Appendix III

BIOSTRATIGRAPHY OF WELL 31/2-5 (NORSKE SHELL)

by

D.O.J. Diederix

and

E. Noordermeer-Perreijn

(SIPM, EP/12)

April 1981

Enclosures:

1. Microfaunal distribution chart (1040 - 1534.5 m), scale 1 : 2500
2. Palynological distribution chart (1535.5 - 2515.1 m), scale 1: 1000

1. INTRODUCTION

On request of Norske Shell, SIPM (EP/12.1) carried out a biostratigraphic study of the sedimentary section penetrated by well 31/2-5.

The major objective of this well was an evaluation of the Jurassic sequence. For the Tertiary and Cretaceous, the main interest was in establishing the major time-stratigraphic boundaries.

The biostratigraphic results led to the following time-stratigraphic interpretation (not adjusted to wireline log readings):

(1040-) - 1127 m	:	Oligocene
1127 - 1396 m	:	Eocene
1396 - 1532.5	:	Paleocene
1533.5 - 1534.5 m	:	Campanian - Maastrichtian
1535.5 - 1668.5 m	:	Oxfordian
1535.5 - 1607.3 m	:	late Late Oxfordian
1636.2 - 1651.5 m	:	early Late Oxfordian
1657.3 - 1668.5 m	:	Early Oxfordian
1677.5 - 1836.6 m	:	Callovian
1677.5 - 1696.5 m	:	Late Callovian
1713 - 1792.5 m	:	Middle Callovian
1796.7 - 1836.6 m	:	Early Callovian
1852.7 - 1884.6 m	:	Late Bathonian to Early Callovian
1894.5 - 1955.2 m	:	Middle Bathonian
1967.1 - 1994.5 m	:	Aalenian to Middle Bathonian
2001.2 - 2017 m	:	Aalenian to Bajocian
2035.1 - 2071.4 m	:	Aalenian
2081.7 - 2189.7 m	:	Toarcian
2201 - 2467.3 m	:	Pliensbachian
2472.1 m	:	?Rhaetian
2479.5 - 2515,1 m	:	?Rhaetian and/or older

2. MICROFAUNA

2.1 General

In order to establish the broad time-stratigraphic frame of the Tertiary-Cretaceous section in well 31/2-5, 29 sidewall cores (1040 - 1534.5 m), 18 ditch cutting samples (1260 - 1528 m) and 3 core chips (1511.75 - 1517.35 m) have been analyzed on microfaunal content. The investigations started at 1040 m, i.e. at the shallowest SWS taken from supposedly Eocene sediments.

As the micropalaeontological studies concentrated on checking of presence/absence of marker types only, the data as presented on the faunal distribution chart (encl. 1) do not give a full account of the assemblages encountered, as only key types and more common species have been recorded.

The quoted depth figures are sample depths, no adjustments to wireline log depths have been attempted. Especially where cutting samples had to be used, discrepancies might be expected.

2.2 Oligocene (highest SWS at 1040 - 1127 m)

The Oligocene age of (part of) this interval is based on the co-occurrence, in SWS 1040 and 1073 m, of

Rotalia canui CUSHMAN
Rotaliatina bulimoides (REUSS)
Sigmoilina sp. A
Turrilina alsatica ANDREAE

in association with

Alabamina tangentialis (CLODIUS)
Cassidulina subglobosa BRADY
Gyroidina girardana (REUSS)
Melonis affine (REUSS)
diatoms
radiolaria
sponge spicules

The base of the Oligocene section cannot be defined accurately on faunal criteria, but a marked log change at 1127 m has been taken to represent the Oligocene/Eocene boundary. A similar log change was observed in well 31/2-3 at 920 m.
Depositional environment: The microfaunal content of the three studied SWS (1040, 1073 and 1107 m) suggests an outer neritic to possibly bathyal environment of deposition.

2.3 Eocene (1127 - 1396 m)

A sidewall core from 1132.5 m yielded a purely arenaceous, non-diagnostic foraminiferal fauna associated with some fish remains. Such poor assemblages are a well-known feature from the upper part of the Eocene in 31/2 block.

The deeper samples (1160 - 1330 m) contain a relatively rich and well diversified arenaceous assemblage with, amongst others,

Ammodiscus sp
Bathysiphon sp
Cyclammina amplectens GRZYBOWSKI
Cyclammina challinori HAYNES
Cyclammina sp
Dorothia cf eocenica (CUSHMAN)
Dorothia sp
Haplophragmoides sp. A
Trochammina sp

Below 1260 m the foraminiferal associations also contain the following Early Eocene markers:

Ammomarginulina sp. A
Spiroplectammina spectabilis (GRZYBOWSKI)
Textularia plummerae LALICKER
Trochammina diagonis (CARSEY)
in association with
Bathysiphon robustus (GRZYBOWSKI)
Glomospira charoides (JONES & PARKER)
Glomospira gordialis (JONES & PARKER)
Haplophragmoides glabra CUSHMAN & WATERS
pyritized diatoms

In SWS 1329 m and cutting 1340 m some calcareous planktonic and benthonic foraminifera were found, e.g.:
Globigerina linaperta/triloculinoides gr.
Pulvinulinella culter (PARKER & JONES)
Similar mixed arenaceous/calcareous assemblages have been encountered in well 31/2-1 at 1170-1180 m, in well 31/2-2 at 1100 - 1130 m, in well 31/2-3 at 1130 - 1150 m, and in well 31/2-4 at 1190 m.

The samples from the lowermost part of the Eocene section (1340 - 1375.8 m) are characterized by rich occurrences of pyritized diatoms, such as
Coscinodiscus sp. 1 BETTENSTAEDT
Coscinodiscus sp. 2 BETTENSTAEDT
Triceratium sp. 1 BETTENSTAEDT
together with poorly preserved arenaceous foraminifera.

In analogy with previously studied wells from the 31/2 block, the Eocene-Paleocene boundary was taken at the base of the tuffaceous lithologies at 1396 m (wire-line log evidence).

Depositional environment: Deeper marine, probably bathyal-outer neritic.

2.4 Paleocene (1396 - 1532.5 m)

The samples from the higher part (1399.4 - 1411.7 m) are practically devoid of any microfauna, as observed regionally in deposits immediately below the basal Eocene tuffaceous strata.

The next deeper interval (1435.2 - 1532.5 m) yielded rich and diversified arenaceous assemblages, similar to the ones from the Eocene, but with the following Paleocene markers:

Rzehakina epigona lata CUSHMAN & JARVIS
Rzehakina epigona minima CUSHMAN & RENZ
Saccamina rhumbleri (FRANKE)

From SWS 1486 m downwards very coarse-grained Bathysiphon specimens were noticed, as also observed in well 31/2-1 below 1332.1 m, in 31/2-2 below 1284.3 m, in 31/2-3 below 1314 m and in 31/2-4 below 1320 m.

In the interval 1501 - 1532.5 m the enumerated arenaceous types continue to be dominant, but also some scarce calcareous species occur, viz.

Bulimina aff. aculeata D'ORBIGNY
Bulimina aff. denticulata CUSHMAN & PARKER
Gyroidina nitida (REUSS)
Rotalia parvula TEN DAM

These calcareous types are indicative for an Early Paleocene (Danian) age.

Depositional environment: Deeper marine, outer neritic - bathyal.

2.5 Late Cretaceous (1533.5 - 1534.5 m)

Two SWS, 1533.5 and 1534.5 m, yielded a rich, although poorly preserved assemblage of Late Cretaceous (Campanian-Maastrichtian) foraminifera (and calcispheres) viz.

Allomorphina allomorphinoides (REUSS)
Bulimina triangularis CUSHMAN & PARKER
Buliminella carseyae PLUMMER
Buliminella obtusa (D'ORBIGNY)
Buliminella parvula BROTZEN
Gavelinella pertusa (MARSSON)
Gavelinopsis bembix (MARSSON)
Globorotalites multiseptus (BROTZEN)
Heterohelix striata/globulosa (EHRENBERG)
Lagena marginata (WALKER & BOYS)
Marssonella oxycona (REUSS)
Praeglobotruncana citae (BOLLI)
Pseudoguembelina excolata (CUSHMAN)
Rugoglobigerina rugosa (PLUMMER)
Stensioina americana CUSHMAN & DORSEY
Stensioina pommerana BROTZEN
Valvulina bullata BROTZEN

Couldn't this be a reworked sequence i.e. Maastrich fm eg.

The presence in SWS 1533.5 m of the Paleocene marker Rotalia parvula TEN DAM can be ascribed to mud contamination.

Depositional environment: Open marine, outer neritic - bathyal.

3. PALYNOMORPHS

3.1 General

A total of 95 sidewall cores and 8 core chips of supposedly Jurassic and older age have been investigated. All samples have been prepared following the standard preparation method, consisting of treatment with HCl and HF, followed by a heavy liquid separation (zinc bromide with S.G. of 2.2). The organic residue was finally sieved through microsieves of 15 micron to concentrate palynomorphs and of 30 micron in order to concentrate dinocysts. Especially in the Jurassic interval, the organic residues received an oxidation by means of cold HNO_3 for a further concentration of palynomorphs.

Ten samples proved to be entirely barren of palynomorphs. A further 19 samples did not contain any dinocysts.

Palynomorph distributions have been recorded on a distribution chart (encl. 2). For the Middle and Upper Jurassic, only dinocysts have been plotted, as general experience has shown such microfossils to be of better stratigraphic use than sporomorphs, provided marine strata are investigated. It should be realized, however, that the overall sandy development of the Middle to Upper Jurassic influenced dinocyst recoveries unfavourably. In the Bajocian to uppermost Triassic interval the diversity of dinocyst species decreased markedly, in agreement with the known evolutionary development of the dinoflagellates. Therefore, selected sporomorph types have been used for a subdivision of this interval, starting from the top occurrence of the dinocyst species Nannoceratopsis gracilis, at 2001.2 m. The age determinations below 2200 m have been based on sporomorph studies, which were carried out by R.A. Couper (EP/12.1).

Throughout the studied section, the sporomorph colour is estimated as "upper light" corresponding to a FCC of less than about 69.

The quoted depth figures are sample depths, no adjustments to wireline log depths have been attempted.

3.2 Oxfordian (1535.5 - 1668.5 m)

Seventeen samples have been examined, of which five proved to be barren of dinocysts.

The whole interval could be dated as Oxfordian, based on the occurrence of the following species:

Adnatosphaeridium aemulum (range: Late Callovian to Oxfordian)
Chytroeisphaeridia chytroeides (Callovian to Oxfordian, common in Oxfordian)
Endoscrinium galeritum (Callovian to Oxfordian)
Occisucysta areolata (Early Oxfordian)
Prolixosphaeridium capitatum (Callovian to Oxfordian)
Scriniodinium crystallinum (rare in Callovian, common in Oxfordian)
Stephanelytron redcliffense (Late Callovian to Oxfordian)
Nov. gen. G nov. sp. 1 (= E 1338/Callovian to Oxfordian)

The interval can be subdivided into three parts, i.e.

a. Late Oxfordian, upper part (1535.5 - 1607.3 m).
Eight samples were investigated, 5 of them proved to be barren of dinocysts. In this section, the marker types which are common in the lower part of the Upper Oxfordian are absent or very rare, except for the frequent presence of the Late Oxfordian Lithodinia sp. 3 (= type E 1778)

b. Late Oxfordian, lower part (1636.2 - 1651.5 m).
Five samples contained fairly rich dinocyst assemblages. The age is determined by the regular presence of:

Escharisphaeridia "infrarugulata" (manuscript name / = E 1836)
Gonyaulacysta jurassica subsp. longicornis

Furthermore, Early Oxfordian types are absent.

c. Early Oxfordian (1657.3 - 1668.5 m)
Four samples show the typical co-occurrence of
Occisucysta areolata
Wanaea fimbriata
in combination with other Oxfordian markers. The Late Oxfordian species Lithodinia sp. 3 (= E 1778) proved to be absent.

Note: The tentative threefold subdivision of the Oxfordian is even more apparent in well 31/2-4. In the wells 31/2-1, -2 and -3 only an Early and a Late Oxfordian could be recognized, no further subdivision of the Late Oxfordian being possible, probably due to the general paucity of dinocysts in these intervals.

3.3 Callovian (1677.5 - 1836.6 m)

Out of a total of 33 investigated samples, 22 proved to contain dinocysts.

The age was concluded from the presence of the following types:
Atopodinium prostatum (common in Callovian, top in Oxfordian)
Compositosphaeridium costatum (Late Callovian to Oxfordian)
Energlynia acollaris (Middle to Late Callovian)
Gonyaulacysta jurassica (base in Early Callovian)
Heslertonia teichophera (Callovian to Early Oxfordian)
Hystrichogonyaulax pectinigera (Middle Bathonian to Middle Callovian)
Lithodinia jurassica (Middle to Late Callovian)
Lithodinia sp. 1 (= L. "suturocomplexa" ms. name/= E 1474/ Late Bathonian to Middle Callovian)
Mendicodinium woodhamensis (common in Callovian, top in earliest Oxfordian)
Pareodinia prolongata (Middle Bathonian to Callovian)
Sentusidinium rioultii (base in Early Callovian)
Wanaea digitata (Late Callovian to Early Oxfordian)
Nov. gen.G n. sp.1 (= E 1338/Callovian to Oxfordian)

Tentatively, the Callovian interval has been subdivided into three units, viz.

a. Late Callovian (1677.5 - 1696.5 m).
The base of this interval is defined as directly above the top occurrence of Lithodinia sp.1 (= L. " suturocomplexa" ms. name/= E 1474).
Within this unit, the following species demonstrate their base occurrences:
Adnatosphaeridium aemulum
Compositosphaeridium costatum
Stephanelytron redcliffense
Wanaea digitata
Nov. gen.F n. sp.4 (= E 1728)
Furthermore, Lithodinia jurassica is present, a species with a known top occurrence in the Late Callovian.

b. Middle Callovian (1713 - 1792.5 m).
In addition to the markers, typifying the Callovian in general, this interval is marked by the presence of Lithodinia sp.1 (= L. "suturocomplexa" ms. name/= E 1474) and absence of the enumerated Late Callovian types.

c. Early Callovian (1796.7 - 1836.6 m).
Within this interval the following types have their base occurrences, viz.

Gonyaulacysta jurassica
Sentusidinium rioultii

Moreover, a number of new, and as yet unpublished species are common to abundant in the lower part of this interval, e.g.

Hystrichosphaeridium sp. (= M 20558)
cf. Lunatadinium sp. 1 (= E 1495)

The base of the interval is taken directly above the top occurrence of Emmetrocysta n. sp.1 (= E 1825)

3.4 Late Bathonian to Early Callovian (1852.7 - 1884.6 m)

Four sidewall samples contained relatively rich palynomorph assemblages. The main characteristic of the section is the top occurrence of Emmetrocysta n. sp.1 (= E 1825). Some other species have a usually conspicuous occurrence in this zone, viz.

Diacanthum filapicatum (Middle Bathonian to Early Callovian)
Lithodinia sp. 6 (= E 1712)
Lithodinia sp.10 (= E 1826/so far found only in wells 31/2-3 and -4)
Lithodinia sp. (= E 1792)

3.5 Middle Bathonian (1894.5 - 1955.2 m)

This interval is recognizable by the relatively regular occurrence of

?Chlamydophorella "rectilinea" ms. name (= E 1834/Middle Bathonian to Oxfordian, acme in Callovian)
Ctenidodinium sp.1 (= E 1828/in the UK sector of the North Sea known from only Middle Bathonian strata)
Hystrichogonyaulax regalis (also found as singular occurrence in SWS 1659.5 m, interpreted as reworked)
Hystrichogonyaulax sp.6 (= E 1832/in the UK sector of the North Sea found only in Middle Bathonian strata)
Pareodinia evittii (main occurrence in Middle Bathonian)

3.6 Barren (1967.1 - 1994.5 m)

The three sidewall cores from this interval proved to be barren of dinocysts.

3.7 Aalenian to Bajocian (2001.2 - 2017 m)

Two sidewall samples are characterized by Nannoceratopsis gracilis (top occurrence in Bajocian), whereas Mancodinium semitabulatum is absent. This latter type, found in the next deeper samples, is known to have a range from Late Pliensbachian to Aalenian. As it usually occurs only rarely, its absence does not justify a post-Aalenian age-determination.

3.8 Aalenian (2035.1 - 2071.4 m)

The three investigated samples are indicative for an Aalenian age based on the presence of

Mancodinium semitabulatum (Late Pliensbachian to Aalenian)
Nannoceratopsis gracilis (Late Pliensbachian to Bajocian)

and on the absence of Toarcian palynomorphs.

3.9 Toarcian (2081.7 - 2189.7 m)

Twelve sidewall samples were investigated and contained rich palynomorph assemblages. A Toarcian age was concluded on the abundant presence of the dinocyst species

Luehndea spinosa (main occurrence in Toarcian)
Nannoceratopsis gracilis (incl. N. senex)

and of the sporomorph species

Cerebropollenites macroverrucosus
Chasmatosporites magnolioides
Klukisporites variegatus (base in uppermost Pliensbachian)
Spheripollenites scabratus (base in Toarcian)

3.10 Pliensbachian (2201 - 2467.3 m)

Sixteen samples were examined of which 13 contain palynomorphs.
The top of the interval is taken directly below the basal occurrence of Spheripollenites scabratus in SWS 2189.7 m.
The age is confirmed by the common co-occurrence of the sporomorph species

Chasmatosporites thiergarti (actual top in lowermost Toarcian)
Densoisporites pseudolaesuratus (base in Pliensbachian)
Gleicheniidites senonicus (base in Pliensbachian)
Indusiisporites cf. velatus (Rhaetian to Late Pliensbachian)
Osmundacidites spinosus

These occurrences exclude a Sinemurian age and definite Sinemurian palynomorph markers proved to be absent in this well.

3.11 ?Rhaetian (SWS 2472.1 m)

This sidewall core yielded a rather poor sporomorph flora, consisting of numerous specimens of:

Riccisporites tuberculatus (Rhaetian to Early Hettangian)
and single specimens of
Limbosporites lundbladii (Rhaetian)
Striomonosaccites sp (= E 426/Rhaetian)

3.12 Barren (2479.5 - 2515.1 m)

None of the seven sidewall samples from this interval yielded any palynomorphs.

STANDARD LEGEND

NF	NO FAUNA/FLORA
•	1 SPECIMEN
/	2 - 5 SPECIMENS
○	6 - 20 "
●	21-100 "
■	> 100 "
▪	QUALITATIVE DETERMINATION

S	SINGLE
R	RARE
C	COMMON
F	FREQUENT
A	ABUNDANT

SAMPLES EXAMINED:

1. CORE SAMPLE
2. SIDEWALL SAMPLE
3. DITCH CUTTING
4. SURFACE SAMPLE
5. SEABOTTOM SAMPLE

SHELL INTERNATIONALE PETROLEUM MIJ.
THE HAGUE | EXPLORATION & PRODUCTION

NORWAY OFFSHORE

PALYNOLOGICAL DISTRIBUTION CHART

WELL: 31/2-5

SCALE 1:1000

AUTHOR: D.O.J. Diederix	ENCL.	DATE: April 1981
Well résumé 31/2-5, appendix III	2	DRAW NO: G.66238/2

31/2-5

SCHLUMBERGER

ELECTRICAL LOG

DEPTH IN DECIMETRES

SAMPLES EXAMINED | SPECIFIC DETERMINATION | INDEX

NF	SP	REG NO.	GENUS	GENUS AND SPECIES	REG NO.	GENUS
	1	1	G.GYROIDINA	G.GIRARDANA	1	ALABAMINA
	1	2	CASSIDULINA	C.SUBGLOBOSA	2	ALLOMORPHINA
	7	3	MONTOR	M.AFFINE	3	AMMOBACULITES
	1	4	ROTALIATINA	R.BULLOIDES	4	AMMODISCUS
	SP	5	BULIMINA		5	ANGULOGERINA
	3	6	ALABAMINA	A.TANDENTIALIS	6	ANNOVERTELLA
	7	7	ROTALIA	R.CANUI	7	ANOMALINA
	7	8	SIGMOILINA	SIGMOILINA SP.A	8	ANOMALINOIDES
	10	9	BULIMINA	TURRILINA ALBATICA	9	ARENOBULIMINA
	2	10	ARENAEGENUS		10	BATHYSIPHON
	SP	11	HAPLOPHRAGMOIDES	RECURVOIDES DISAMBIGUUS	11	BULIMINA
	SP	12	CYCLAMMINA		12	
	1	13	I.	C.AMPLECTENS	13	
	SP	14	AMMODISCUS		14	
	SP	15	BATHYSIPHON		15	
	15	16	HAPLOPHRAGMOIDES	HAPLOPHRAGMOIDES SP.B	16	
	4	17	CYCLAMMINA	C.CHALLINORI	17	
	9	18	DOROTHIA	D.EOCENICA	18	
	SP	19	TROCHAMMINA		19	
	3	20	SPIROPLECTAMMINA	S.SPECTABILIS	20	
	SP	21	DOROTHIA		21	
	SP	22	NODOSARIA		22	
	1	23	GLOBOSPIRA	G.GORDIALIS	23	
	22	24	TEXTULARIA	T.PLUMMERAE	24	
	13	25	HAPLOPHRAGMOIDES	H.COLABRA	25	
	2	26	GLOBOSPIRA	G.CHAROIDES	26	
	9	27	BATHYSIPHON	BATHYSIPHON SP.A	27	
	18	28	TROCHAMMINA	T.OLAPONIS	28	
	7	29	ANGULOGERINA		29	
	12	30	ANOMALINA		30	
	61	31	CIBICIDES		31	
	2	32	PARRELLA	PUEYINULINELLA CULTER	32	
	8	33	DOROTHIA	D.EOCENICA	33	
	18	34	AMMOBACULITES	AMMOBACULITES SP.A	34	
	SP	35	CALCARENOUS		35	
	17	36	TROCHAMMINA	T.QUADRILOBA	36	
	19	37	HAPLOPHRAGMOIDES	H.CORONATA	37	
	1	38	REOPHAX	CYSTAMMINA PRICTOCOCLATA	38	
	SP	39	AMMOBACULITES		39	
	SP	40	HAPLOPHRAGMOIDES		40	
	SP	41	QUINQUELOCULINA		41	
	42	42	D.IMPRESSA		42	
	49	43	ANOMALINA	GLOBOSPIRELLA WOODI	43	
	41	44	ANNOVERTELLA	H.KIRKI	44	
	45	45	HAPLOPHRAGMOIDES	S.RHUMBLERI	45	
	48	46	SACCAMMINA	P.QUATERNARIA	46	
	47	47	SIGMOILINA	RZEHAKINA EPIGONA LATA	47	
	48	48	PULLENIA	ANNOVERTELLA SP.A	48	
	49	49	SIGMOILINA	B.DENTICULATA	49	
	50	50	ANNOVERTELLA	TROCHAMMINA RUTHVEN-MURRAYI	50	
	51	51	BULIMINA	T.INFLATA	51	
	52	52	CYCLOPORA	B.AFFIACULATA	52	
	53	53	HAPLOPHRAGMOIDES	D.INTITA	53	
	54	54	TROCHAMMINA		54	
	55	55	BULIMINA		55	
	56	56	DENTALINA		56	
	57	57	GYROIDINA		57	
	58	58	LENTICULINA	RZEHAKINA EPIGONA MINIMA	58	
	59	59	SIGMOILINA		59	
	60	60	SPIROPLECTAMMINA		60	
	61	61	ANOMALINA	ROTALIA PARVULA	61	
	62	62		GAVELINELLA PERTUSA	62	
	63	63	BULIMINA	BULIMINELLA OBTUSA	63	
	64	64	CIBICIDES	GAVELINOPSIS BEMBIX	64	
	65	65	LAGENA	L.MARGINATA	65	
	66	66	MARGINULINA	M.OXYCONA	66	
	67	67	VAGINULINA		67	
	68	68	SIPHONINA	S.AMERICANA	68	
	69	69	ALLOMORPHINA	R.ALLOMORPHINOIDES	69	
	70	70	BULIMINA	B.TRINIDADENSIS	70	
	71	71		B.TRINIDADINA	71	
	72	72	STENSIOINA		72	
	73	73	ARENOBULIMINA		73	
	74	74	BULIMINA	BULIMINELLA CARSEYAE	74	
	75	75	EPONIDES	GLOBOROTALITES MULTISEPTUS	75	
	76	76	STENSIOINA	S.PYRENAICA	76	
	77	77	GLOBIGERINA	G.PRAEBULLOIDES	77	
	78	78		G.PRAEVA	78	
	79	79	PLANKTONICS		79	
	80	80	GLOBIGERINA	G.LINAPERTA/TRILOCULINOIDES	80	
	81	81	GLOBIGERINELLA		81	
	82	82	QUINQUELOCULINA		82	
	83	83		HETEROHELIX STRIATA/GLOBULOSA	83	
	84	84	PARAGLOBOTRUNC.	P.CITAE	84	
	85	85	ANOMALOGERINA	A.ANGULOSA	85	
	86	86	GLOBOTRUNCANA		86	
	87	87			87	
	88	88			88	
	89	89			89	
	90	90			90	
	91	91			91	
	92	92			92	
	93	93		COSCINODISCUS SP.1	93	
	94	94		COSCINODISCUS SP.2	94	
	95	95		TRACHYSPHAERA SP.1	95	
	96	96		COSCINODISCUS SP.3	96	
	97	97			97	
	98	98			98	
	99	99			99	

BENTHONIC FORAMINIFERA

PLANKTONIC FORAMINIFERA

OTHER FOSSILS

	CALCISPHERES
	CODCINODISCUS
	DISCOASTER
	FISH REMAINS
	RADIOLARIA
	SPONGES
	ECHINOIDS
	FORAM. REMAINS
	RADIOLARIA
	SPONGES
	ECHINOIDS

REMARKS

10400 R.bulimoides

G.linaperta/Trilocullinoides gr. 13400
Coscinodiscus spl

14860 ± cra Bathysiphon spp
15010 R.deaticulata

PALAEONTOLOGICAL AGE DETERMINATION | BIOSTRATIGRAPHIC SUBDIVISION

BIOFACIES DEVELOPMENT

MICROFLORAL ZONATION

TIME-STRATIGRAPHIC SUBDIVISION

DEPOSITIONAL ENVIRONMENTS

OLIGOCENE

outer neritic

possibly bathyal

OLIGOCENE

deeper marine, probably bathyal - outer neritic

PALEOCENE

EARLY | MIDDLE - LATE

deeper marine, outer neritic - bathyal

PALEOCENE

CA-MA | CA-MA

STANDARD LEGEND

NF	NO FAUNA/FLORA	
•	1 SPECIMEN	
/	2-5 SPECIMENS	
O	6-20 "	
●	21-100 "	
■	> 100 "	
X	QUALITATIVE DETERMINATION	

S	SINGLE
R	RARE
C	COMMON
F	FREQUENT
A	ABUNDANT

SAMPLES EXAMINED:

1. CORE SAMPLE
2. SIDEWALL SAMPLE
3. DITCH CUTTING
4. SURFACE SAMPLE
5. SEABOTTOM SAMPLE

SHELL INTERNATIONALE PETROLEUM MIJ.
THE HAGUE | EXPLORATION & PRODUCTION

NORWAY OFFSHORE

MICROFAUNAL DISTRIBUTION CHART

WELL : 31/2-5

SCALE 1:2500

AUTHOR:	E. Noordermeer	ENCL.	4
Wellresumé 31/2-5, appendix III		DATE:	April 1981
		DRAW NO:	G.66230/1