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Geochemical investigation of a crude oil sample from  
well Kimmeridge-1, United Kingdom

by

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## *Geochemical investigation of a crude oil sample from well Kimmeridge-1, United Kingdom*

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### 1.0 Introduction

A geochemical investigation has been carried out on a crude oil sample (stock tank oil most likely from the Middle Jurassic (Callovian) Cornbrash reservoir, OMC 6683) from well Kimmeridge-1, United Kingdom.

The geochemical parameters are shown on pages 2 to 17, analysis results are presented on the yellow pages.

### 2.0 Conclusions

#### 1. Transformation processes

The oil has probably been very slightly biodegraded (C7-distribution, whole oil gas chromatogram).

The oil sample has most likely been water washed (low amounts of aromatics in the gasoline fraction).

#### 2. Maturity

The oil has been expelled from a well-mature source rock (API; low amounts of sulphur, nickel and vanadium; high amounts of rearranged steranes; C7- and biomarker VRE's 0.86-0.93; large gasoline fraction; gross composition).

#### 3. Environment of deposition / Type of organic matter

The oil has been derived from a shaly source rock (high amounts of rearranged steranes, low sulphur, pristane/phytane > 1.0, C7-distribution), that contained predominantly structureless organic matter (n-alkane distribution, biomarker distribution).

Detailed GC/MS/MS showed the presence of 24-n-propylcholestanes indicative for a marine environment of deposition.

#### 4. Correlation

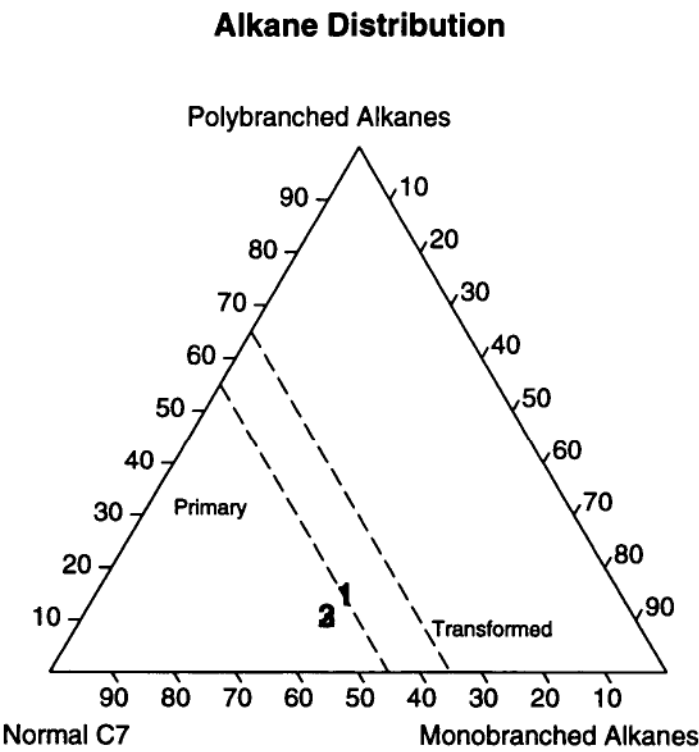
A comparison with the Jurassic and Triassic reservoired crudes from Wytch Farm and surface oil seeps from Mupe Bay, Osmington Mills and Lulworth Cove show that all these oils type very similar and therefore have been derived from the same source rock (strong similarities in: biomarker distributions and carbon isotopes). The relatively light carbon isotopes and the slight C29-sterane predominance suggests a Liassic source rock.

It should be noted that the Kimmeridge-1 oil has a similar (high) maturity as the Wytch Farm Triassic reservoired oil (OMC 2952) and the Mupe Bay and Osmington mills impregnations. All these crudes have a slightly higher maturity compared to the shallower Wytch Farm Jurassic reservoired oil (OMC 2264) and the Lulworth Cove impregnation.

## Correlation table well Kimmeridge-1, United Kingdom

	KIMMERIDGE-1	WYTCH FARM	WYTCH FARM	MUPE BAY	MUPE BAY	OSMINGTON	LULWORTH
	depth unknown	Jurassic	Triassic	BTX-440	BTX-441	BTX-442	BTX-477
	S172936/1	S104929/0	S104928/0	S167293/0	S167294/0	S167292/0	S173159/11
OMC	6683	2264	2952	impreg	impreg	impreg	impreg
API	43.7	36.0	35.8	no data	no data	no data	no data
Sulphur (%)	0.1	0.1	0.1	no data	no data	no data	no data
Vanadium (ppm)	1.0	0.0	0.0	no data	no data	no data	no data
Nickel (ppm)	1.0	2.0	2.0	no data	no data	no data	no data
Pristane/Phytane	1.41	1.51	1.37	no data	no data	no data	no data
Pristane/n-C17	0.50	0.62	0.45	no data	no data	no data	no data
Phytane/n-C18	0.43	0.50	0.41	no data	no data	no data	no data
Gasoline fraction (%)	19.6	13.0	10.0	no data	no data	no data	no data
C7 ALKANES:							
normal	44	49	49	no data	no data	no data	no data
monobranched	41	40	40				
polybranched	15	11	11				
C7 ALKANES/CYCLOALKANES:							
normal	26	29	30	no data	no data	no data	no data
cycloalkanes	42	42	39				
branched	32	29	31				
C7 ALKANES/AROMATICS:							
alkanes	57	55	58	no data	no data	no data	no data
cycloalkanes	40	40	36				
aromatics	3	5	6				
C7 VR/E	0.86	0.83	0.92	no data	no data	no data	no data
AROMATIC FRACTION:							
MNR	1.14	no data	no data	1.44	1.32	1.61	no data
DNR-1	2.29	no data	no data	3.40	not detectable	not detectable	no data
TNR-1	0.71	no data	no data	0.86	0.88	2.18	no data
TNR-2	1.77	no data	no data	not detectable	not detectable	0.89	no data
MPI-1	0.60	no data	no data	0.00	0.67	0.00	no data
MPI-2	0.59	no data	no data	0.00	0.76	0.00	no data
F-1	0.46	no data	no data	0.00	0.46	0.00	no data
F-2	0.23	no data	no data	0.00	0.27	0.00	no data
Naphthalene VR/E	0.88	no data	no data	0.93	1.04	1.21	no data
STERANES/TRITERPANES:							
iso steranes	25	25	29	29	32	25	28
rearranged steranes	69	57	64	65	60	69	51
triterpanes	6	18	7	6	8	6	21
STERANE CONVERSION:							
iso steranes	28	33	36	34	36	31	36
rearranged steranes	53	50	55	50	45	56	45
normal steranes	19	17	9	16	19	13	19
STERANE CARBON NUMBERS:							
C27 steranes	35	33	35	30	29	31	35
C28 steranes	26	26	26	27	30	27	30
C29 steranes	39	41	39	43	41	42	35
3R/(3R+5R) terpanes	0.40	0.14	0.44	0.40	0.32	0.39	0.31
Ts/Tm	1.23	0.32	6.55	1.53	1.52	1.78	1.05
20S/20(R+S) C29 steranes	0.47	0.49	0.35	0.60	0.50	0.54	0.53
Iso/(iso+normal) C29 steranes	0.58	0.64	0.84	0.64	0.61	0.66	0.64
Biomarker VR/E	0.93	0.72	0.99	0.93	0.90	0.94	0.87
CARBON ISOTOPE RATIOS (per mil):							
total oil	-30.1	-28.6	-29.8	-29.8	-29.7	-29.6	-29.6
saturates	-30.4	-29.4	-30.2	-29.2	-29.1	-28.7	-28.8
aromatics	-29.1	-27.9	-29.1	not detectable	not detectable	not detectable	not detectable

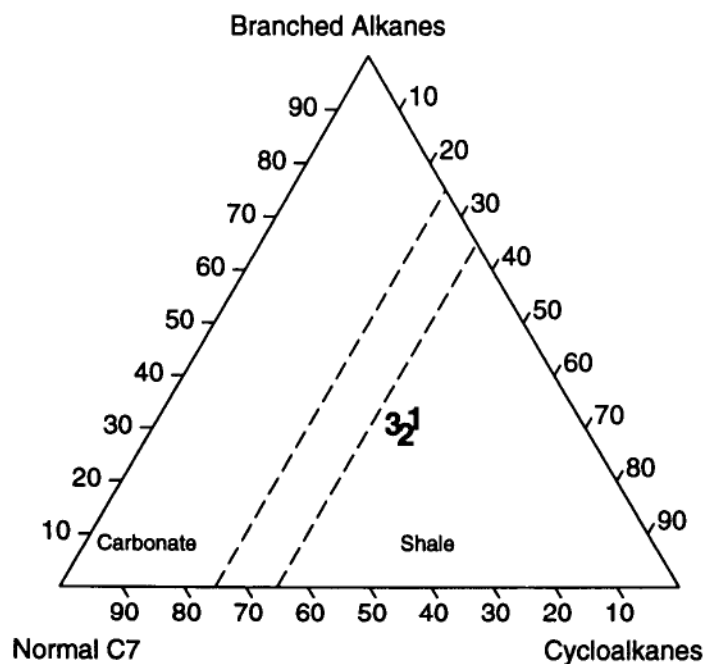
*Correlation figure  
well Kimmeridge-1, United Kingdom*



Samples :		Normal	Mono- branched	Poly- branched
1	KIMMERIDGE-1 (depth unknown)	44	41	15
2	WYTCH FARM-D5 (depth unknown)	49	40	11
3	WYTCH FARM-D5 (depth unknown)	49	40	11
4	MUPE BAY BACON HOLE (BTX-440)	no data		
5	MUPE BAY BACON HOLE (BTX-441)	no data		
6	OSMINGTON MILLS (BTX-442)	no data		
7	LULWORTH COVE (BTX-477)	no data		

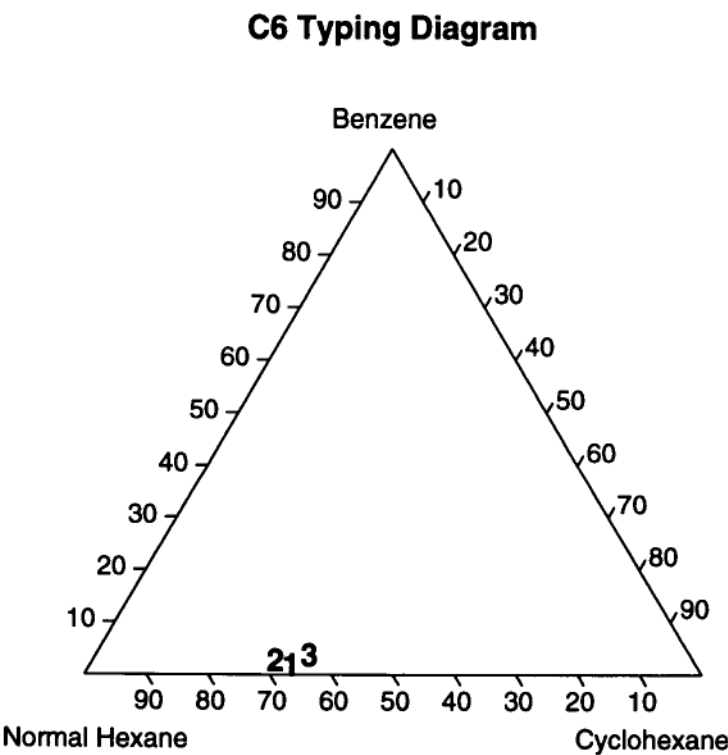
## Correlation figure well Kimmeridge-1, United Kingdom

### Alkane/Cycloalkane Distribution



Samples :		Normal	Cyclo- alkanes	Branched Alkanes
1	KIMMERIDGE-1 (depth unknown)	26	42	32
2	WYTCH FARM-D5 (depth unknown)	29	42	29
3	WYTCH FARM-D5 (depth unknown)	30	39	31
4	MUPE BAY BACON HOLE (BTX-440)	no data		
5	MUPE BAY BACON HOLE (BTX-441)	no data		
6	OSMINGTON MILLS (BTX-442)	no data		
7	LULWORTH COVE (BTX-477)	no data		

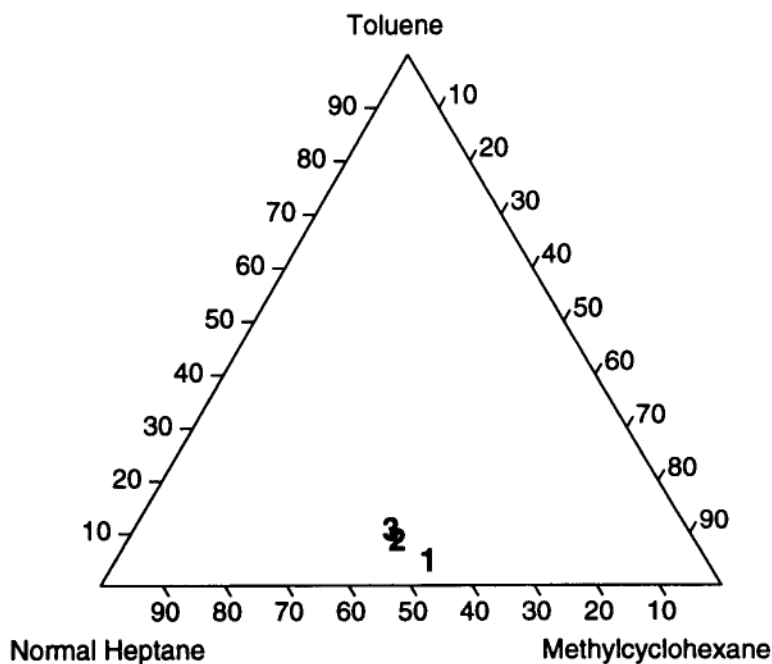
Correlation figure  
well Kimmeridge-1, United Kingdom



Samples :		Normal Hexane	Cyclo- hexane	Benzene
1	KIMMERIDGE-1 (depth unknown)	65	33	2
2	WYTCH FARM-D5 (depth unknown)	67	30	3
3	WYTCH FARM-D5 (depth unknown)	61	35	4
4	MUPE BAY BACON HOLE (BTX-440)	no data		
5	MUPE BAY BACON HOLE (BTX-441)	no data		
6	OSMINGTON MILLS (BTX-442)	no data		
7	LULWORTH COVE (BTX-477)	no data		

**Correlation figure  
well Kimmeridge-1, United Kingdom**

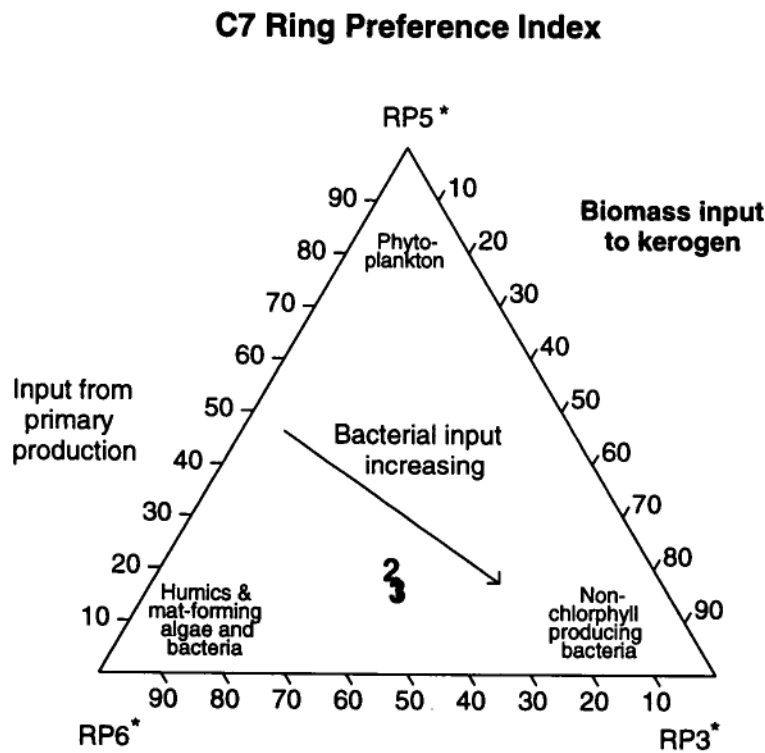
**C7 Typing Diagram**



Samples :		Normal Heptane	Me-cyclo- hexane	Toluene
1	KIMMERIDGE-1 (depth unknown)	44	51	5
2	WYTCH FARM-D5 (depth unknown)	47	44	9
3	WYTCH FARM-D5 (depth unknown)	47	42	11
4	MUPE BAY BACON HOLE (BTX-440)	no data		
5	MUPE BAY BACON HOLE (BTX-441)	no data		
6	OSMINGTON MILLS (BTX-442)	no data		
7	LULWORTH COVE (BTX-477)	no data		



Correlation figure  
well Kimmeridge-1, United Kingdom

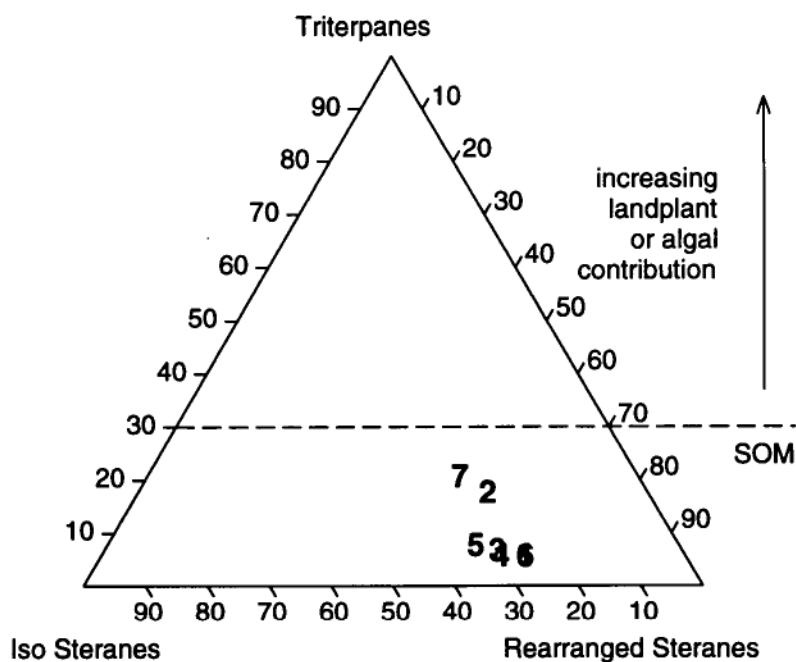


\* RP3 = 3-membered rings  
RP5 = 5-membered rings  
RP6 = 6-membered rings

Samples :		RP6	RP3	RP5
1	KIMMERIDGE-1 (depth unknown)	43	42	16
2	WYTCH FARM-D5 (depth unknown)	42	38	20
3	WYTCH FARM-D5 (depth unknown)	43	41	16
4	MUPE BAY BACON HOLE (BTX-440)			
5	MUPE BAY BACON HOLE (BTX-441)			
6	OSMINGTON MILLS (BTX-442)			
7	LULWORTH COVE (BTX-477)			

# **Correlation figure** **well Kimmeridge-1, United Kingdom**

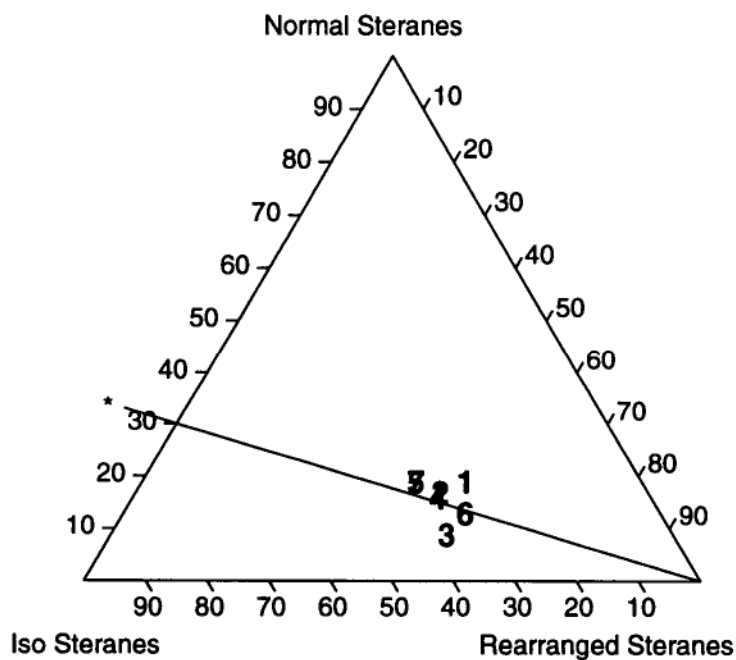
## **Sterane/Triterpane Diagram**



Samples :		Iso Steranes	Rearr. Steranes	Triterpanes
1	KIMMERIDGE-1 (depth unknown)	25	69	6
2	WYTCH FARM-D5 (depth unknown)	25	57	18
3	WYTCH FARM-D5 (depth unknown)	29	64	7
4	MUPE BAY BACON HOLE (BTX-440)	29	65	6
5	MUPE BAY BACON HOLE (BTX-441)	32	60	8
6	OSMINGTON MILLS (BTX-442)	25	69	6
7	LULWORTH COVE (BTX-477)	28	51	21

## Correlation figure well Kimmeridge-1, United Kingdom

### Sterane Conversion Diagram

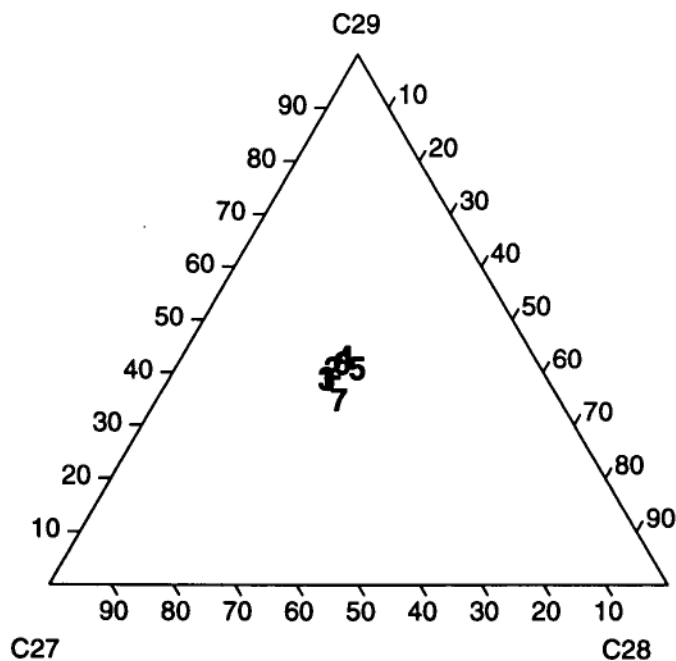


- \* The line of complete sterane isomerisation  
indicating a mature character

Samples :		Iso	Rear- ranged	Normal
1	KIMMERIDGE-1 (depth unknown)	28	53	19
2	WYTCH FARM-D5 (depth unknown)	33	50	17
3	WYTCH FARM-D5 (depth unknown)	36	55	9
4	MUPE BAY BACON HOLE (BTX-440)	34	50	16
5	MUPE BAY BACON HOLE (BTX-441)	36	45	19
6	OSMINGTON MILLS (BTX-442)	31	56	13
7	LULWORTH COVE (BTX-477)	36	45	19

*Correlation figure  
well Kimmeridge-1, United Kingdom*

**Sterane Typing Diagram**



Samples :		C27	C28	C29
1	KIMMERIDGE-1 (depth unknown)	35	26	39
2	WYTCH FARM-D5 (depth unknown)	33	26	41
3	WYTCH FARM-D5 (depth unknown)	35	26	39
4	MUPE BAY BACON HOLE (BTX-440)	30	27	43
5	MUPE BAY BACON HOLE (BTX-441)	29	30	41
6	OSMINGTON MILLS (BTX-442)	31	27	42
7	LULWORTH COVE (BTX-477)	35	30	35

## Summary of the geochemical data of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom

### Gravity and Gross Composition

API gravity (degrees) :	43.7
Specific gravity (g/ml) :	0.808
Viscosity (centipoise) :	no data
Pourpoint (degrees C) :	no data
Total Acid Number (mgKOH/g) :	no data
Wax content (%) :	no data

#### Gross Composition (wt%)

Weight lost on topping :	40.3
Saturates :	91
Aromatics :	4
Heterocompounds :	6
Rest (high molecular) :	0
Gasoline fraction (%) :	19.6
Sulphur (%) :	0.1
Vanadium (ppm) :	1.0
Nickel (ppm) :	1.0

### Saturates Distribution

(Gas Chromatography)

Pristane / Phytane :	1.41
Pristane / n-C17 :	0.50
Phytane / n-C18 :	0.43
ACI :	17
Corr. Coeff. :	-0.9983

### C7 Distribution

(Gas Chromatography)

C7 Alkanes (%)	
Normal C7 :	44
Monobranched :	41
Polybranched :	15
C7 Alkanes / Cycloalkanes (%)	
Normal C7 :	26
Cycloalkanes :	42
Branched Alkanes :	32
C7 Alkanes / Aromatics (%)	
Alkanes :	57
Cycloalkanes :	40
Aromatics :	3
C7 VR/E	0.86

### Biomarkers Distribution

(Gas Chromatography / Mass Spectrometry)

Steranes/Triterpanes (%)	
Iso Steranes :	25
Rearranged Steranes :	69
Triterpanes :	6
Sterane Conversion (%)	
Iso Steranes :	28
Rearranged Steranes :	53
Normal Steranes :	19
Steranes Carbon Numbers (%)	
C27 :	35
C28 :	26
C29 :	39
Triterpanes (%)	
C30 Hopane :	100
Oleanane ( $\alpha + \beta$ ) :	0
W + T :	0
C29 Sterane Ratios	
20S / (20R + 20S) :	0.47
Iso / (Iso + Normal) :	0.58
Triterpane Ratios	
Ts / Tm :	1.23
Ts / (Ts + Tm) :	0.55
3R / (3R + 5R) :	0.40
Biomarker VR/E	0.93

### Aromatics Distribution

(Gas Chromatography / Mass Spectrometry)

Monoaromatic Steroids (%)	
C27 :	no data
C28 :	
C29 :	
Phenanthrene Ratios	
MPI-1 :	0.60
F-1 :	0.46
F-2 :	0.23
Naphthalene VR/E	0.88

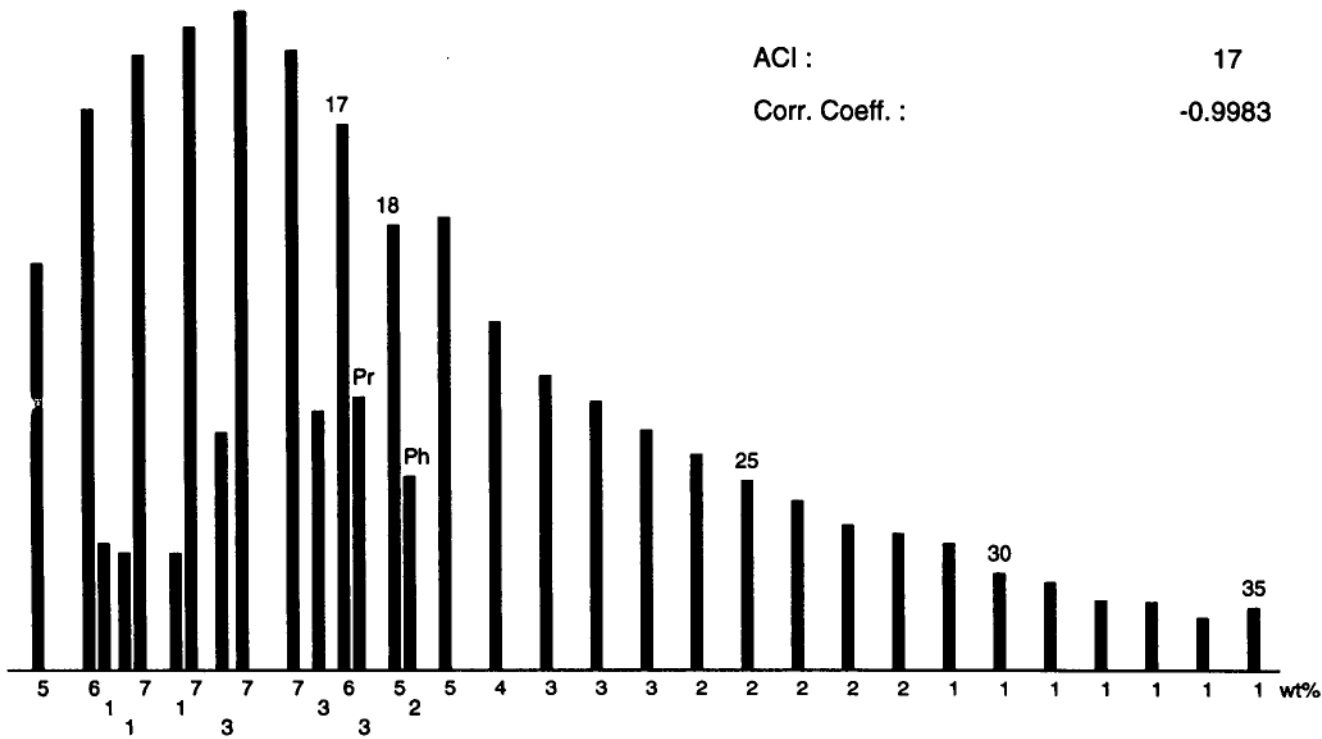
### Carbon Isotope Ratios

(Mass Spectrometry)

Total Oil (topped) :	-30.1
Saturates :	-30.4
Aromatics :	-29.1

Bar diagram of normal alkanes & isoprenoids of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom

Pristane / Phytane :	1.41
Pristane / n-C17 :	0.50
Phytane / n-C18 :	0.43
ACI :	17
Corr. Coeff. :	-0.9983

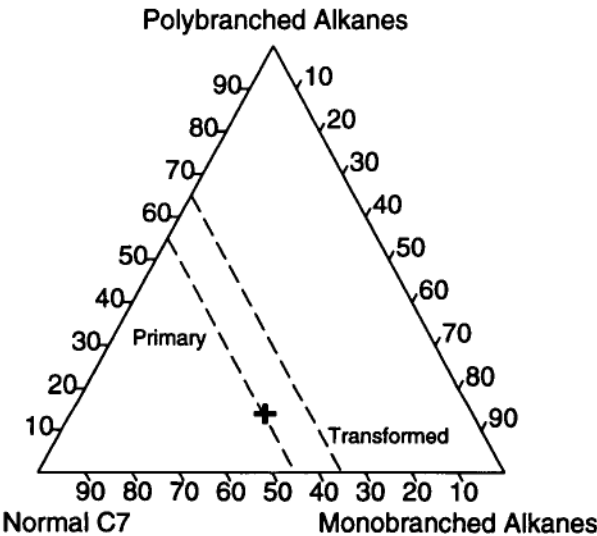


Conclusions based on saturate fraction :

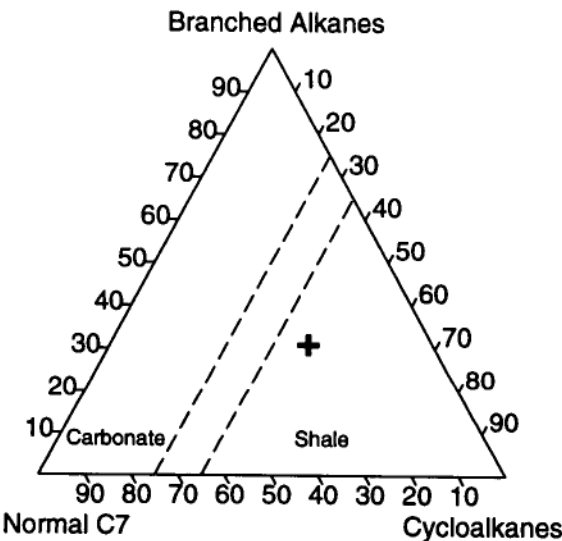
- 1 : the saturates show no indication of bacterial degradation
- 2 : the n-alkane distribution has a mature character
- 3 : the saturates indicate that the oil has been expelled from a source rock containing predominantly structureless organic matter

*The light fraction (< 120 C) of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom*

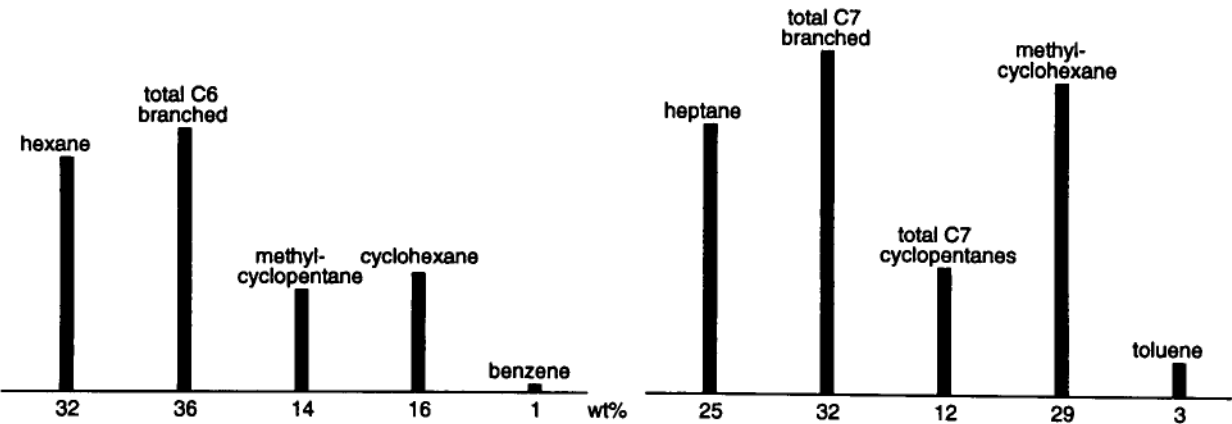
**Alkane Distribution**



**Alkane/Cycloalkane Distribution**



**C6 and C7 Distributions**



**C7 ALKANES (%)**

Normal C7 :	44
Monobranched :	41
Polybranched :	15

**C7 ALKANES / CYCLOALKANES (%)**

Normal C7 :	26
Cycloalkanes :	42
Branched Alkanes :	32

**C7 ALKANES / AROMATICS (%)**

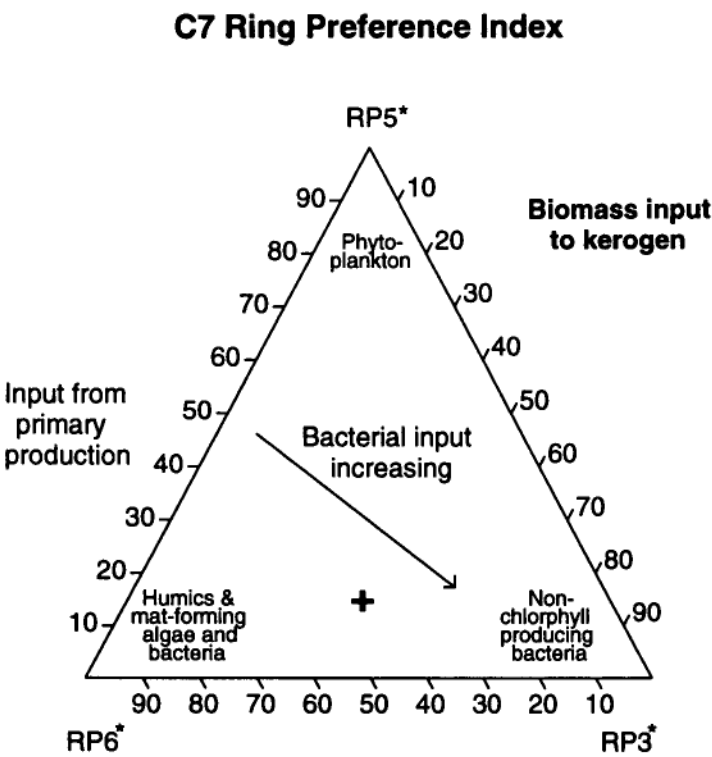
Alkanes :	57
Cycloalkanes :	40
Aromatics :	3

C7 TEMP. OF EXPULSION (C) :	133
C7 VR/E :	0.86

**Conclusions based on light fraction :**

- 1 : the light fraction shows no indication of bacterial degradation
- 2 : the aromatics indicate that this oil has possibly been water washed
- 3 : the light fraction has a mature character
- 4 : the light fraction indicates a shaly source rock

C7 ring preference index of the oil sample from  
well KIMMERIDGE-1 (depth unknown), United Kingdom



\* RP3 = 3-membered rings  
RP5 = 5-membered rings  
RP6 = 6-membered rings

Prime sum :	0.88
New C7 temp :	131
PCI (Petroleum Composition Index) :	0.14

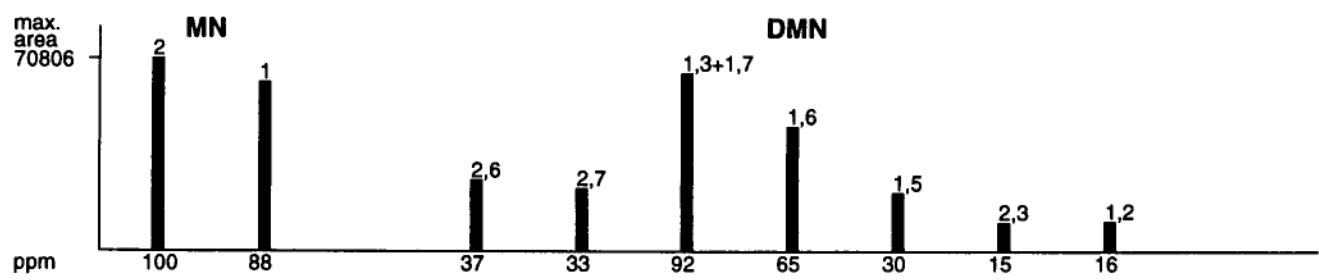
Conclusions based on C7 ring preference index :

1 :

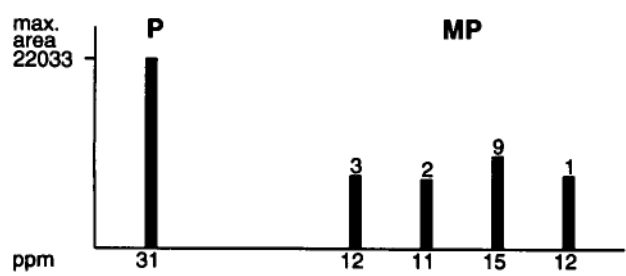


GC/MS of the aromatic fraction of the oil sample from  
well KIMMERIDGE-1 (depth unknown), United Kingdom

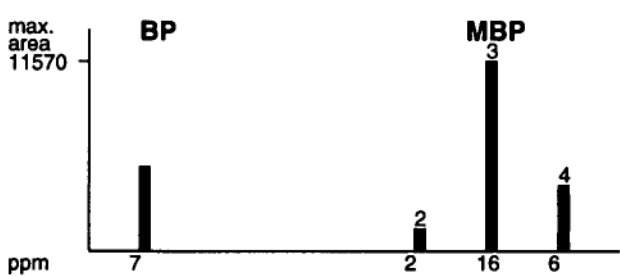
Naphthalenes



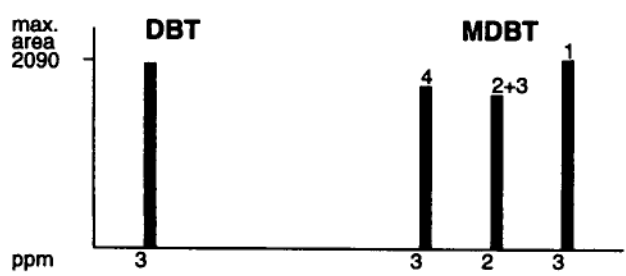
Phenanthrenes



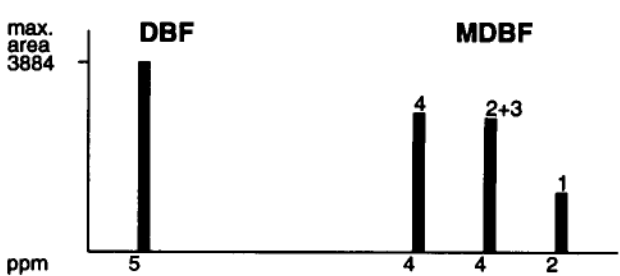
Biphenyls



Dibenzothiophenes



Dibenzofurans



Conclusions based on aromatic fraction :

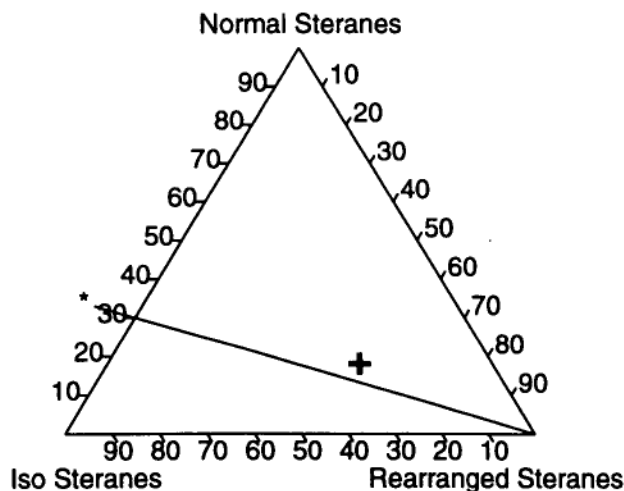
1 :

RATIOS	(value)	(VR/E*)
Naphthalenes		
MNR :	1.14	1.01
DNR-1 :	2.29	1.00
TNR-1 :	0.71	0.70
TNR-2 :	1.77	no data
Naphthalene VR/E :	0.88	
Phenanthrenes		
MPI-1 :	0.60	0.73
MPI-2 :	0.59	0.71
F-1 :	0.46	0.87
F-2 :	0.23	0.73
Overall ratios		
Biphenyls/Naph. :	0.18	
Dibenzothiophenes/Naph. :	0.06	
Dibenzofurans/Naph. :	0.09	

\* Calibration based on literature values

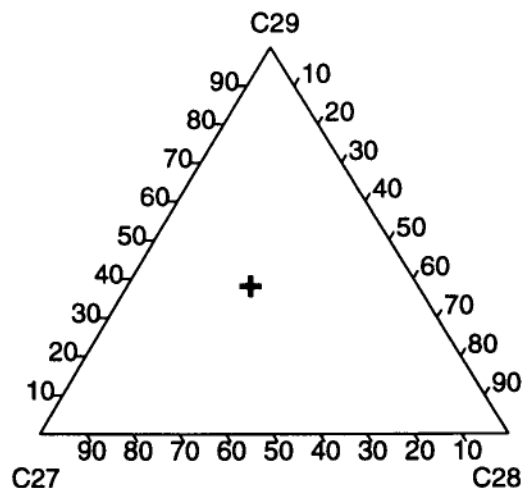
## GC/MS sterane typing of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom

### Sterane Conversion Diagram

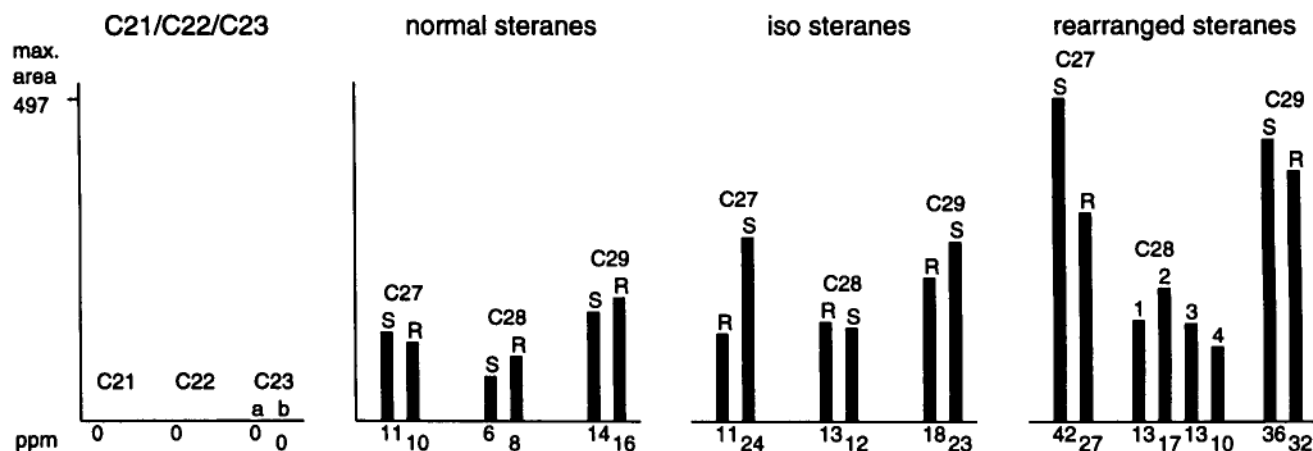


\* The line of complete sterane isomerisation indicating a mature character

### Sterane Typing Diagram



### Sterane Distribution



STERANE DISTRIBUTION	(ppm)	(%)
Iso Steranes :	101	28
Rearranged Steranes :	189	53
Normal Steranes :	65	19

CARBON NUMBER DISTRIBUTION		
C27 :	125	35
C28 :	91	26
C29 :	140	39

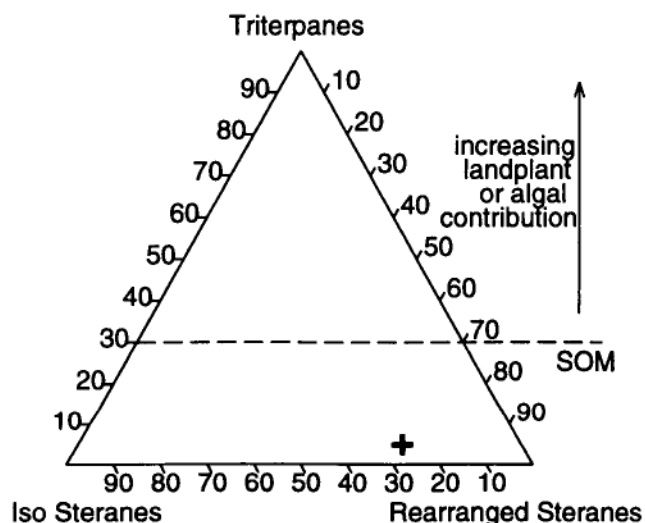
C29 STERANE CONVERSION RATIOS	
20S / (20R + 20S) :	0.47
Iso / (Iso + Normal) :	0.58
Biomarker VR/E :	0.93

### Conclusions based on steranes :

- 1 : the complete sterane isomerisation indicates that this oil has been expelled from a mature source rock
- 2 : the steranes indicate a shaly source rock

## GC/MS triterpane typing of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom

### Sterane/Triterpane Diagram



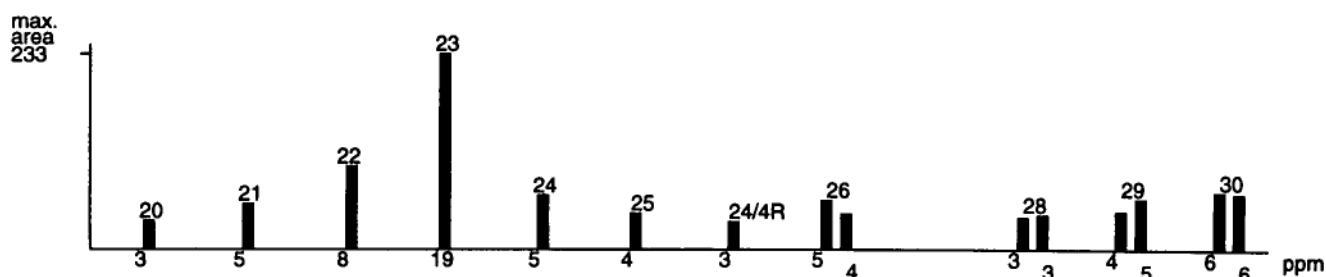
### STERANES/TRITERPANES (calculated %)

Iso Steranes :	25
Rearranged Steranes :	69
Triterpanes :	6

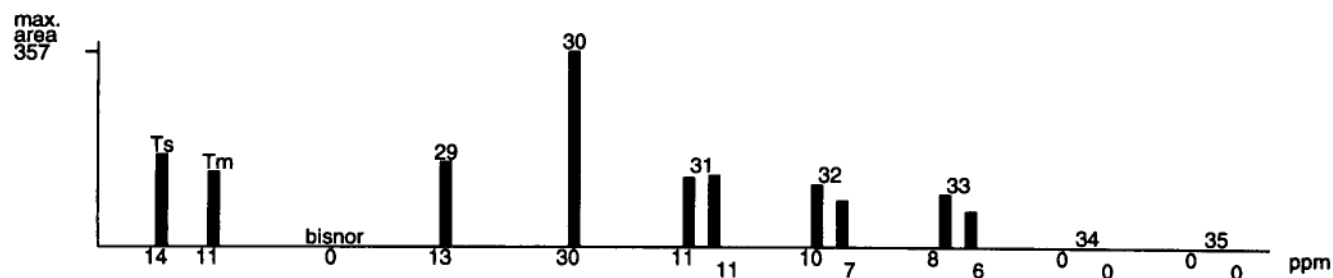
### TRITERPANE CONVERSION RATIOS

Ts / Tm :	1.23
Ts / (Ts + Tm) :	0.55
3R / (3R + 5R) :	0.40
C30 Hopane (ppm) :	30

### Tri- and Tetracyclic Terpanes



### Pentacyclic Terpanes

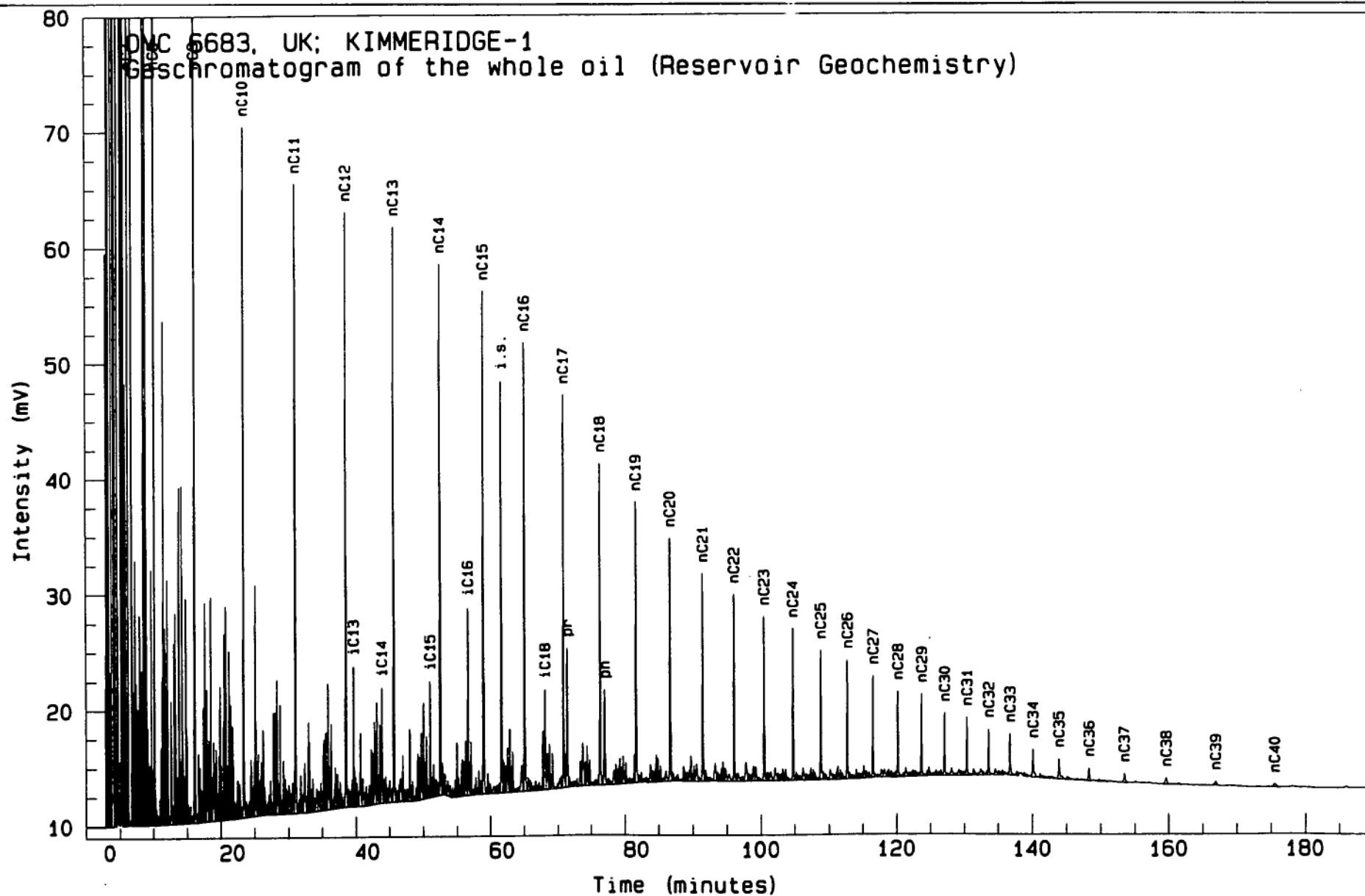


### Conclusions based on triterpanes :

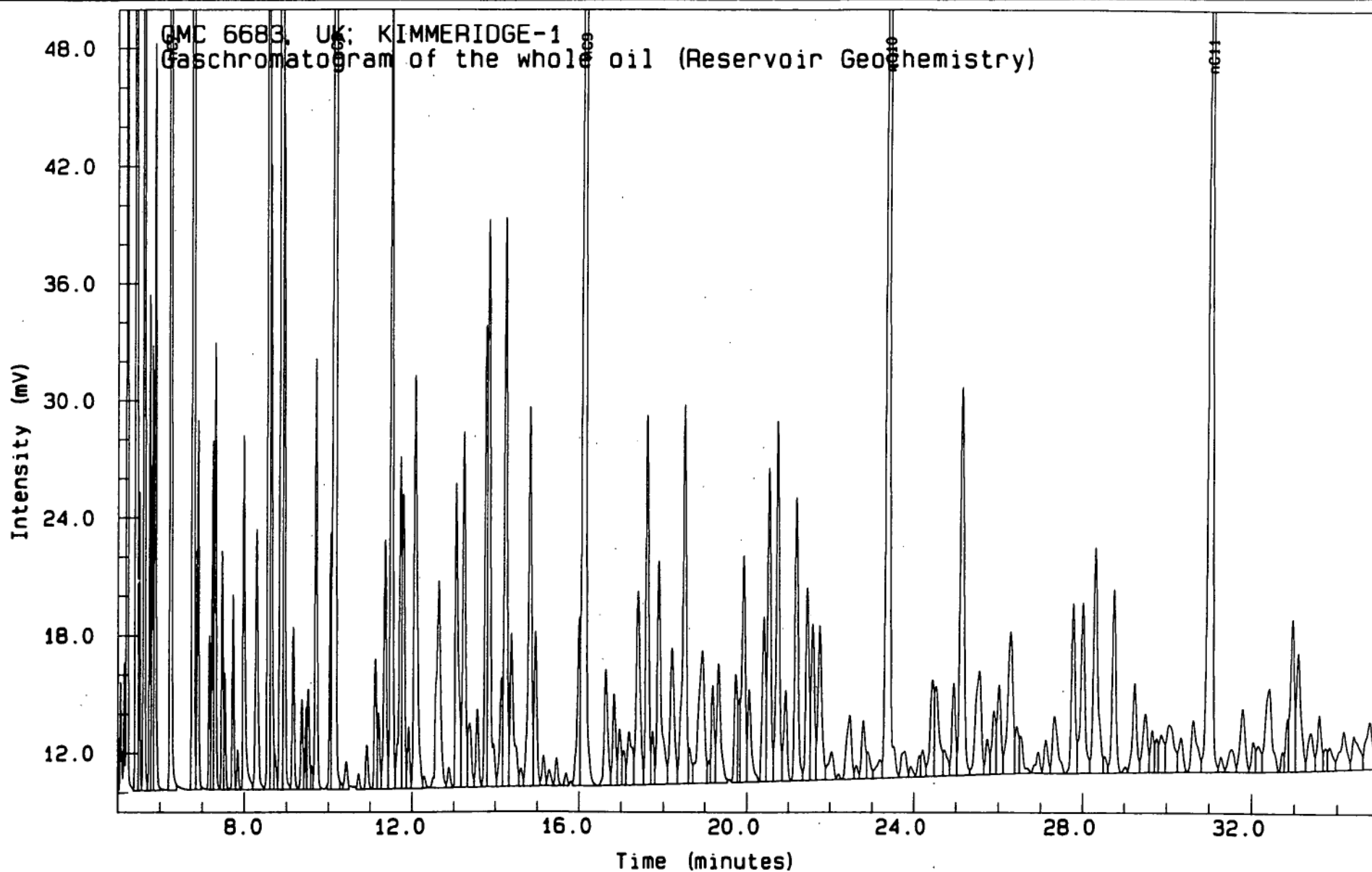
1 : the triterpane distribution indicates a source rock containing predominantly structureless organic matter

*ANALYTICAL DATA*  
*well KIMMERIDGE-1 (depth unknown), United Kingdom*

Gas chromatogram of the whole oil sample from  
well KIMMERIDGE-1 (depth unknown), United Kingdom



*Enlarged part of the whole oil gas chromatogram from  
well KIMMERIDGE-1 (depth unknown), United Kingdom*



# Data for the enlarged part of the whole oil gas chromatogram from well KIMMERIDGE-1 (depth unknown), United Kingdom

## Injection Report

Acquired on 23-JUN-1995 at 05:46

Sample Name : OMC 6683, UK; KIMMERIDGE-1  
Sample Id : S172936/1  
Sample Type : Sample Amount=0.00000  
Bottle No : 1

## PEAK INFORMATION

Peak RT mins Hght uV Area uVs Peak name

Peak	RT mins	Hght uV	Area uVs	Peak name
1	3.256	77783	152540	
2	3.376	106739	284768	
3	3.488	1627	4640	
4	3.603	13257	38060	
5	3.645	13286	75750	
6	3.947	987925	15481998	
7	4.408	509	1712	
8	5.424	112545	273865	
9	5.504	15220	32312	
10	5.616	112028	222374	
11	5.752	25340	51475	
12	5.819	22736	48525	
13	5.883	38154	98479	
14	6.253	206709	469291	nC7
15	6.784	226993	569399	
16	6.893	18833	51311	
17	7.168	7827	19576	
18	7.245	17777	44694	
19	7.301	22816	62040	
20	7.469	12149	32560	
21	7.528	5919	16458	
22	7.731	9945	27443	
23	7.843	2017	5819	
24	7.984	18054	59920	
25	8.291	13258	54442	
26	8.573	74287	225330	
27	8.603	34057	110608	
28	8.709	2025	6472	
29	8.880	91358	355766	
30	8.920	40726	104747	
31	9.160	8278	26928	
32	9.363	4568	15334	
33	9.469	4159	9483	
34	9.475	4094	1306	
35	9.477	4057	1297	
36	9.483	4046	1296	
37	9.485	4094	1304	
38	9.488	4163	1323	
39	9.491	4268	1351	
40	9.512	5094	16303	
41	9.595	1211	4080	
42	9.696	21962	73835	
43	10.056	13041	35701	
44	10.152	117759	432562	nC8
45	10.280	395	1140	

Peak	RT mins	Hght uV	Area uVs	Peak name
46	10.422	1103	6415	
47	10.717	799	2966	
48	10.915	2233	9156	
49	11.120	6610	24191	
50	11.192	3852	14523	
51	11.347	12670	54884	
52	11.496	43566	167087	
53	11.712	16888	69632	
54	11.776	14999	56907	
55	11.904	3125	12864	
56	12.061	21058	112322	
57	12.285	596	2554	
58	12.629	10506	74320	
59	12.877	1059	4970	
60	13.048	15563	78914	
61	13.243	18172	82262	
62	13.381	3249	21392	
63	13.560	3931	17672	
64	13.773	23558	92646	
65	13.840	28957	134963	
66	14.141	5492	24037	
67	14.240	29074	131333	
68	14.376	7800	47571	
69	14.605	909	4485	
70	14.813	19355	101038	
71	14.947	7887	37527	
72	15.147	1594	7693	
73	15.285	792	4698	
74	15.461	1418	6337	
75	15.693	626	2779	
76	16.000	8573	39127	
77	16.131	77214	396656	nC9
78	16.635	5909	34712	
79	16.832	4609	23733	
80	16.963	2902	15328	
81	17.059	1780	8041	
82	17.179	2728	21548	
83	17.389	9838	63310	
84	17.613	18882	91966	
85	17.744	2698	12214	
86	17.885	11375	72642	
87	18.200	6961	47296	
88	18.501	19267	116254	
89	18.616	1834	9200	
90	18.936	6759	69972	
91	19.101	1156	4387	
92	19.179	5011	24569	
93	19.323	6054	40216	
94	19.731	5531	28897	
95	19.824	4245	13208	
96	19.917	11526	65702	
97	20.051	4730	29752	
98	20.405	8391	47256	
99	20.528	15971	86858	
100	20.733	18376	99685	
101	20.925	4641	27230	
102	21.184	14475	77094	
103	21.443	9781	51624	



*Data for the enlarged part of the whole oil gas chromatogram from well KIMMERIDGE-1 (depth unknown), United Kingdom*

Peak	RT min	Height	Area	Peak Name
104	21.573	7965	49482	
105	21.741	7853	52141	
106	22.035	1466	12603	
107	22.200	330	1236	
108	22.464	3311	27114	
109	22.621	689	3756	
110	22.784	2975	18732	
111	22.896	1351	8576	
112	23.187	956	8827	
113	23.389	59639	347407	nC10
114	23.776	1323	11809	
115	23.925	592	3541	
116	24.147	1077	5466	
117	24.232	1364	8631	
118	24.453	4928	30113	
119	24.536	4584	34784	
120	24.739	1355	9889	
121	24.949	4687	27020	
122	25.141	19829	128550	
123	25.555	5299	50826	
124	25.741	1749	10592	
125	25.891	3280	20574	
126	26.019	4578	29893	
127	26.288	7314	63391	
128	26.435	2395	13969	
129	26.528	1880	12049	
130	26.944	1085	7757	
131	27.131	1666	10852	
132	27.328	2909	26332	
133	27.773	8697	51740	
134	28.003	8761	61374	
135	28.288	11560	84395	
136	28.525	876	4604	
137	28.739	9424	57220	
138	29.016	332	1647	
139	29.235	4546	31489	
140	29.485	2972	24749	
141	29.653	2122	13088	
142	29.755	1767	8993	
143	29.867	1951	15791	
144	30.048	2461	30983	
145	30.331	1793	13679	
146	30.613	2677	25055	
147	31.024	54381	342465	nC11
148	31.272	735	4774	
149	31.512	1124	11740	
150	31.776	3178	27284	
151	32.032	1541	9226	
152	32.141	1342	10320	
153	32.405	4260	47803	
154	32.715	1024	4496	
155	32.840	2716	12234	
156	32.947	7771	50734	
157	33.083	6007	46556	
158	33.384	1930	17382	
159	33.581	2805	19208	
160	33.731	1191	6541	
161	33.829	1158	9751	



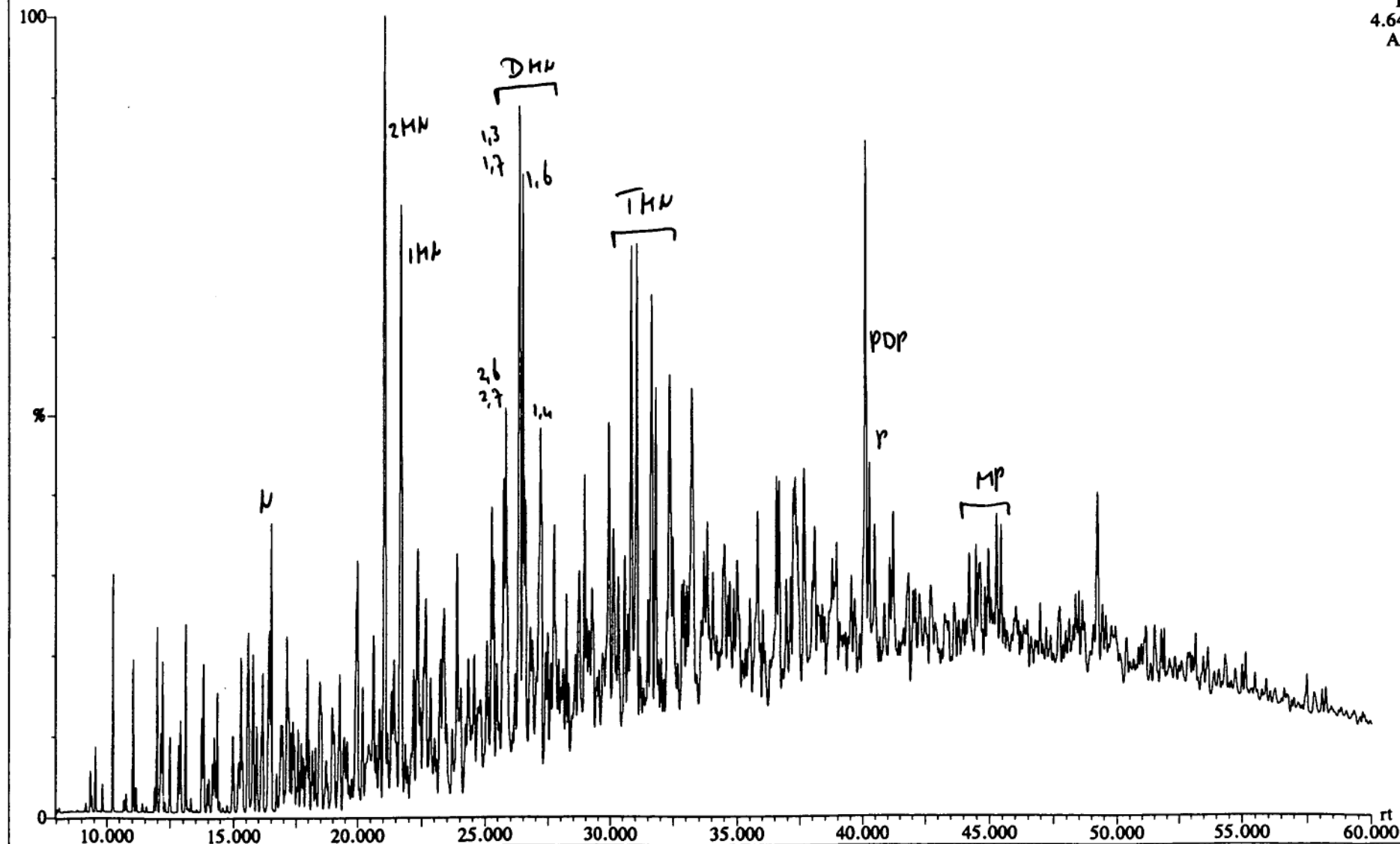
817293601

# GC/MS chromatogram of the aromatic fraction from well KIMMERIDGE-1 (depth unknown), United Kingdom

KSEPL  
07-Sep-1995 16:22:34  
A1729361 Sm (SG, 1x2)

U.K. Kimmeridge-1 depth unknown omc 6683

MD-800  
Ron  
Scan EI+  
TIC  
4.64e6  
Area



# GC/MS data of the aromatic fraction from well KIMMERIDGE-1 (depth unknown), United Kingdom

Report of sample: U.K. Kimmeridge-1 depth unknown omc 6683

Acquired at : 07-Sep-1995

Standard used for calculations: PDP  
Discrimination factor : 0.23

## I) NAPHTHALENES

### a) Concentrations (ppm)

2-MN  
1-MN  
2,6+2,7-DMN  
1,6-DMN  
1,5-DMN  
1,3,5+1,4,6-TMN  
2,3,6-TMN  
1,2,5-TMN  
C4-NAPH  
THN  
CAD  
Total Naphthalenes

### b) Parameters

100 4-MDBT/2+3-MDBT 1.06  
88 4-MDBT/1-MDBT 0.86  
70 2+3-MDBT/1-MDBT 0.81  
65 4-MDBT/DBT 0.88  
30 2+3-MDBT/DBT 0.83  
40 1-MDBT/DBT 1.02  
28

## IV) BIPHENYLS

### 11 a) Concentrations (ppm)

10 BP 7  
5 2-MBP 2  
463 3-MBP 16  
4-MBP 6  
Total Biphenyls 31

### b) Parameters

2-MN/1-MN (MNR) 1.14  
2,6+2,7-DMN/1,5-DMN (DNR-1) 2.29  
2,3,6-TMN/1,3,5+1,4,6-TMN (TNR-1) 0.71  
2,3,6-TMN/1,2,5-TMN (TNR-2) 1.77  
2,3,6-TMN/THN 2.73  
2,3,6-TMN/Cadelene 5.33

### b) Parameters

0.71 3-MBP/BP 2.25  
1.77 3-MBP/4-MBP 2.90  
2.73 3-MBP/2-MBP 8.56  
5.33

## II) PHENANTHRENES

### a) Concentrations (ppm)

P  
3-MP  
2-MP  
9-MP  
1-MP  
Total Phenantrenes

## V) DIBENZOFURANS

### a) Concentrations (ppm)

DBF 5  
31 4-MDBF 4  
12 2+3-MDBF 4  
11 1-MDBF 2  
15 Total Dibenzofurans 15  
12

### b) Parameters

4-MDBF/2+3-MDBF 1.04  
4-MDBF/1-MDBF 2.33  
0.95 2+3-MDBF/1-MDBF 2.25  
0.60 4-MDBF/DBF 0.73  
0.59 2+3-MDBF/DBF 0.70  
0.86 1-MDBF/DBF 0.31  
0.46

### b) Parameters

2-MP/1-MP  
1.5\*(2+3-MP/(P+1+9-MP)) (MPI-1)  
3\*(2-MP/(P+1+9-MP)) (MPI-2)  
2+3-MP/1+9-MP  
2+3-MP/1+9+2+3-MP

## VI) OVERALL RATIOS

Biphenyls/NAPH\* 0.18  
Dibenzothiophenes/NAP 0.06  
3 Dibenzofurans/NAPH\* 0.09

## III) DIBENZOTHIOPHENES

### a) Concentrations (ppm)

DBT  
4-MDBT  
2+3-MDBT  
1-MDBT  
Total Dibenzothiophenes

3  
3  
2  
3  
11

MN = methylnaphthalene  
DMN = dimethylnaphthalene  
TMN = trimethylnaphthalene  
THN = tetrahyronaphthalene  
DBF = methyldibenzofuran  
MDBF = methyldibenzofuran  
NAPH\* = 2,6+2,7-DMN + 1,5-DMN + 1,4,6+1,3,5-TMN + 2,3,4-TMN

P = phenantrene  
MP = methylphenanthrene  
DBT = dibenzothiophene  
MDBT = methyldibenzothiophene  
BP = biphenyl  
MBP = methylbiphenyl

# GC/MS data of the aromatic fraction from well KIMMERIDGE-1 (depth unknown), United Kingdom

## VII ) Misc. NAPHTHALENES

## a) Concentrations (ppm)

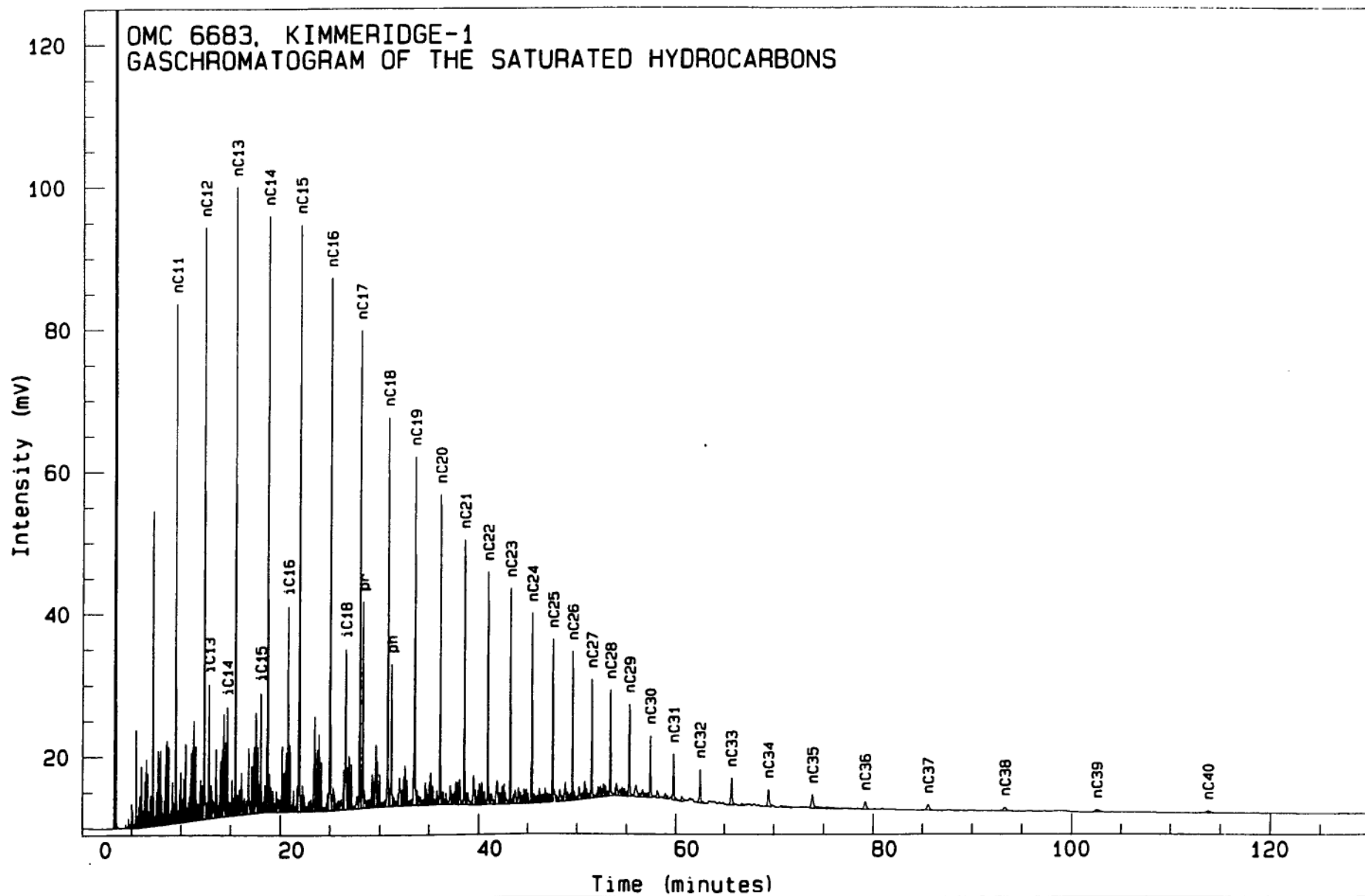
2,6-DMN	37	4,5-DMP	1
2,7-DMN	33	2,6+3,6-DMP	4
1,3+1,7-DMN	92	3,5-DMP	4
1,6-DMN	65	2,7-DMP	2
1,4-DMN	n.d.	3,9-DMP	20
2,3-DMN	15	1,6+2,5+2,9-DMP	9
1,5-DMN	30	1,7-DMP	6
1,2-DMN	16	1,9+4,9-DMP	7
1,4+2,3-DMN	15	1,5-DMP	n.d.
		1,8-DMP	1
		1,2-DMP	1
		9,10-DMP	n.d.
1,3,7-TMN	43	1,2,6-TMP	1
1,3,6-TMN	53	1,2,5-TMP	1
1,3,5+1,4,6-TMN	40	1,2,9-TMP	1
2,3,6-TMN	28	1,2,7-TMP	n.d.
1,2,7-TMN	9	1,2,8-TMP	2
1,6,7-TMN	38		
1,2,6-TMN	1		
1,2,4-TMN	4		
1,2,5-TMN	16		
1,3,5,7-TeMN	16		
1,3,6,7-TeMN	19		
1,2,4,7-TeMN	10		
1,2,5,7-TeMN	6		
2,3,6,7-TeMN	4		
1,2,6,7-TeMN	3		
1,2,5,6-TeMN (C4-NAPH)	11		

## b) Parameters

1,2,5-TMN/1,3,6-TMN	0.30
1,2,7-TMN/1,3,7-TMN	0.22

The assignment of some of these peaks is tentative

Gas chromatogram of the saturated hydrocarbons of the oil sample from  
well KIMMERIDGE-1 (depth unknown), United Kingdom



## Gross composition of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom

Printed at 02:24pm on 12 July 1995

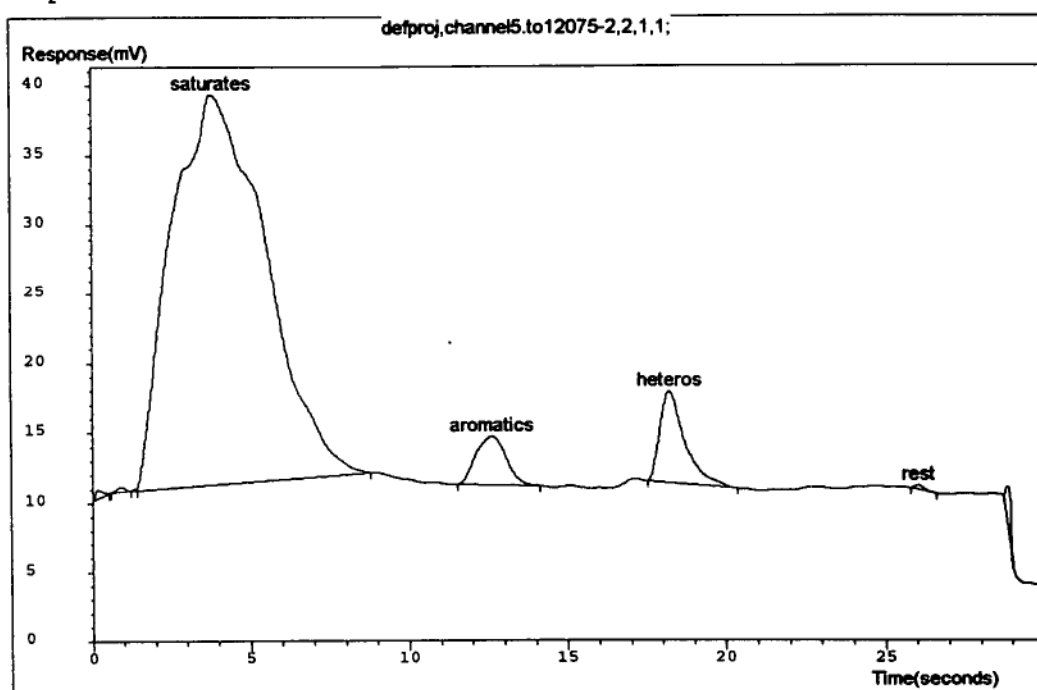
Project: defproj Instrument: channel5

Sample: OMC 6683

Page 1

Analysis: tol2075-

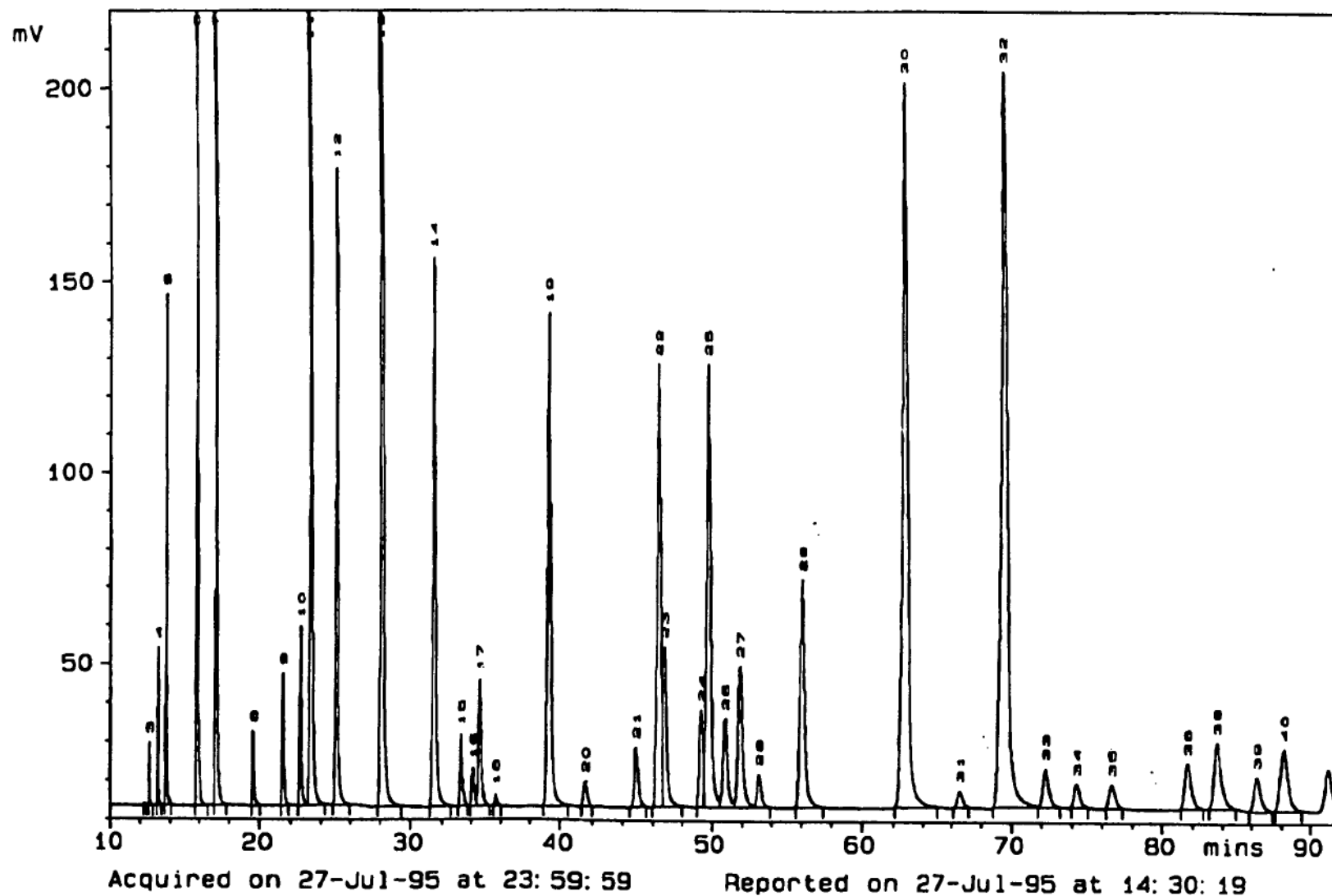
Injection: 1



### Peak information

Peak No.	Peak Nam	Amount	N	Area
4	saturate	90.7		96.10
5	aromatic	3.5		3.76
6	heteros	5.6		5.94
7	rest	0.1		0.11

# Gas chromatogram of the light fraction (< 120 C) of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom



# GC data of the light fraction (< 120 C) of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom

## INJECTION REPORT

Injection C: <DEFPROJ> 3 0172936,1,1

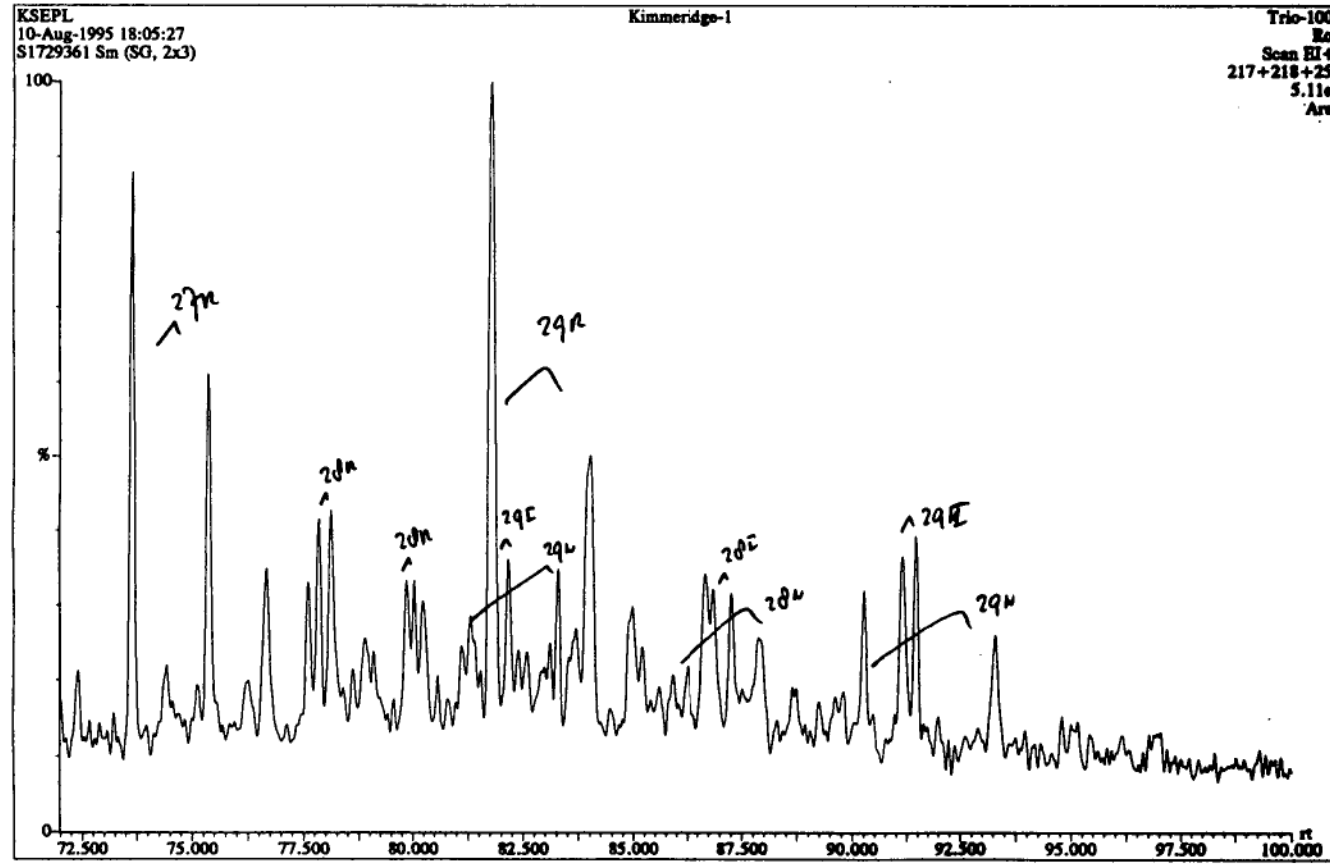
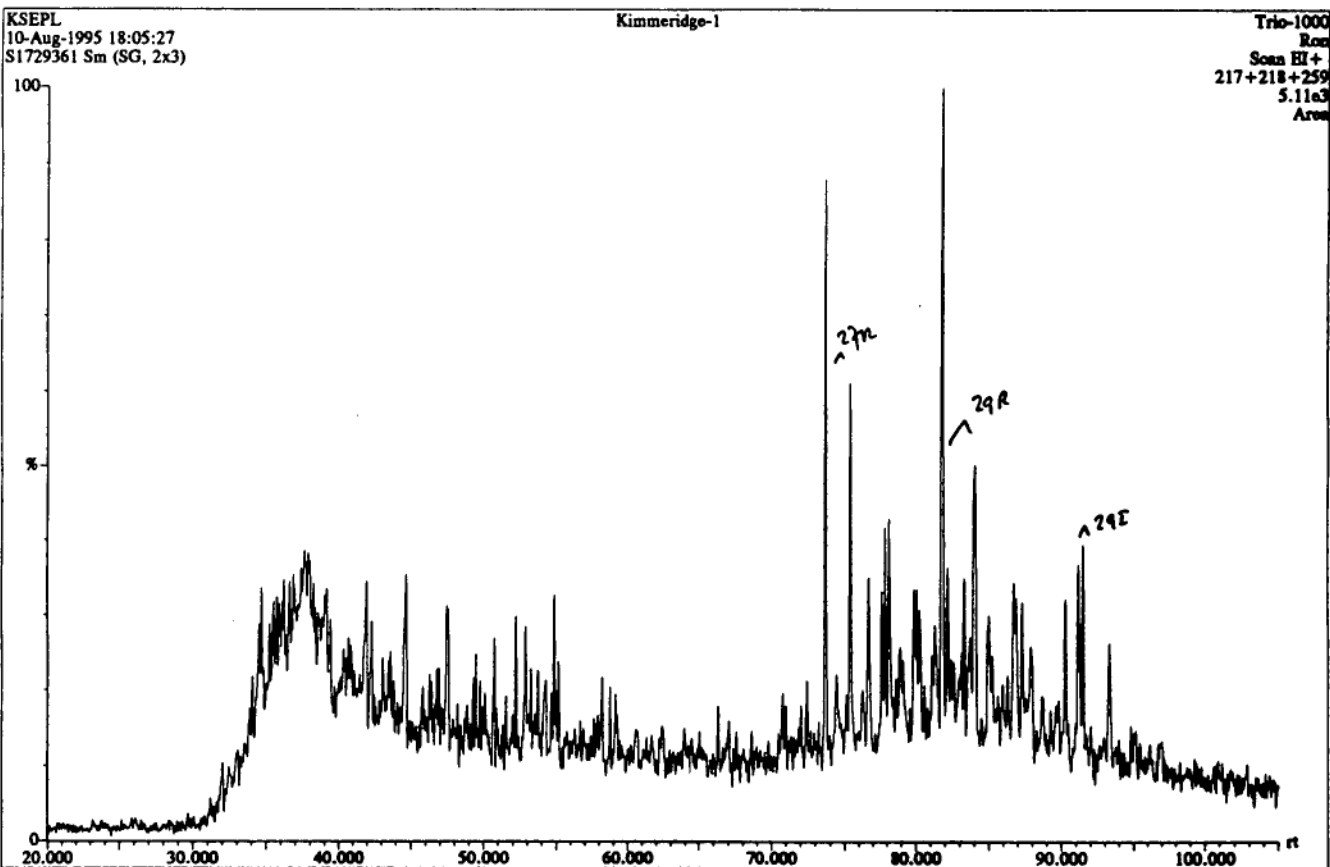
Acquired on 27-Jul-95 at 23:59:59

Reported on 27-Jul-95 at 14:24:30

## PEAK INFORMATION

RT mins	Hght uV	Area uVs	w% C6+	Peak name
12.650	16287	6747	0.179	3
13.200	40755	17369	0.460	4
13.716	133440	59268	1.570	5
15.847	284097	153974	4.080	6
17.157	361814	209196	5.543	7
19.620	19344	13356	0.354	8
21.473	34013	26729	0.708	9
22.653	46067	37782	1.001	10
23.329	291078	239065	6.334	11
25.052	165915	149625	3.965	12
28.111	390733	390510	10.347	13
31.484	143207	169328	4.487	14
33.313	18346	21339	0.565	15
34.123	9814	12574	0.333	16
34.577	32470	41127	1.090	17
35.662	2945	3613	0.096	18
39.249	128641	197527	5.234	19
41.559	6393	9590	0.254	20
44.890	15288	25374	0.672	21
46.395	115114	186691	4.947	22
46.796	41052	74859	1.984	23
49.282	24935	39403	1.044	24
49.737	115158	218506	5.790	25
50.883	22725	45937	1.217	26
51.864	36181	73054	1.936	27
53.128	8540	17004	0.451	28
56.024	58563	122999	3.259	29
62.757	188014	449334	11.906	30
66.565	4193	9898	0.262	31
69.522	190600	520652	13.796	32
72.283	9890	26530	0.703	33
74.307	6066	15475	0.410	34
76.637	6142	16584	0.439	35
81.679	11678	34117	0.904	36
83.623	16997	54968	1.456	38
86.373	8793	27950	0.741	39
88.168	15911	55971	1.483	40
Total 3021198 3774039 100.000				
Residual 130507 516770 0.000				

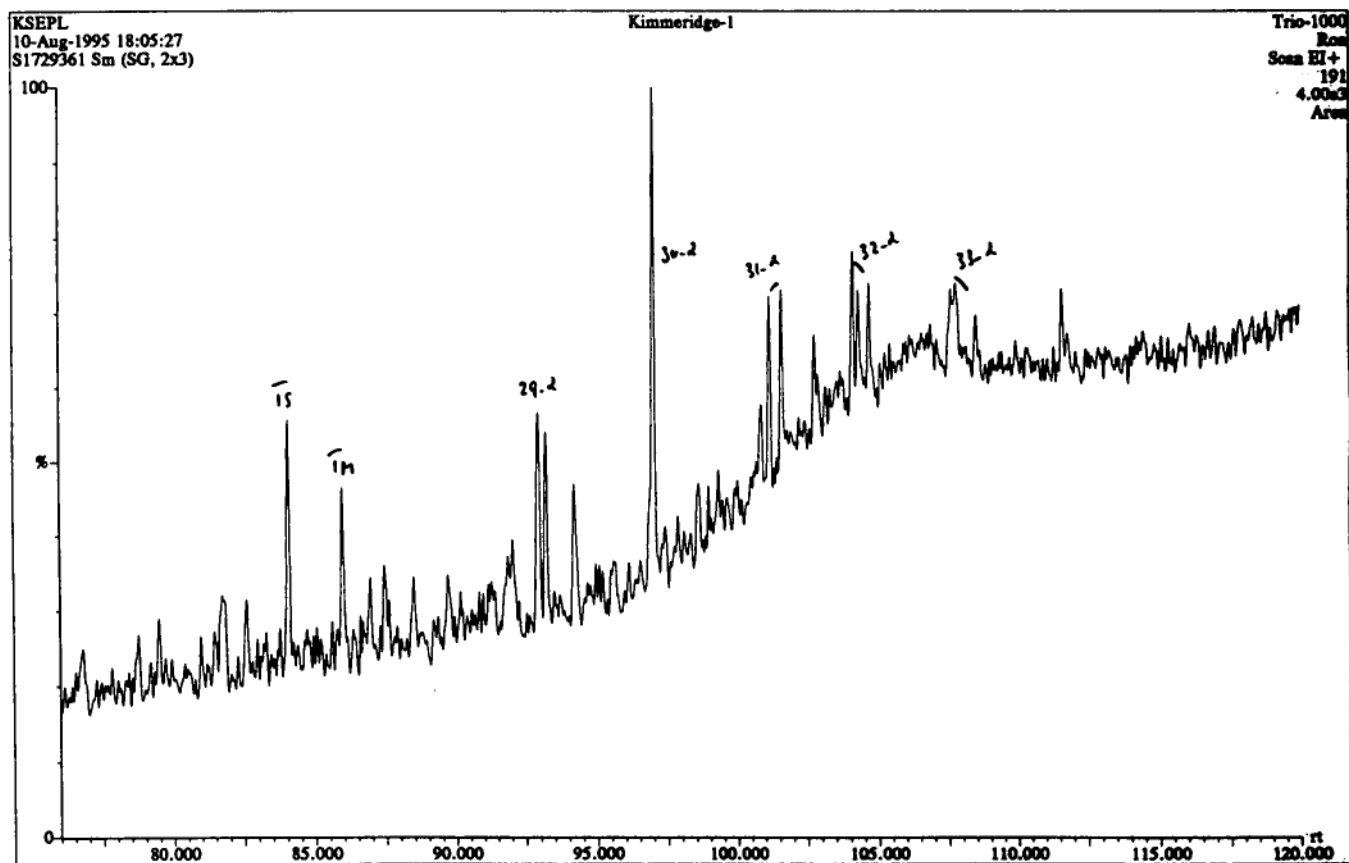
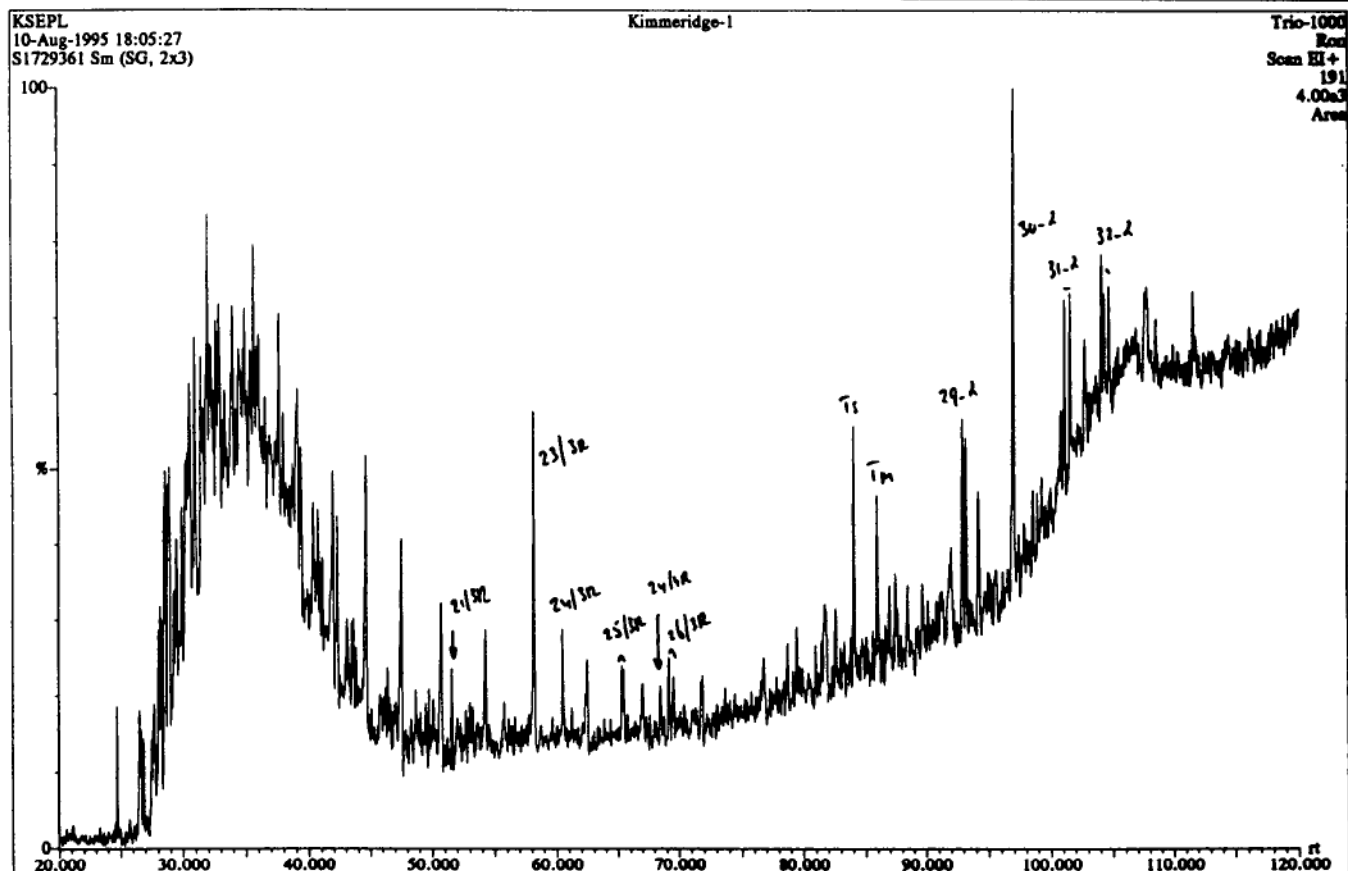
GC/MS fragmentograms of the steranes of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom



S17293601



# GC/MS fragmentograms of the triterpanes of the oil sample from well KIMMERIDGE-1 (depth unknown), United Kingdom



S17293601

Confidential