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WA.277-09.9(1)  
B.J. L SOURCE ROCK EVALUATION

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*M.S.*

INTER-OFFICE CORRESPONDENCE / SUBJECT:  
BARTLESVILLE, OKLAHOMA

North Sea, Norwegian Sector  
Eldfisk-2/7-9X Source Rock Evaluation

McE-3-80

TO: J. E. Jennings  
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Attn: S. A. Miles  
  
FROM: M. N. McElroy  
176 PL

We have completed geochemical source rock evaluation of 24 cuttings samples recovered over the 10190 - 14460 foot interval in the Eldfisk 2/7-9X, Norwegian Sector, North Sea. The following conclusions are supported by data displayed in Table I and Figures 1-9.

1. The interval sampled that has the highest source potential is 14440 - 14460 feet (Lower Cretaceous). Other Lower Cretaceous intervals (13040 - 13050, 13380 - 13390, and 13440 - 13450 feet). are possible source rocks, but contain either indigenous or migrated oil, making identification as sources less certain.
2. The extract from 14440 - 14460 feet does not resemble oil produced from any Eldfisk well, nor do the extracts from the other possible source intervals listed above. It is concluded that the source interval for Eldfisk oils was not penetrated by the 2/7-9X.
3. The three intervals sampled by Drill Stem Tests in the 2/7-9X (#1: 14150 - 14290 feet, #2: 13770 - 13795 feet, and #3: 11210 - 11275 feet) contain petroleum that are geochemically identical. The extract from the potential source rock at 14440 - 14460 feet does not resemble these oils.
4. Vitrinite reflectance data determined by EPS show an abrupt increase in thermal maturity below 13540 feet. An unconformity is inferred. Samples from below that depth are in the "dry gas" stage of petroleum generation.

MNM/kks

*Unconformity in Barremian ??? (One involving significant change in thermal maturity) See*

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TABLE 1a

GEOLOGICAL BRANCH	DEPTH		AGE	SOURCE ROCK EVALUATION DATA			NORTH SEA		ELDFISK		2/7-9X		ASPHALTICS		ODD-EVEN PREDOM- INANCE
	UPPER	LOWER		CARBONATE CARBON WT. %	OR- GANIC CARBON WT. %	RATIO SOLUBLE /TOTAL CARBON	TOTAL WT.%	C-13	SATURATES WT.%	SOLUBLE C-13	ORGANIC MATTER AROMATICS WT.%	C-13	WT.%	C-13	
GI79CBM	10,190	10,200	Dan.	5.34	.49	.168	.103	-27.0	53.5	-28.1	17.3	-26.7	29.2	-25.2	1.04
GI79CBN	10,290	10,300	"	4.87	.48	.094	.057	-27.3	24.2	-28.2	26.6	-27.1	49.1	-27.0	1.06
GI79CBO	10,790	10,800	U. Cret.	9.84	.30	.282	.106	-27.7	55.2	-28.3	23.0	-26.9	21.8	-26.9	1.06
GI79CBP	11,190	11,200	"	9.74	.85	.696	.740	-26.6	60.8	-27.0	27.4	-26.2	11.9	-26.0	1.05
GI79CBQ	11,220	11,230	"	8.81	.69	.620	.535	-27.0	62.8	-27.4	22.8	-26.4	14.4	-26.5	1.04
GI79CBR	11,690	11,700	"	2.30	.64	.155	.125	-27.9	56.1	-28.6	17.7	-27.2	26.3	-27.4	1.06
GI79CBS	12,250	12,260	"	2.34	.70	.173	.152	-27.3	53.8	-27.7	17.4	-26.6	28.8	-27.0	1.05
GI79CBT	12,270	12,280	"	1.39	.73	.159	.145	-27.4	49.9	-28.0	17.5	-26.6	32.6	-27.2	.00
GI79CBU	12,880	12,890	"	2.08	.57	.114	.081	-27.5	46.5	-28.0	21.2	-26.7	32.2	-27.2	1.05
GI79CBV	13,040	13,050	L. Cret.	2.25	.81	.086	.088	-27.6	31.6	-28.2	27.6	-26.8	40.8	-27.1	1.13
GI79CBW	13,140	13,150	"	.98	.63	.093	.074	-27.6	41.9	-28.3	26.9	-27.0	31.2	-27.0	1.21
GI79CBX	13,240	13,250	"	1.35	.53	.119	.079	-27.5	36.8	-28.2	28.0	-27.1	35.2	-27.2	.94
GI79CBY	13,380	13,390	"	5.68	2.01	.130	.327	-26.7	55.3	-27.3	24.4	-26.2	20.5	-26.5	1.21
GI79CBZ	13,440	13,450	"	3.62	1.08	.072	.098	-27.2	53.8	-27.8	23.9	-26.6	22.3	-26.6	1.10
GI79CCA	13,540	13,550	"	5.52	.39	.119	.058	-27.3	60.3	-29.1	19.9	-26.5	19.8	-26.7	1.07
GI79CCB	13,590	13,600	"	4.99	.27	.127	.043	-27.7	39.8	-28.8	34.1	-27.4	26.0	-26.9	1.02
GI79CCC	13,640	13,650	"	4.92	.19	.215	.051	-27.9	57.5	-28.7	25.1	-27.5	17.5	-26.6	.96
GI79CCD	13,770	13,780	"	3.59	.23	.151	.044	-27.3	35.1	-28.1	34.4	-27.1	30.5	-26.5	.96
GI79CCE	13,840	13,850	"	4.48	.40	.127	.064	-27.6	55.0	-28.4	24.9	-27.0	20.1	-27.1	1.04
GI79CCF	13,940	13,950	"	4.07	.31	.121	.047	-27.4	49.3	-28.4	18.8	-26.7	31.9	-26.5	.92

TABLE 1b

GEOLOGICAL BRANCH	SOURCE ROCK EVALUATION DATA														
				NORWAY		NORTH SEA		ELDFISK		2/7-9X				ODD-EVEN PREDOM- INANCE	
	UPPER	DEPTH	LOWER	AGE	CARBONATE CARBON WT. %	OR- GANIC CARBON WT. %	RATIO SOLUBLE /TOTAL CARBON	TOTAL WT. %	C-13	SATURATES WT. %	SOLUBLE ORGANIC C-13	AROMATICS WT. %	ORGANIC MATTER C-13		ASPHALTICS WT. %
GI79CCG	14,000	14,010	L.Cret.	3.61	.16	.151	.030	.0	46.1	-28.8	23.0	-26.6	31.0		-27.0
GI79CCH	14,160	14,170	"	3.68	.31	.149	.058	-26.0	26.4	.0	42.3	-25.5	31.3	-25.9	.99
GI79CCI	14,270	14,290	"	3.27	.27	.139	.047	-27.6	47.8	-28.7	26.0	-27.1	26.2	-27.0	1.09
GI79CCJ	14,440	14,460		5.75	2.90	.019	.072	-27.4	49.1	-28.0	25.7	-26.6	25.2	-27.1	1.29

Sample meets all geochemical criteria for petroleum source rocks

Figure 1. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for two cuttings samples recovered from Danian intervals in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

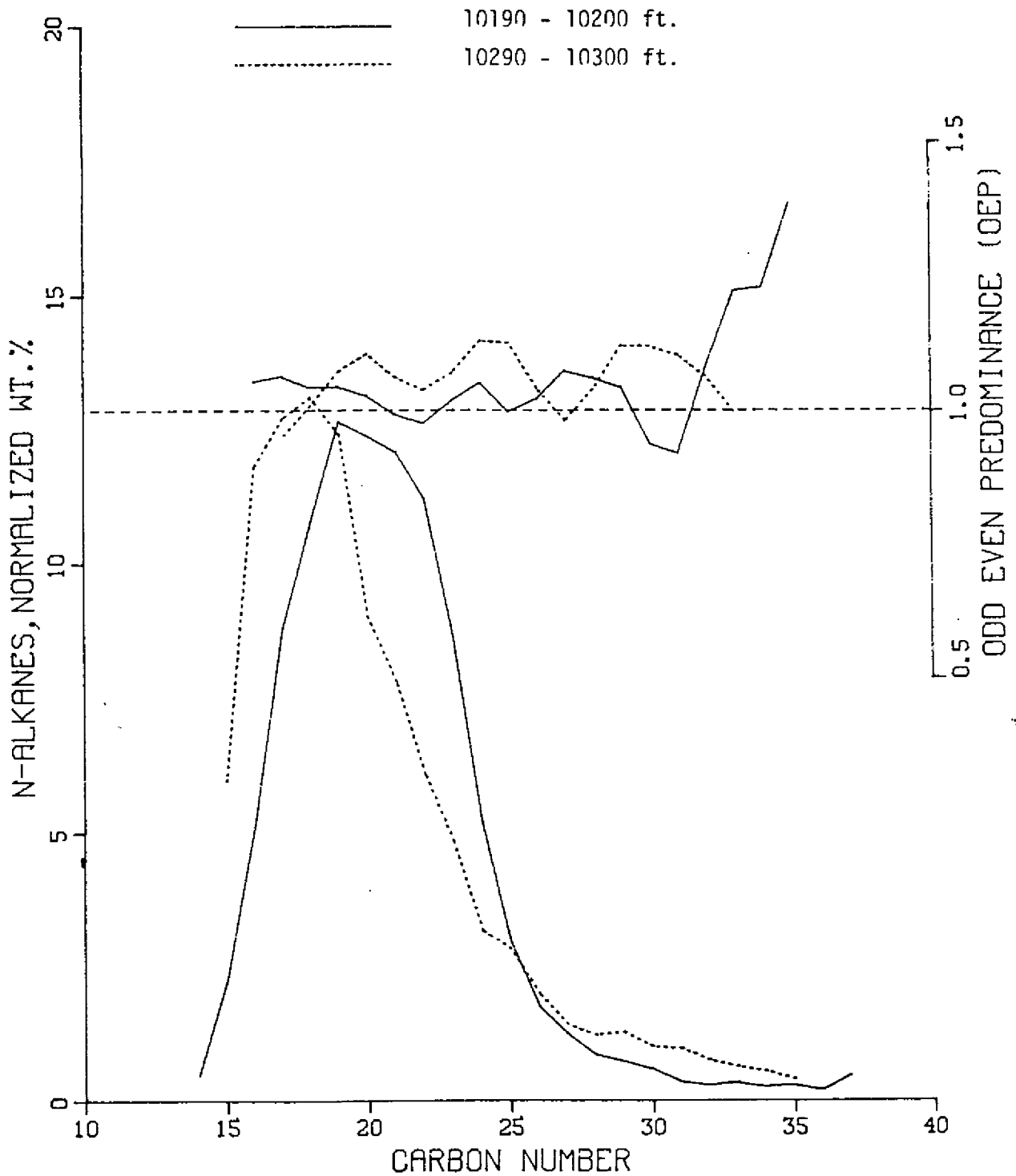


Figure 2. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for four cuttings samples recovered from Upper Cretaceous intervals (10790 - 11700 ft.) in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

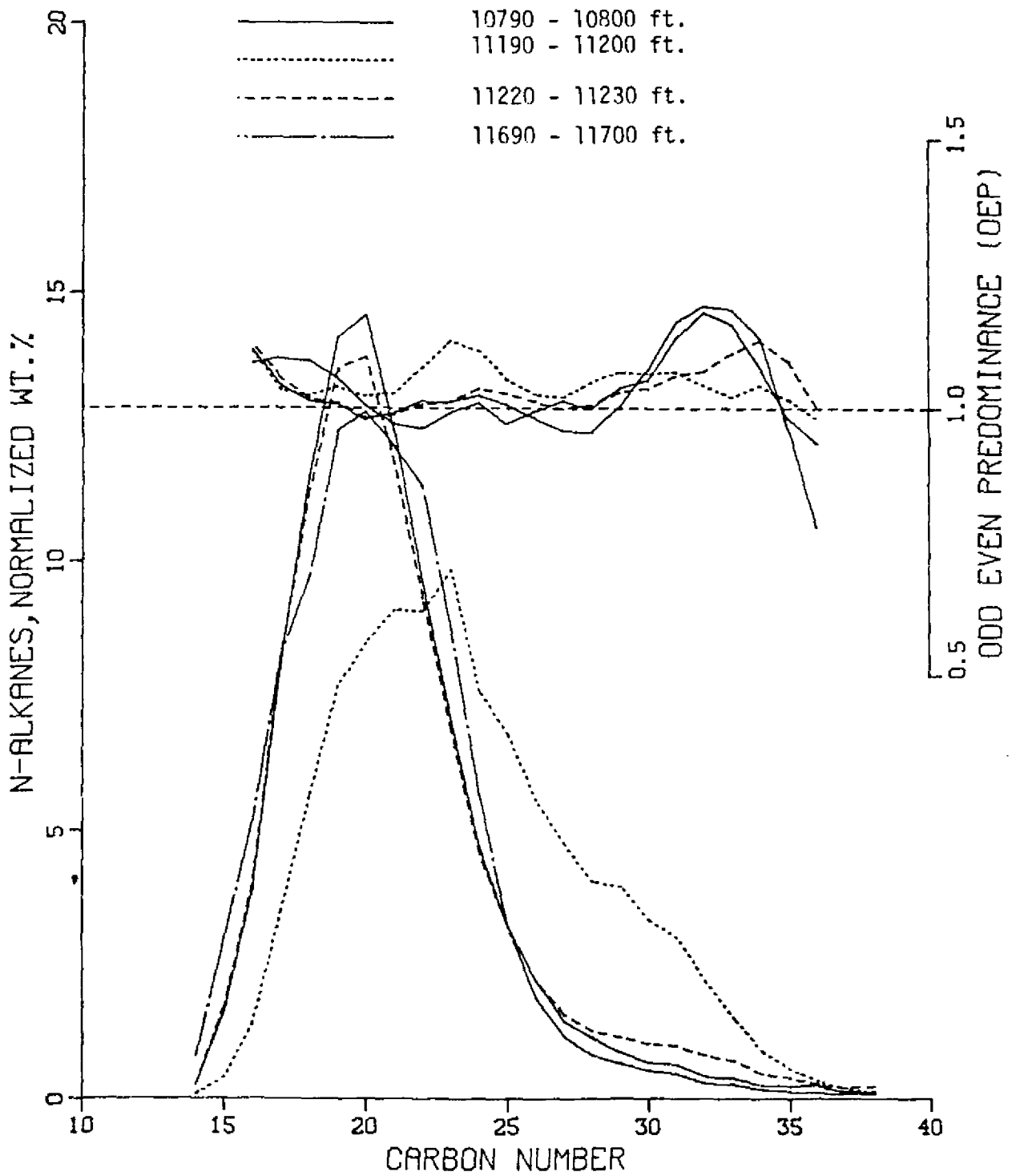


Figure 3. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for three cuttings samples recovered from Upper Cretaceous intervals (12250 - 12890 ft.) in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

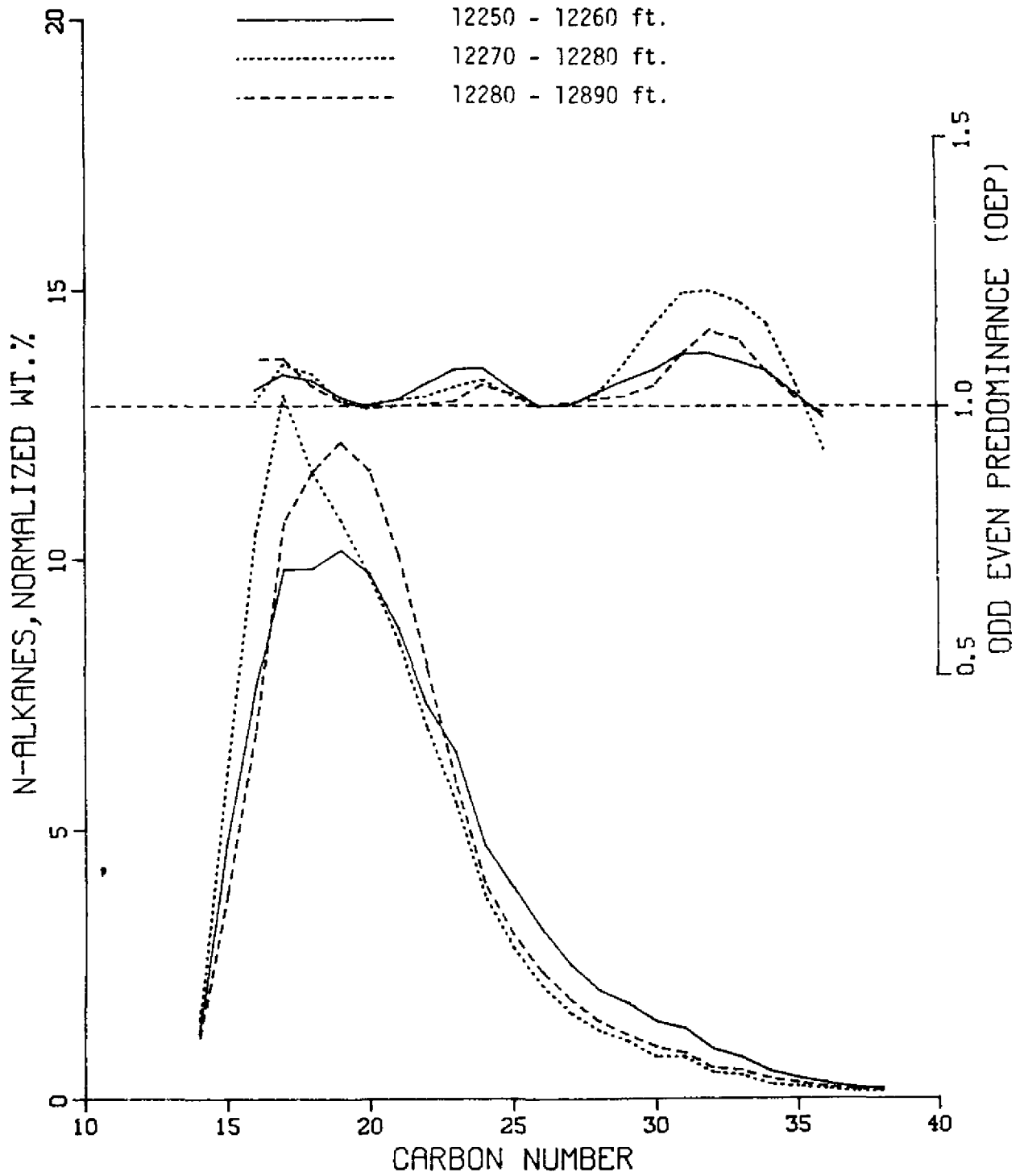


Figure 4. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for three cuttings samples recovered from Lower Cretaceous intervals in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

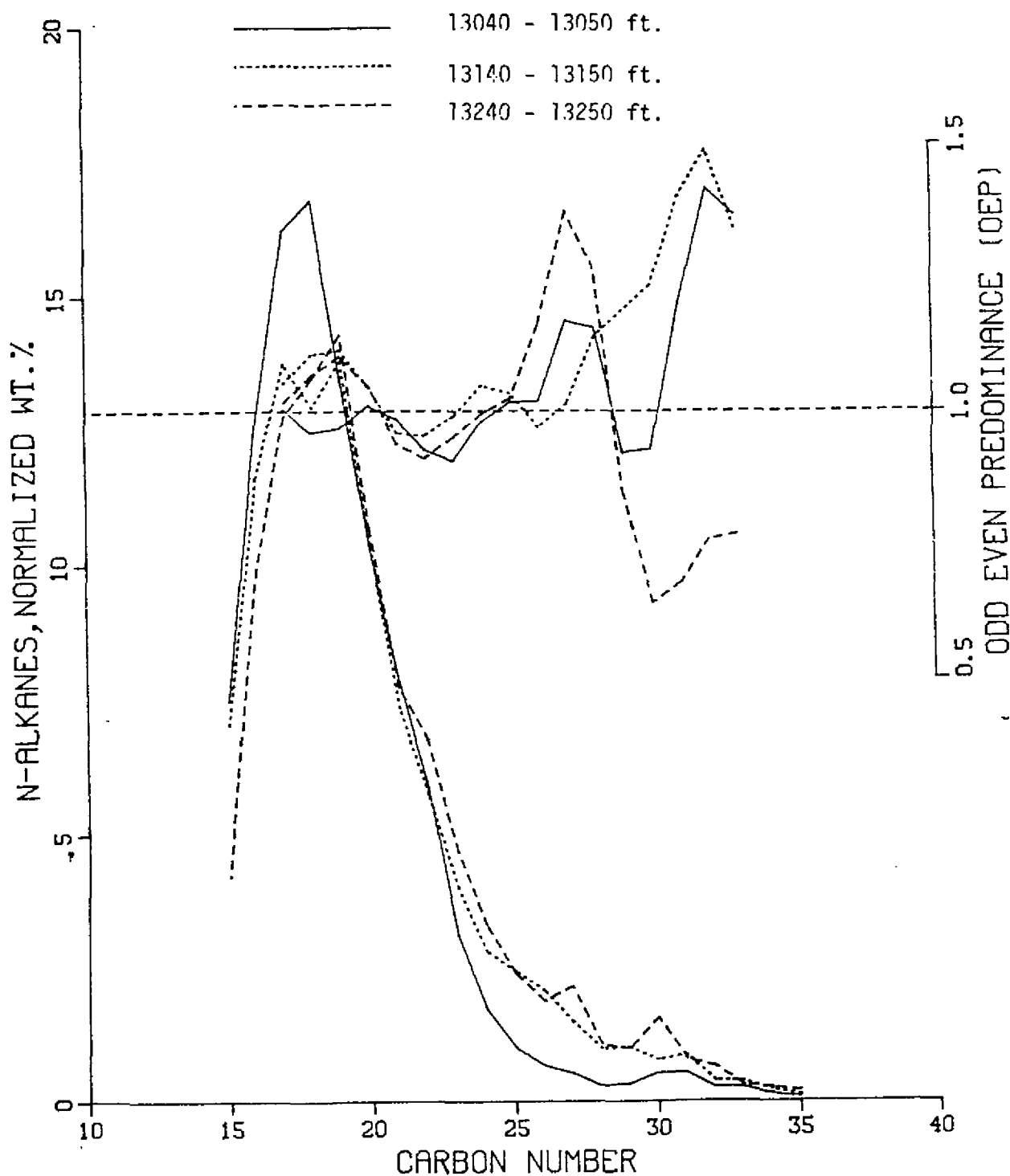


Figure 5. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for five cuttings samples recovered from Upper Jurassic intervals (13380 - 13650 ft.) in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

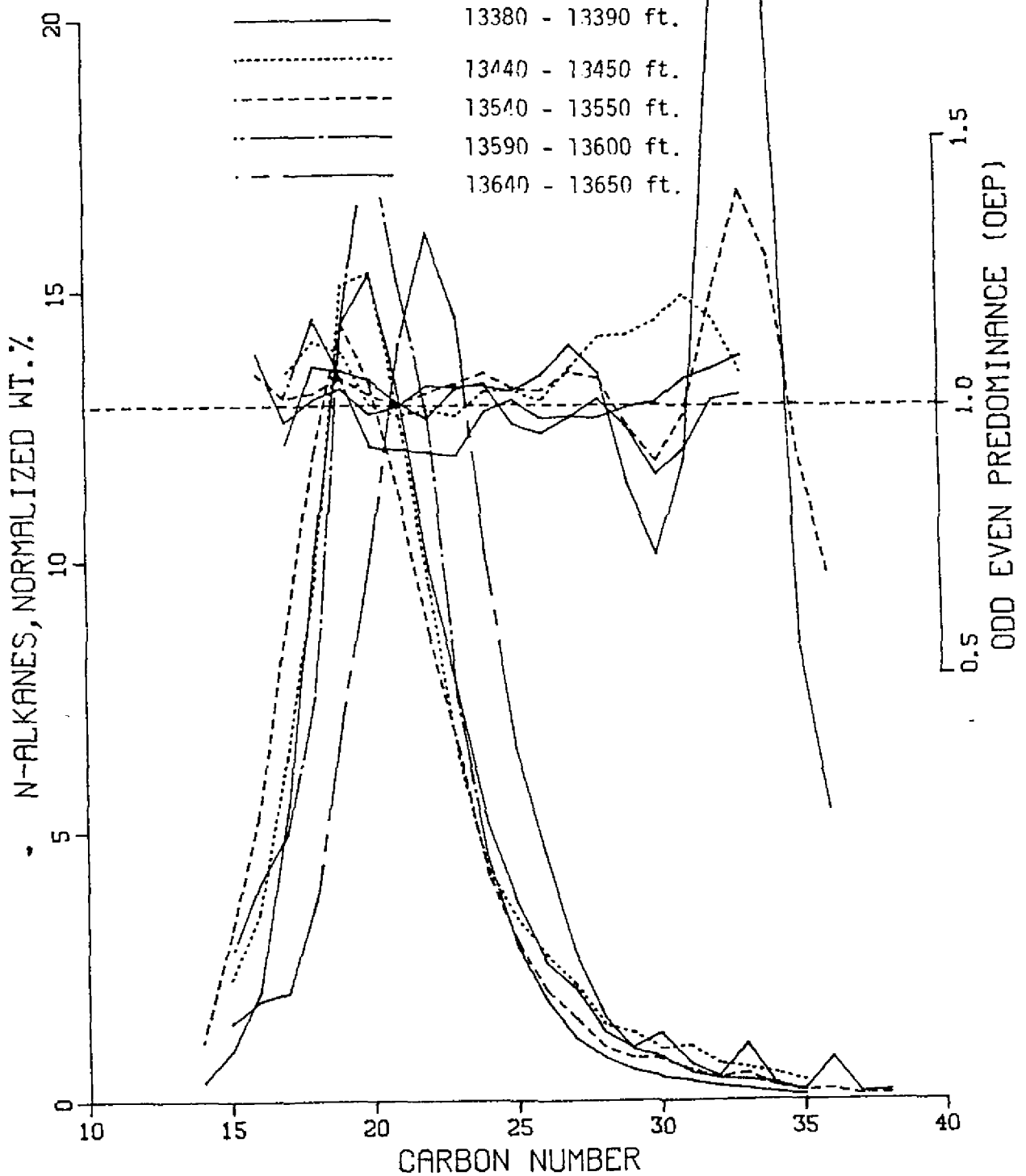




Figure 6. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for four cuttings samples recovered from Upper Jurassic intervals (13770 - 14010 ft.) in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

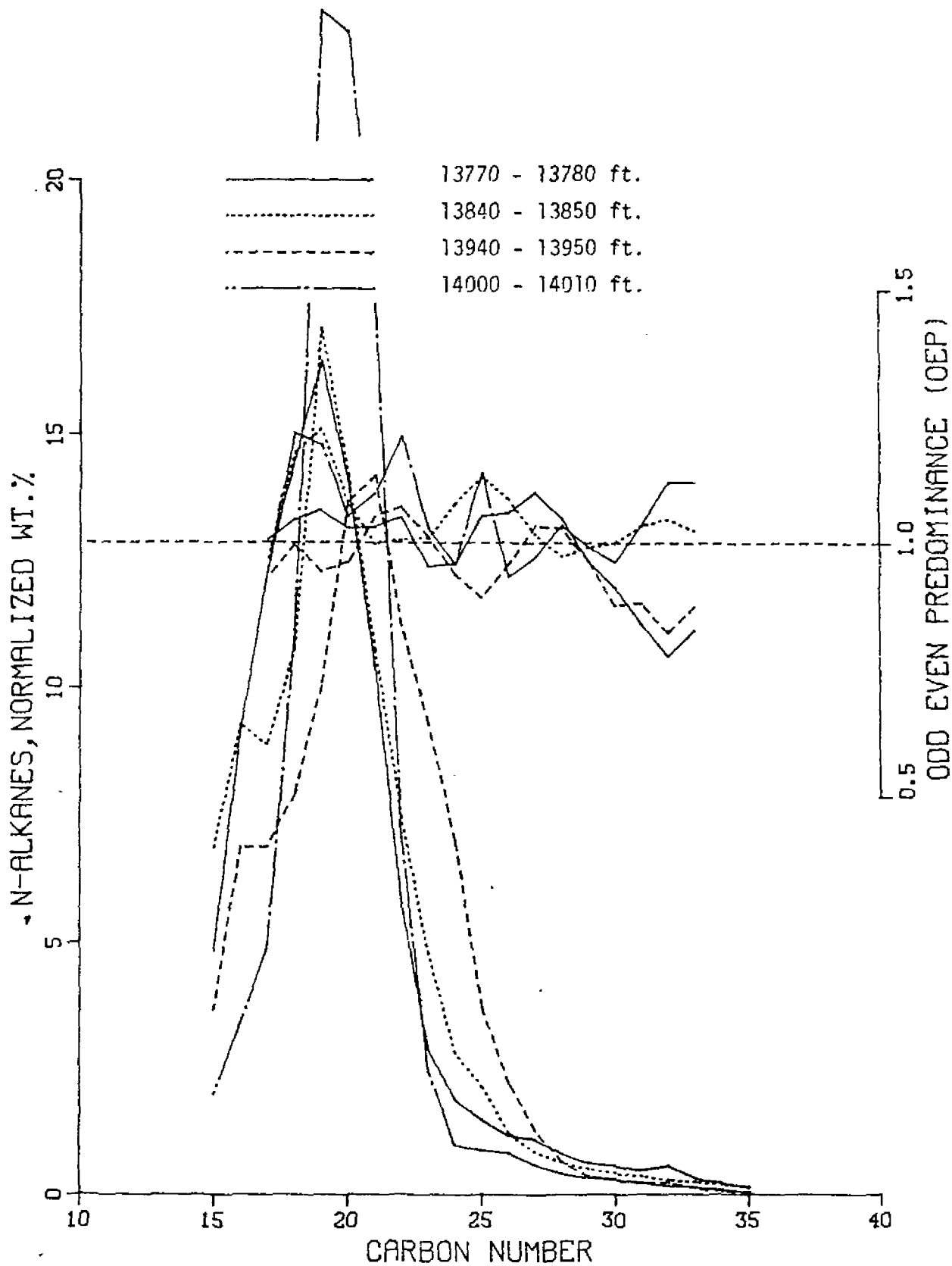


Figure 7. Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for three cuttings samples recovered from Upper Jurassic intervals (14160 - 14460 ft.) in the Eldfisk 2/7-9X, Norwegian Sector, North Sea.

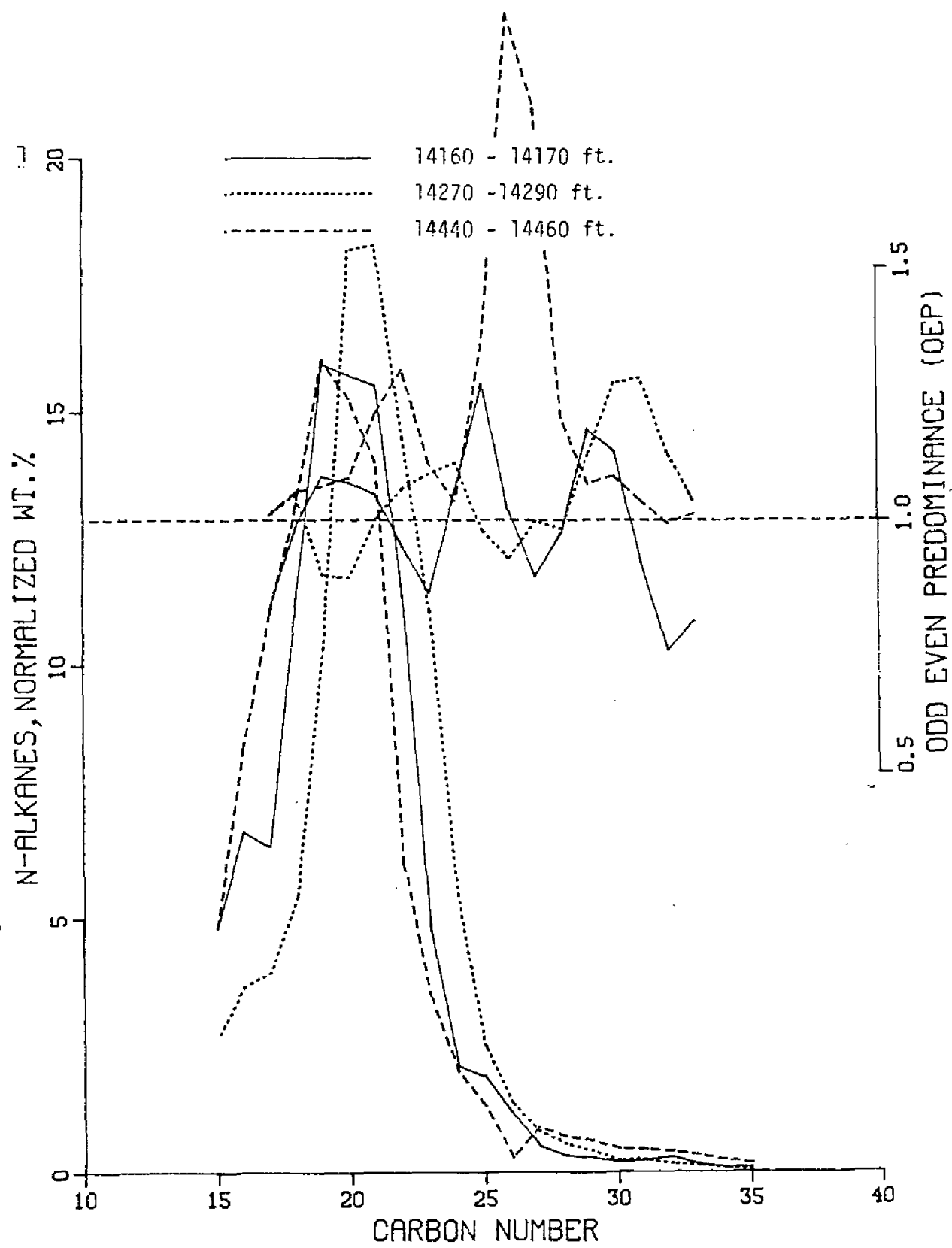


Figure 8.

Odd-Even Predominance and distribution of normal alkanes as functions of carbon number for an envelope of curves from eleven oils produced from Eldfisk wells (cross-hatched) and the rock extract from 14440 - 14460 feet in the Eldfisk 2/7-9X, Norwegian Sector, North Sea (solid line). Note that rock extract does not match oils.

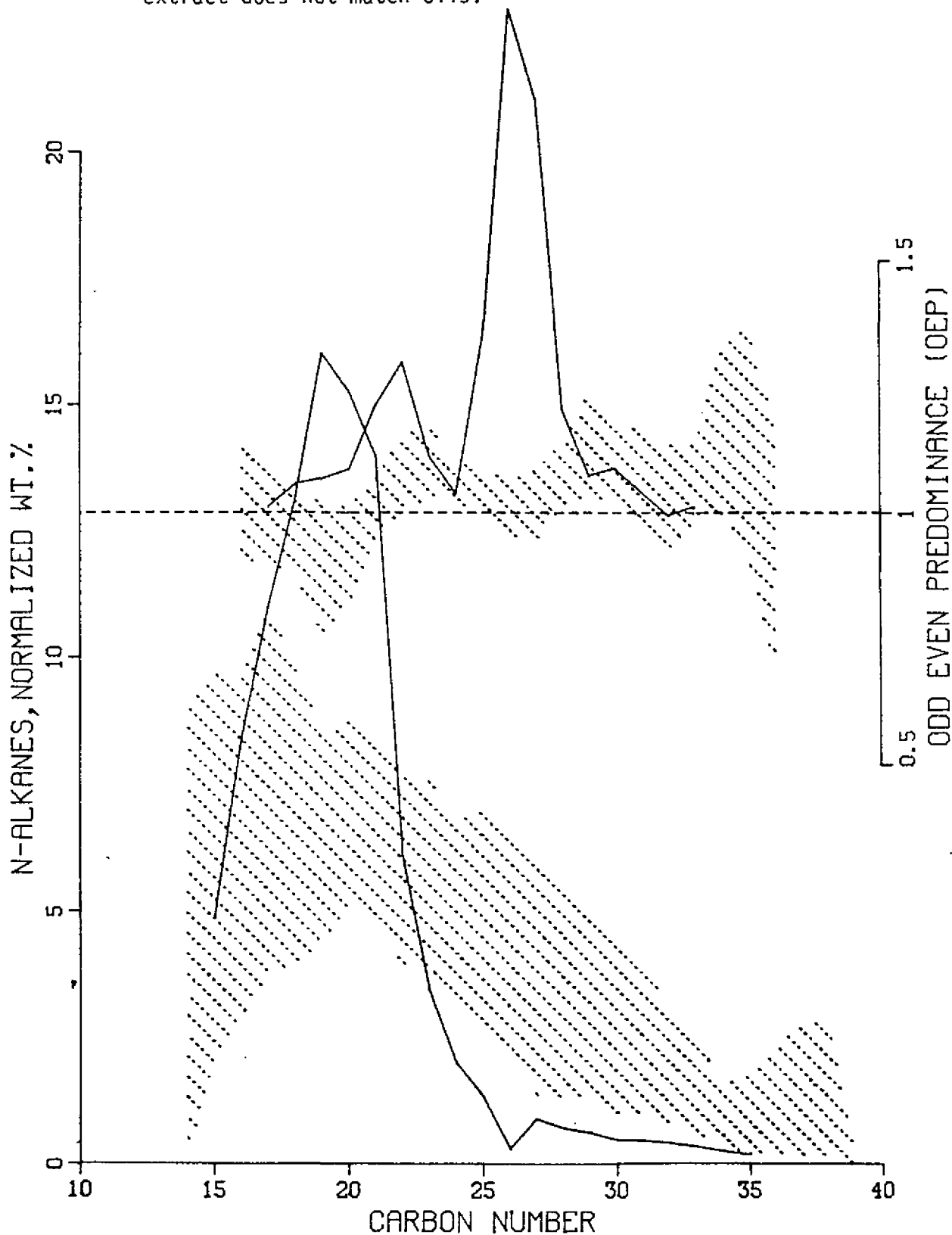


Figure 9. Odd-Even dominance and distribution of normal alkanes as functions of carbon number for oils recovered during Drill Stem Tests 1, 2, and 3 in the Eldfisk 2/7-9X, compared with rock extract from a potential source rock at 14440 - 14460 feet. Note dissimilarity of oils to rock extract, similarity of oils from all three tested intervals.

