

Palynology and Source Rock Potential
of the Ebba 2/7-~~6~~ 19X(9(1))
Well, Norwegian
North Sea

By

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GEOLOGY FILE

Summary

The 14,910'-16,000' (TD) interval of the Ebba 2/7-19X well was divided palynostratigraphically into four intervals dated Barremian, Hauterivian, Hauterivian-Valanginian, and Valanginian-Berriasian. Source rock potential was determined for the interval between 13,900' and 16,000' (TD). The entire interval is within the thermal maturation range necessary for gas generation but a particularly promising interval between 15,700' and 16,000' (TD) is delimited on the basis of high (greater than 2%) total organic carbon (see attached summary chart).

Introduction

The Ebba 2/7-19X well was examined between 14,910' and 16,000' (TD). Eleven ditch cutting composites yielded well preserved palynofloras. Sidewall core material was not made available, but the recovery of progressively older floras, combined with the gradual increase of vitrinite reflectance in the interval support the interpretation that the palynofloras were not caved. The interval was divided into four intervals dated Barremian, Hauterivian, Hauterivian-Valanginian and Valanginian-Berriasian. A summary of the Phillips ages contrasted with those of the consultant is shown on the following page.

Source rock analysis of twenty-one samples was completed. A summary plot of the results is included. The interval sampled was within the maturity range necessary to produce gas. The total organic carbon values below 15,200' indicate an interval with fair to rich sourcing capabilities. The three samples between 15,700' and 16,000' have TOC values over 2% indicating a particularly good potential gas source.

Discussion

Interval: 14,910-15,100'
Age: Barremian
Environment: (2 samples) Marine

The Barremian age determination is based on the presence of Tenua anaphrissa.

Palynomorphs characteristic of the interval include: Tenua anaphrissa, Subtilisphaera terrula, Chlamydaphorella spp., Sirmoidinium grossi, and Gardodinium eisenacki (elongatum).

Interval: 15,100'-15,500'
Age: Hauterivian
Environment: (4 samples) Marine

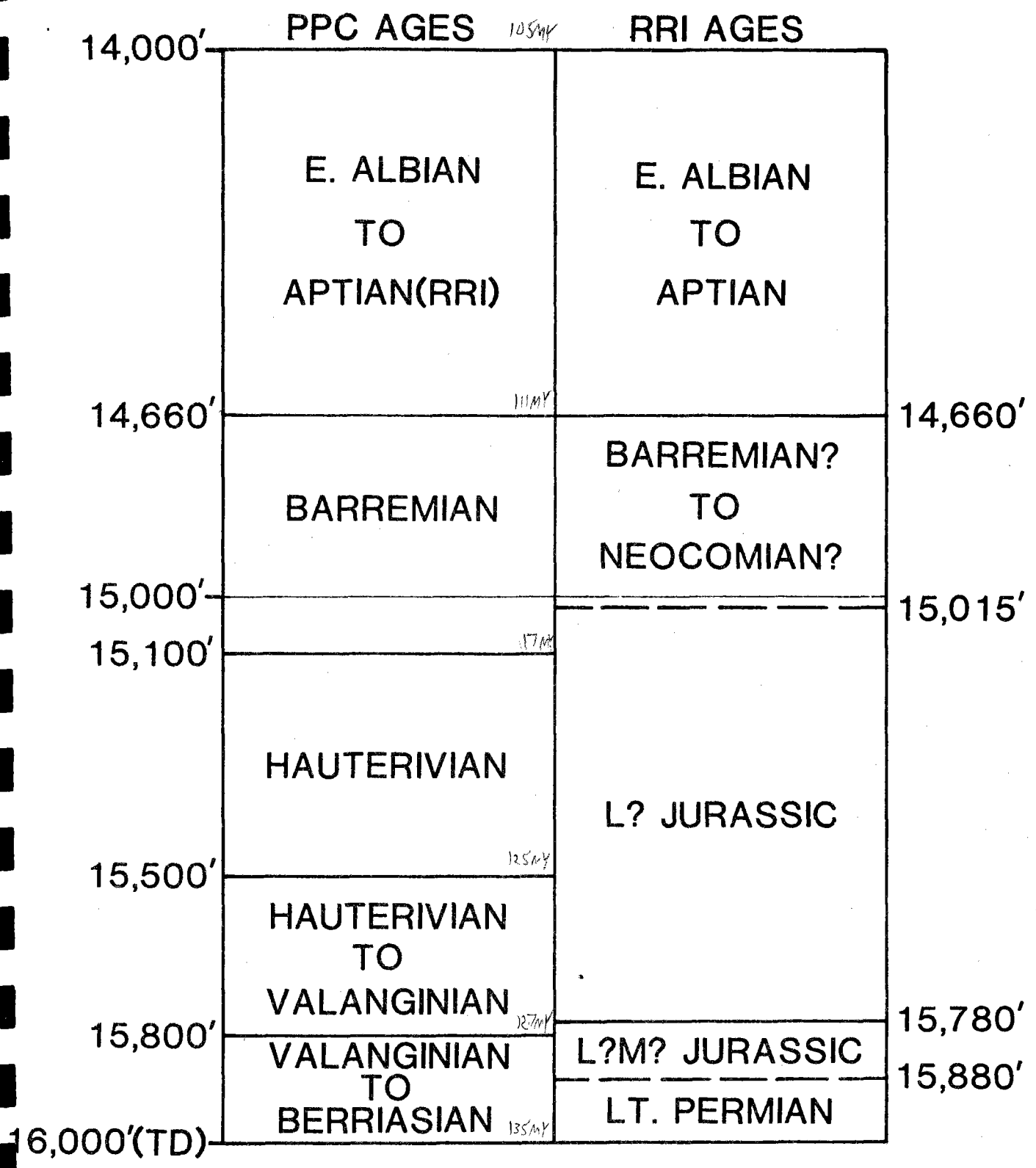
The age of the interval is based on the abundant recovery of Nelchinopsis kostromiensis.

Palynomorphs characteristic of the interval include: Nelchinopsis kostromiensis, Kleisthriasphaeridium simplicispinum, Pareodinia ceratophora, and Odontodnitina operculata.

The recovery of Stephanelytron redcliffense indicates Jurassic reworking is encountered.

Interval: 15,500'-15,800'

PALYNOSTRATIGRAPHIC SUMMARY OF THE 15,000-16,000(TD) INTERVAL OF PPC 2/7 19X



Age: Hauterivian-Valanginian

Environment: (3 samples) Marine

The age is based on the recovery of Nelchinopsis kostromiensis and Gonyaulacysta naploderma.

Palynomorphs characteristic of the interval include:

Nelchinopsis kostromiensis, Chlamydophorella spp.,

Achomosphaera neptuni and Cyclonephelium compactum.

Interval: 15,800'-16,000' (T.D.)

Age: Valanginian-Berriasian

Environment: (2 samples) Marine

The age is based on the recovery of Gonyaulacysta fastigiata.

Palynomorphs characteristic of the interval include:

Gonyaulacysta fastigiata, Hystrichoclinium voigtii, and

Cyclonephelium spp..

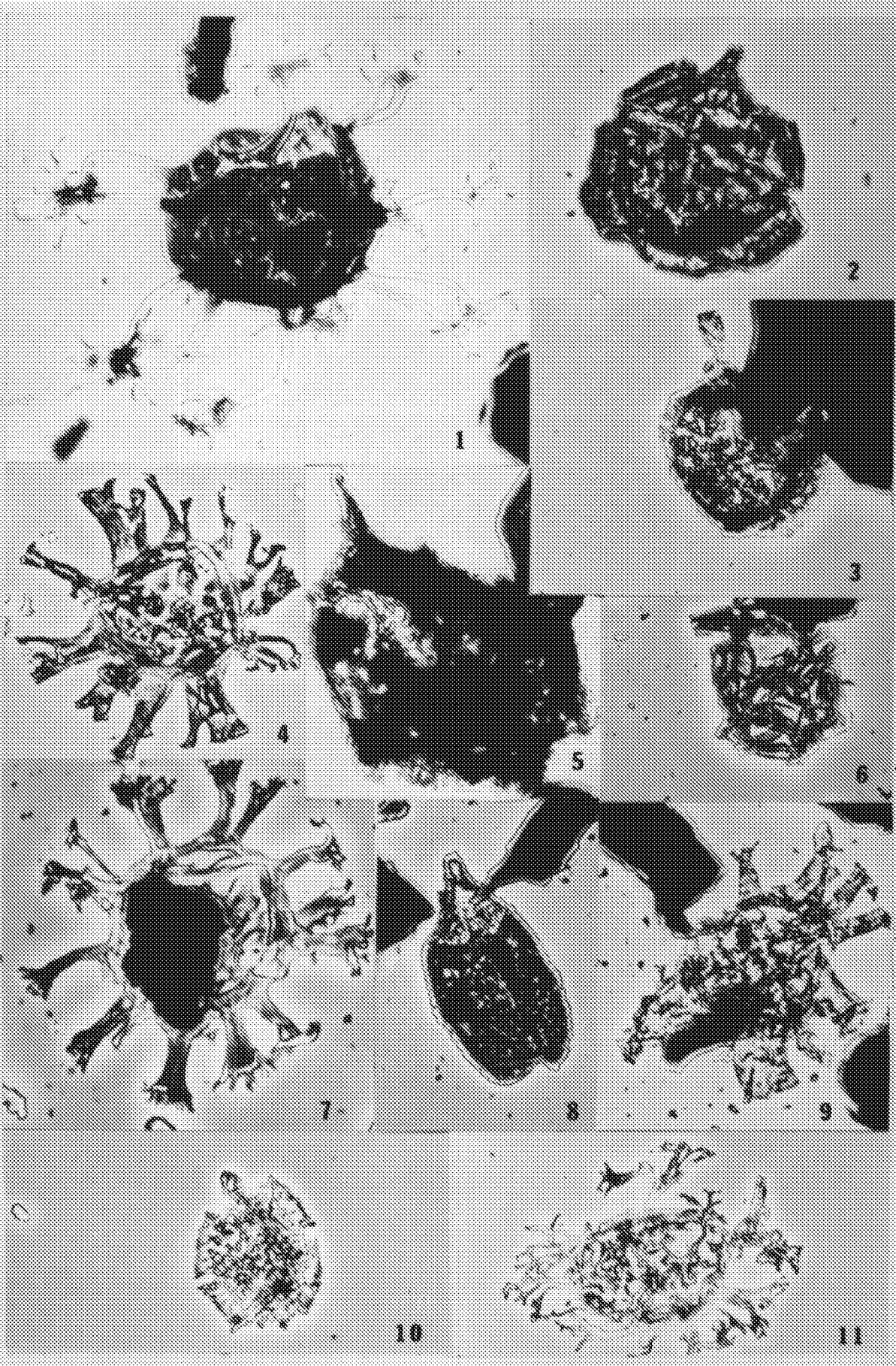

E. B. Robertson

Approved: 
D. W. Dalrymple

Plate 1

Partial Suite of Neocomian
Microplankton Recovery from the
15,000-16,000' Interval of the
Ebba 2/7-19X Well,
Norwegian North Sea

- Figure 1. Oligosphaeridium complex
- Figure 2. Sirmiodinium grossi
- Figure 3. Gardodinium eisenacki (elongatum)
- Figure 4. Kleithriasphaeridium simplicispinum
- Figure 5. Tenua anaphrissa
- Figure 6. Gonyaulacysta haploderma
- Figure 7. Cordosphaeridium eionoides
- Figure 8. Pareodinia ceratophora
- Figure 9. Hystrichosphaeridium cooksoni
- Figure 10. Nelchinopsis kostromiensis
- Figure 11. Systematophora complicata



INTERVAL (FEET)		TYPE	NORMALIZED TO 100% BY VOLUME (LIQUID PHASE) (GAS PHASE)					STND. DEV	MODE	RANGE		NO. OF VIT. READINGS	TOTAL ORGANIC CARBON (WT %)	EXTN VAL (%)
TOP	BASE		TAI	EXI- NITE	ALGI- NITE	VITRI- NITE	OTHER			LOW	HIGH			
+13830.	13900.	CC	23	0.	61.	40.	0.						1.49	
+13900.	14000.	CC	24	10.	60.	30.	0.	1.54	0.12	1.36	1.13	1.56	57	1.37
+14100.	14200.	CC	23	10.	61.	30.	0.	1.56	0.12	1.57	1.32	1.77	57	1.57
-14200.	14300.	CC	21	10.	50.	40.	0.							1.52
-14300.	14400.	CC	25	0.	30.	70.	0.	1.61	0.15	1.60	1.31	1.93	66	1.50
-14400.	14500.	CC	24	10.	60.	30.	0.	1.54	0.15	1.57	1.31	1.84	67	1.57
-14500.	14600.	CC	25	10.	50.	40.	0.	1.55	0.16	1.35	1.31	1.87	65	1.55
-14620.	14700.	CC	24	10.	40.	50.	0.	1.62	0.15	1.69	1.32	1.94	81	1.60
-14700.	14800.	CC	25	10.	50.	40.	0.	1.56	0.17	1.45	1.29	1.97	81	1.49
-14800.	14900.	CC	26	10.	30.	60.	0.	1.57	0.17	1.37	1.31	1.91	67	1.46
-14900.	15000.	CC	26	10.	50.	40.	0.	1.62	0.17	1.56	1.30	1.94	67	1.50
-15000.	15100.	CC	27	10.	40.	50.	0.	1.56	0.18	1.31	1.30	1.94	68	1.75
-15100.	15200.	CC	30	10.	40.	60.	0.							1.45
-15200.	15300.	CC	28	10.	40.	50.	0.	1.58	0.18	1.57	1.30	1.93	74	1.57
-15300.	15400.	CC	29	10.	30.	60.	0.	1.56	0.17	1.37	1.31	1.87	68	1.61
-15400.	15500.	CC	28	10.	30.	60.	0.	1.53	0.15	1.49	1.31	1.95	44	1.85
-15500.	15600.	CC	32	10.	30.	60.	0.							1.19
-15600.	15700.	CC	31	10.	30.	60.	0.	1.59	0.18	1.35	1.34	1.97	71	1.12
-15700.	15800.	CC	28	10.	50.	40.	0.	1.62	0.19	1.69	1.30	2.00	65	2.35
-15800.	15900.	CC	32	10.	70.	20.	0.	1.52	0.15	1.37	1.31	1.90	57	2.78
-15900.	16000.	CC	33	10.	50.	40.	0.	1.57	0.16	1.73	1.32	2.00	62	2.17

TERMINOLOGY USED FOR SOURCE ROCK PLOT

- TAI = THERMAL ALTERATION INDEX (SPORE COLOR) (1-2 YELLOW) (2-3 BROWN) (3-4 DARK BROWN) (5 BLACK)
- EXINITE = POLLEN AND SPORE EXINE + PLANT CUTICLES + RESINS + OTHER STRONGLY FLUORESCENT ORGANIC MATERIALS
+ AMORPHOUS HERBACEOUS (IF RECOGNIZABLE AS FROM TERRESTRIAL SOURCE - IF NOT IT IS RECORDED UNDER ALGINITE)
- ALGINITE = (ALGAL DEBRIS - CYSTS AND BODIES) + AMORPHOUS SAPROPEL
- VITRINITE = WOODY TISSUE (ALTERED TO HUMIC COMPOUNDS) + NONFLUORESCENT STRUCTURED TRANSLUCENT MATERIAL
- OTHER = (FOR OPTIONAL USE + NORMALLY USED FOR COALY MATERIAL INCLUDING INERTINITE AND FUSINITE)
- * RATIO = EOM / (1.25 * TOC)

APPENDIX

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NORWAY

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14910.-15000.

APTEODINIUM GRANULATUM(R), CHLAMYDOPHORELLA SPP.(VA),
CONOSPHAERIDIUM SPP.(VR), CYCLONEPHELIUM COMPACTUM(A),
DINOFLAGELLATES(VA), DINOPTERYGIUM CLADOIDES(VR),
EXOCHOSPHAERIDIUM PHRAGMITES(R),
E. STRIOLATUM(VR), GARDODINIUM EISENACKI(ELONGATUM)***(VR),
GONYAULACYSTA HAPLODERMA***(VR), G. SPP.(R),
HYSTRICHODINIUM SPP.(C), H. VOIGTII***(C),
HYSTRICHOSPHAERIDIUM TUBIFERUM(VR),
MEMBRANOSPHAERA MAASTRICHTIAN(R), MICRHYSTRIDIUM SPP.(VR),
MICRODINIUM SPP.(C), ODONTOCHINA OPERCULATA(R),
OLIGOSPHAERIDIUM COMPLEX(A), PARODINIA SPP.(VR),
POLYSPHAERIDIUM SPP.(C), PTERODINIUM SPP.(C),
SCRINIODINIUM SPP.(VR), SPINIFERITES SPP.(A),
SUBTILISPHAERA TERRULA(VR), TANYOSPHAERIDIUM VARIECALAMUM(R),
TENUA ANAPHRISSA(VR),

ALISPORITES GRANDIS(R), A. SPP.(C),
CALLIALASPORITES TRILOBATUS(VR),
CEREBROPOLLENITES MESOZOICUS(R), CICATRICOSISPORITES SPP.(VR),
DELTOIDOSPORA SPP.(C), FORAMINISPORIS WONGTHAGGIENSIS(R),
GLEICHENIIDITES SPP.(VR), LETOLEPIDITES VERRUCATUS(VR),
PINUSPOLLENITES SPP.(C), PETICULATISPORITES SPP.(R),
SPORES INDET.(R), VITREISPORITES SPP.(R),

15000.-15100.

APTEODINIUM GRANULATUM(VR), A. SPP.(R),
CANNOSPHAEROPSIS SPP.(VR), CHLAMYDOPHORELLA SPP.(C),
CORDOSPHAERIDIUM EIONOIDES(VR), CRIBROPERIDIUM SPP.(R),
CYCLONEPHELIUM COMPACTUM(A), C. SPP.(VR), DINOFLAGELLATES(A),
GARDODINIUM EISENACKI(ELONGATUM)***(R),
GONYAULACYSTA HAPLODERMA***(VR), HYSTRICHODINIUM SPP.(R),
H. VOIGTII***(VR), HYSTRICHOSPHAERIDIUM COOKSONI(VR),
ODONTOCHINA OPERCULATA(C), OLIGOSPHAERIDIUM COMPLEX(R),
O. SPP.(R), POLYSPHAERIDIUM SPP.(R), PTERODINIUM SPP.(VA),
SIRMIODINIUM GROSSI(VR), SPINIFERITES SPP.(A),
TANYOSPHAERIDIUM VARIECALAMUM(VR), TENUA ANAPHRISSA(VR),

ALISPORITES SPP.(C), GLEICHENIIDITES SPP.(VR),
SPORES INDET.(R), VITREISPORITES SPP.(C),

15100.-15200.

ACHOMOSPHAERA SPP.(R), APTEODINIUM GRANULATUM(R),
CHLAMYDOPHORELLA SPP.(C), CYCLONEPHELIUM COMPACTUM(C),
C. SPP.(VR), DINOFLAGELLATES(VA), GARDODINIUM SPP.(R),
GONYAULACYSTA HAPLODERMA***(VR), G. SPP.(R),
HYSTRICHODINIUM SPP.(R), HYSTRICHOSPHAERIDIUM COOKSONI(R),
KLEITHRIASPHAERIDIUM SIMPLICISPINUM***(VR),

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MICRHYSTRIDIUM SPP.(C), NELCHINOPSOS KOSTROMIENSIS***(VR),
ODONTOCHINA OPERCULATA(R), OLIGOSPHAERIDIUM SPP.(R),
PAREODINIA CERATOPHORA***(VR), POLYSPHAERIDIUM SPP.(R),
PTERODINIUM SPP.(A), SCRINIODINIUM SPP.(VR),
SPINIFERITES SPP.(R).

ALISPORITES SPP.(C), GLEICHENIIDITES SPP.(VR),
SPORES INDET.(R), VITREISPORITES SPP.(R),

15200.-15300.

CHLAMYDOPHORELLA SPP.(A), CRIBROPERIDIUM SPP.(VR),
CYCLONEPHELIUM COMPACTUM(R), C. SPP.(R), DINOFLAGELLATES(A),
GARDODINIUM EISENACKI(ELONGATUM)***(VR),
GCNYAULACYSTA SPP.(VR), HYSTRICHODINIUM VOIGTII***(R),
KLEITHRIASPHAERIDIUM SIMPLICISPINUM***(VR),
NELCHINOPSOS KOSTROMIENSIS***(C), ODONTOCHINA OPERCULATA(R),
ODONTOCHITINA SPP.(R), O. STRIATOPERFORATA(R),
OLIGOSPHAERIDIUM COMPLEX(R), O. PULCHERRIMUM(R),
O. SPP.(R), PALAEOPERIDIUM CRETACEUM(R), PARODINIA SPP.(VR),
POLYSPHAERIDIUM SPP.(VR), PTERODINIUM SPP.(A),
SCRINIODINIUM SPP.(VR), SPINIFERITES SPP.(VR), TENUA SPP.(R),
VERYHACHIUM SPP.(R),

ALISPORITES SPP.(C), CEREBROPOLLENITES MESOZOICUS(VR),
DELTOIDOSPORA SPP.(VR), GLEICHENIIDITES SPP.(R),
PINUSPOLLENITES SPP.(R), PODOCARPIDITES BIFORMIS(R),
RETICULATISPORITES SPP.(R), UNDULATISPORITES SPP.(VR),
VITREISPORITES SPP.(R),

15300.-15400.

APTEODINIUM GRANULATUM(R), CHLAMYDOPHORELLA SPP.(C),
CYCLONEPHELIUM COMPACTUM(C), DINOFLAGELLATES(C),
GARDODINIUM EISENACKI(ELONGATUM)***(R),
HYSTRICHODINIUM VOIGTII***(R),
KLEITHRIASPHAERIDIUM SIMPLICISPINUM***(VR),
MEMBRANOSPHAERA MAASTRICHTIAN(VR), ODONTOCHINA OPERCULATA(R),
OLIGOSPHAERIDIUM ASTERIGERUM(VR),
O. COMPLEX(VR), O. PULCHERRIMUM(R), POLYSPHAERIDIUM SPP.(R),
PTERODINIUM SPP.(C), SPINIFERITES SPP.(C),
SYSTEMATOPHORA COMPLICATA(VR), TANYOSPHAERIDIUM SPP.(VR),

ALISPORITES GRANDIS(VR), A. SPP.(R), GLEICHENIIDITES SPP.(R),
PODOCARPIDITES BIFORMIS(R), SPORES INDET.(VR),
TAXODIACEAPOLLENITES SPP.(VR), VITREISPORITES SPP.(VR),

15400.-15500.

ACHMOSPHAERA NEPTUNII(VR), CHLAMYDOPHORELLA SPP.(R),
CYCLONEPHELIUM SPP.(R), DINOFLAGELLATES(A),
GCNYAULACYSTA CLADOPHORA***(VR),

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HYSTRICHODINIUM VOIGTII*** (R),
 KLEITHRIASPHAERIDIUM SIMPLICISPINUM*** (VR),
 MICRHYSTRIDIUM SPP. (R), NELCHINOPSOS KOSTROMIENSIS*** (C),
 ODONTOCHINA OPERCULATA (R), ODONTOCHITINA STRIATOPERFORATA (VR),
 OLIGOSPHAERIDIUM PULCHERRIMUM (R), POLYSPHAERIDIUM SPP. (VR),
 PTERODINIUM SPP. (R), SIRMIODINIUM GROSSI (VR),
 SPINIFERITES SPP. (VR), STEPHANELYTRON REDCLIFFENSE (RW),

PINUSPOLLENITES SPP. (VR), PODOCARPIDITES SPP. (VR),
 SPORES INDET. (C), UNDULATISPORITES SPP. (VR),
 VITREISPORITES SPP. (VR),

15500.-15600.

CHLAMYDOPHORELLA SPP. (VR), MICRHYSTRIDIUM SPP. (VR),
 NELCHINOPSOS KOSTROMIENSIS*** (R),
 OLIGOSPHAERIDIUM PULCHERRIMUM (VR), POLYSPHAERIDIUM SPP. (VR),
 VERYHACHIUM SPP. (VR),

GLEICHENIIDITES SPP. (VR), PINUSPOLLENITES SPP. (C),
 SPORES INDET. (R),

15600.-15700.

CHLAMYDOPHORELLA SPP. (C), CYCLONEPHELIUM COMPACTUM (VR),
 DINOFLAGELLATES (C), MICRHYSTRIDIUM SPP. (R),
 OCCISUCYSTA SPP. (VR), OLIGOSPHAERIDIUM ASTERIGERUM (VR),
 PALAEOPERIDIUM CRETACEUM (VR), SPINIFERITES SPP. (R),

PINUSPOLLENITES SPP. (VR), SPORES INDET. (VR),
 UNDULATISPORITES SPP. (R),

15700.-15800.

CANNOSPHAEROPSIS SPP. (VR), CYCLONEPHELIUM COMPACTUM (C),
 DINOFLAGELLATES (A), EXOCHOSPHAERIDIUM PHRAGMITES (VR),
 GONYAULACYSTA HAPLODERMA*** (VR),
 HYSTRICHOSPHAERIDIUM COOKSONI (VR), MICRHYSTRIDIUM SPP. (R),
 NELCHINOPSOS KOSTROMIENSIS*** (R),
 OLIGOSPHAERIDIUM ASTERIGERUM (VR), O. SPP. (VR),
 POLYSPHAERIDIUM SPP. (VR), PTERODINIUM SPP. (R),
 SPINIFERITES SPP. (C), TENUA SPP. (VR),

PODOCARPIDITES SPP. (R), SPORES INDET. (VR),
 UNDULATISPORITES SPP. (R), VITREISPORITES SPP. (R),

15800.-15900.

CYCLONEPHELIUM SPP. (VR), DINOFLAGELLATES (C),
 OLIGOSPHAERIDIUM ASTERIGERUM (VR),

ALISPORITES SPP. (R), UNDULATISPORITES SPP. (P),

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15900.-16000.

ACHOMOSPHAERA SPP.(VR), BALTISPHAERIDIUM SP.(R),
CYCLONEPHELIUM COMPACTUM(VR), C. SPP.(R), DINOFLAGELLATES(R),
GONYAULACYSTA FASTIGIATA***(VR),
HYSTRICHODINIUM VOIGTII***(R), POLYSPHAERIDIUM SPP.(VR),
PTERODINIUM SPP.(R), SPINIFERITES SPP.(R),
ALISPORITES SPP.(R), SPORES INDET.(C).

LEGEND:

(VA) = VERY ABUNDANT	(RW) = REWORKED
(A) = ABUNDANT	(?) = QUESTIONABLE
(C) = COMMON	(CV) = CAVINGS
(R) = RARE	(CF) = CLOSE AFFINITY
(VR) = VERY RARE	