CHART NO.
2.12.68	CWH. PR	Norwegian North Sea Well 7/11-3X	2
FOR			2000' - 3000'
Phillips Petroleum Company, Norway.			

LIMESTONE · SILTSTONE · SALT
DOLOMITE · SANDSTONE · COAL
OOLITIC LIMESTONE · CONGLOMERATE · CHERT
CLAY · GYPSUM · F Fossil fragments
SHALE · VOLCANICS · P Pyrites
SILTY/SANDY SHALE · INTRUSIVES

LITHOLOGY | DEPTH IN FEET | SYSTEM | STAGE | ZONE

DEPTH IN FEET: 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000

SYSTEM: UPPER PLIOCENE | LOWER PLIOCENE | UPPER MIOCENE

STAGE: SCALDISIAN | UPPER DIESTIAN | LOWER DIESTIAN

ZONE

FORAMINIFERA AND OSTRACODA

MICROFOSSILS
Quinqueloculina seminulum
Nonion barleeanum var. inflatum
Cassidulina laevigata pliocarinata
Elphidium sp.1
Elphidium advenum
Cassidulina laevigata
Nonion granosum
Marginulina sp.
Elofsonella concinna
Cassidulina crassa
Bulimina aculeata
Guttulina lactea
Uvigerina asperula
Discorbis milletti
Nonion affine
Cibicides lobatulus var. grossa
Pyrgo cf. fornasinii
Triloculina oblonga
Cibicides scaldisiensis
Bulimina elongata
Lagena laevigata
Cibicides lobatulus
Glandulina laevigata
Aurila convexa
Globigerina bulloides
Bulimina elongata var. subulata
Elphidium antoninum
Nonion soldanii
Cibicides refulgens
Lagena hexagona
Elphidium inflatum
Cassidulina subglobosa
Sigmoilina celata
Cibicides peelensis
Cytheridea mulleri
Pyrgo bulloides
Pullenia quinqueloba
Rotalia beccarii var.
Lagena striata
Glandulina aequabilis
Bulimina elongata var. tenera
Cibicides aknerianus

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MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE: 3.12.68 | ANALYST: CWH. PR. | LOCATION: Norwegian North Sea Well 7/11-3X

FOR: Phillips Petroleum Company, Norway. | CHART NO. 3 | 3000' - 4000'

LIMESTONE | SILTSTONE | S SALT
DOLOMITE | SANDSTONE | COAL
OOLITIC LIMESTONE | CONGLOMERATE | C CHERT
CLAY | GYPSUM | P Pyrite
SHALE | VOLCANICS | F Fossil fragments
SILTY/SANDY SHALE | INTRUSIVES |

LITHOLOGY

DEPTH IN FEET: 100 200 300 400 500 600 700 800 900 1000

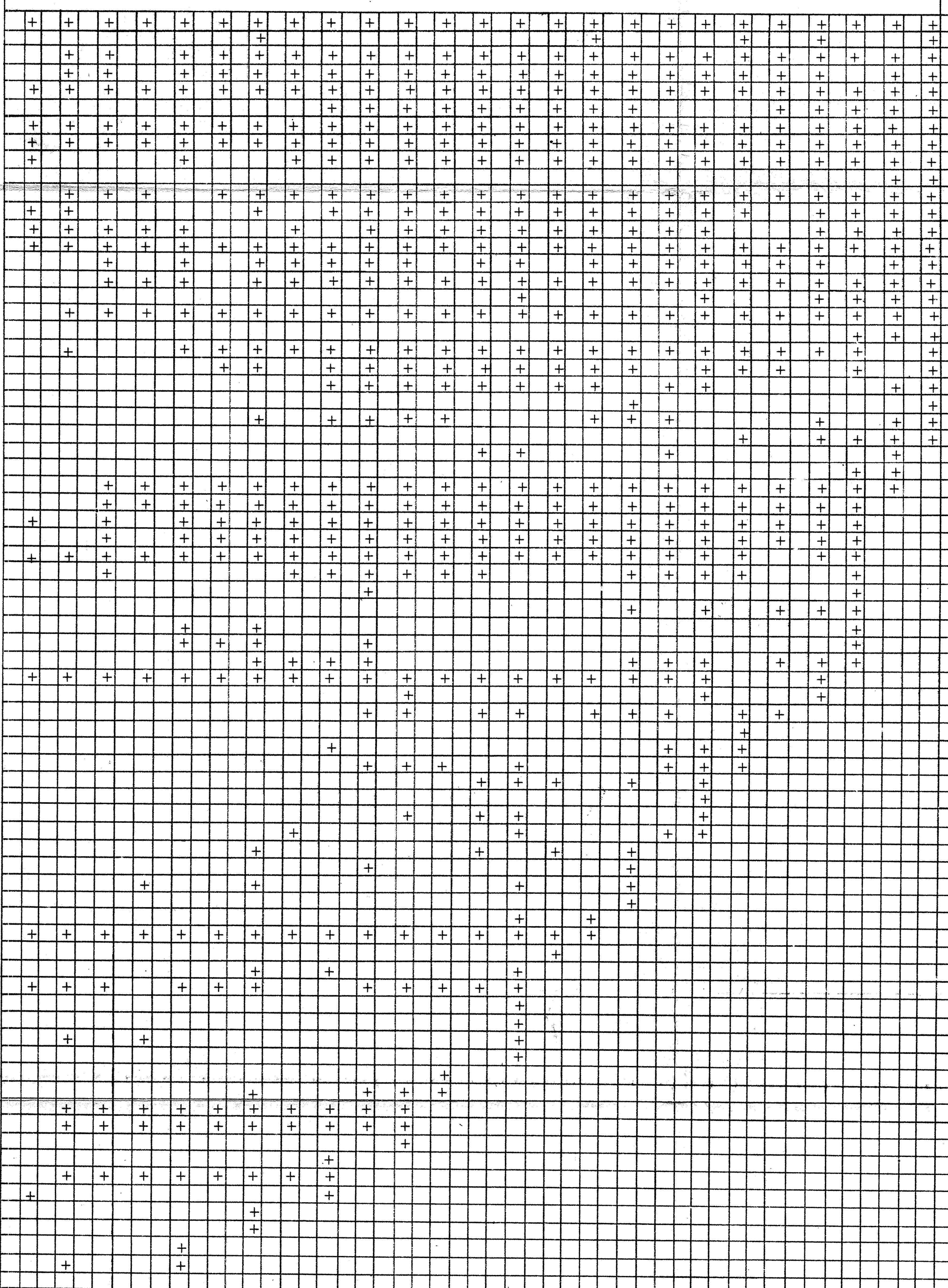
SYSTEM: UPPER MIOCENE — MIDDLE MIOCENE

STAGE: LOWER DIESTIAN

ZONE

MICROFOSSILS

FORAMINIFERA AND OSTRACODA



Cassidulina laevigata
Dentalina soluta
Bulimina elongata var. subulata
Cibicides aknerianus
Globigerina bulloides
Uvigerina asperula
Nonion affine
Nonion soldanii
Nonion granosum
Bulimina elongata
Quinqueloculina seminulum
Bulimina elongata var. tenera
Elphidium antoninum
Sigmoilina celata
Lagena laevigata
Cibicides lobatulus var. grossa
Pullenia quinqueloba
Rotalia beccarii var.
Elphidium advenum
Cibicides pseudoungerianus
Glandulina laevigata
Elphidium inflatum
Nonion barleeanum var. inflatum
Nodosaria pyrula
Discorbis milletti
Lagena striata
Bolivina subspinescens
Cibicides pygmensis
Pullenia sphaeroides
Loxostomum sinuosum
Cassidulina subglobosa
Globigerina angustiumbilicata
Bolivina beyrichi
Lenticulina grandis
Pyrgo bulloides
Sphaeroidina bulloides
"Cythere" latimarginata
Karreriella siphonella
Nonion boueanum
Vaginulina obtusicosta
Eponides repandus
Spiroloculina canaliculata
Aurila convexa
Listerella communis
Quadracythere macropora
Haplophragmoides latidorsatus
Nodosaria scalaroides
Cibicides lobatulus
Lenticulina hauerina
Krithe cf. papillosa
Cancris auriculus
Cyclammina placenta
Cytherella beyrichi
Globigerina praebulloides praebulloides
Carinocythereis aff. carinatum
Trifarina bradyi
Uvigerina hosiusi
Lagena tenuis
Lagena sulcata
Lagena hexagona
Echinocythereis scabra
Ammodiscus sp.
Siphotextularia labiata
Globorotalia mayeri
Globigerina cf. venezuelana
Dentalina divergens
Glandulina aequabilis
Uvigerina canariensis
Bolivina cf. cookei
Cytheridea mülleri
Globorotalia inflata
Orbulina universa
Sigmoilina miocenica

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST	LOCATION	
5.12.68.	CWH PR	Norwegian North Sea Well 7/11-3X	
FOR			CHART NO. 4
Phillips Petroleum Company, Norway			4000' - 5000'

LIMESTONE — SILTSTONE — SALT
DOLOMITE — SANDSTONE — COAL
OOLITIC LIMESTONE — CONGLOMERATE — CHERT
CLAY — GYPSUM — P Pyrite
SHALE — VOLCANICS
SILTY/SANDY SHALE — INTRUSIVES

LITHOLOGY | DEPTH IN FEET | SYSTEM | STAGE | ZONE

MIDDLE MIOCENE

FORAMINIFERA AND OSTRACODA

MICROFOSSILS

- Globigerina angustiumbilicata
- Rotalia beccarii var.
- Globigerina bulloides
- Nonion affine
- Nonion soldanii
- Cassidulina laevigata
- Loxostomum sinuosum
- Bulimina elongata var. subulata
- Uvigerina canariensis
- Uvigerina hosiusi
- Cibicides peelensis
- Nonion boueanum
- Pullenia sphaeroides
- Elphidium antoninum
- Cibicides aknerianus
- Sigmoilina celata
- Glandulina laevigata
- Globigerina praebulloides praebulloides
- Globigerina venezuelana
- Lenticulina hauerina
- Globorotalia mayeri
- Bolivina beyrichi
- Sphaeroidina bulloides
- Eponides repandus
- Nonion granosum
- Haplophragmoides latidorsatus
- Cassidulina subglobosa
- Glomospira charoides
- Quinqueloculina seminulum
- Krithe cf. papillosa
- Coscinodiscus sp.
- Lagena laevigata
- Cibicides lobatulus
- Cibicides pseudoungerianus
- Epistomina elegans
- Bathysiphon dubia
- Listerella communis
- Bulimina elongata var. tenera
- Cancris auriculus
- Ammodiscus incertus
- Cyclammina sp.
- Cyclammina placenta
- Ammodiscus dominicensis
- Lenticulina grandis
- Nodosaria pyrula
- Globigerina foliata
- Globigerina bradyi
- Globorotaloides variabilis
- Orbulina universa

OTHER FOSSILS

- Radiolaria

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE: 9.12.68. | ANALYST: CWH, PR | LOCATION: Norwegian North Sea Well 7/11-3X

FOR: Phillips Petroleum Company, Norway | CHART NO. 5 | 5000' - 6000'

LITHOLOGY: LIMESTONE, DOLOMITE, OOLITIC LIMESTONE, CLAY, SHALE, SILTY/SANDY SHALE; SILTSTONE, SANDSTONE, CONGLOMERATE, GYPSUM, VOLCANICS, INTRUSIVES; SALT, COAL, CHERT, P Pyrite

DEPTH IN FEET: 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000

SYSTEM: LOWER MIOCENE | MIDDLE MIOCENE

STAGE: BURDIGALIAN | AQUITANIAN (?)

ZONE

MICROFOSSILS

FORAMINIFERA

Uvigerina hosiusi	
Globigerina bulloides	
Globigerina juvenilis	
Globigerina foliata	
Globigerina bradyi	
Globigerina angustiumbilicata	
Globigerina praebulloides praebulloides	
Cyclammina sp.	
Nonion affine	
Nonion soldanii	
Eponides repandus	
Pullenia sphaeroides	
Bulimina elongata var. tenera	
Bulimina elongata var. subulata	
Loxostomum sinuosum	
Cassidulina laevigata	
Pyrulina cylindroides	
Cyclammina placenta	
Haplophragmoides latidorsatus	
Bathysiphon dubia	
Ammodiscus incertus	
Cassidulina subglobosa	
Rotalia beccarii var.	
Glomospira charoides	
Globorotalia mayeri	
Gyroidina girardana	
Sigmoilina celata	
Ammodiscus dominicensis	
Cibicides aknerianus	
Sphaeroidina bulloides	
Nonion boueanum	
Glandulina laevigata	
Pullenia quinqueloba	
Listerella communis	
Orbulina universa	
Uvigerina tenuipustulata	
Uvigerina canariensis	
Cibicides peelensis	
Dentalina divergens	
Trifarina bradyi	
Globorotalia fohsi barisanensis	
Globorotalia scitula scitula	
Orbulina suturalis	
Pseudoclavulina chitinosa	
Angulogerina gracilis var. tenuistriata	
Sphaeroidinellopsis seminulina seminulina	
Sigmoilina miocenica	
Siphonina sp.	
Frondicularia nysti	
Lagena laevigata	
Haplophragmoides carinatum	
Globigerinoides triloba immatura	
Globigerinoides triloba triloba	
Globorotalia scitula praescitula	
Haplophragmoides cf. latidorsatus	
Asterigerina staeschei	
Bulimina elongata	
Karreriella siphonella	

OTHER FOSSILS

Radiolaria	

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE: 17.12.68. | ANALYST: CWH, PR. | LOCATION: Norwegian North Sea Well 7/11-3X

FOR: Phillips Petroleum Company, Norway | CHART NO. 6: 6000' - 7000'

LIMESTONE, DOLOMITE, OOLITIC LIMESTONE, CLAY, SHALE, SILTY/SANDY SHALE, SILTSTONE, SANDSTONE, CONGLOMERATE, GYPSUM, VOLCANICS, INTRUSIVES, SALT, COAL, CHERT

LITHOLOGY | DEPTH IN FEET | SYSTEM | STAGE | ZONE

100 200 300 400 500 600 700 800 900 1000

OLIGOCENE

LOWER MIOCENE

AQUITANIAN

FORAMINIFERA

MICROFOSSILS

- Globigerinoides triloba triloba
- Globigerinoides triloba immatura
- Globorotalia scitula praescitula
- Globorotalia fohsi barisanensis
- Asterigerina staeschei
- Gyroidina girardana
- Cyclammina placenta
- Cyclammina sp.
- Haplophragmoides latidorsatus
- Eponides umbonatus
- Cibicides aknerianus
- Globigerina angustiumbilicata
- Globigerina praebulloides praebulloides
- Nodosaria spinescens
- Bathysiphon dubia
- Uvigerina tenuipustulata
- Nonion boueanum
- Lagena laevigata
- Glomospira charoides
- Pullenia sphaeroides
- Nodosaria scalaroides
- Coscinodiscus sp.
- Pseudoclavulina chitinosa
- Sigmoilina celata
- Bulimina elongata var. subulata
- Haplophragmoides carinatum
- Haplophragmoides narivaensis
- Lenticulina grandis
- Karreriella siphonella
- Globorotalia mayeri
- Ammodiscus incertus
- Nonion affine
- Globigerina concinna
- Loxostomum sinuosum
- Sphaeroidinellopsis seminulina seminulina
- Hormosina sp.
- Cancris turgidus
- Globigerina aff. ampliapertura
- Cribrostomoides sp. 1
- Bulimina alsatica
- Sphaeroidina variabilis
- Rhabdammina sp.
- Recurvoides sp.
- Globigerina praebulloides leroyi
- Frondicularia seminuda
- Gravellina cf. narivaensis
- Ammodiscus dominicensis
- Catapsydrax unicavus
- Bulimina elongata
- Siphonodosaria hirsuta
- Sigmomorphina regularis

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MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE: 20.12.68. | ANALYST: CWH PR | LOCATION: Norwegian North Sea Well 7/11-3X

FOR: Phillips Petroleum Company Norway | CHART NO. 7 | 7000' - 8000'

LIMESTONE, DOLOMITE, OOLITIC LIMESTONE, CLAY, SHALE, SILTY/SANDY SHALE, SILTSTONE, SANDSTONE, CONGLOMERATE, GYPSUM, VOLCANICS, INTRUSIVES, SALT, COAL, CHERT

LITHOLOGY | DEPTH IN FEET | SYSTEM | STAGE | ZONE

OLIGOCENE

MICROFOSSILS

FORAMINIFERA AND OSTRACODA

- Asterigerina gürichi
- Coscinodiscus sp.
- Bathysiphon dubia
- Cyclammina sp.
- Cyclammina placenta
- Ammodiscus incertus
- Cibicides tenellus
- Haplophragmoides latidorsatus
- Haplophragmoides carinatum
- Eponides umbonatus
- Haplophragmoides narivaensis
- Sigmoilina schlumbergeri
- Rhabdammina sp.
- Sigmoilina tenuis
- Cassidulina laevigata
- Globigerina praebulloides praebulloides
- Bulimina elongata var. tenera
- Nonion affine
- Globigerina angustiumbilicata
- Ammodiscus dominicensis
- Cribrostomoides sp. 1
- Bulimina alsatica
- Gravellina cf. narivaensis
- Sphaeroidina variabilis
- Catapsydrax unicavus
- Hormosina sp.
- Cytherella cf. transversa
- Pullenia sphaeroides
- Lenticulina hauerina
- Nodosaria spinescens
- Quinqueloculina buchiana
- Cancris turgidus
- Glomospira charoides
- Pseudoclavulina chitinosa

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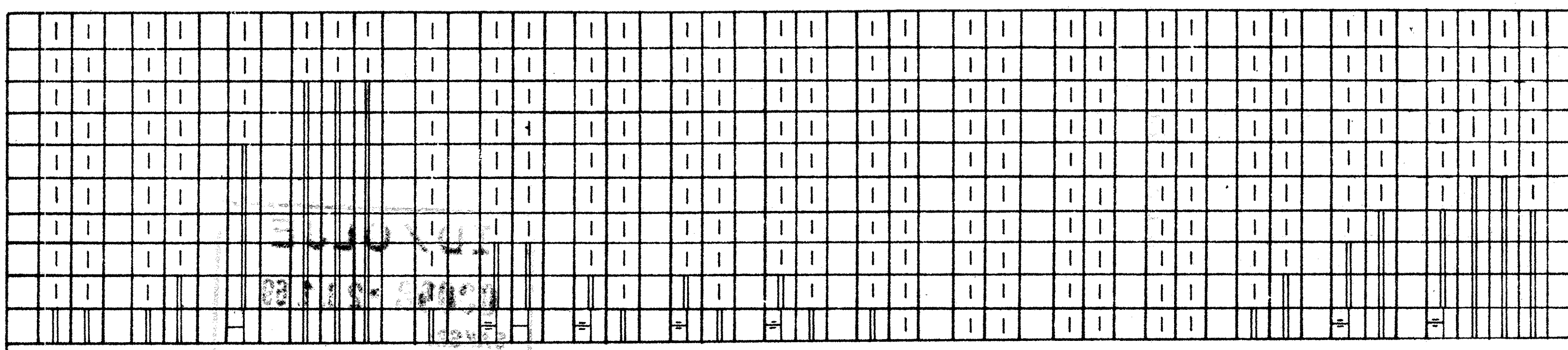
MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST	LOCATION	
20.12.68.	CWH, PR.	Norwegian North Sea Well 7/11-3X	
FOR Phillips Petroleum Company, Norway			CHART NO. 8 8000' - 9000'

LIMESTONE · SILTSTONE · SALT
DOLOMITE · SANDSTONE · COAL
OOLITIC LIMESTONE · CONGLOMERATE · CHERT
CLAY · GYPSUM
SHALE · VOLCANICS
SILTY/SANDY SHALE · INTRUSIVES

LITHOLOGY



DEPTH IN FEET

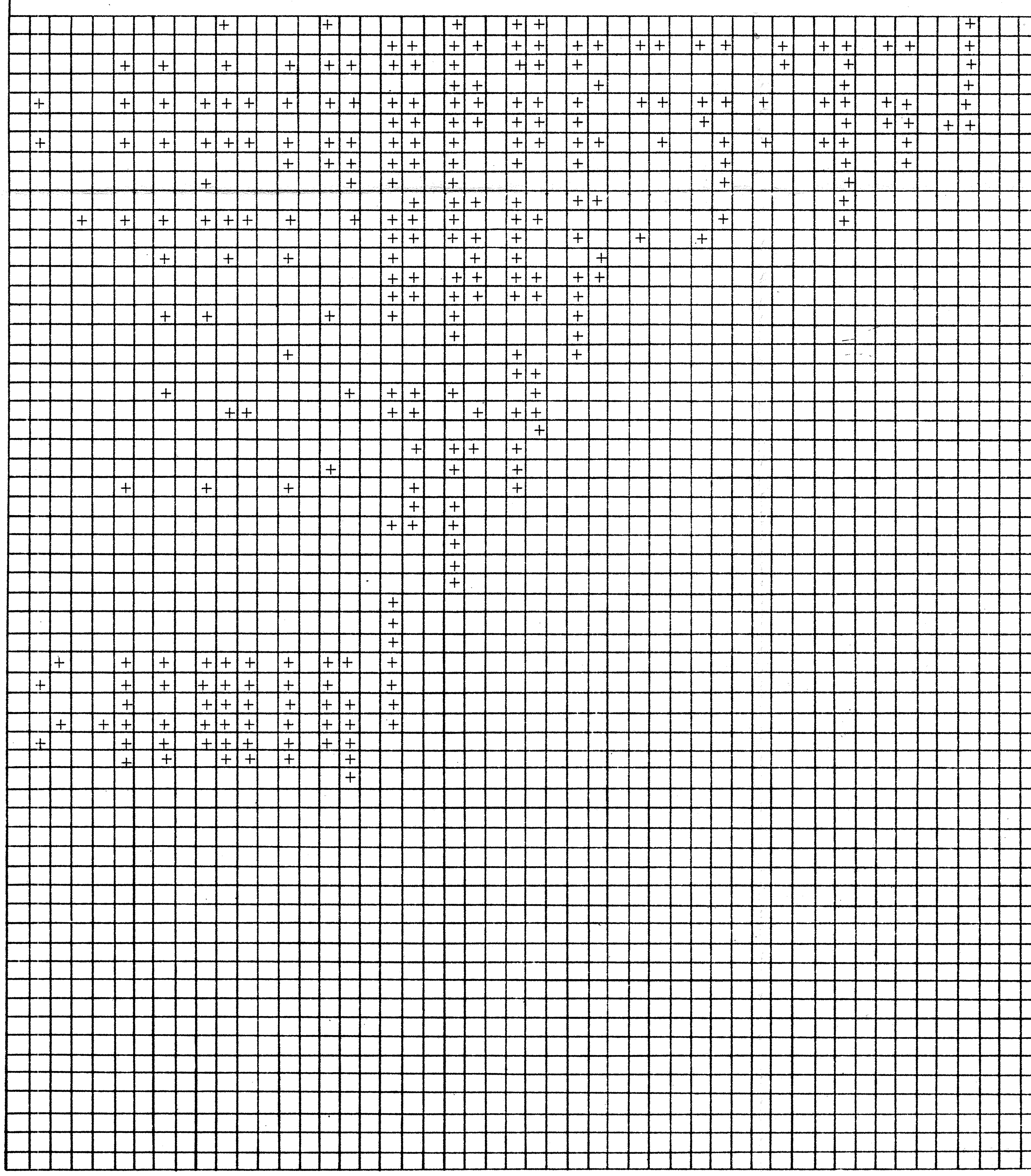
SYSTEM

EOCENE | OLIGOCENE

STAGE

ZONE

MICROFOSSILS



FORAMINIFERA AND OSTRACODA

Coscinodiscus sp.
Bathysiphon dubia
Ammodiscus incertus
Pseudoclavulina chitinosa
Cyclammina sp.
Cyclammina placenta
Glomospira charoides
Haplophragmoides narivaensis
Sigmoilina schlumbergeri
Ammodiscus dominicensis
Haplophragmoides latidorsatus
Globigerina angustiumbilicata
Catapsydrax unicavus
Globigerina praebulloides praebulloides
Globigerina globulosa
Sigmoilina tenuis
Echinocythereis scabra
Rhabdammina sp.
Cibicides tenellus
Nonion affine
Haplophragmoides carinatum
Lenticulina grandis
Quinqueloculina buchiana
Hormosina sp.
Lagena laevigata
Asterigerina gürichi
Gyroidina girardana
Cribrostomoides sp. 1
Guttulina problema
Hemicytherideis cf. lithodomoides
Pullenia quinqueloba
Gravellina cf. narivaensis
Rotaliatina buliminoides
Trochammina globigeriniformis
Trochammina globigeriniformis var. altiformis
Cribrostomoides sp. 2
Bathysiphon eocenicus
Globigerina cf. linaperta linaperta
Globigerina barbosa
Glandulina laevigata

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST	LOCATION
23.12.68.	CWH, PR.	Norwegian North Sea Well 7/11-3X

FOR: Phillips Petroleum Company, Norway

CHART NO: 9000' - 10000'

LIMESTONE, DOLOMITE, OOLITIC LIMESTONE, CLAY, SHALE, SILTY/SANDY SHALE, SILTSTONE, SANDSTONE, CONGLOMERATE, GYPSUM, VOLCANICS, INTRUSIVES, SALT, COAL, CHERT, P Pyrites

LITHOLOGY | DEPTH IN FEET | SYSTEM | STAGE

100 200 300 400 500 600 700 800 900 1000

EOCENE

?LOWER EOCENE - ?PALAEOCENE

PALAEOCENE

ZONE

MICROFOSSILS

FORAMINIFERA

- Glomospira charoides
- Bathysiphon eocenicus
- Cyclammina sp.
- Catapsydrax unicavus
- Ammodiscus incertus
- Trochammina globigeriniformis
- Haplophragmoides latidorsatus
- Coscinodiscus sp.
- Trochammina globigeriniformis var. altiformis
- Globigerina barbosa
- Sigmoilina tenuis
- Hormosina sp.
- Haplophragmoides carinatum
- Cribrostomoides sp. 1
- Cibicides sulzensis
- Globigerina cf. linaperta linaperta
- Pullenia sphaeroides
- Rhabdammina sp.
- Pelosina sp.
- Globigerina cf. senni
- Nonion affine
- Cibicides proprius
- Globigerina triangularis
- Cyclammina incisa
- Trochammina pentagona
- Cyclammina challinori
- Globigerina triloculinoides
- Globigerina cf. spiralis
- Globigerina inaequispira
- Glomospirella woodi
- Haplophragmoides cf. obliquicameratus

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST	LOCATION	
29.12.68.	PR, CWH, JWC.	Norwegian North Sea Well 7/11-3X	
FOR			CHART NO. 10
Phillips Petroleum Company, Norway			10000' - 11000'

LIMESTONE, DOLOMITE, OOLITIC LIMESTONE, CLAY, SHALE, SILTY/SANDY SHALE, SILTSTONE, SANDSTONE, CONGLOMERATE, GYPSUM, VOLCANICS, INTRUSIVES, SALT, COAL, CHERT, Glauconite (G), Pyrites (P), White Chalk

* Reworked Upper Cretaceous forms

LITHOLOGY

DEPTH IN FEET: 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000

SYSTEM: PALAEOCENE; DANIAN

STAGE

ZONE

Core 1

Core 2

Core 3

MICROFOSSILS — FORAMINIFERA

Globigerina triloculinoides	
Globigerina inaequispira	
Haplophragmoides carinatum	
Glomospirella woodi	
Coscinodiscus sp.	
Bathysiphon eocenicus	
Haplophragmoides cf. obliquicameratus	
Involutina pyrotecnica	
Trochamminoides sp.	
Cibicides proprius	
Cyclammina challinori	
Cribrostomoides sp. ?	
Cyclammina incisa	
Trochammina globigeriniformis	
Trochammina globigeriniformis var. altiformis	
Globigerina cf. pseudobulloides	
Trochammina pentagona	
Spiroplectammina spectabilis	
Pseudotextularia elegans fructicosa	*
Globigerina pseudobulloides	
Osangularia lens	
Globotruncana arca	*
Rugoglobigerina rugosa rugosa	*
Gavelinella bullata	
Pseudotextularia elegans elegans	*
Rugoglobigerina rugosa rotundata	*
Allomorphina halli	
Allomorphina paleocenica	
Robulus turbinatus	
Pullenia quaternaria	

OTHER FOSSILS

Radiolaria