WCR (VOL. 2)
DIGBY - 1
W1130

GFE Resources Ltd

WELL COMPLETION REPORT

DIGBY-1

DIGBY JOINT VENTURE

OTWAY BASIN, VICTORIA

compiled by

Kevin Lanigan

November, 1995

VOLUME 2

APPENDICES 9 - 12

Level 6, 6 Riverside Quay, Southbank, Victoria 3006 Telephone: (03) 9684-4888 Facsimile: (03) 9684-4897

APPENDIX 9

GFE RESOURCES LTD

APPENDIX 9

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DIGBY-1

APPENDIX 9A

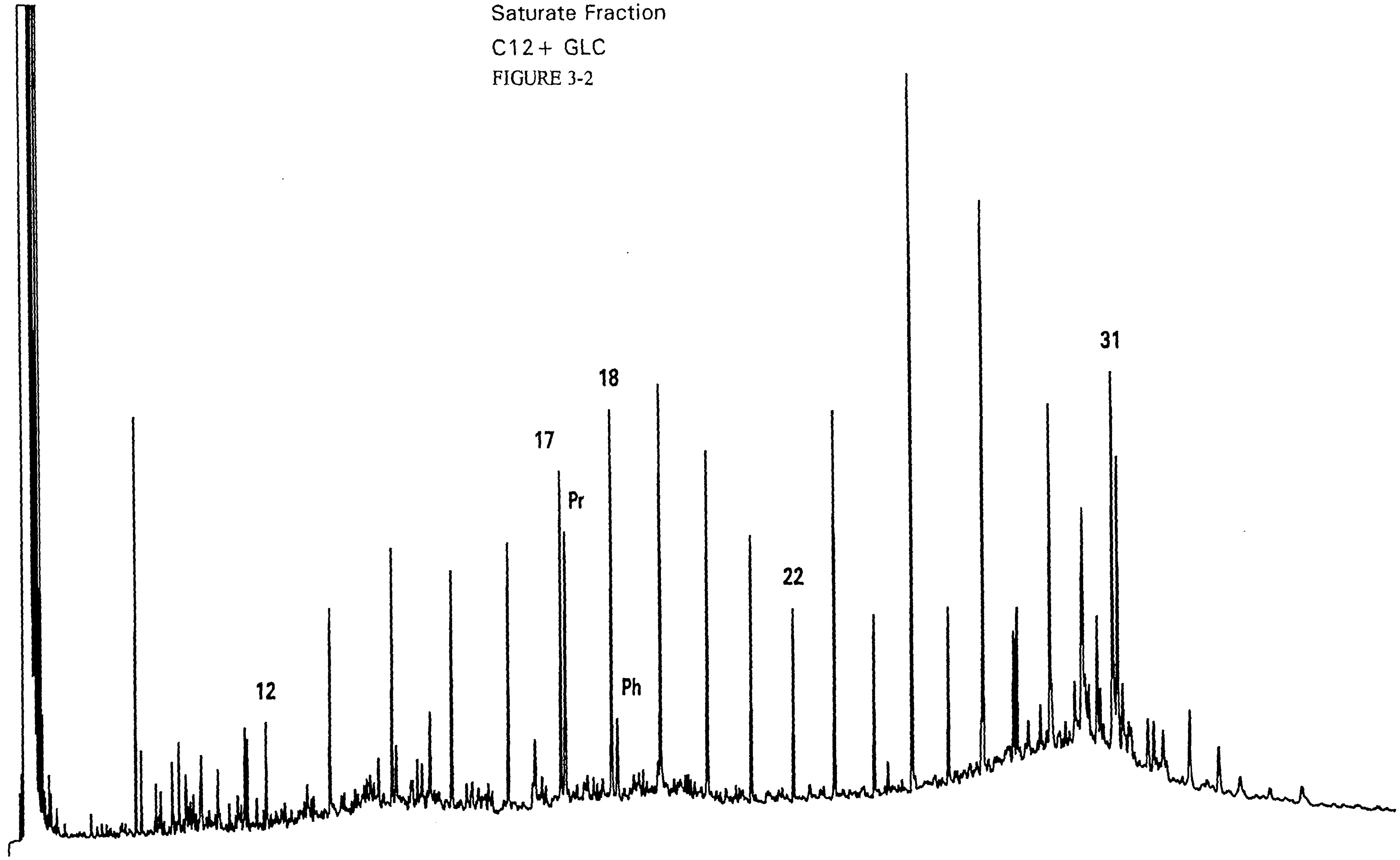
GAS CHROMATOGRAMS

FROM

CUTTINGS AND DST MUD

DIGBY-1

DIBGY 1, 450m, Cuttings
Saturate Fraction
C12+ GLC
FIGURE 3-2



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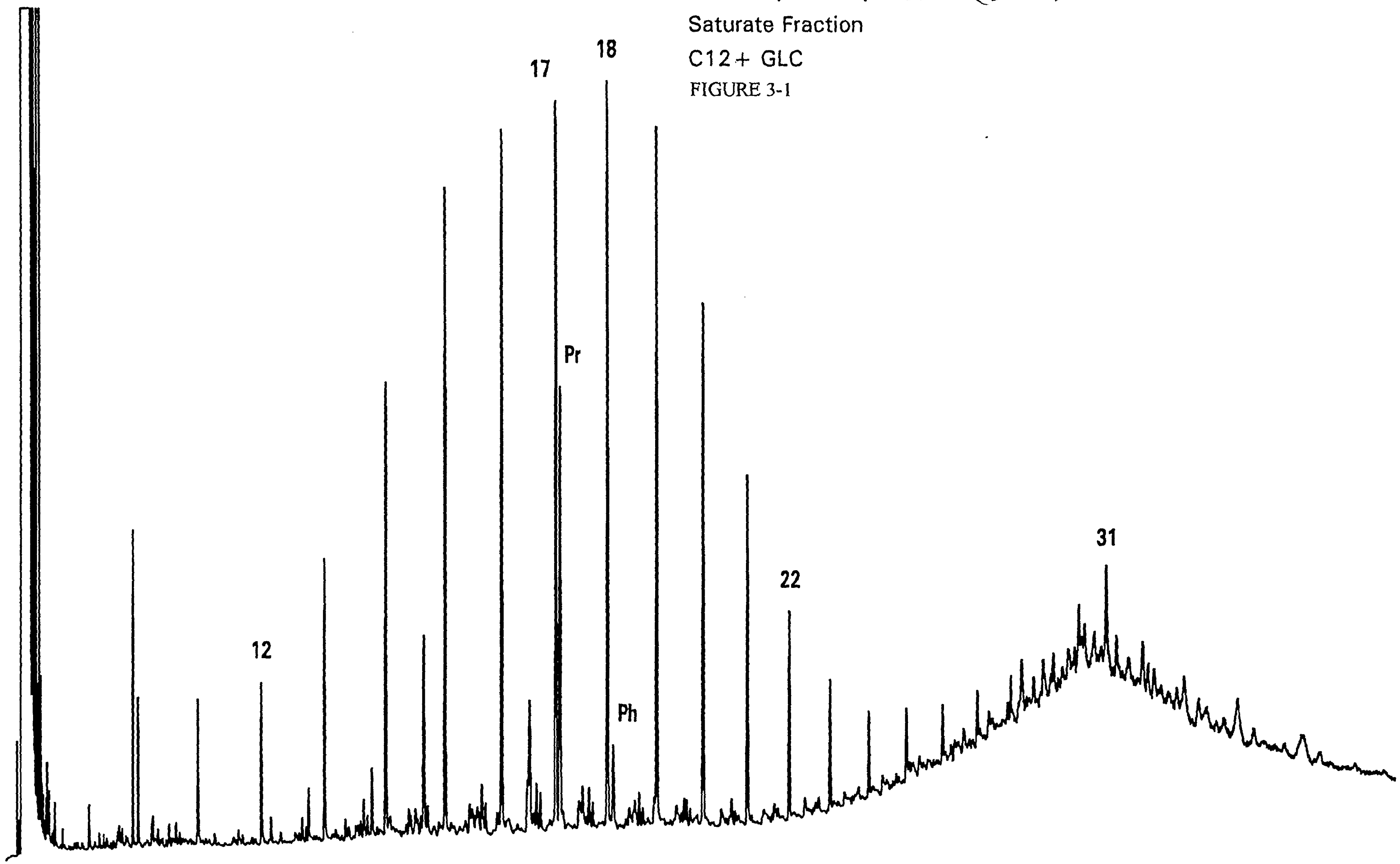
GEOTECHNICAL SERVICES PTY LTD

DIBGY 1, DST 1, Mud (DST-1 1460-1467.9 mKB)
Saturate Fraction
C12+ GLC
FIGURE 3-1



2176ED4

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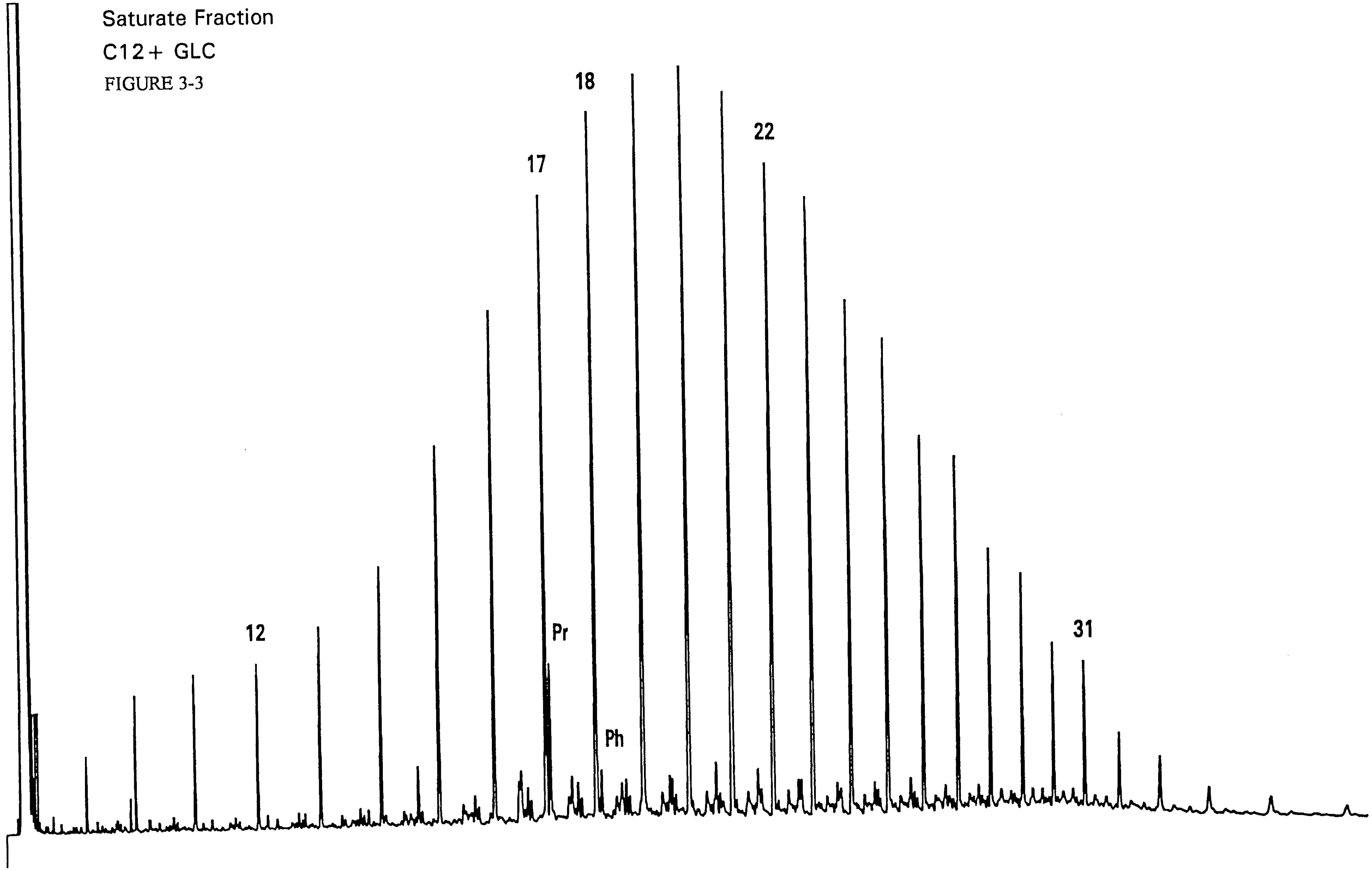
DIGBY 1, 1468m, Cuttings
Saturate Fraction
C12+ GLC
FIGURE 3-3



2176ED1

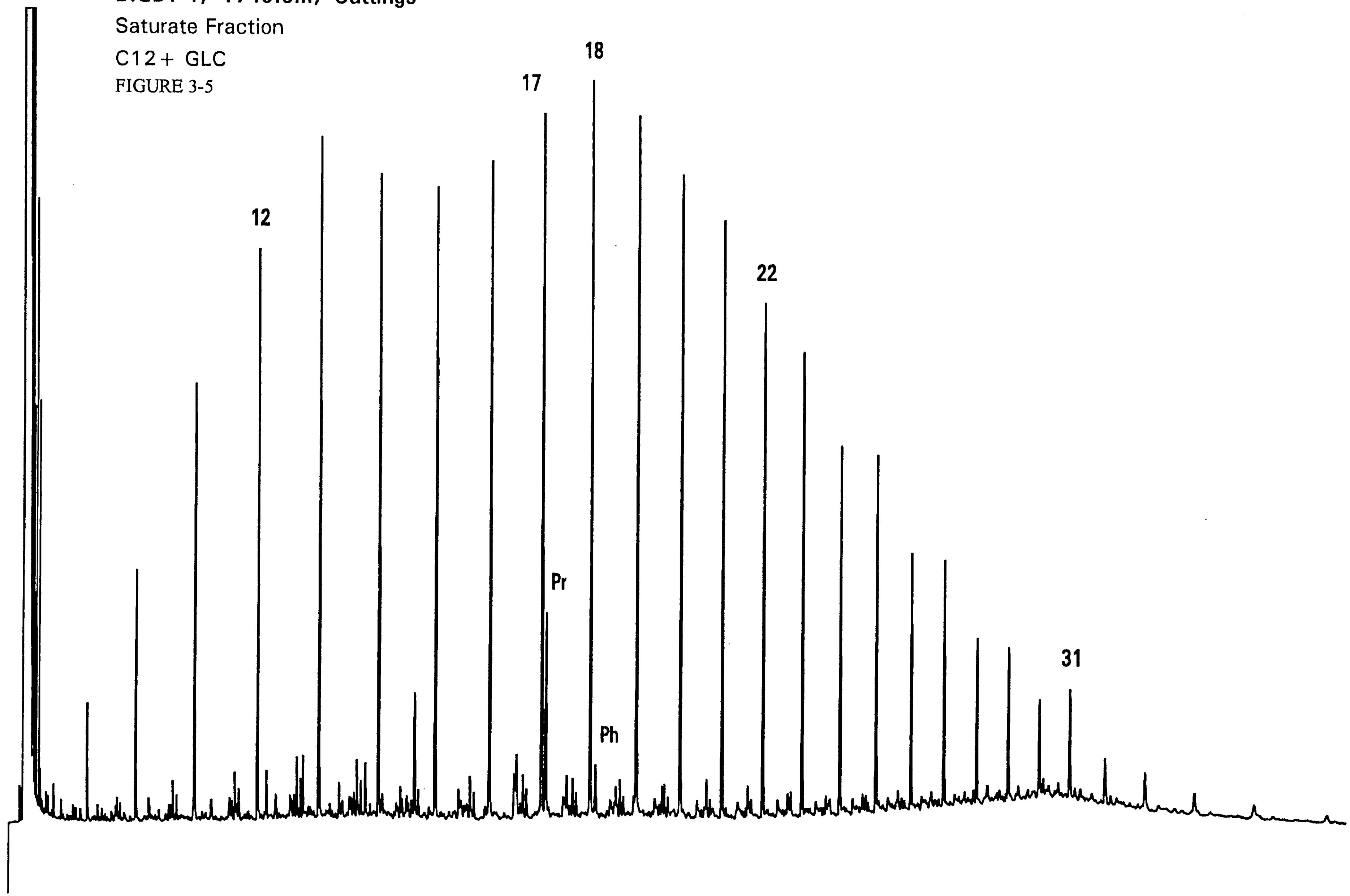
GEOTECHNICAL SERVICES PTY LTD

DIGBY 1, 1740.0m, Cuttings

Saturate Fraction

C12+ GLC

FIGURE 3-5



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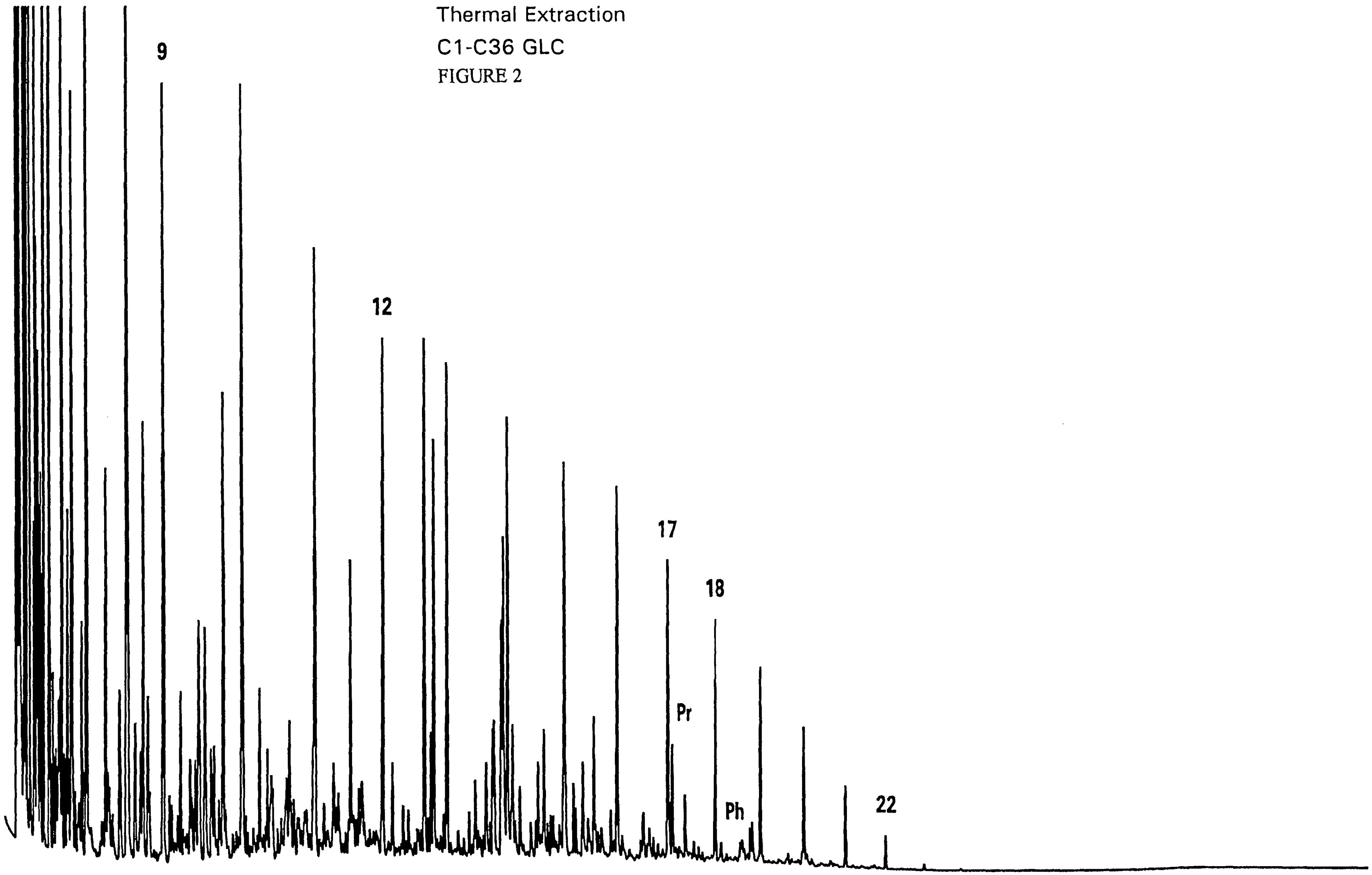
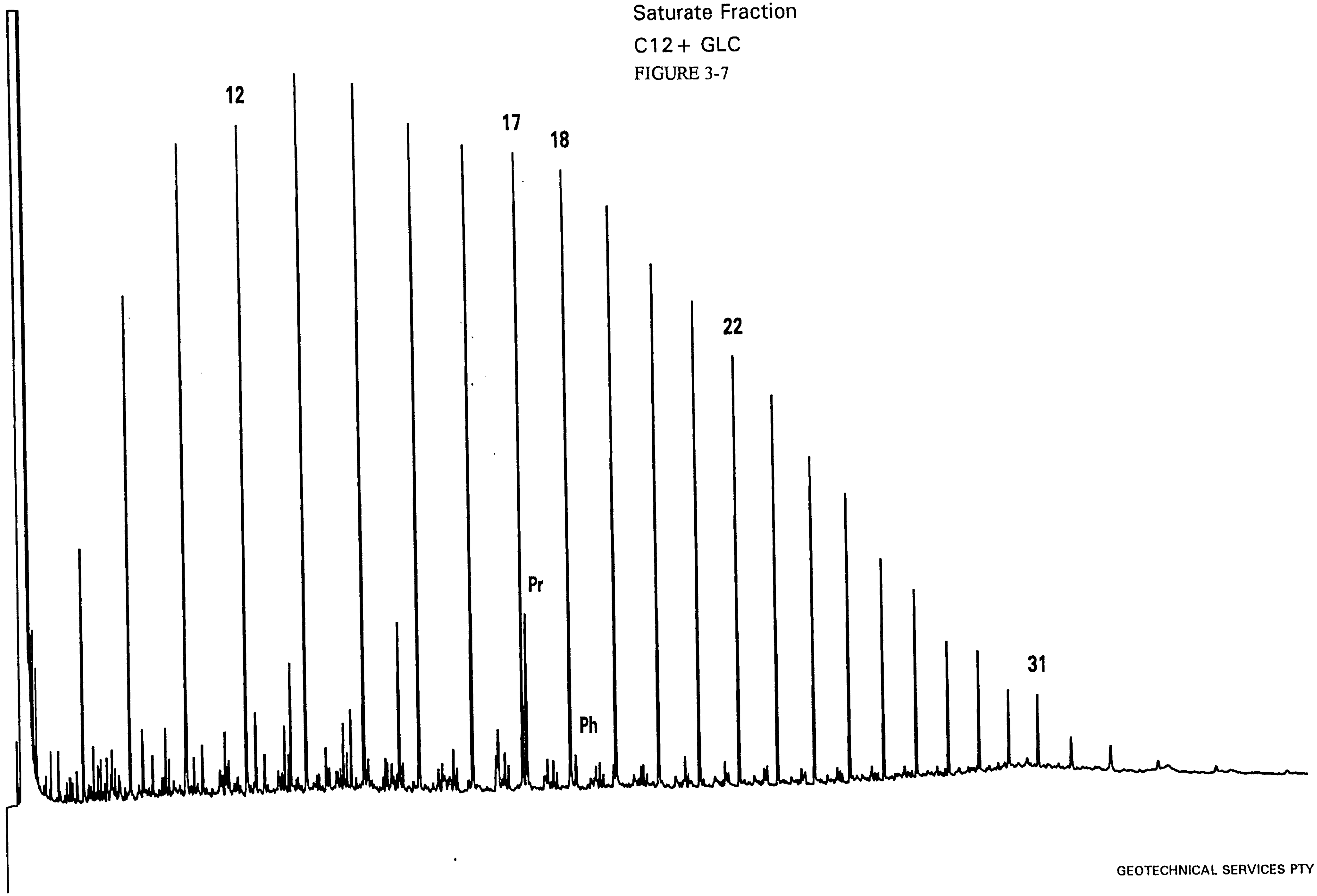
GEOTECHNICAL SERVICES PTY LTD

DIGBY 1, 1930m, Cuttings
Thermal Extraction
C1-C36 GLC
FIGURE 2



C290

DIGBY 1, 1930m, Cuttings
Saturate Fraction
C12+ GLC
FIGURE 3-7



2176ED2

GEOTECHNICAL SERVICES PTY LTD

TABLE 5-1

Summary of Extraction and Liquid Chromatography

DIGBY 1 Jun-95

A. Concentrations of Extracted Material

DEPTH(m)	Weight of Rock Extd (grams)	Total Extract (ppm)	Loss on Column (ppm)	Hydrocarbons: Saturates (ppm)	Hydrocarbons: Aromatics (ppm)	Hydrocarbons: HC Total (ppm)	Nonhydrocarbons: NSO's (ppm)	Nonhydrocarbons: Asphalt (ppm)	Nonhydrocarbons: NonHC Total (ppm)
450.0	22.0	27.3	nd	nd	nd	nd	nd	nd	nd
DST 1	220.5	7.7	nd	nd	nd	nd	nd	nd	nd
450*	224.9	71.6	6.2	23.1	13.8	36.9	28.5	nd	28.5
1468.0	118.1	368.2	0.8	245.5	74.5	320.0	47.4	nd	47.4
1740.0	97.4	181.7	6.2	86.2	39.0	125.2	50.3	nd	50.3
1930.0	12.7	3252.2	133.5	1201.9	926.9	2128.8	989.8	nd	989.8

TABLE 5-1

Summary of Extraction and Liquid Chromatography

DIGBY 1 Jun-95

B. Compositional Data

DEPTH(m)	Hydrocarbons: %SAT	Hydrocarbons: %AROM	Hydrocarbons: %HC's	Nonhydrocarbons: %NSO	Nonhydrocarbons: %ASPH	Nonhydrocarbons: %Non HC's	EOM(mg) / TOC(g)	SAT(mg) / TOC(g)	SAT / AROM	ASPH / NSO	HC / Non HC
450.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
DST 1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
450*	35.4	21.1	56.5	43.5	nd	43.5	nd	nd	1.7	nd	1.3
1468.0	66.8	20.3	87.1	12.9	nd	12.9	nd	nd	3.3	nd	6.8
1740.0	49.1	22.2	71.3	28.7	nd	28.7	nd	nd	2.2	nd	2.5
1930.0	38.5	29.7	68.3	31.7	nd	31.7	nd	nd	1.3	nd	2.2

nd = no data

* = total sample

TABLE 6-1

DIGBY 1

Summary of Gas Chromatography Data

A. Alkane Compositional Data

SATURATE FRACTION

DEPTH(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
450.0	nd	nd	nd	nd	nd	nd
DST 1	4.99	0.66	0.14	0.89	1.04	1.18
450*	2.99	0.92	0.28	2.20	3.26	0.86
1468.0	3.44	0.21	0.05	1.13	1.12	3.35
1740.0	4.03	0.34	0.08	1.20	1.19	3.36
1930.0	4.73	0.36	0.08	1.13	1.12	3.34

TABLE 6-1

DIGBY 1

Summary of Gas Chromatography Data

B, n-Alkane Distributions

SATURATE FRACTION

DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC3'
450.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
DST 1	1.8	3.2	5.5	8.2	9.3	9.9	6.5	9.5	1.3	8.9	6.8	4.7	2.9	2.4	1.7	1.6	1.3	1.3	2.7	3.8	4.3	2.2
450*	1.4	3.1	3.3	3.2	3.7	4.9	4.5	5.3	1.5	5.9	4.9	3.6	2.6	5.4	2.6	10.7	2.7	9.2	2.3	4.9	6.6	7.7
1468.0	1.3	1.7	2.4	3.8	5.4	7.2	1.5	8.3	0.4	9.3	9.1	8.7	7.6	7.0	5.7	5.2	3.8	3.6	2.5	2.3	1.6	1.5
1740.0	5.1	6.3	6.2	6.4	6.9	7.6	2.6	7.7	0.6	7.8	7.1	6.2	5.3	4.9	4.0	3.9	2.7	2.7	1.7	1.7	1.1	1.3
1930.0	6.9	7.6	7.6	7.8	7.5	7.5	2.7	7.0	0.6	6.9	6.0	5.6	4.9	4.5	3.7	3.5	2.5	2.2	1.6	1.5	1.0	0.9

nd = no data

* = total sample

AMDEL LQ3915

FIGURE 2

Digby-1
DST-2 (1920-1951mKB)
GC of Extractable Organic Matter

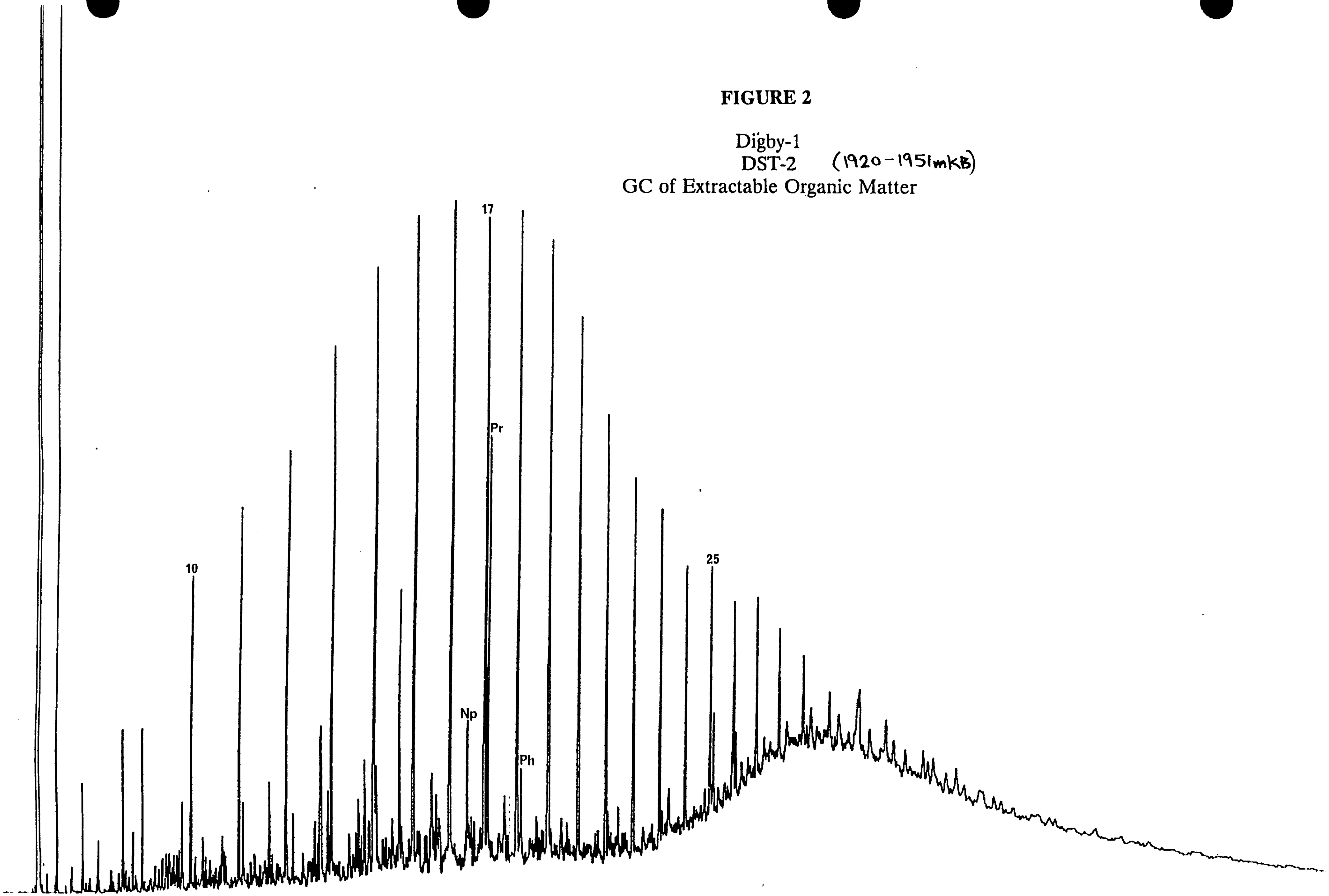
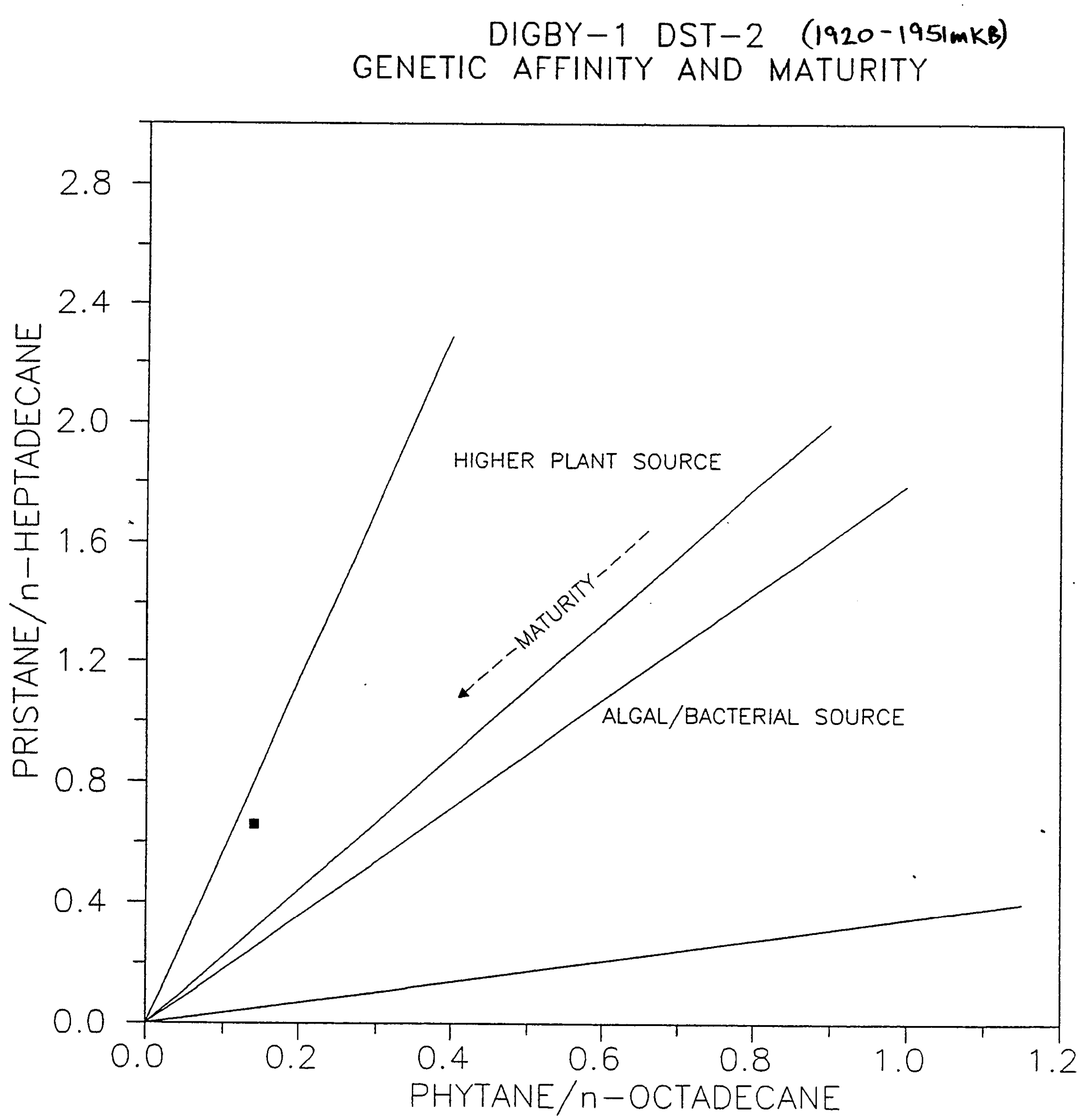


FIGURE 3



AMDEL LQ3915

APPENDIX 9B

GAS CHROMATOGRAMS

FROM

SIDEWALL CORES

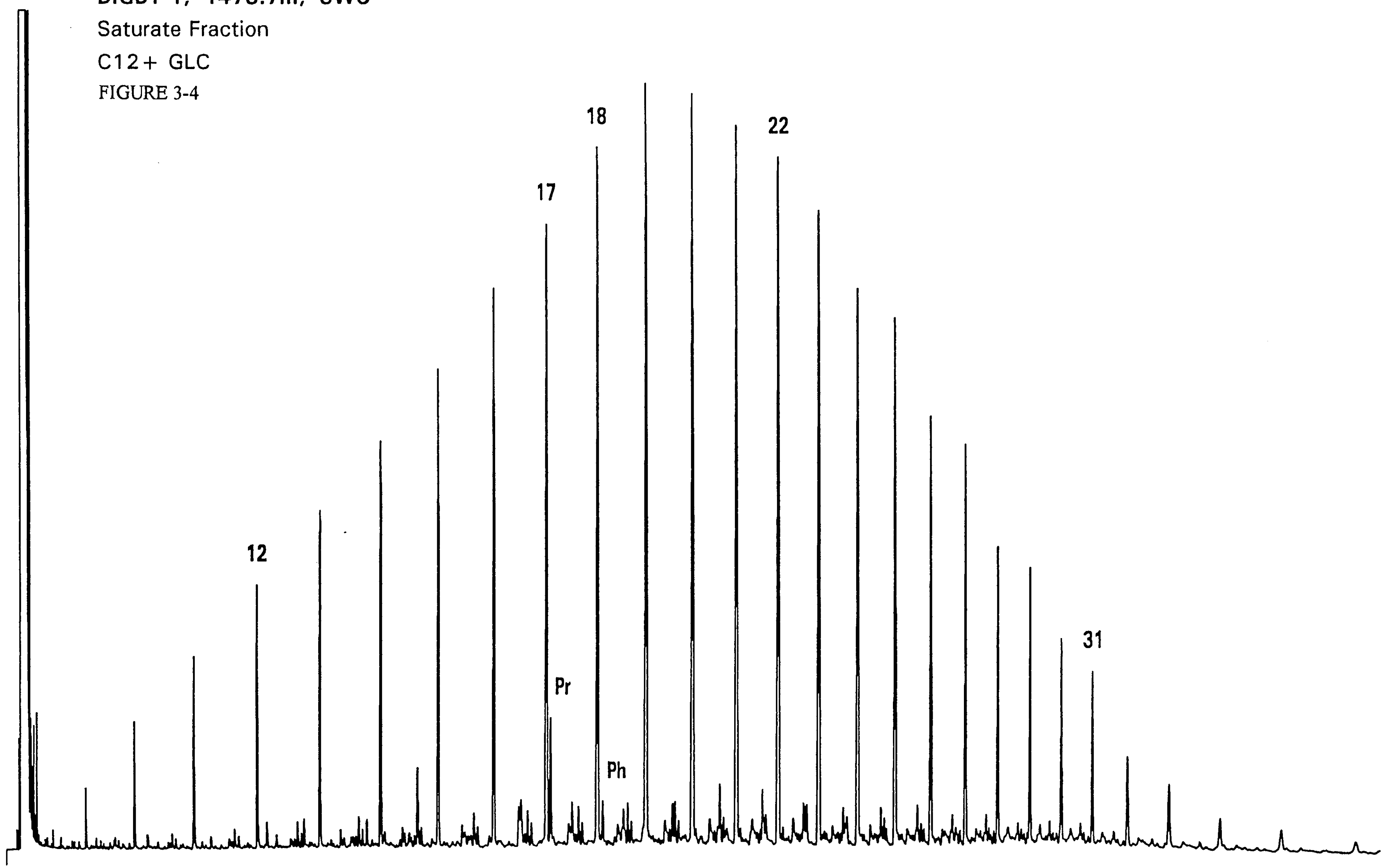
DIGBY-1

DIGBY 1, 1473.7m, SWC

Saturate Fraction

C12+ GLC

FIGURE 3-4



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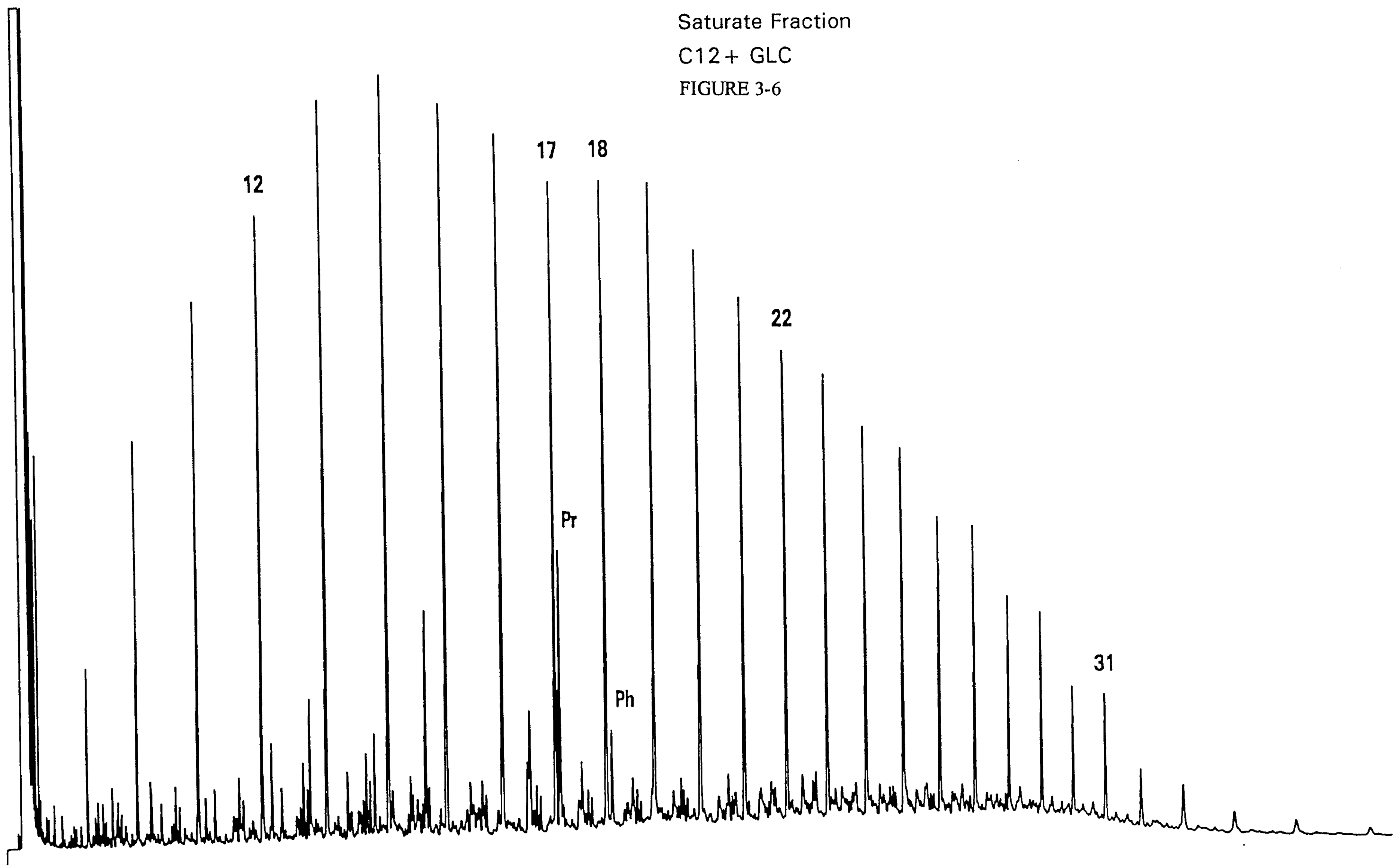
GEOTECHNICAL SERVICES PTY LTD

DIGBY 1, 1903.2m, SWC

Saturate Fraction

C12+ GLC

FIGURE 3-6



2176ED8

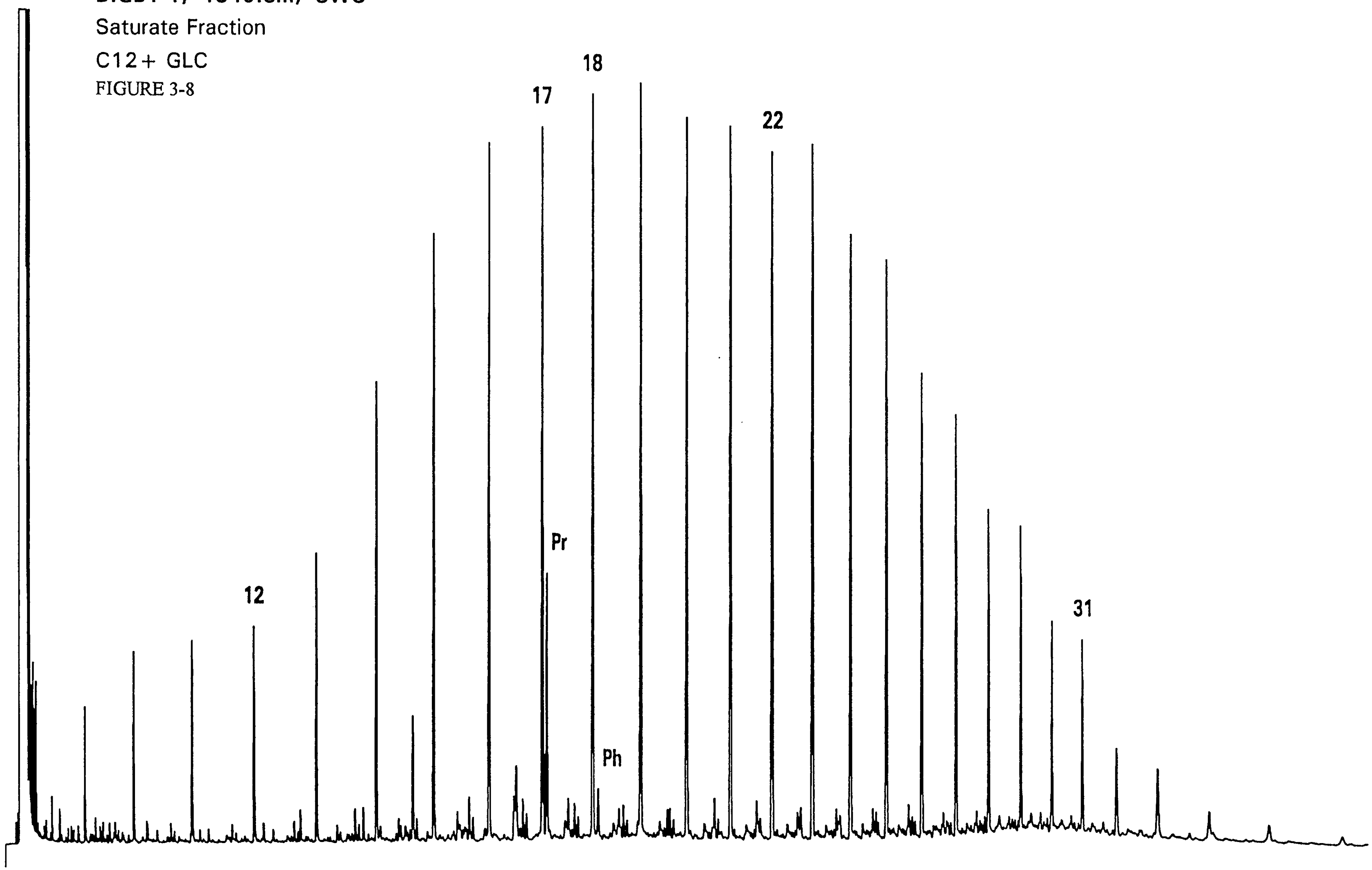
GEOTECHNICAL SERVICES PTY LTD

DIGBY 1, 1940.8m, SWC

Saturate Fraction

C12+ GLC

FIGURE 3-8



2176ED7

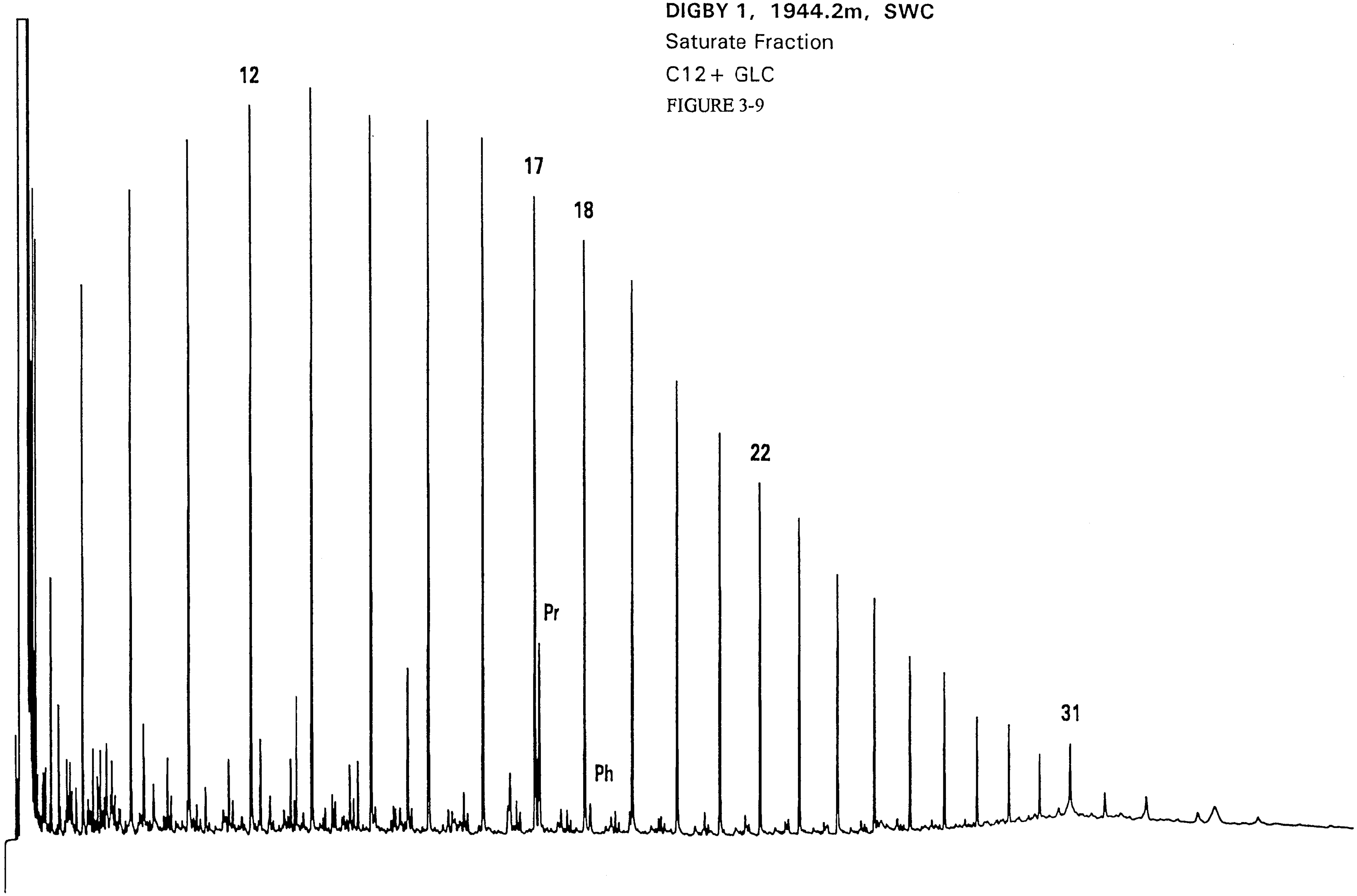
GEOTECHNICAL SERVICES PTY LTD

DIGBY 1, 1944.2m, SWC

Saturate Fraction

C12+ GLC

FIGURE 3-9



2176ED9

TABLE 5-2

Summary of Extraction and Liquid Chromatography

DIGBY 1 Jul-95

A. Concentrations of Extracted Material

				Hydrocarbons			Nonhydrocarbons		
	Weight of Rock Extd	Total Extract	Loss on Column	Saturates	Aromatics	HC Total	NSO's	Asphalt	NonHC Total
DEPTH(m)	(grams)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
1473.7	11.8	440.7	nd	nd	nd	nd	nd	nd	nd
1903.2	3.4	1858.4	nd	nd	nd	nd	nd	nd	nd
1940.8	9.7	569.4	nd	nd	nd	nd	nd	nd	nd
1944.2	5.5	4058.5	585.0	804.4	1316.3	2120.7	1352.8	nd	1352.8

TABLE 5-2

Summary of Extraction and Liquid Chromatography

DIGBY 1 Jul-95

B. Compositional Data

	Hydrocarbons			Nonhydrocarbons			EOM(mg)	SAT(mg)	SAT	ASPH	HC
DEPTH(m)	%SAT	%AROM	%HC's	%NSO	%ASPH	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
1473.7	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1903.2	nd	nd	nd	nd	nd	nd	75.2	nd	nd	nd	nd
1940.8	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1944.2	23.2	37.9	61.1	38.9	nd	38.9	11.3	2.2	0.6	nd	1.6

nd = no data

TABLE 6-2

DIGBY 1

Summary of Gas Chromatography Data

A. Alkane Compositional Data

SATURATE FRACTION

DEPTH(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
1473.7	3.06	0.18	0.05	1.11	1.11	3.17
1903.2	3.13	0.43	0.14	1.18	1.16	2.50
1940.8	5.48	0.38	0.07	1.14	1.13	2.55
1944.2	5.78	0.36	0.07	1.16	1.10	3.50

TABLE 6-2

DIGBY 1

Summary of Gas Chromatography Data

B. n-Alkane Distributions

SATURATE FRACTION

DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
1473.7	1.8	2.5	3.1	4.0	5.0	6.3	1.1	7.4	0.4	8.5	8.7	8.6	7.8	7.2	5.9	5.5	4.0	3.8	2.7	2.4	1.7	1.5
1903.2	5.4	6.7	7.2	7.3	7.2	7.1	3.1	7.1	1.0	6.9	5.8	5.3	4.7	4.6	4.0	4.2	2.9	2.8	2.1	2.0	1.2	1.4
1940.8	1.6	2.1	3.5	5.2	6.3	6.9	2.6	7.2	0.5	7.6	7.1	7.1	6.9	6.9	5.6	5.6	4.2	3.9	2.8	2.7	1.8	1.8
1944.2	7.8	8.1	8.0	8.1	8.2	7.9	2.9	7.3	0.5	6.7	5.9	5.1	4.2	3.8	3.3	3.0	2.2	2.0	1.4	1.3	0.9	1.6

nd = no data

APPENDIX 9C

VITRINITE REFLECTANCE

AND ROCK-EVAL

(FROM CUTTINGS AND SIDEWALL CORES)

DIGBY-1

GEOTECH GEOTECHNICAL SERVICES PTY LTD
41-45 Furnace Road, Welshpool, Western Australia. 6106
Locked Bag 27, Cannington, Western Australia. 6107
Telephone: (09) 458 8877
Facsimile: (09) 458 8857

RECEIVED
3238
FILE COPY

9 June, 1995

Mr. K. Lanigan
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Kevin,

Please find enclosed extraction, GC and vitrinite reflectance results for samples from Digby-1, as well as an invoice for this work.

Although the interval covered by the Digby samples is only 920m, reflectance rises from below 0.4% at the top of the section to between 0.56 and 0.58% at the base. It is possible that the data from the deepest sample are biased by cavings, but the lower reflectances could also have been part of the indigenous population. Coals are present in the 4 deeper samples and abundant in the deepest two. The coal facies is typical of the Strzlecki facies. This is also present in the Otway Group, but the coals in some Otway sections are more rich in inertinite than the Digby coals. Data quality is good throughout.

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

JOB # 2176A, DIGBY-1, OTWAY BASIN

KK/Ref. No.	Depth(m) Type	$\bar{R}_v max$	Range	N	Description Including Liptinite (Exinite) Fluorescence
T1392	130 Ctgs	0.37	0.29-0.53	26	Sparse lamalginite, bright yellow to orange, rare liptodetrinite, bright yellow to orange. (Silty claystone>> sandstone. Dom common, I>V>L. All three maceral groups sparse. Mineral fluorescence pervasive, weak yellow to orange. Iron oxides sparse. Pyrite sparse.)
T1393	260 Ctgs	0.40	0.32-0.53	26	Sparse lamalginite and liptodetrinite, bright yellow to orange, rare cutinite, yellow. (Silty claystone. Dom sparse, I>L>V. All three maceral groups sparse. Mineral fluorescence pervasive, weak yellow to orange. Iron oxides common. Pyrite sparse.)
T1394	440 Ctgs	0.42	0.31-0.61	25	Sparse lamalginite, bright yellow to orange, rare liptodetrinite, bright yellow to orange. (Claystone>>carbonate. Dom sparse, L>I=V. All three maceral groups sparse. Mineral fluorescence pervasive, yellow to orange. Iron oxides sparse. Pyrite sparse.)
T1395	480 Ctgs	0.43	0.32-0.67	25	Sparse lamalginite, yellow to orange, rare liptodetrinite, yellow to yellow. (Clayey siltstone>>carbonate>coal. Coal rare, I>>V. Vitrinertite. Dom sparse, V>I=L. All three maceral groups sparse. Mineral fluorescence faint green. Iron oxides sparse. Pyrite sparse.)
T1396	635 Ctgs	0.44	0.33-0.64	30	Sparse lamalginite and liptodetrinite, yellow to orange, rare cutinite orange to dull orange, rare resinite green to yellow. (Calcareous siltstone>claystone>coal. Coal sparse, V>>L. Vitrite>>clarite. Dom common, V>L>I. All three maceral groups sparse. Oil droplets rare, green. Mineral fluorescence pervasive weak green to orange. Iron oxides rare. Pyrite sparse.)
T1397	850 Ctgs	0.58	0.50-0.67	33	Sparse lamalginite, greenish yellow to orange, sparse sporinite, resinite and liptodetrinite yellow to orange. (Silty claystone>>carbonate>coal. Coal abundant, V=90%, L=6, I=4%. Vitrite>clarite>duroclarite. Dom common, L>V>I. All three maceral groups sparse. Mineral fluorescence pervasive, weak green to orange. Pyrite sparse.)
T1398	1050 Ctgs $\bar{R}_I max$	0.56 0.79	0.44-0.71 -	31 1	Sparse sporinite, yellow to dull orange, sparse cutinite and suberinite orange to dull orange, sparse lamalginite, yellow to orange, rare resinite and liptodetrinite yellow to orange. (Silty claystone>carbonate>coal. Coal common, V=80%, L=8%, I=12%. Duroclarite>clarite>vitrite. Dom common, V>I>L. All three maceral groups sparse. Mineral fluorescence pervasive weak green to orange. Pyrite sparse.)

amdel

Amdel Limited
A.C.N. 008 127 802

Petroleum Services
PO Box 338
Torrensville Plaza SA 5031

Telephone: (08) 416 5240
Facsimile: (08) 234 2933

31 July, 1995

GFE Resources Ltd
PO Box 629
Market Street Post Office
MELBOURNE VIC 8007

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4705
KL
TDF
NN

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Attention: Kevin Lanigan

REPORT LQ3915

CLIENT REFERENCE:

WELL NAME/RE: Digby-1

MATERIAL: Cuttings

WORK REQUIRED: Source Rock Geochemistry

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

Brian Watson

Brian L. Watson
Manager
Petroleum Services

1. INTRODUCTION

Five (5) unwashed cuttings samples from Digby-1 were received for TOC analysis and Rock-Eval pyrolysis and one (1) DST liquid sample was received for extraction and gas chromatographic analysis of any hydrocarbons present. This report is a formal presentation of results forwarded by facsimile as they became available.

2. ANALYTICAL PROCEDURES

2.1 Sample Preparation

The cuttings samples were first washed and dried and then ground in a Siebtechnik mill for 20-30 seconds. Liquid extraction was performed on the DST sample as no hydrocarbons could be easily separated. A low boiling point organic solvent was used and carefully dried to yield the extract which was subsequently analysed by gas chromatography.

2.2 Total Organic Carbon (TOC)

Total organic carbon was determined by digestion of a known weight (approximately 0.2g) of powdered rock in HCl to remove carbonates, followed by combustion in oxygen in the induction furnace of a Leco WR-12 Carbon Determinator and measurement of the resultant CO_2 by infra-red detection.

2.3 Rock-Eval Pyrolysis

A 100 mg portion of powdered rock was analysed by the Rock-Eval pyrolysis technique (Girdel IFP-Fina Mark 2 instrument; operating mode, Cycle 1).

3. RESULTS

TOC and Rock-Eval data are listed in Table 1. Figure 1 is a plot of T_{max} versus Hydrogen Index illustrating kerogen type and maturity. Figure 2 is a gas chromatograph of the Digby-1, DST-2 extractable organic matter while Figure 3 is a plot of pristane/n-heptadecane versus phytane/n-octadecane illustrating genetic affinity and maturity.

4. INTERPRETATION

4.1 Maturity

Reliable Rock-Eval T_{max} values show only a slight variation over the narrow interval studied (generally 448-455°C). These values, in conjunction with the Hydrogen

Indices (Table 1; Figure 1), suggest that the sediments analysed are mature for the generation of liquid hydrocarbons ($Vr_{equiv} \approx 0.8\text{-}0.9\%$).

High Production Indices (>0.2) in samples from 1920, 1955 and 1985 metres depth suggest that migrated hydrocarbons may be present in these samples.

4.2 Source Richness

Organic richness ranges from fair to good in the samples studied (TOC = 2.30 - 8.90%; Table 1), with the richer samples occurring at the shallower depths.

Source richness for the generation of hydrocarbons ranges from poor to excellent in the samples studied ($S_1 + S_2$ = 0.91 - 36.75 kg of hydrocarbons/tonne: Table 1). The sample with best source richness occurs at 1920 metres depth.

4.3 Kerogen Type and Source Quality

Hydrogen Index and T_{max} values (Table 1: Figure 1) indicate that the sediments examined contain organic matter which have bulk compositions ranging from Type IV to Type II kerogen.

4.4 Gas Chromatography

Figures 2 and 3 indicate that the extracted hydrocarbons are likely to be a terrestrially derived oil. Odd/Even predominance can be seen in the C_{23}-C_{27} n-alkanes suggesting the oil is of low to moderate maturity. It should be noted that the boiling point range of the n-alkane portion of the oil is such that the possibility of diesel contamination cannot be ruled out.

TABLE 1

AMDEL PETROLEUM SERVICES

Rock–Eval Pyrolysis

28/07/95

Client: *GFE Resources Ltd*

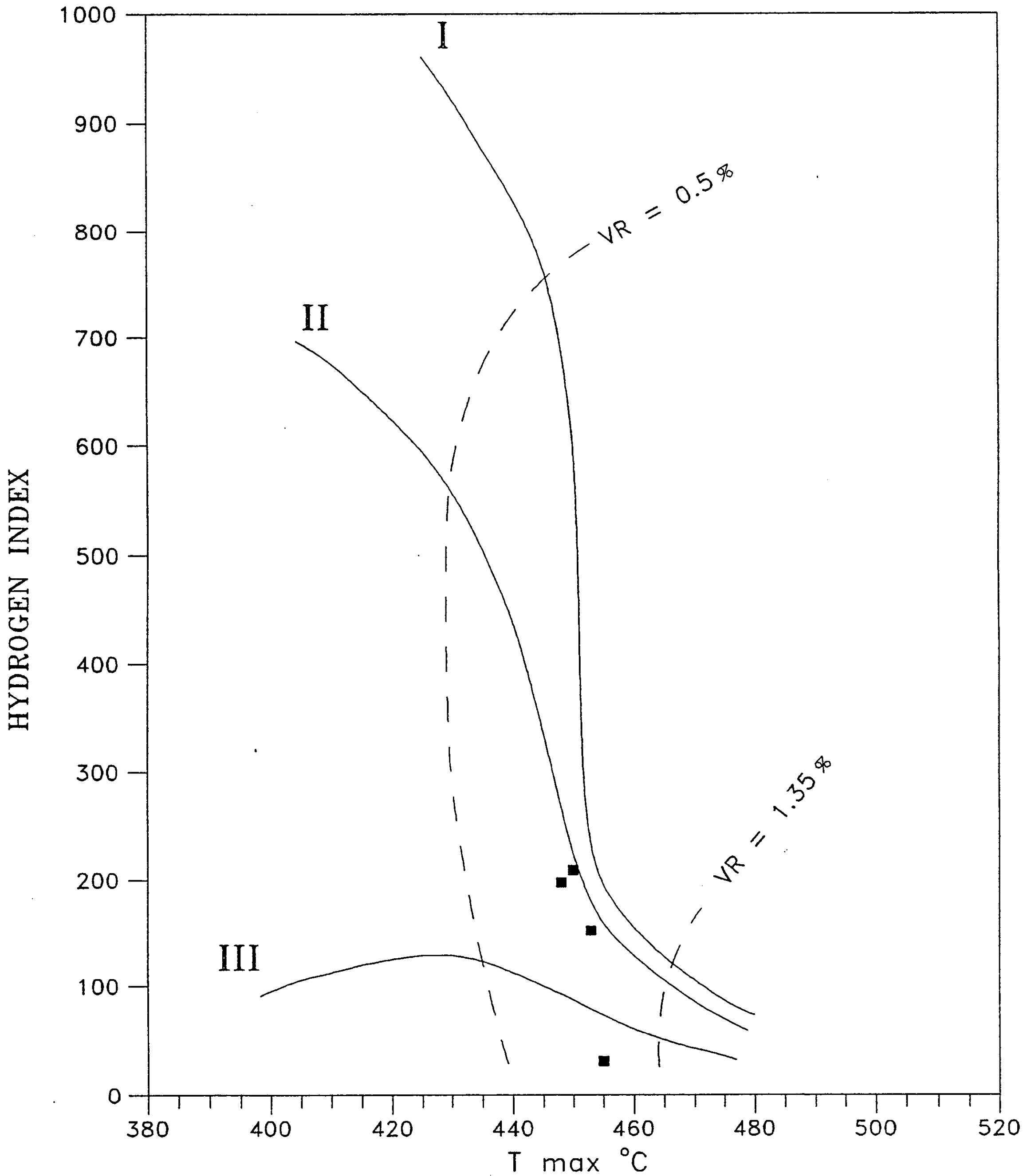
Well: *Digby–1*

Depth (m)	Tmax	S1	S2	S3	S1+S2	PI	S2/S3	PC	TOC	HI	OI
1920	322	15.05	21.70	8.24	36.75	0.41	2.63	3.06	8.90	244	93
1955	453	1.83	7.02	0.89	8.85	0.21	7.89	0.73	4.60	152	19
1985	448	1.60	4.95	1.97	6.55	0.24	2.51	0.54	2.50	198	78
2020	450	1.13	4.80	0.93	5.93	0.19	5.16	0.49	2.30	209	40
2040	455	0.15	0.76	4.64	0.91	0.17	0.16	0.07	2.40	31	193

FIGURE 1

HYDROGEN INDEX vs T max

Client: GFE Resources Ltd
Location: Digby-1



GEOTECH GEOTECHNICAL SERVICES PTY LTD
41-45 Furnace Road, Welshpool, Western Australia. 6106
Locked Bag 27, Cannington, Western Australia. 6107
Telephone: (09) 458 8877
Facsimile: (09) 458 8857

FILE COPY

12 July, 1995

RECEIVED
17 JUL 1995
4173
GFE RESOURCES LTD

Mr. K. Lanigan
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Kevin,

Please find enclosed rock-eval pyrolysis results and vitrinite reflectance data for Digby-1, as well as an invoice for this work.

Please note that a 50% urgency surcharge has been charged for the vitrinite work.

The vitrinite reflectances found follow on from the trend found with the earlier batch of samples. However, the reflectances in the interval sampled with the SWC cores increase rapidly down-section, with reflectance of over 0.9% being found in the 1900m to 2000m interval. The organic facies is characterised by a dominance of inertinite over vitrinite with liptinite typically being present only in trace amounts. The vitrinite shows a relatively high reflectance range in individual samples. Where coals are absent, this could be due to the difficulty of distinguishing sclerophyll tissues preserved as low reflectance semifusinite from vitrinite. This is not, however, a problem where coals are present. Thus, two of the coaly samples provide excellent control over the discrimination of inertinite from vitrinite. The data from 2028.2m are probably the poorest of the suite but that for 2048.2m are good.

Reflectances found are unusually high for 2000m from the Otway Basin. The deeper samples have abundant carbonate. Some of this may be syngenetic and be associated with the conditions that favoured formation of inertinite over vitrinite. However, some of the mineralisation (including an unidentified fibrous phase) are clearly epigenetic in origin. It is possible that the deeper part of the section shows some effects caused by the circulation of hot fluids. These could be associated with igneous activity or they could be the product of deep basin dewatering.

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

JOB # 2176A, OTWAY BASIN, DIGBY-1

KK/Ref. No.	Depth(m) Type	$\bar{R}_v$ max	Range	N	Description Including Liptinite (Exinite) Fluorescence
T1507	1096.8 SWC-43	0.59	0.45-0.72	25	Sparse cutinite, yellow to orange, rare liptodetrinite and sporinite, yellow to orange. (Silty claystone. Dom common, I>V>L. All three maceral groups sparse. Mineral fluorescence pervasive, moderate green to yellow. Iron oxides rare. Pyrite sparse.)
T1508	1364.4 SWC-39	0.57 $\bar{R}_I$ max 1.24	- 1.02-1.79	1 7	Rare cutinite, sporinite and liptodetrinite, yellow to orange. (Claystone. Dom sparse, I>L>V. Inertinite sparse, liptinite and vitrinite rare. Mineral fluorescence pervasive, moderate yellow to orange. Iron oxides sparse. Pyrite sparse.)
T1509	1445.2 SWC-37	0.88	0.64-1.03	25	Rare resinite and lamalginite, dull orange. (Calcareous siltstone>>shaly coal>coal. Coal rare, I only. Inertite. Shaly coal sparse, V>I. Vitrite. Dom abundant, V>I>L. Vitrinite and inertinite common, liptinite absent. Mineral fluorescence pervasive, faint green. Iron oxides common. Pyrite rare.)
T1510	1536.4 SWC-29	0.72	0.61-0.84	6	Rare lamalginite, orange. (Siltstone. Dom common, I>V>L. Inertinite common, vitrinite and liptinite rare. Mineral fluorescence pervasive, moderate yellow to orange. Iron oxides common. Pyrite rare.)
T1511	1591.0 SWC-27	0.81	0.56-1.02	15	Fluorescing liptinite absent. (Calcareous silty claystone. Dom rare, V=I. Vitrinite and inertinite rare, liptinite absent. Mineral fluorescence pervasive, orange. Iron oxides sparse. Pyrite sparse.)
T1512	1926.4 SWC-18	0.91	0.83-0.99	26	Rare cutinite, sporinite and liptodetrinite, orange to dull orange. (Sandstone>siltstone>coal>claystone. Coal abundant, vitrite>inertite. Mineral-free maceral group composition of the coal: vitrinite - 70%, inertinite - 30%, liptinite - tr. Dom abundant, V>I>>L. Vitrinite abundant, inertinite common, liptinite rare. Oil drops rare, bright green to yellow. Iron oxides sparse. Pyrite sparse.)
T1513	1944.2 SWC-13	0.93	0.76-1.07	31	Rare cutinite, resinite and sporinite, orange to dull orange. (Coal>>carbonate>calcareous claystone. Coal dominant, inertite>vitrinertite>vitrite. Dom abundant, I>V>>L. Inertinite abundant, vitrinite common, liptinite rare. Mineral fluorescence pervasive, yellow to dull orange. Iron oxides rare. Pyrite rare.)
T1514	2028.2 SWC-4	0.74 $\bar{R}_I$ max 1.50	0.65-0.81 1.34-1.73	3 4	Rare liptodetrinite, dull orange. (Carbonate. Dom rare, I>V>L. Mineral fluorescence pervasive, orange. Iron oxides abundant. Pyrite sparse.)
T1515	2048.2 SWC-3	0.94	0.74-1.11	25	Fluorescing liptinite absent. (Carbonate>calcareous siltstone. Dom common, I>V. Inertinite and vitrinite sparse, liptinite absent. Mineral fluorescence pervasive, yellow to orange. Iron oxides sparse. Pyrite sparse.)

APPENDIX 9D

PYROLYSIS GC

FROM

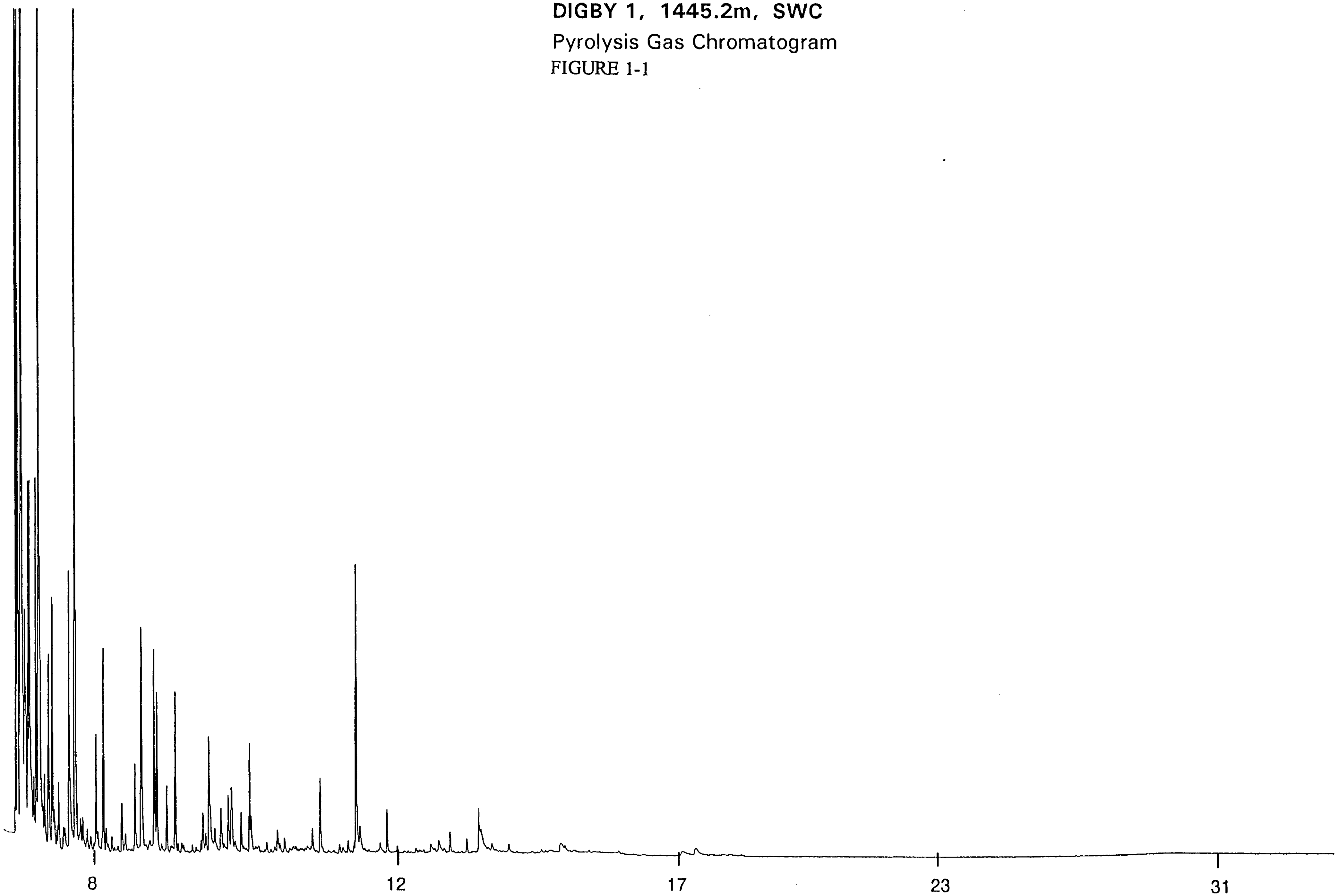
SIDEWALL CORES

DIGBY-1

DIGBY 1, 1445.2m, SWC

Pyrolysis Gas Chromatogram

FIGURE 1-1



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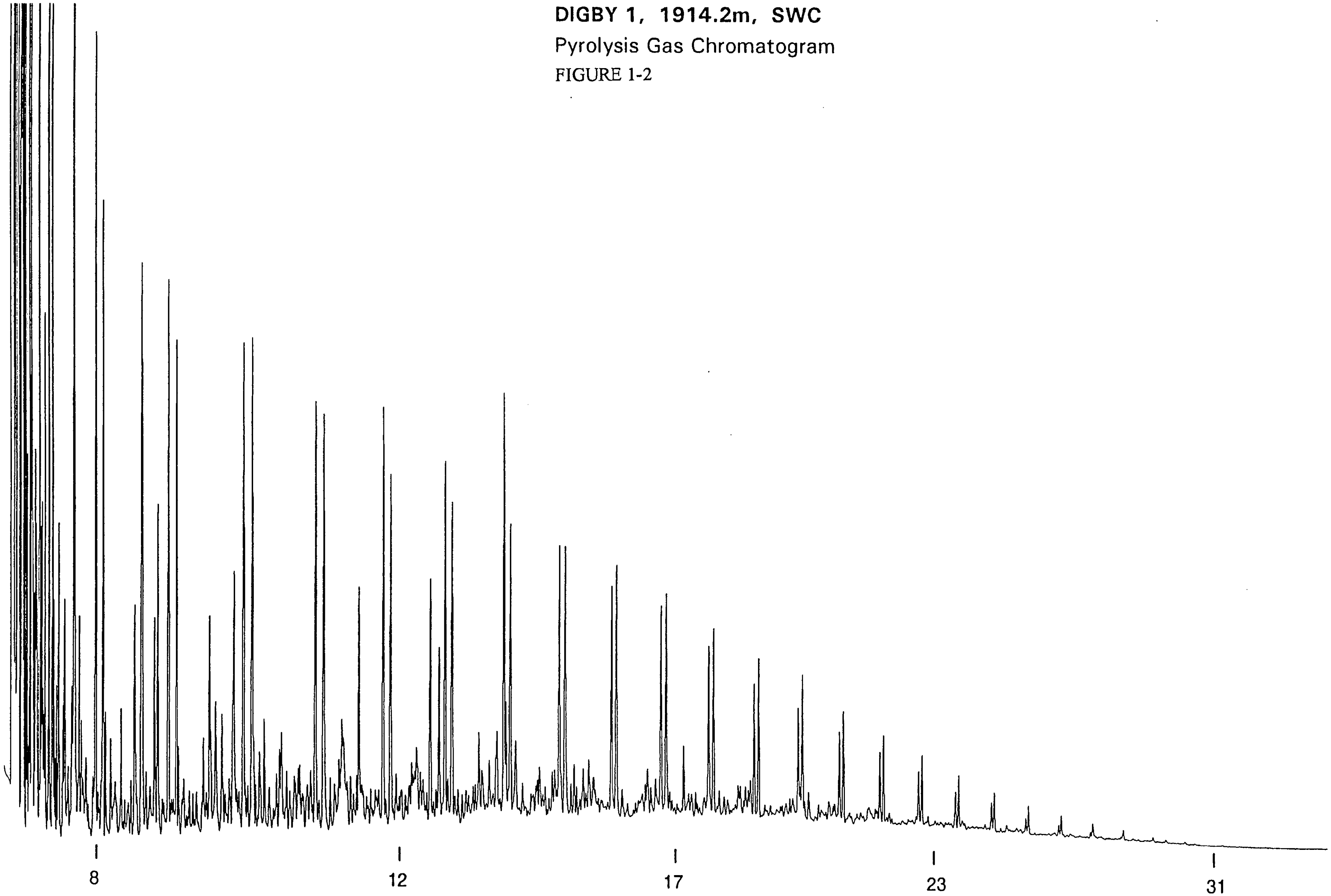
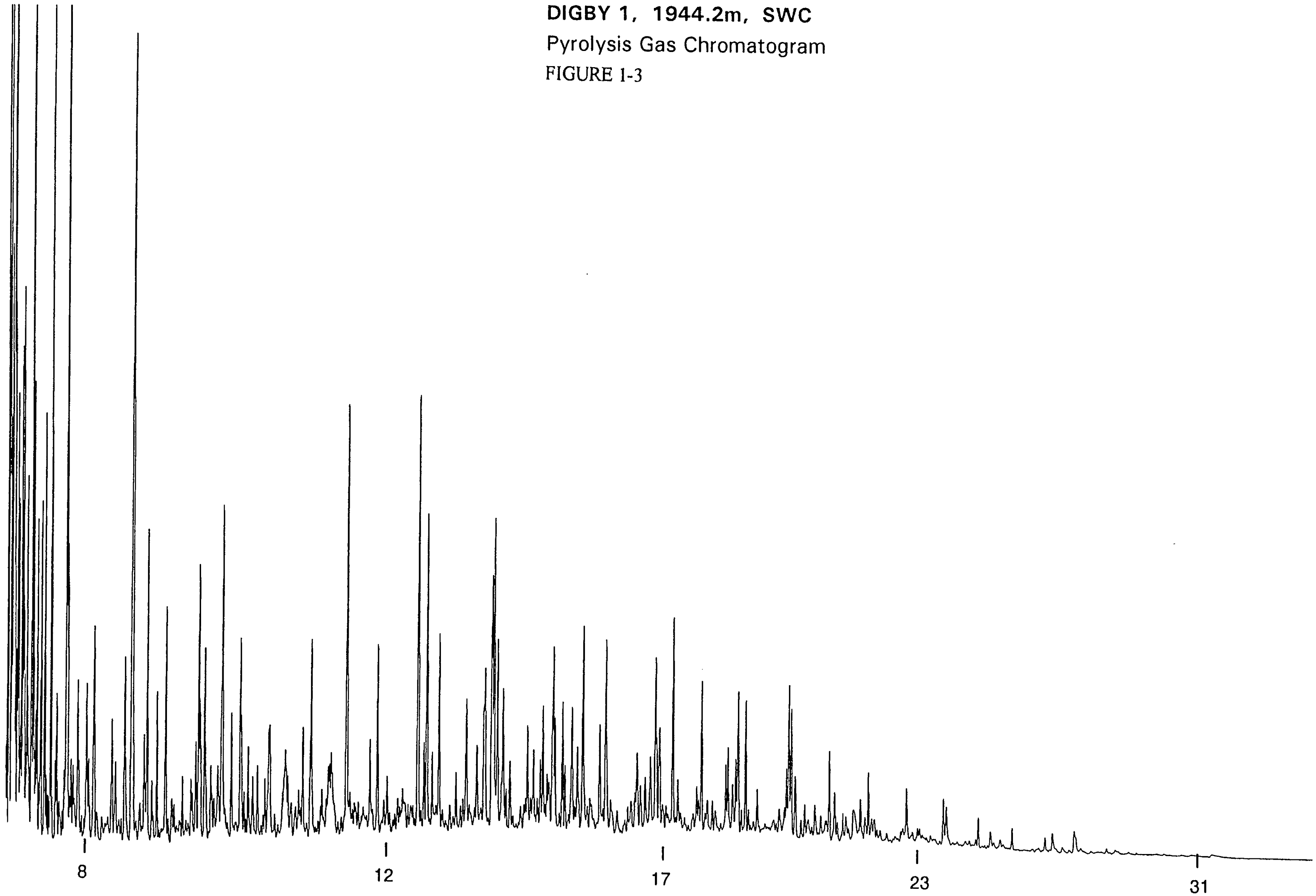
DIGBY 1, 1914.2m, SWC

Pyrolysis Gas Chromatogram

FIGURE 1-2



DIGBY 1, 1944.2m, SWC
Pyrolysis Gas Chromatogram
FIGURE 1-3

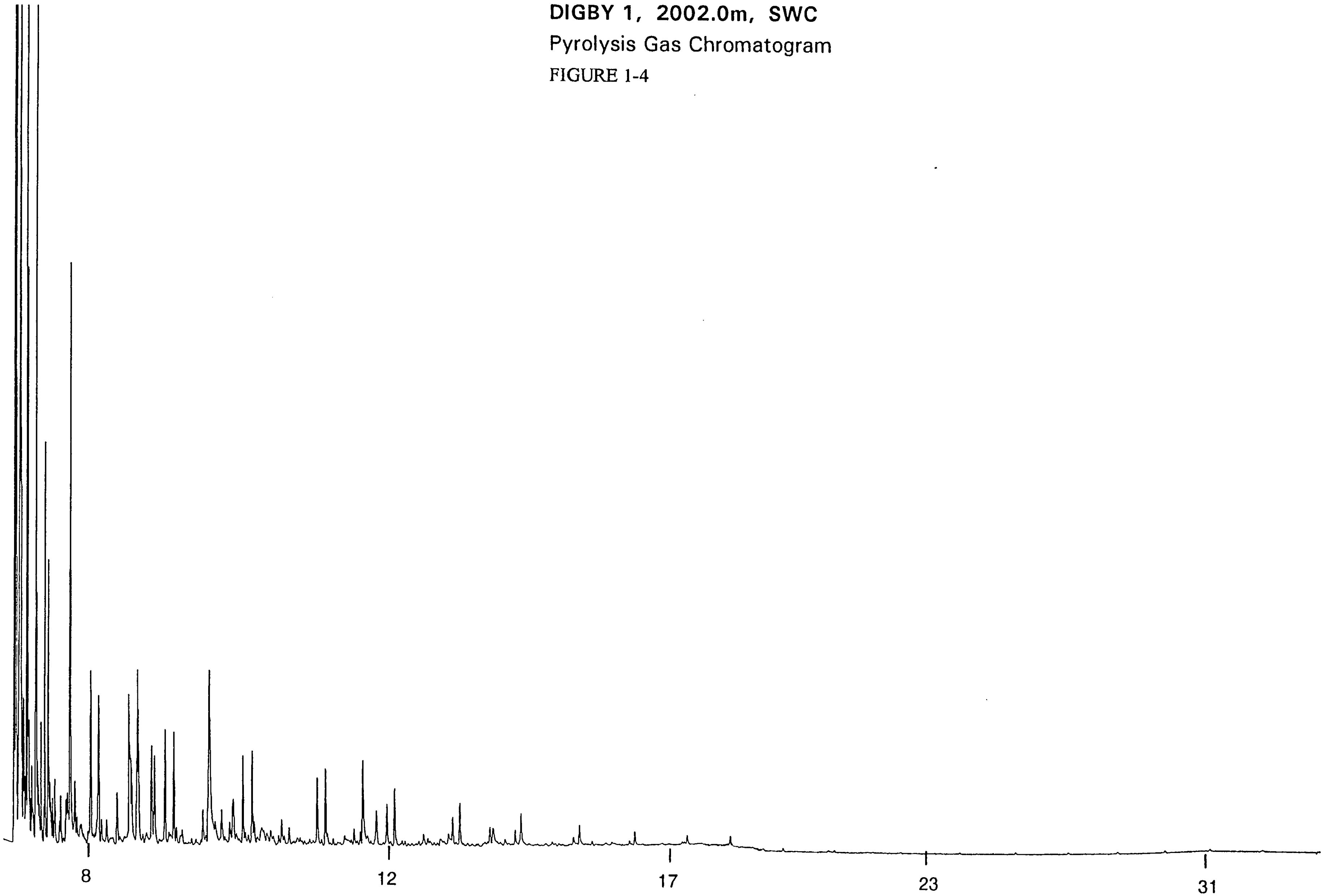


GEOTECHNICAL SERVICES PTY LTD

DIGBY 1, 2002.0m, SWC

Pyrolysis Gas Chromatogram

FIGURE 1-4



GEOTECHNICAL SERVICES PTY LTD

TABLE 2-1

ALKENE AND ALKANE COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 1445.2m, SWC 37 Jul-95

Carbon No.	----Alkane + Alkene----			-------Alkane-------			-------Alkene-------			Alkane/Alkene
	A	B	C	A	B	C	A	B	C	
1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	4.104	0.062	0.057	2.320	0.035	0.032	1.784	0.027	0.025	1.30
6	2.896	0.044	0.040	1.583	0.024	0.022	1.313	0.020	0.018	1.21
7	1.746	0.026	0.024	0.899	0.014	0.013	0.847	0.013	0.012	1.06
8	1.126	0.017	0.016	0.720	0.011	0.010	0.406	0.006	0.006	1.77
9	0.824	0.012	0.012	0.572	0.009	0.008	0.252	0.004	0.004	2.27
10	0.526	0.008	0.007	0.371	0.006	0.005	0.155	0.002	0.002	2.39
11	0.397	0.006	0.006	0.288	0.004	0.004	0.109	0.002	0.002	2.64
12	0.235	0.004	0.003	0.160	0.002	0.002	0.075	0.001	0.001	2.13
13	0.123	0.002	0.002	0.090	0.001	0.001	0.033	0.000	0.000	2.73
14	0.033	0.000	0.000	0.033	0.000	0.000	0.000	0.000	0.000	nd
15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd

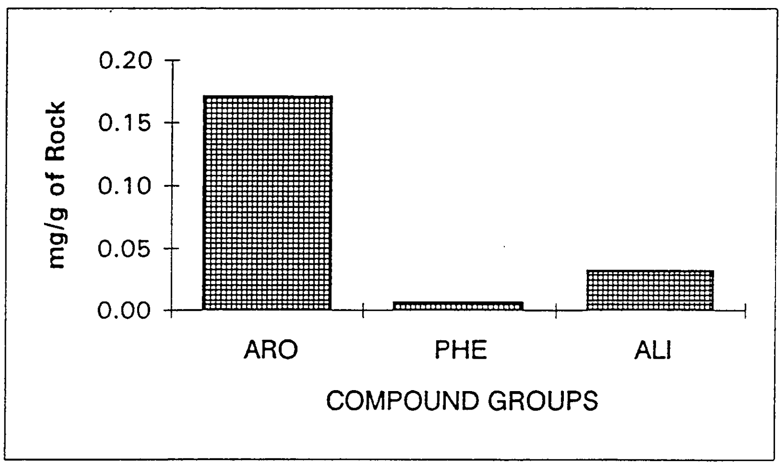
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC

TABLE 3-1

AROMATIC AND PHENOLIC COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 1445.2m, SWC 37 Jul-95

Key	Compound Name	Value A	Value B	Value C
A.	Benzene	4.405	0.067	0.062
B.	Toluene	3.801	0.057	0.053
C.	Ethylbenzene	0.388	0.006	0.005
D.	m- + p-xylene	1.171	0.018	0.016
E.	Styrene	0.864	0.013	0.012
F.	o-xylene	0.668	0.010	0.009
G.	Phenol	0.414	0.006	0.006
H.	o-cresol	0.000	0.000	0.000
I.	m- + p-cresol	0.000	0.000	0.000
J.	C2 phenol	0.000	0.000	0.000
K.	C2 phenol	0.000	0.000	0.000



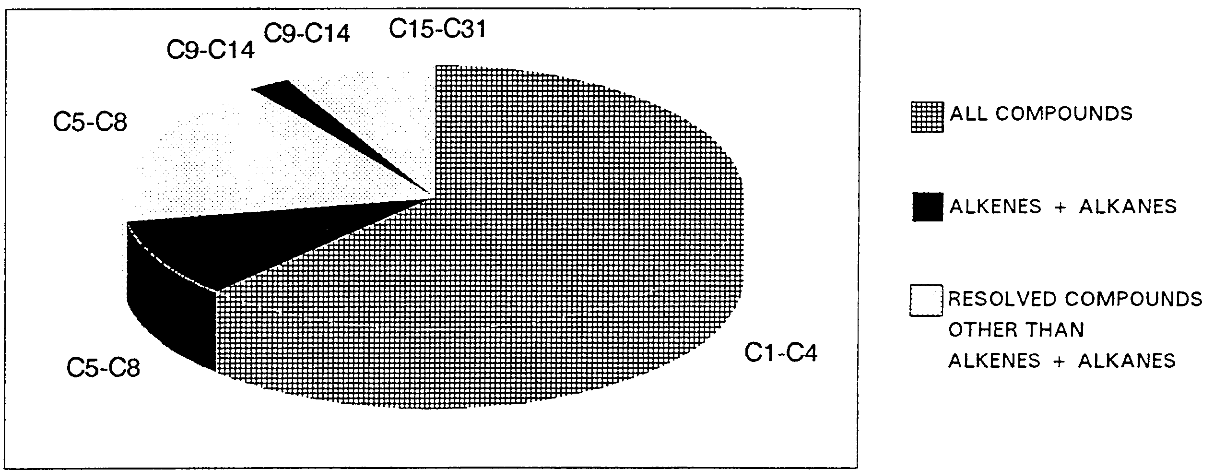
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
ARO = aromatic compounds (A to F)
PHE = phenolic compounds (G to K)
ALI = aliphatic compounds (C9 to C31 alkenes + alkanes)

TABLE 4-1

PARAMETER SUMMARY FOR PYROLYSIS GAS CHROMATOGRAPHY

DIGBY 1, 1445.2m, SWC 37 Jul-95

Parameter	A	B (Value)	C	D
C1-C4 abundance (all compounds)	62.27	0.94	0.87	
C5-C8 abundance (all resolved compounds)	27.70	0.42	0.39	
C5-C8 abundance (alkanes + alkenes)	9.87	0.15	0.14	
C9-C14 abundance (all resolved compounds)	9.95	0.15	0.14	
C9-C14 abundance (alkanes + alkenes)	2.14	0.03	0.03	
C15-C31 abundance (all resolved compounds)	0.08	0.00	0.00	
C15-C31 abundance (alkanes + alkenes)	0.00	0.00	0.00	
C9-C31 abundance (all resolved compounds)	10.03	0.15	0.14	
C9-C31 abundance (alkanes + alkenes)	2.14	0.03	0.03	
C5-C31 abundance (all resolved compounds)	37.73	0.57	0.53	
C5-C31 abundance (alkanes + alkenes)	12.01	0.18	0.17	
C5-C31 alkane abundance	7.04	0.11	0.10	
C5-C31 alkene abundance	4.97	0.08	0.07	
C5-C8 alkane/alkene				1.27
C9-C14 alkane/alkene				2.43
C15-C31 alkane/alkene				nd
C5-C31 alkane/alkene				1.41
(C1-C5)/C6+				2.21
R				2.88



nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
D = no units
R = m+p-xylene/n-octene

ALKENE AND ALKANE COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 1914.2m, SWC 21 Jul-95

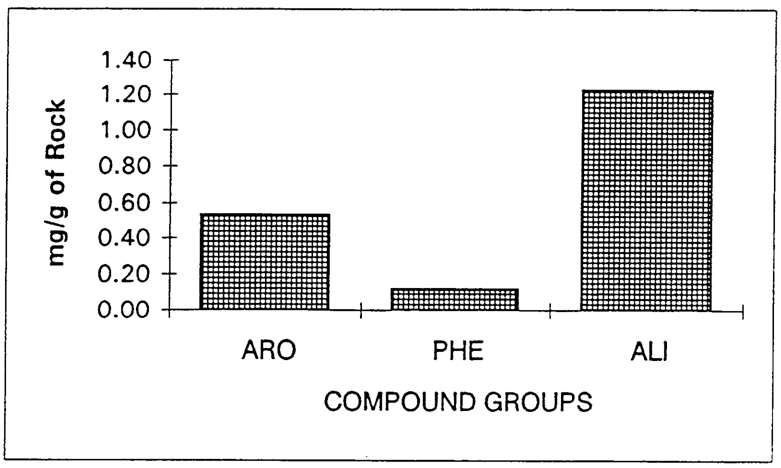
Carbon No.	----Alkane + Alkene----			-------Alkane-------			-------Alkene-------			Alkane/Alkene
	A	B	C	A	B	C	A	B	C	
1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	3.887	0.324	0.076	2.169	0.181	0.042	1.718	0.143	0.033	1.26
6	2.953	0.246	0.057	1.271	0.106	0.025	1.682	0.140	0.033	0.76
7	2.757	0.230	0.054	1.277	0.107	0.025	1.480	0.123	0.029	0.86
8	2.260	0.188	0.044	0.995	0.083	0.019	1.265	0.106	0.025	0.79
9	1.881	0.157	0.037	0.881	0.073	0.017	1.000	0.083	0.019	0.88
10	1.794	0.150	0.035	0.885	0.074	0.017	0.909	0.076	0.018	0.97
11	1.726	0.144	0.034	0.881	0.073	0.017	0.845	0.070	0.016	1.04
12	1.507	0.126	0.029	0.720	0.060	0.014	0.787	0.066	0.015	0.91
13	1.357	0.113	0.026	0.654	0.055	0.013	0.703	0.059	0.014	0.93
14	1.145	0.095	0.022	0.503	0.042	0.010	0.642	0.054	0.012	0.78
15	0.980	0.082	0.019	0.598	0.050	0.012	0.382	0.032	0.007	1.57
16	0.918	0.077	0.018	0.475	0.040	0.009	0.443	0.037	0.009	1.07
17	0.756	0.063	0.015	0.394	0.033	0.008	0.362	0.030	0.007	1.09
18	0.621	0.052	0.012	0.306	0.026	0.006	0.315	0.026	0.006	0.97
19	0.489	0.041	0.010	0.270	0.023	0.005	0.219	0.018	0.004	1.23
20	0.348	0.029	0.007	0.205	0.017	0.004	0.143	0.012	0.003	1.43
21	0.322	0.027	0.006	0.181	0.015	0.004	0.141	0.012	0.003	1.28
22	0.239	0.020	0.005	0.133	0.011	0.003	0.106	0.009	0.002	1.25
23	0.182	0.015	0.004	0.102	0.009	0.002	0.080	0.007	0.002	1.28
24	0.144	0.012	0.003	0.080	0.007	0.002	0.064	0.005	0.001	1.25
25	0.102	0.009	0.002	0.060	0.005	0.001	0.042	0.004	0.001	1.43
26	0.062	0.005	0.001	0.042	0.004	0.001	0.020	0.002	0.000	2.10
27	0.043	0.004	0.001	0.029	0.002	0.001	0.014	0.001	0.000	2.07
28	0.026	0.002	0.001	0.020	0.002	0.000	0.006	0.001	0.000	3.33
29	0.014	0.001	0.000	0.014	0.001	0.000	0.000	0.000	0.000	nd
30	0.005	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	nd
31	0.003	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	nd

nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC

AROMATIC AND PHENOLIC COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 1914.2m, SWC 21 Jul-95

Key	Compound Name	Value A	Value B	Value C
A.	Benzene	1.700	0.142	0.033
B.	Toluene	2.014	0.168	0.039
C.	Ethylbenzene	0.443	0.037	0.009
D.	m- + p-xylene	1.326	0.111	0.026
E.	Styrene	0.379	0.032	0.007
F.	o-xylene	0.514	0.043	0.010
G.	Phenol	0.641	0.053	0.012
H.	o-cresol	0.000	0.000	0.000
I.	m- + p-cresol	0.000	0.000	0.000
J.	C2 phenol	0.328	0.027	0.006
K.	C2 phenol	0.435	0.036	0.008

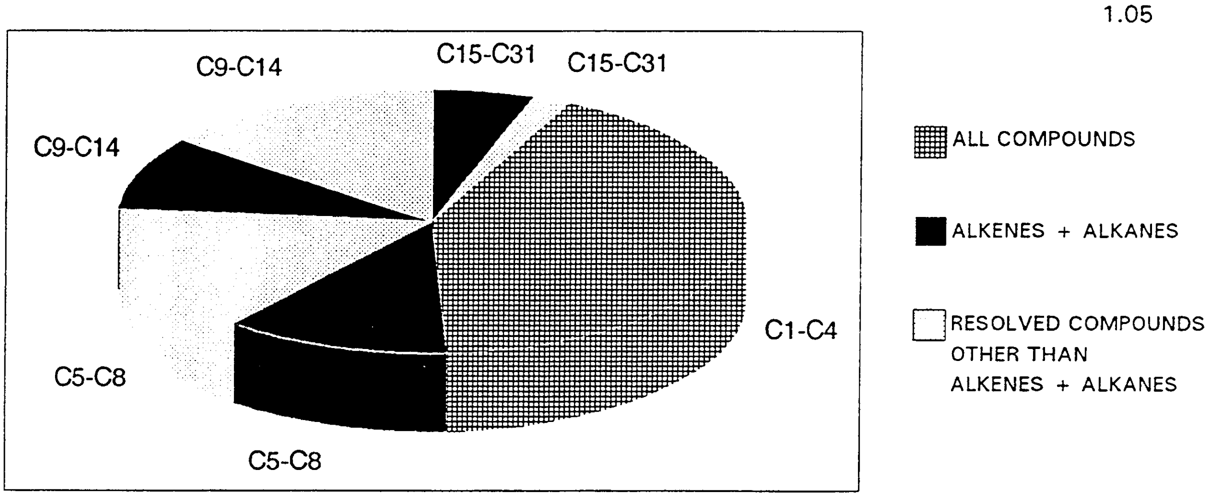


nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
ARO = aromatic compounds (A to F)
PHE = phenolic compounds (G to K)
ALI = aliphatic compounds (C9 to C31 alkenes + alkanes)

PARAMETER SUMMARY FOR PYROLYSIS GAS CHROMATOGRAPHY

DIGBY 1, 1914.2m, SWC 21 Jul-95

Parameter	A	B	C	D
		-------------------Value------------------		
C1-C4 abundance (all compounds)	42.37	3.53	0.82	
C5-C8 abundance (all resolved compounds)	27.54	2.30	0.54	
C5-C8 abundance (alkanes + alkenes)	11.86	0.99	0.23	
C9-C14 abundance (all resolved compounds)	24.08	2.01	0.47	
C9-C14 abundance (alkanes + alkenes)	9.41	0.78	0.18	
C15-C31 abundance (all resolved compounds)	7.46	0.62	0.14	
C15-C31 abundance (alkanes + alkenes)	5.25	0.44	0.10	
C9-C31 abundance (all resolved compounds)	31.54	2.63	0.61	
C9-C31 abundance (alkanes + alkenes)	14.66	1.22	0.29	
C5-C31 abundance (all resolved compounds)	59.08	4.93	1.15	
C5-C31 abundance (alkanes + alkenes)	26.52	2.21	0.52	
C5-C31 alkane abundance	13.15	1.10	0.26	
C5-C31 alkene abundance	13.37	1.11	0.26	
C5-C8 alkane/alkene				0.93
C9-C14 alkane/alkene				0.93
C15-C31 alkane/alkene				1.25
C5-C31 alkane/alkene				0.98
(C1-C5)/C6+				0.90
R				1.05



nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
D = no units
R = m+p-xylene/n-octene

TABLE 2-3

ALKENE AND ALKANE COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 1944.2m, SWC 13 Jul-95

Carbon No.	----Alkane + Alkene----			-------Alkane-------			-------Alkene-------			Alkane/Alkene
	A	B	C	A	B	C	A	B	C	
1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	2.073	1.067	0.030	0.936	0.482	0.013	1.137	0.585	0.016	0.82
6	1.122	0.578	0.016	0.620	0.319	0.009	0.502	0.258	0.007	1.24
7	1.158	0.596	0.017	0.604	0.311	0.009	0.554	0.285	0.008	1.09
8	0.831	0.428	0.012	0.493	0.254	0.007	0.338	0.174	0.005	1.46
9	0.685	0.353	0.010	0.447	0.230	0.006	0.238	0.123	0.003	1.88
10	0.585	0.301	0.008	0.362	0.186	0.005	0.223	0.115	0.003	1.62
11	0.750	0.386	0.011	0.520	0.268	0.007	0.230	0.118	0.003	2.26
12	0.563	0.290	0.008	0.361	0.186	0.005	0.202	0.104	0.003	1.79
13	0.553	0.285	0.008	0.403	0.207	0.006	0.150	0.077	0.002	2.69
14	0.754	0.388	0.011	0.302	0.155	0.004	0.452	0.233	0.006	0.67
15	0.389	0.200	0.006	0.343	0.177	0.005	0.046	0.024	0.001	7.46
16	0.662	0.341	0.009	0.471	0.242	0.007	0.191	0.098	0.003	2.47
17	0.358	0.184	0.005	0.188	0.097	0.003	0.170	0.088	0.002	1.11
18	0.325	0.167	0.005	0.263	0.135	0.004	0.062	0.032	0.001	4.24
19	0.286	0.147	0.004	0.248	0.128	0.004	0.038	0.020	0.001	6.53
20	0.267	0.137	0.004	0.198	0.102	0.003	0.069	0.036	0.001	2.87
21	0.154	0.079	0.002	0.154	0.079	0.002	0.000	0.000	0.000	nd
22	0.105	0.054	0.002	0.105	0.054	0.002	0.000	0.000	0.000	nd
23	0.108	0.056	0.002	0.108	0.056	0.002	0.000	0.000	0.000	nd
24	0.082	0.042	0.001	0.082	0.042	0.001	0.000	0.000	0.000	nd
25	0.050	0.026	0.001	0.050	0.026	0.001	0.000	0.000	0.000	nd
26	0.042	0.022	0.001	0.042	0.022	0.001	0.000	0.000	0.000	nd
27	0.024	0.012	0.000	0.024	0.012	0.000	0.000	0.000	0.000	nd
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd

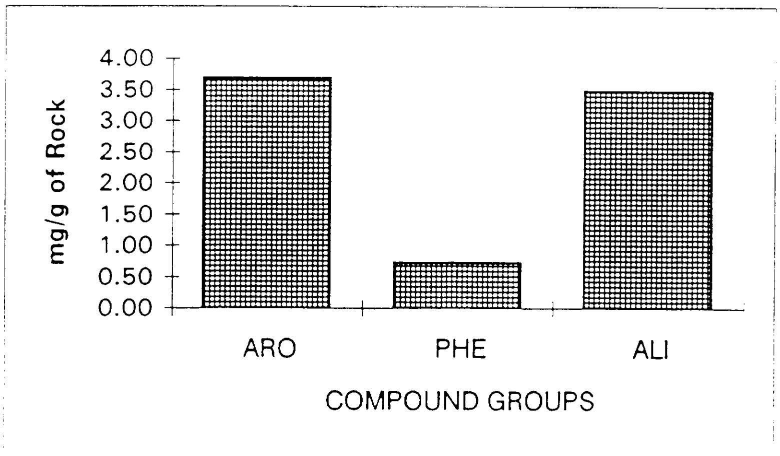
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC

TABLE 3-3

AROMATIC AND PHENOLIC COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 1944.2m, SWC 13 Jul-95

Key	Compound Name	A	B	C
		---Value---		
A.	Benzene	1.473	0.758	0.021
B.	Toluene	2.236	1.151	0.032
C.	Ethylbenzene	0.449	0.231	0.006
D.	m- + p-xylene	2.209	1.137	0.032
E.	Styrene	0.245	0.126	0.004
F.	o-xylene	0.543	0.280	0.008
G.	Phenol	0.876	0.451	0.013
H.	o-cresol	0.232	0.119	0.003
I.	m- + p-cresol	0.285	0.147	0.004
J.	C2 phenol	0.000	0.000	0.000
K.	C2 phenol	0.000	0.000	0.000



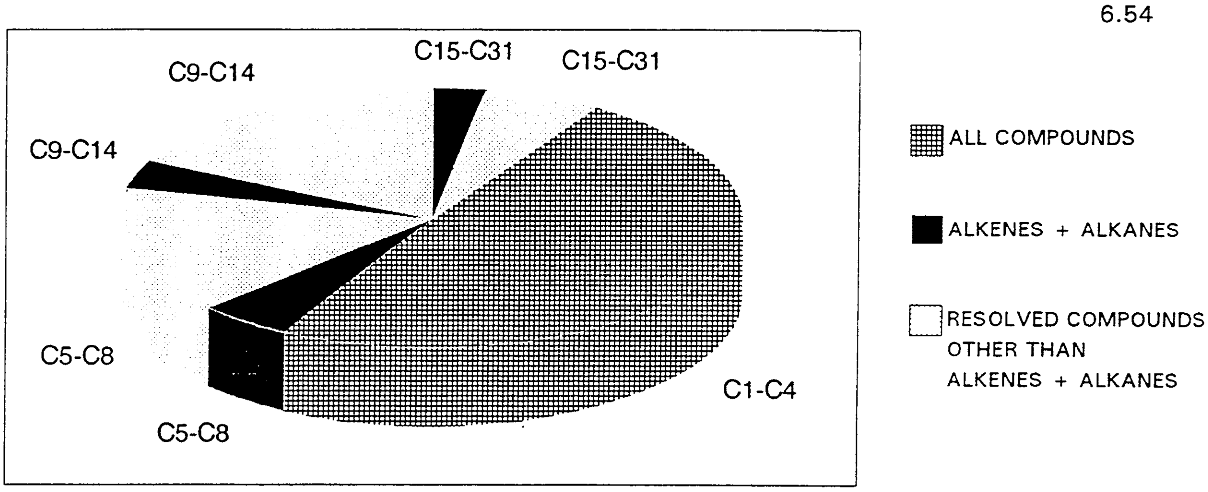
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
ARO = aromatic compounds (A to F)
PHE = phenolic compounds (G to K)
ALI = aliphatic compounds (C9 to C31 alkenes + alkanes)

TABLE 4-3

PARAMETER SUMMARY FOR PYROLYSIS GAS CHROMATOGRAPHY

DIGBY 1, 1944.2m, SWC 13 Jul-95

Parameter	A	B	C	D
	-----	Value	-----	
C1-C4 abundance (all compounds)	50.01	25.74	0.72	
C5-C8 abundance (all resolved compounds)	21.19	10.91	0.30	
C5-C8 abundance (alkanes + alkenes)	5.18	2.67	0.07	
C9-C14 abundance (all resolved compounds)	21.92	11.29	0.31	
C9-C14 abundance (alkanes + alkenes)	3.89	2.00	0.06	
C15-C31 abundance (all resolved compounds)	9.01	4.64	0.13	
C15-C31 abundance (alkanes + alkenes)	2.85	1.47	0.04	
C9-C31 abundance (all resolved compounds)	30.94	15.93	0.44	
C9-C31 abundance (alkanes + alkenes)	6.74	3.47	0.10	
C5-C31 abundance (all resolved compounds)	52.12	26.83	0.75	
C5-C31 abundance (alkanes + alkenes)	11.93	6.14	0.17	
C5-C31 alkane abundance	7.32	3.77	0.11	
C5-C31 alkene abundance	4.60	2.37	0.07	
C5-C8 alkane/alkene				1.05
C9-C14 alkane/alkene				1.60
C15-C31 alkane/alkene				3.95
C5-C31 alkane/alkene				1.59
(C1-C5)/C6+				1.09
R				6.54



nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
D = no units
R = m+p-xylene/n-octene

TABLE 2-4

ALKENE AND ALKANE COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 2002m, SWC 6 Jul-95

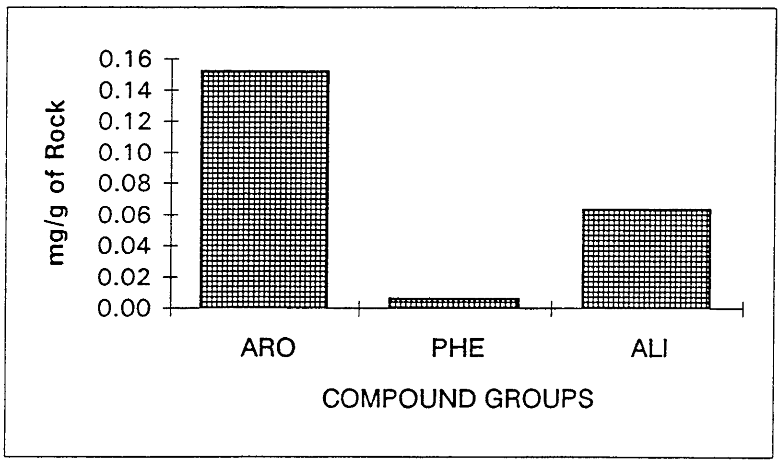
Carbon No.	----Alkane + Alkene----			-------Alkane-------			-------Alkene-------			Alkane/Alkene
	A	B	C	A	B	C	A	B	C	
1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	5.567	0.057	0.084	4.878	0.050	0.073	0.689	0.007	0.010	7.08
6	3.928	0.040	0.059	1.539	0.016	0.023	2.389	0.024	0.036	0.64
7	3.121	0.032	0.047	1.490	0.015	0.022	1.631	0.017	0.024	0.91
8	2.314	0.024	0.035	1.098	0.011	0.016	1.216	0.012	0.018	0.90
9	1.701	0.017	0.026	0.837	0.009	0.013	0.864	0.009	0.013	0.97
10	1.283	0.013	0.019	0.647	0.007	0.010	0.636	0.006	0.010	1.02
11	1.053	0.011	0.016	0.536	0.005	0.008	0.517	0.005	0.008	1.04
12	0.768	0.008	0.012	0.403	0.004	0.006	0.365	0.004	0.005	1.10
13	0.580	0.006	0.009	0.349	0.004	0.005	0.231	0.002	0.003	1.51
14	0.367	0.004	0.006	0.264	0.003	0.004	0.103	0.001	0.002	2.56
15	0.192	0.002	0.003	0.132	0.001	0.002	0.060	0.001	0.001	2.20
16	0.119	0.001	0.002	0.097	0.001	0.001	0.022	0.000	0.000	4.41
17	0.067	0.001	0.001	0.067	0.001	0.001	0.000	0.000	0.000	nd
18	0.043	0.000	0.001	0.043	0.000	0.001	0.000	0.000	0.000	nd
19	0.013	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000	nd
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd
31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	nd

nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC

AROMATIC AND PHENOLIC COMPONENT ANALYSIS FROM PYROLYSIS-GC

DIGBY 1, 2002m, SWC 6 Jul-95

Key	Compound Name	A	B	C
		--------------------Value--------------------		
A.	Benzene	7.615	0.078	0.114
B.	Toluene	3.915	0.040	0.059
C.	Ethylbenzene	0.701	0.007	0.011
D.	m- + p-xylene	1.054	0.011	0.016
E.	Styrene	0.834	0.009	0.013
F.	o-xylene	0.747	0.008	0.011
G.	Phenol	0.574	0.006	0.009
H.	o-cresol	0.000	0.000	0.000
I.	m- + p-cresol	0.000	0.000	0.000
J.	C2 phenol	0.000	0.000	0.000
K.	C2 phenol	0.000	0.000	0.000



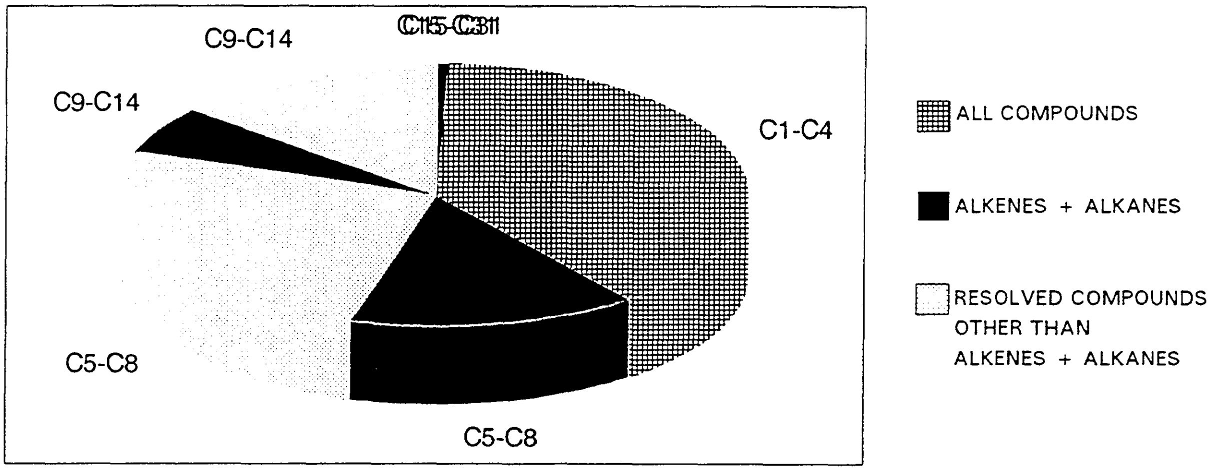
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
ARO = aromatic compounds (A to F)
PHE = phenolic compounds (G to K)
ALI = aliphatic compounds (C9 to C31 alkenes + alkanes)

TABLE 4-4

PARAMETER SUMMARY FOR PYROLYSIS GAS CHROMATOGRAPHY

DIGBY 1, 2002m, SWC 6 Jul-95

Parameter	A	B	C	D
		---Value---		
C1-C4 abundance (all compounds)	38.88	0.40	0.58	
C5-C8 abundance (all resolved compounds)	40.99	0.42	0.61	
C5-C8 abundance (alkanes + alkenes)	14.93	0.15	0.22	
C9-C14 abundance (all resolved compounds)	19.61	0.20	0.29	
C9-C14 abundance (alkanes + alkenes)	5.75	0.06	0.09	
C15-C31 abundance (all resolved compounds)	0.52	0.01	0.01	
C15-C31 abundance (alkanes + alkenes)	0.43	0.00	0.01	
C9-C31 abundance (all resolved compounds)	20.14	0.21	0.30	
C9-C31 abundance (alkanes + alkenes)	6.19	0.06	0.09	
C5-C31 abundance (all resolved compounds)	61.12	0.62	0.92	
C5-C31 abundance (alkanes + alkenes)	21.12	0.22	0.32	
C5-C31 alkane abundance	12.39	0.13	0.19	
C5-C31 alkene abundance	8.72	0.09	0.13	
C5-C8 alkane/alkene				1.52
C9-C14 alkane/alkene				1.12
C15-C31 alkane/alkene				4.29
C5-C31 alkane/alkene				1.42
(C1-C5)/C6+				0.93
R				0.87



nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
D = no units
R = m+p-xylene/n-octene

TABLE 1

ROCK-EVAL PYROLYSIS DATA (one run)

DIGBY 1 Jul-95

DEPTH (m)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
1096.8	nd	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd
1364.4	nd	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd
1414.6	nd	nd	nd	nd	nd	nd	nd	nd	0.41	nd	nd
1445.2	448	0.20	1.51	0.21	1.71	7.19	0.12	0.14	1.08	140	19
1536.4	447	0.16	0.69	0.20	0.85	3.45	0.19	0.07	0.53	130	38
1591.0	nd	nd	nd	nd	nd	nd	nd	nd	0.29	nd	nd
1903.2	446	0.73	3.97	1.09	4.70	3.64	0.16	0.39	2.47	161	44
1914.2	446	1.89	8.34	1.11	10.23	7.51	0.18	0.85	4.29	194	26
1926.4	449	1.68	6.31	0.30	7.99	21.03	0.21	0.66	3.27	193	9
1936.4	454	1.32	6.80	0.54	8.12	12.59	0.16	0.67	3.65	186	15
1944.2	458	12.87	51.48	1.20	64.35	42.90	0.20	5.34	35.90	143	3
2002.0	451	0.43	1.02	1.05	1.45	0.97	0.30	0.12	0.68	150	154
2028.2	nd	nd	nd	nd	nd	nd	nd	nd	0.42	nd	nd
2048.2	448	0.25	0.60	12.43	0.85	0.05	0.29	0.07	0.53	113	2345

TMAX = Max. temperature S2
S1+S2 = Potential yield
PC = Pyrolysable carbon
OI = Oxygen Index
S1 = Volatile hydrocarbons (HC)
S3 = Organic carbon dioxide
TOC = Total organic carbon
nd = no data
S2 = HC generating potential
PI = Production index
HI = Hydrogen index

GEOTECHNICAL SERVICES PTY LTD

APPENDIX 9E

GC-MS

(BRANCHED / CYCLICS & AROMATICS)

DIGBY-1

GEOTECH GEOTECHNICAL SERVICES PTY LTD
41-45 Furnace Road, Welshpool, Western Australia. 6106
Locked Bag 27, Cannington, Western Australia. 6107
Telephone: (09) 458 8877
Facsimile: (09) 458 8857

FILE COPY

31 July, 1995

4572

Mr. N. Newell
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Noel,

Please find enclosed GC sat, GC-MS b/c and GC-MS arom results for two Digby-1 source rock samples from 1903.2m and 1944.2m depth as well as GC-MS data for SWCs 13, 14, 22 and 32.

Based on the data available, the following conclusions can be drawn:

- The oil shows at 1473.7m and 1940.8m are considerably different in terms of their organic source facies. The deeper oil is significantly more terrestrial than the shallower one, as reflected in C_{27}/C_{29} diasterane and sterane ratios of 0.09 and 0.29 at 1940.8m vs 0.58 and 0.83 at 1437.7m.

  Both oils were sourced from predominantly terrestrial organic matter, but the deeper one was generated from a coaly exclusively higher plant derived source, whereas the shallower one was generated from "normal" terrestrial organic matter with minor input from algae and bacteria.

  The depositional environment of the coaly source for the 1940.8m oil was much more oxic than the environment during deposition of the source for the 1473.7m oil, as characterised by a higher pristane/phytane ratio (5.48 vs 3.06) and less prominent dia- and neohopanes.

- The oil from 1473.7m correlates well with the source rock from 1903.2m, both in terms of its moderately terrestrial source character and the mixed oxic/anoxic depositional environment.

- The oil from 1940.8m is believed to be genetically related to the coaly source rock from 1944.2m: both samples show very terrestrial, coaly biomarker signatures and markers for quite oxic depositional environments.

  The higher proportion of light ends (up to about n-C_{15}) in the GC trace for 1944.2m is in agreement with the coaly nature of this organic matter (which is also reflected in its PGC trace).

  The lower proportions of n-alkanes up to C_{15} in the 1940.8m oil believed to be generated from this organic matter is likely to be due to migration effects.

- All four samples analysed are mature at present, with sterane ratios suggesting maturities of about 1.0 to 1.1% V_R equivalent and MPIs equivalent to approximately 0.8 to 0.9% V_R.

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

TABLE 10

SELECTED AROMATIC PARAMETERS

DIGBY 1 Jul-95

DEPTH	TYPE	DNR-1	DNR-5	DNR-6	TNR-1	TNR-5	TNR-6	MPR-1	MPI-1	MPI-2	Rc(a)	Rc(b)
1473.7m	SWC	3.39	nd	1.89	0.64	0.95	nd	1.67	0.76	0.81	0.85	1.85
1903.2m	SWC	4.22	nd	2.37	0.70	0.78	nd	1.48	0.63	0.69	0.78	1.92
1940.8m	SWC	4.58	nd	2.48	0.66	1.06	nd	1.17	0.69	0.81	0.82	1.88
1944.0m	SWC	4.55	nd	2.82	0.75	1.72	nd	1.02	0.65	0.80	0.79	1.91

response factors have been applied to DNR 6, TNR 1, TNR 5, MPI 1 and MPI 2

TABLE 10

SELECTED AROMATIC PARAMETERS CONT.

DIGBY 1 Jul-95

DEPTH	TYPE	1,7-DMP/X (m/z 206)	RETENE/9-MP (m/z 219,192)	1MP/9MP
1473.7m	SWC	0.92	0.36	0.94
1903.2m	SWC	0.81	0.04	1.03
1940.8m	SWC	1.55	0.31	1.62
1944.0m	SWC	2.70	0.64	2.27

nd = no data

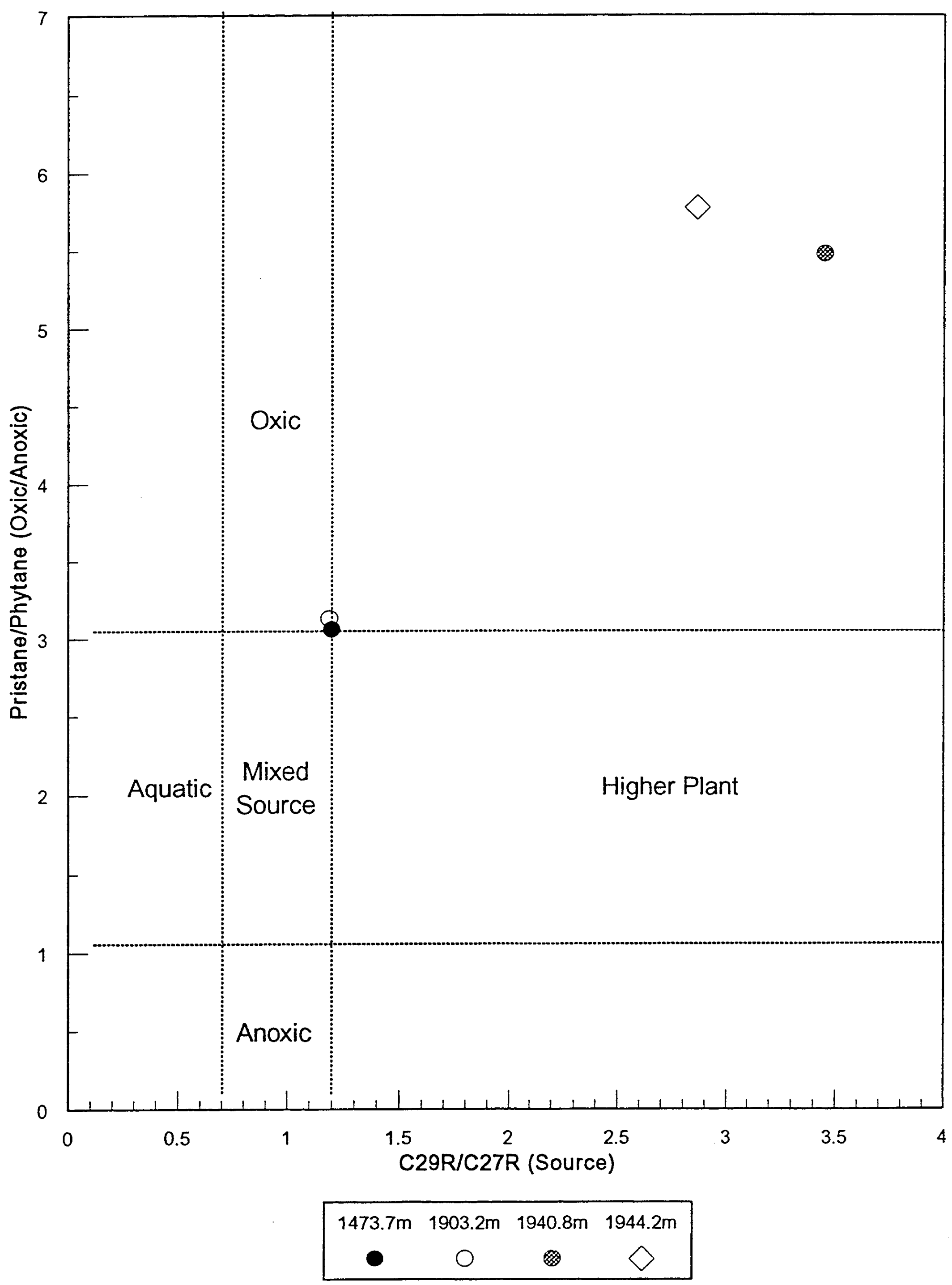
TABLE 8

SUMMARY OF PARAMETERS FROM GC-MS ANALYSIS

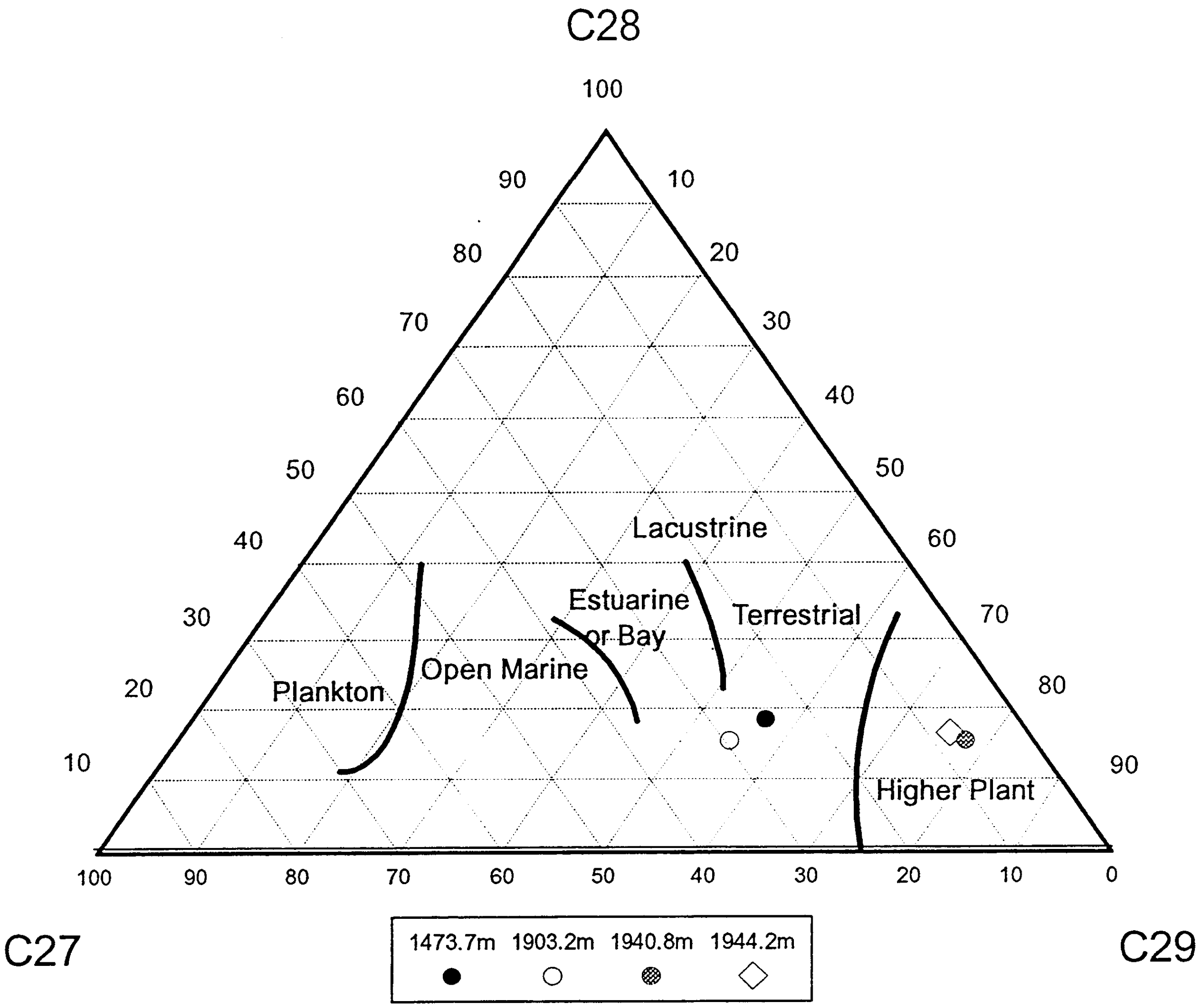
DIGBY 1

		TRITERPANES					STERANES						BICYCLANES	
WELL	SAMPLE	Ts/Tm	C30H/C30M	C31 22S/22R	C32 22S/22R	HOPANES/ STERANES	C29 20S/20R	C29 20S/20S+20R	C29 αBB/ααα+αBB	C29 DIAS/NORMAL	DIASTERANES C27/C29	NORMAL C27/C29	D/HD	R1+R2/ D+HD
DIGBY 1	1473.7m	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.74	1.11
DIGBY 1	1473.7m, Topped	2.53	8.69	1.24	1.56	1.63	1.11	0.53	0.61	1.22	0.58	0.83	nd	nd
DIGBY 1	1903.2m	1.03	10.11	1.34	1.48	1.13	0.97	0.49	0.57	0.62	0.61	0.84	0.33	0.68
DIGBY 1	1940.8m	1.03	11.08	1.32	1.37	0.56	1.06	0.52	0.61	0.76	0.09	0.29	0.40	0.72
DIGBY 1	1944.2m	0.45	10.86	1.53	1.28	1.27	0.92	0.48	0.58	0.63	0.23	0.35	0.57	0.30

DIGBY 1
Pristane/Phytane vs C29R/C27R



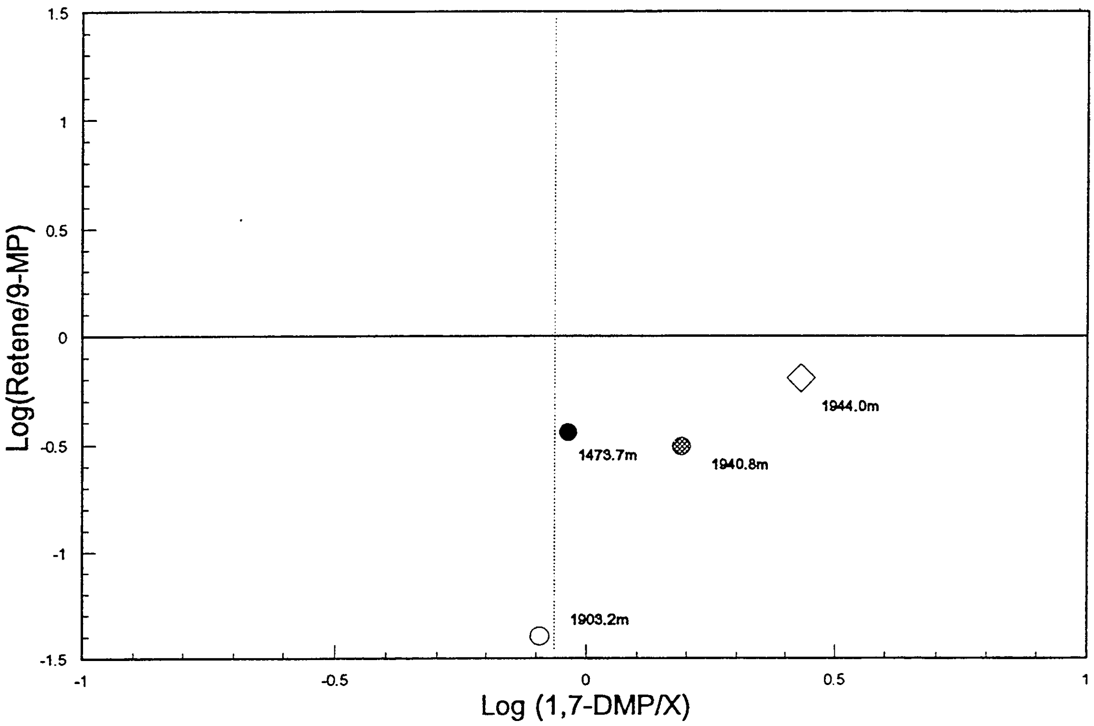
DIGBY 1 Comparison GC-MS (B/C) Data
Facies Interpretation based on Steranes



m/z 218 Iso Steranes

DIGBY 1 GC-MS (AROMS) Data

Aromatic Source Input Parameters



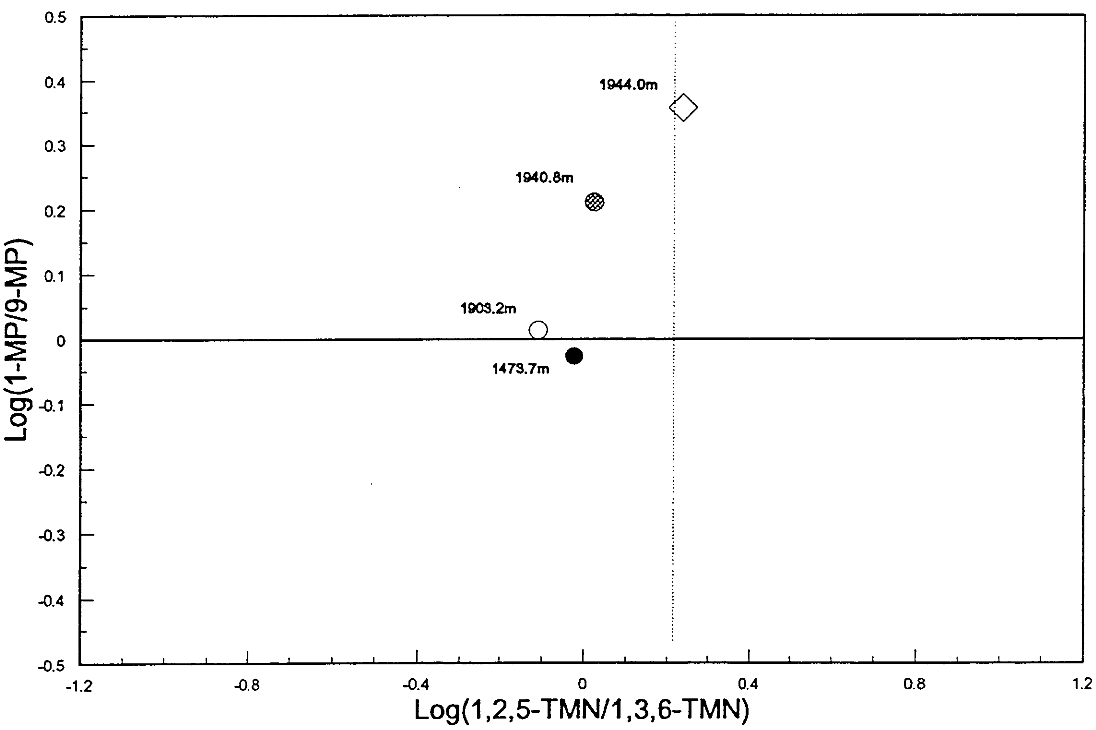


Figure 3

DIGBY 1 GC-MS (AROMS) Data
MPI-derived VR versus Depth

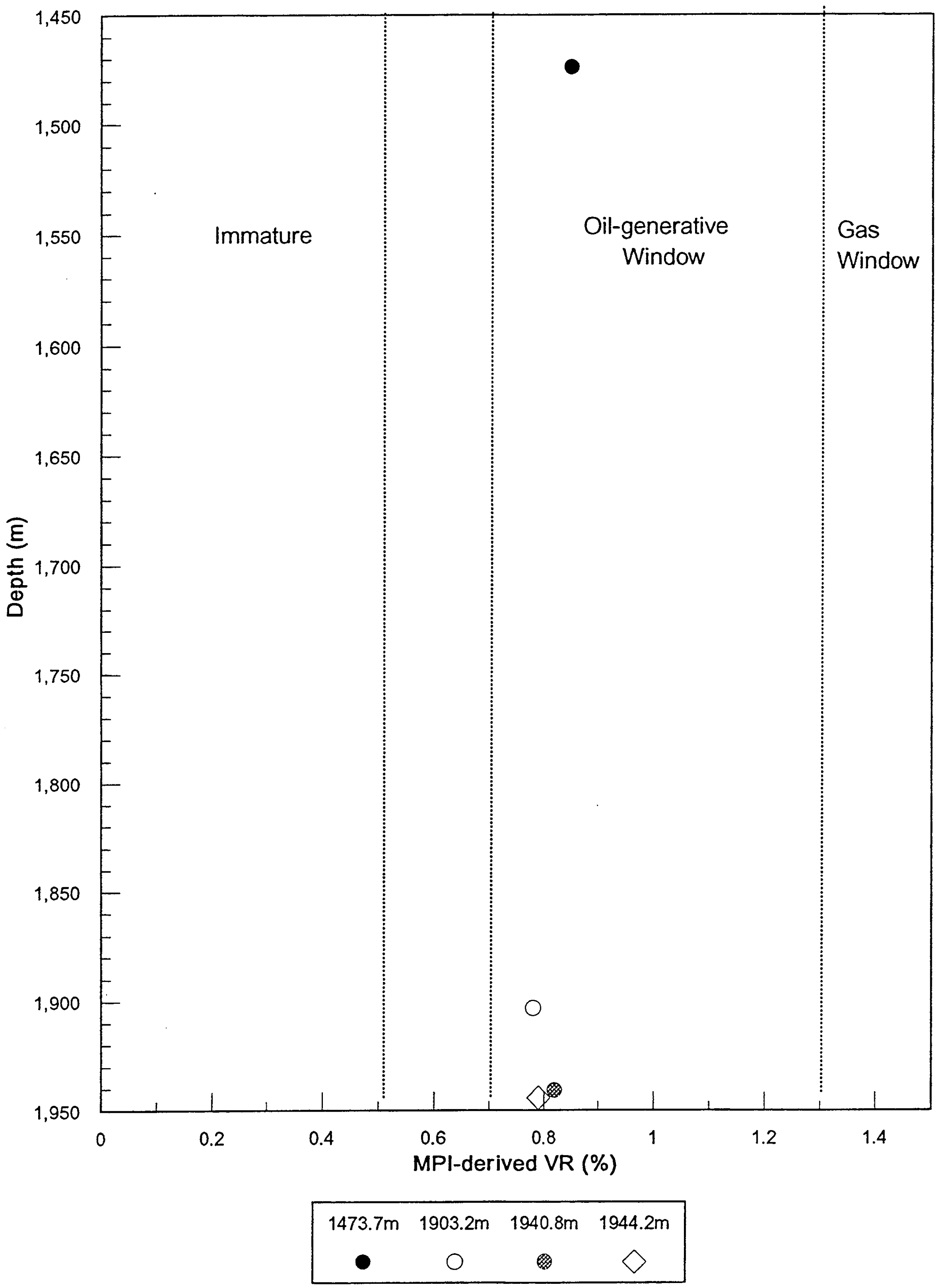


Figure 4

TABLE 9-1

SELECTED PARAMETERS FROM GC/MS ANALYSIS

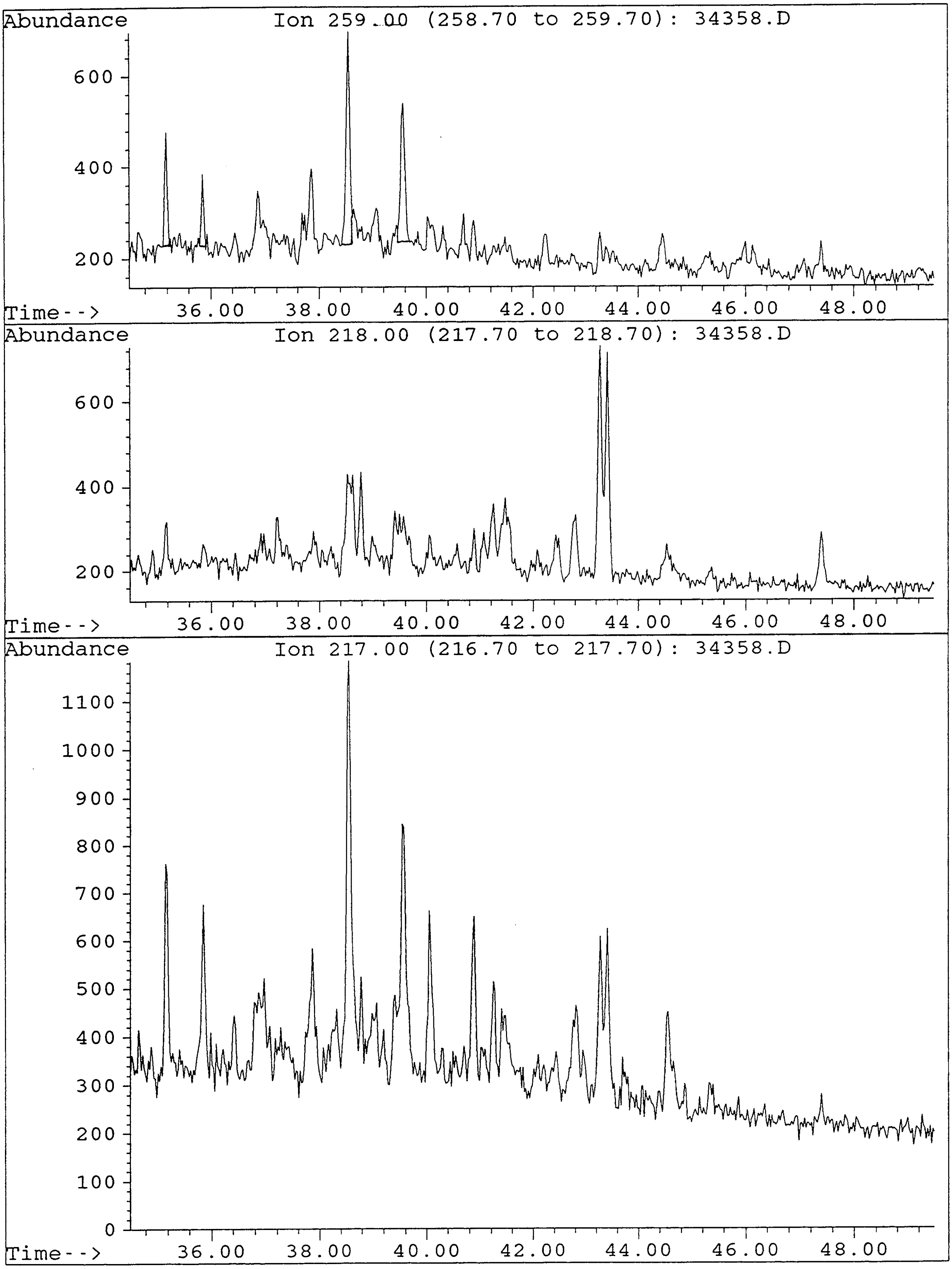
DIGBY 1, 1473.7m, SWC

	Parameter	Ion(s)	Value
1.	18 α (H)- hopane/17 α (H)-hopane (Ts/Tm)	191	nd
2.	C30 hopane/C30 moretane	191	nd
3.	C31 22S hopane/C31 22R hopane	191	nd
4.	C32 22S hopane/C32 22R hopane	191	nd
5.	C29 20S ααα sterane/C29 20R ααα sterane	217	nd
6.	C29 ααα steranes (20S / 20S+20R)	217	nd
7.	C29 αββ steranes / (C29 ααα steranes + C29 αββ steranes)	217	nd
8.	C27/C29 diasteranes	259	nd
9.	C27/C29 steranes	217	nd
10.	18 α (H)-oleanane/C30 hopane	191	nd
11.	C29 diasteranes / (C29 ααα steranes + C29 αββ steranes)	217	nd
12.	C30 (hopane + moretane) / C29 (steranes + diasteranes)	191/217	nd
13.	C15 drimane/C16 homodrimane	123	0.74
14.	Rearranged drimanes/normal drimanes	123	1.11

nd = not detectable

File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95

FIGURE 6-1



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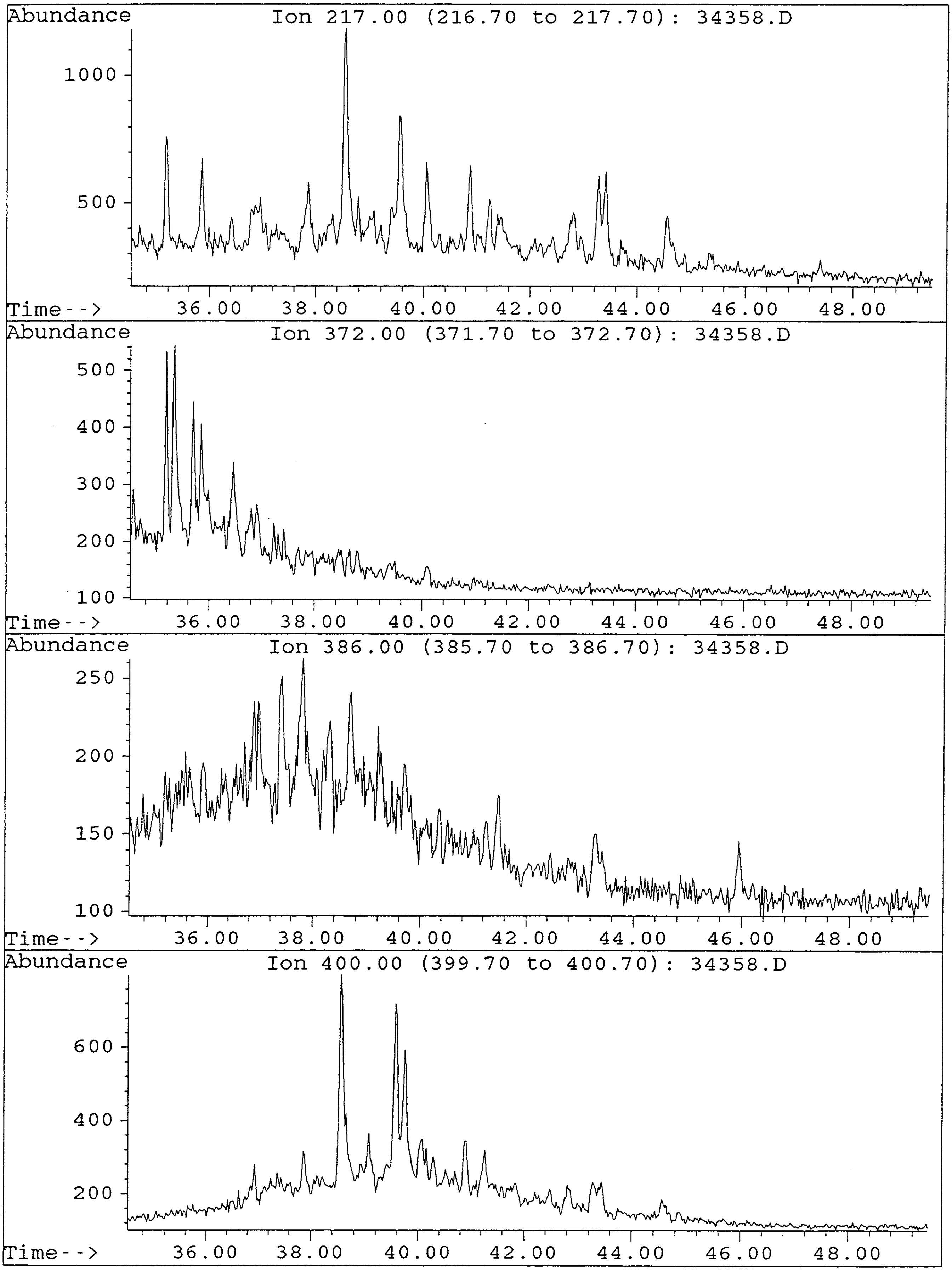
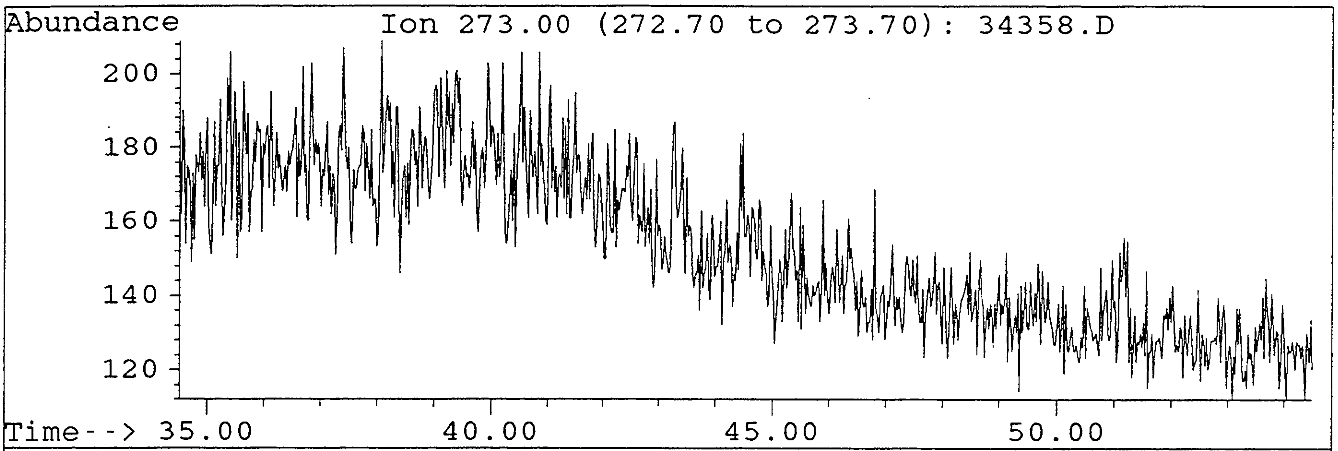
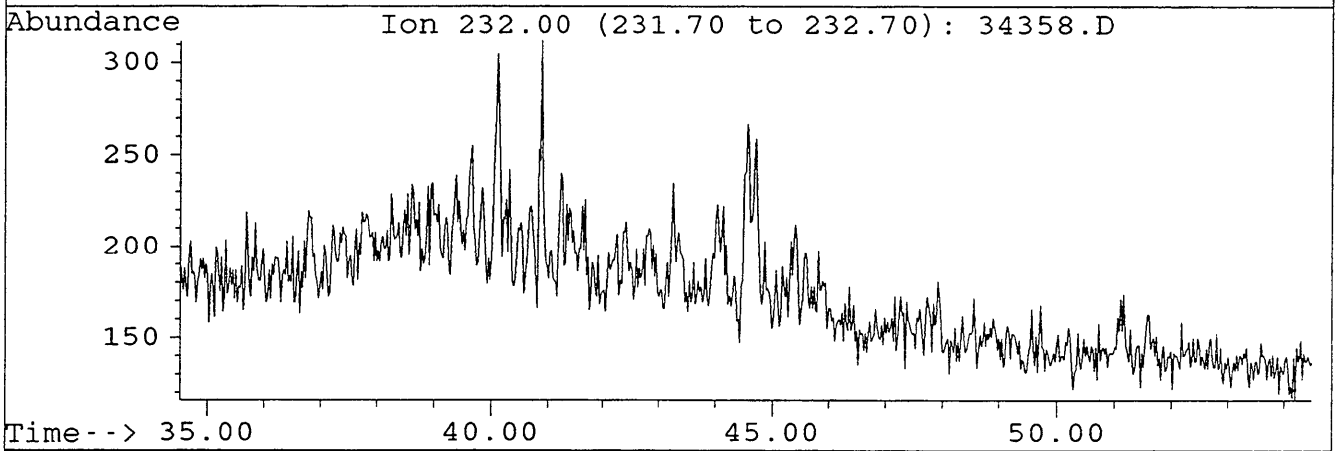
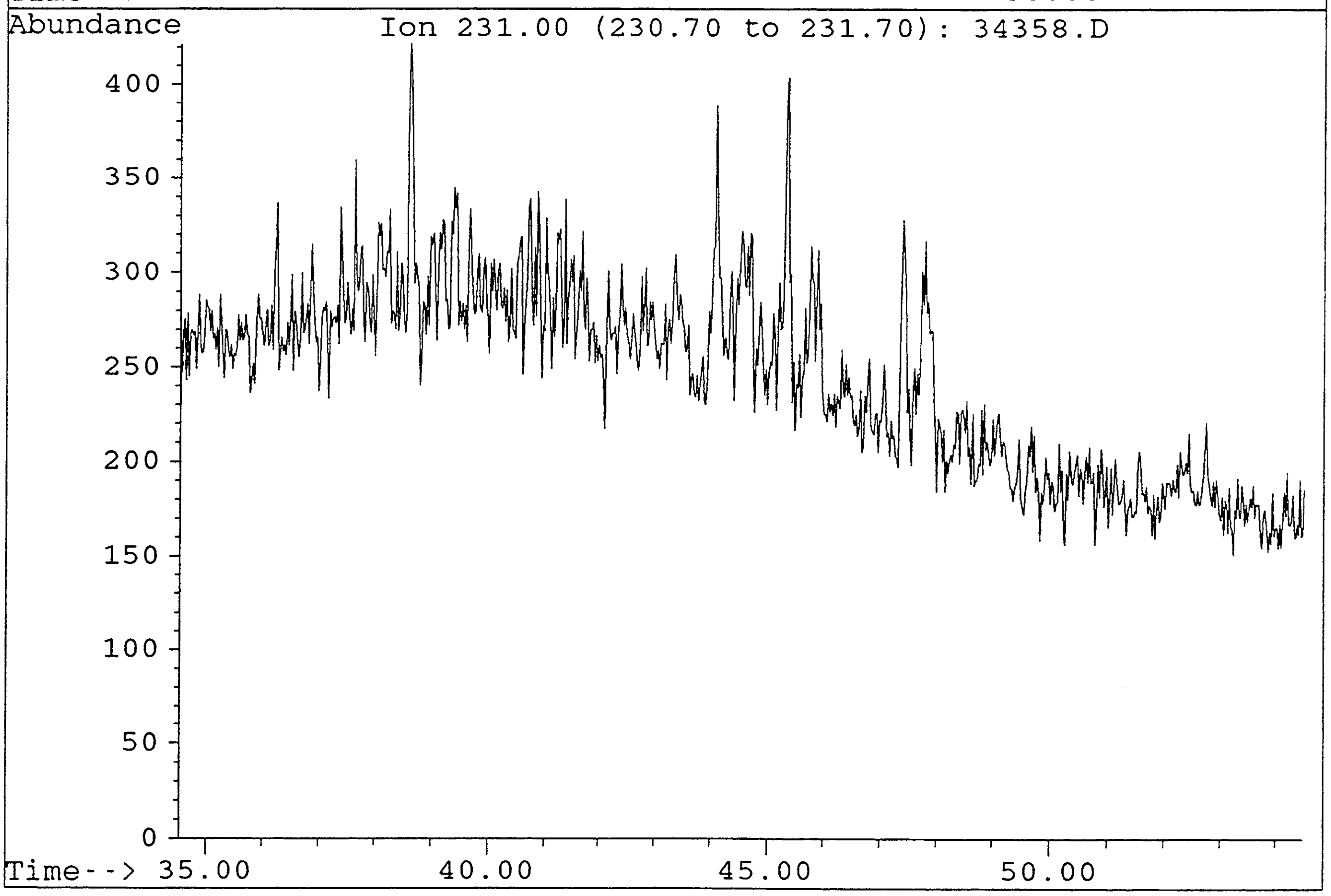
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



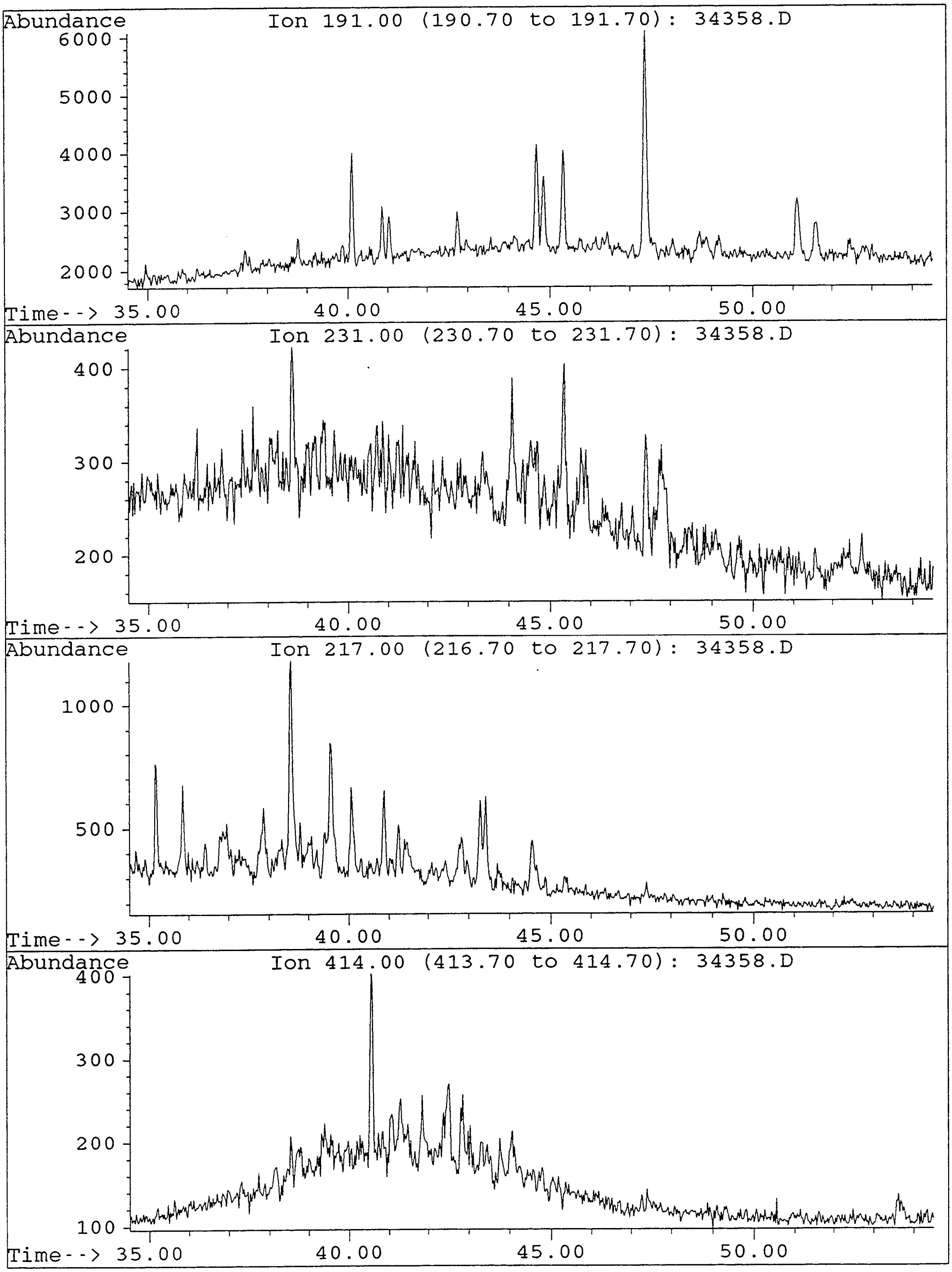
File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



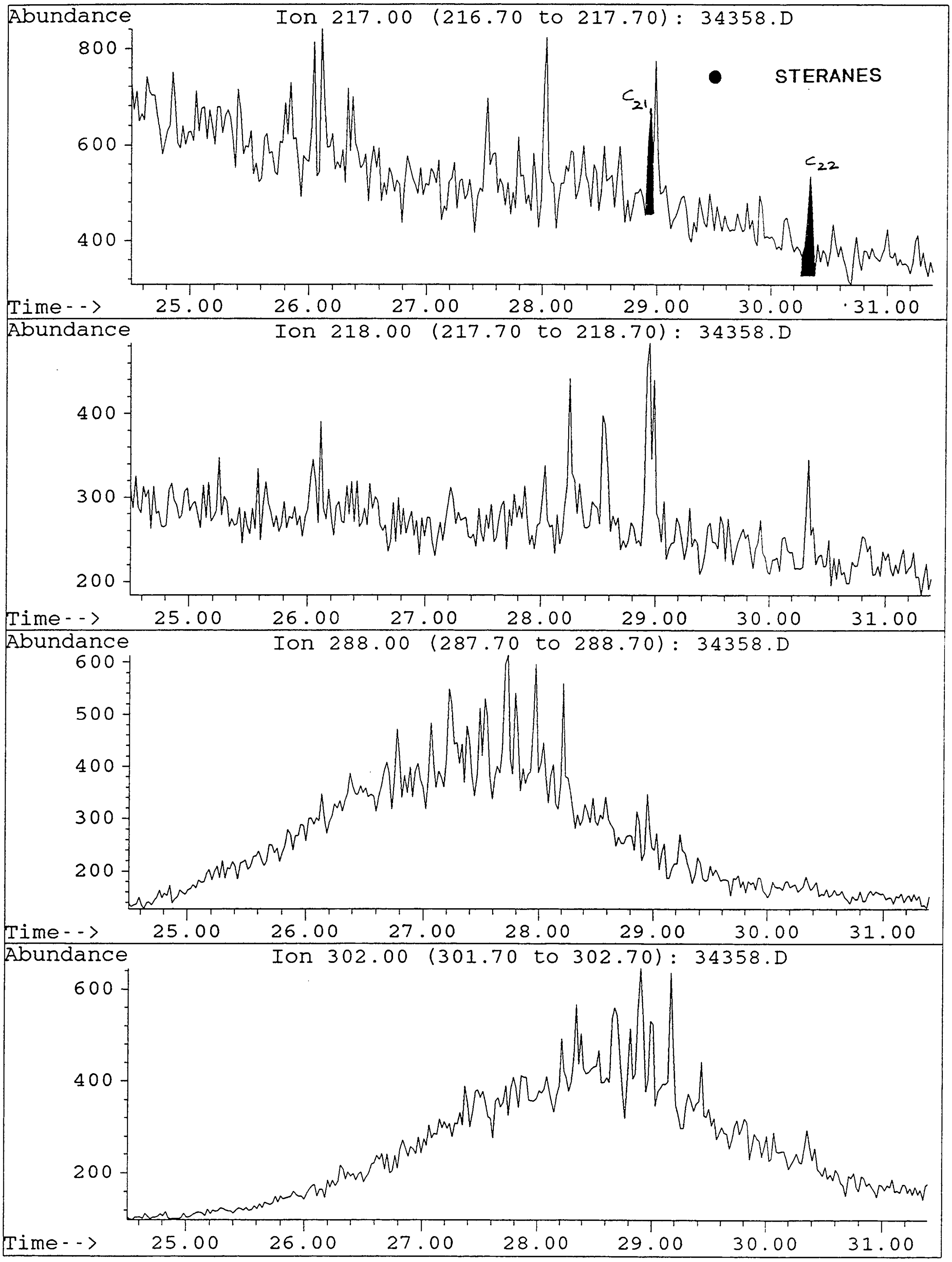




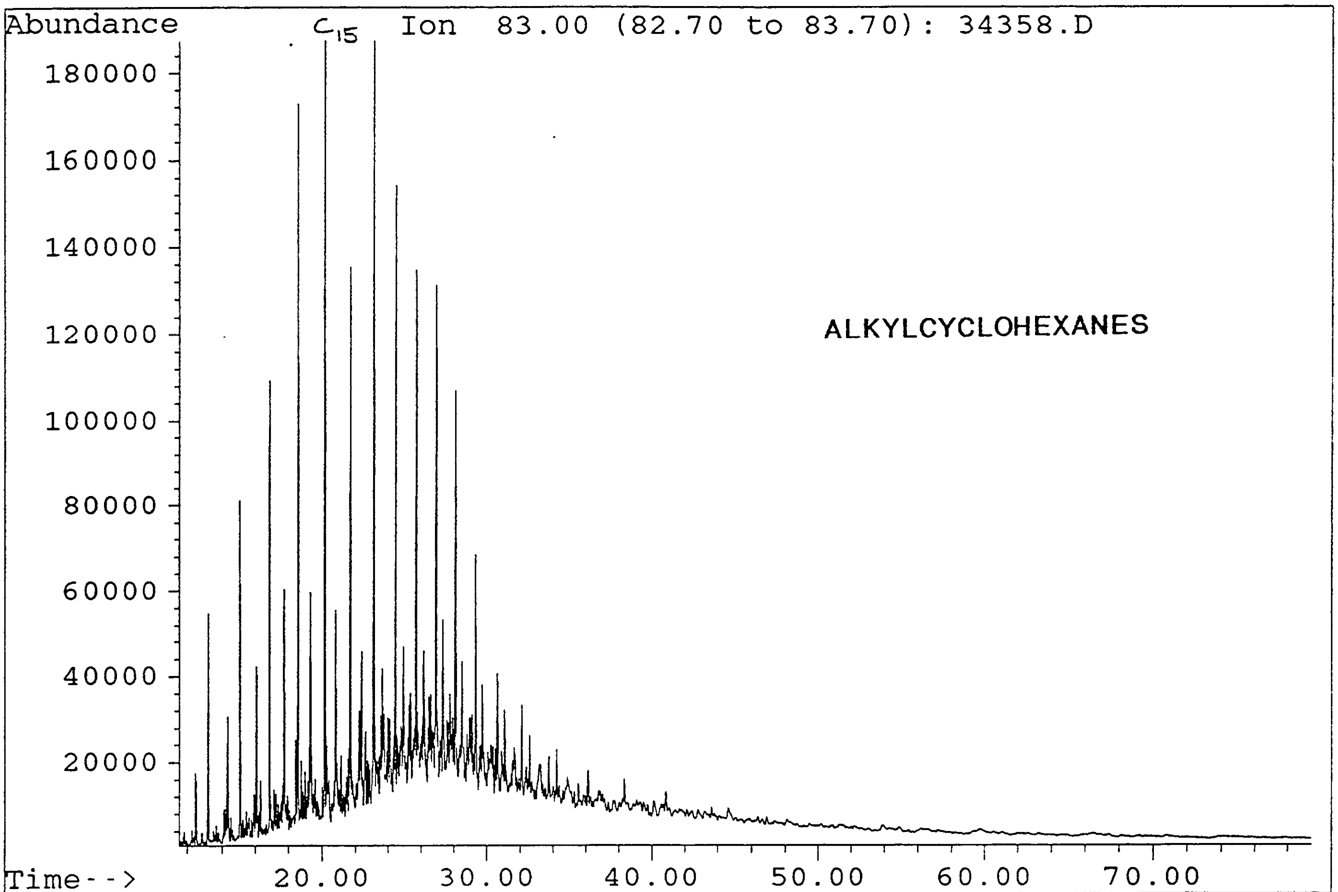
File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95

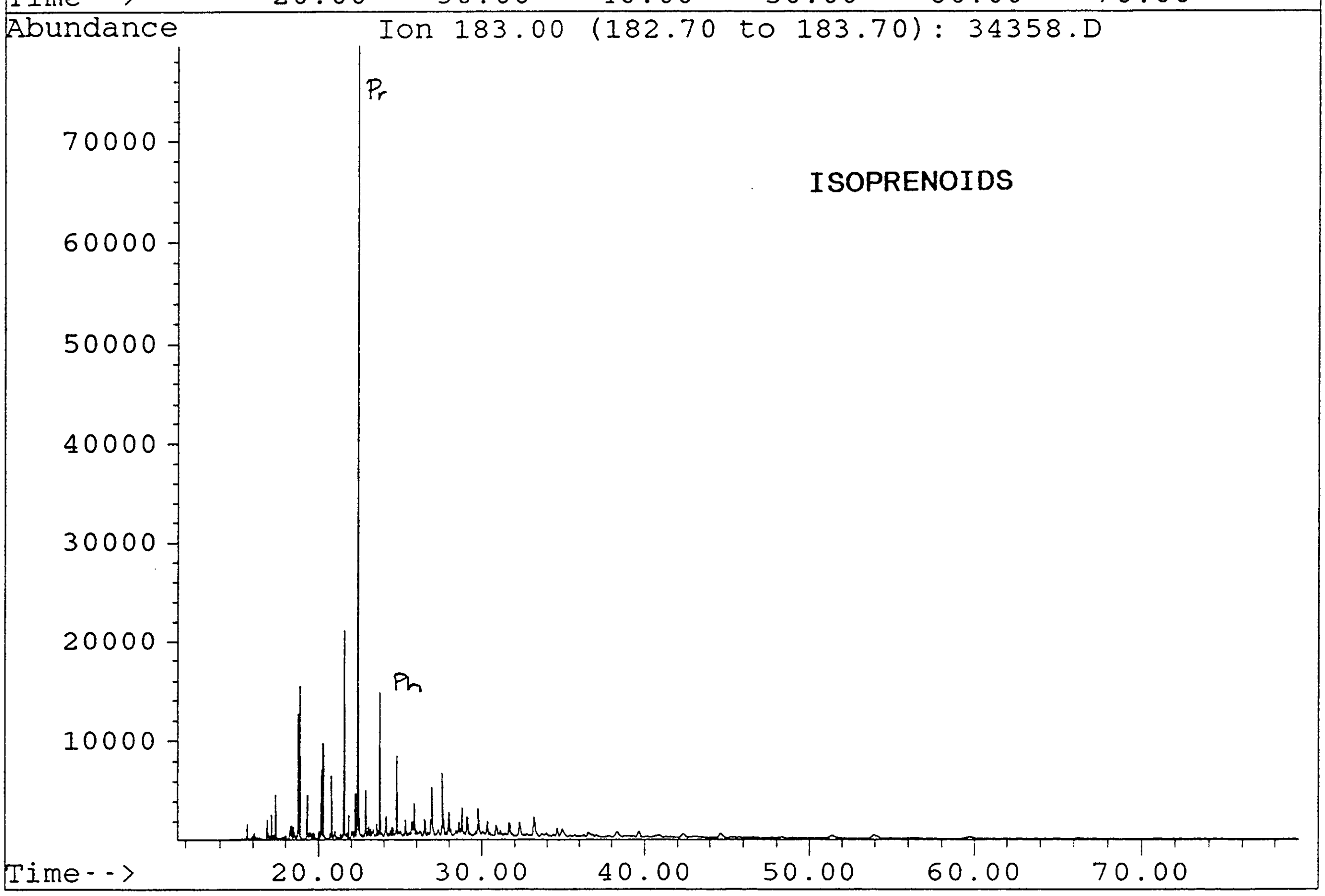


File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95

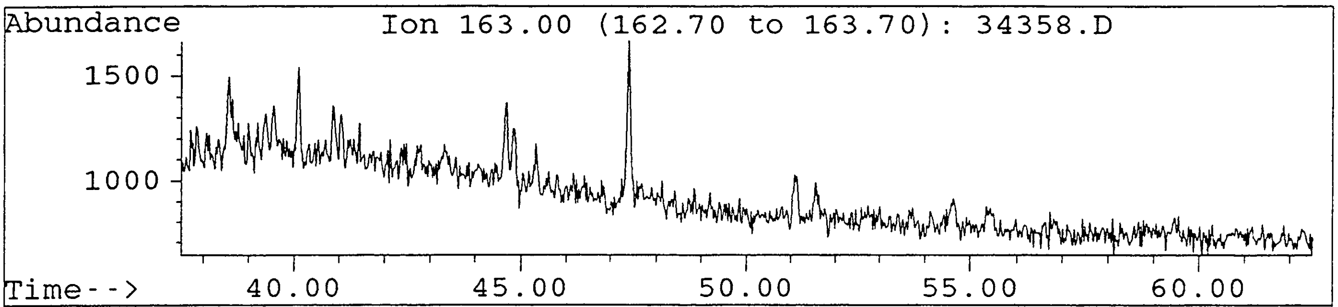


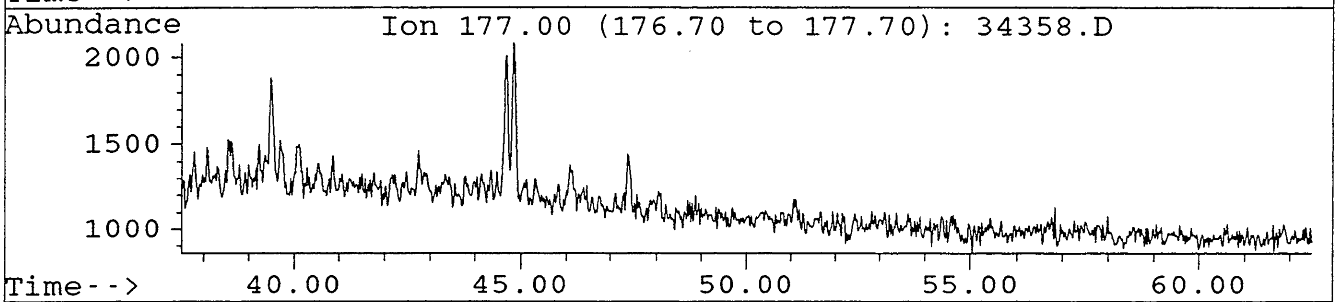
File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95

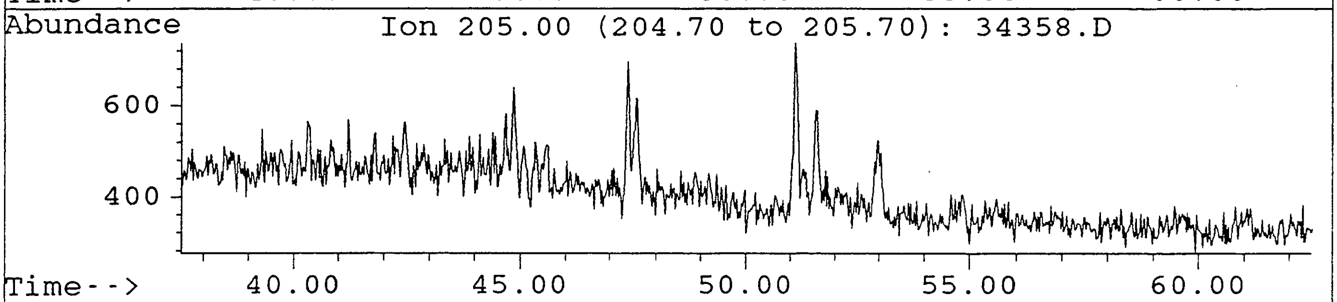


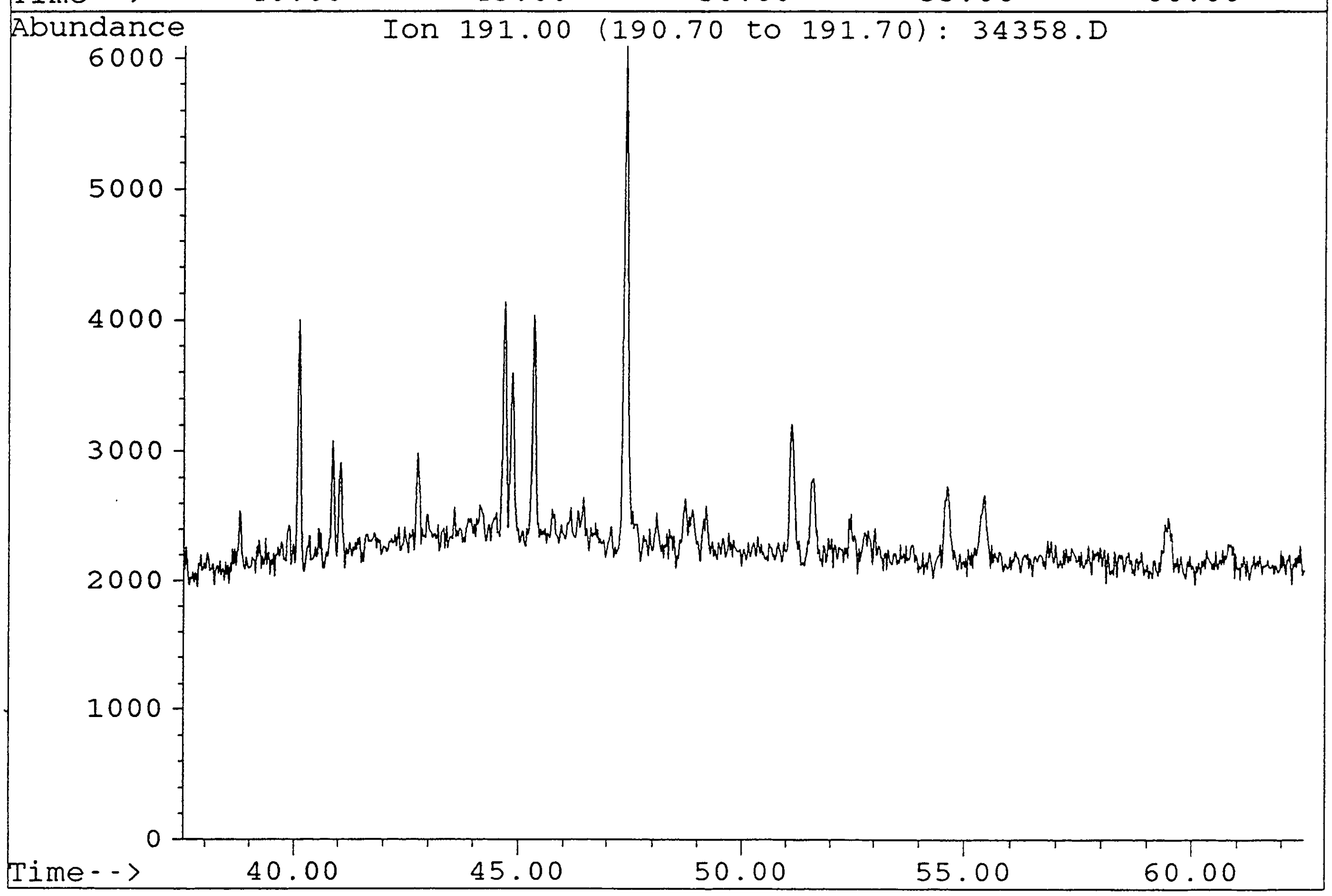


File :   34358.D
Sample :   DIGBY-1 1473.7m B/C
Misc. Info :   COL#164. DJ. 10-7-95

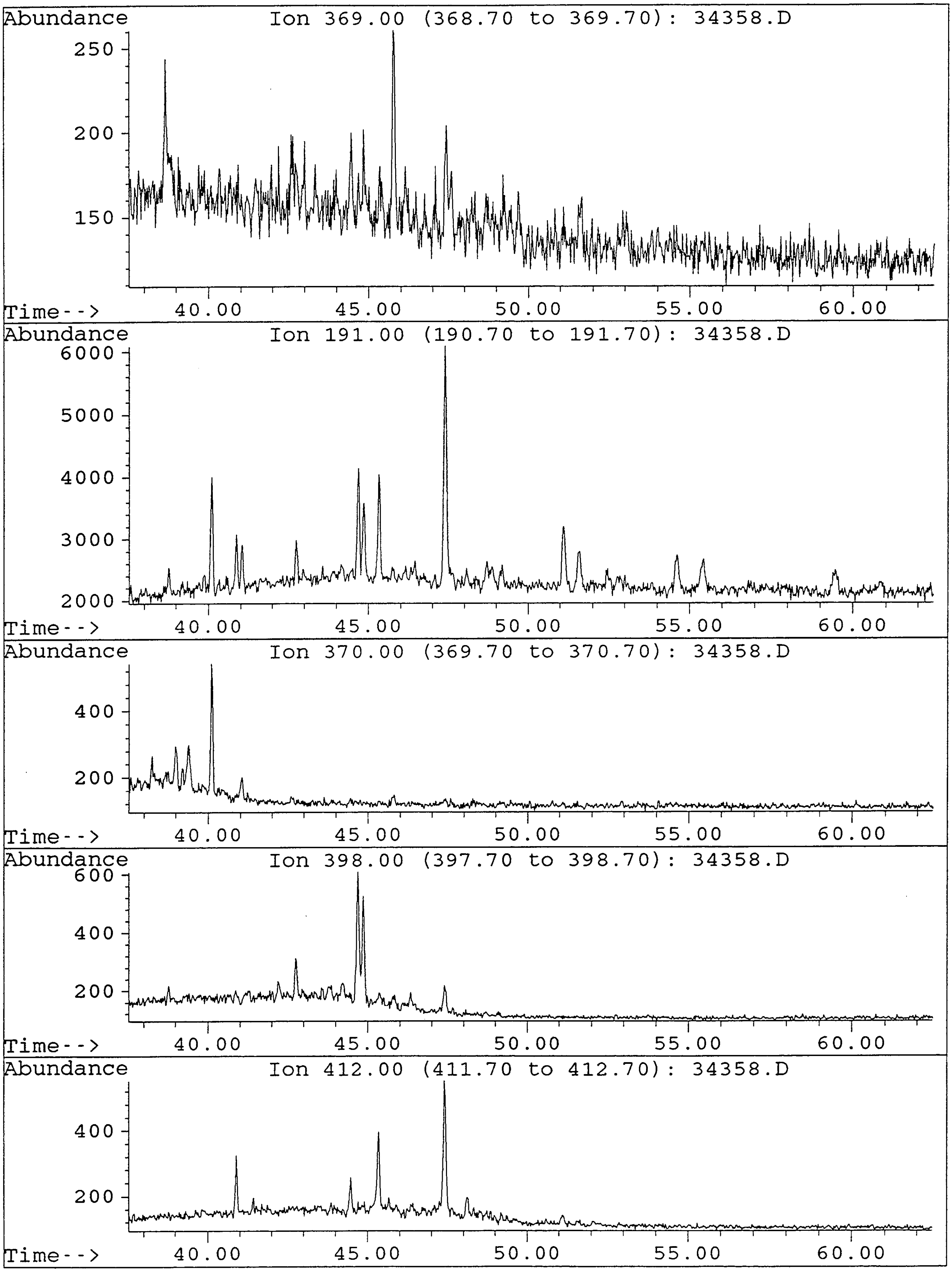








File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



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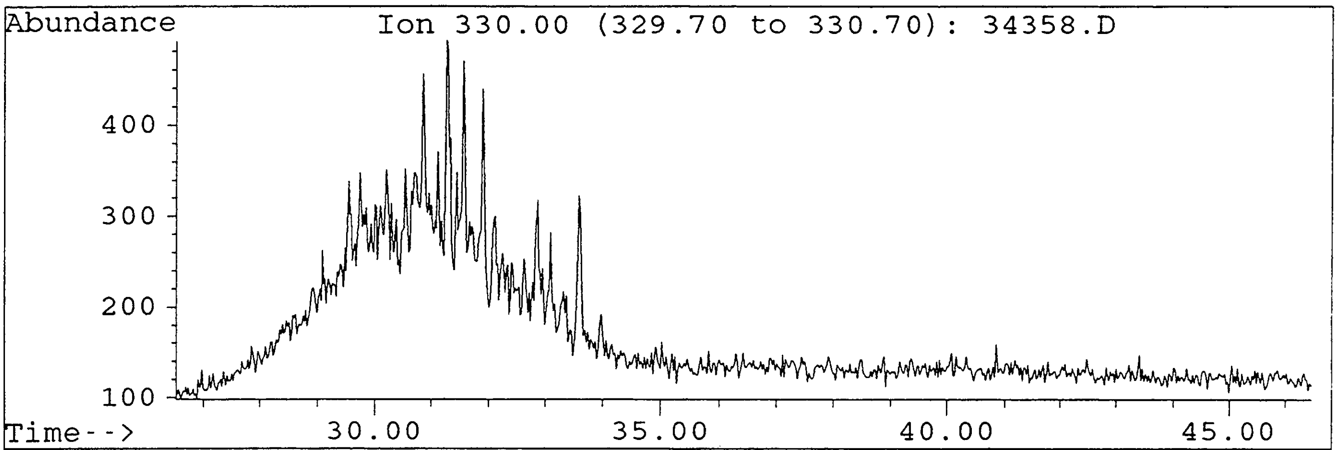
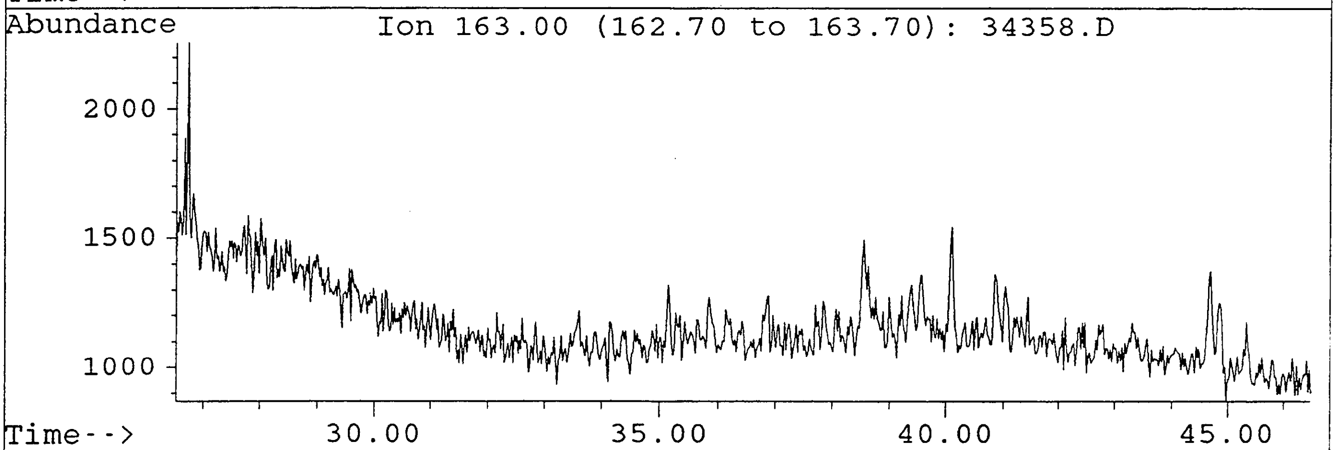
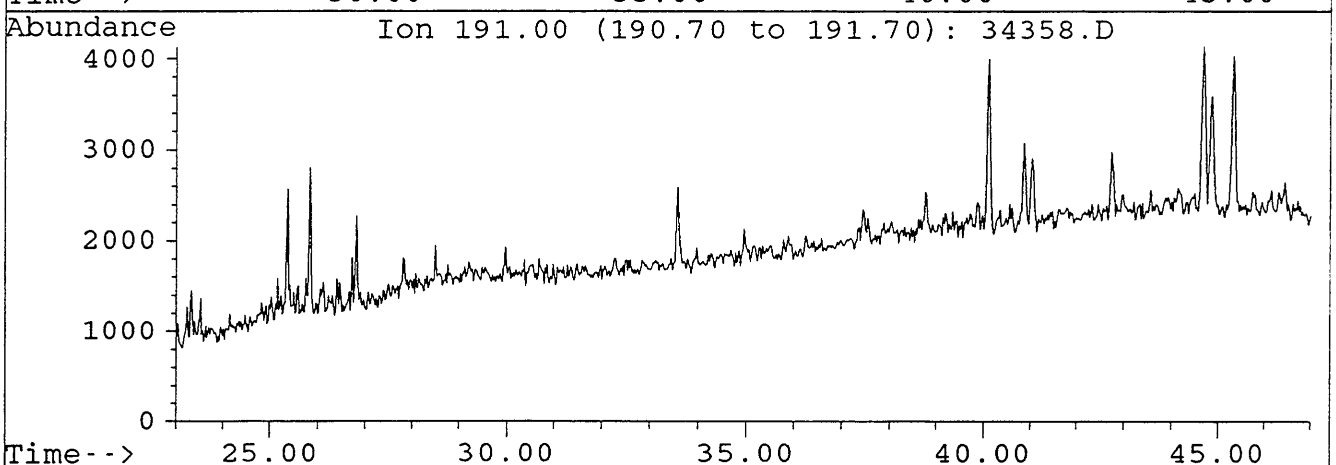
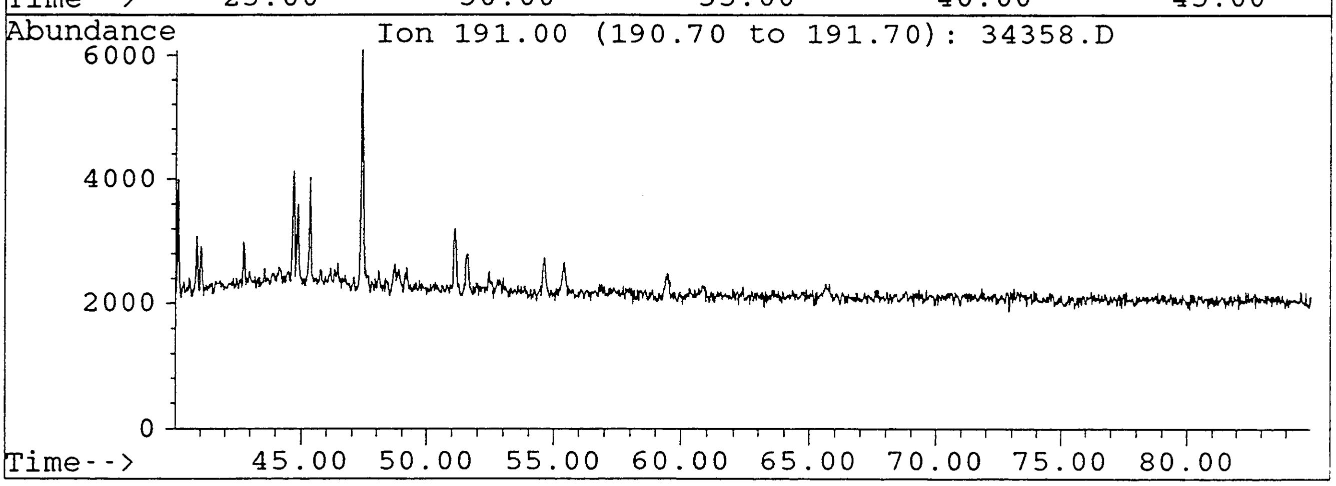
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95









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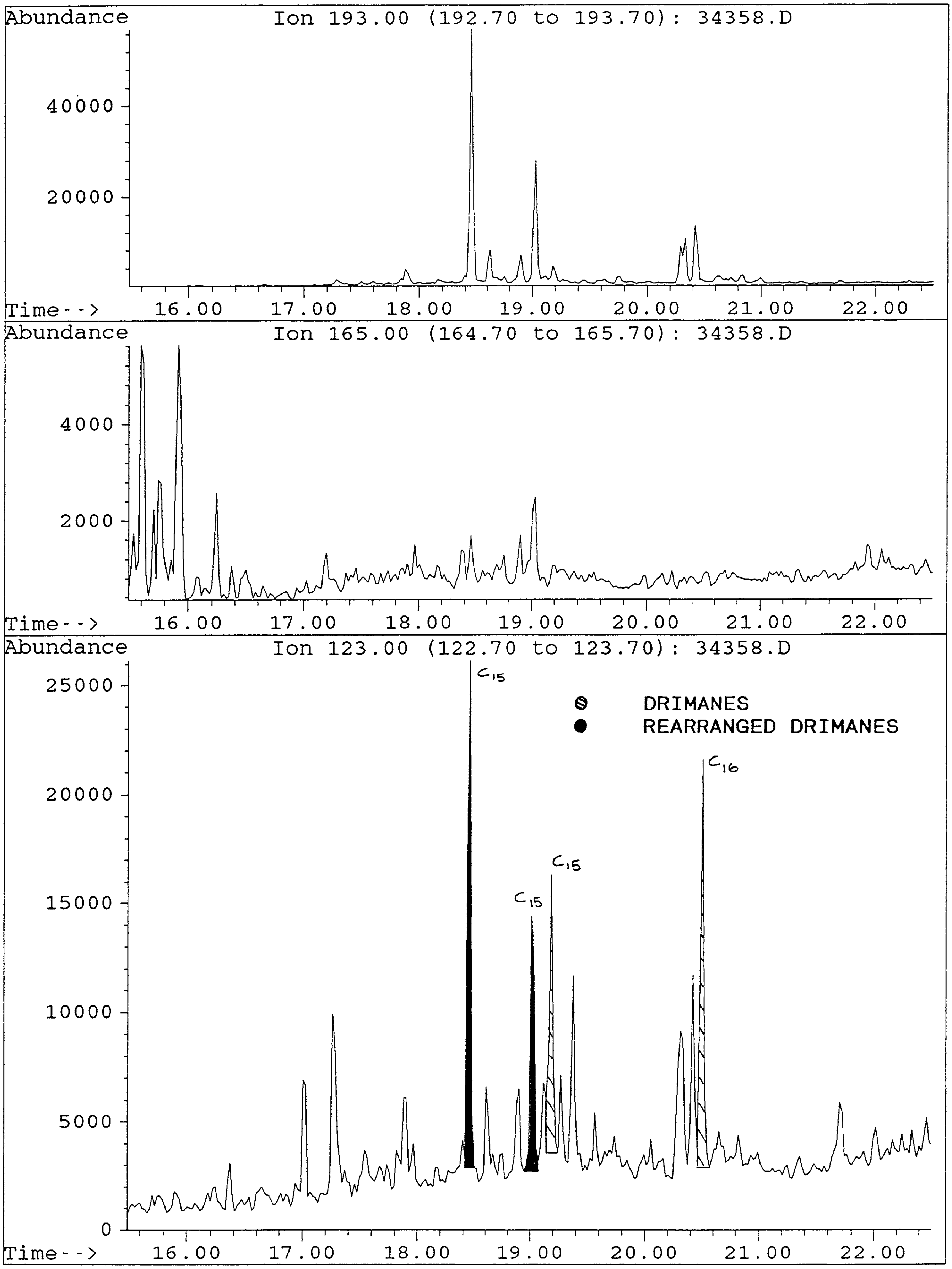
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



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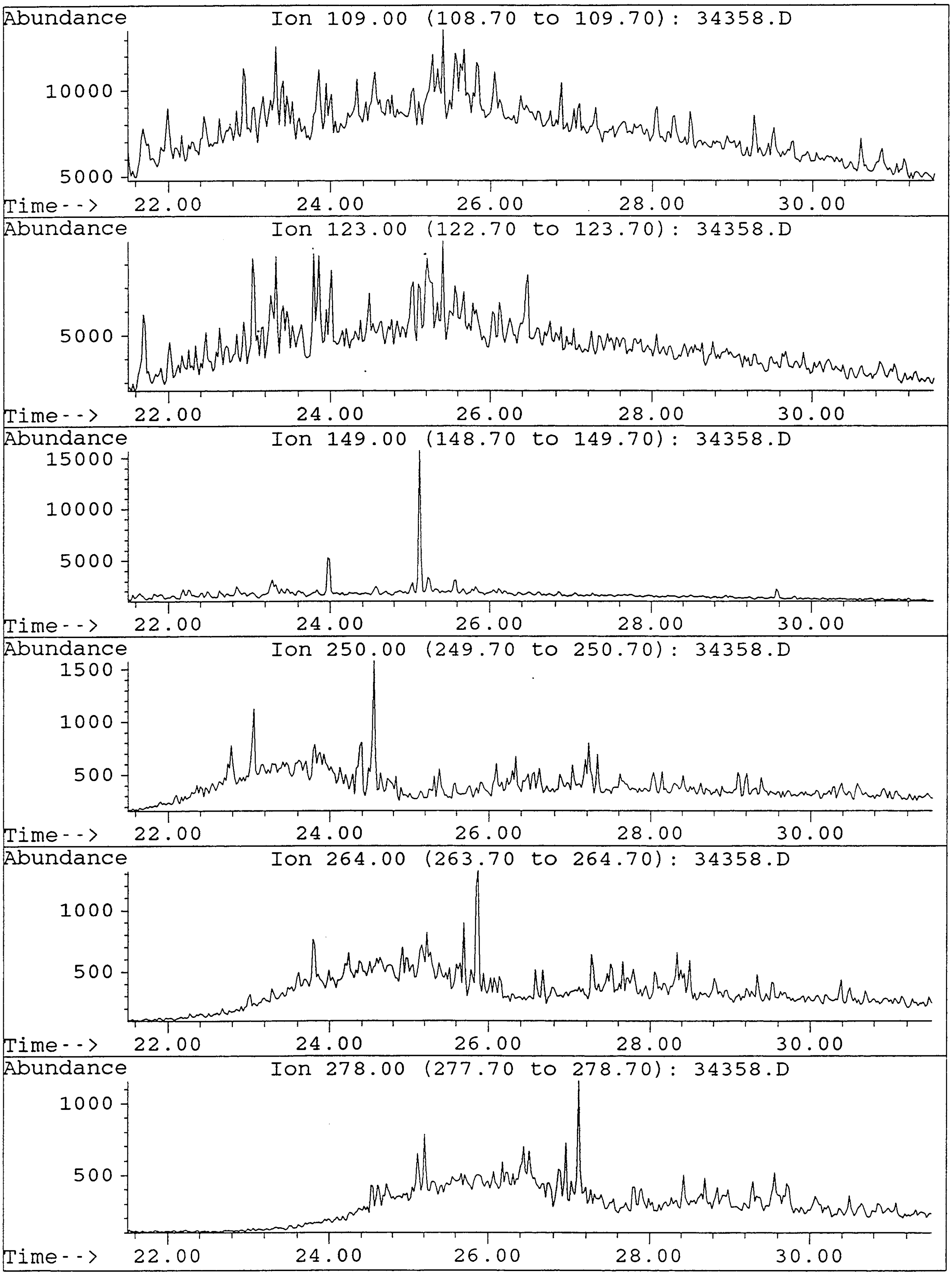
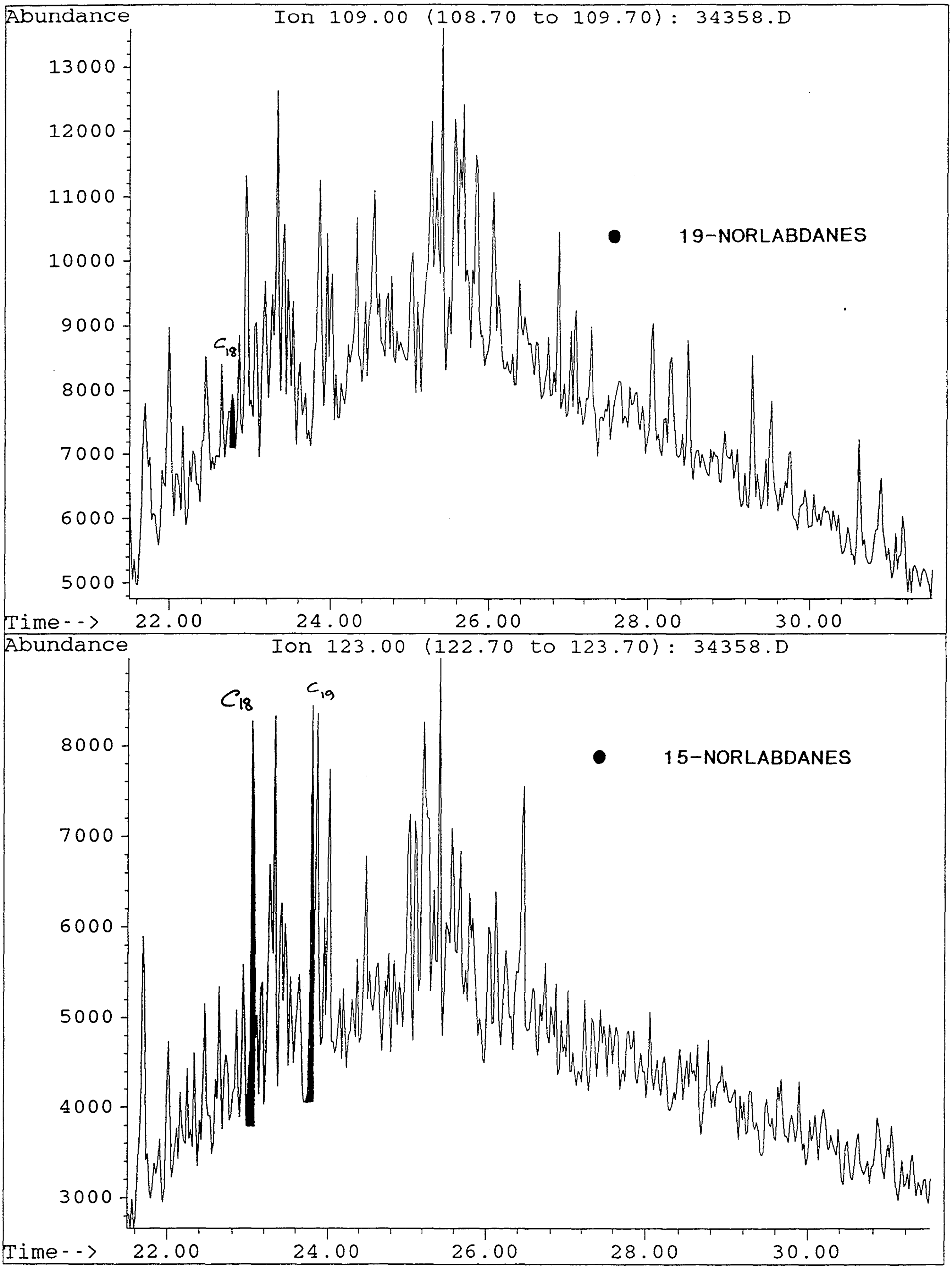
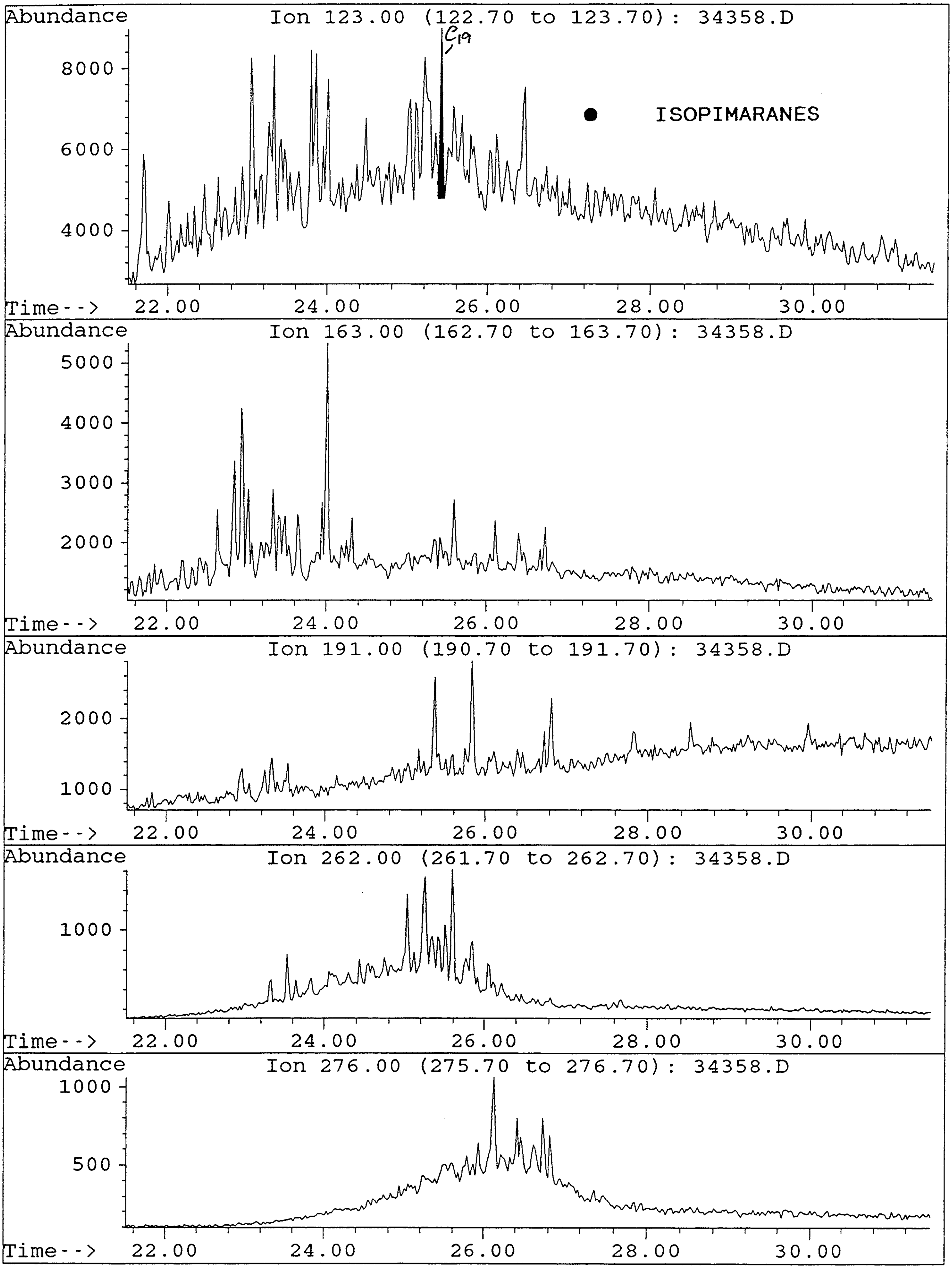
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



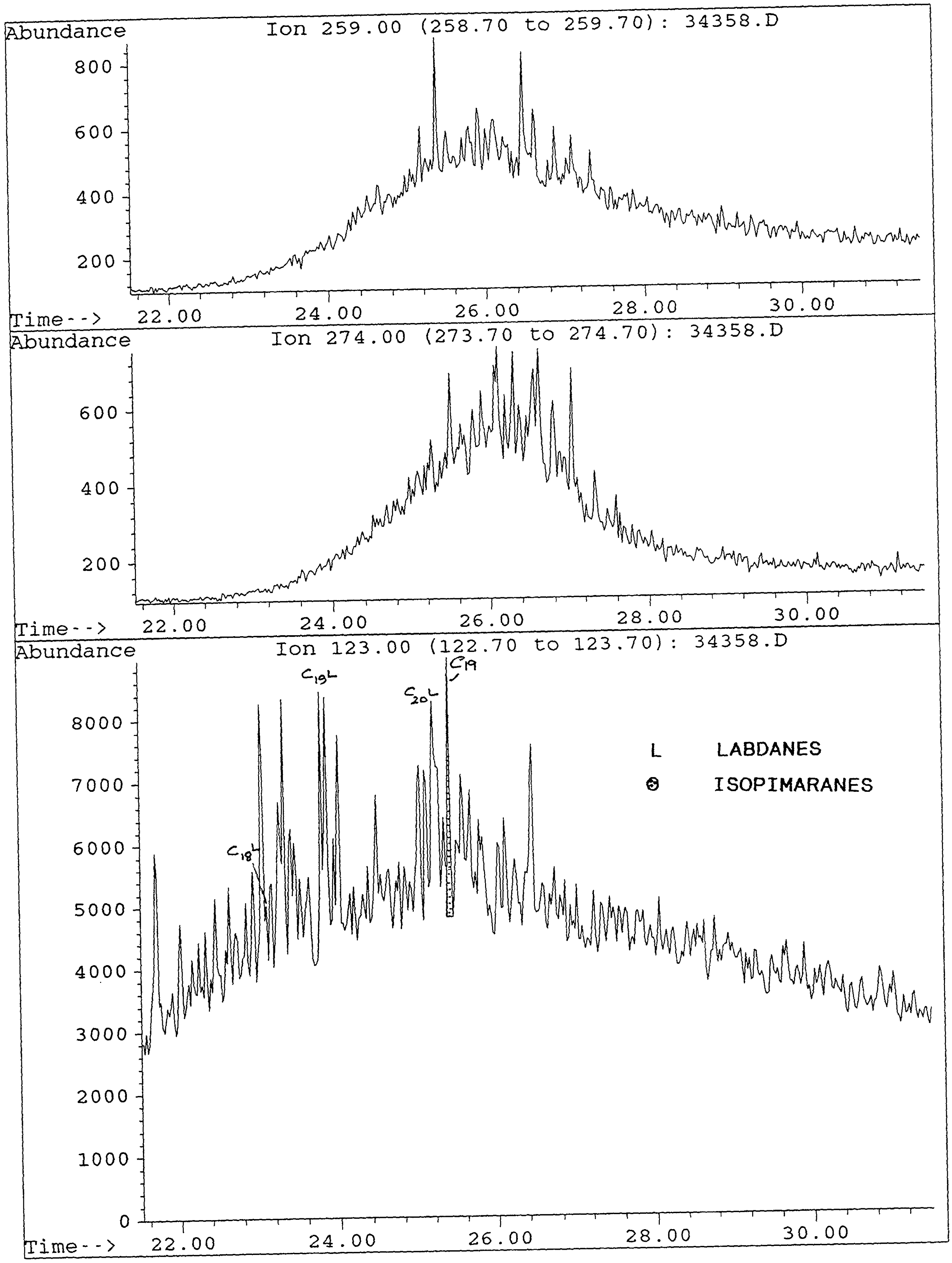
File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



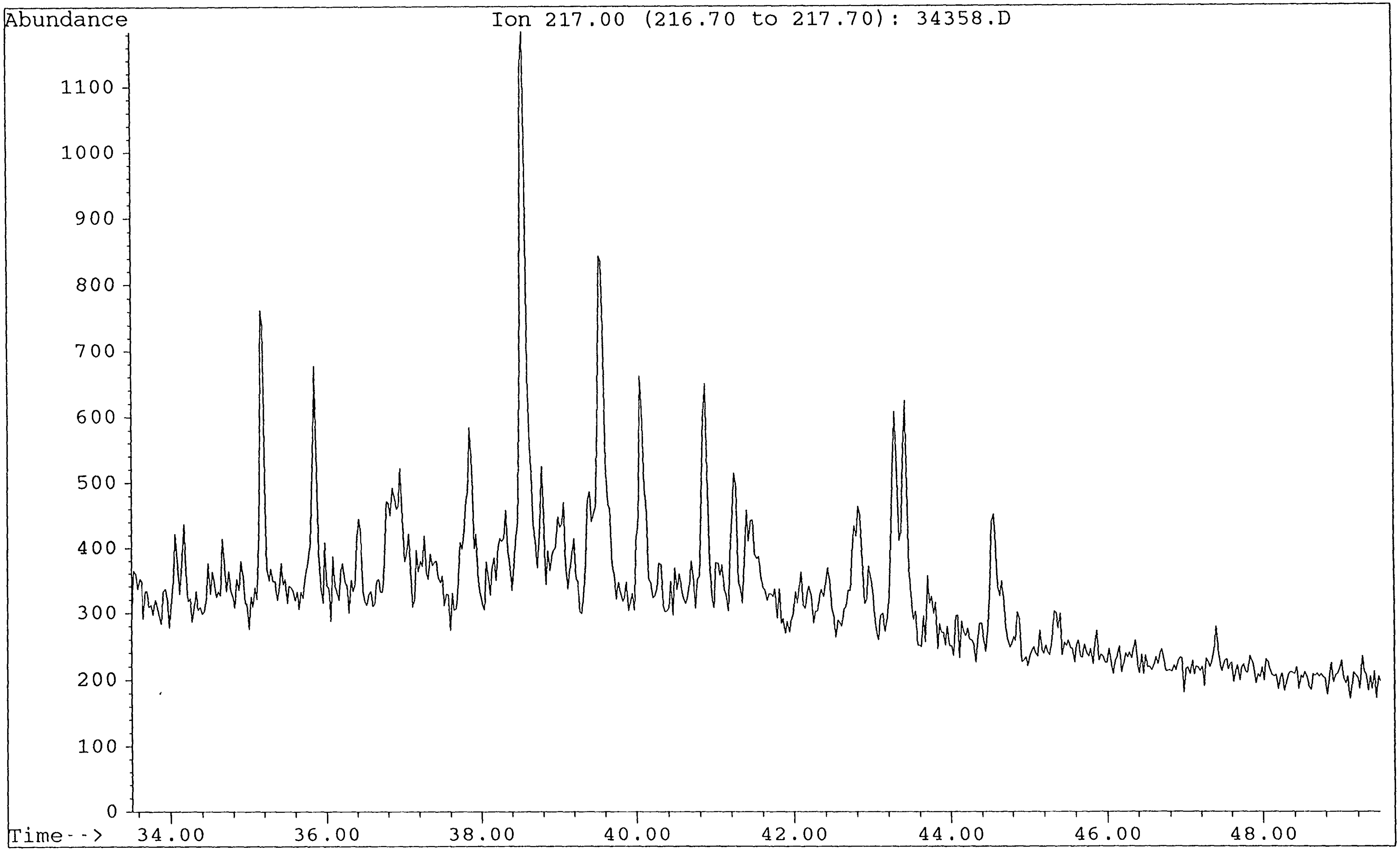
File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



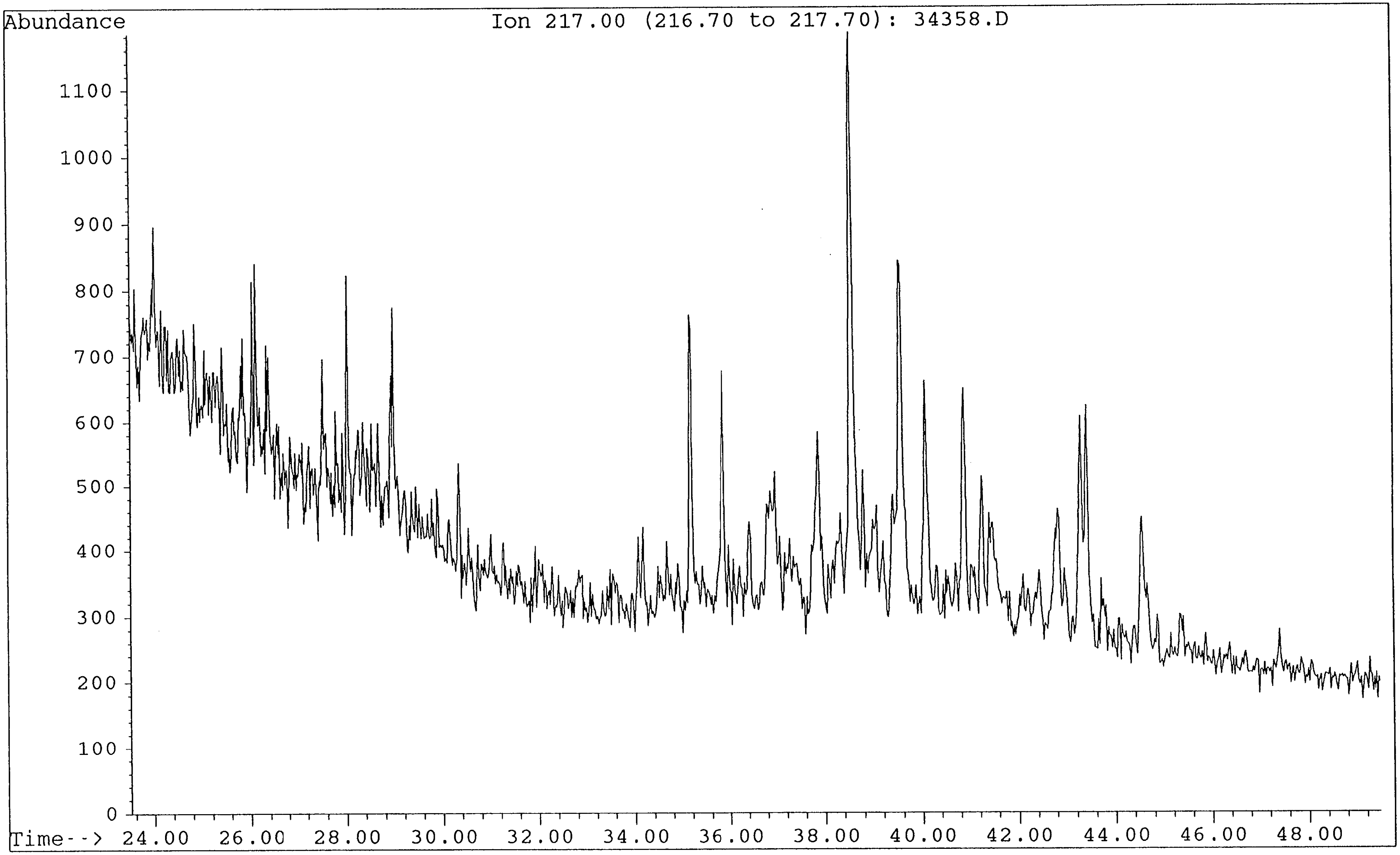
File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



File : 34358.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 10-7-95



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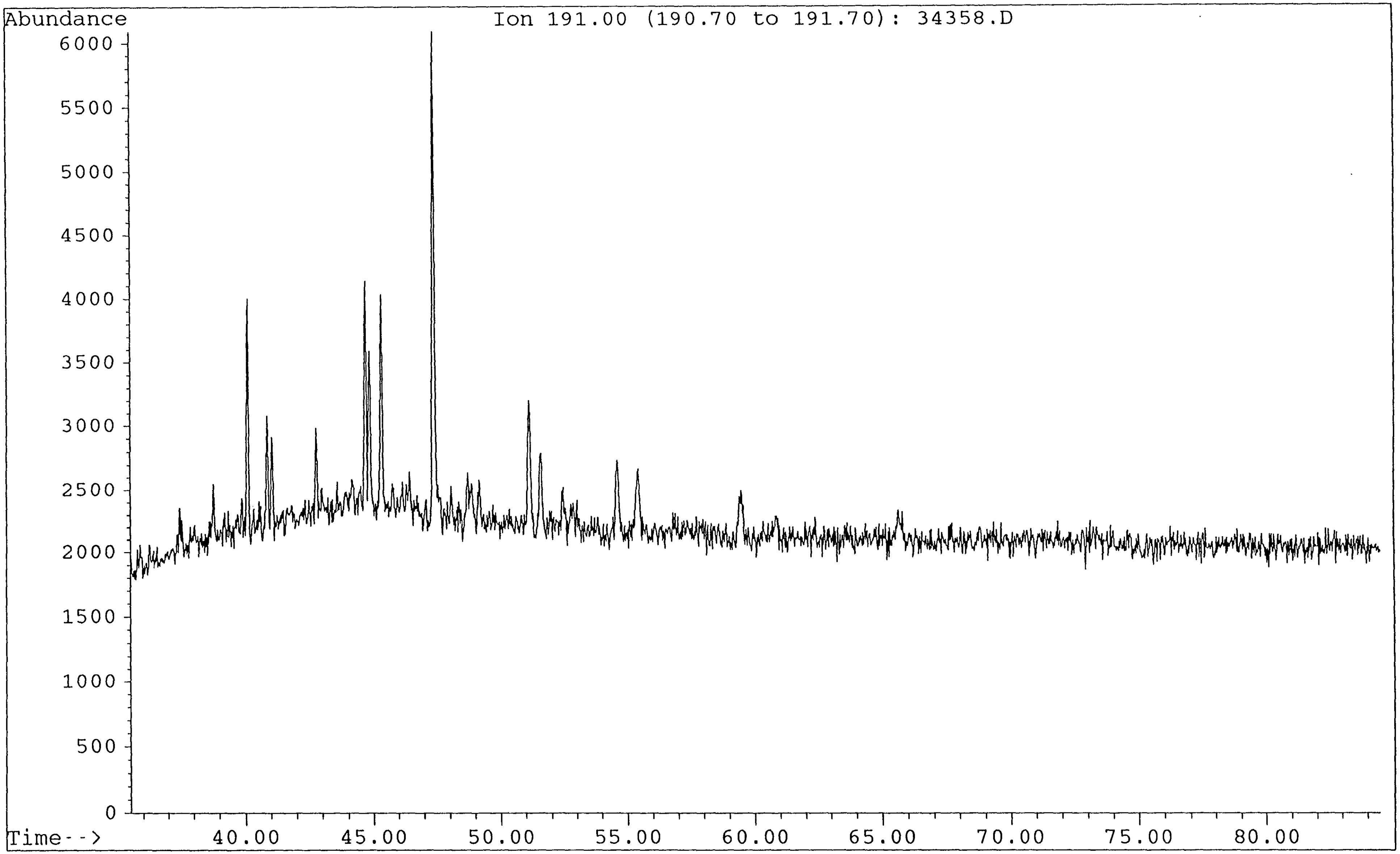
Misc. Info : COL#164. DJ. 10-7-95



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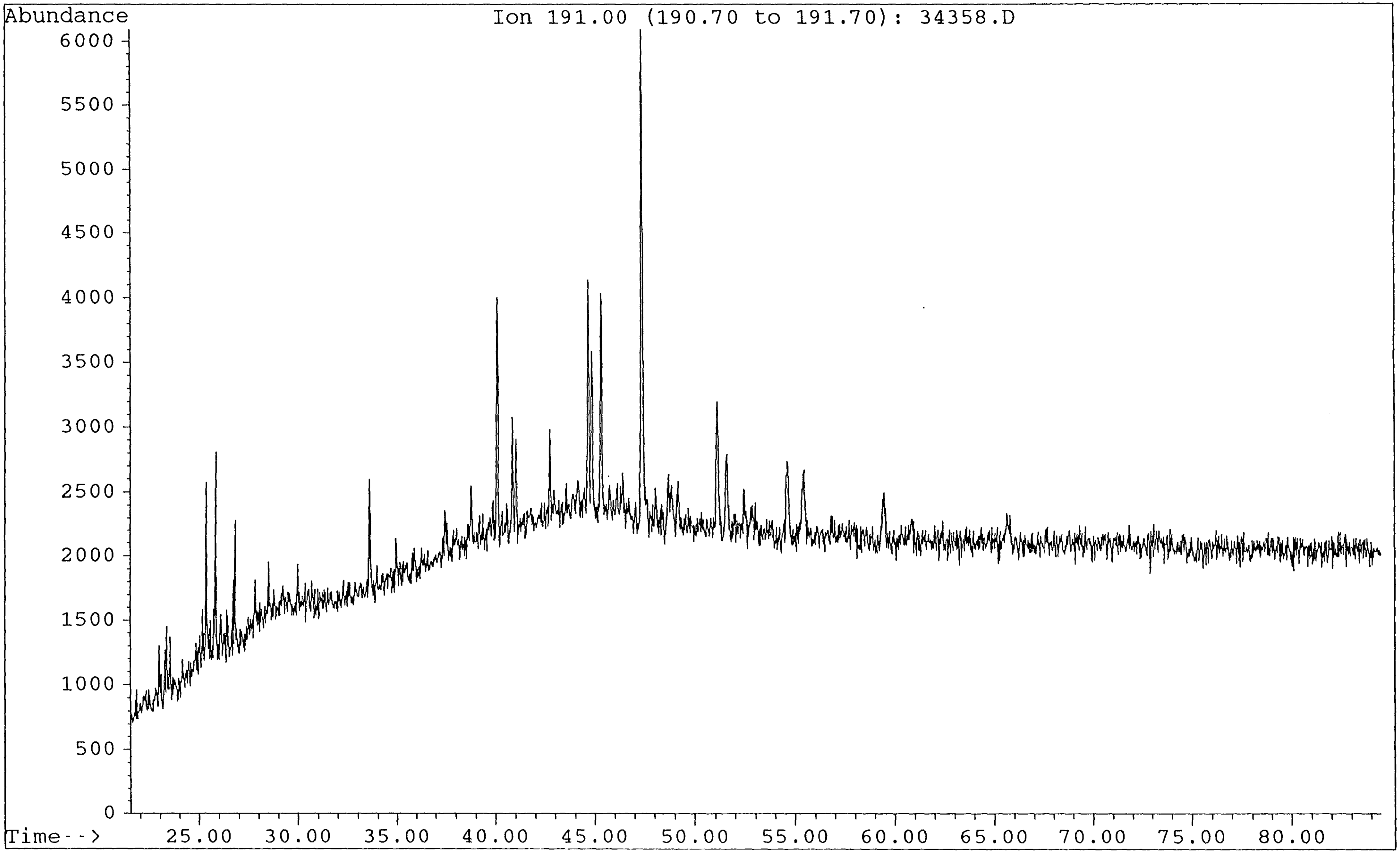
Misc. Info : COL#164. DJ. 10-7-95



SELECTED PARAMETERS FROM GC/MS ANALYSIS

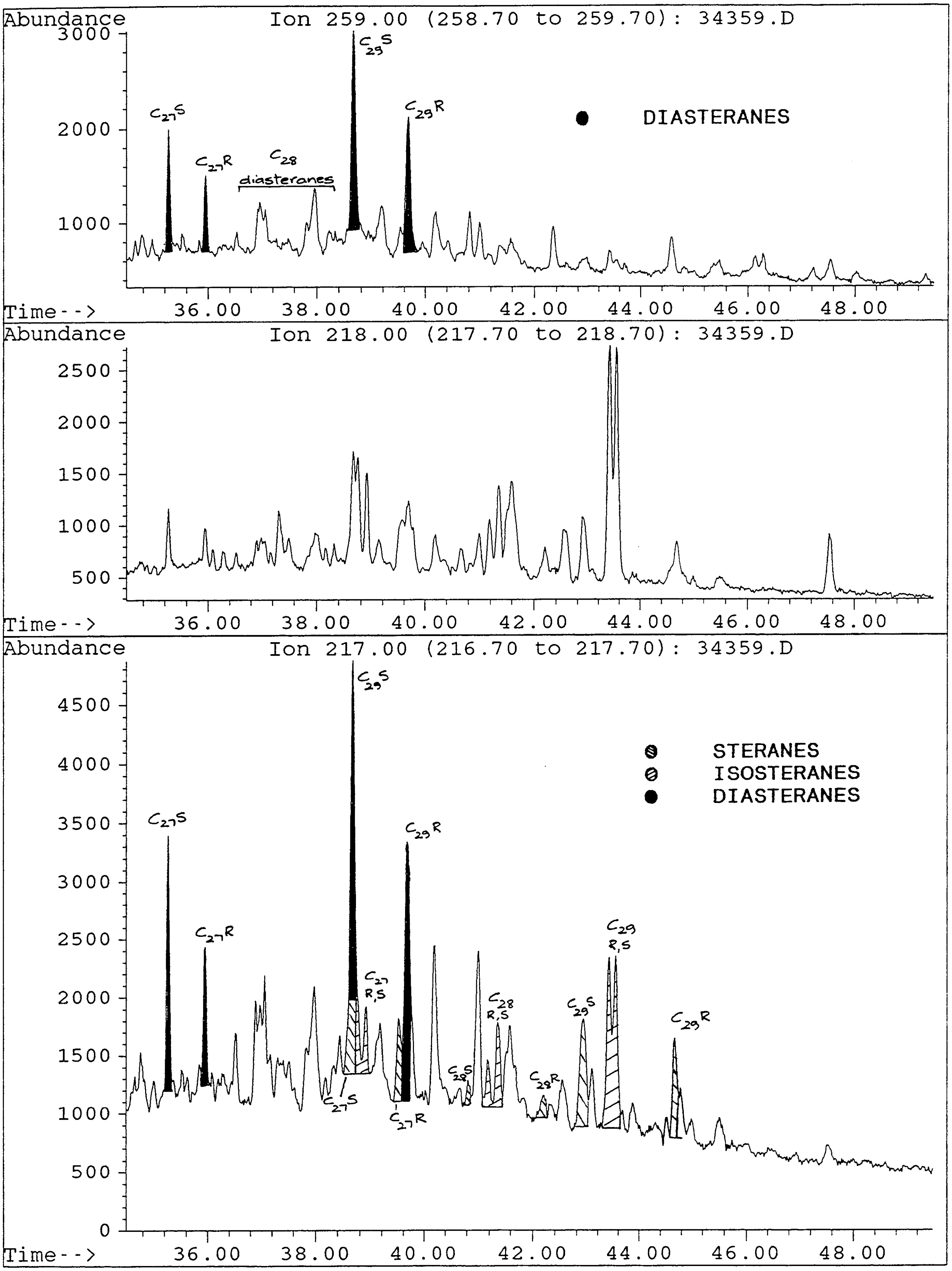
DIGBY 1, 1473.7m, Topped, SWC

	Parameter	Ion(s)	Value
1.	18 α (H)- hopane/17 α (H)-hopane (Ts/Tm)	191	2.53
2.	C30 hopane/C30 moretane	191	8.69
3.	C31 22S hopane/C31 22R hopane	191	1.24
4.	C32 22S hopane/C32 22R hopane	191	1.56
5.	C29 20S $\alpha\alpha\alpha$ sterane/C29 20R $\alpha\alpha\alpha$ sterane	217	1.11
6.	C29 $\alpha\alpha\alpha$ steranes (20S / 20S+20R)	217	0.53
7.	C29 $\alpha\beta\beta$ steranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.61
8.	C27/C29 diasteranes	259	0.58
9.	C27/C29 steranes	217	0.83
10.	18 α (H)-oleanane/C30 hopane	191	nd
11.	C29 diasteranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	1.22
12.	C30 (hopane + moretane) / C29 (steranes + diasteranes)	191/217	1.63
13.	C15 drimane/C16 homodrimane	123	nd
14.	Rearranged drimanes/normal drimanes	123	nd

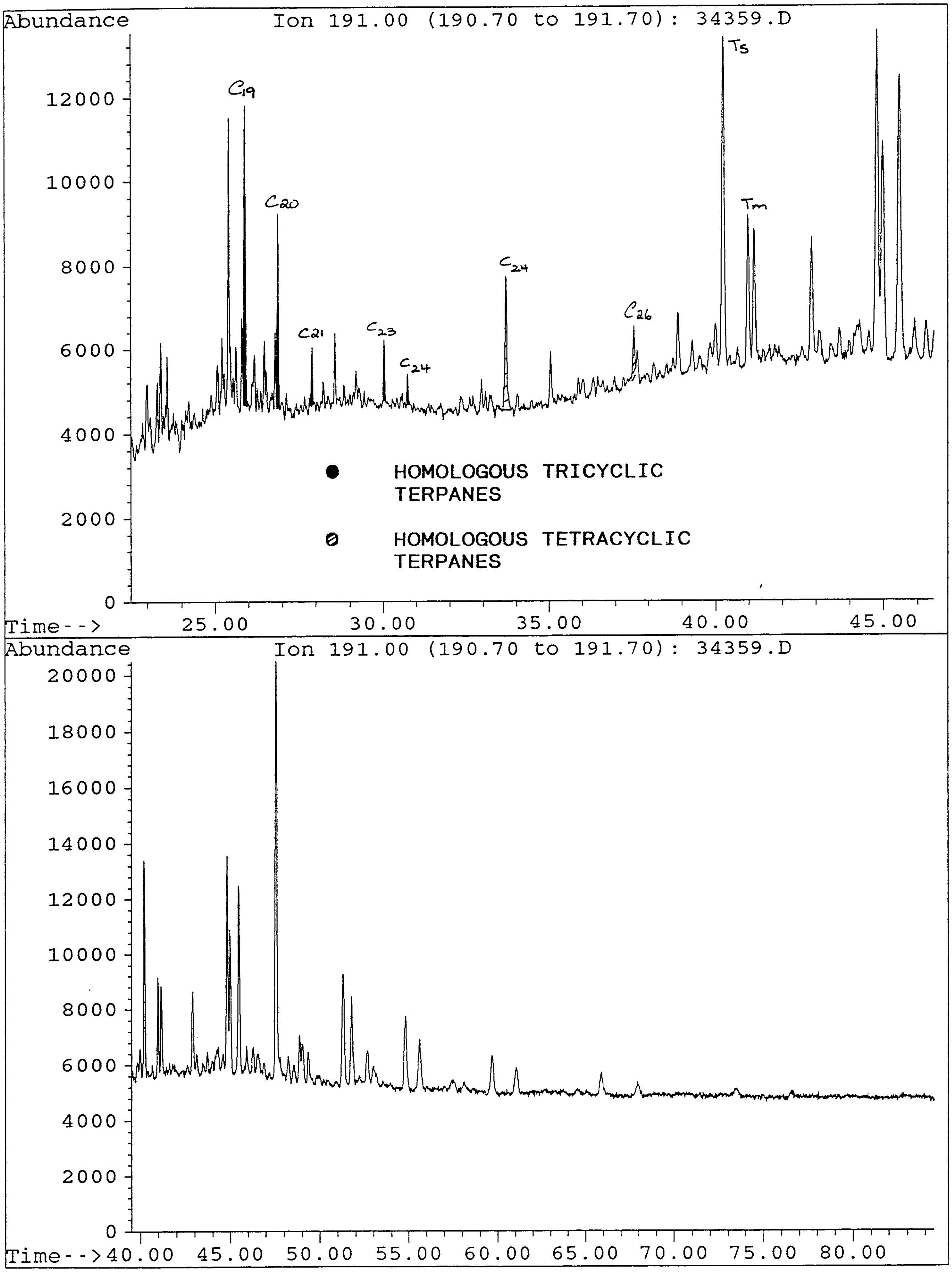
nd = not detectable

File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95

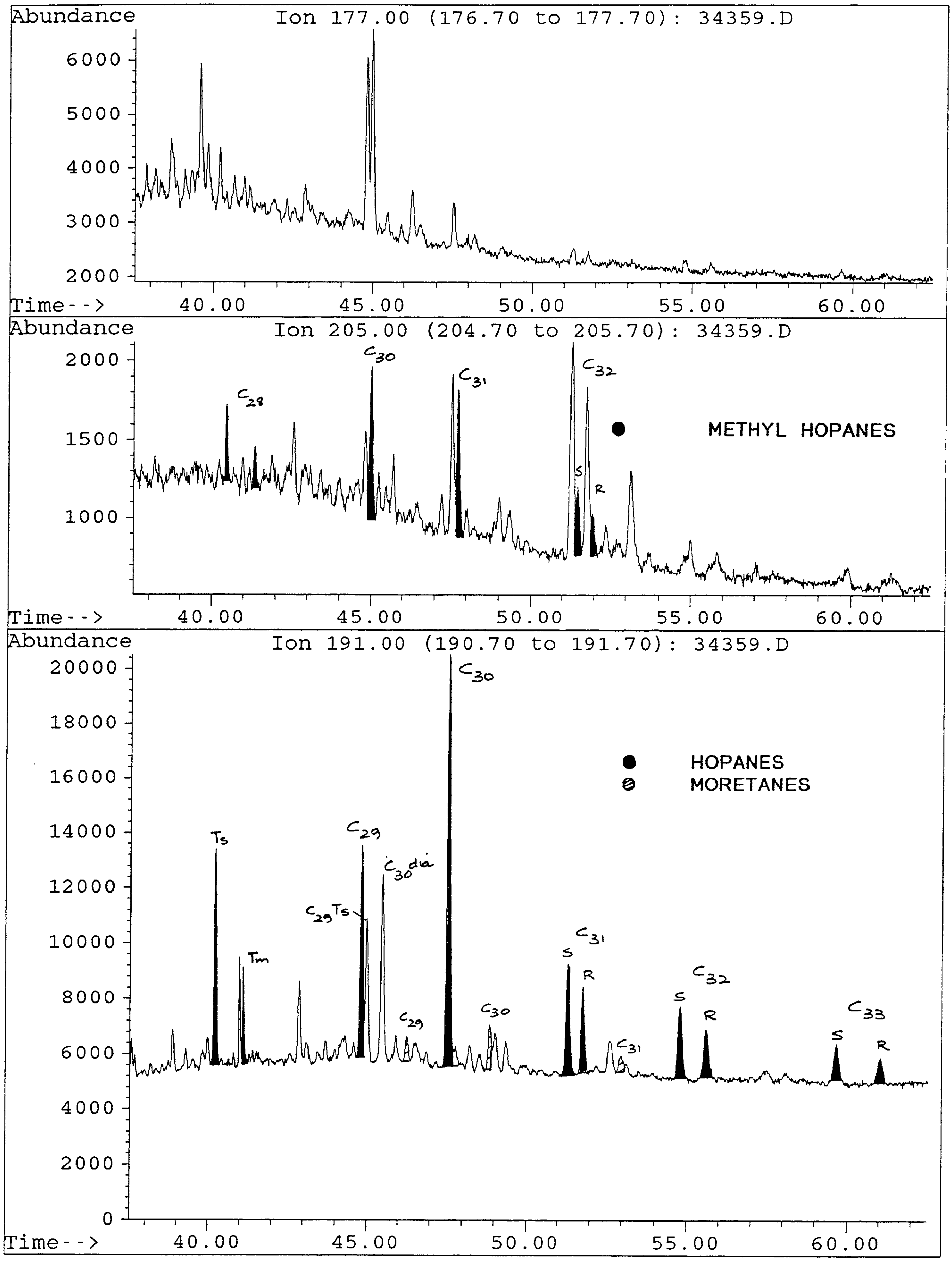
FIGURE 6-1T



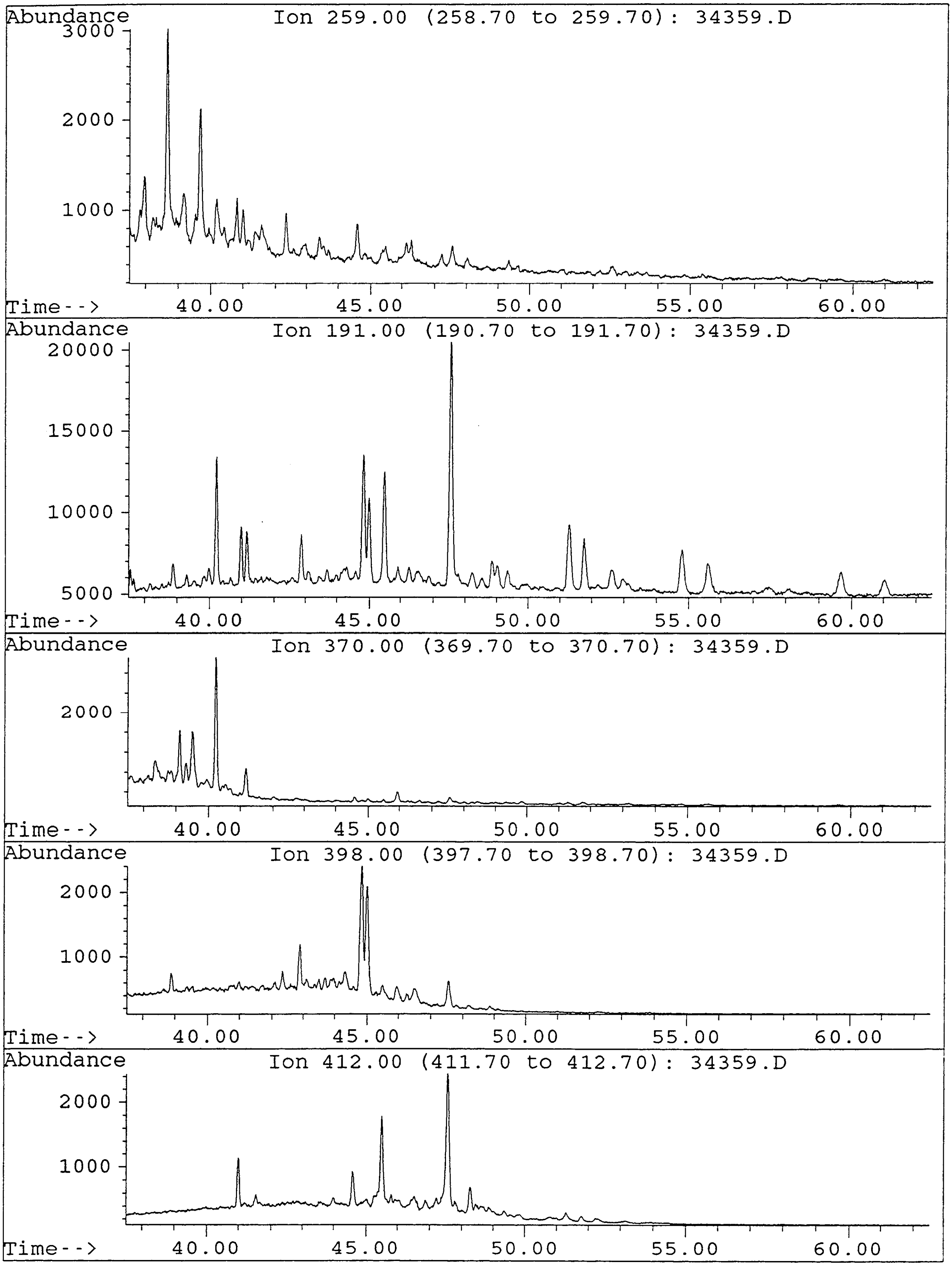
File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95



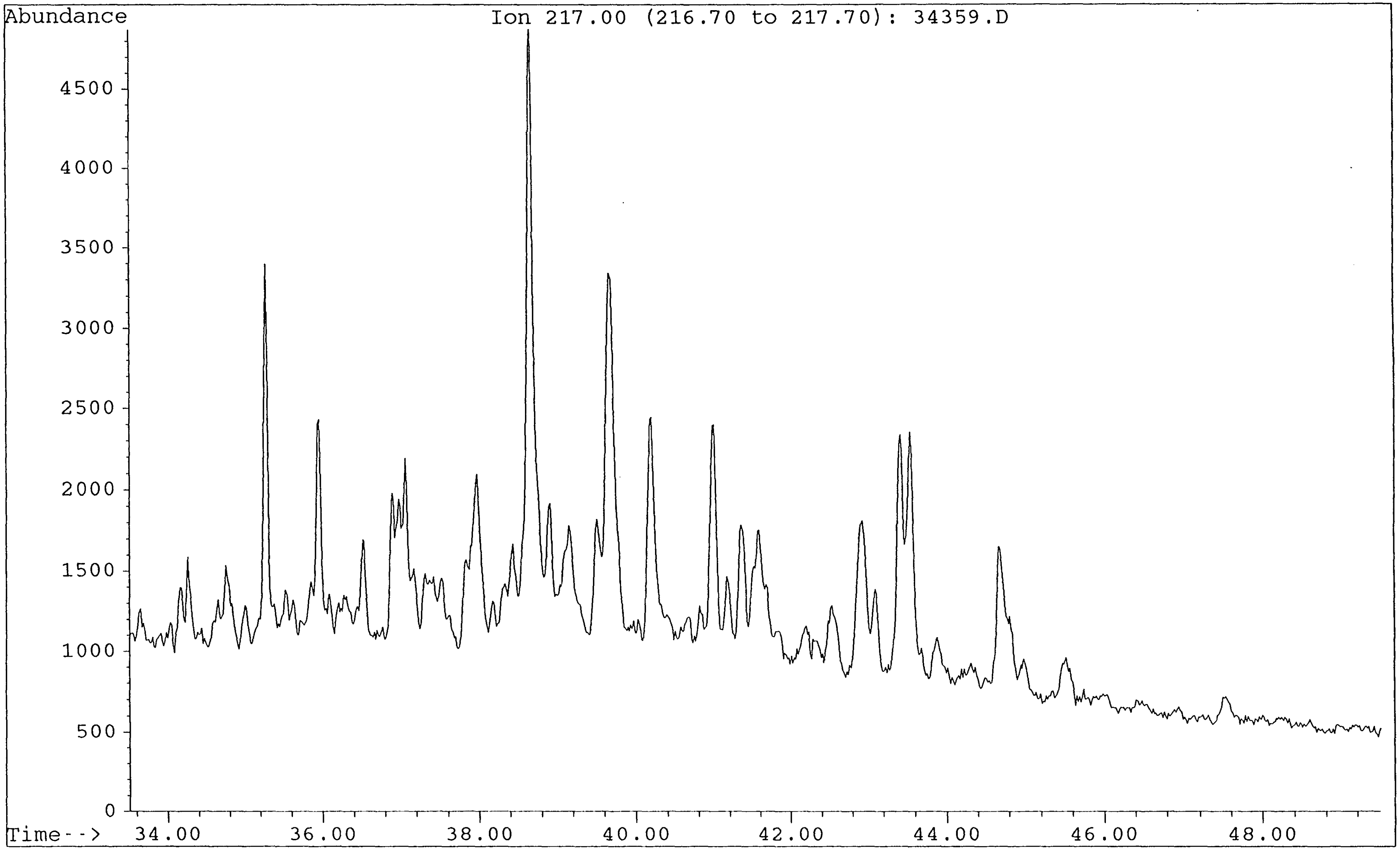
File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95



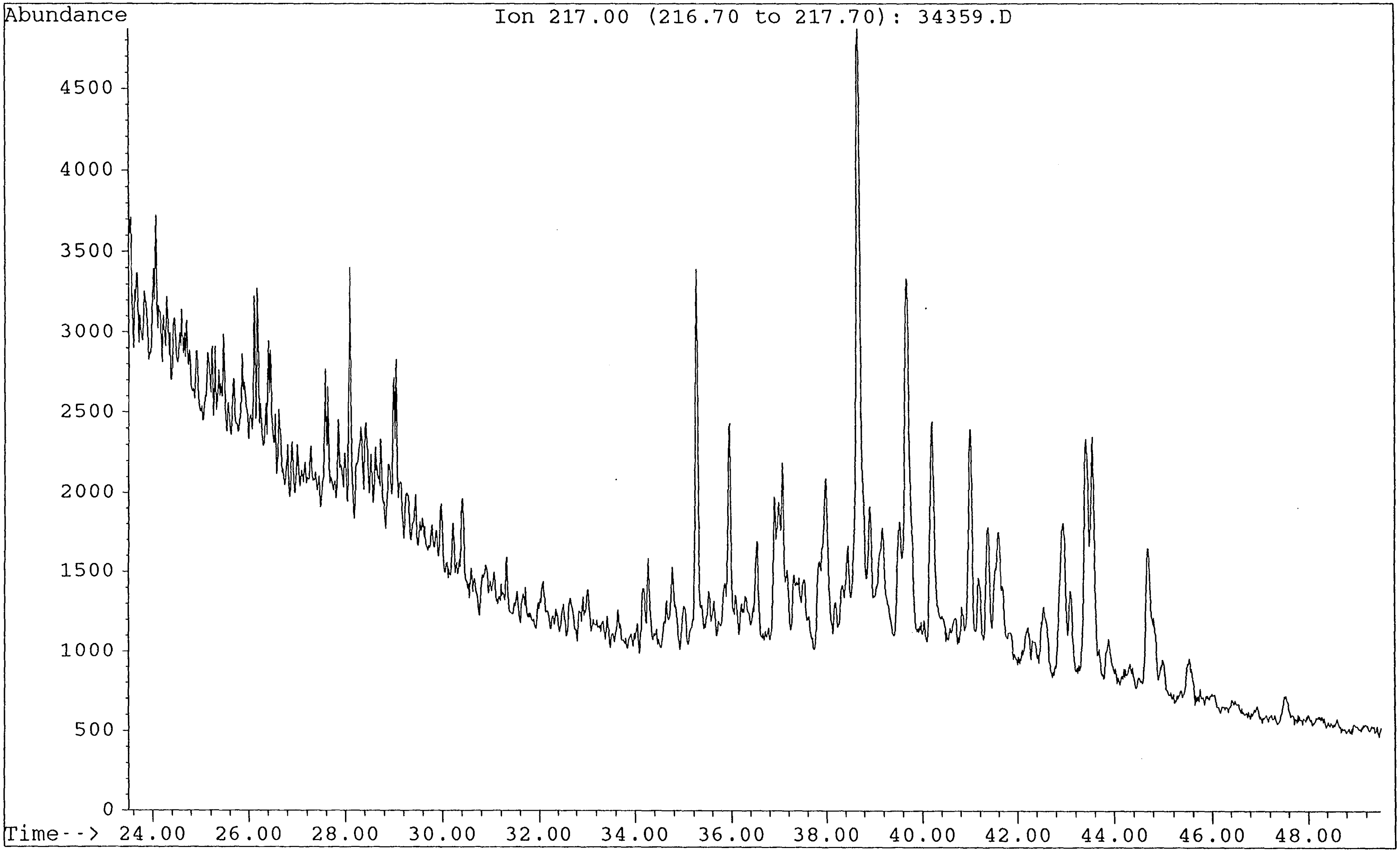
File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95



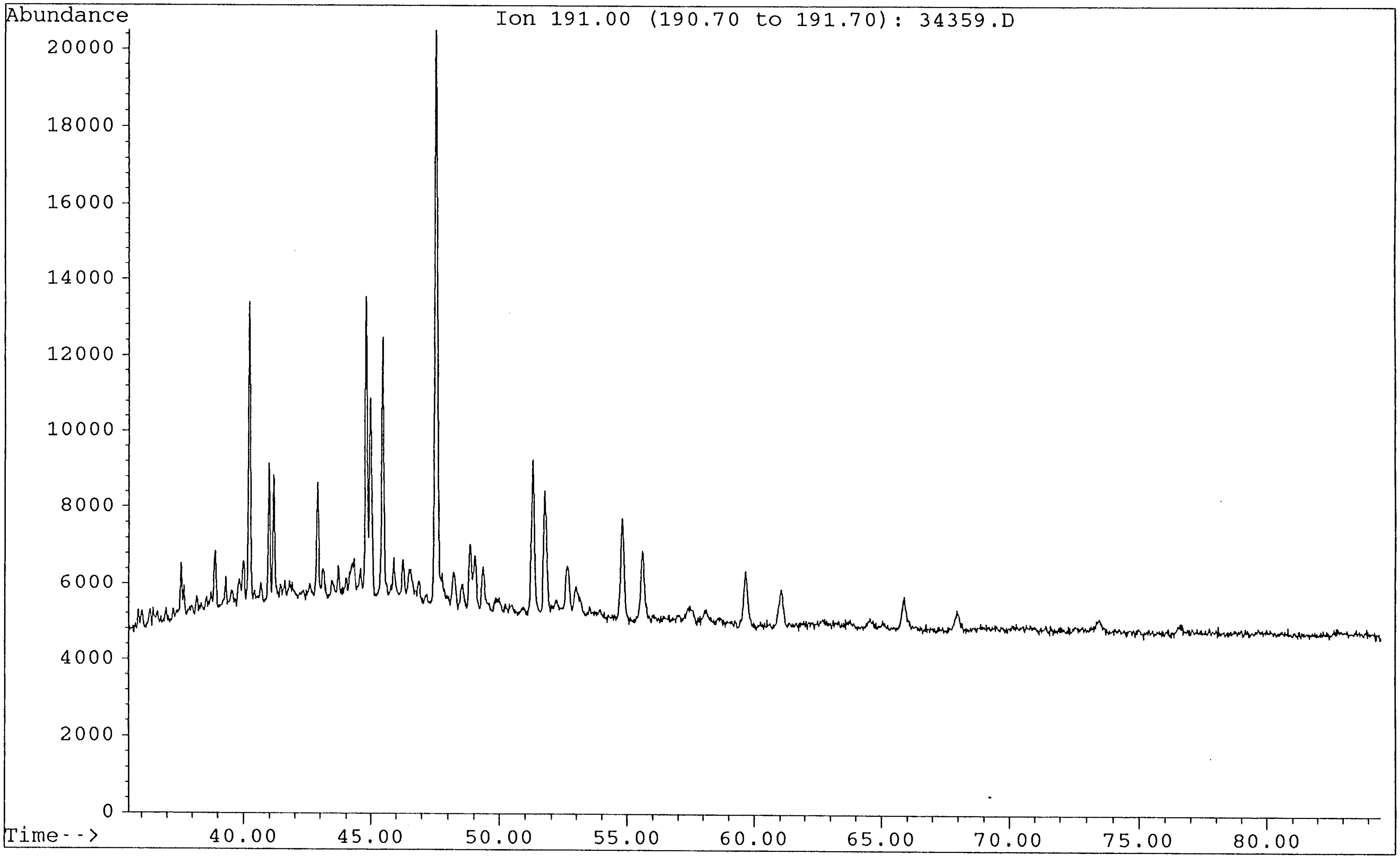
File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95



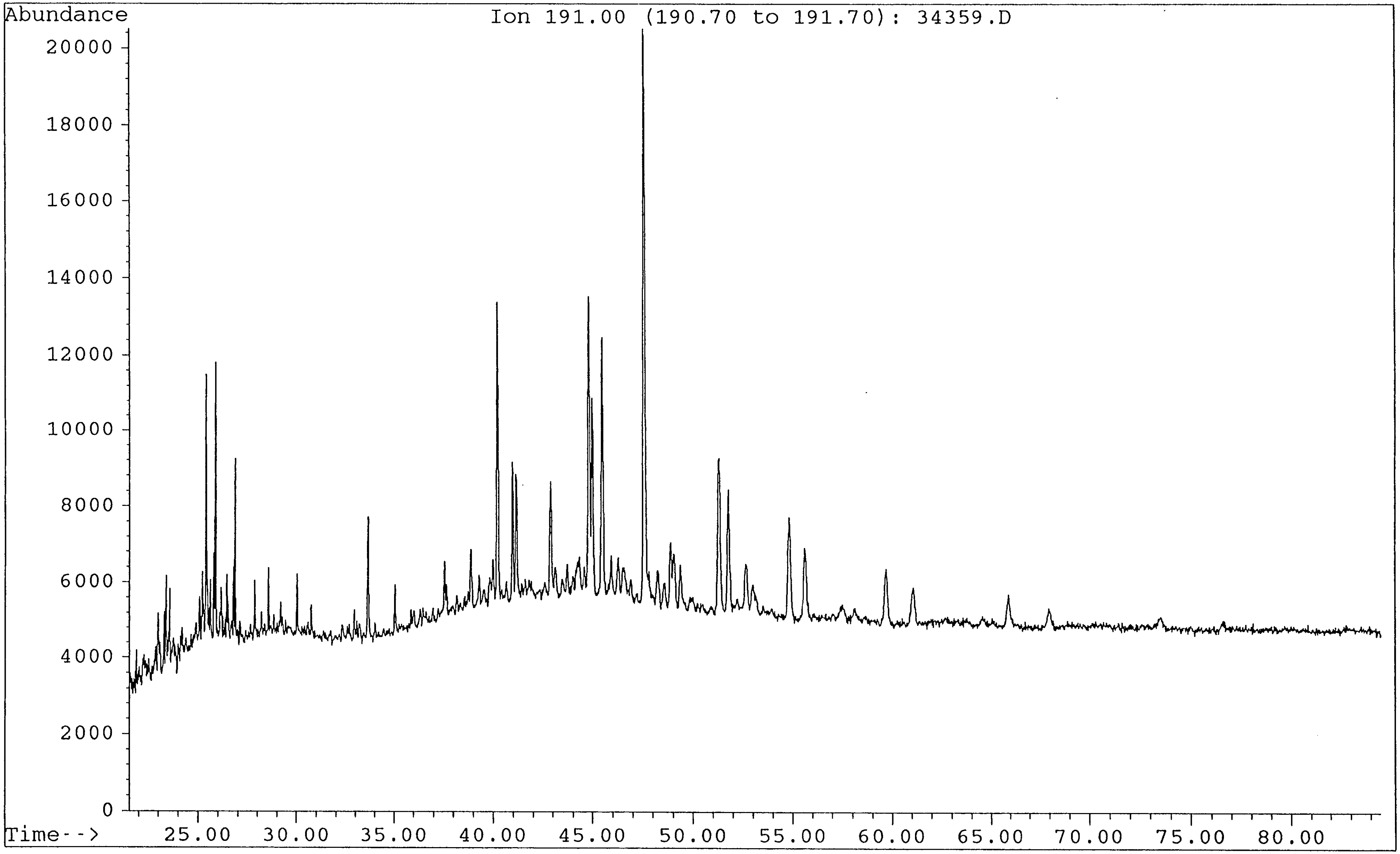
File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95



File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95

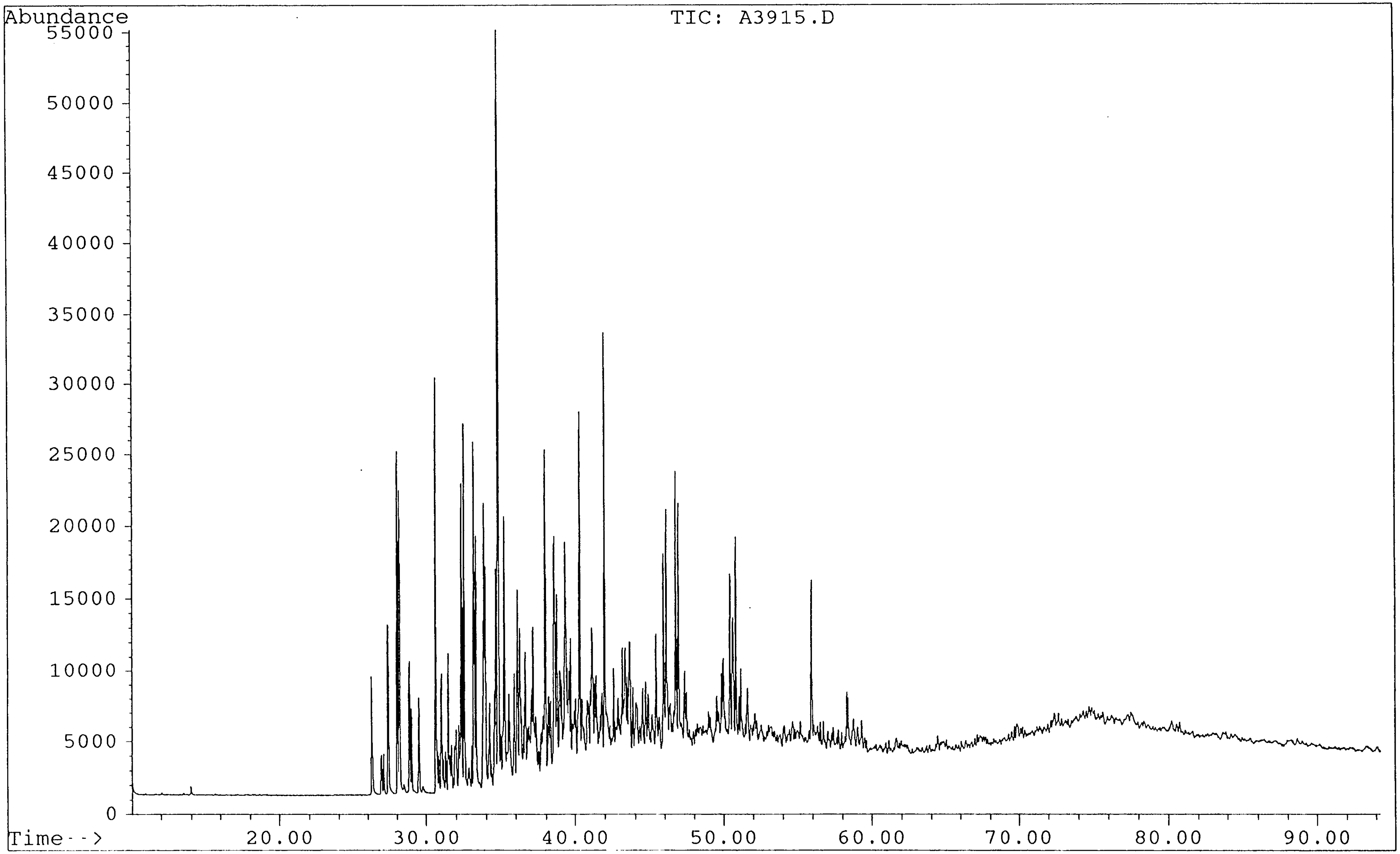


File : 34359.D
Sample : DIGBY-1 1473.7m B/C
Misc. Info : COL#164. DJ. 11-7-95

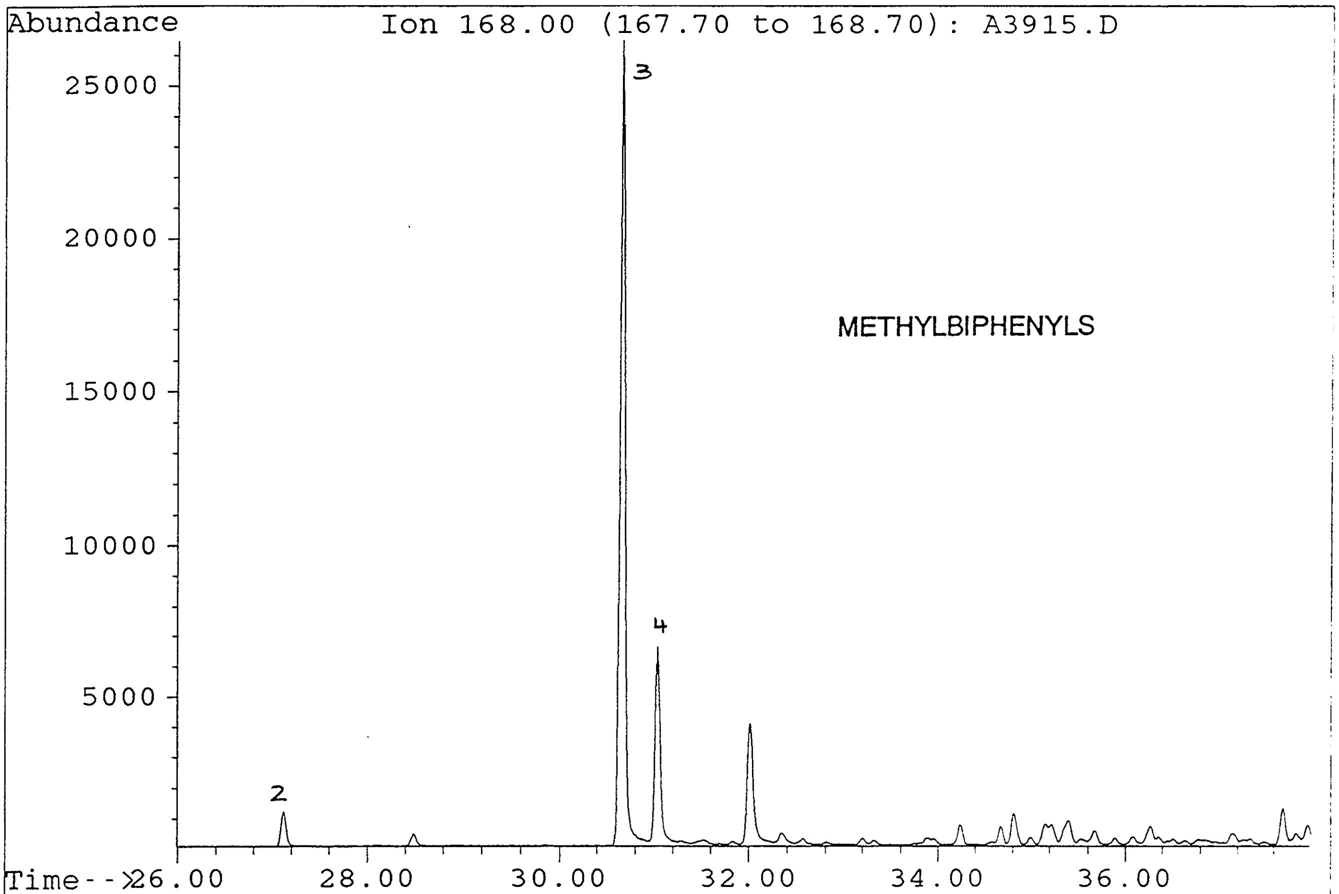


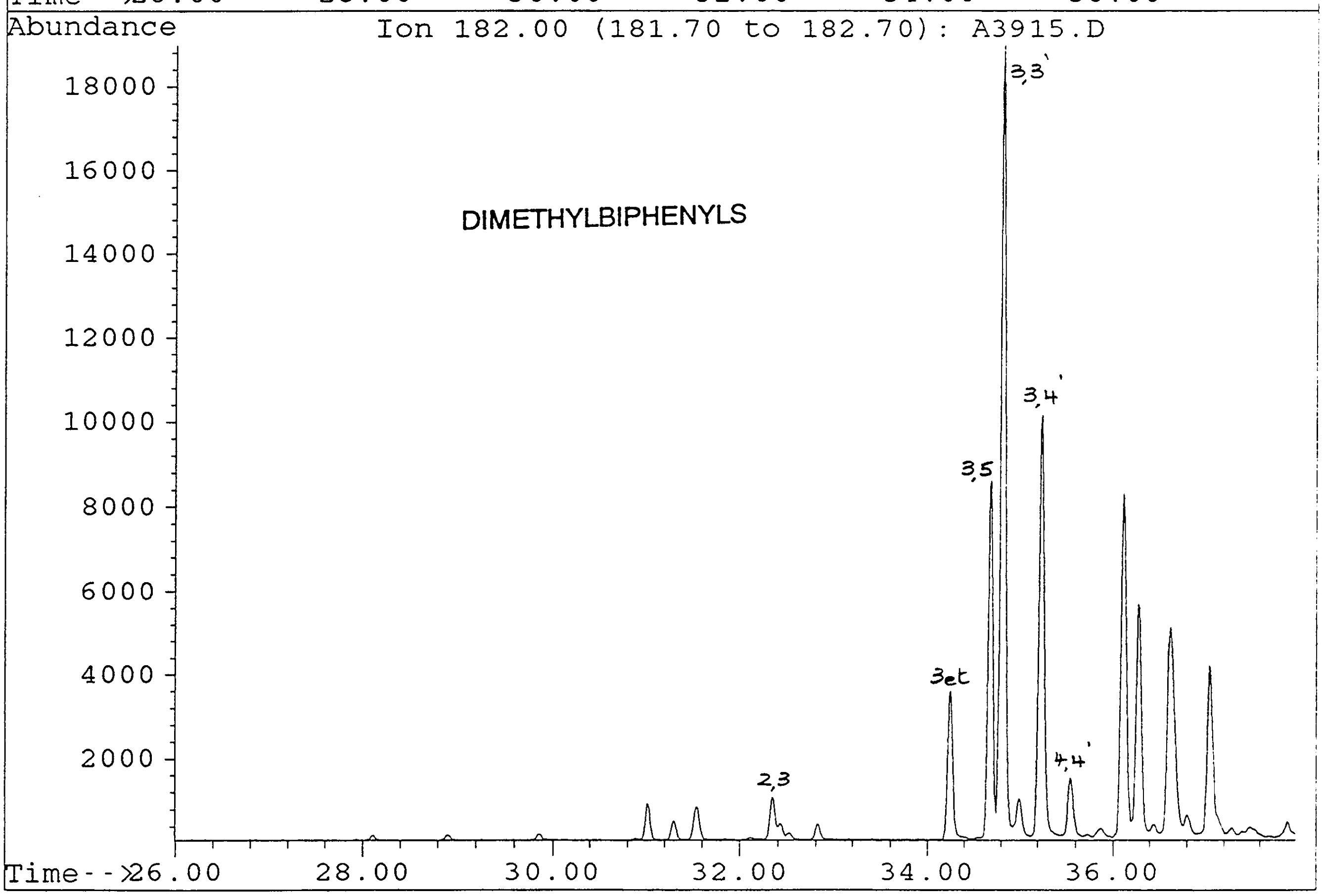
File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.

FIGURE 8-1



File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.





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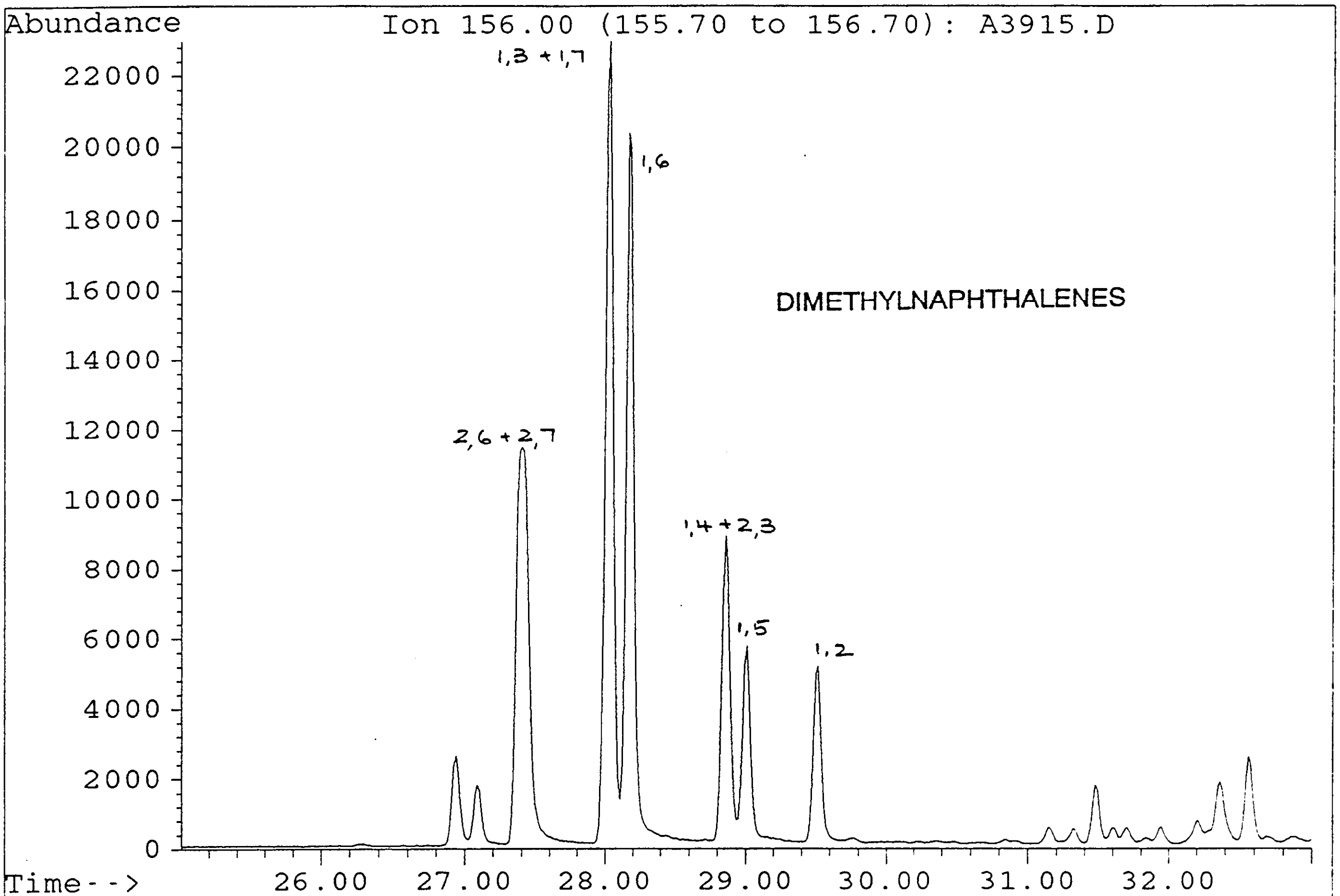
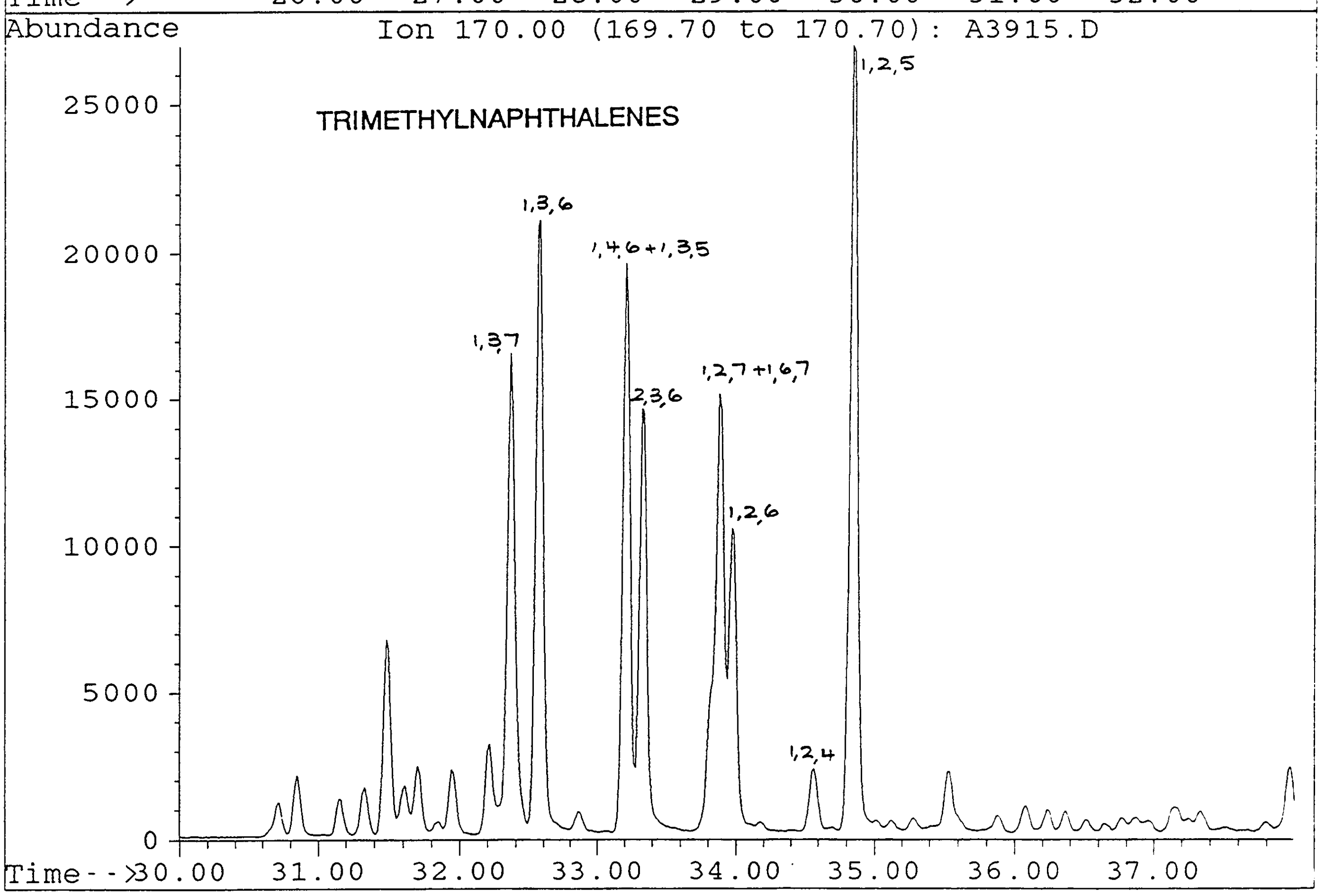
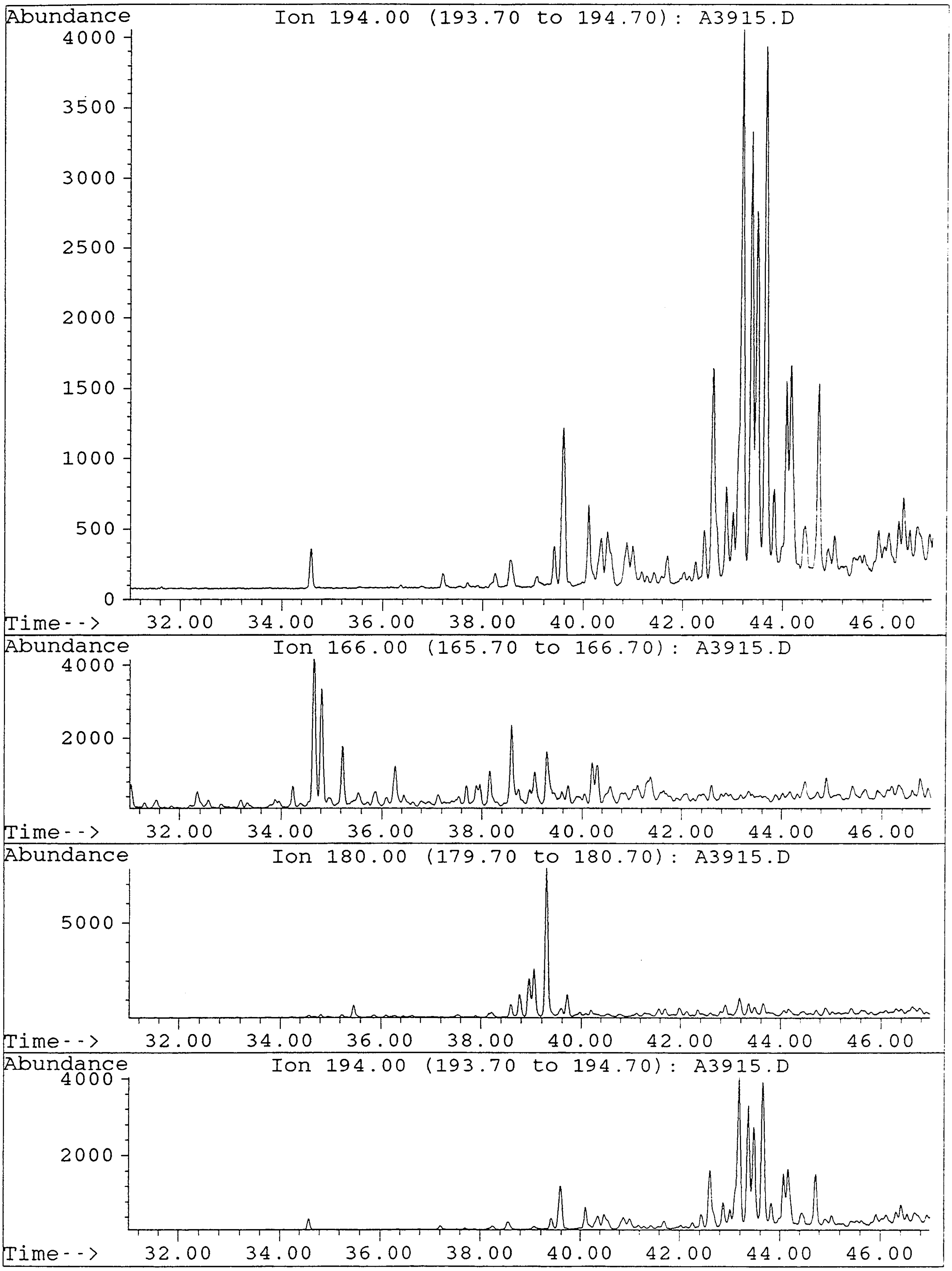
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.



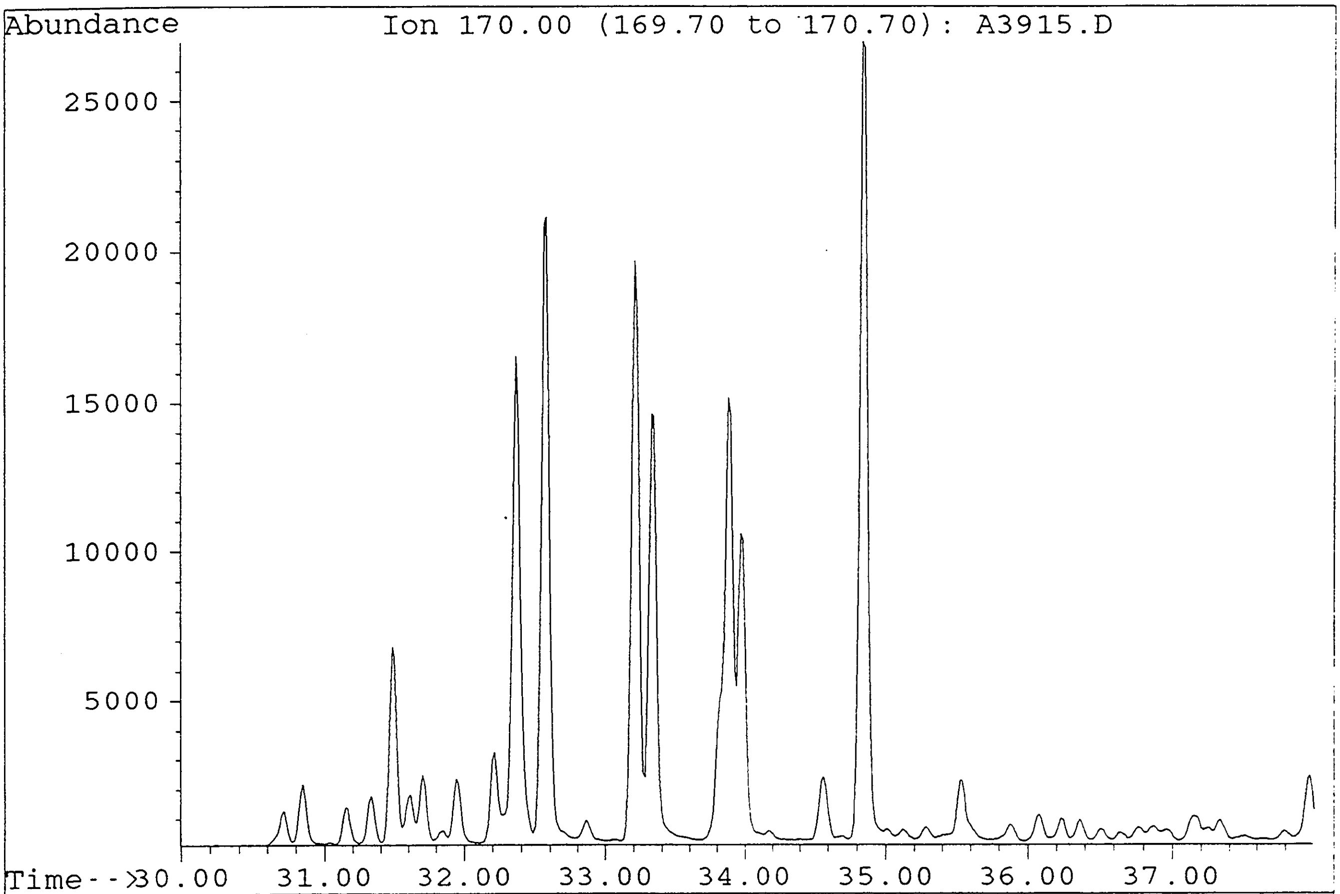


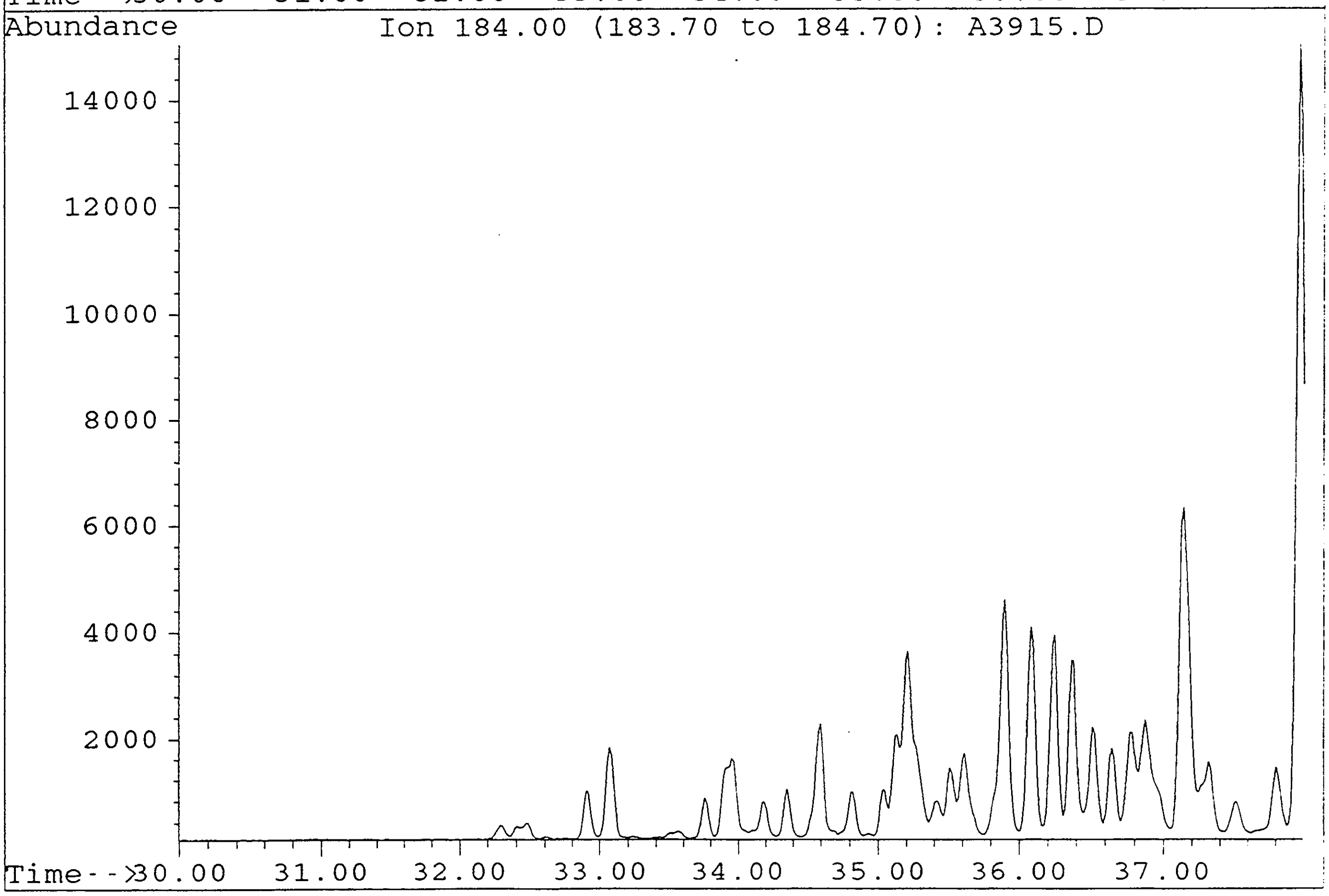
File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.

FLUORENES

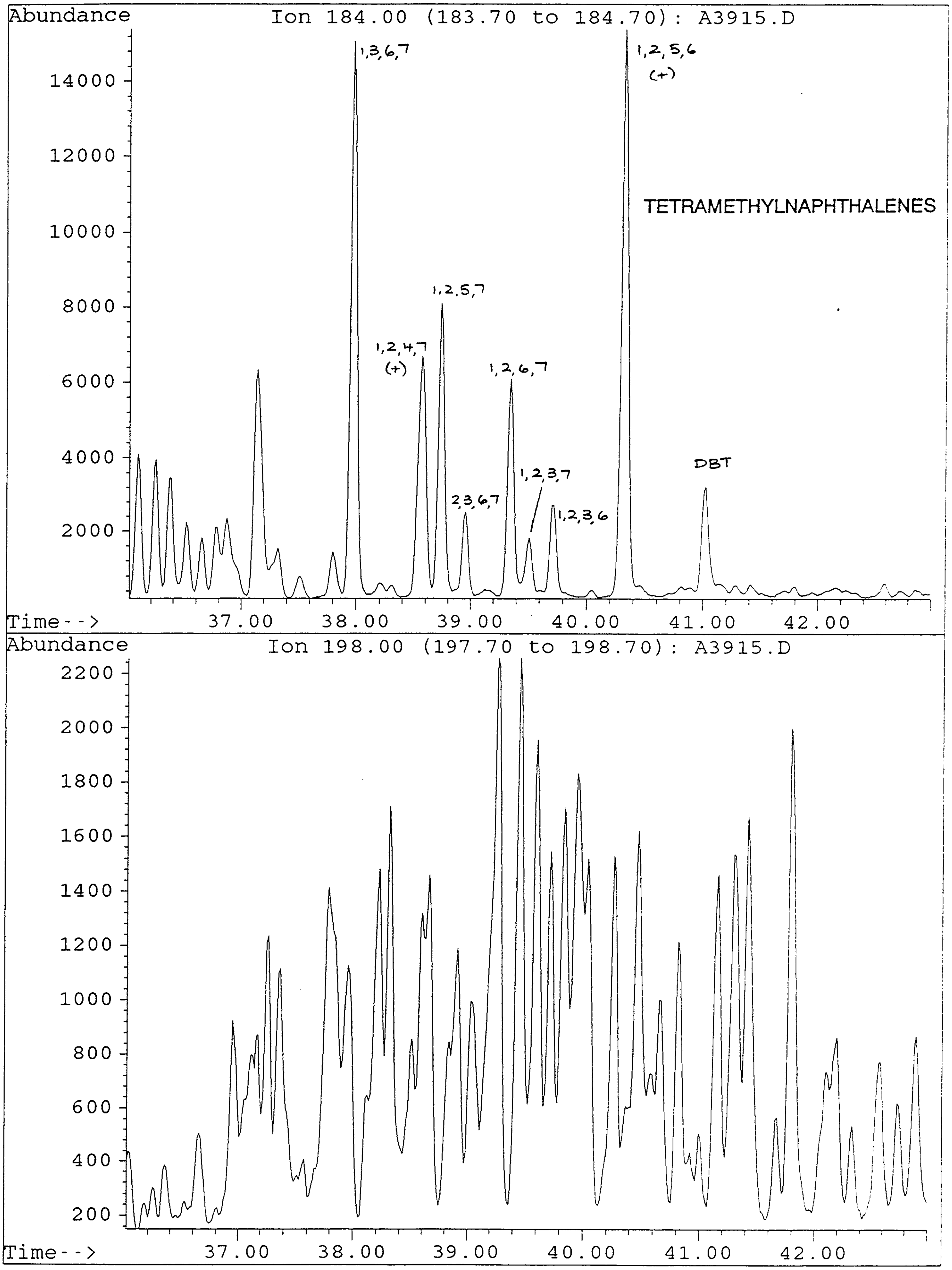


File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.

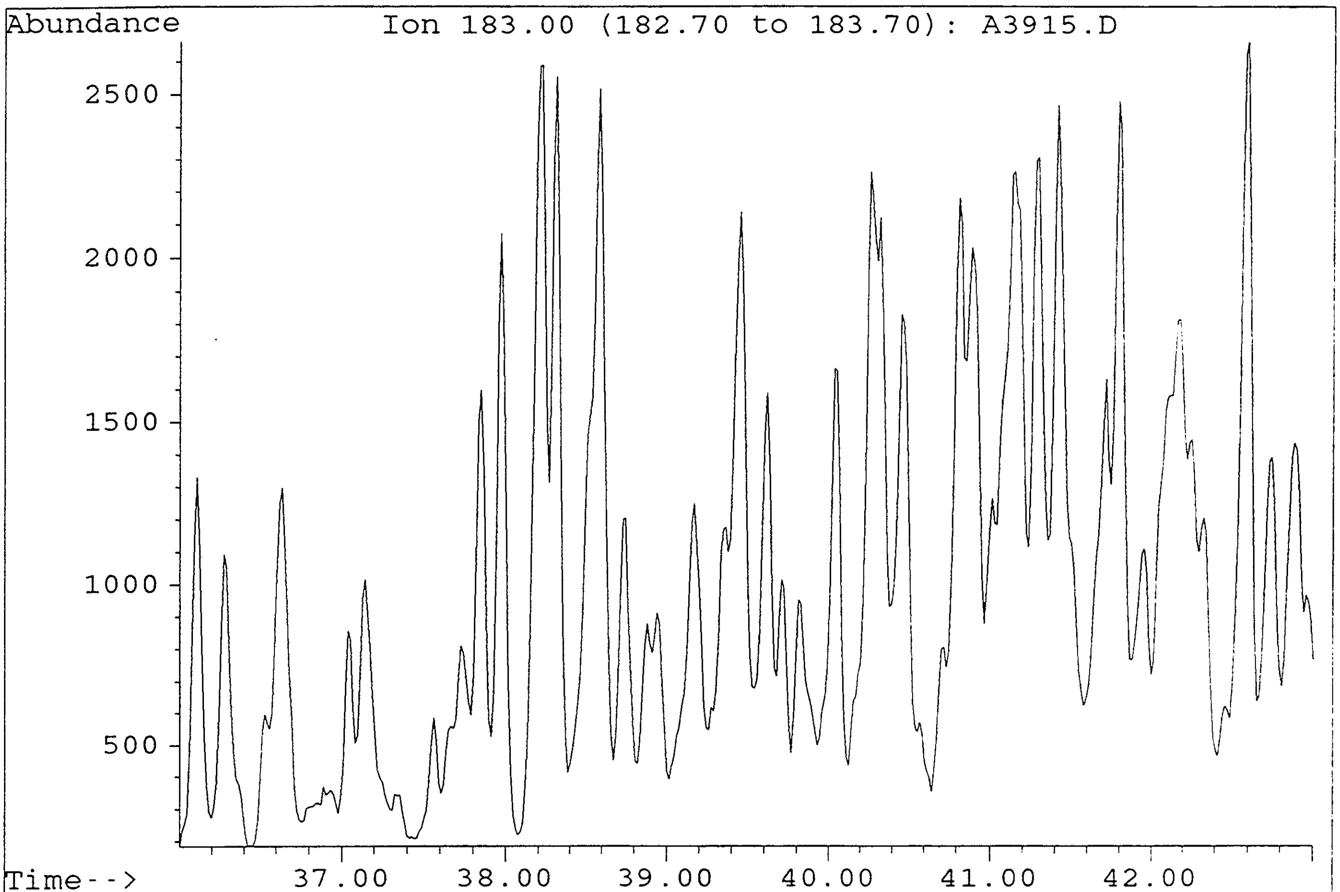


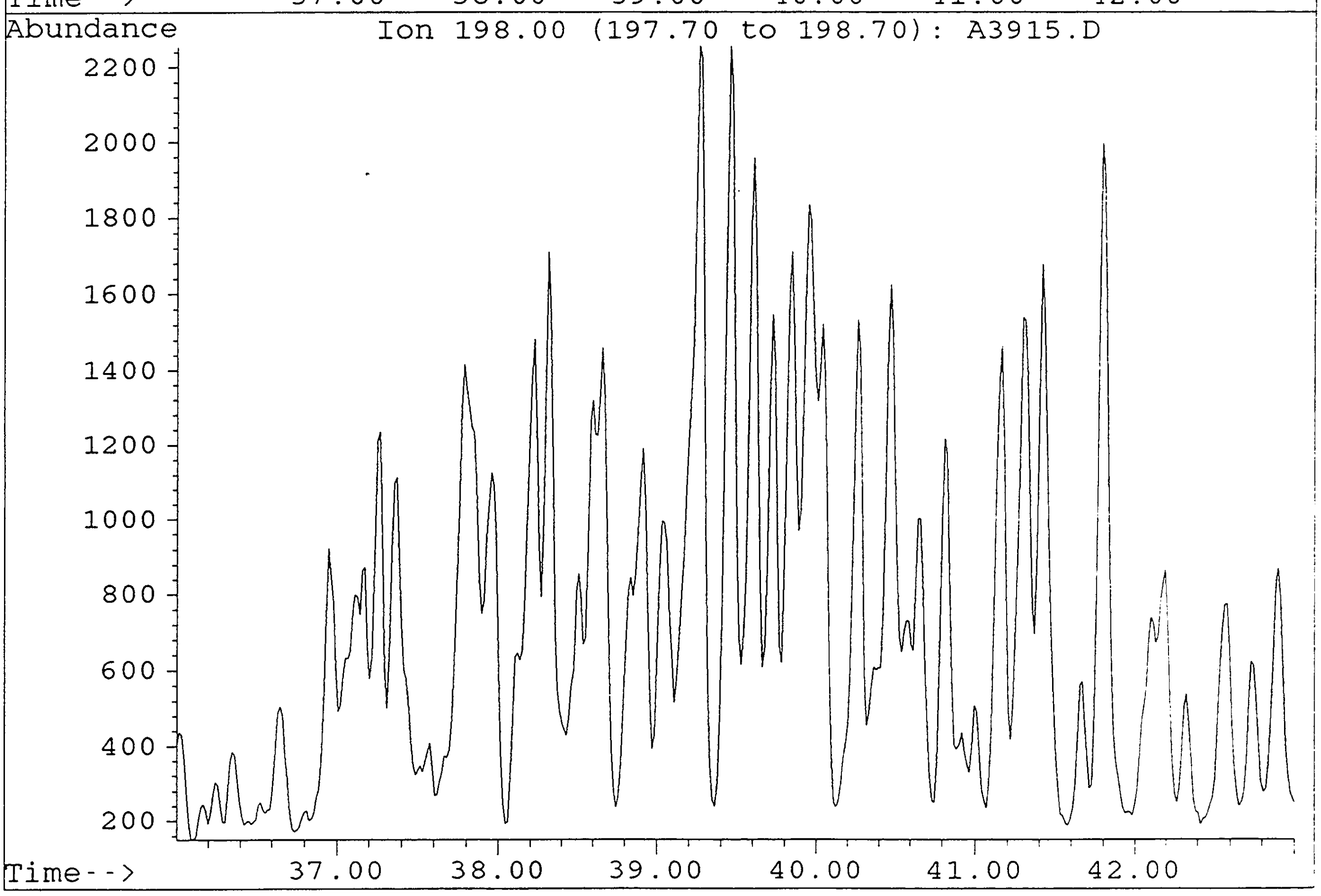


File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.

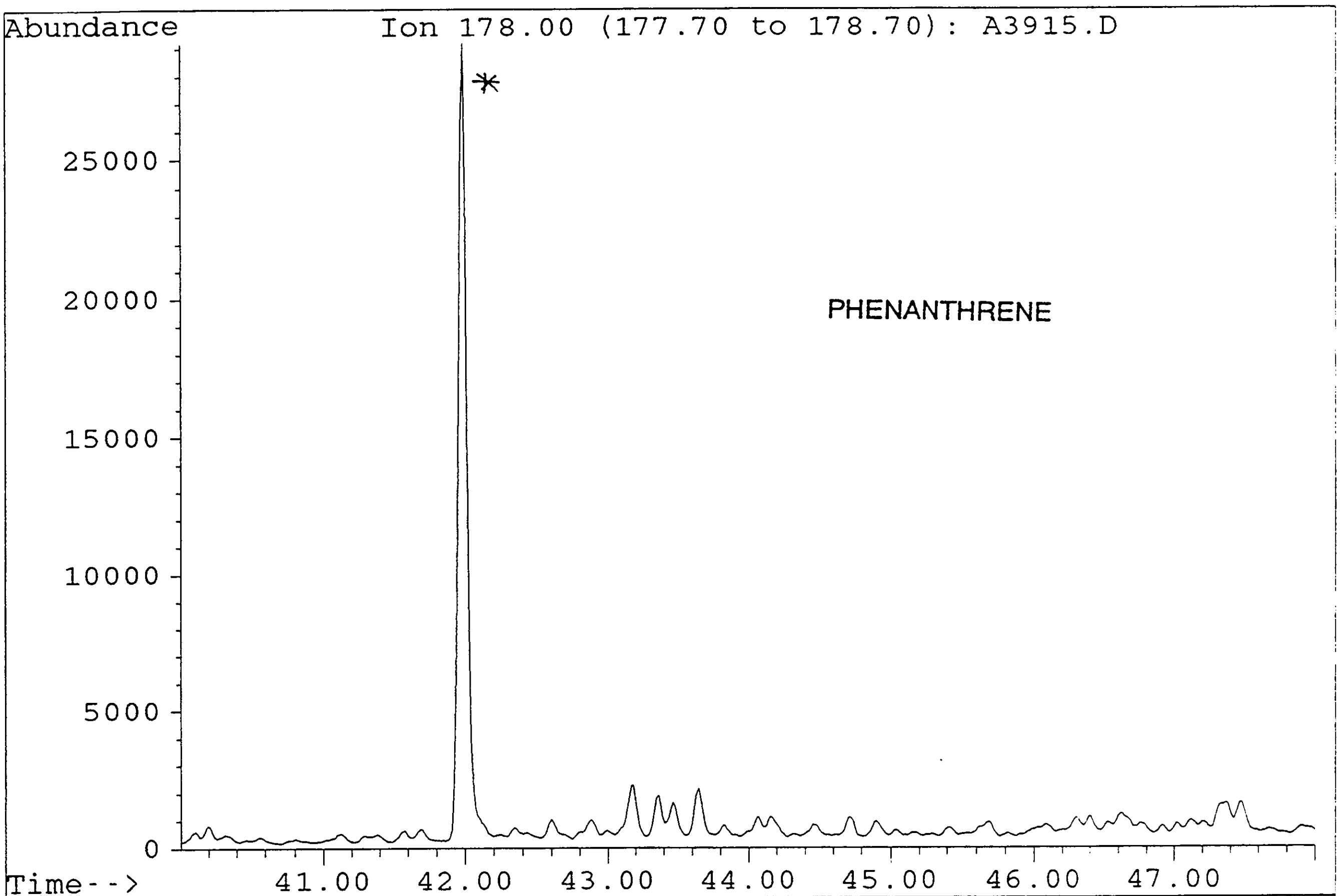


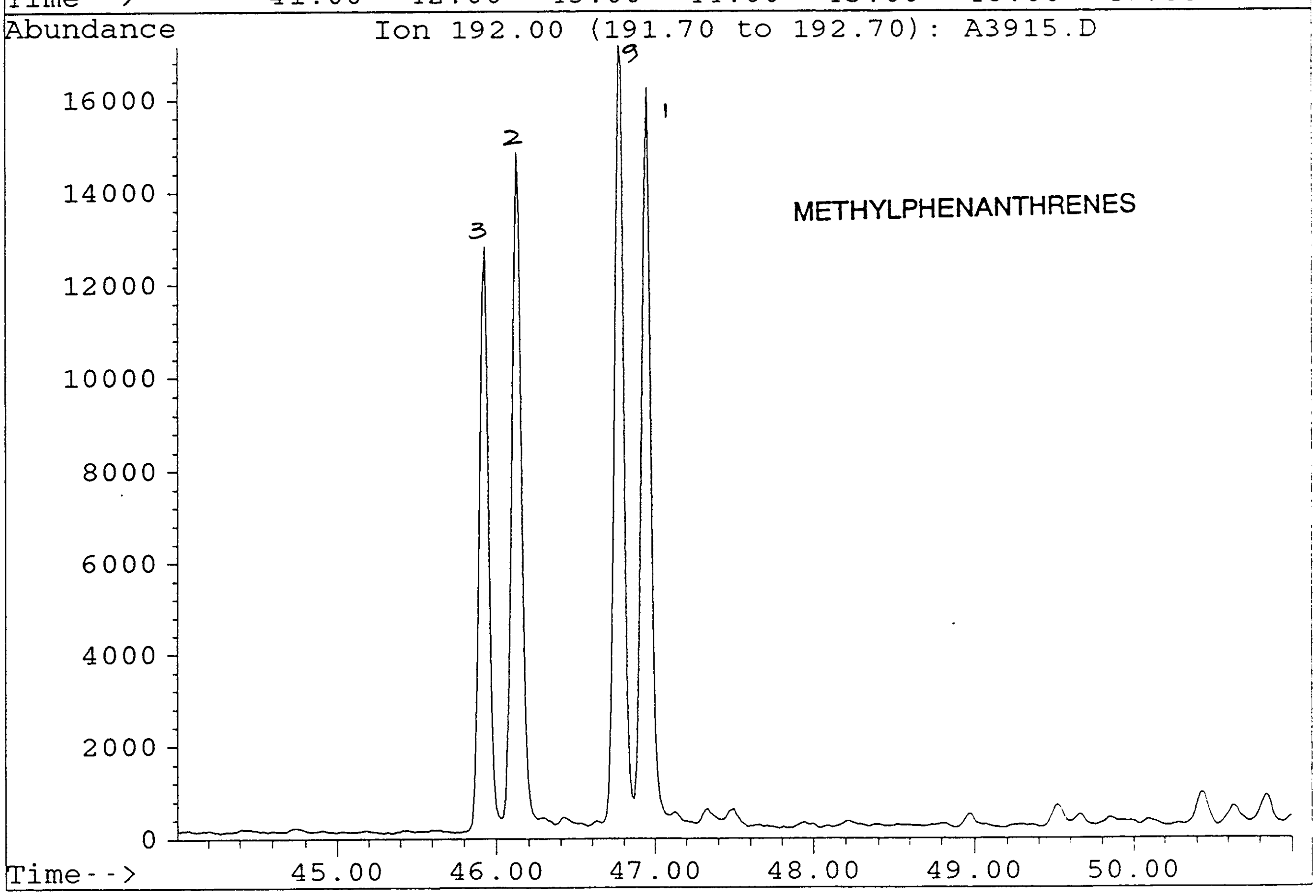
File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.



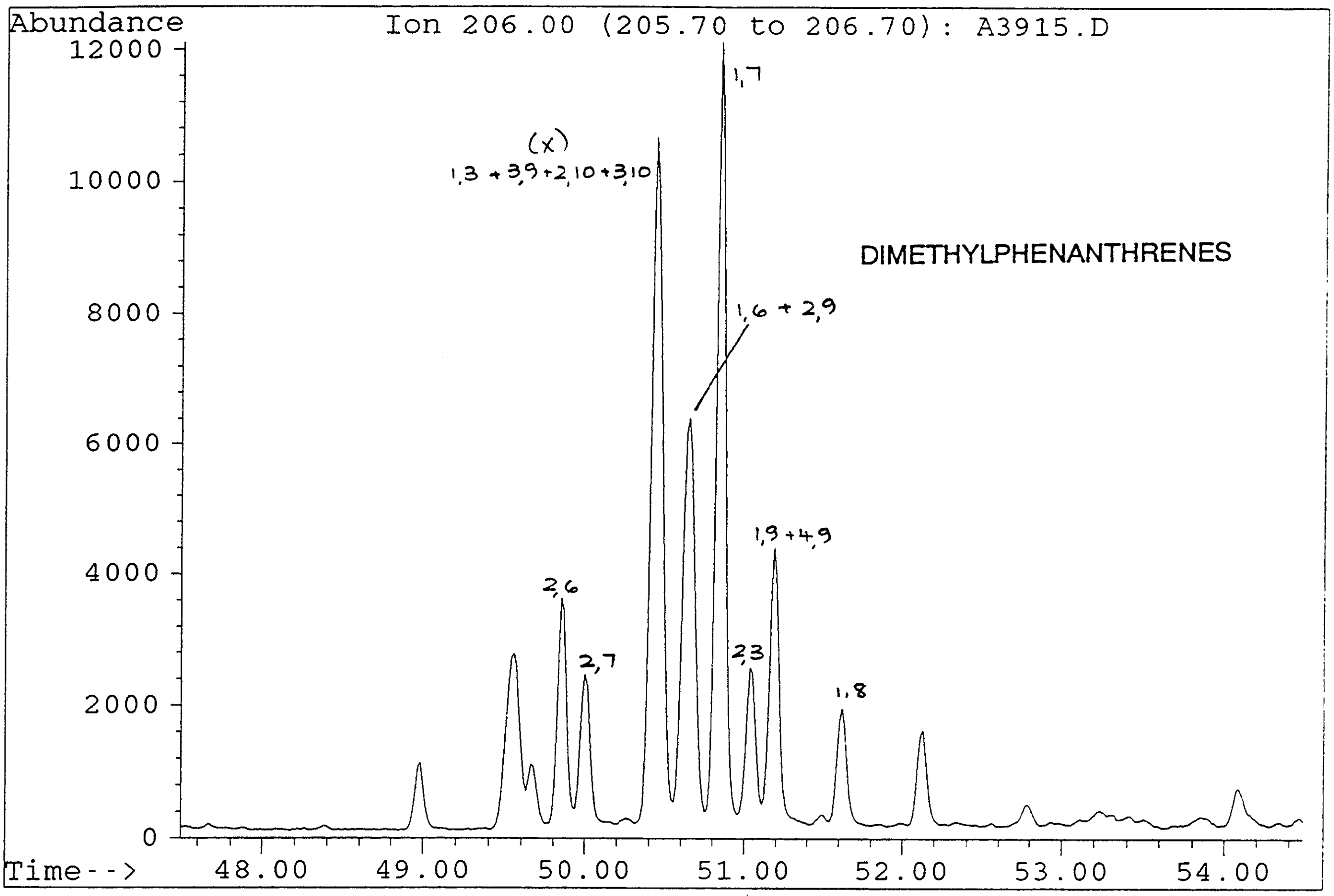


File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.





File : A3915.D
Sample : DIGBY#1, 1473.7m. AROS. (RE-SEPARATED)
Misc. Info : COL#155. 28-7-95. GEC.



File : A3915.D
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Misc. Info : COL#155. 28-7-95. GEC.

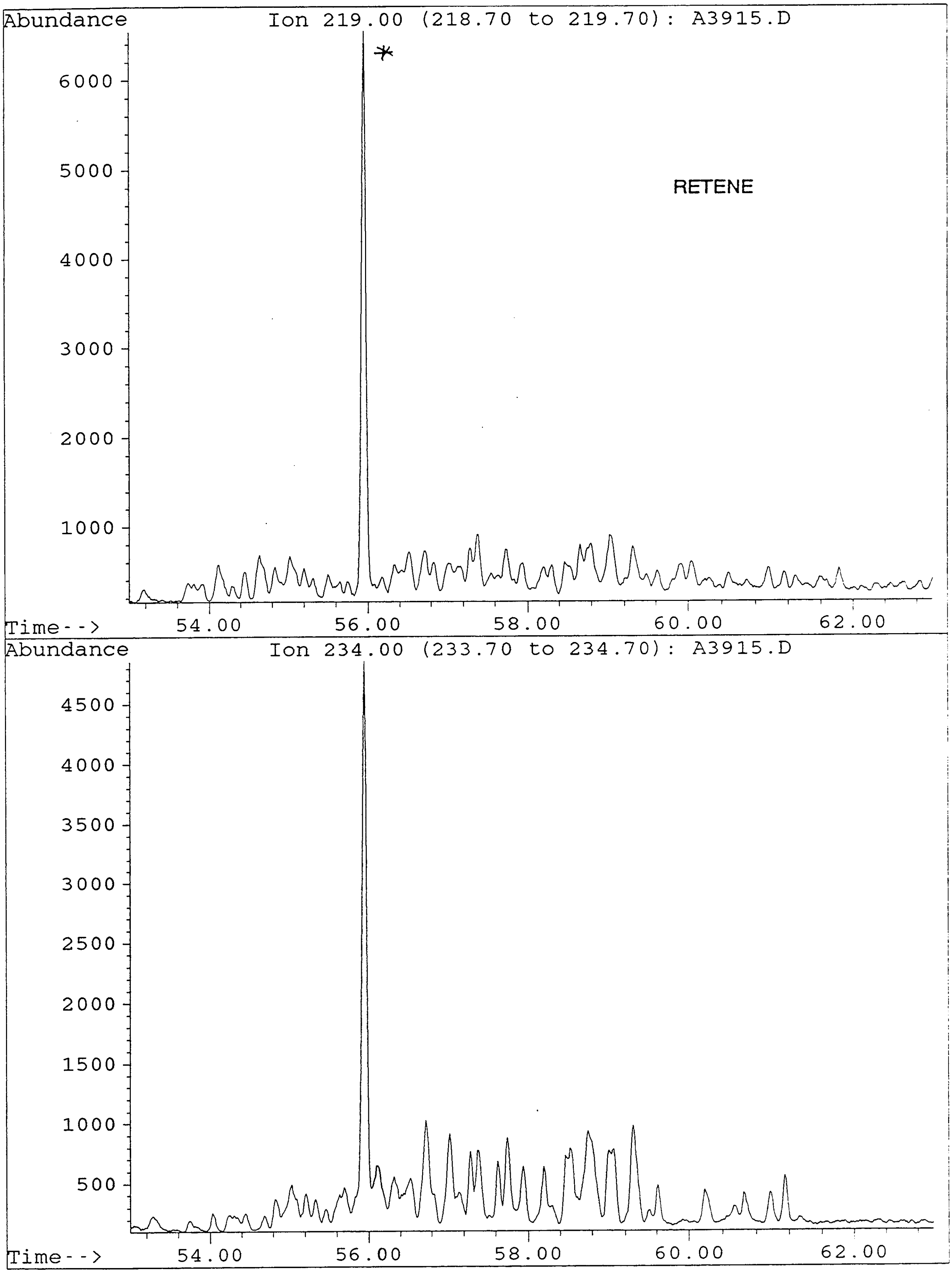


TABLE 9-2

SELECTED PARAMETERS FROM GC/MS ANALYSIS

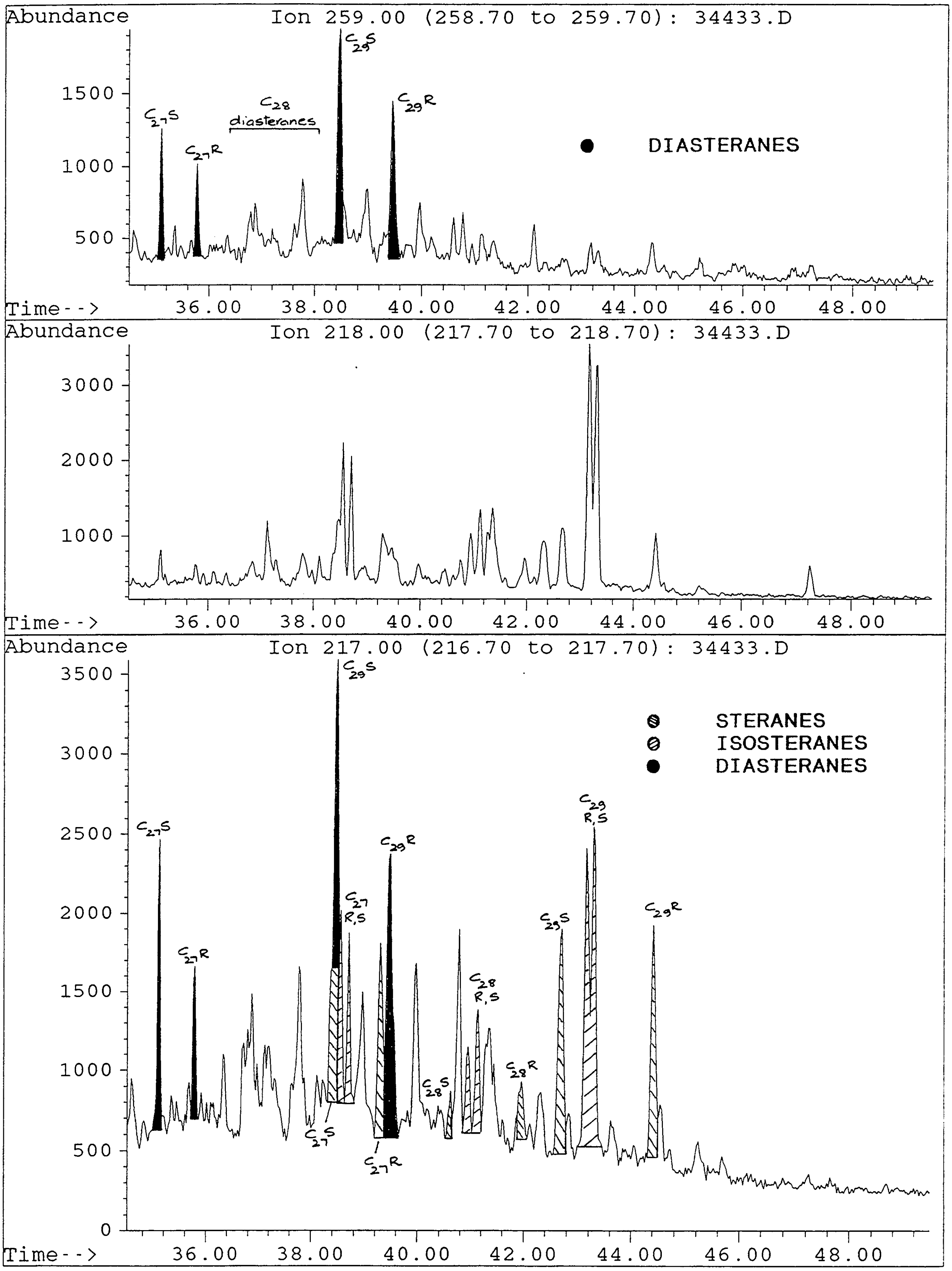
DIGBY 1, 1903.2m, SWC

	Parameter	Ion(s)	Value
1.	18 α (H)- hopane/17 α (H)-hopane (Ts/Tm)	191	1.03
2.	C30 hopane/C30 moretane	191	10.11
3.	C31 22S hopane/C31 22R hopane	191	1.34
4.	C32 22S hopane/C32 22R hopane	191	1.48
5.	C29 20S $\alpha\alpha\alpha$ sterane/C29 20R $\alpha\alpha\alpha$ sterane	217	0.97
6.	C29 $\alpha\alpha\alpha$ steranes (20S / 20S+20R)	217	0.49
7.	C29 $\alpha\beta\beta$ steranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.57
8.	C27/C29 diasteranes	259	0.61
9.	C27/C29 steranes	217	0.84
10.	18 α (H)-oleanane/C30 hopane	191	nd
11.	C29 diasteranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.62
12.	C30 (hopane + moretane) / C29 (steranes + diasteranes)	191/217	1.13
13.	C15 drimane/C16 homodrimane	123	0.33
14.	Rearranged drimanes/normal drimanes	123	0.68

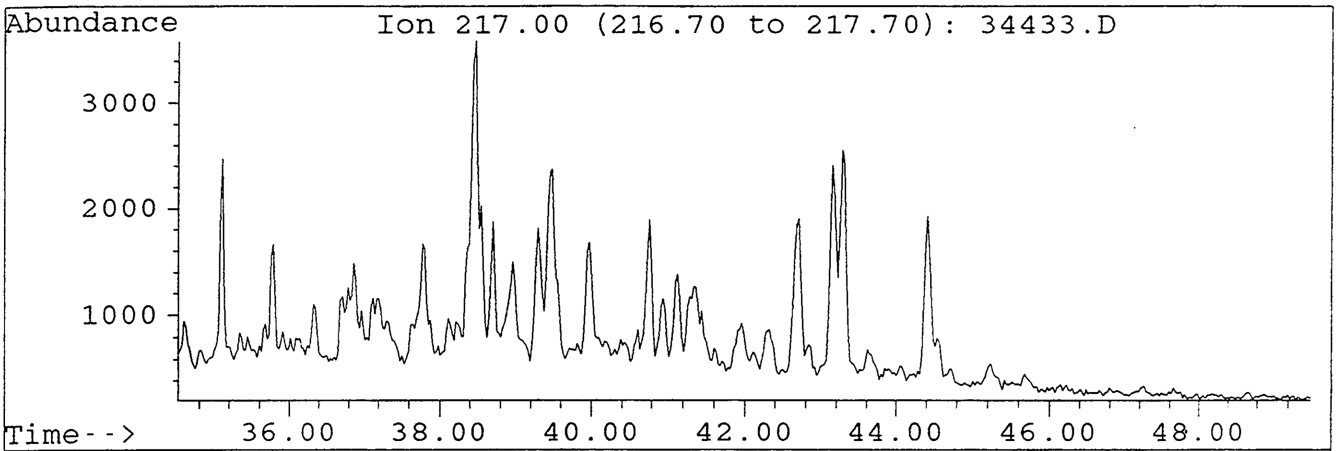
nd = not detectable

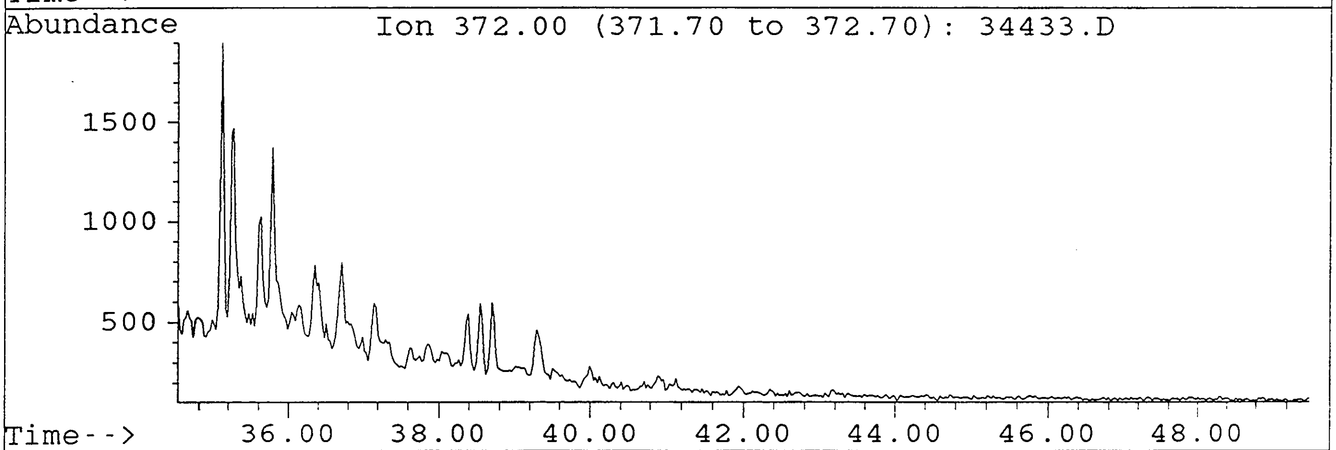
File : 34433.D
Sample : DIGBY#1, 1903.2m B/C
Misc. Info : COL#164. GEC/DJ. 26-7-95.

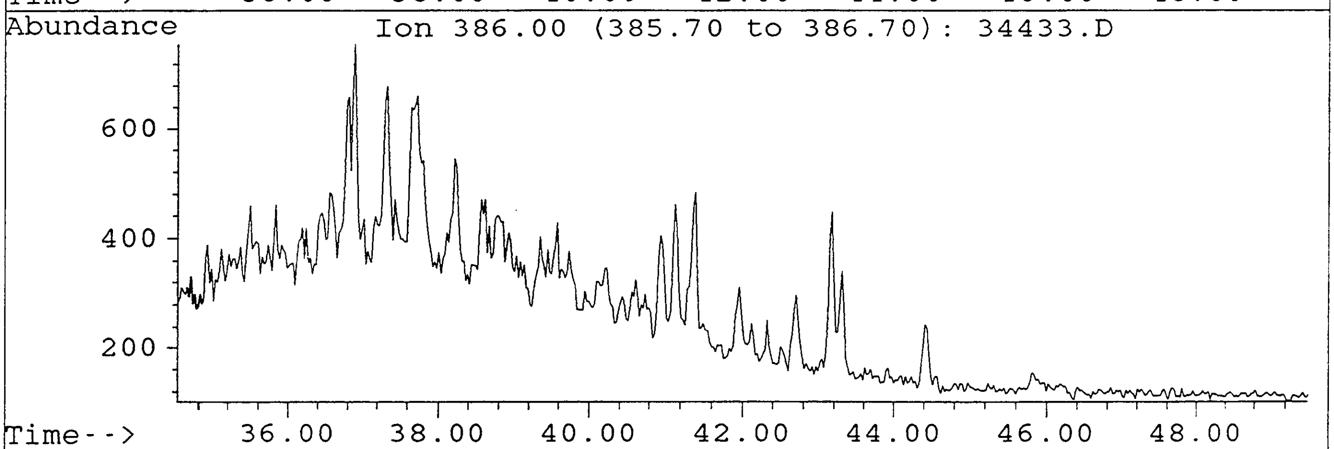
FIGURE 6-2

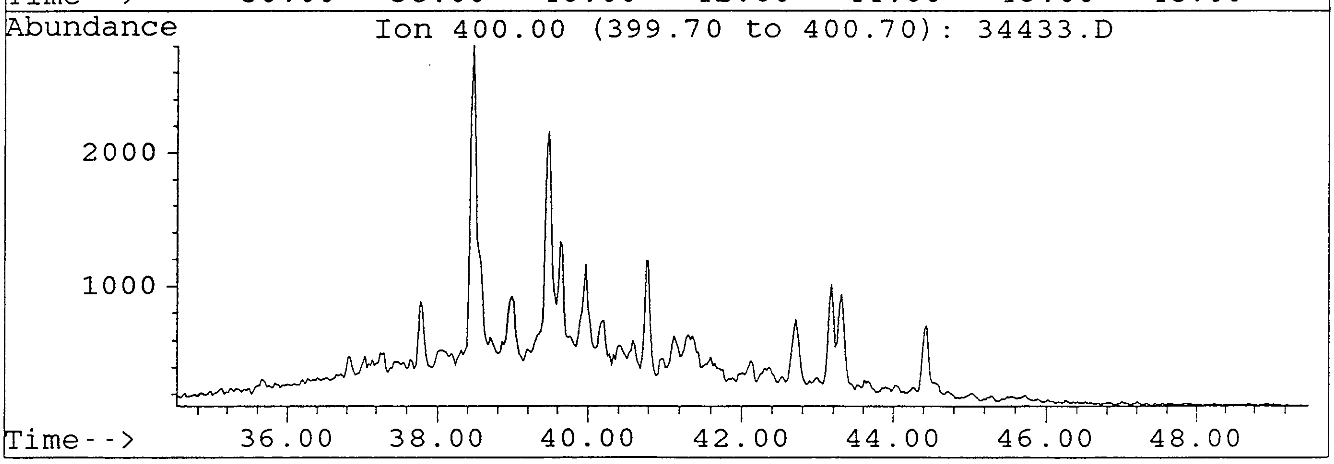


File :   34433.D
Sample :   DIGBY#1, 1903.2m B/C
Misc. Info :   COL#164. GEC/DJ. 26-7-95.

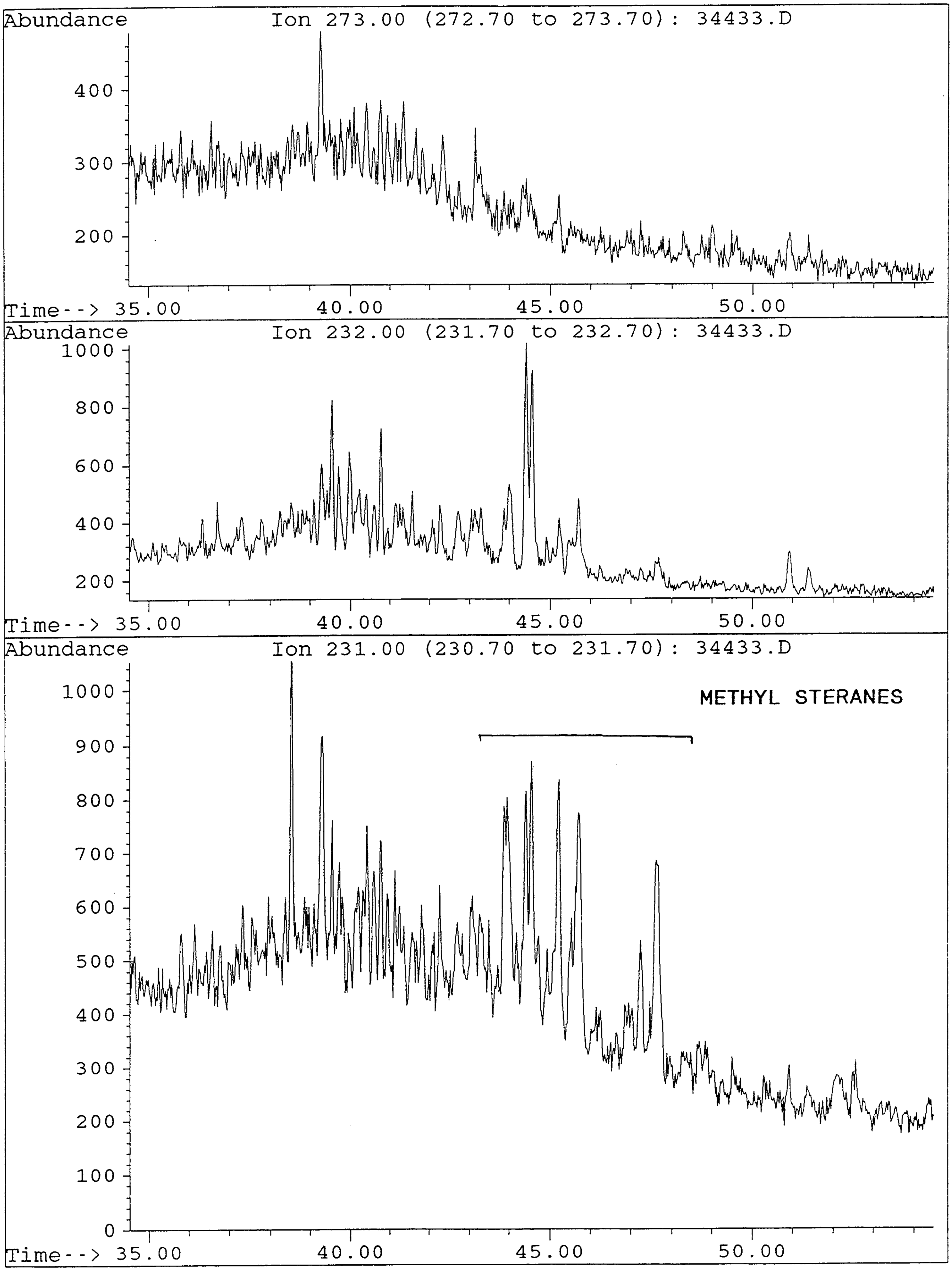




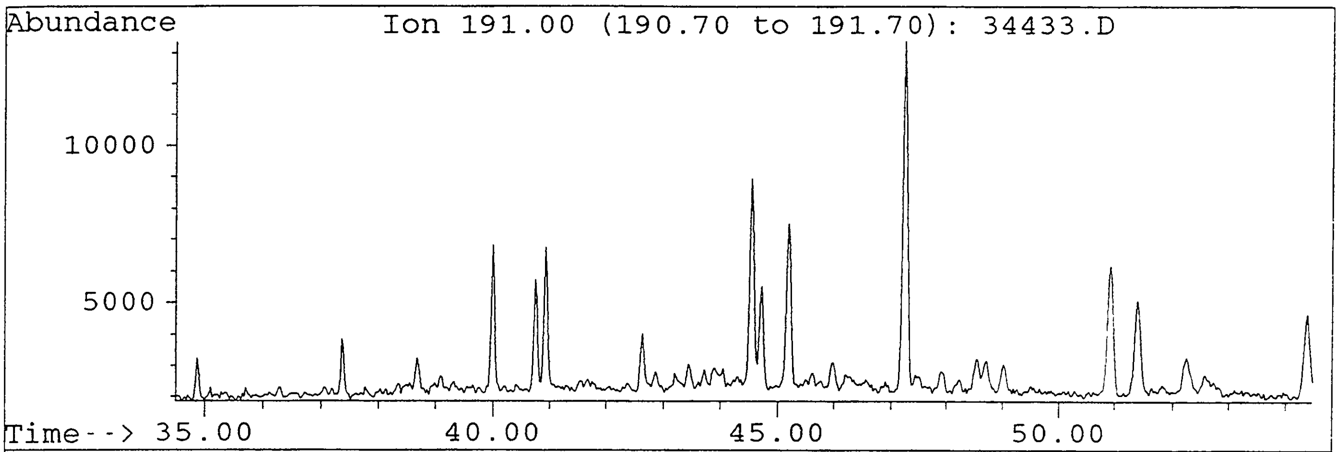


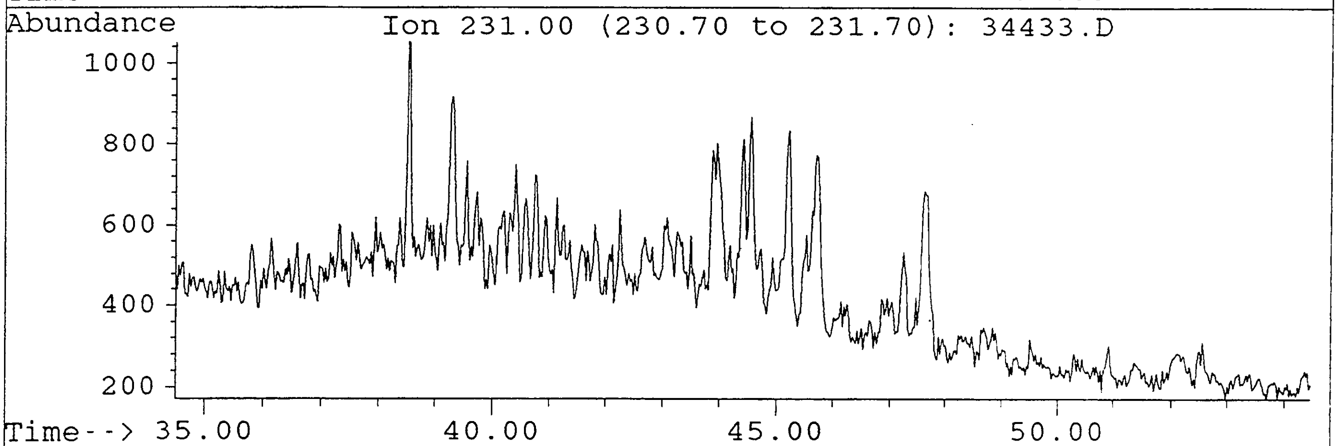


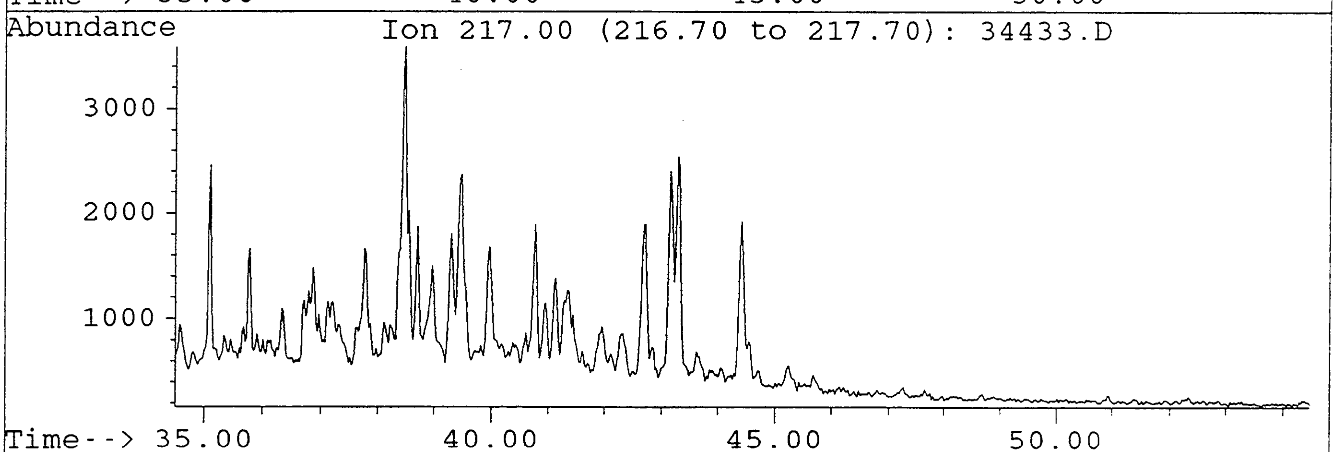
File : 34433.D
Sample : DIGBY#1, 1903.2m B/C
Misc. Info : COL#164. GEC/DJ. 26-7-95.

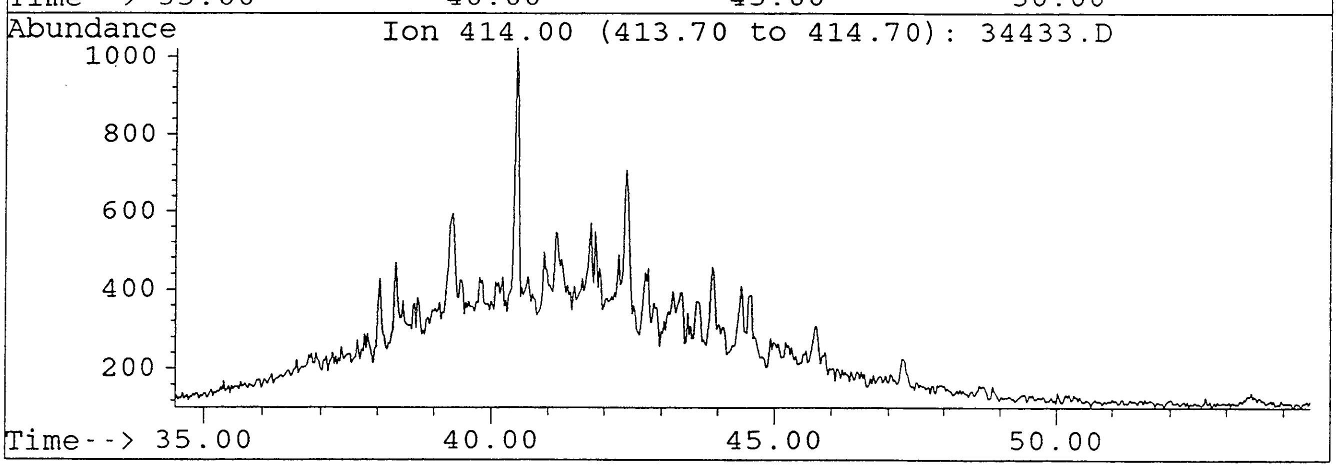


File : 34433.D
Sample : DIGBY#1, 1903.2m B/C
Misc. Info : COL#164. GEC/DJ. 26-7-95.

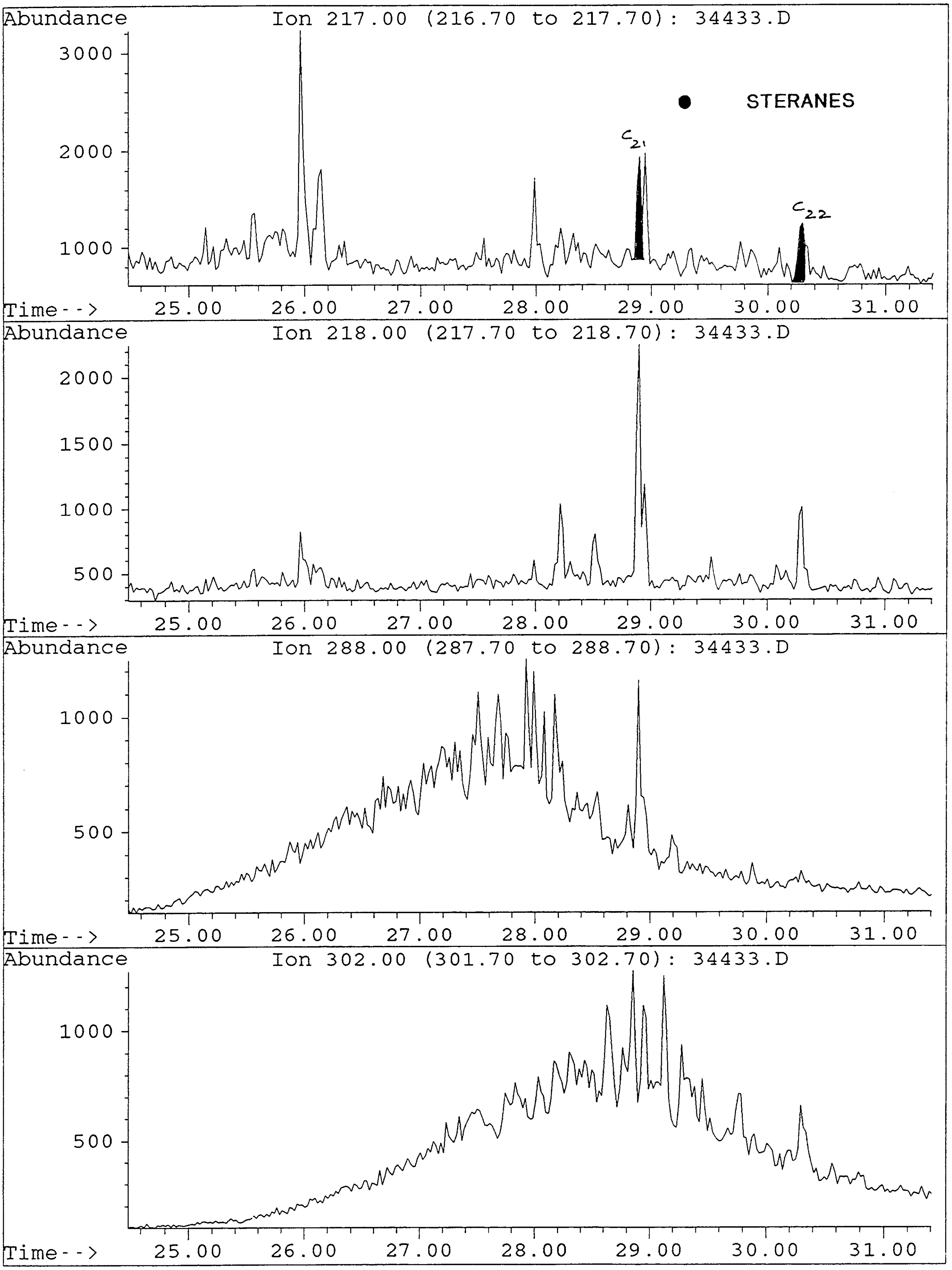








File : 34433.D
Sample : DIGBY#1, 1903.2m B/C
Misc. Info : COL#164. GEC/DJ. 26-7-95.



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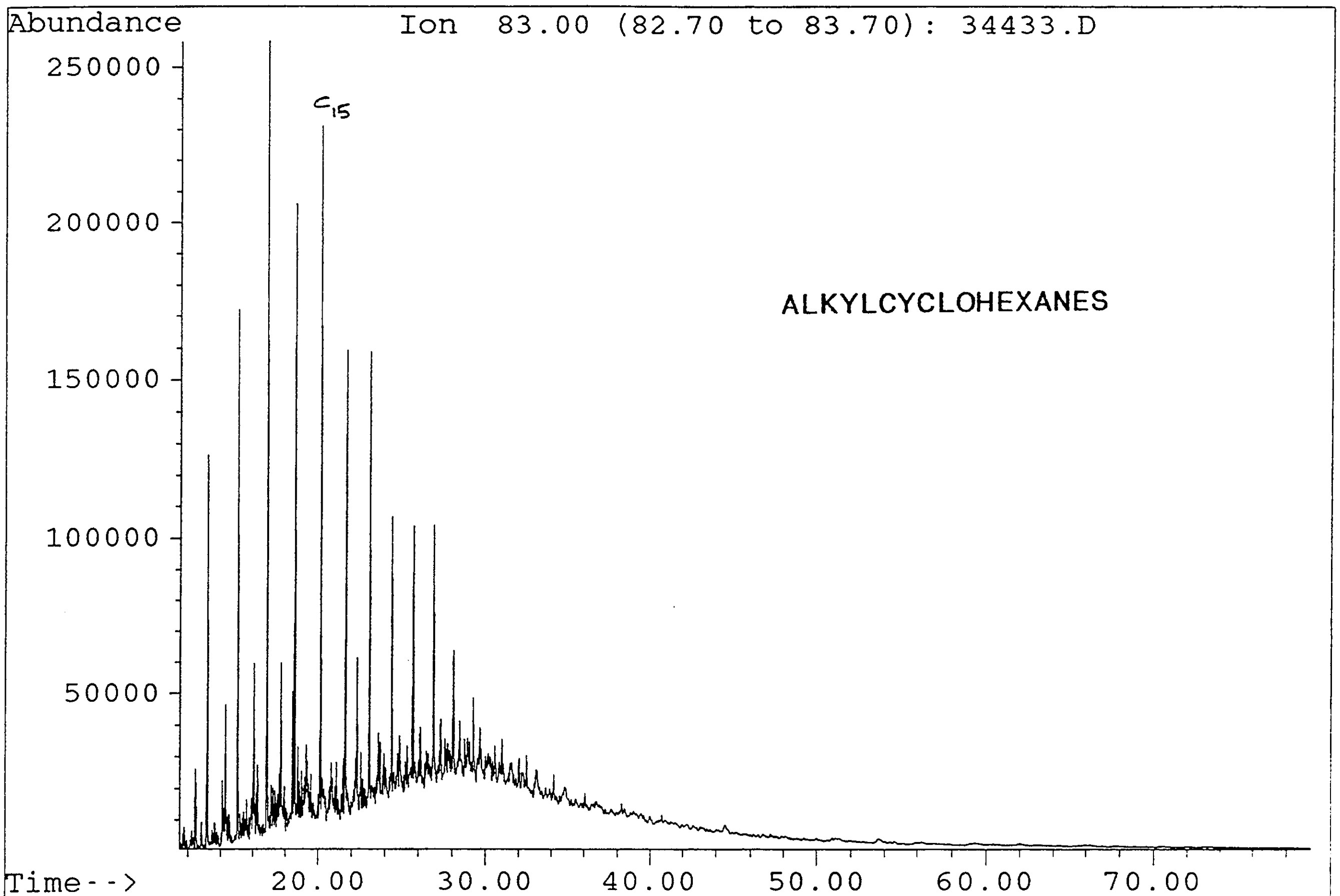
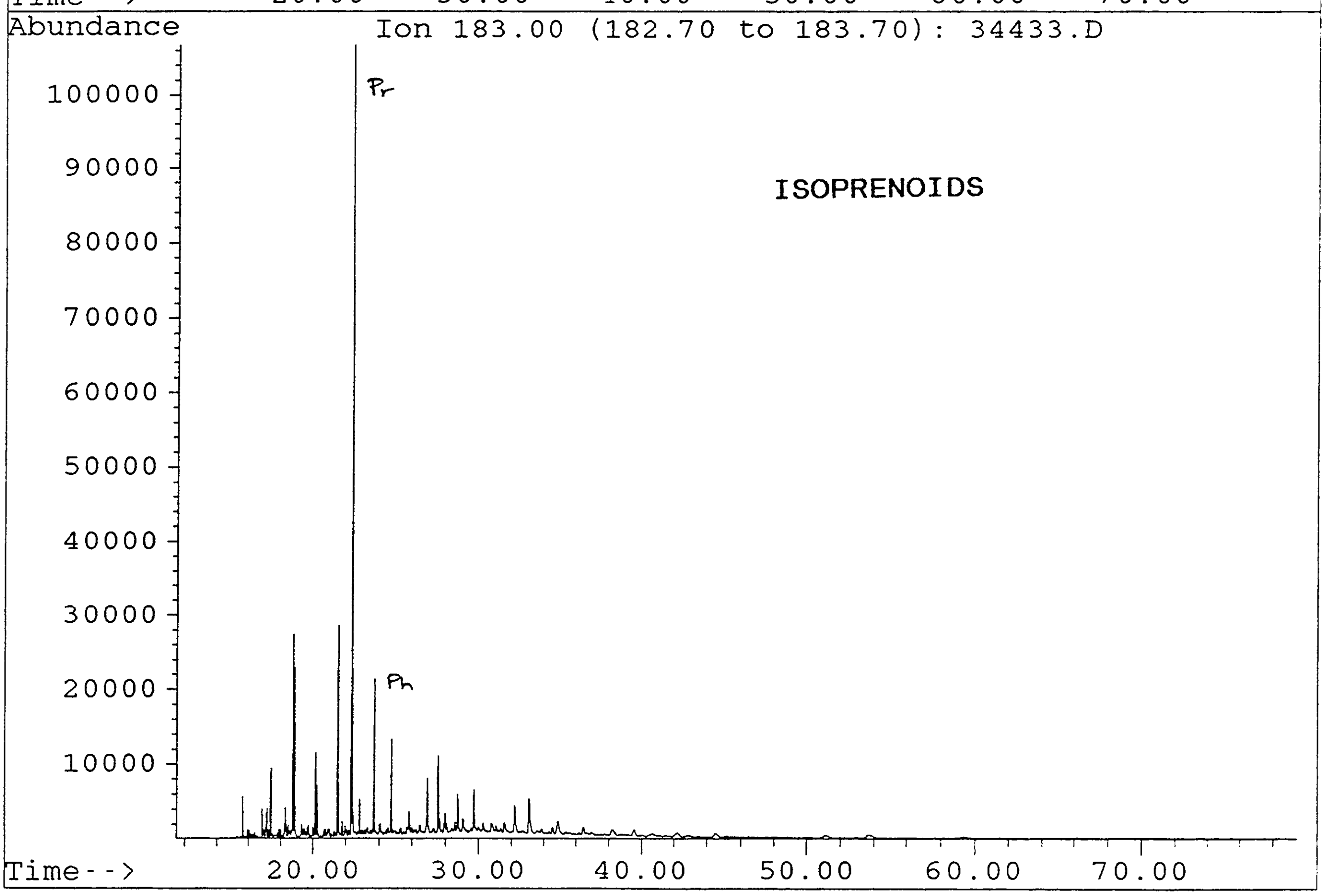
Misc. Info : COL#164. GEC/DJ. 26-7-95.





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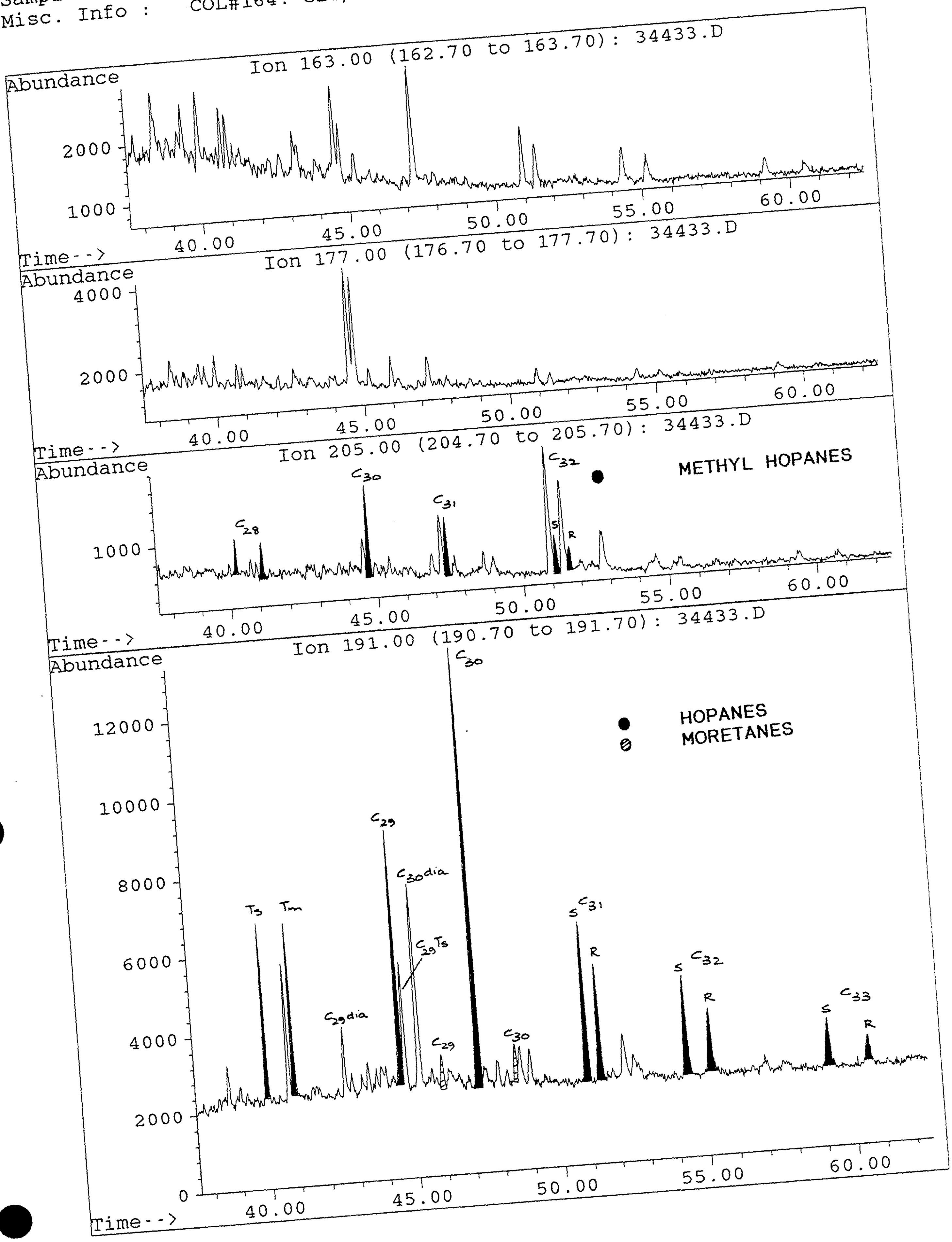

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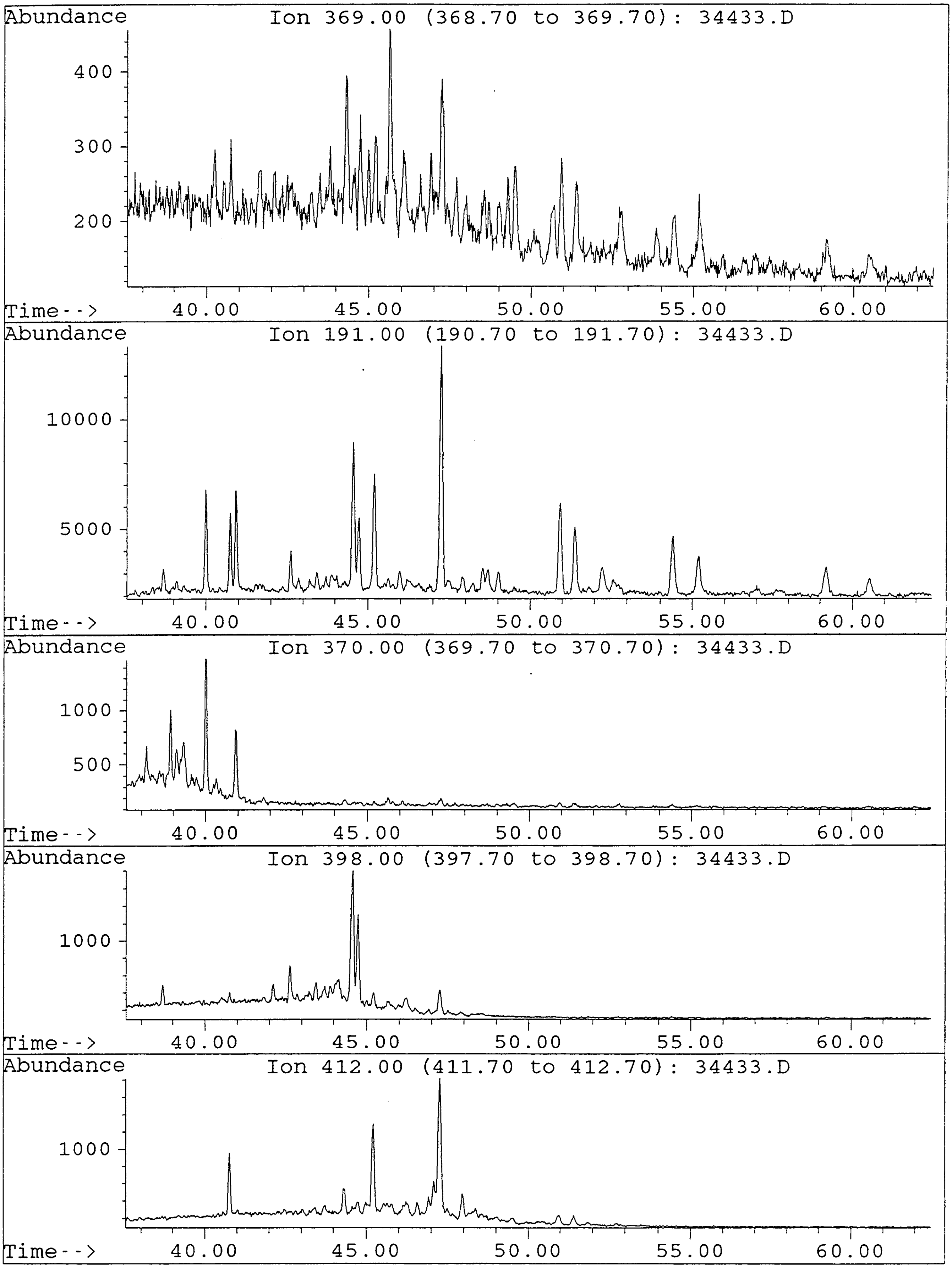

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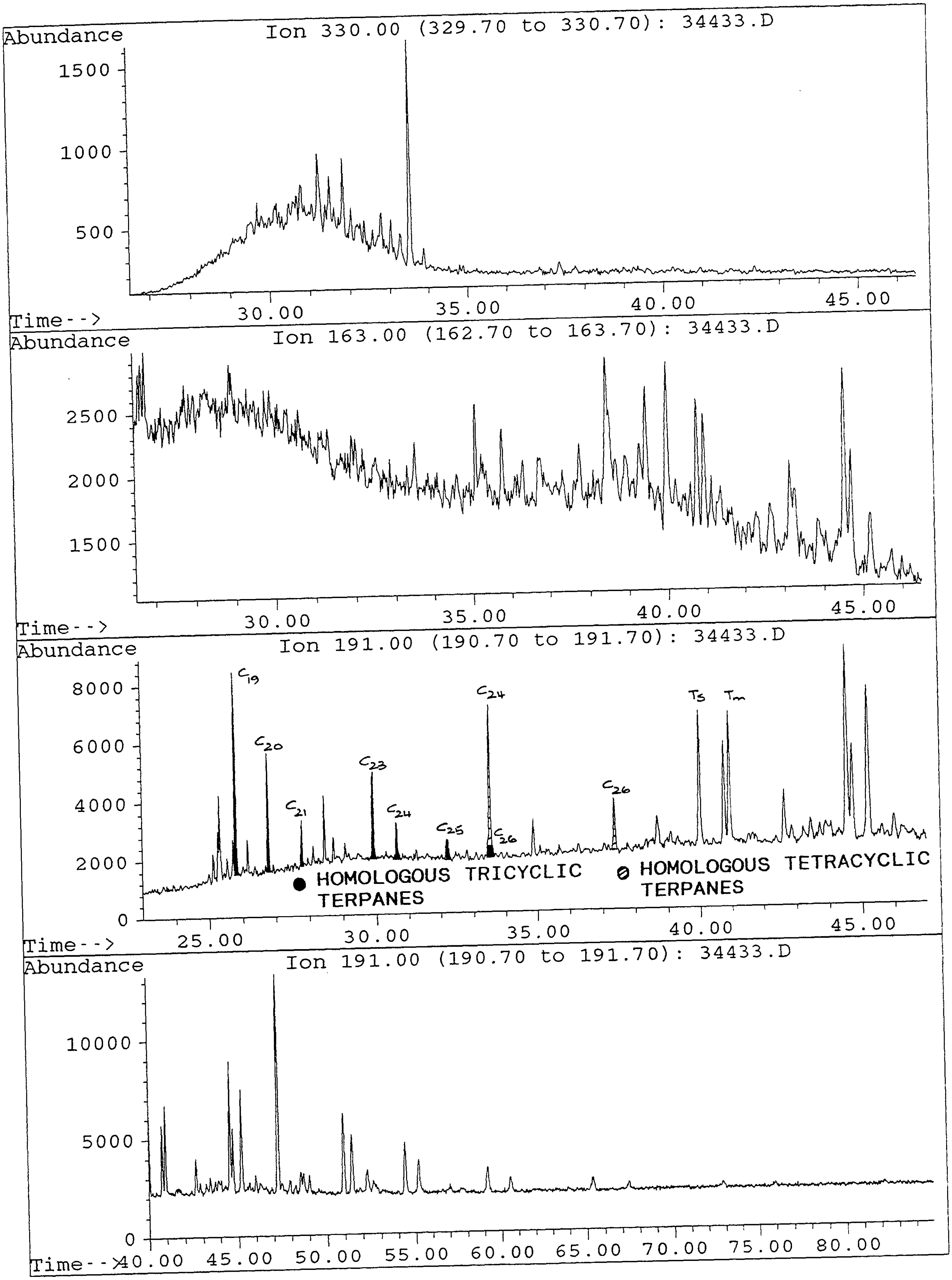

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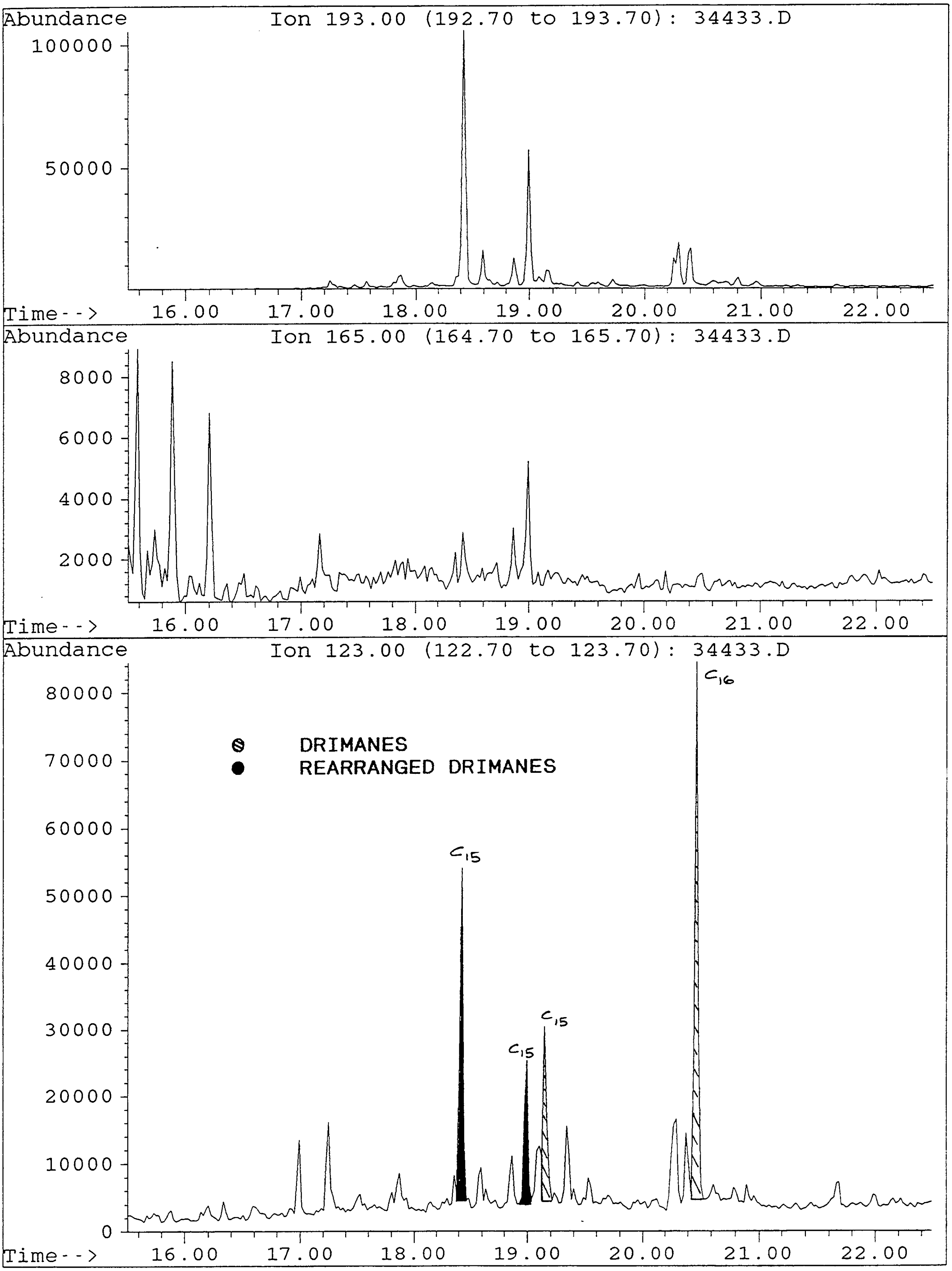

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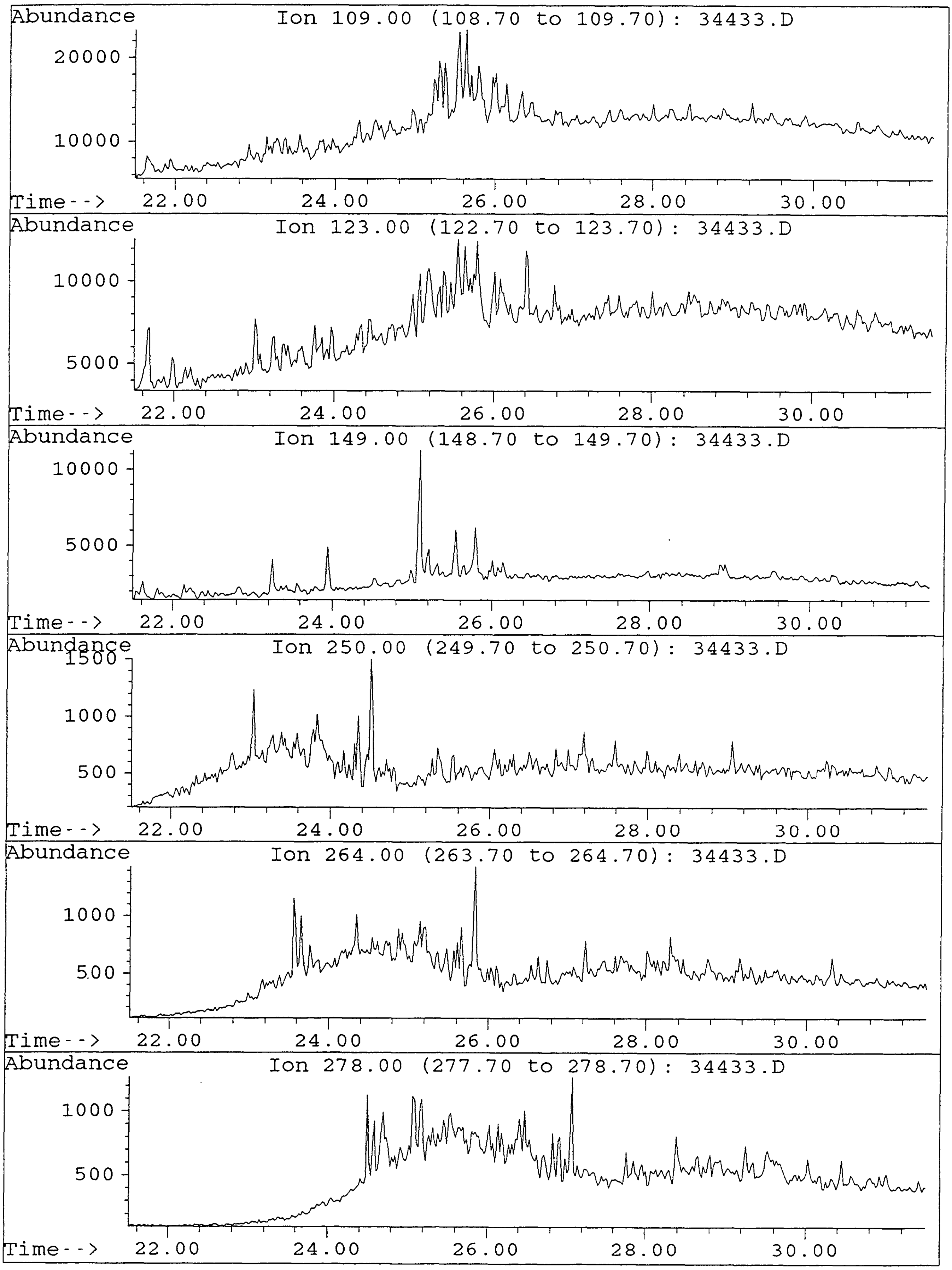

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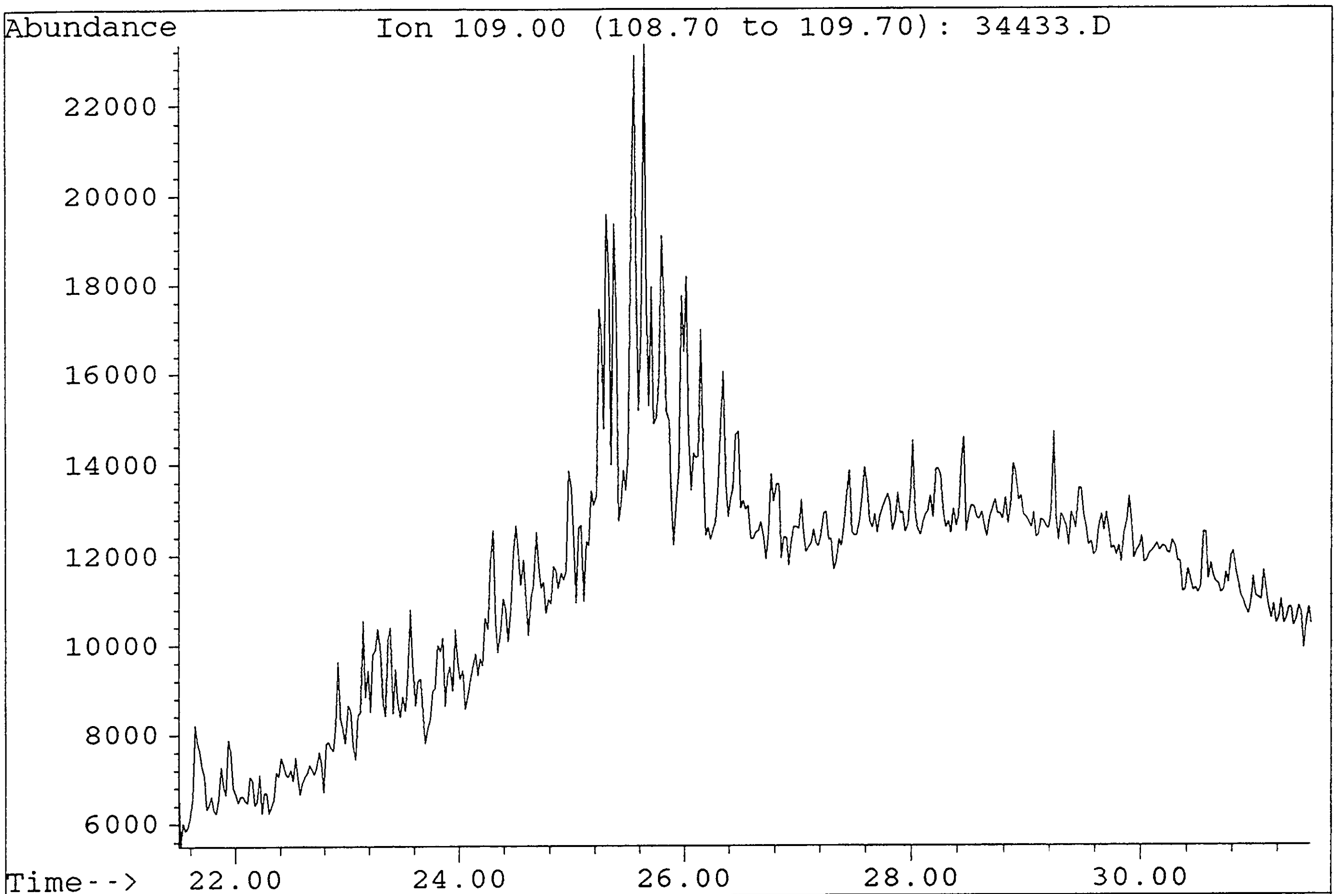

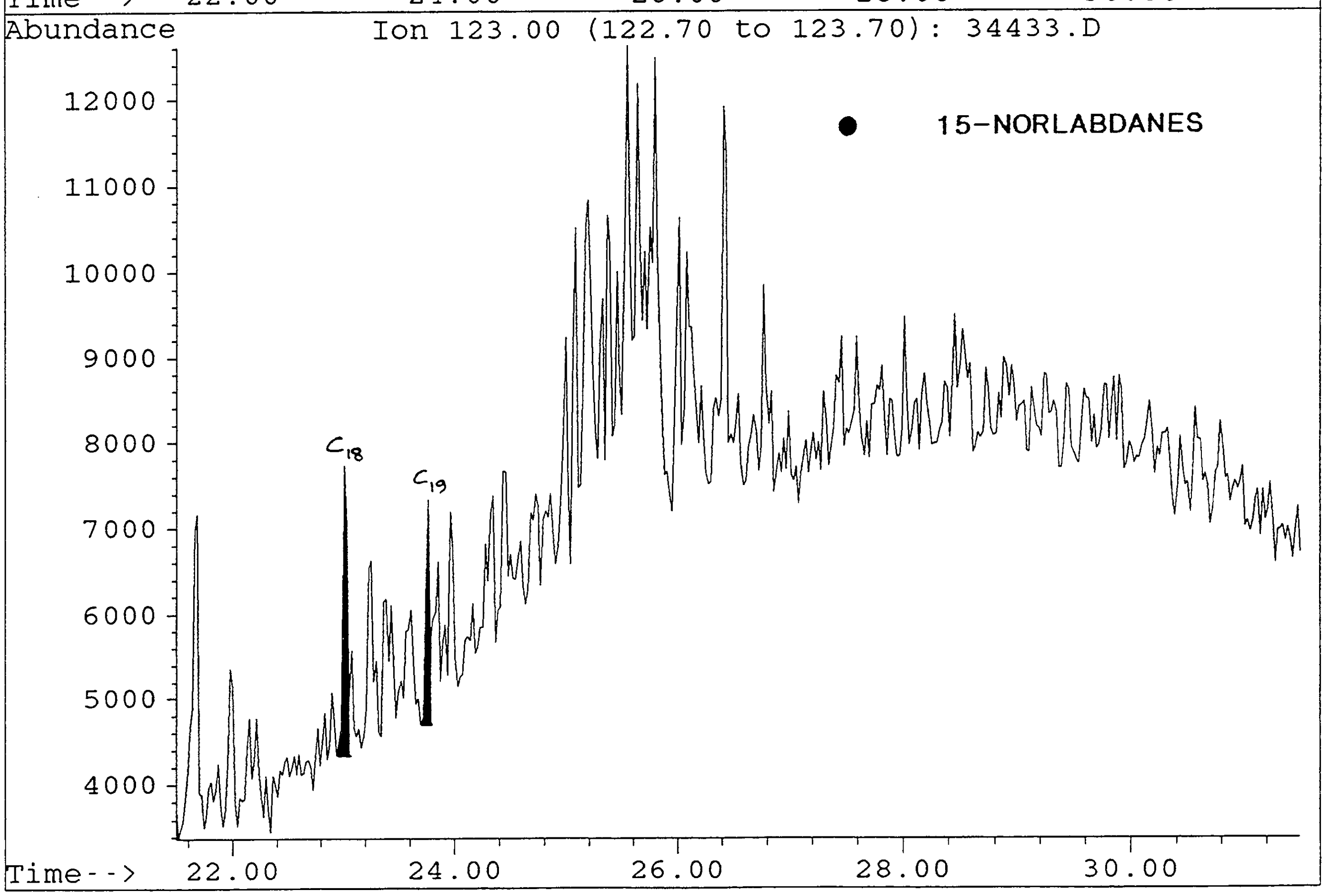

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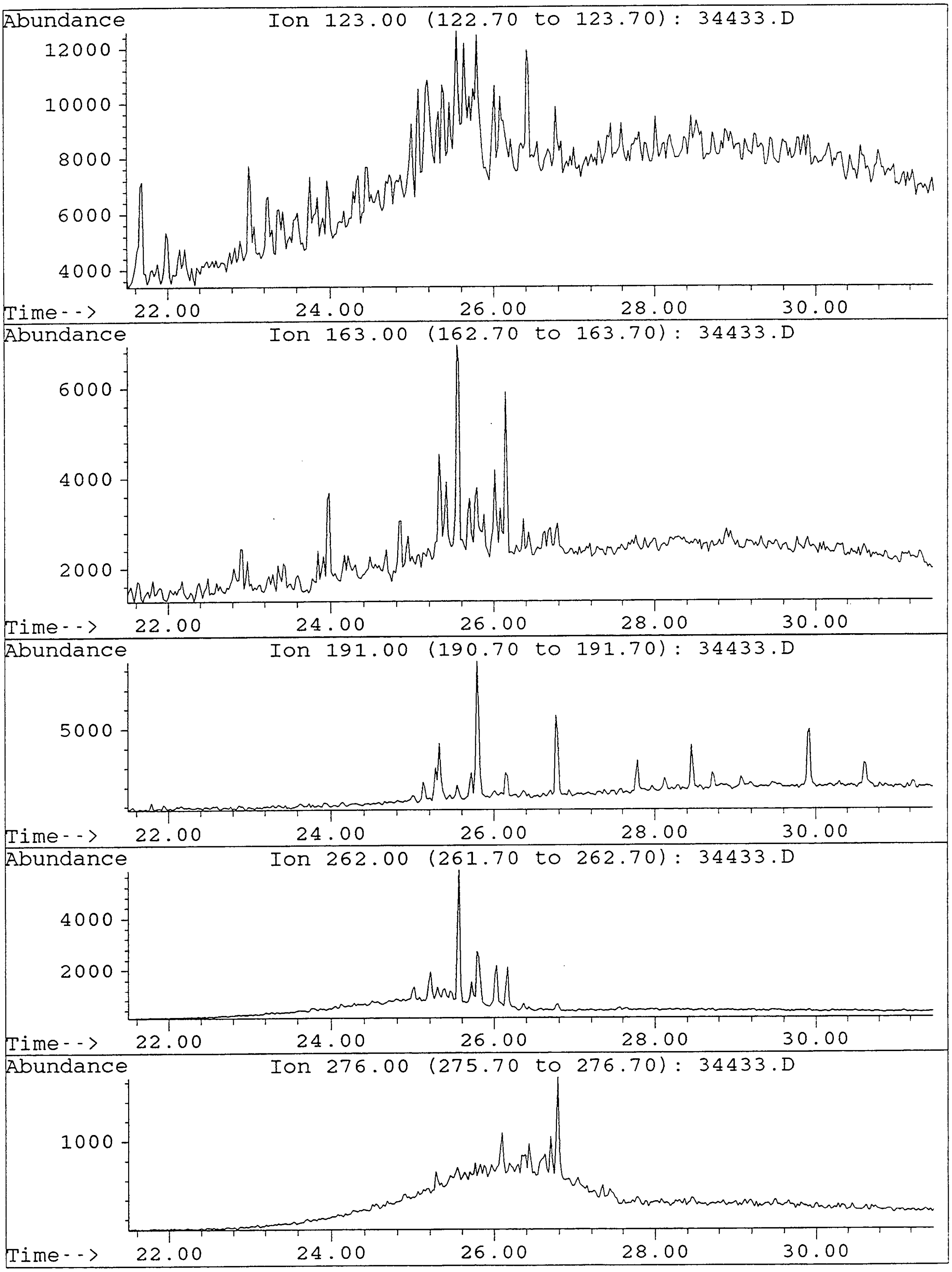

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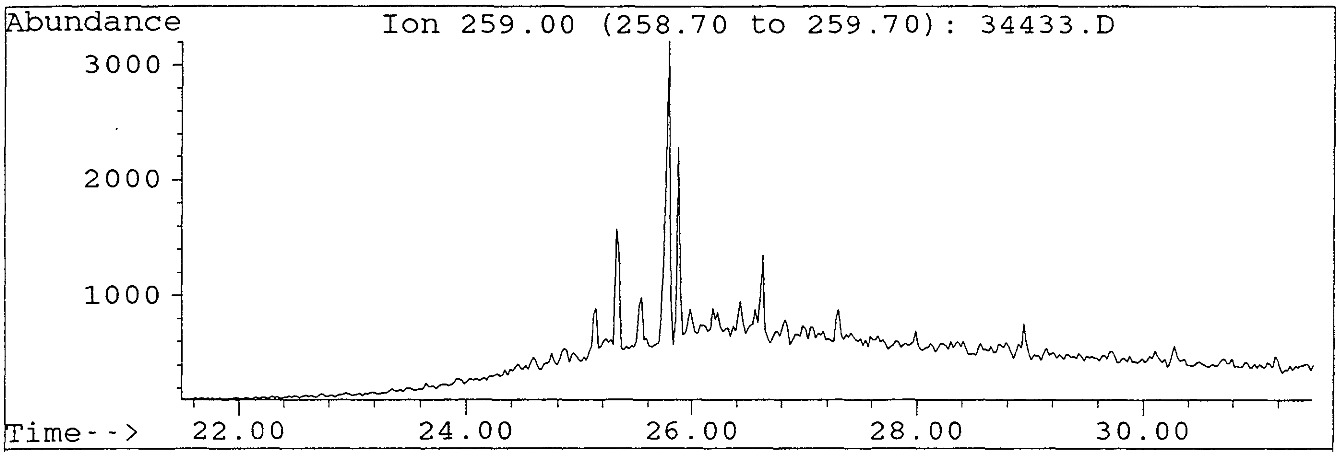

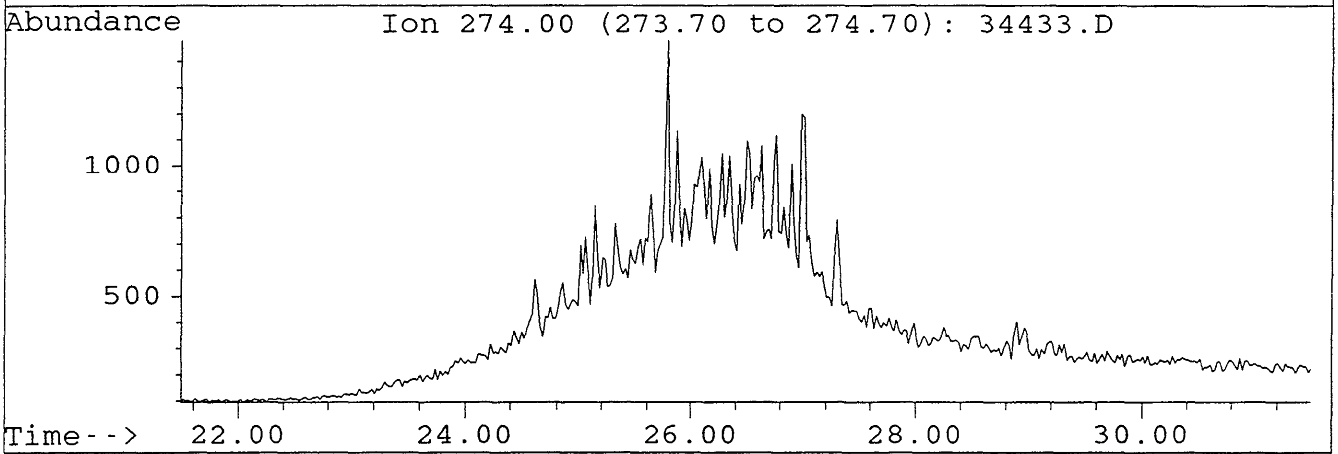

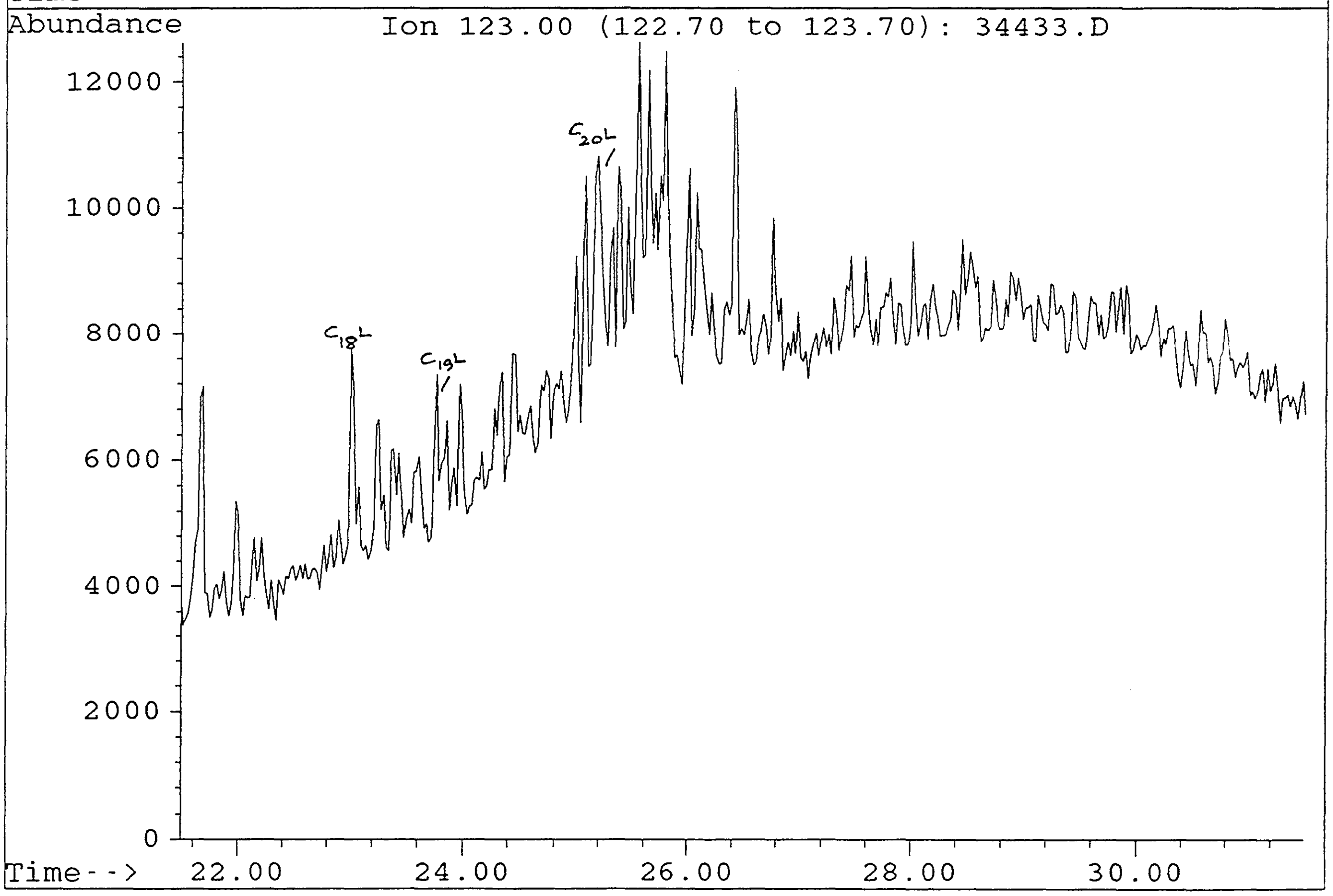

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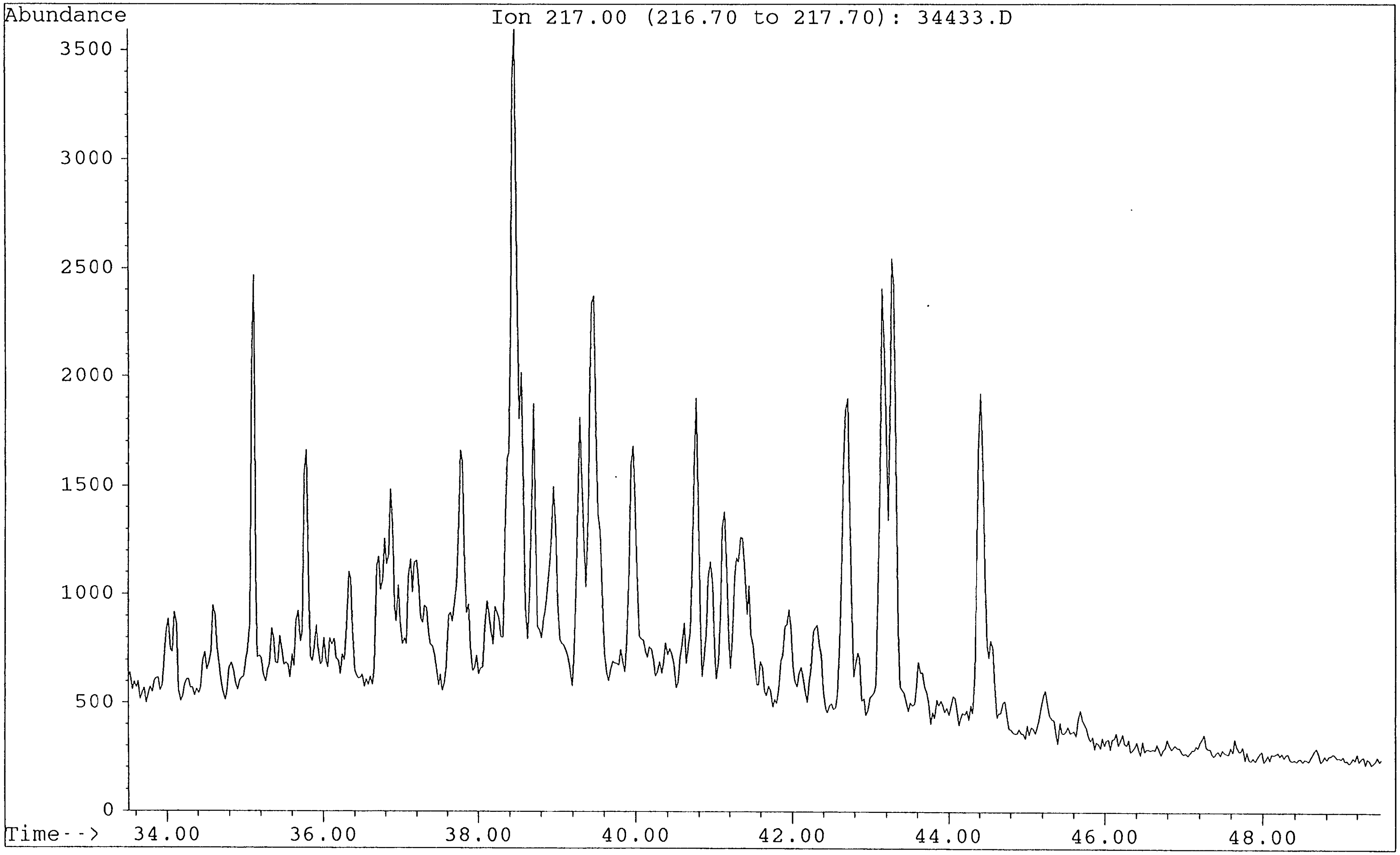

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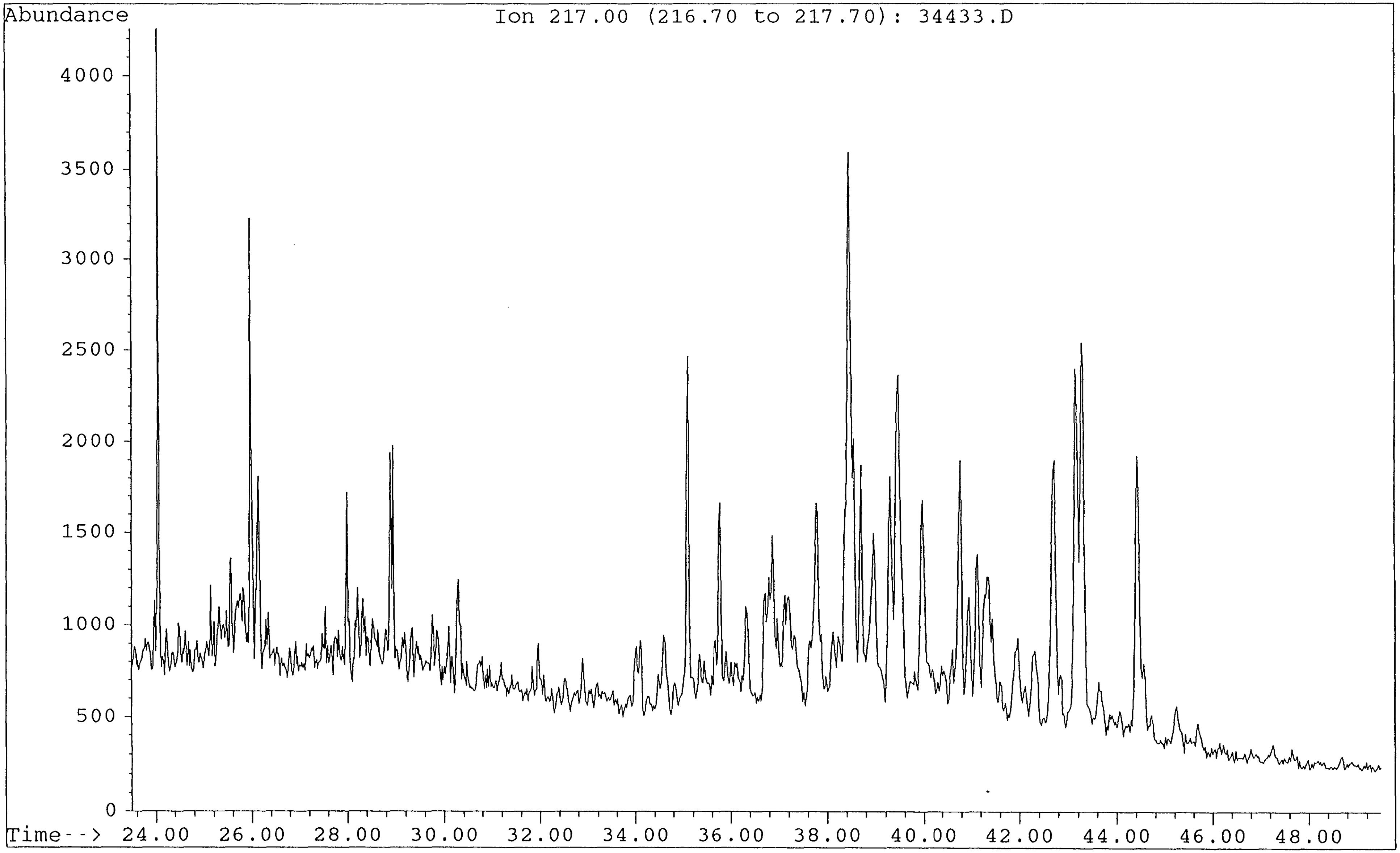

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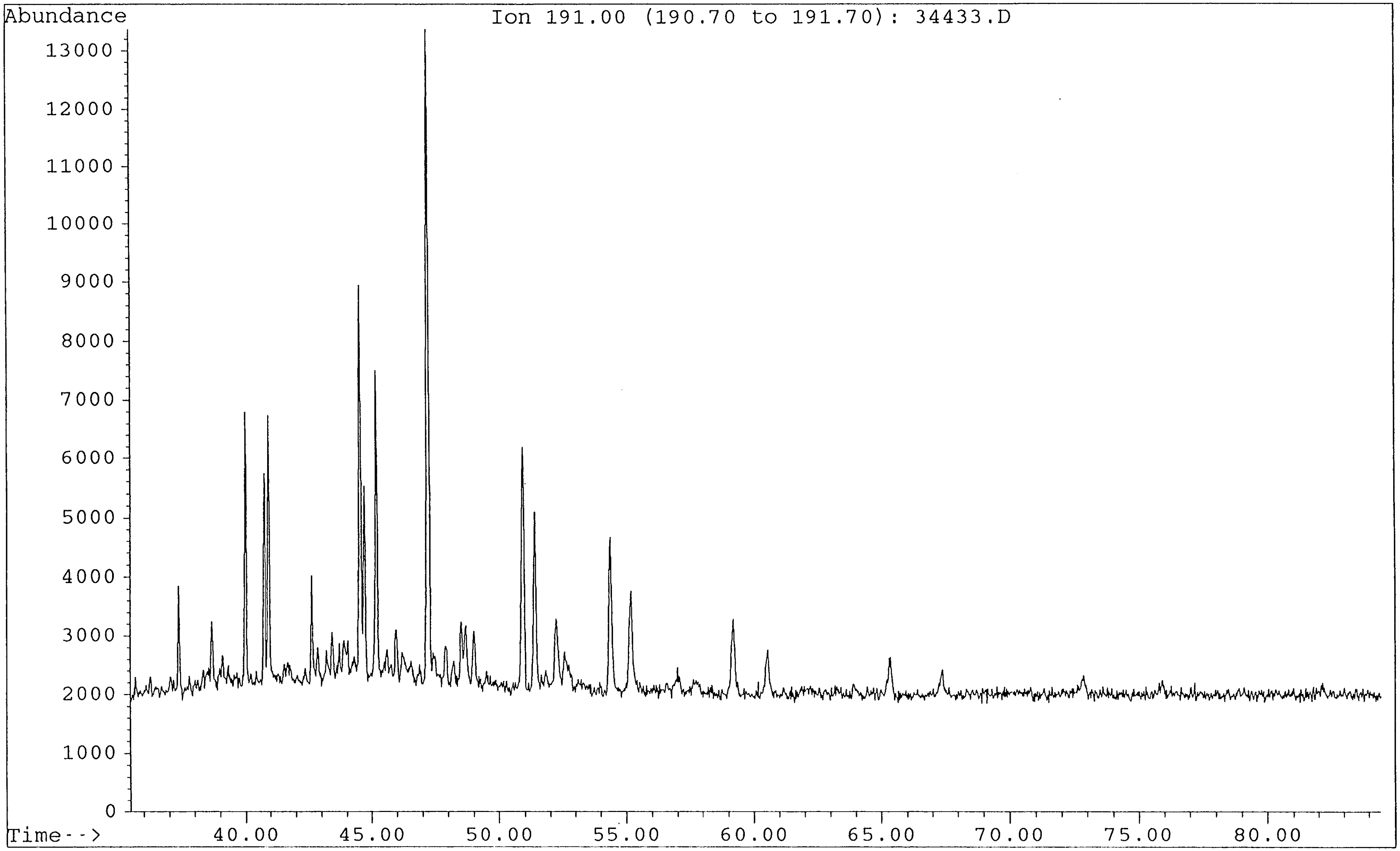

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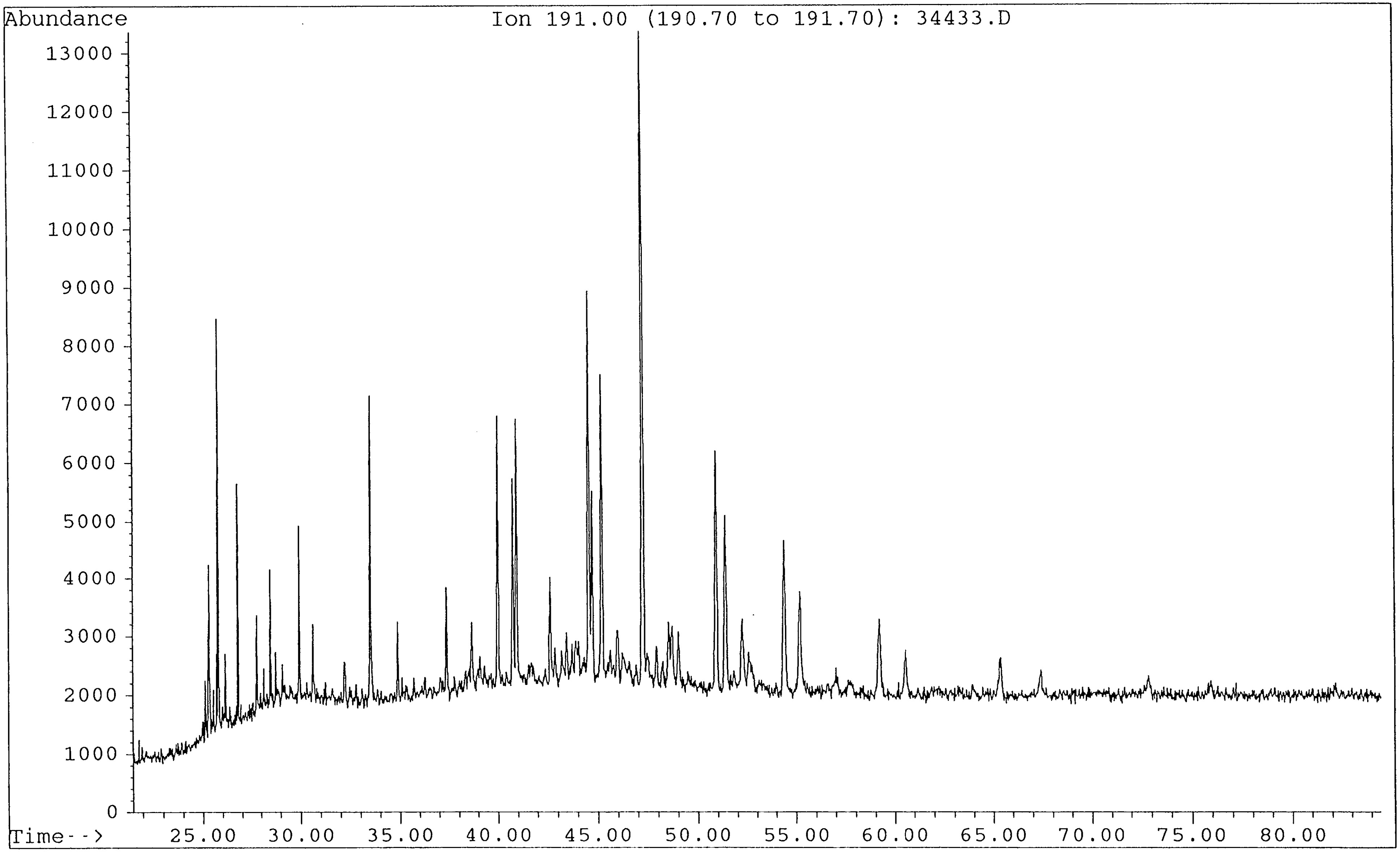
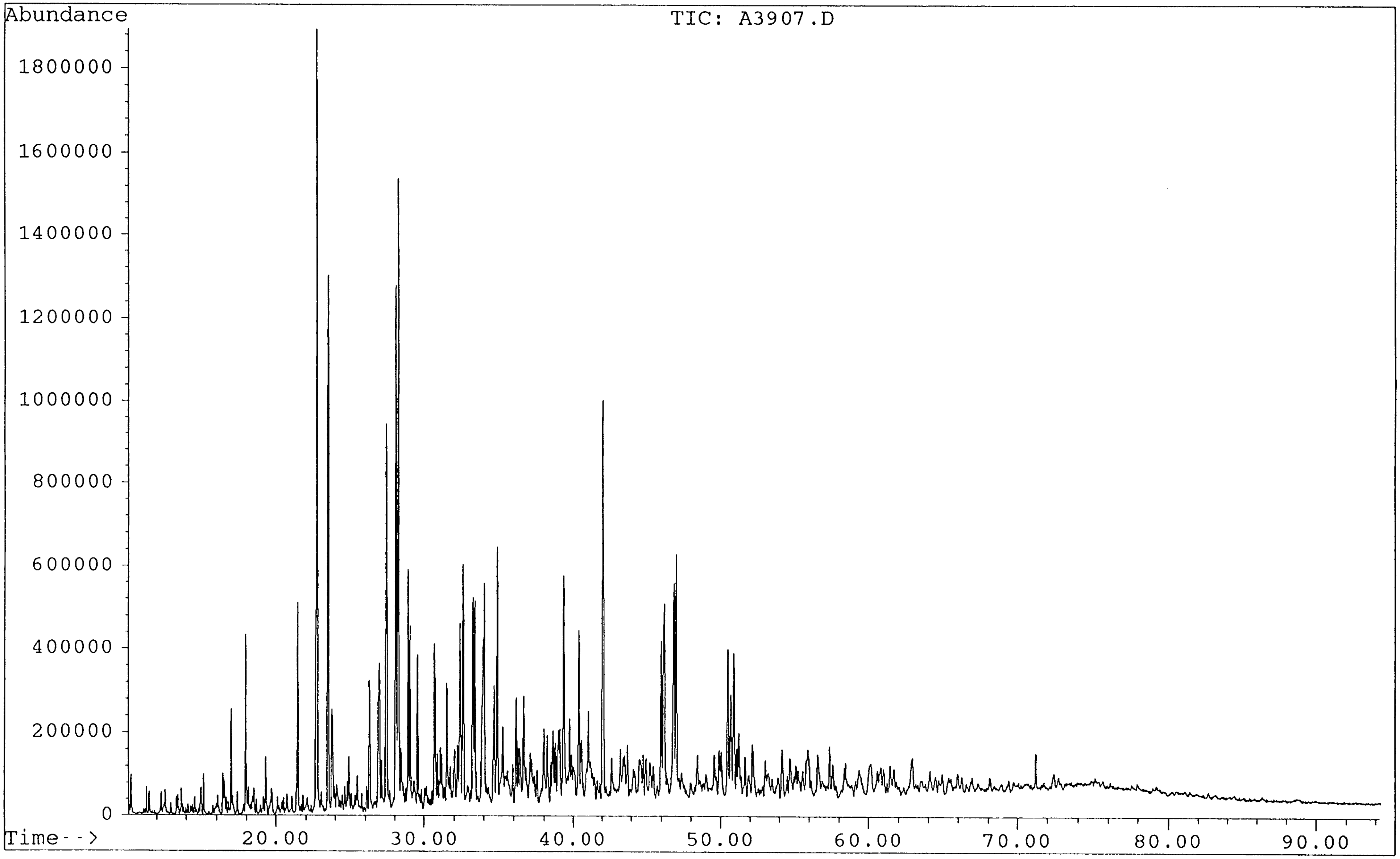
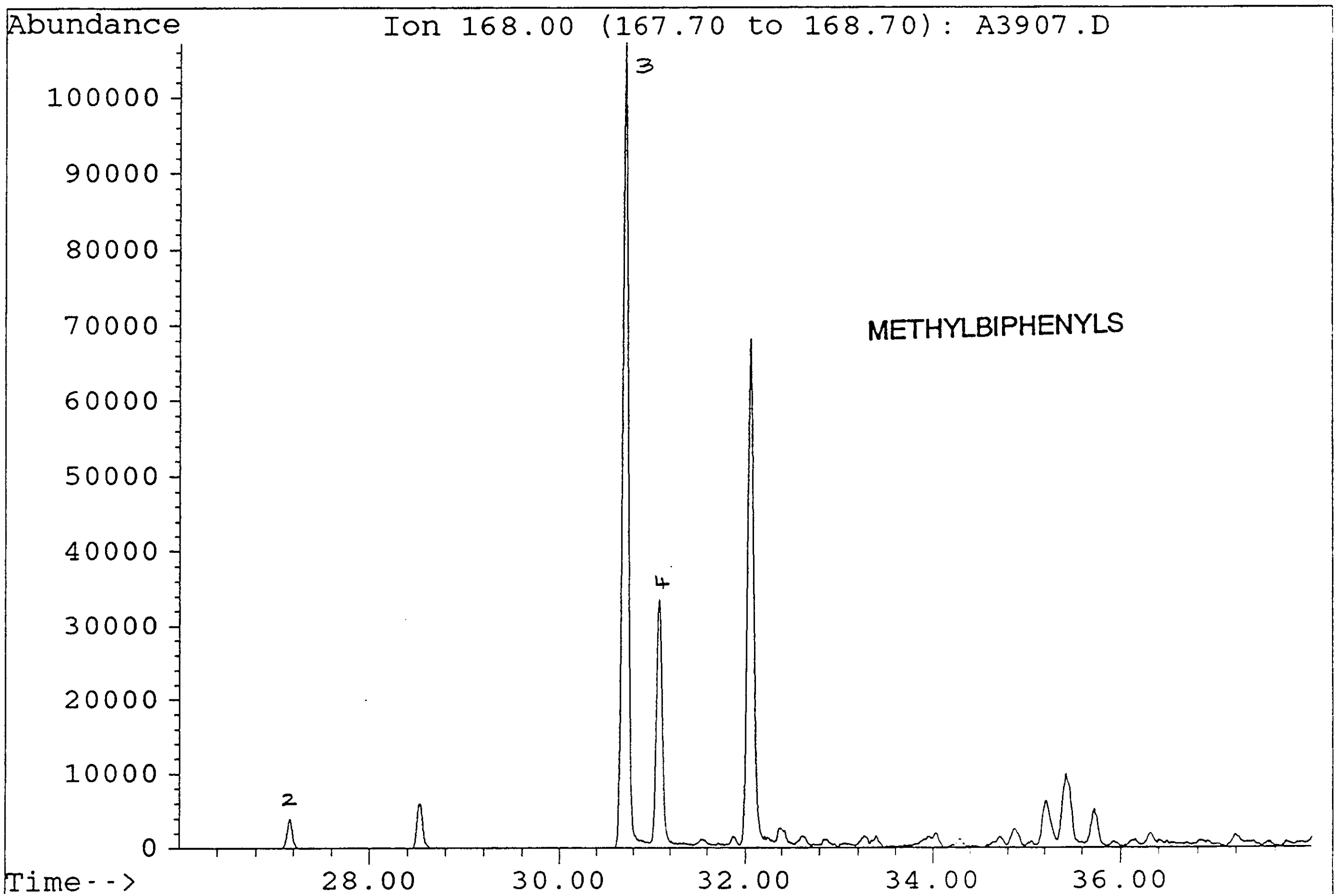


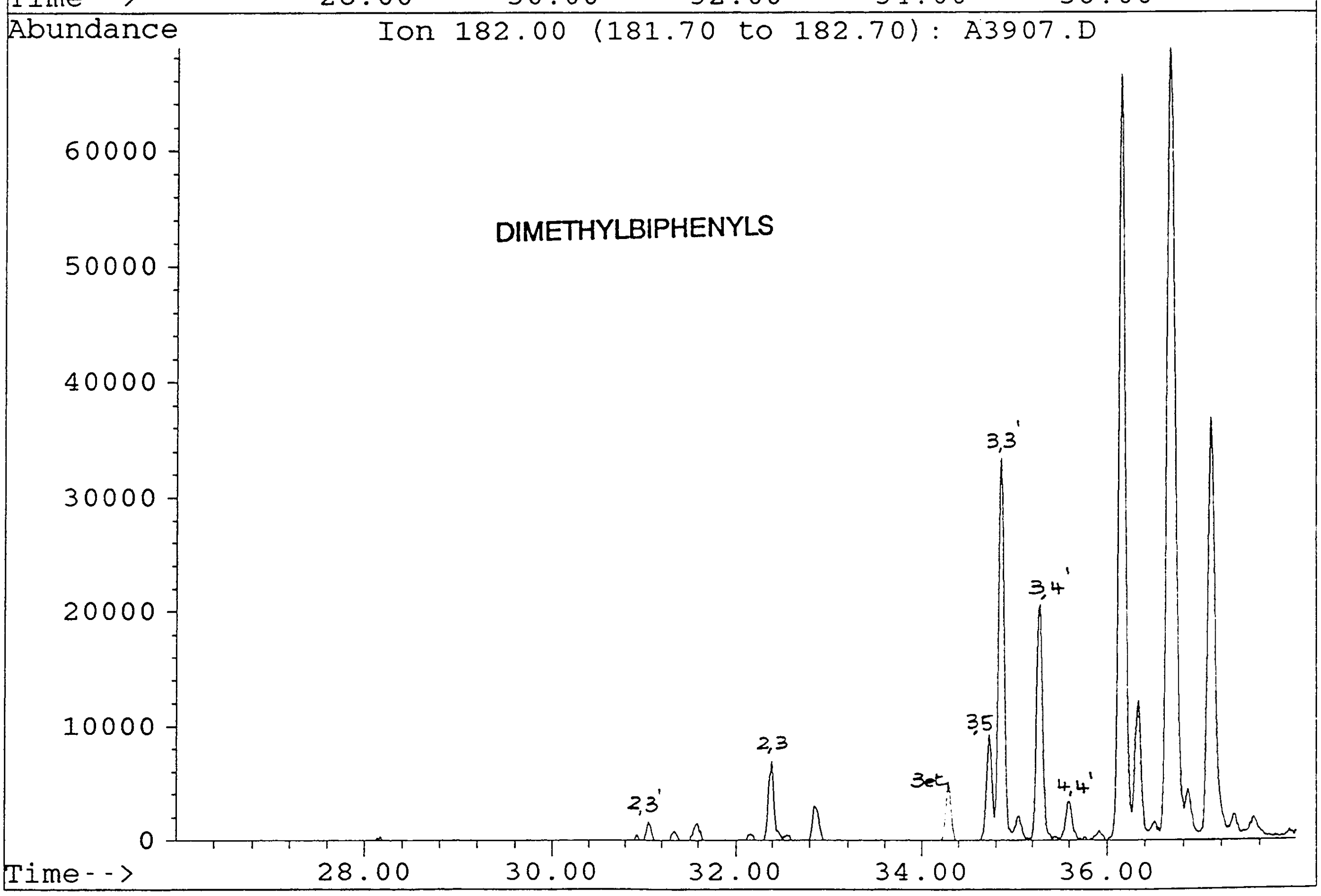
File : A3907.D
Sample : DIGBY#1, 1903.2m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.

FIGURE 8-2



File : A3907.D
Sample : DIGBY#1, 1903.2m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.





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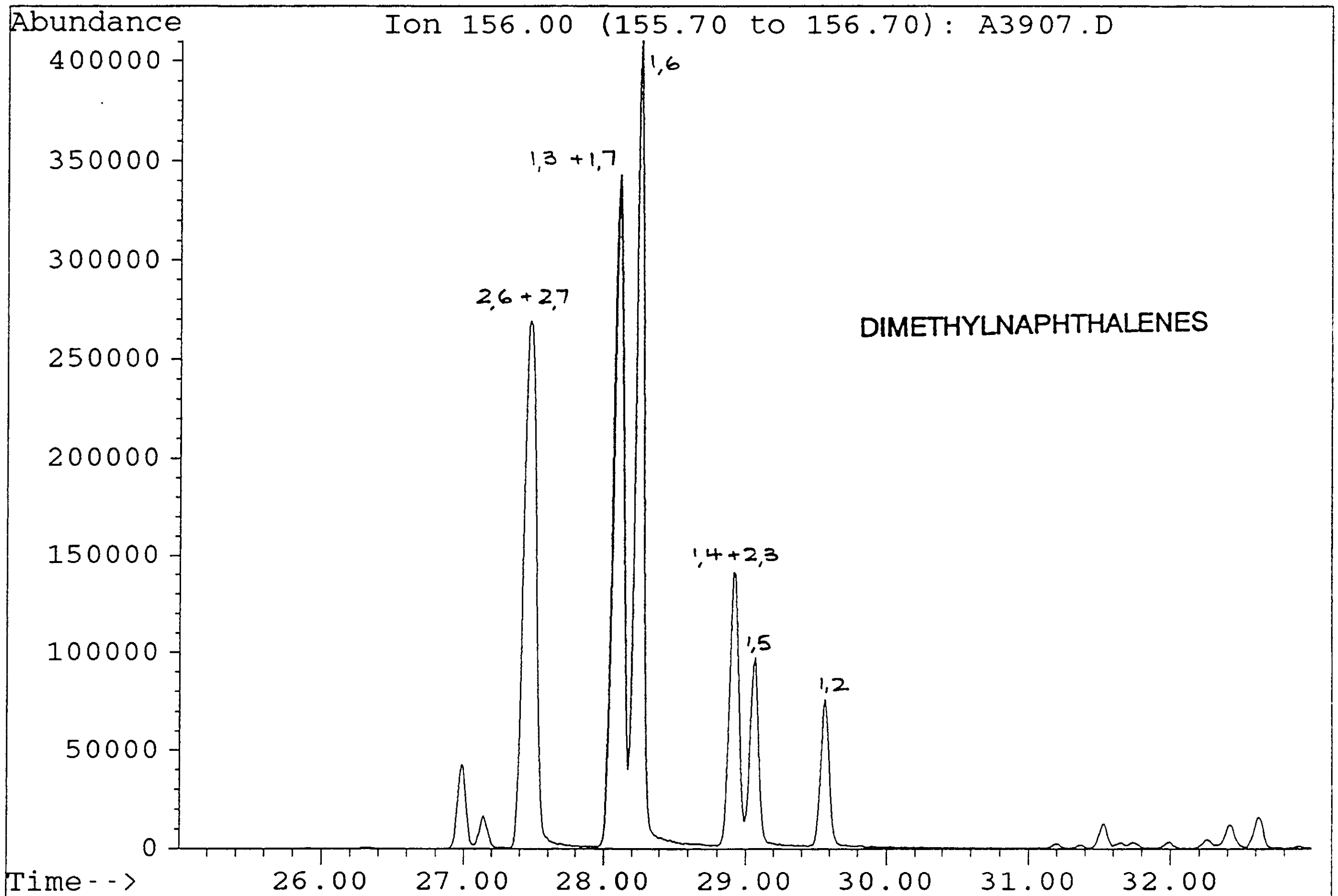
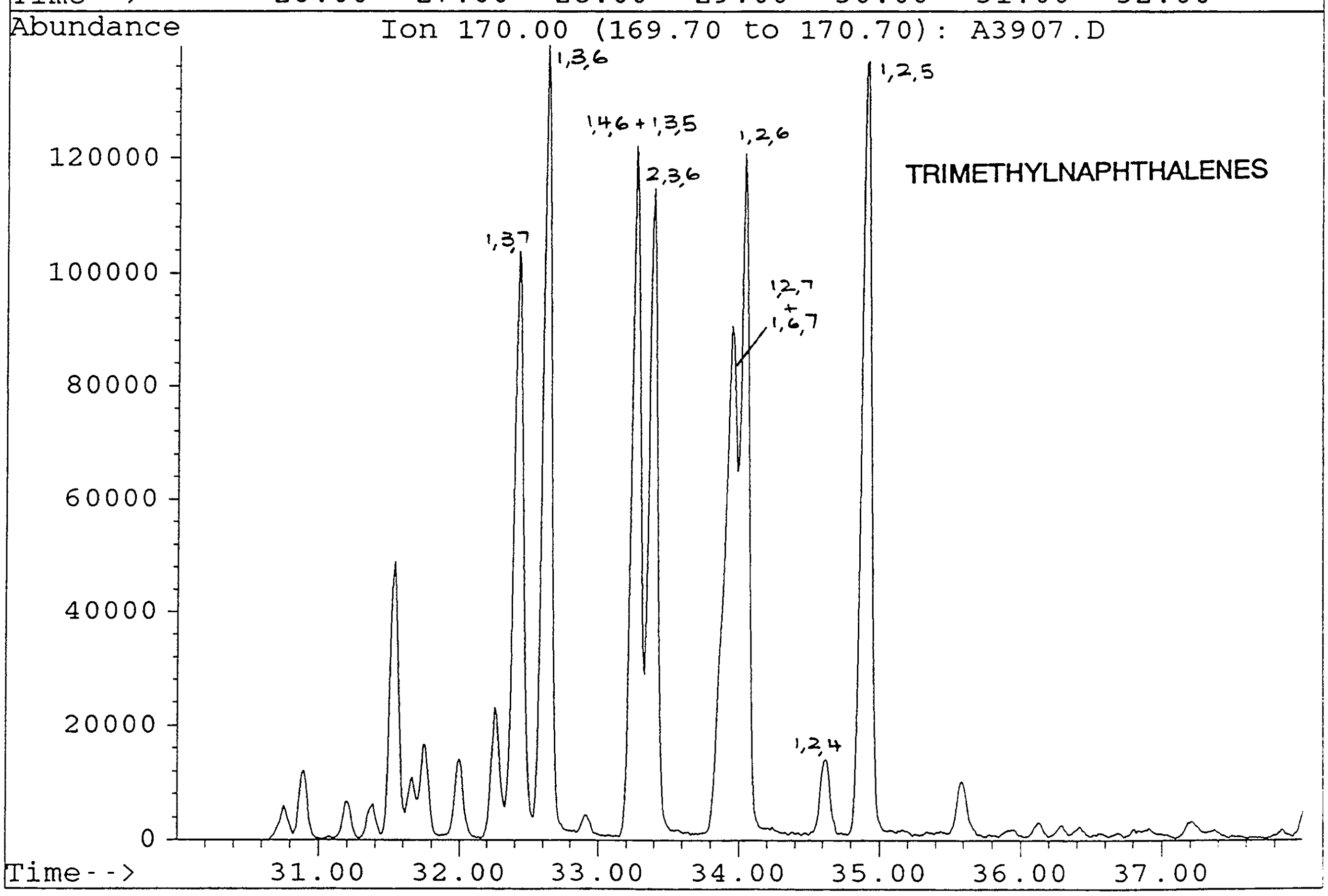
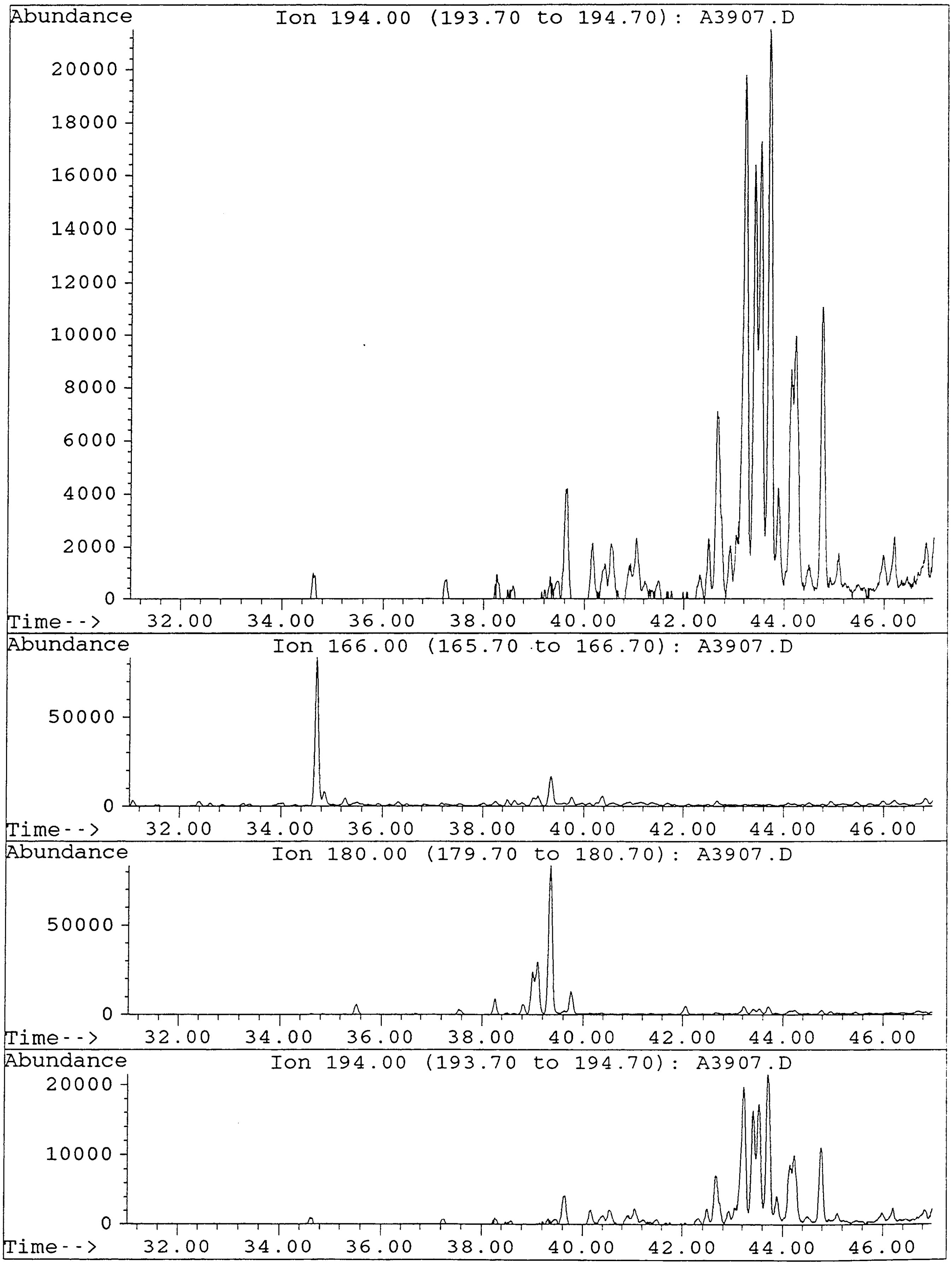


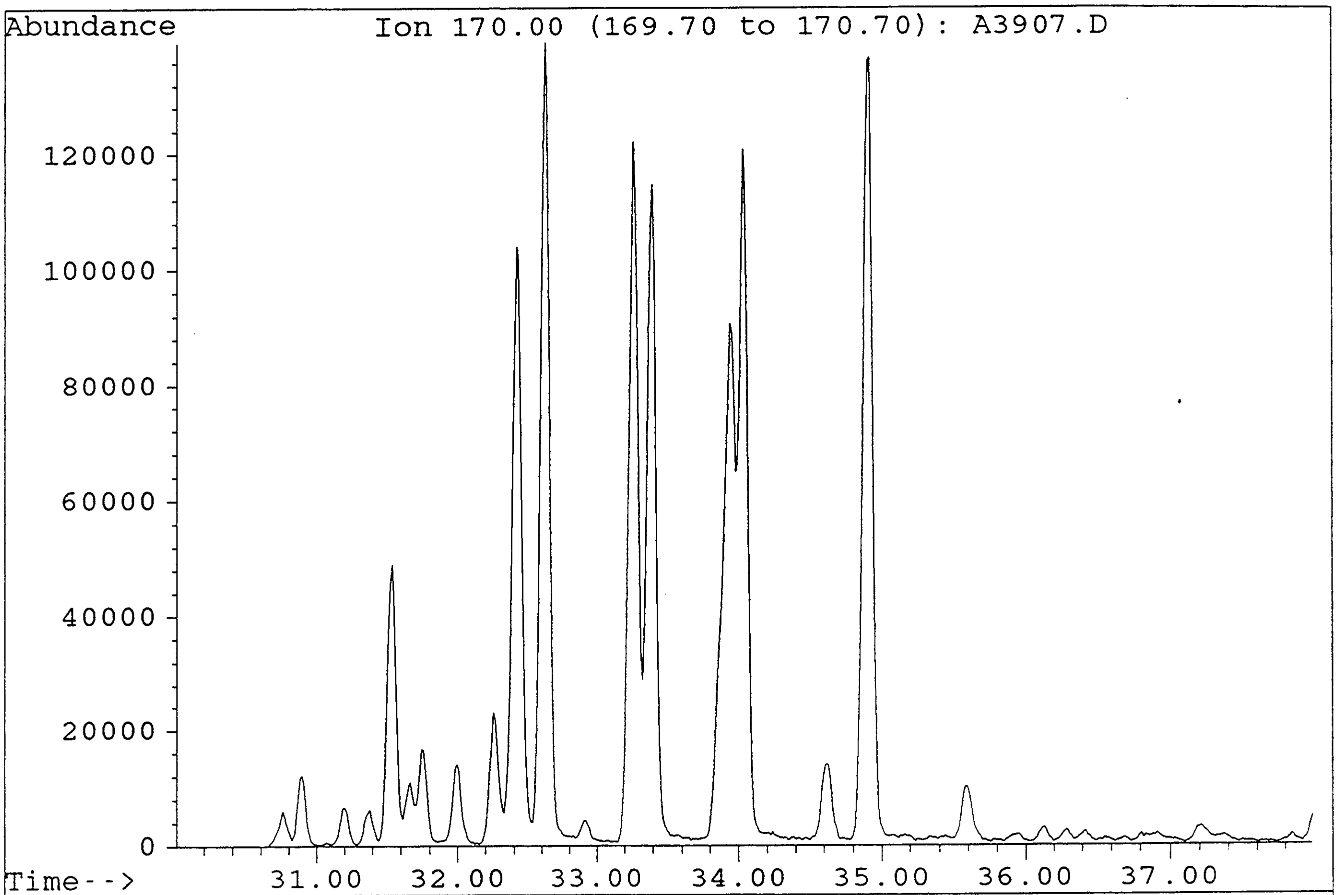


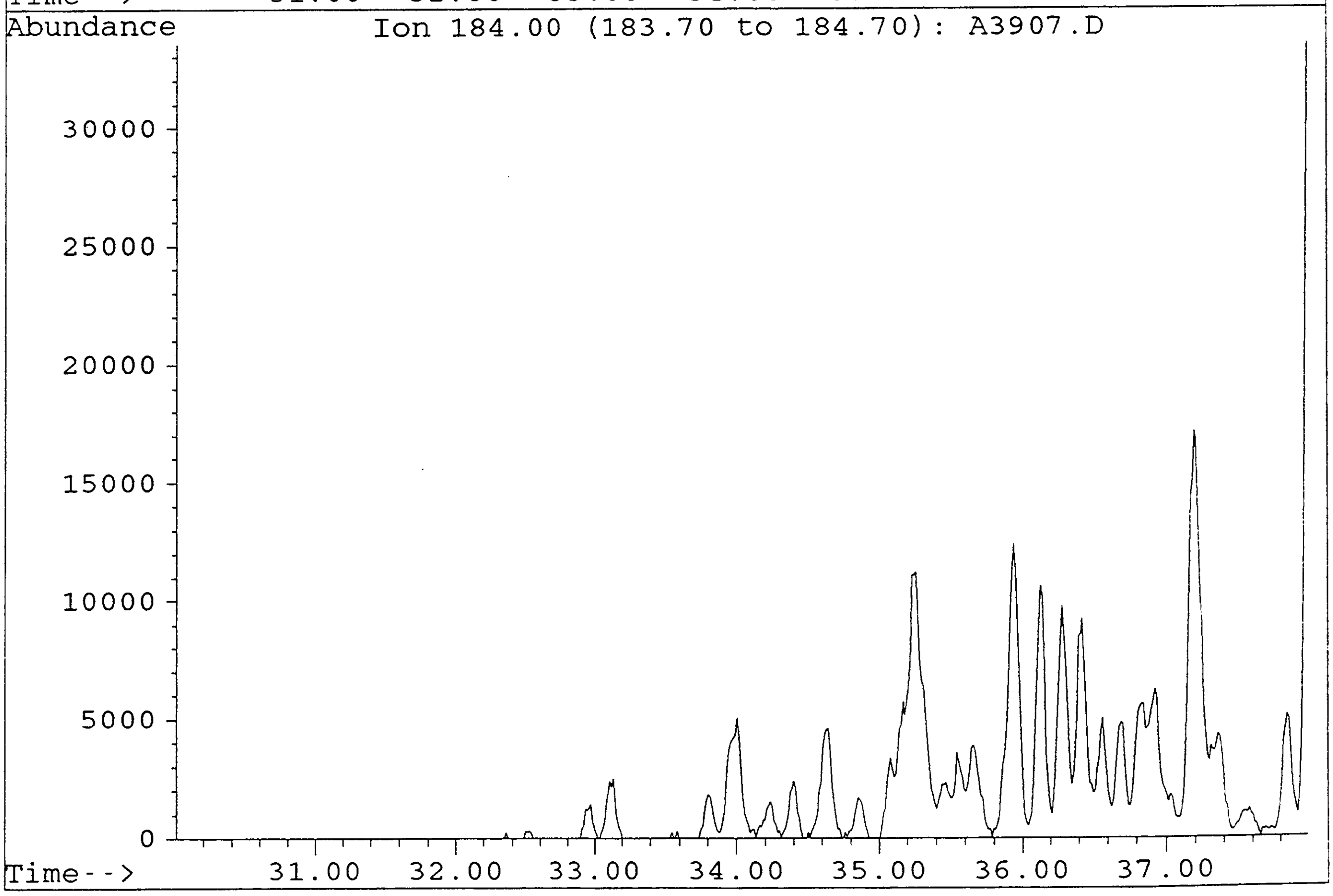
File : A3907.D
Sample : DIGBY#1, 1903.2m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.

FLUORENES



File : A3907.D
Sample : DIGBY#1, 1903.2m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.





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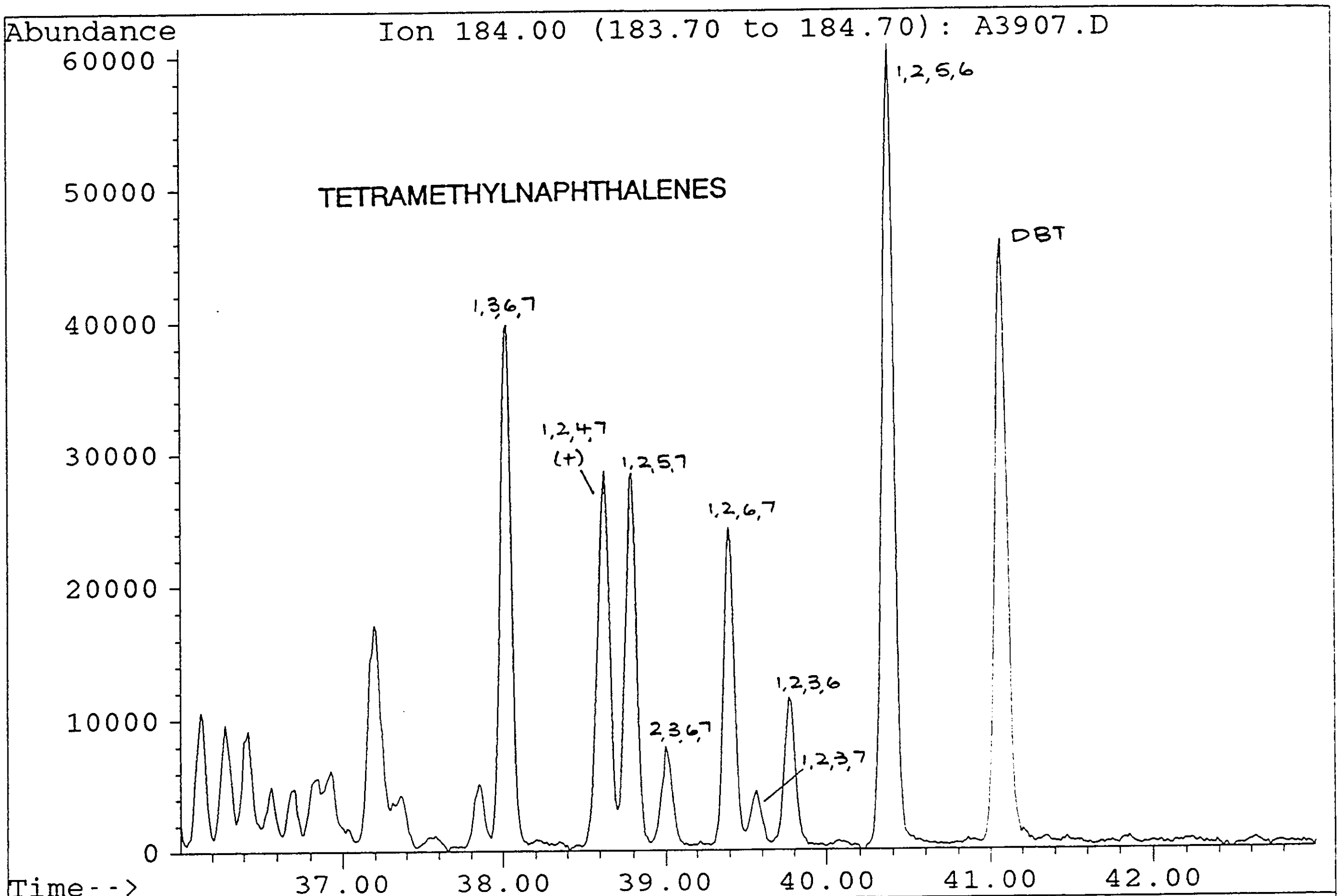

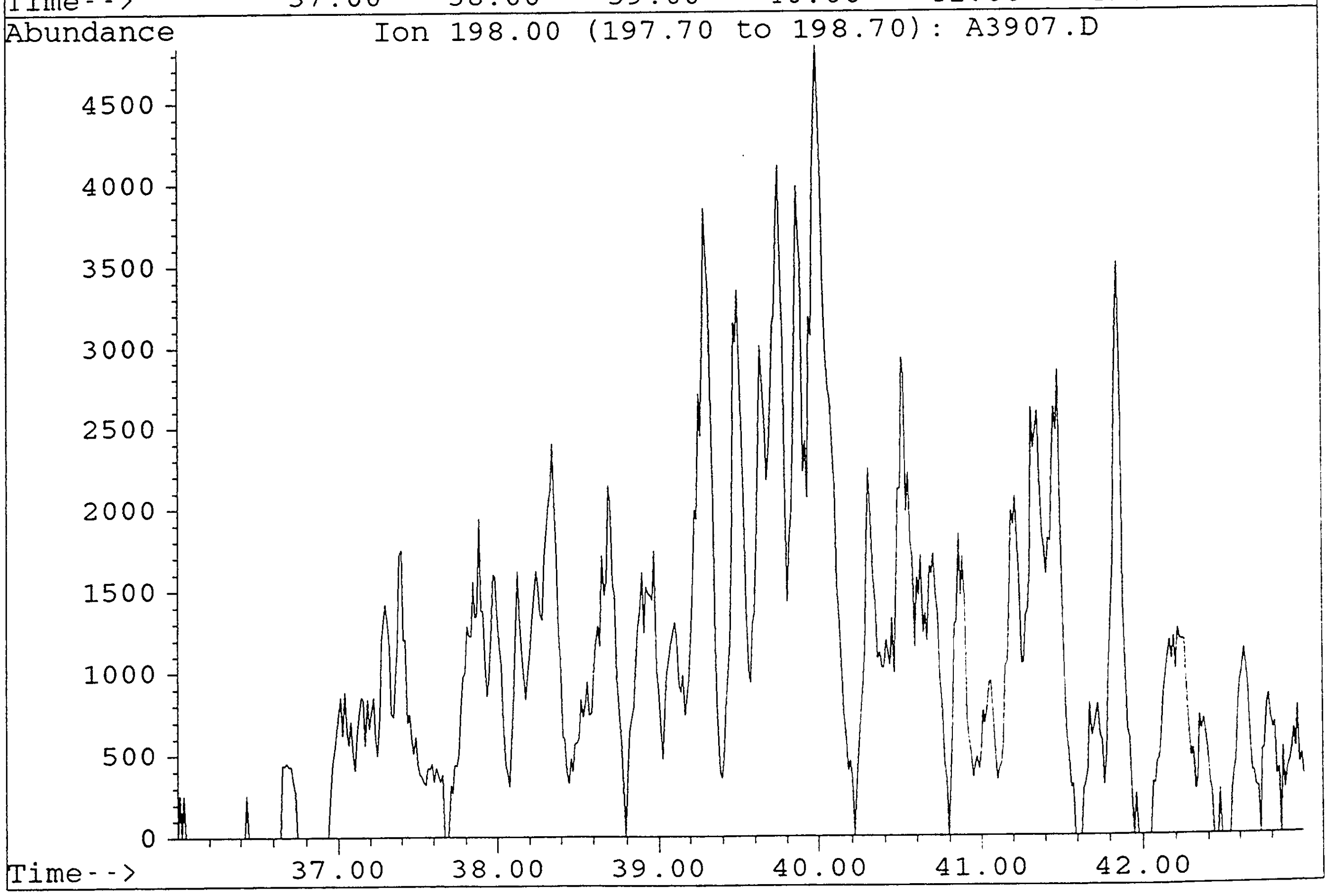

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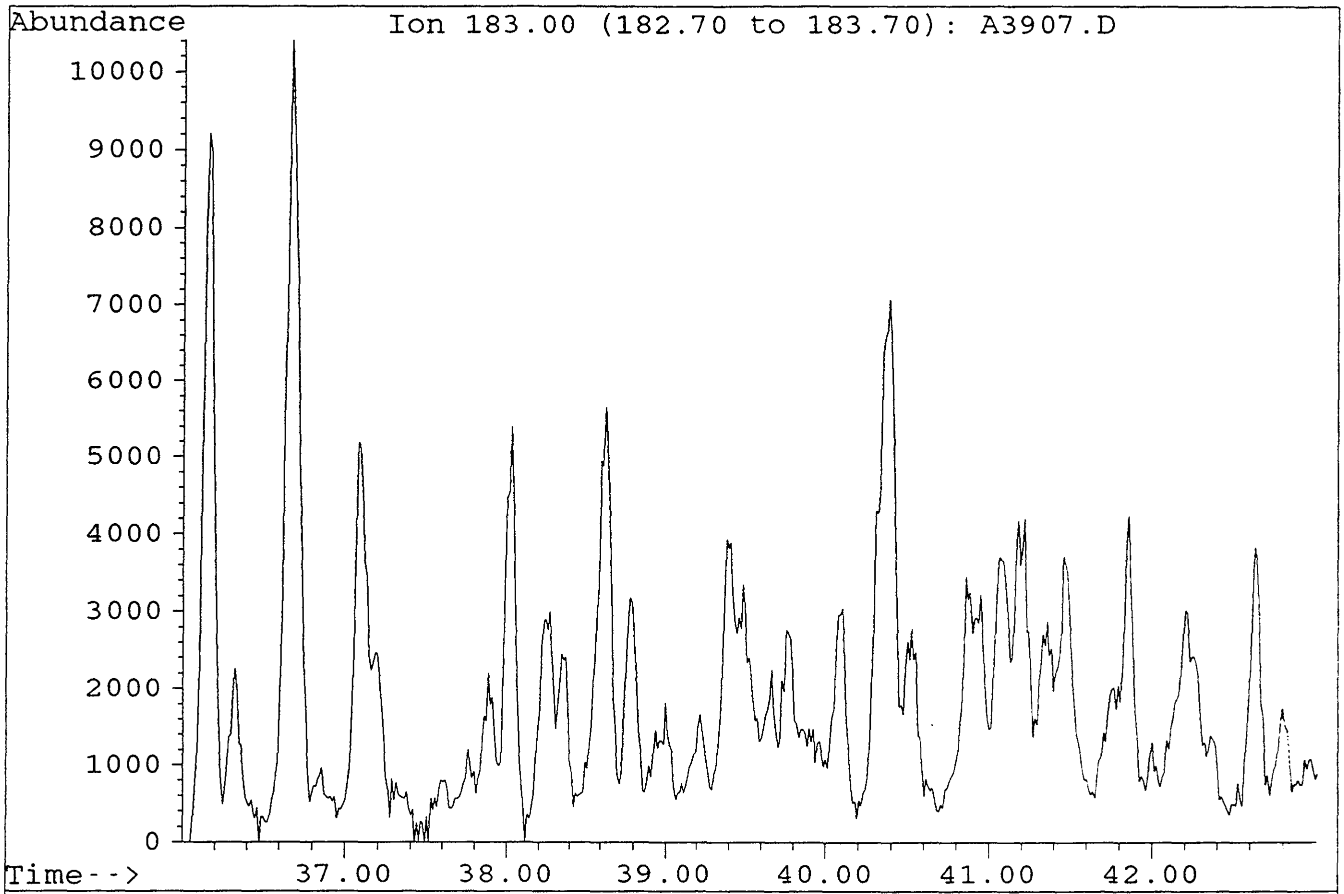

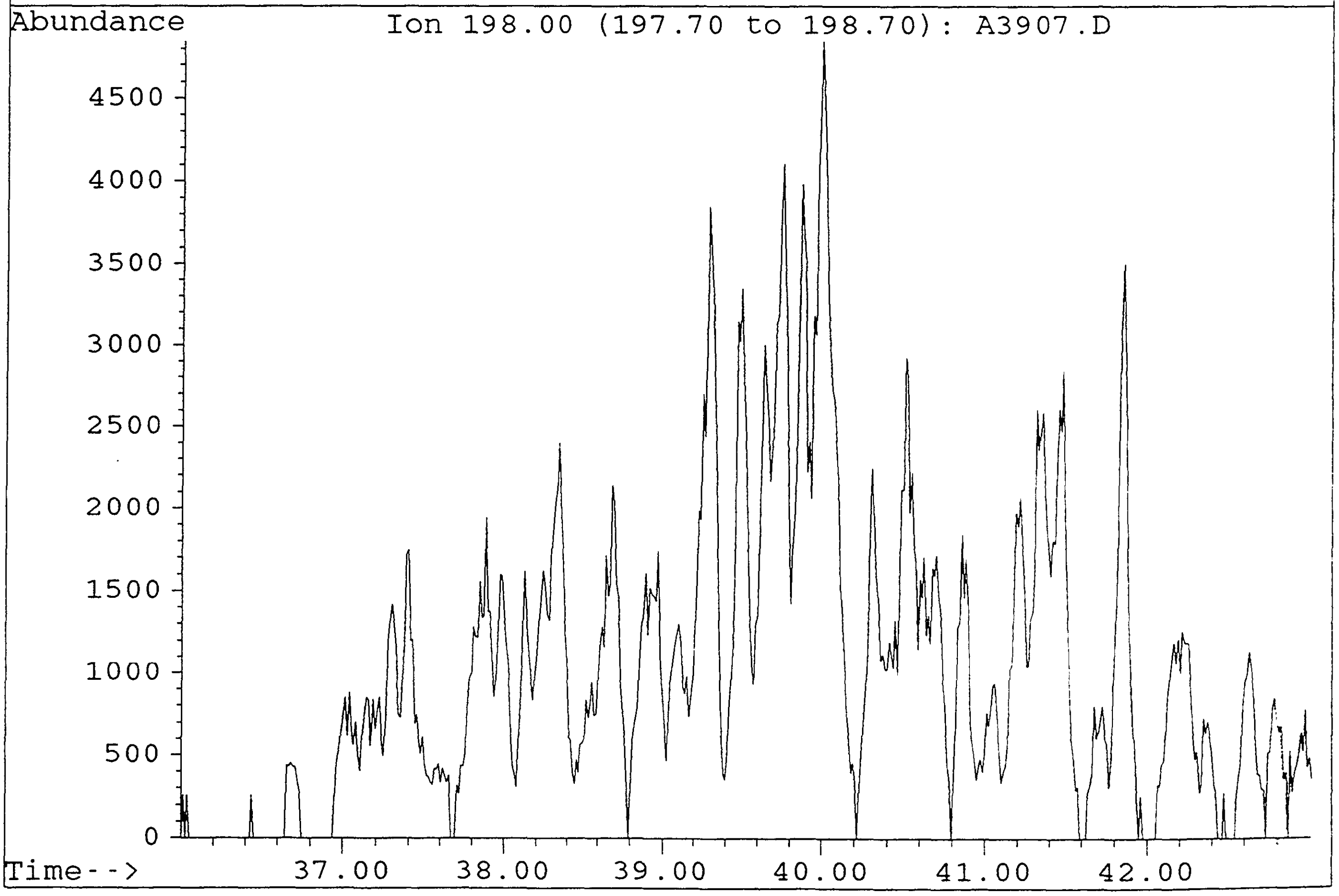

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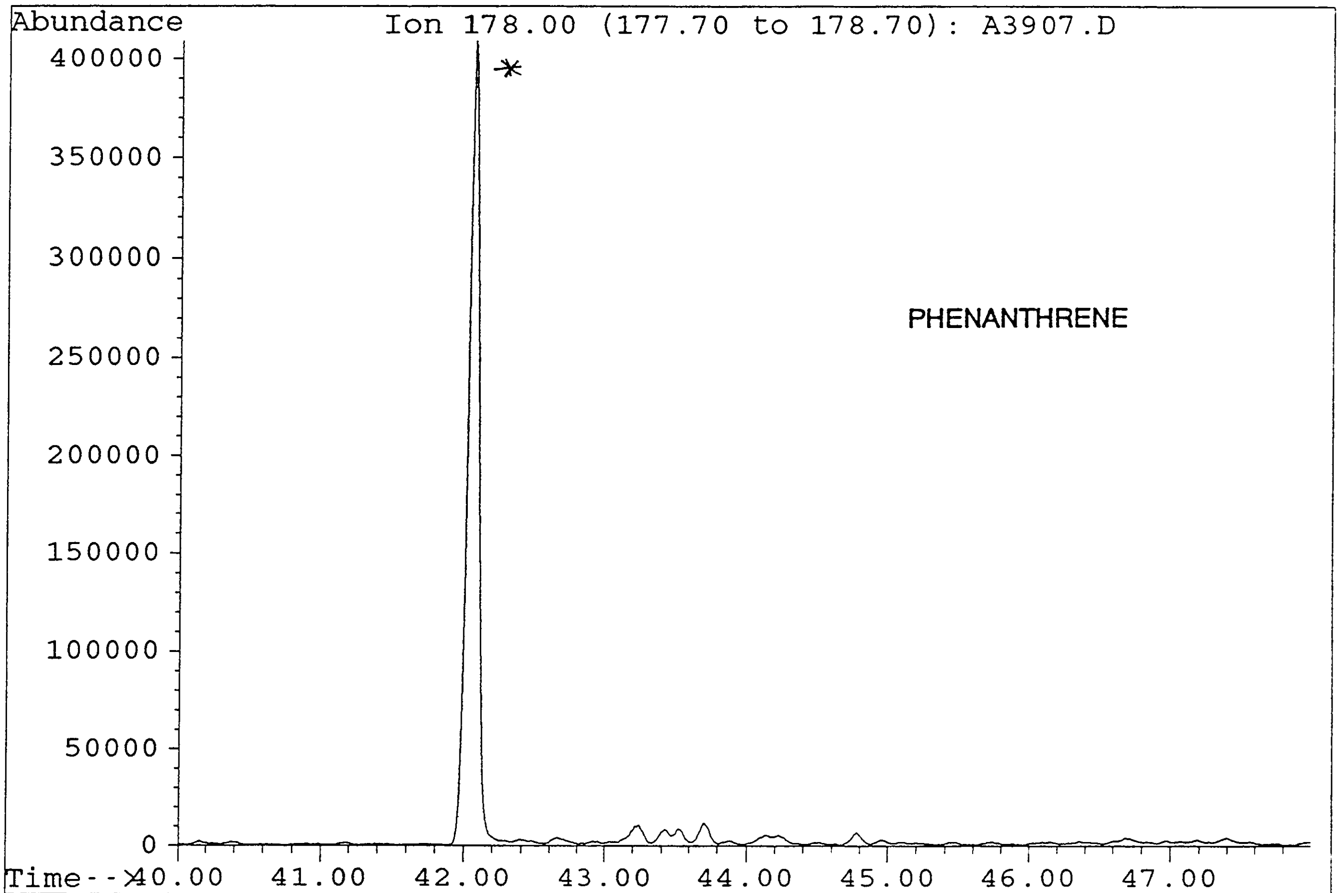

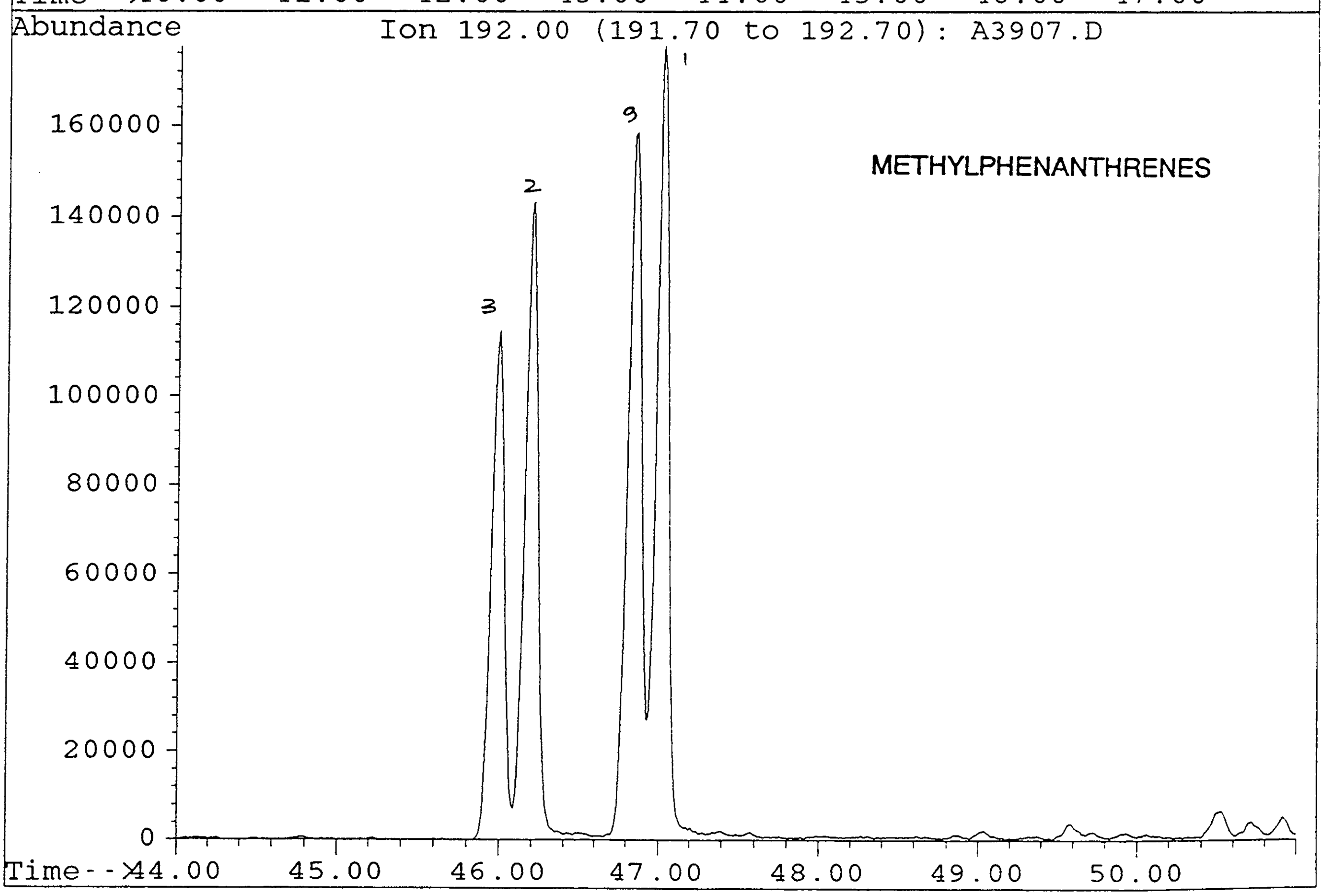

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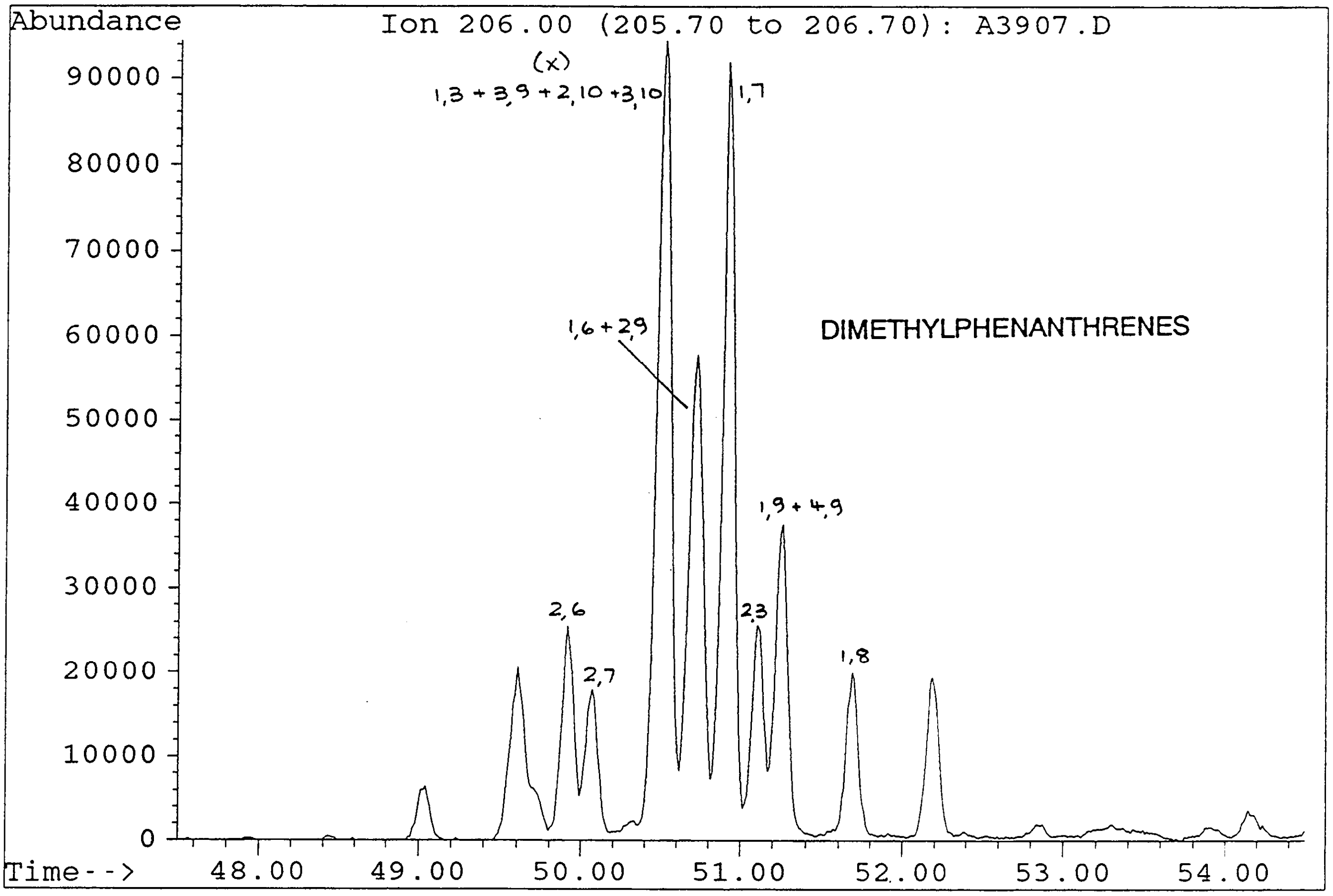

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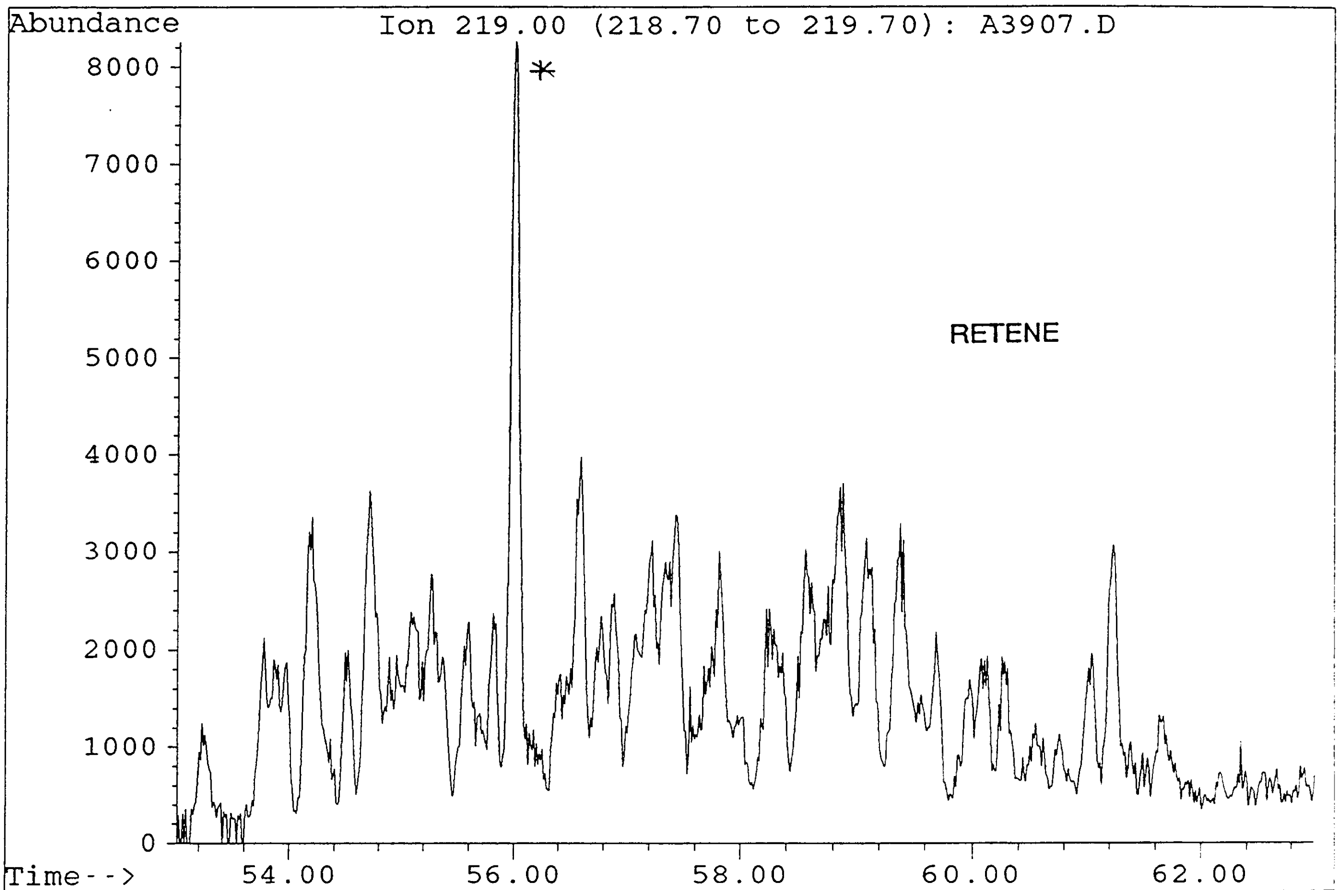


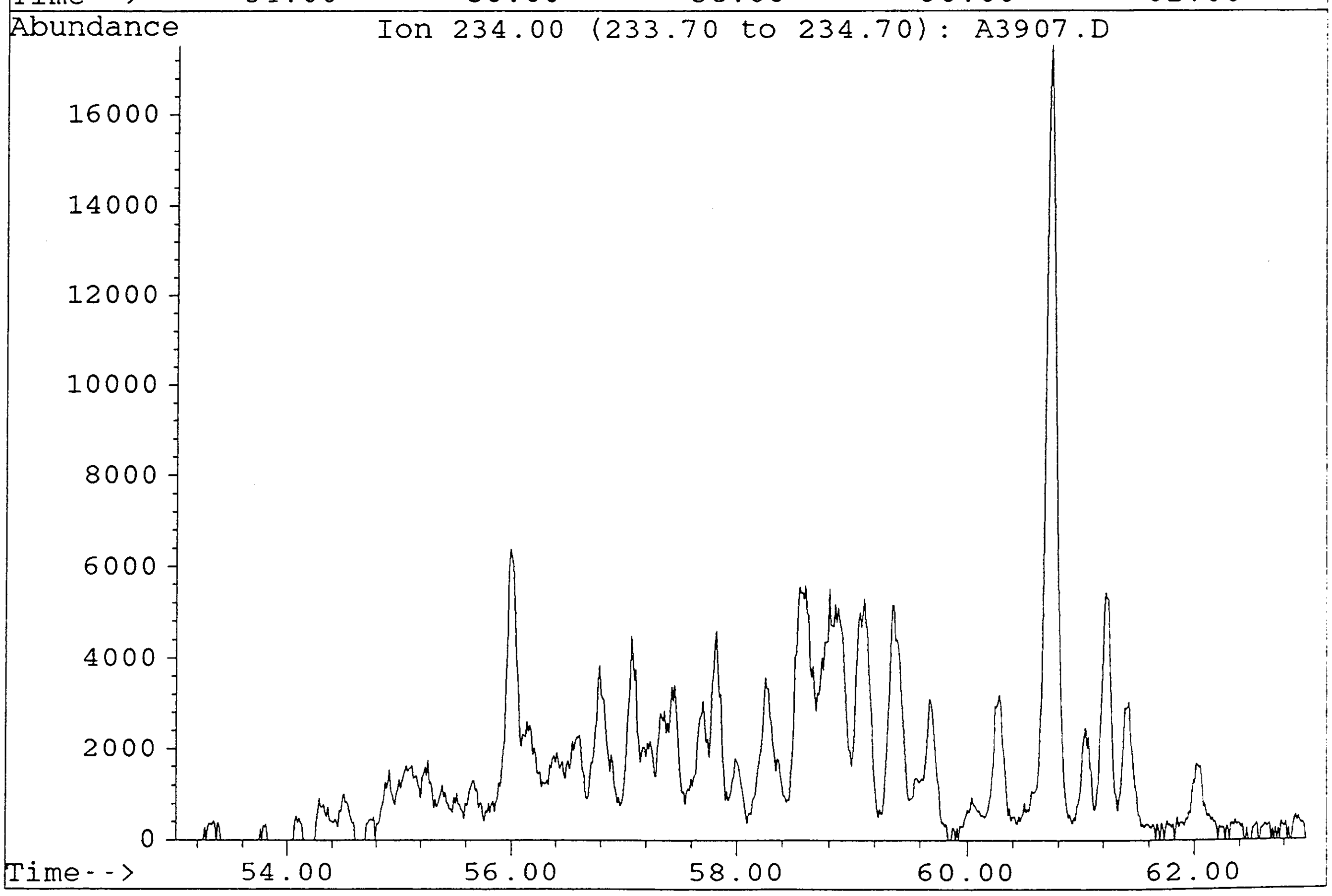


TABLE 9-3

SELECTED PARAMETERS FROM GC/MS ANALYSIS

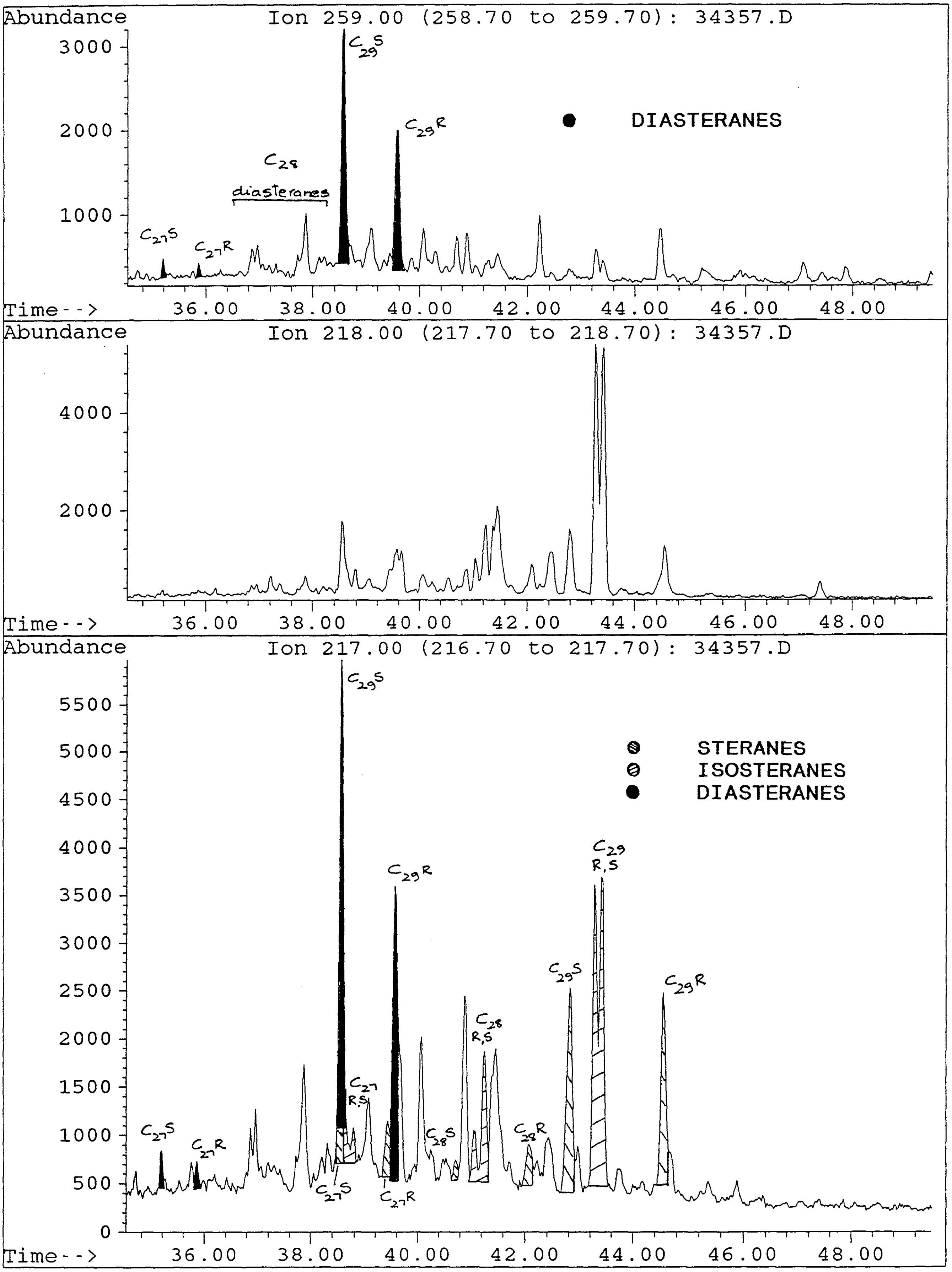
DIGBY 1, 1940.8m, SWC

	Parameter	Ion(s)	Value
1.	18 α (H)- hopane/17 α (H)-hopane (Ts/Tm)	191	1.03
2.	C30 hopane/C30 moretane	191	11.08
3.	C31 22S hopane/C31 22R hopane	191	1.32
4.	C32 22S hopane/C32 22R hopane	191	1.37
5.	C29 20S $\alpha\alpha\alpha$ sterane/C29 20R $\alpha\alpha\alpha$ sterane	217	1.06
6.	C29 $\alpha\alpha\alpha$ steranes (20S / 20S+20R)	217	0.52
7.	C29 $\alpha\beta\beta$ steranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.61
8.	C27/C29 diasteranes	259	0.09
9.	C27/C29 steranes	217	0.29
10.	18 α (H)-oleanane/C30 hopane	191	nd
11.	C29 diasteranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.76
12.	C30 (hopane + moretane) / C29 (steranes + diasteranes)	191/217	0.56
13.	C15 drimane/C16 homodrimane	123	0.40
14.	Rearranged drimanes/normal drimanes	123	0.72

nd = not detectable

File : 34357.D
Sample : DIGBY-1 1940.8m B/C
Misc. Info : COL#164. DJ. 10-7-95

FIGURE 6-3



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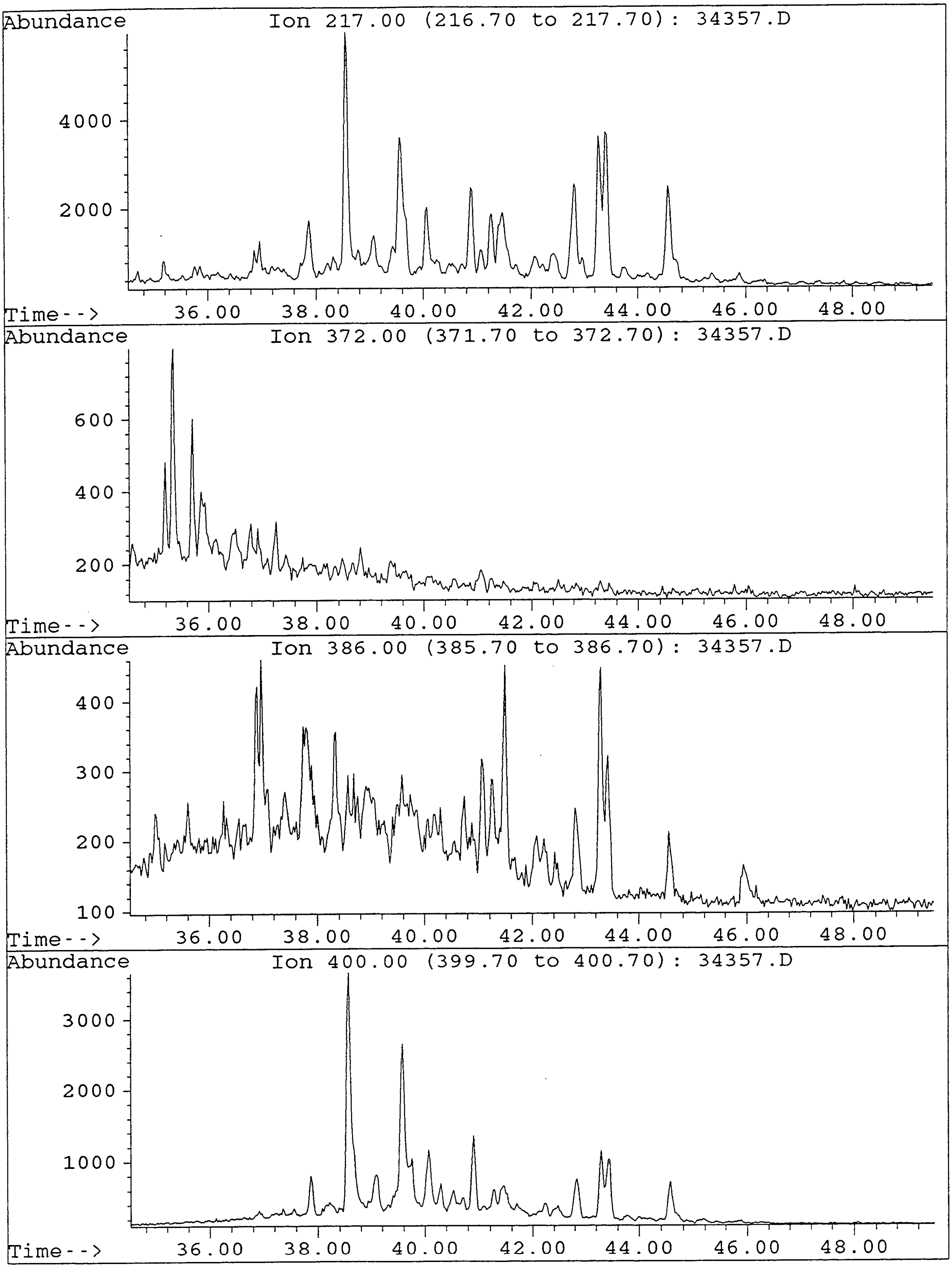
Misc. Info : COL#164. DJ. 10-7-95



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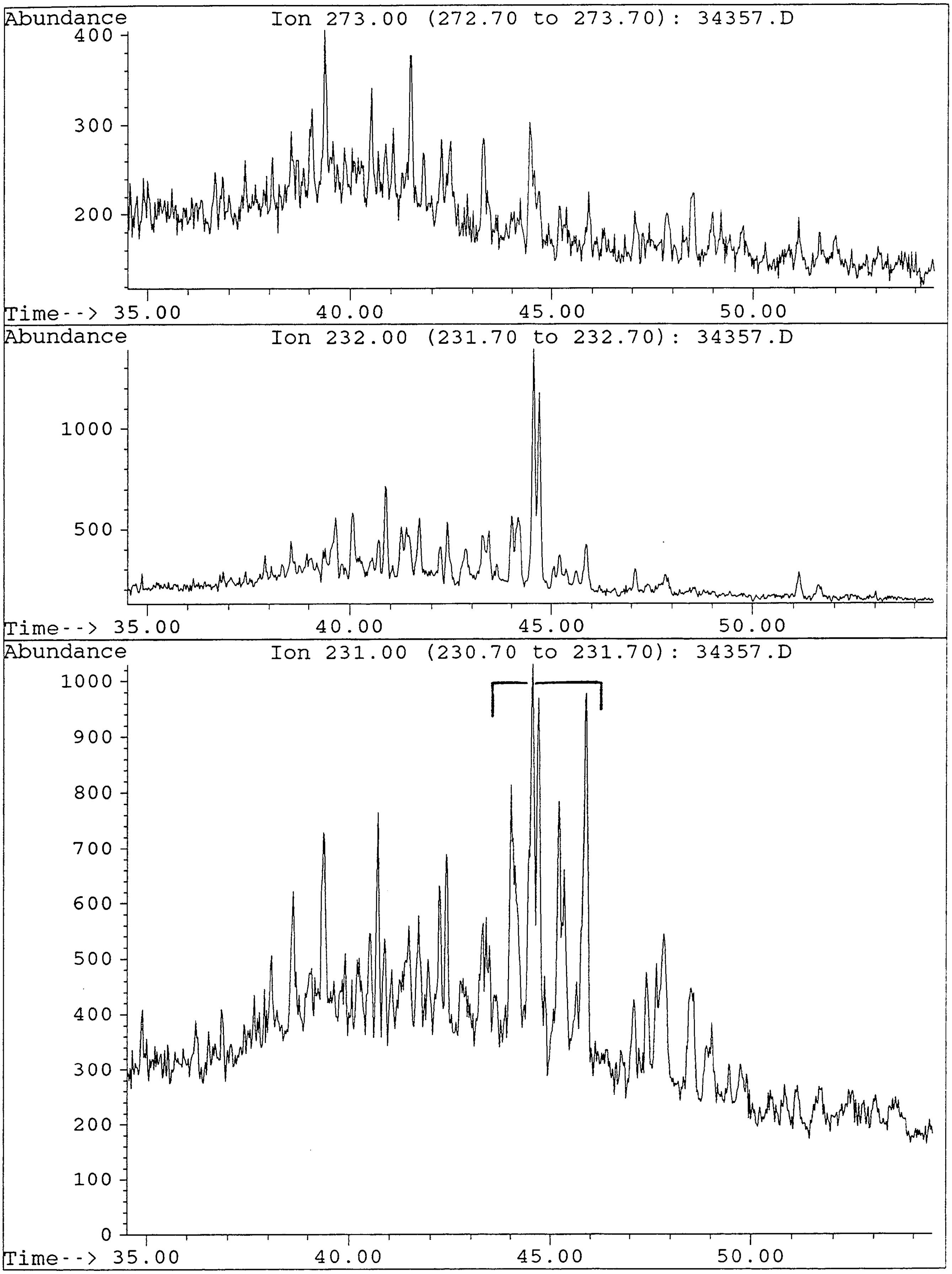

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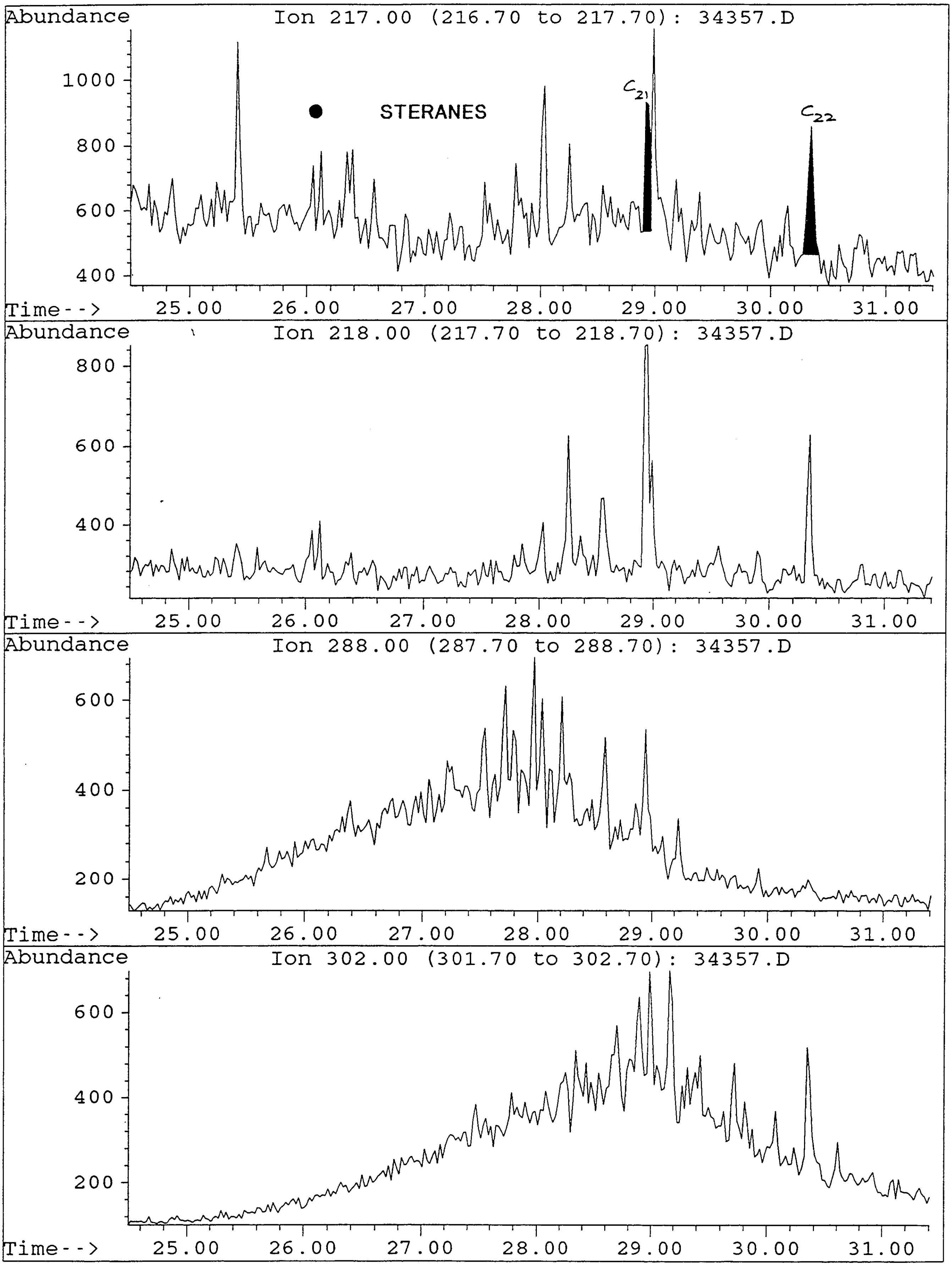

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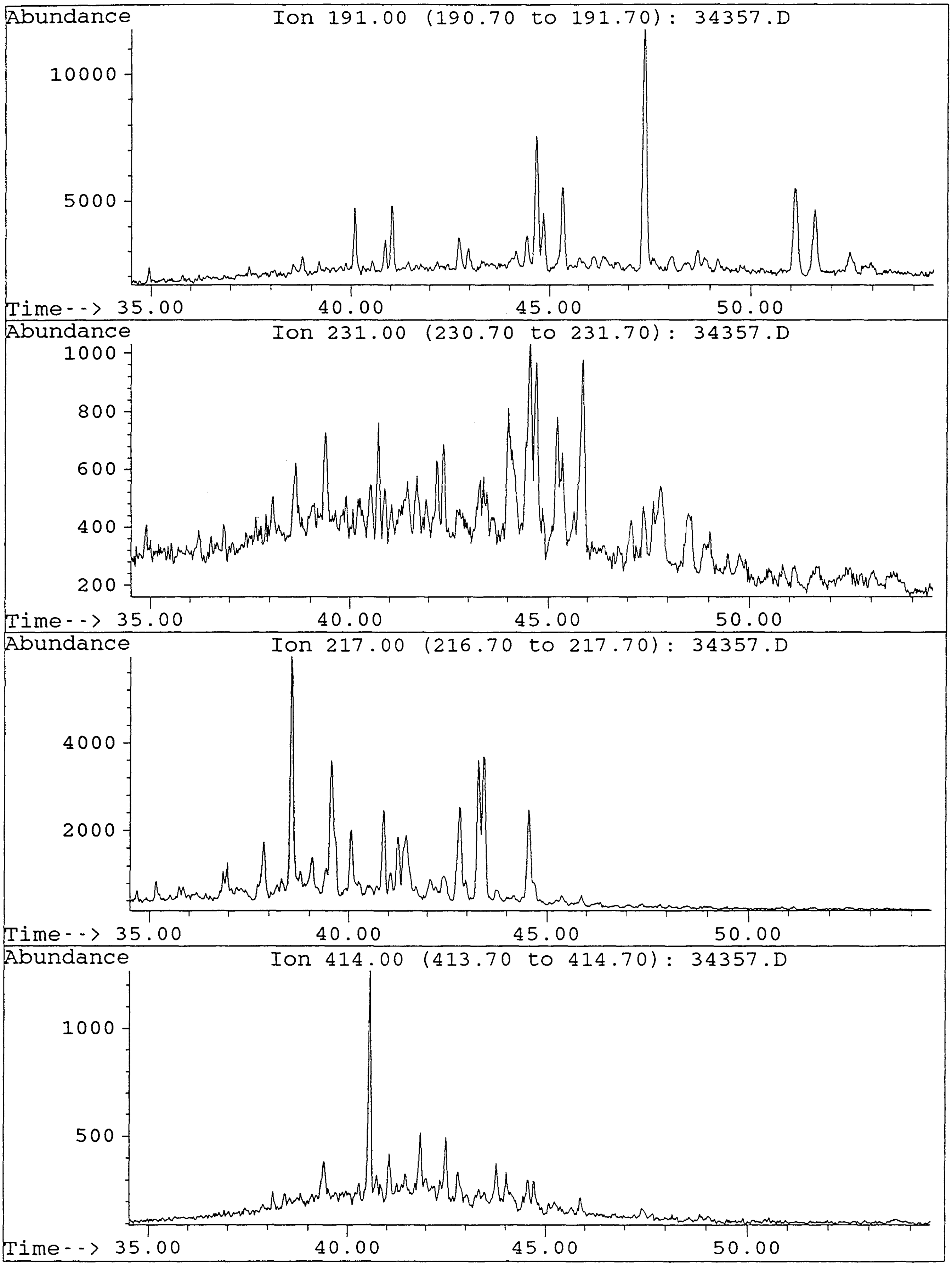

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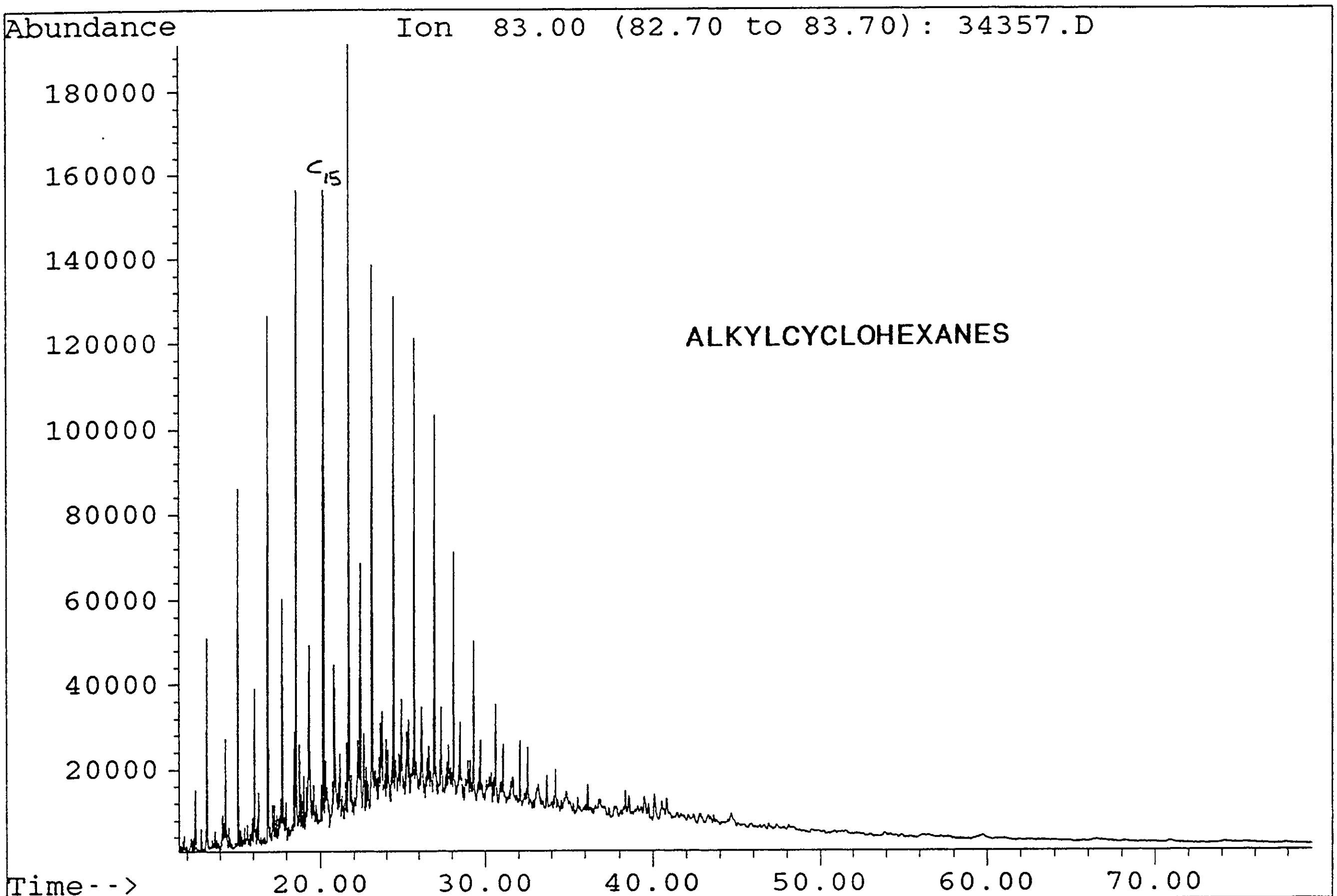

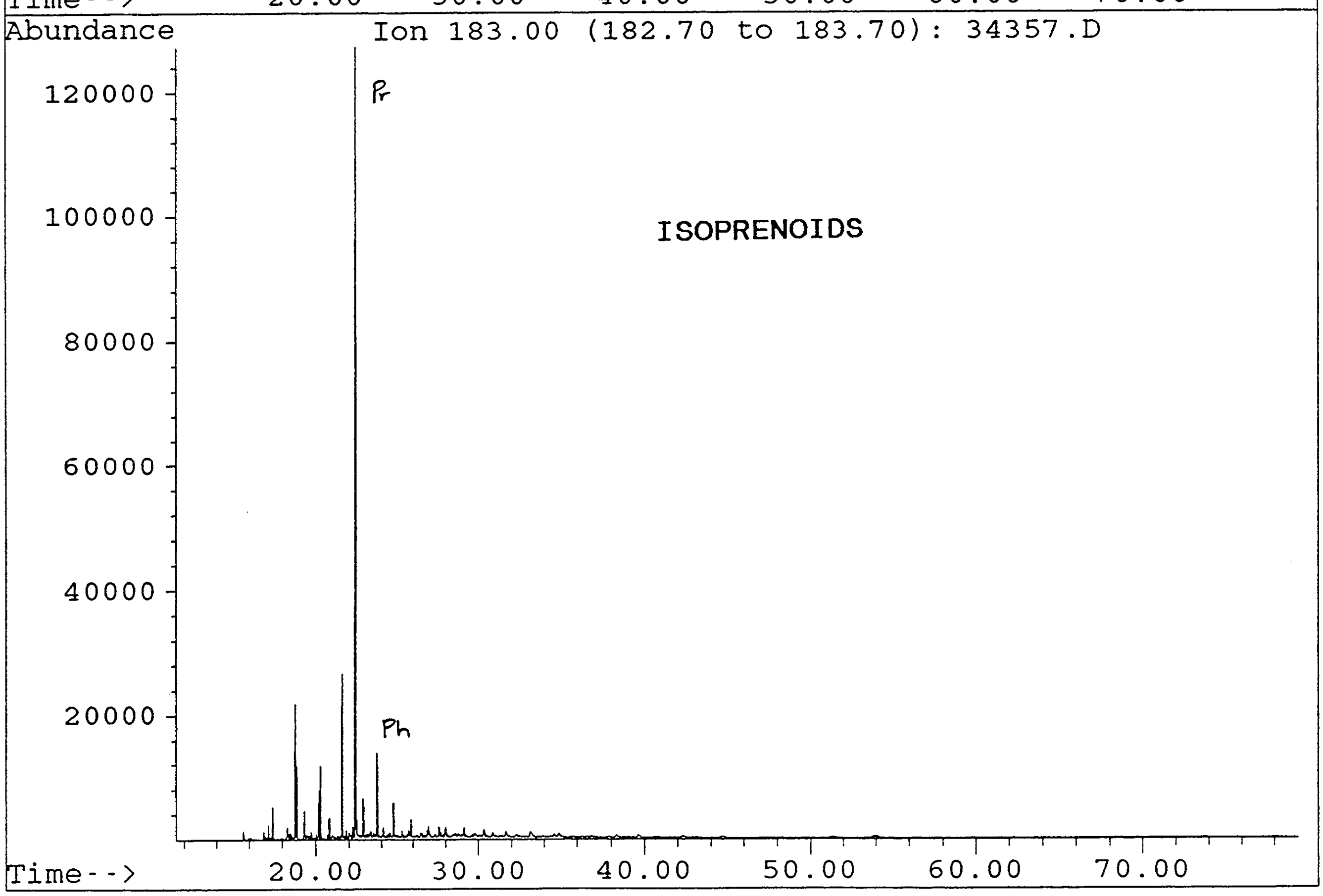

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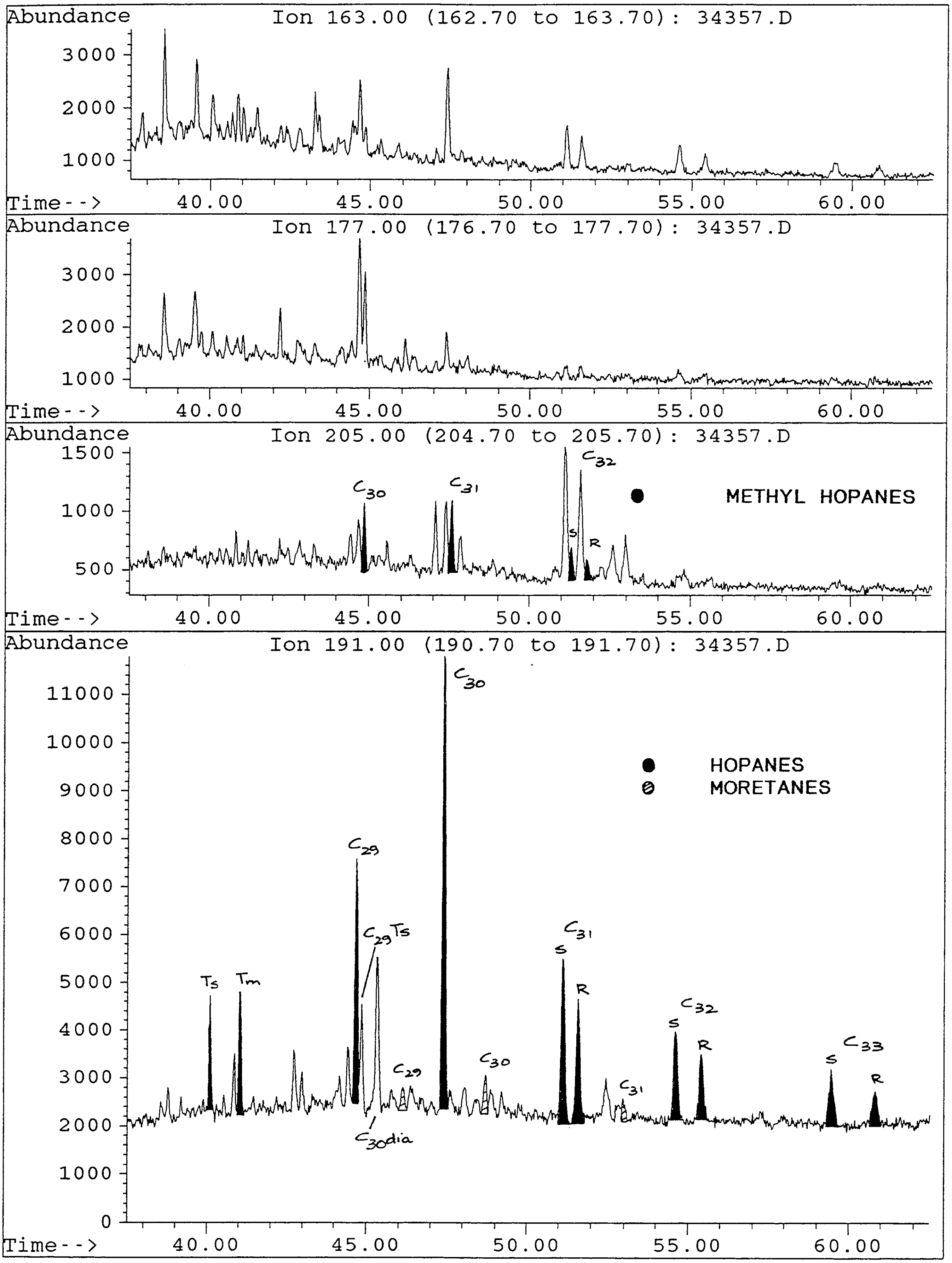

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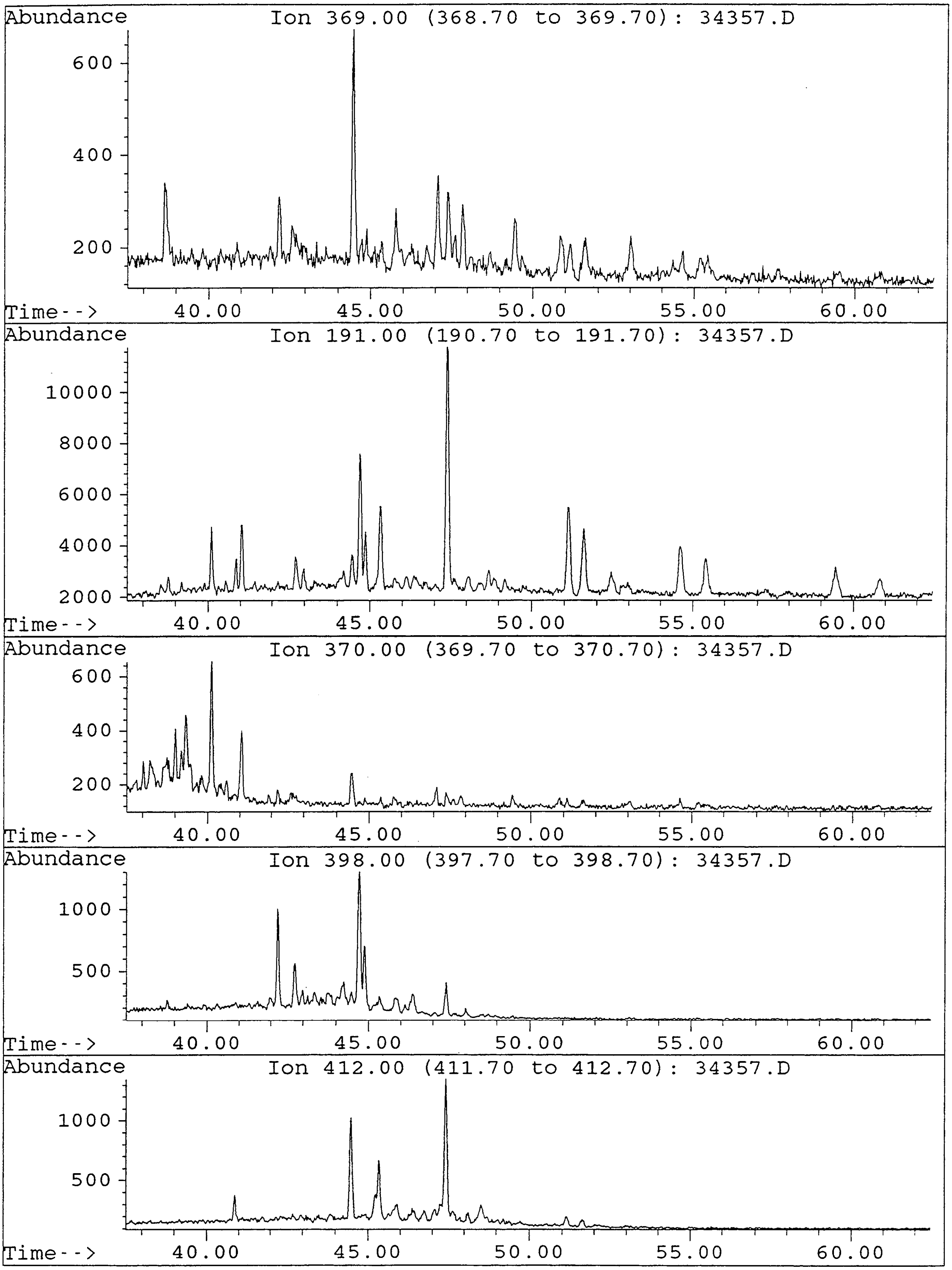

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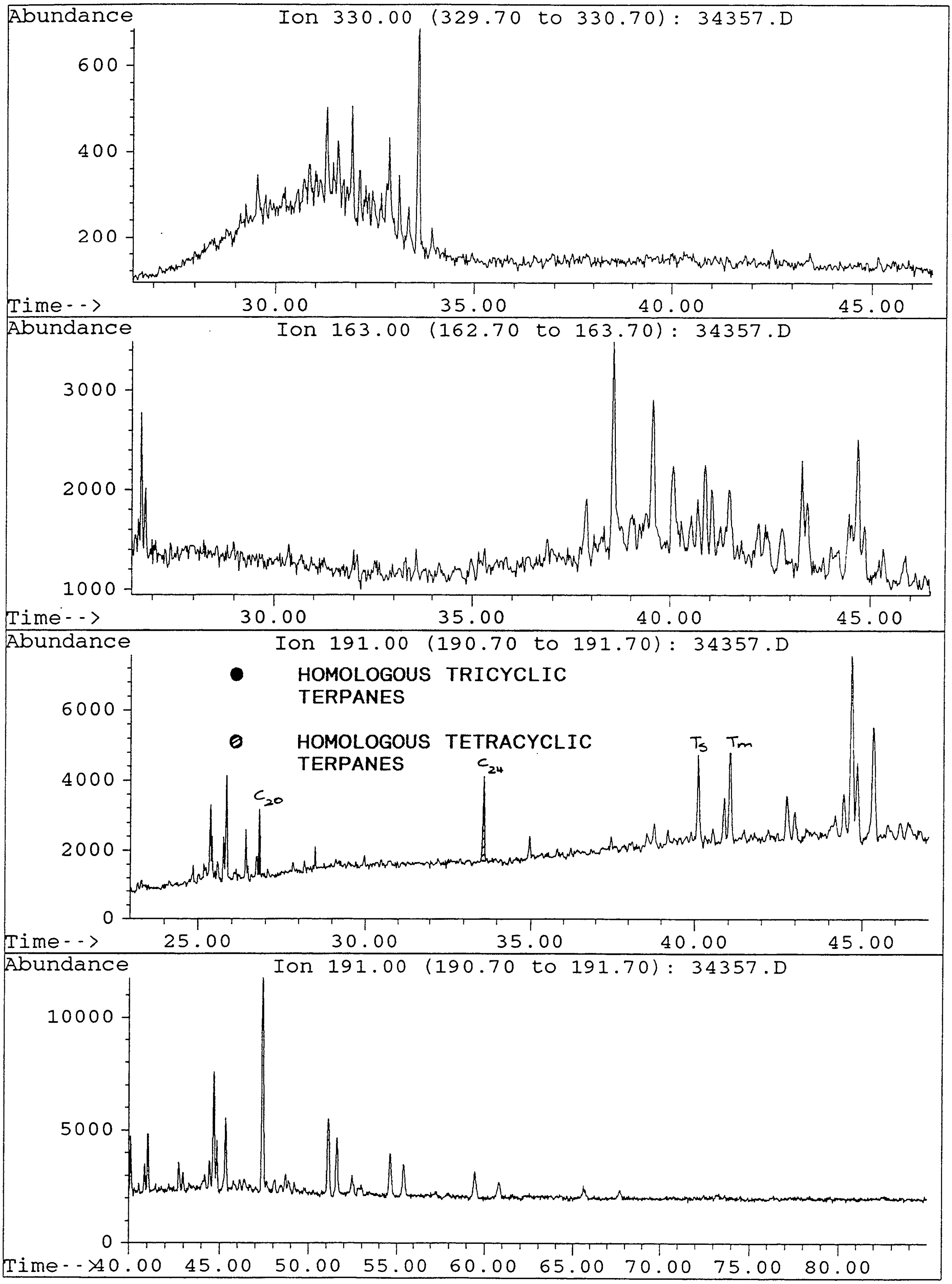

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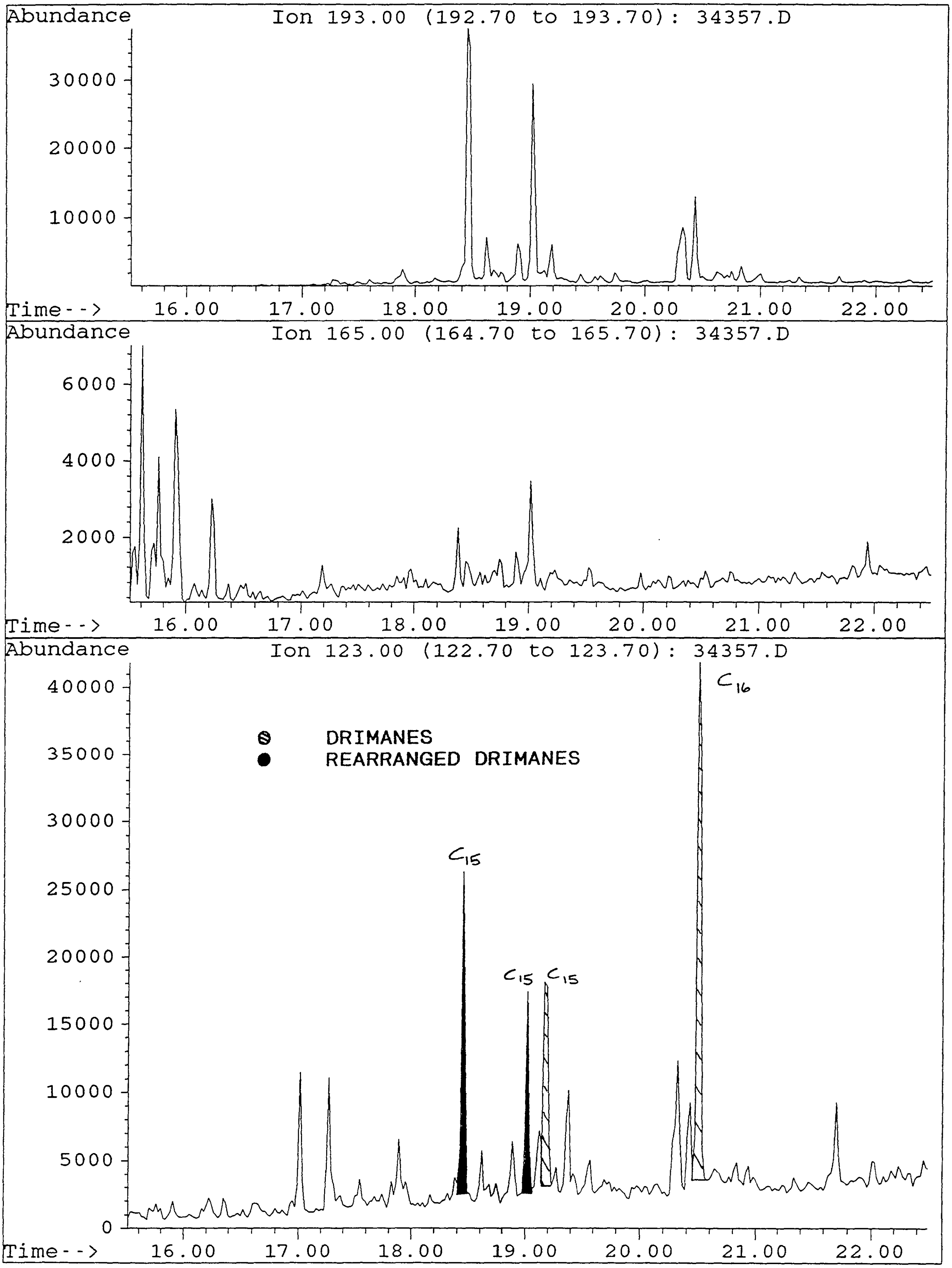

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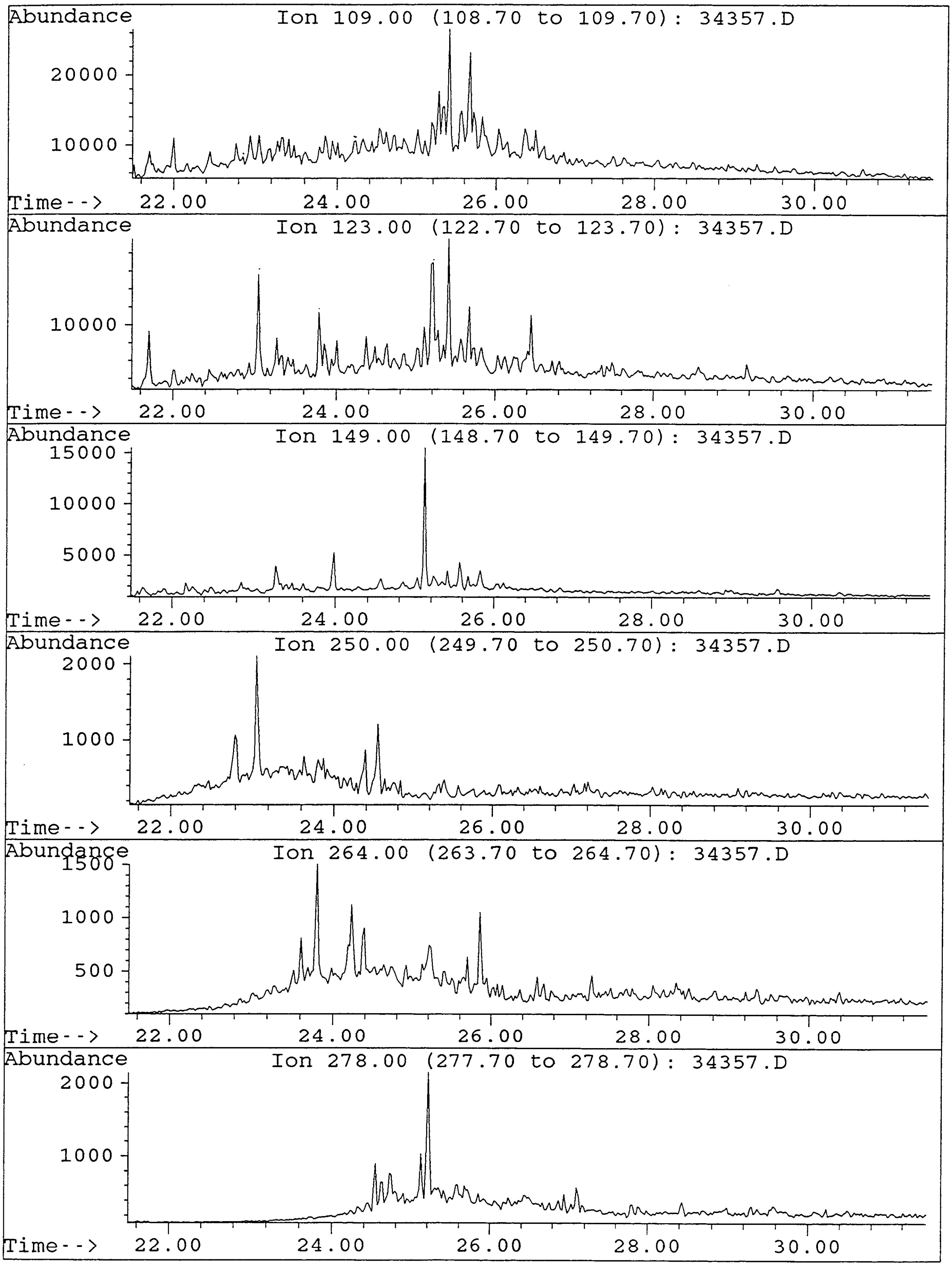

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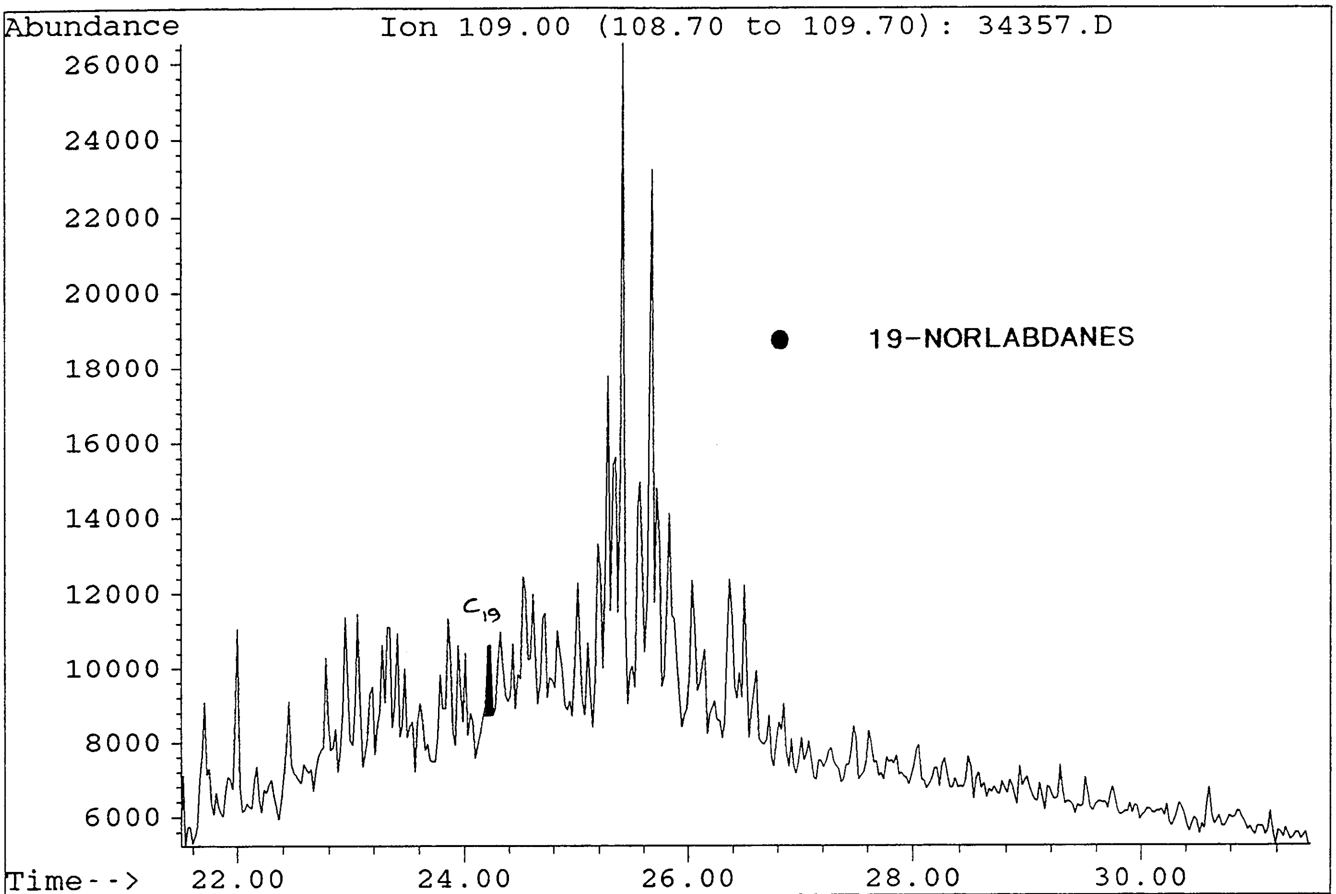

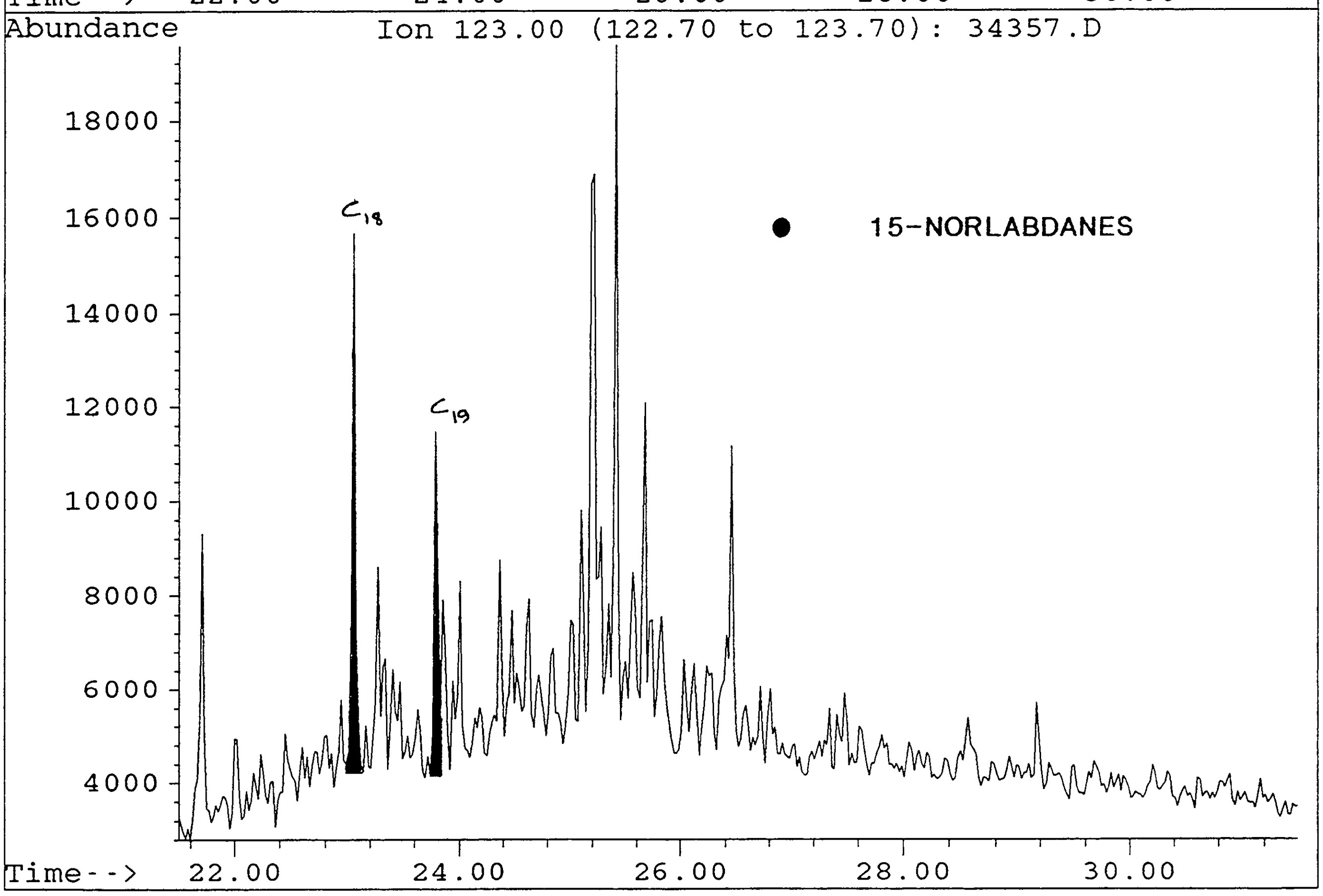

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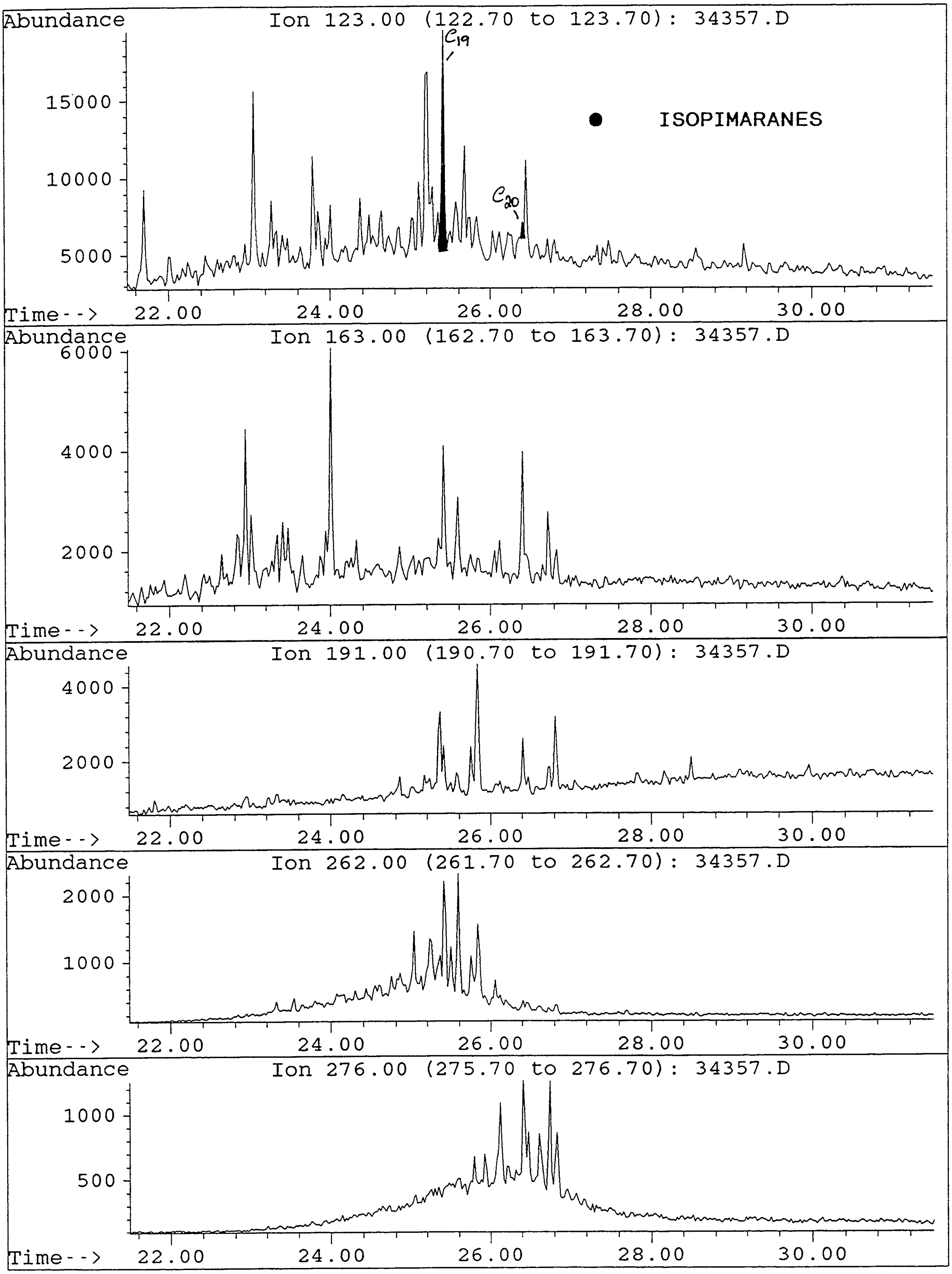

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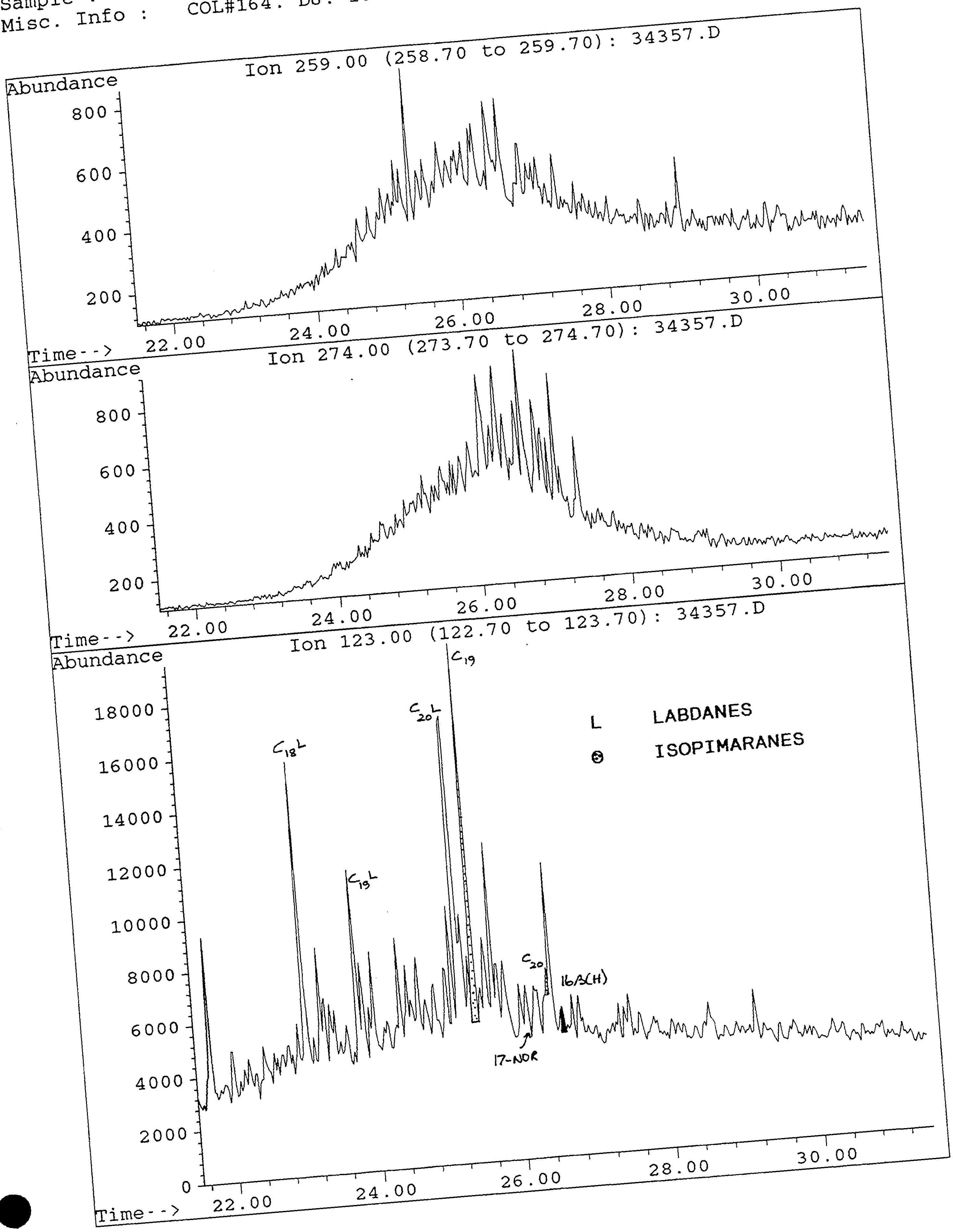

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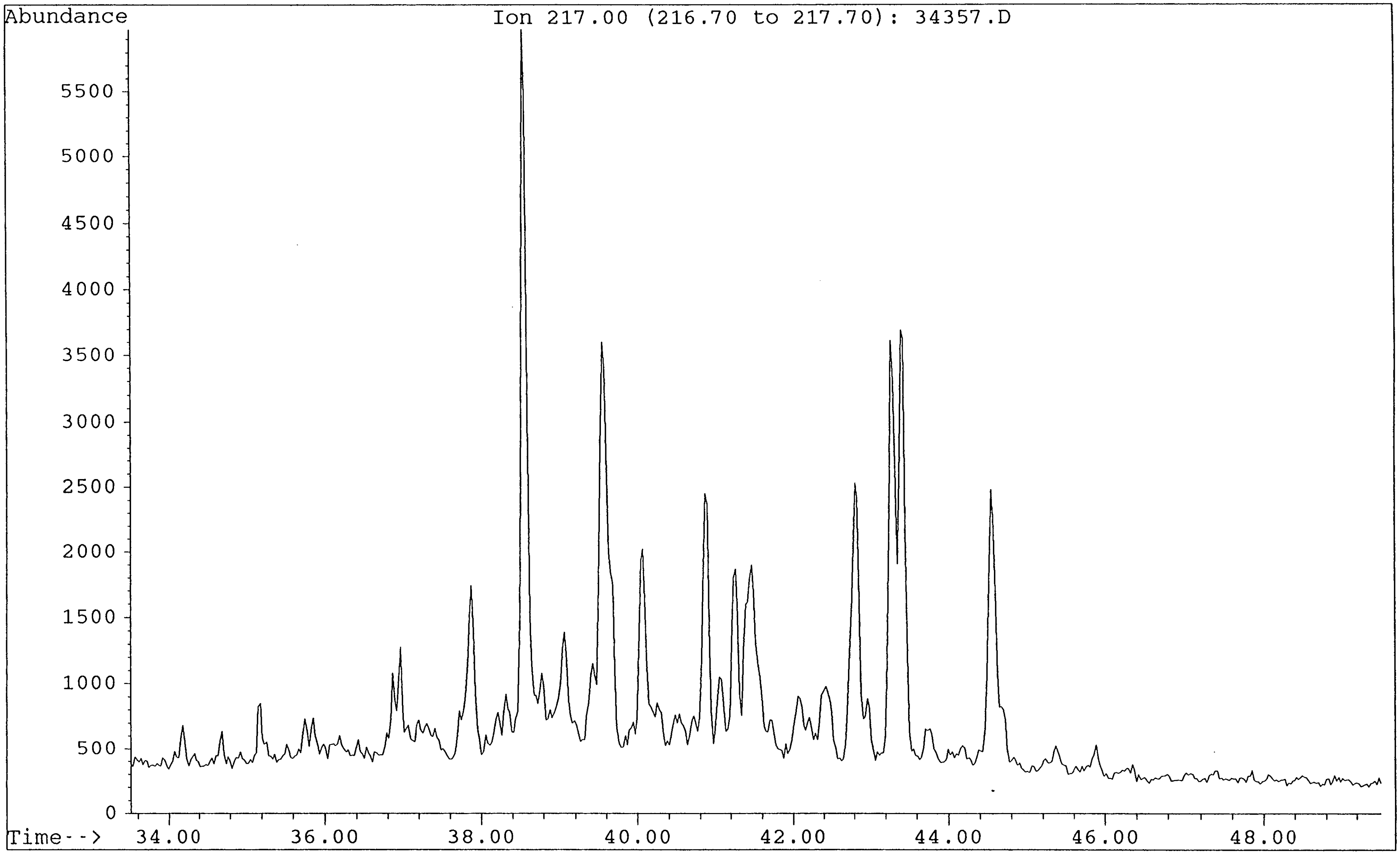
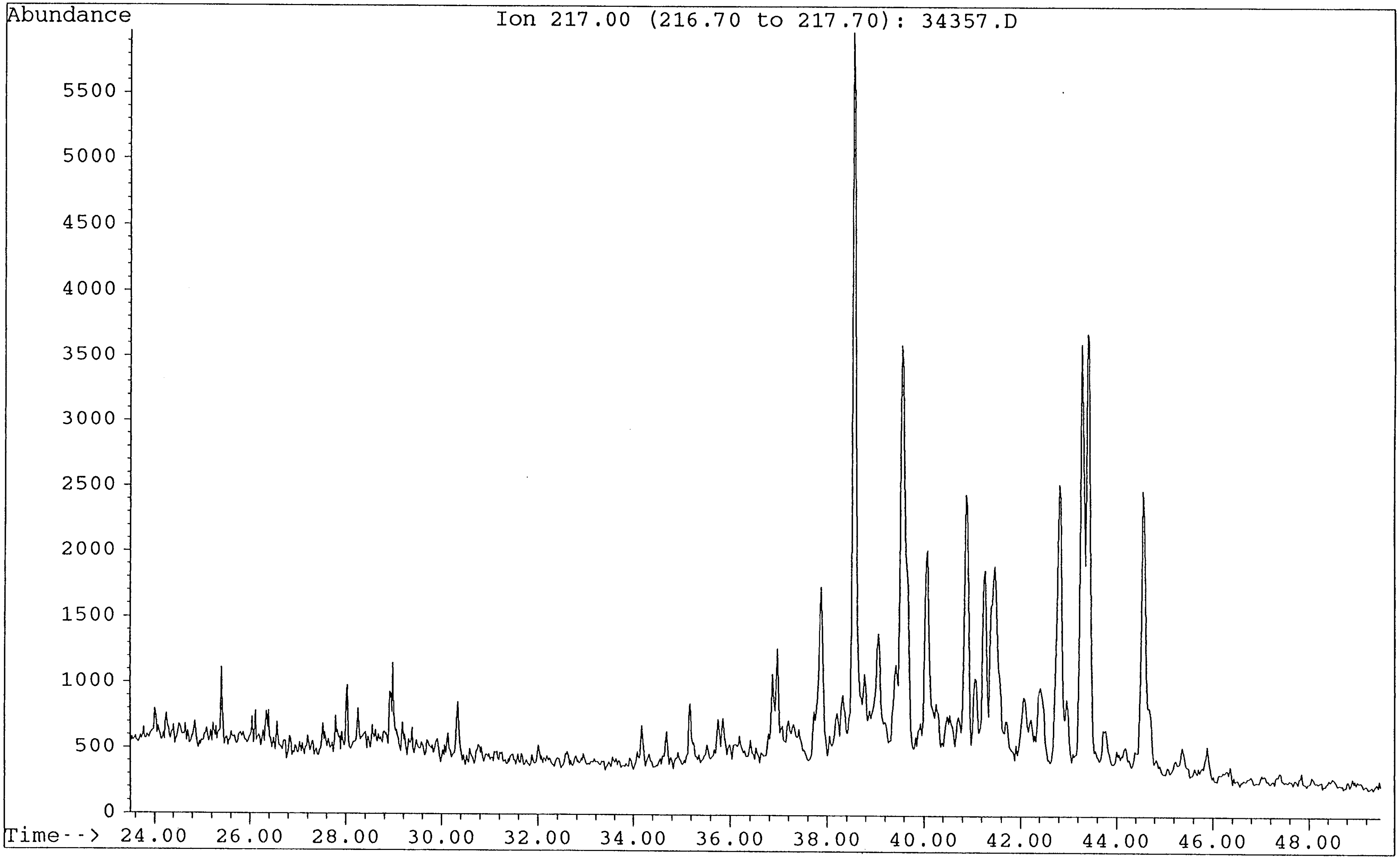
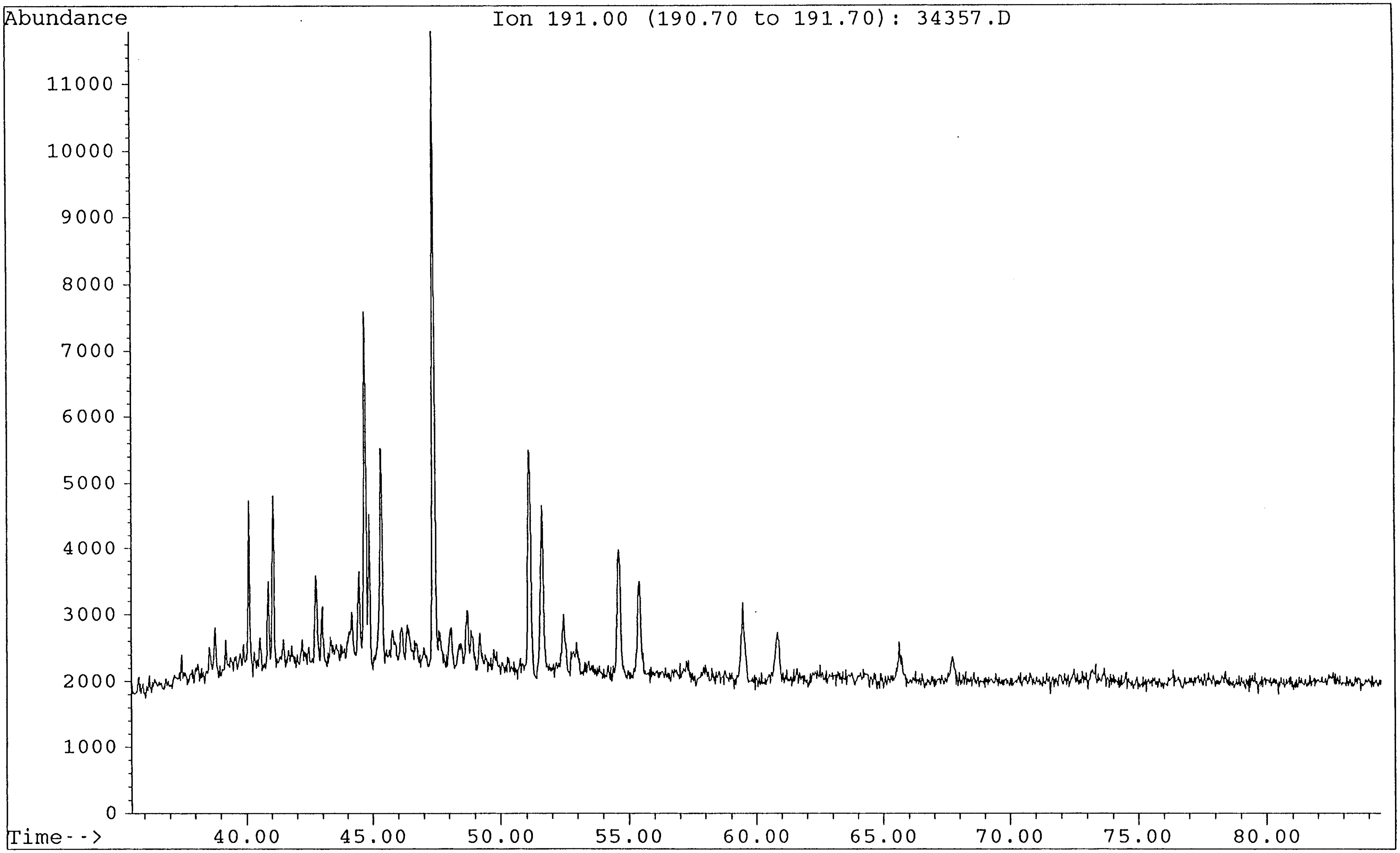


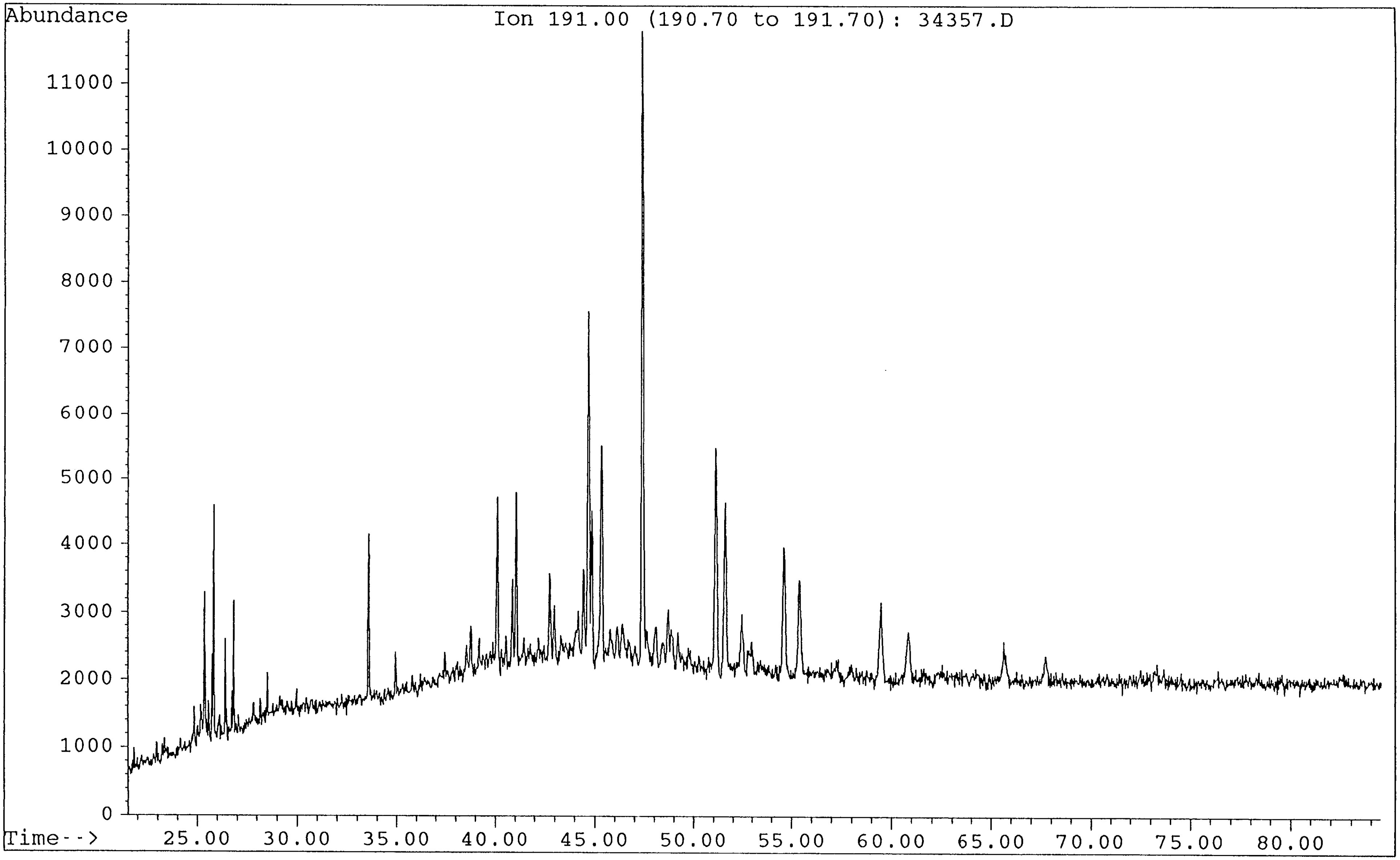
File : 34357.D
Sample : DIGBY-1 1940.8m B/C
Misc. Info : COL#164. DJ. 10-7-95



File : 34357.D
Sample : DIGBY-1 1940.8m B/C
Misc. Info : COL#164. DJ. 10-7-95

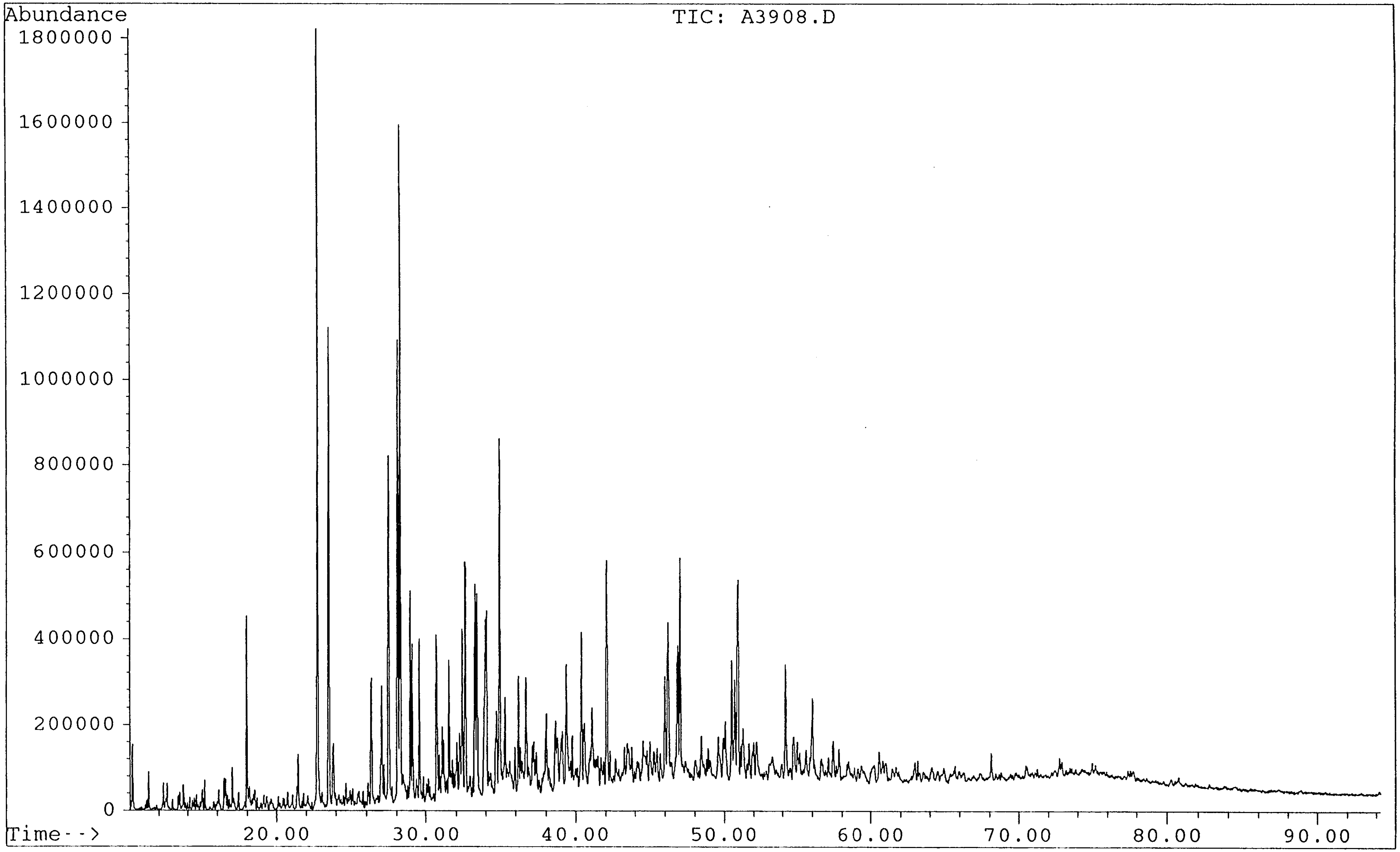


File : 34357.D
Sample : DIGBY-1 1940.8m B/C
Misc. Info : COL#164. DJ. 10-7-95

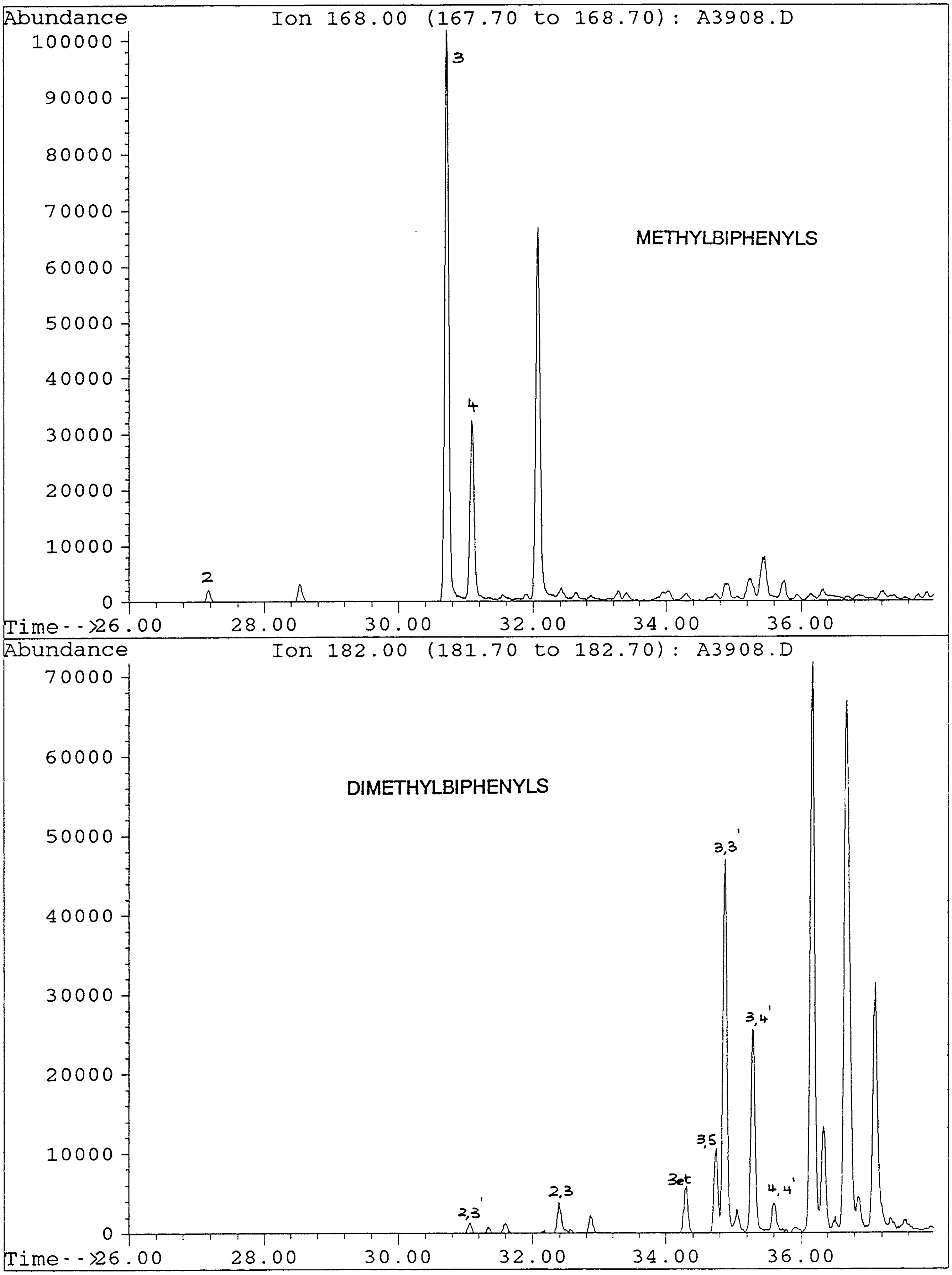


File : A3908.D
Sample : DIGBY#1, 1940.8m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.

FIGURE 8-3



File : A3908.D
Sample : DIGBY#1, 1940.8m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.



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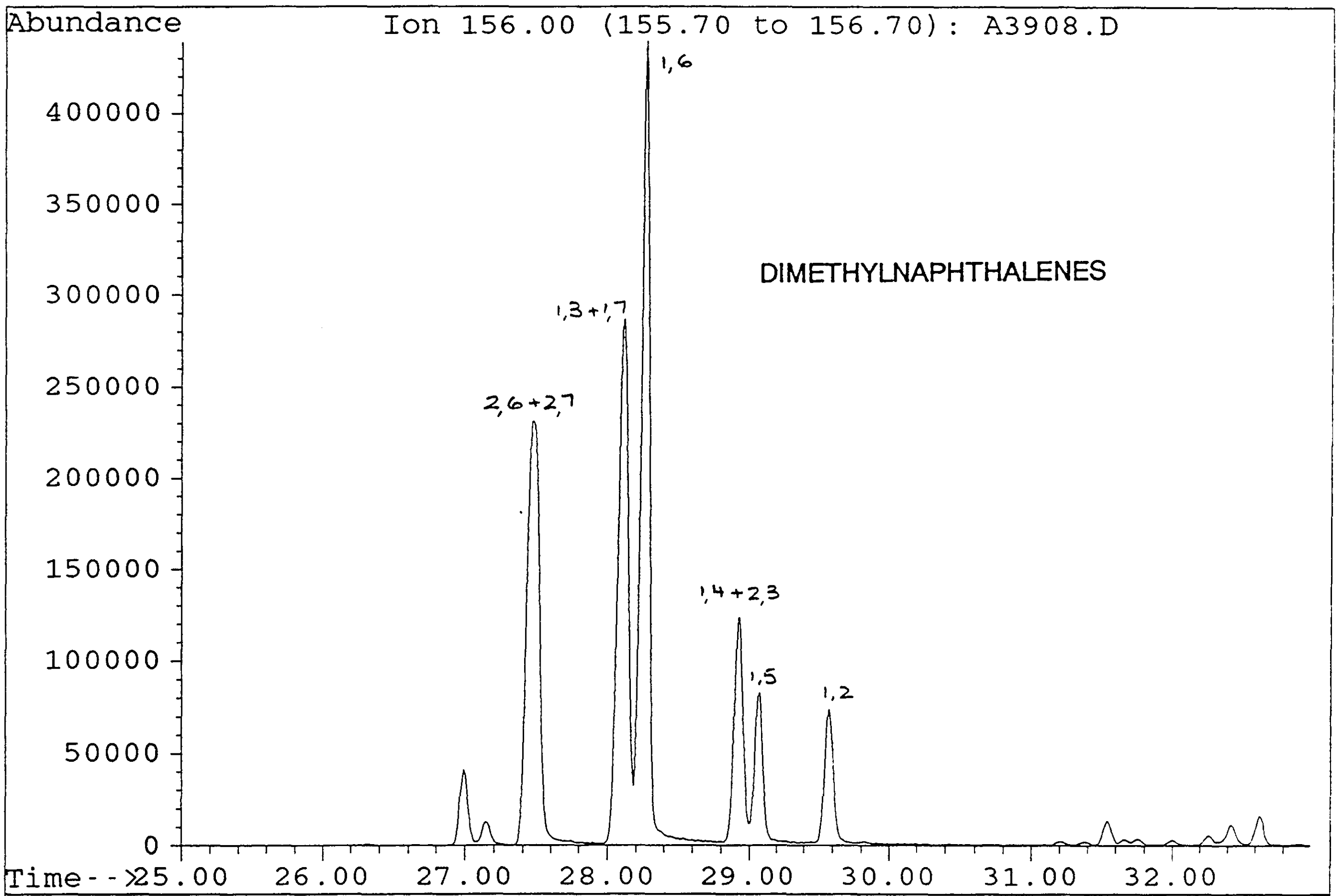
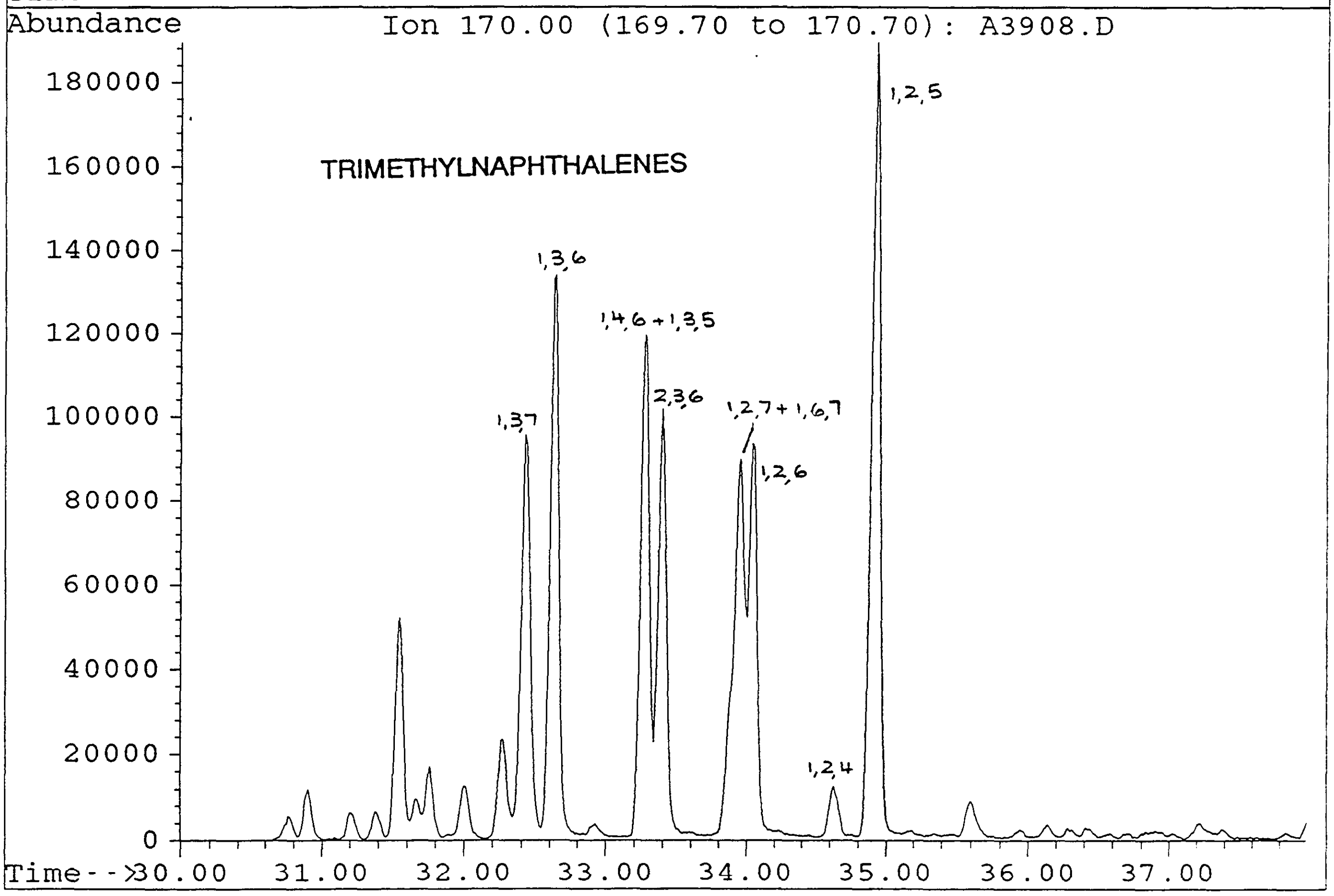
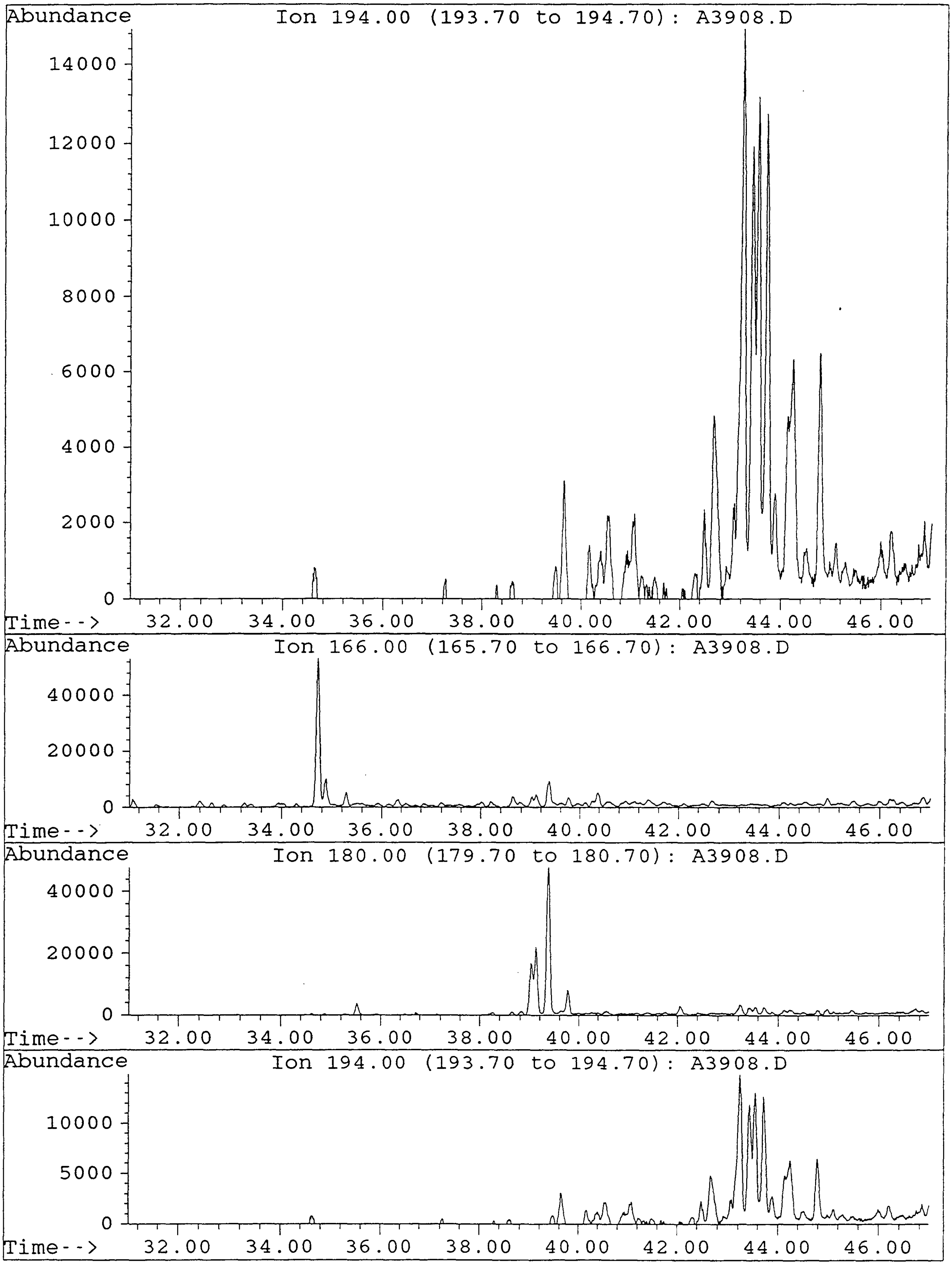
Sample : DIGBY#1, 1940.8m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.





File : A3908.D
Sample : DIGBY#1, 1940.8m. AROS.
Misc. Info : COL#155. 26-7-95. GEC.

FLUORENES



File : A3908.D
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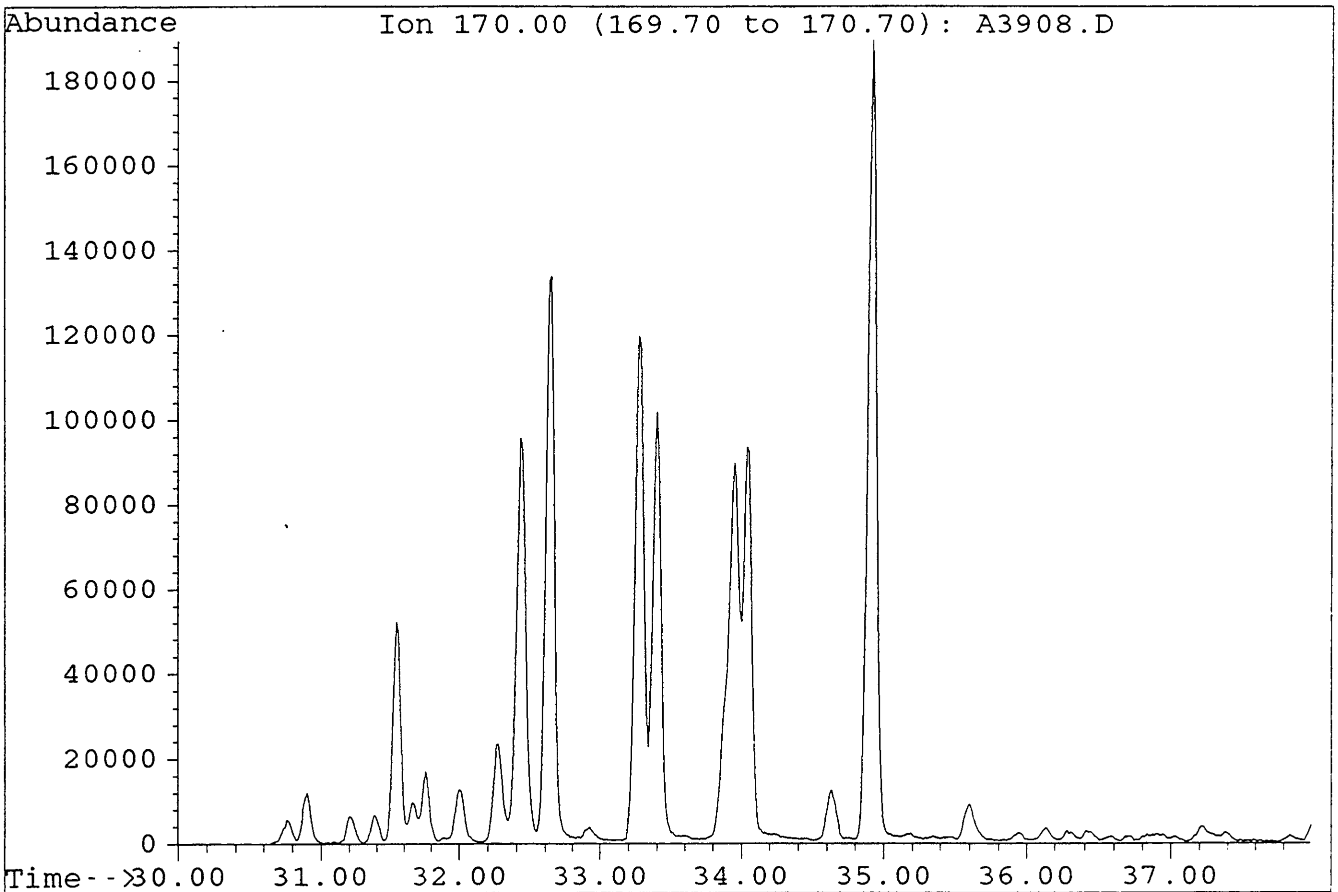

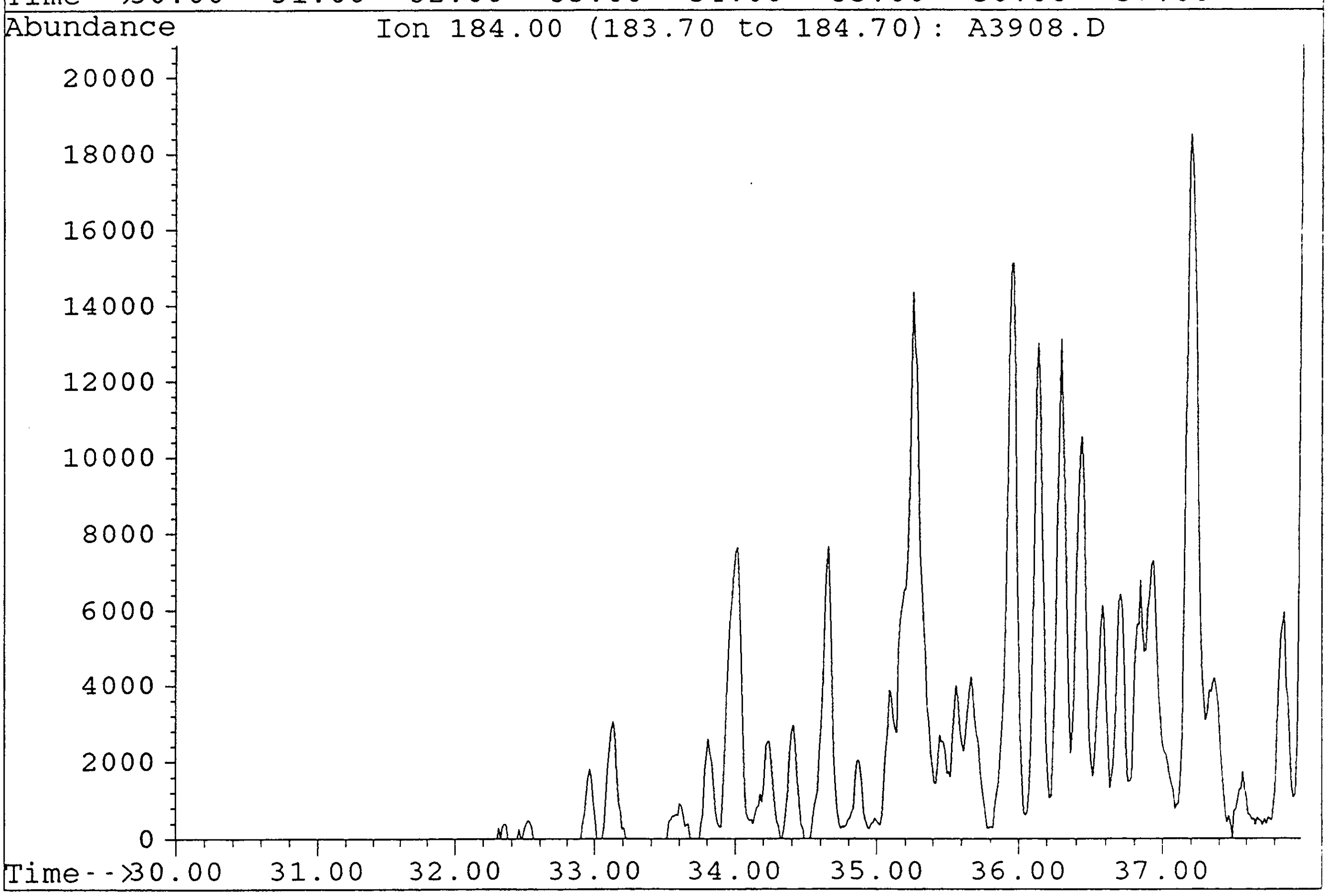

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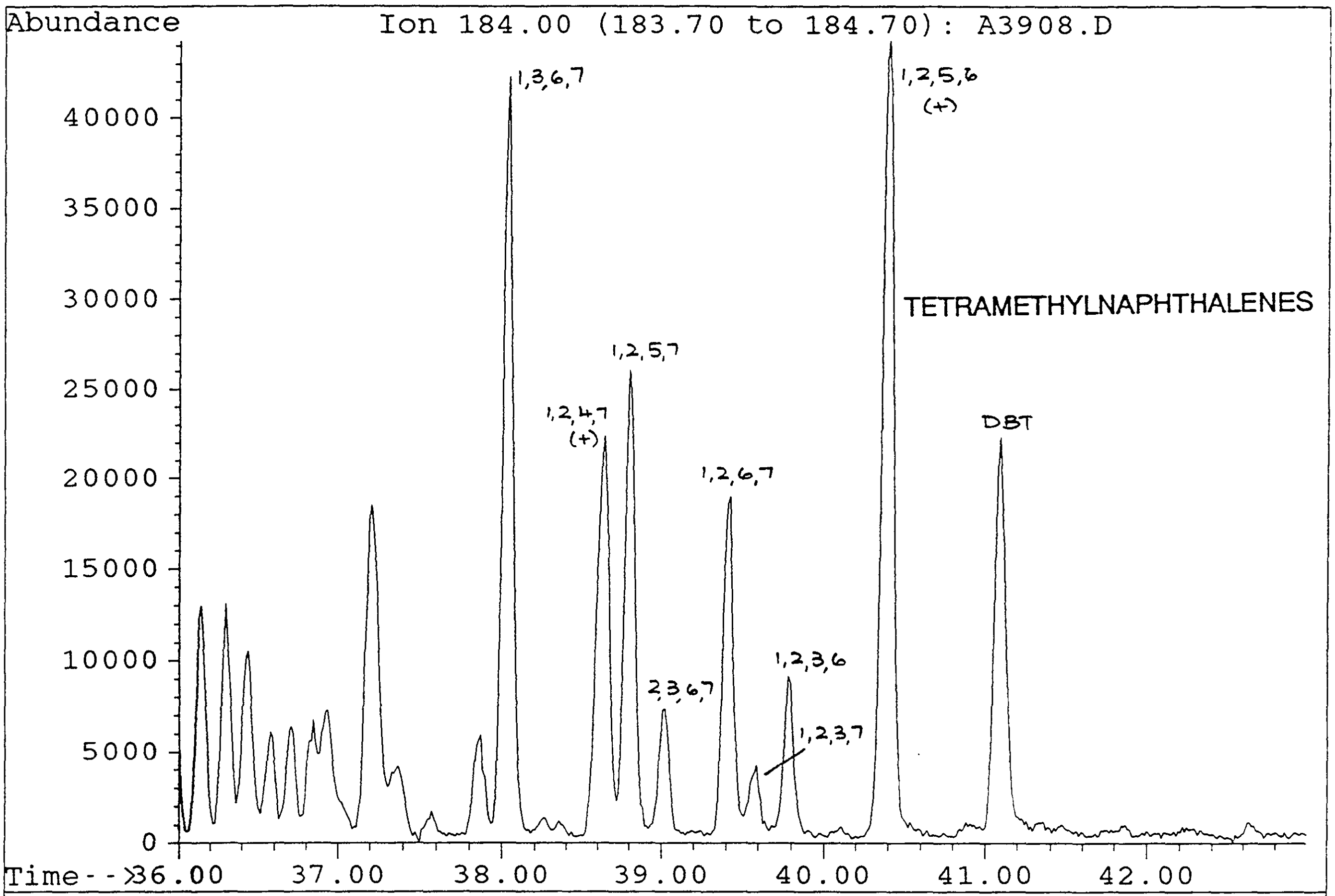

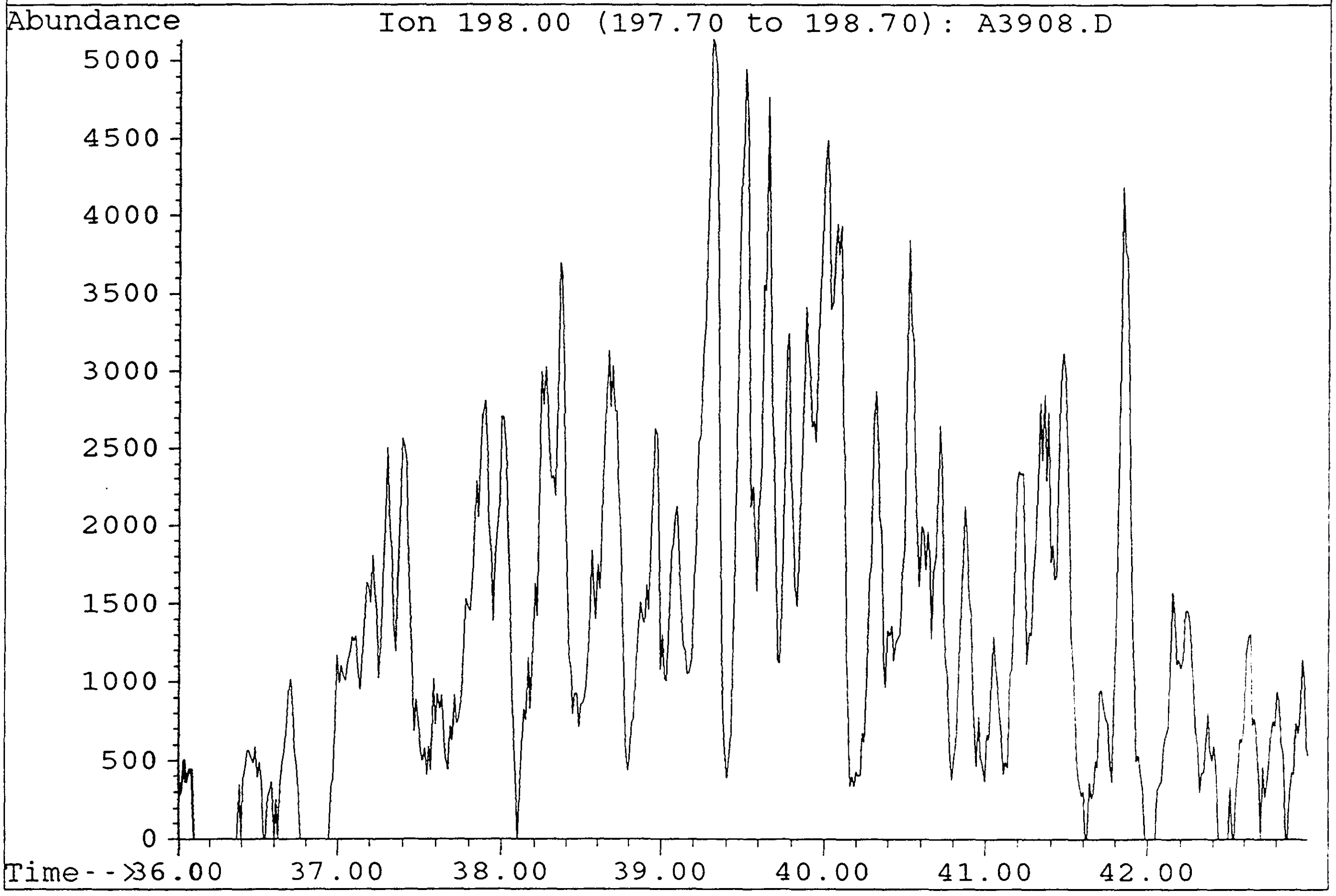

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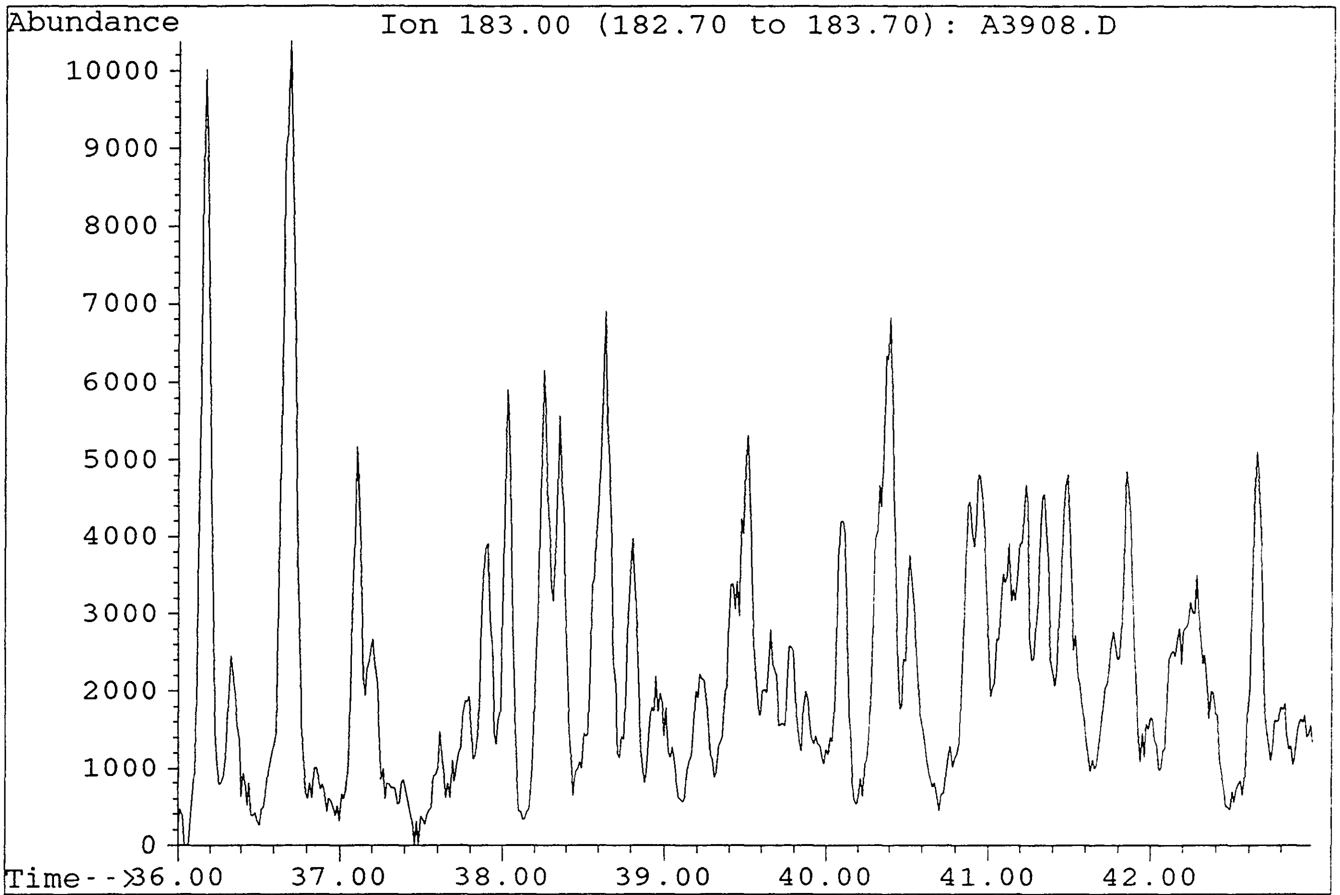

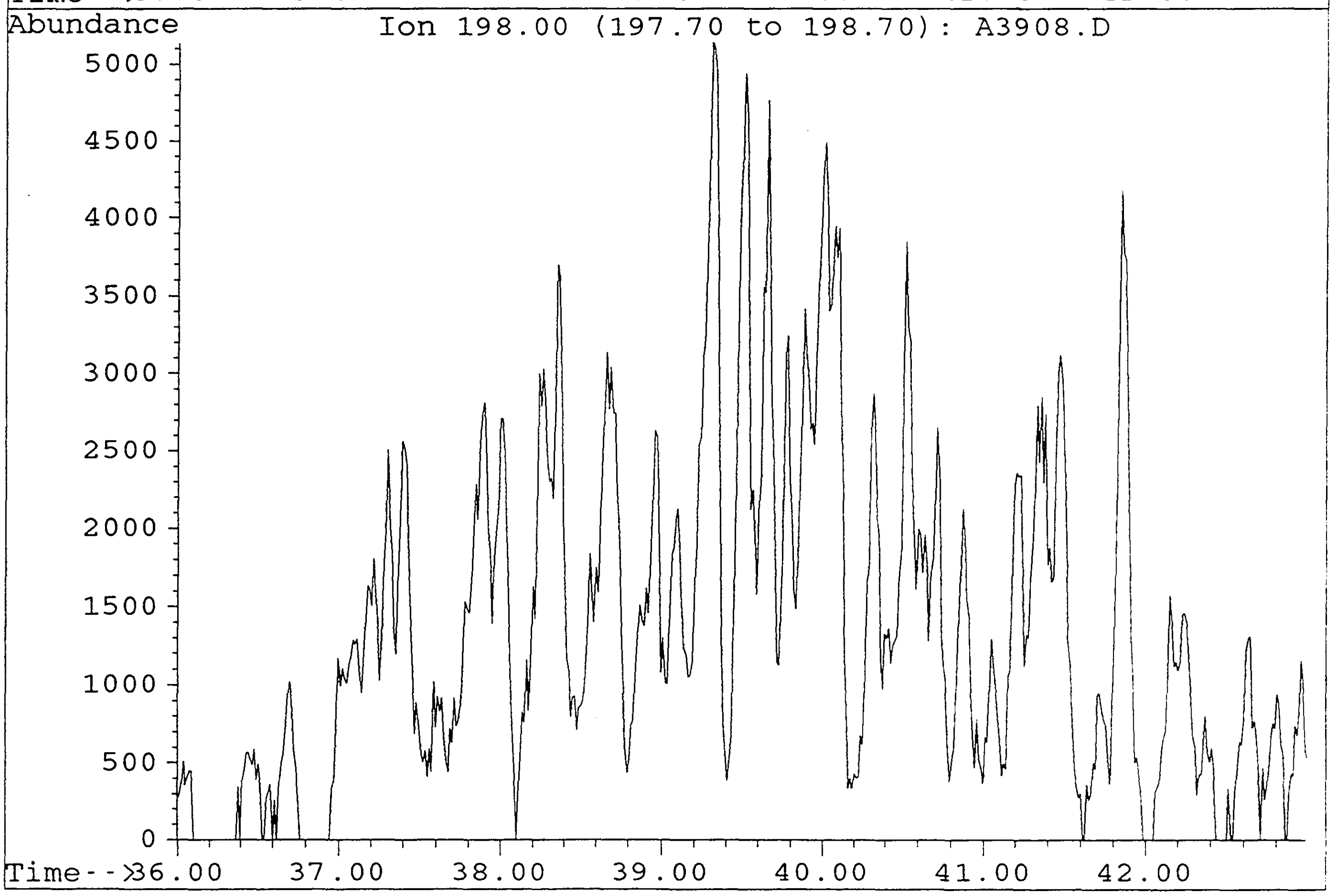

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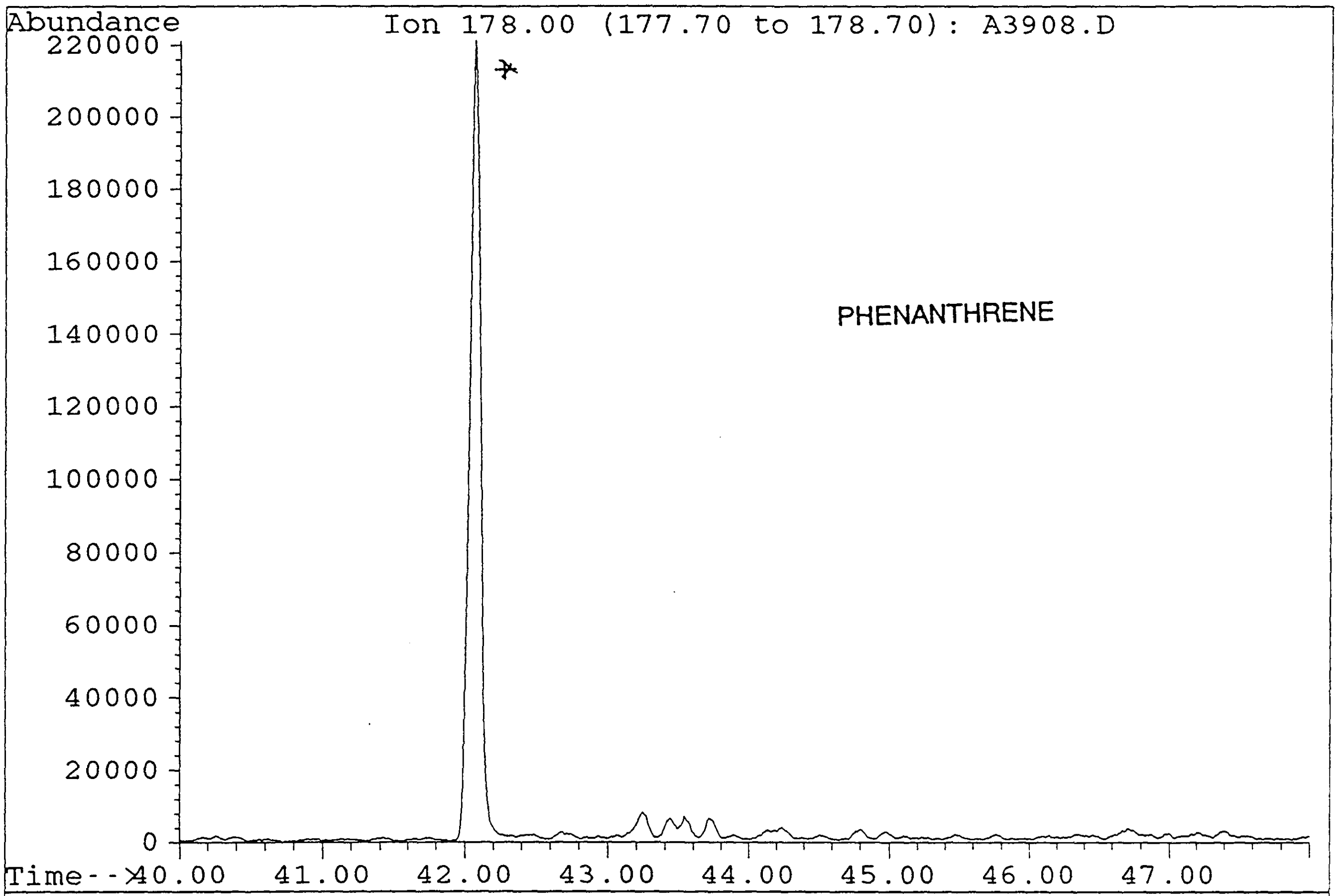

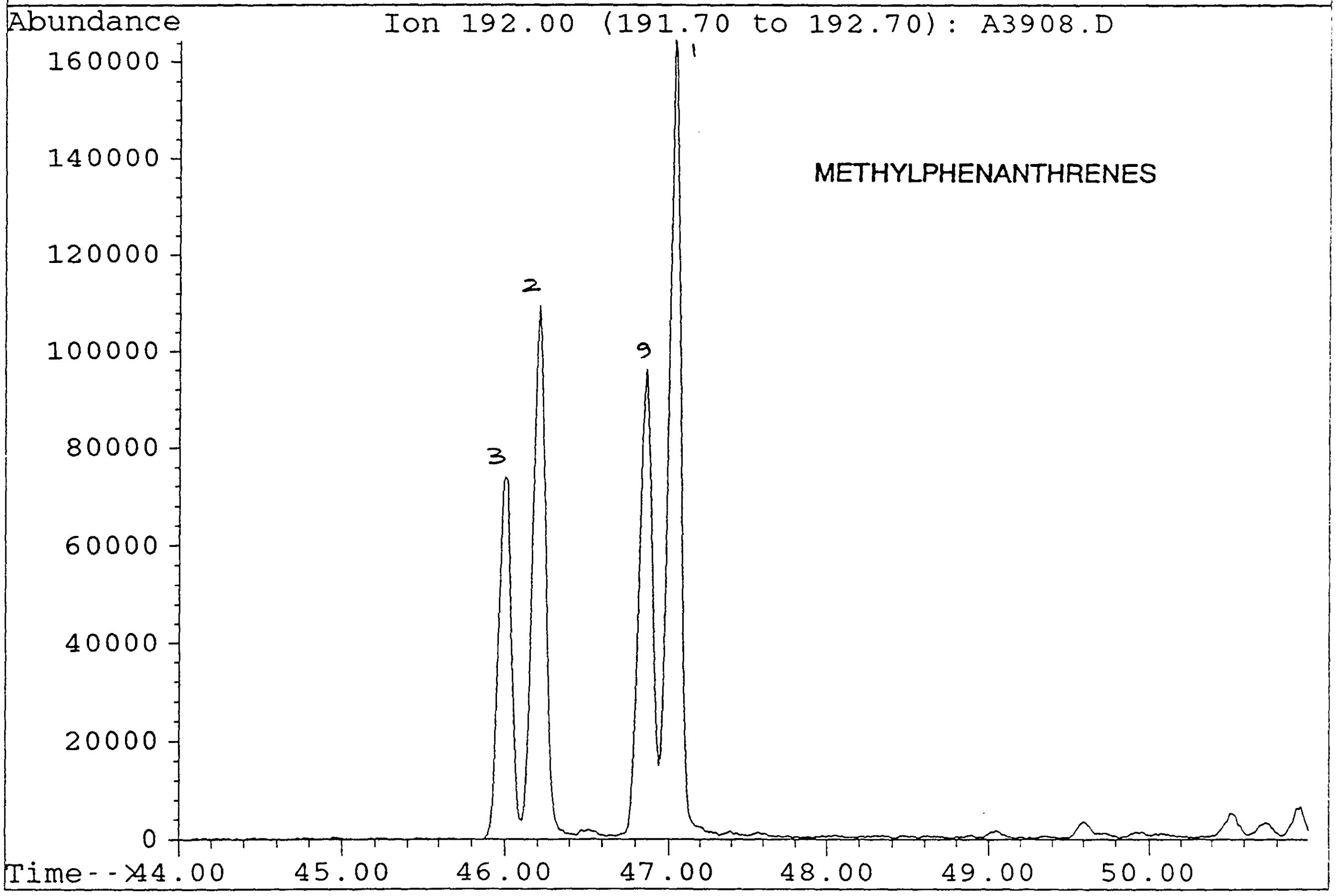

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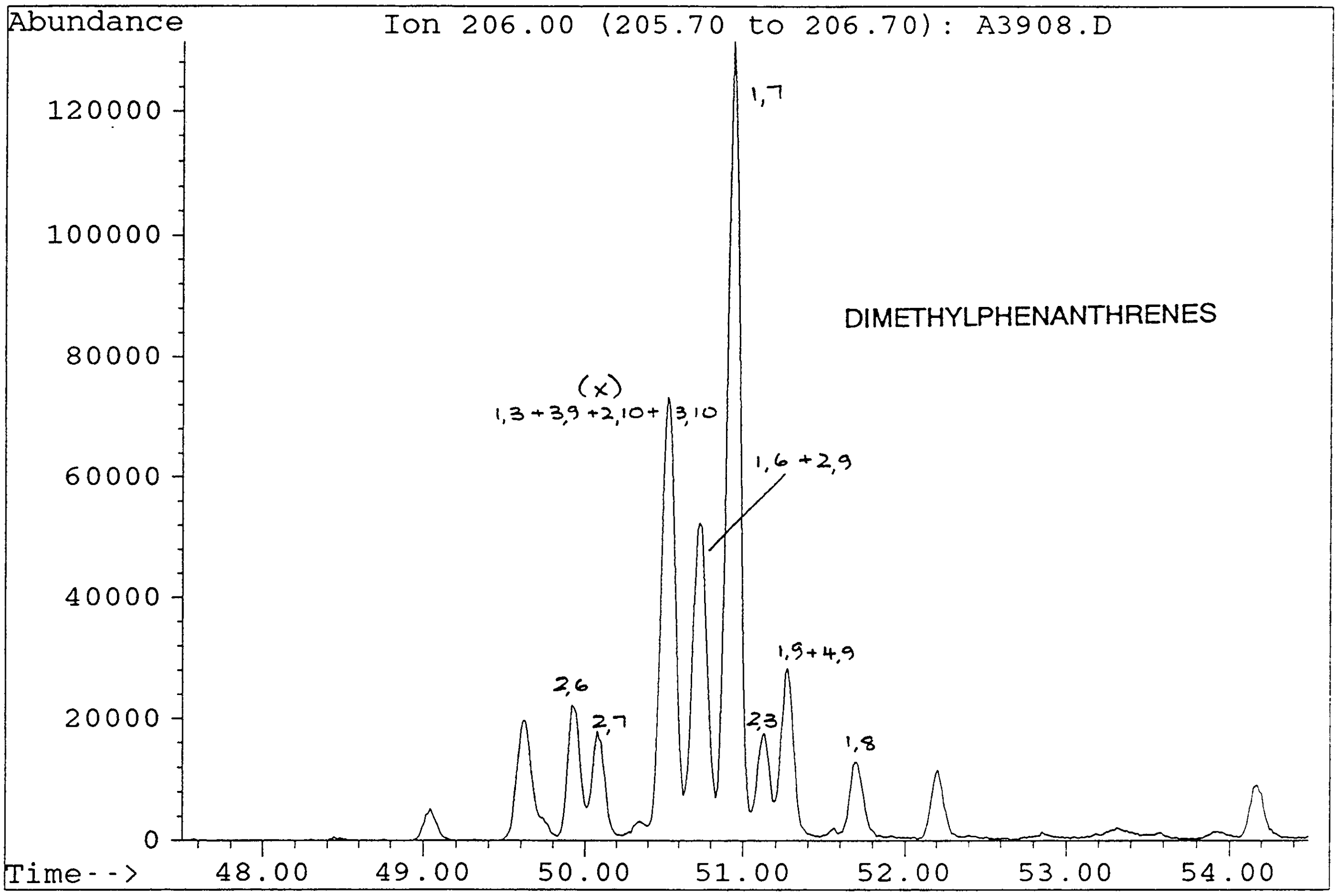

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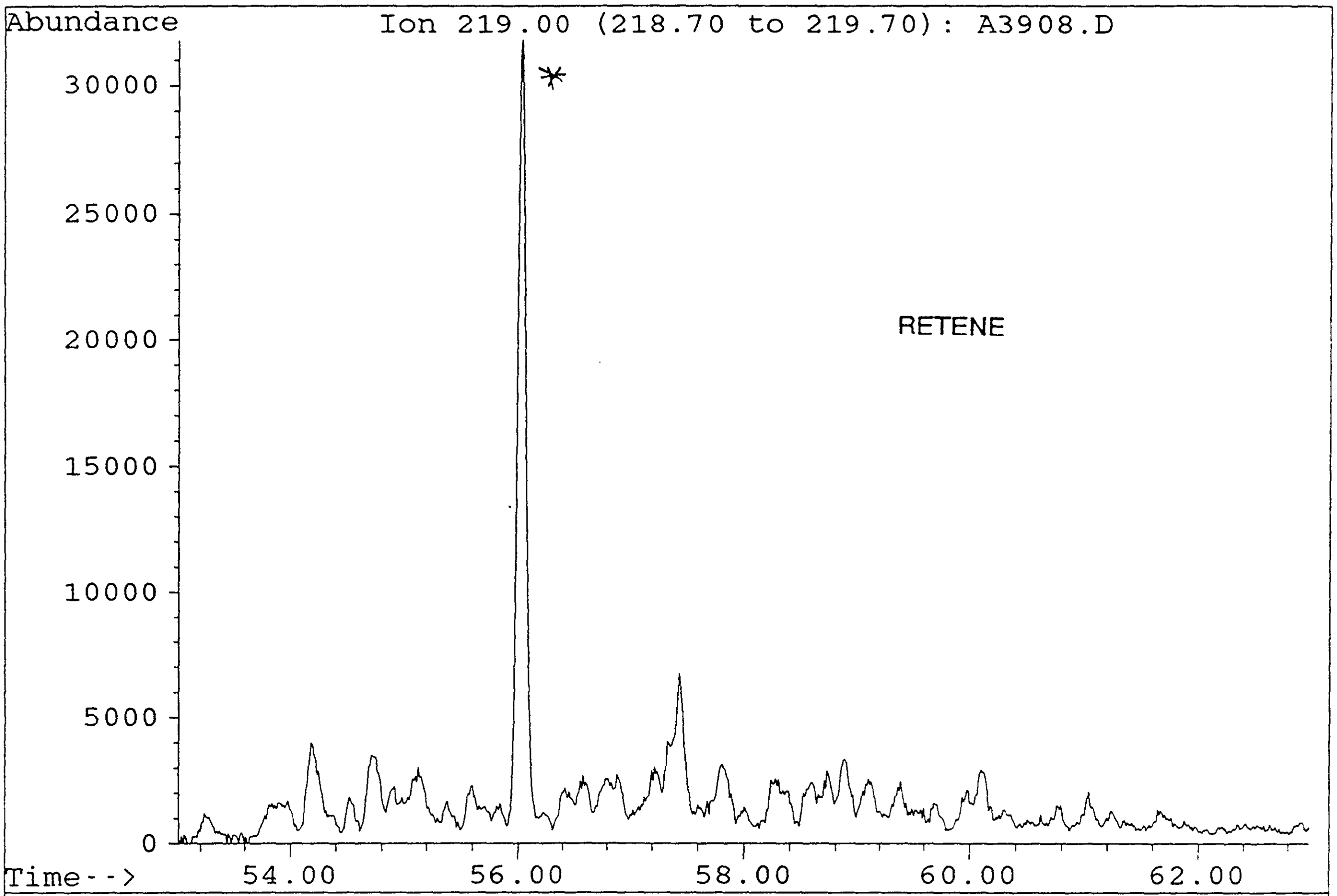
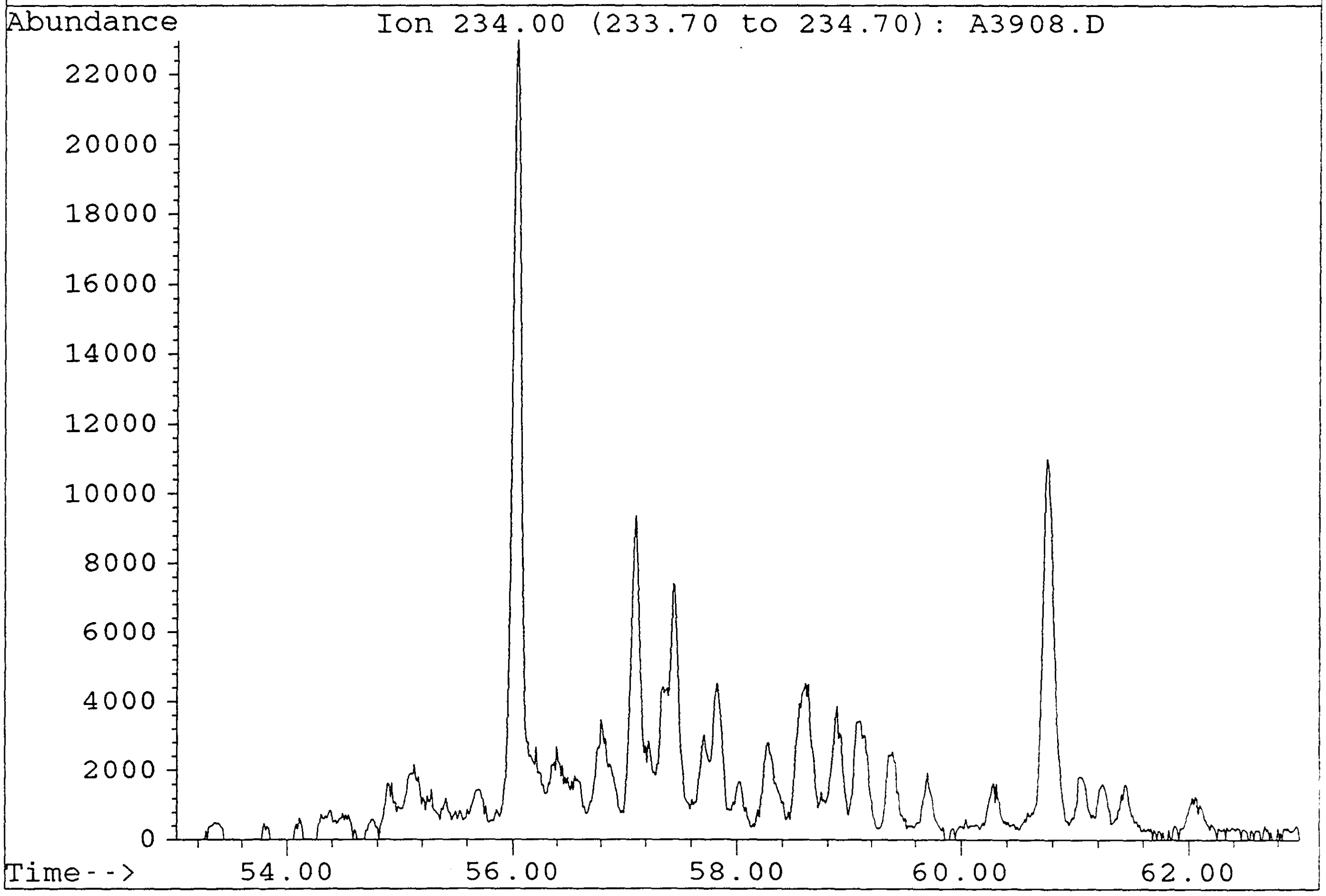




SELECTED PARAMETERS FROM GC/MS ANALYSIS

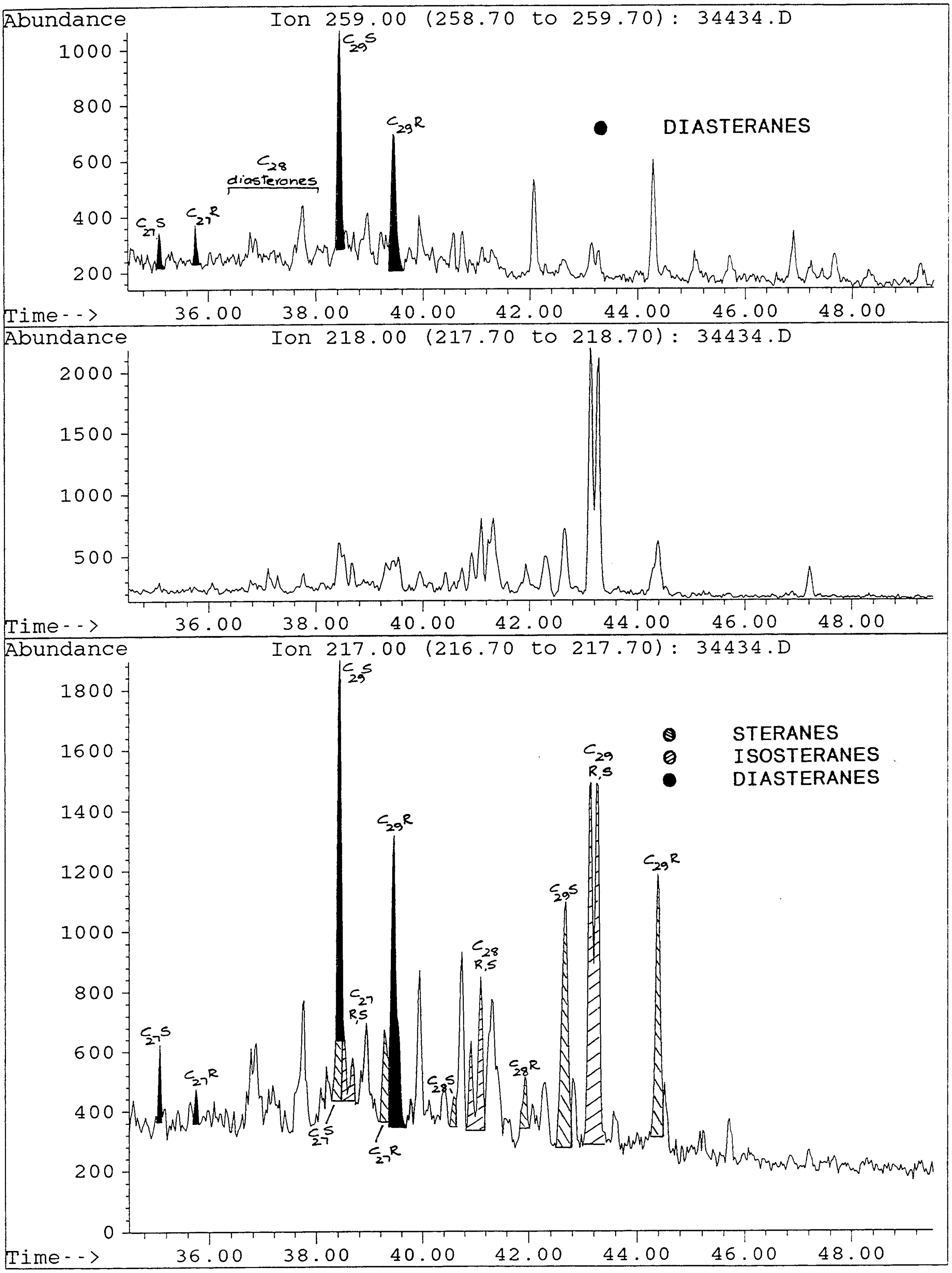
DIGBY 1, 1944.2m, SWC

	Parameter	Ion(s)	Value
1.	18 α (H)- hopane/17 α (H)-hopane (Ts/Tm)	191	0.45
2.	C30 hopane/C30 moretane	191	10.86
3.	C31 22S hopane/C31 22R hopane	191	1.53
4.	C32 22S hopane/C32 22R hopane	191	1.28
5.	C29 20S ααα sterane/C29 20R ααα sterane	217	0.92
6.	C29 ααα steranes (20S / 20S+20R)	217	0.48
7.	C29 αββ steranes / (C29 ααα steranes + C29 αββ steranes)	217	0.58
8.	C27/C29 diasteranes	259	0.23
9.	C27/C29 steranes	217	0.35
10.	18 α (H)-oleanane/C30 hopane	191	nd
11.	C29 diasteranes / (C29 ααα steranes + C29 αββ steranes)	217	0.63
12.	C30 (hopane + moretane) / C29 (steranes + diasteranes)	191/217	1.27
13.	C15 drimane/C16 homodrimane	123	0.57
14.	Rearranged drimanes/normal drimanes	123	0.30

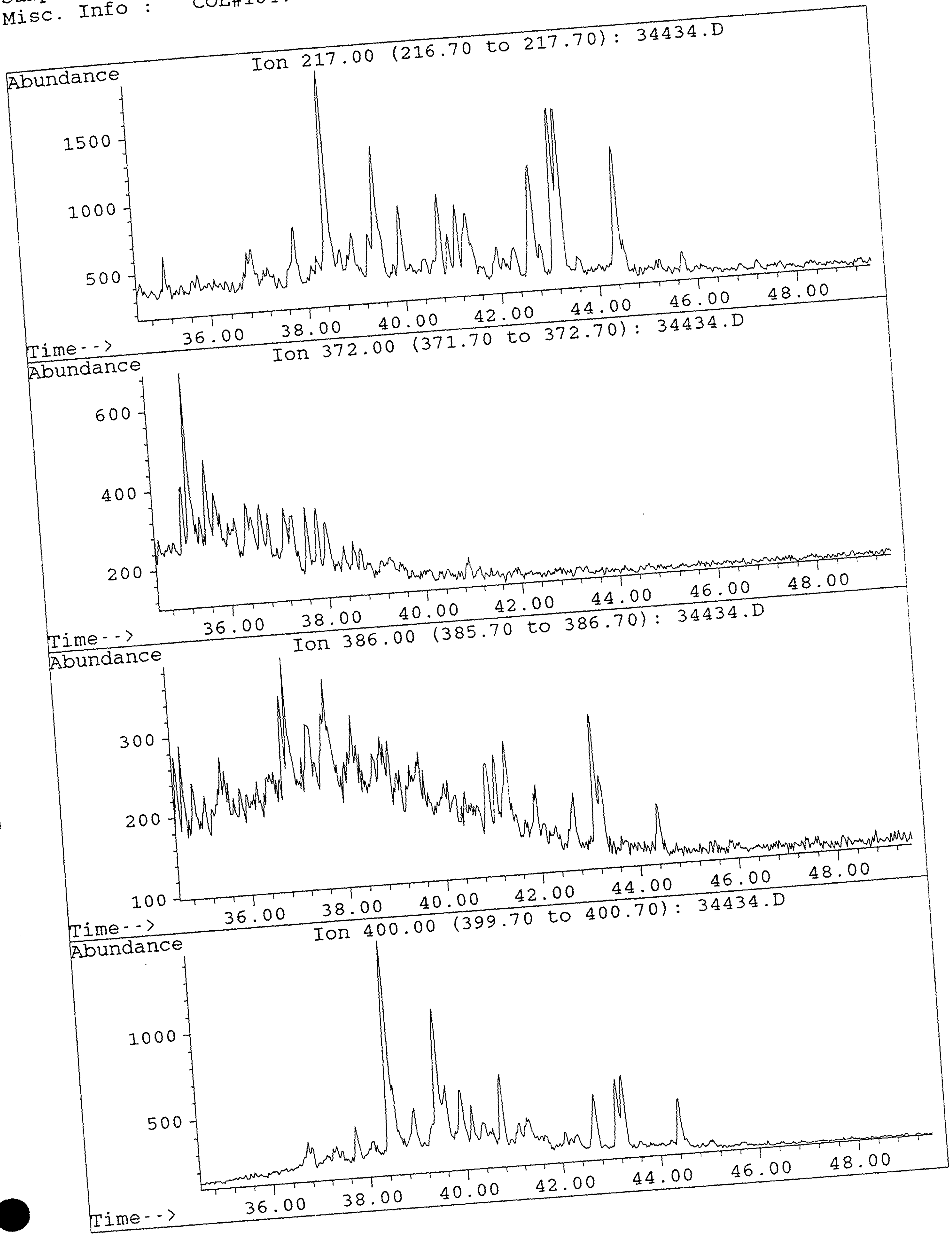
nd = not detectable

File : 34434.D
Sample : DIGBY#1, 1944.2m B/C
Misc. Info : COL#164. GEC/DJ. 26-7-95.

FIGURE 6-4



File : 34434.D
Sample : DIGBY#1, 1944.2m B/C
Misc. Info : COL#164. GEC/DJ. 26-7-95.



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Sample : DIGBY#1, 1944.2m B/C
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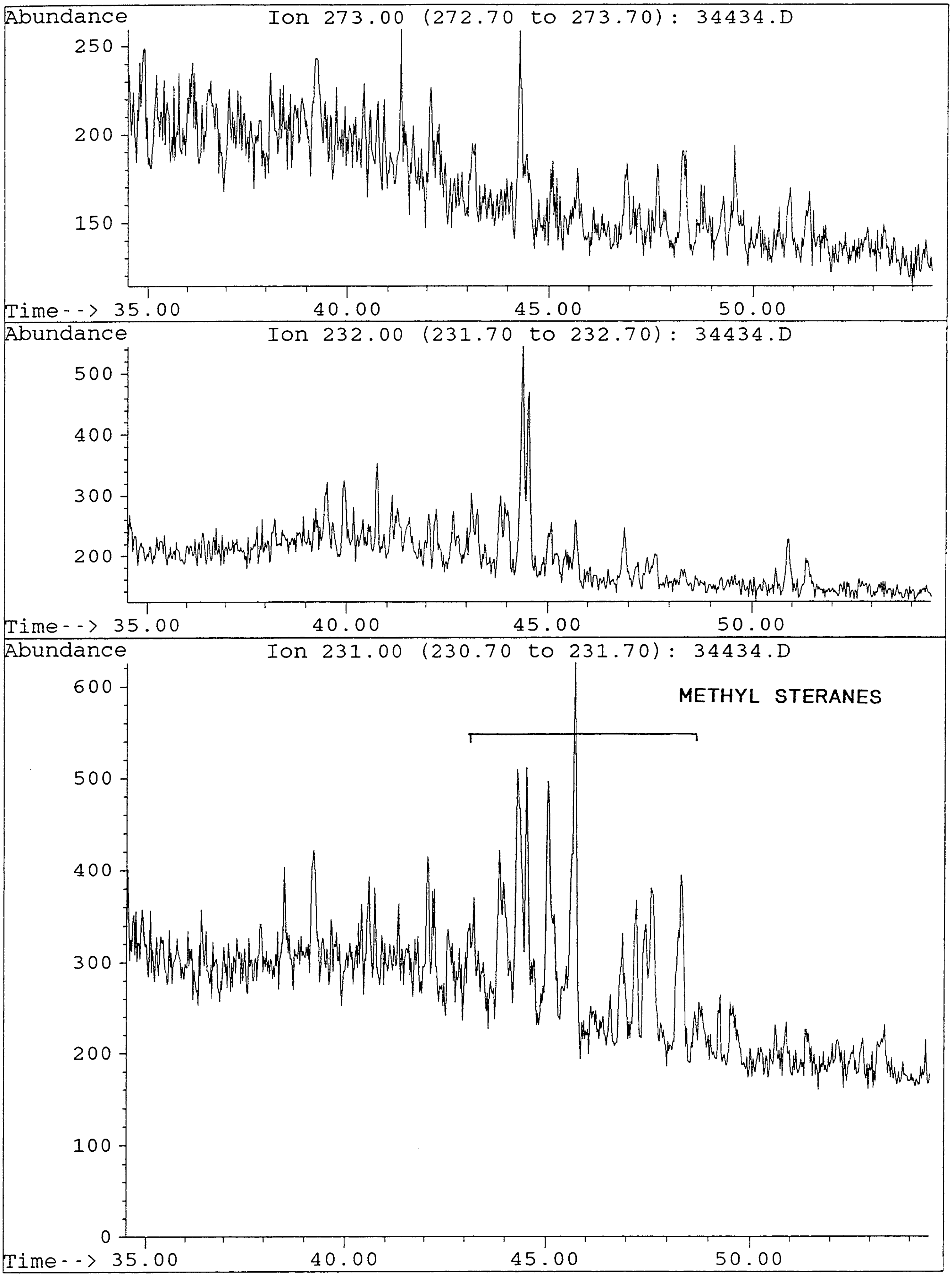

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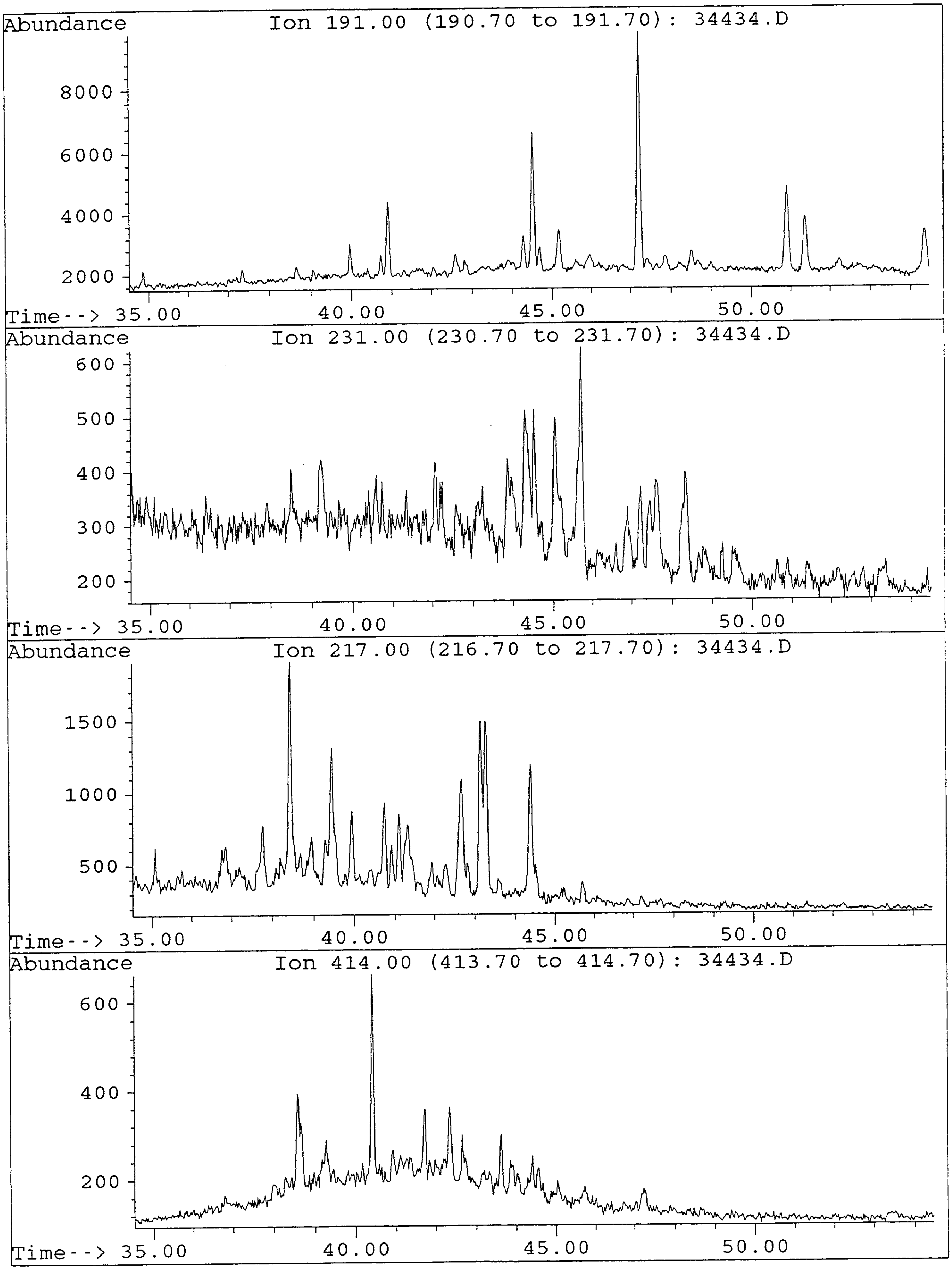

File : 34434.D
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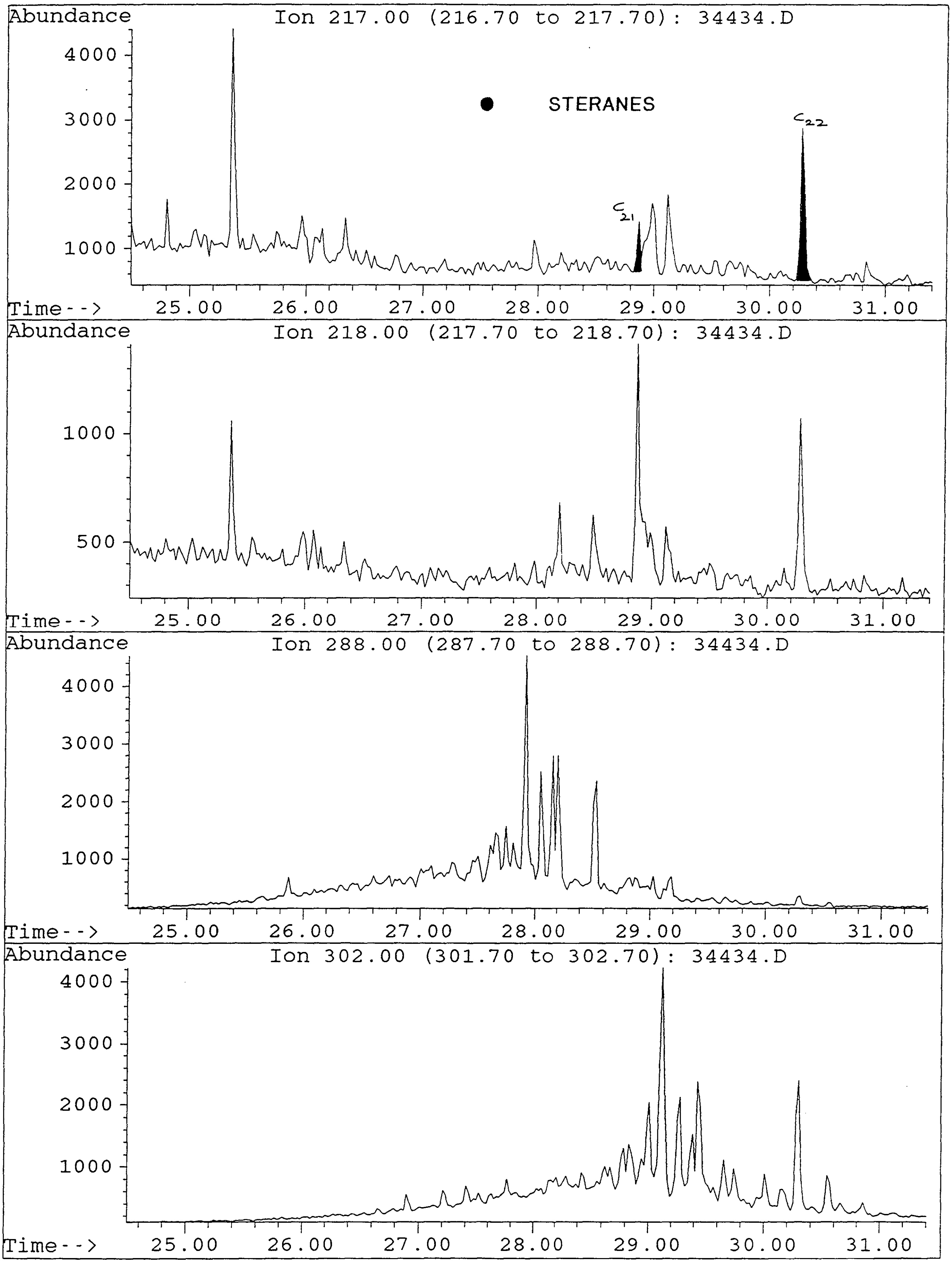

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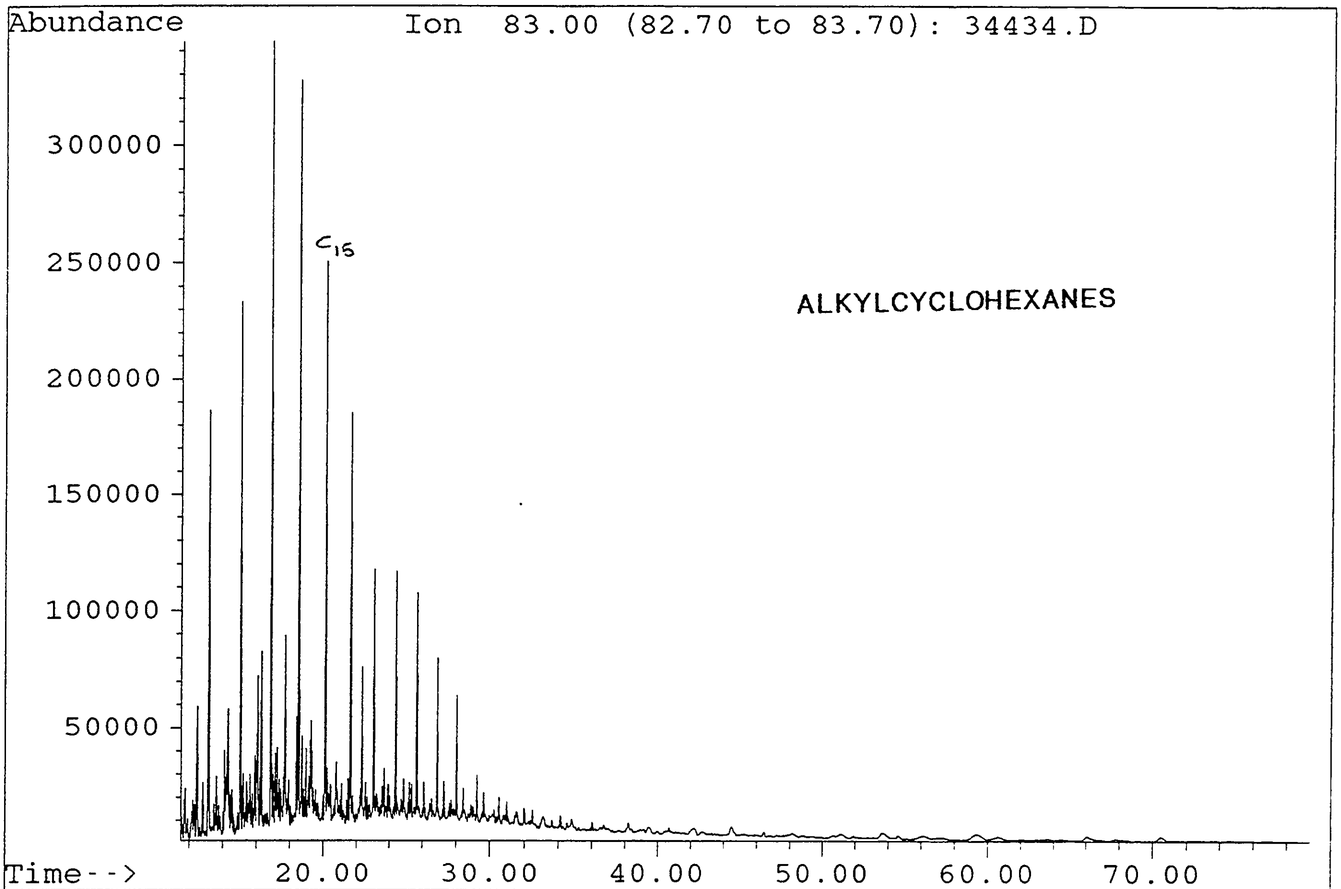

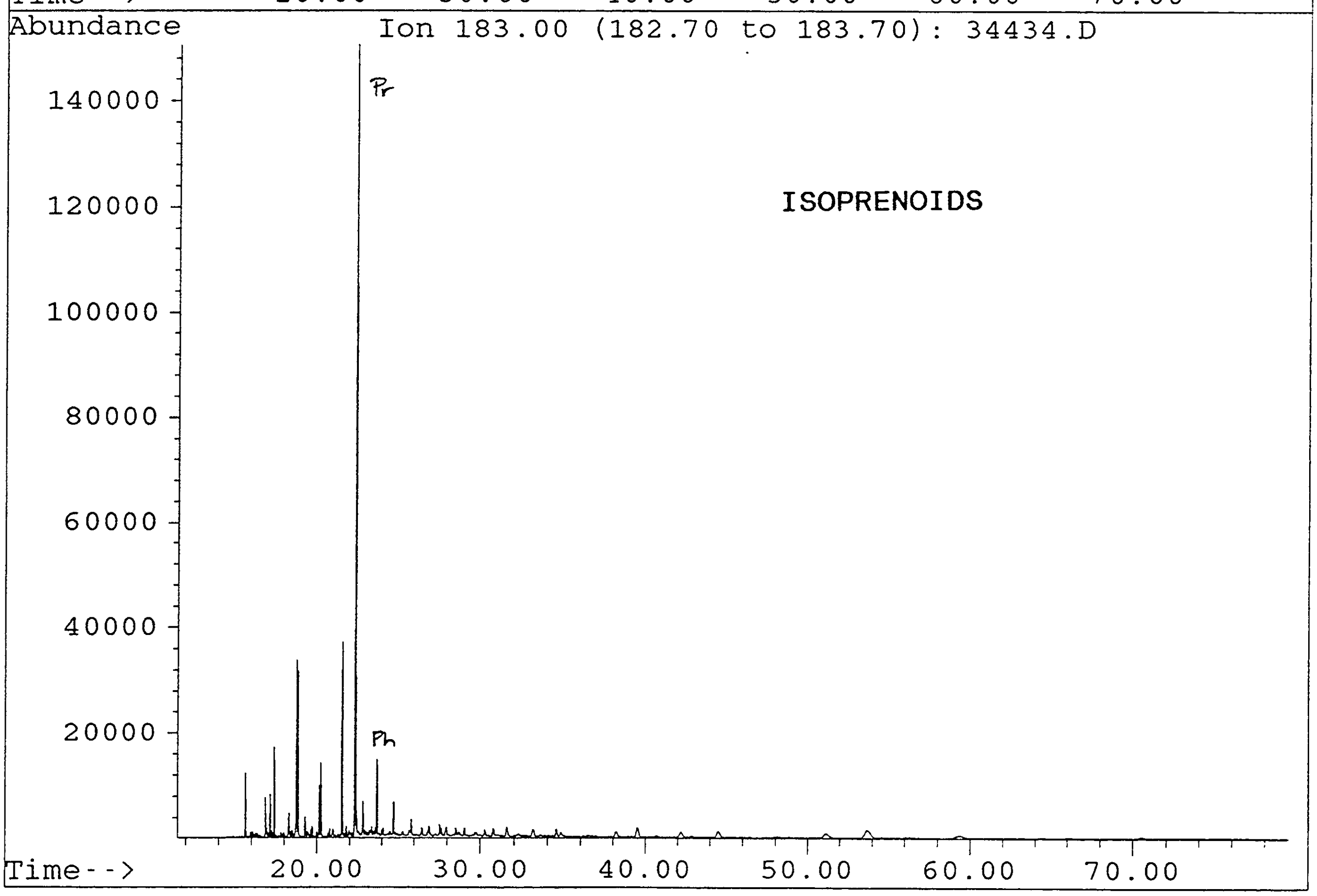

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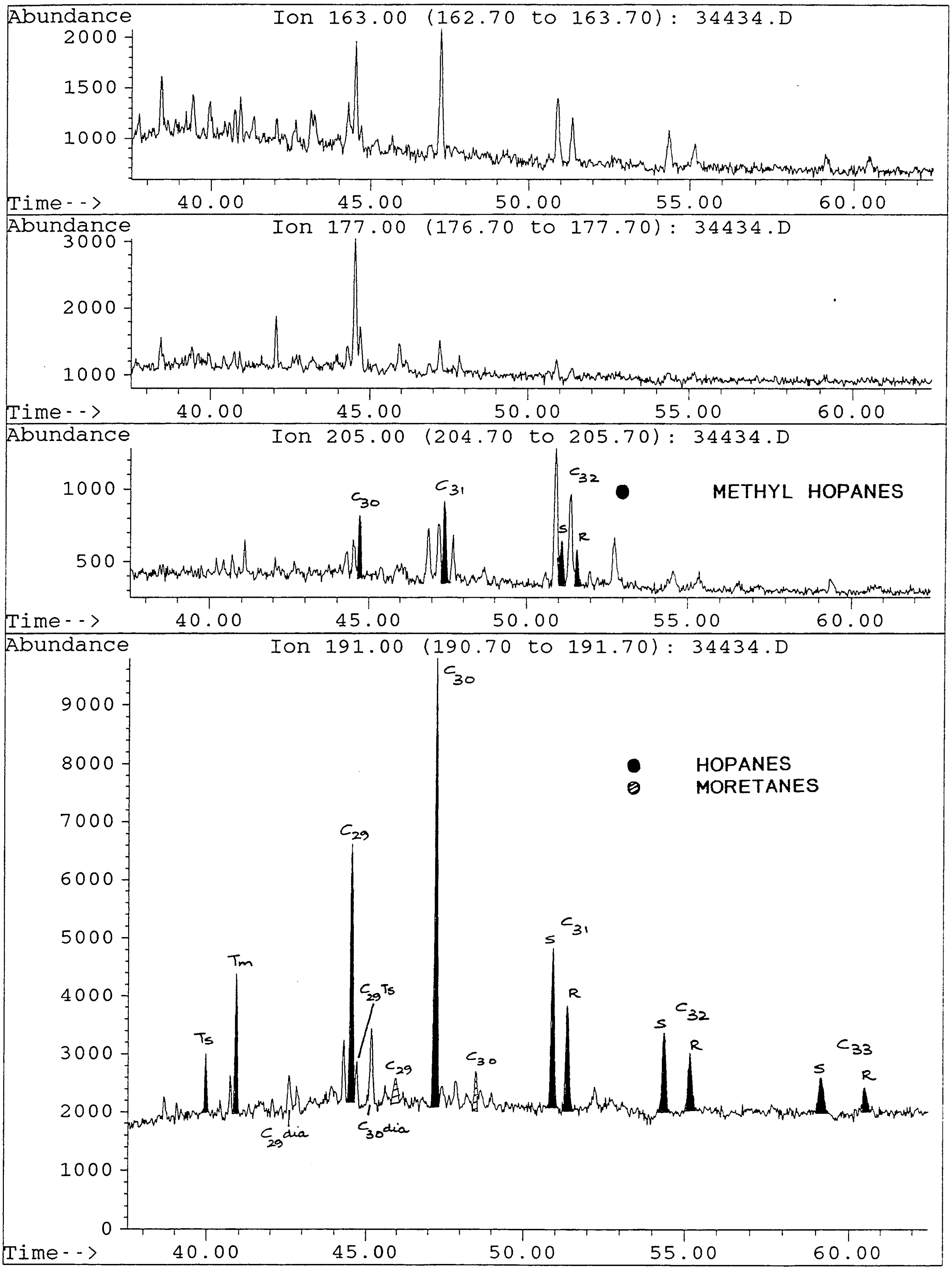

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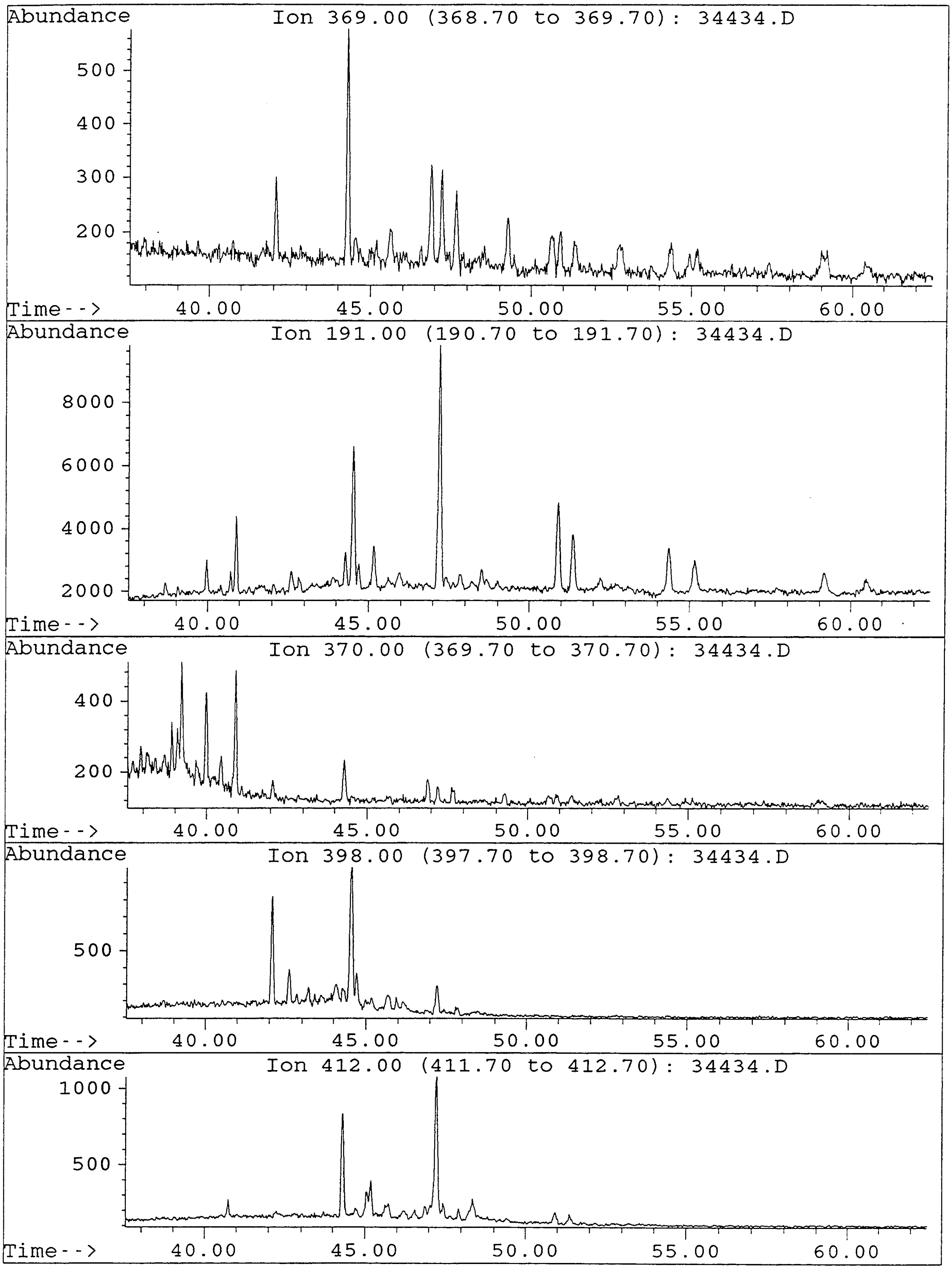

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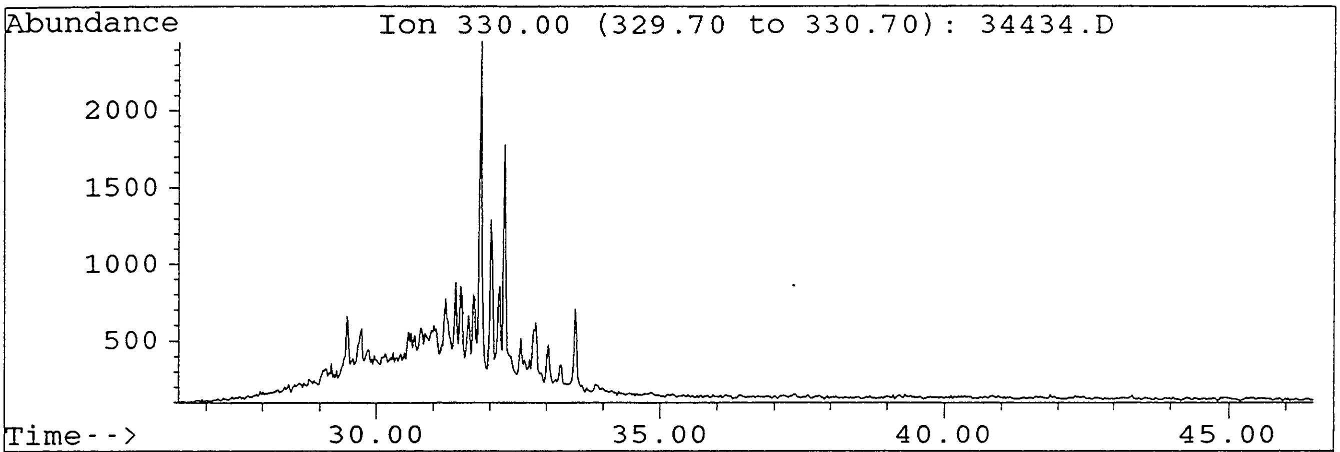

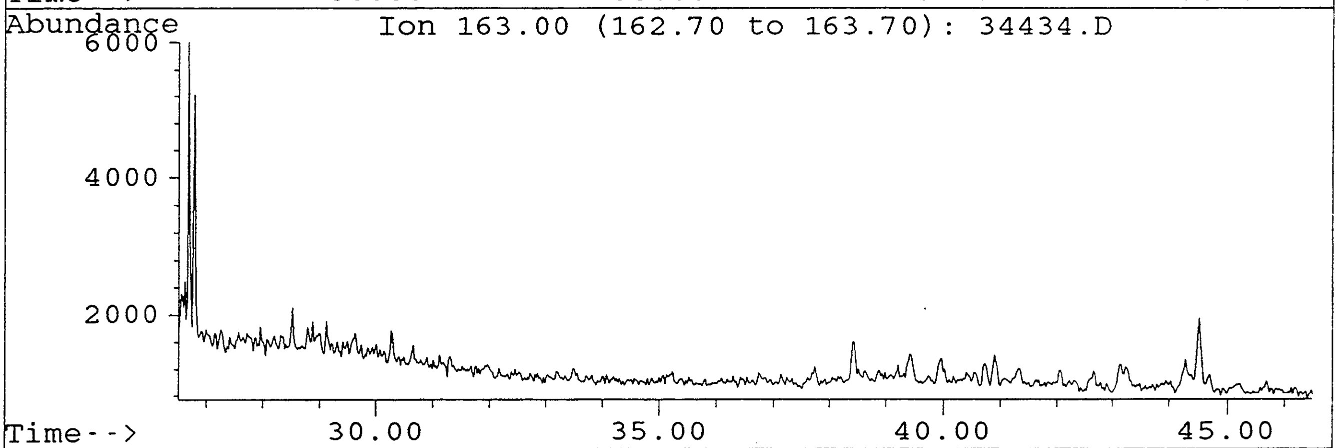

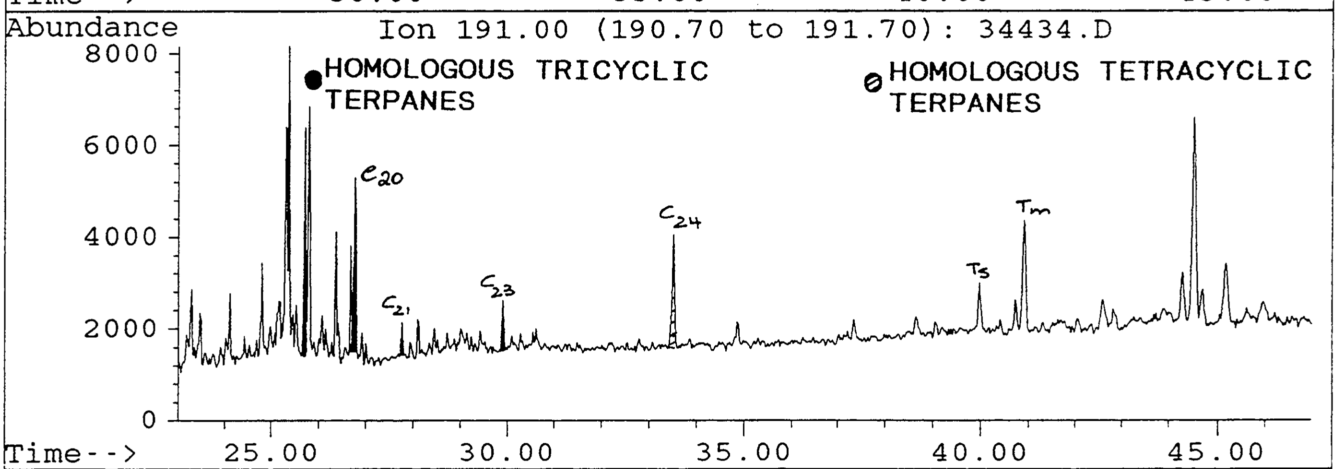

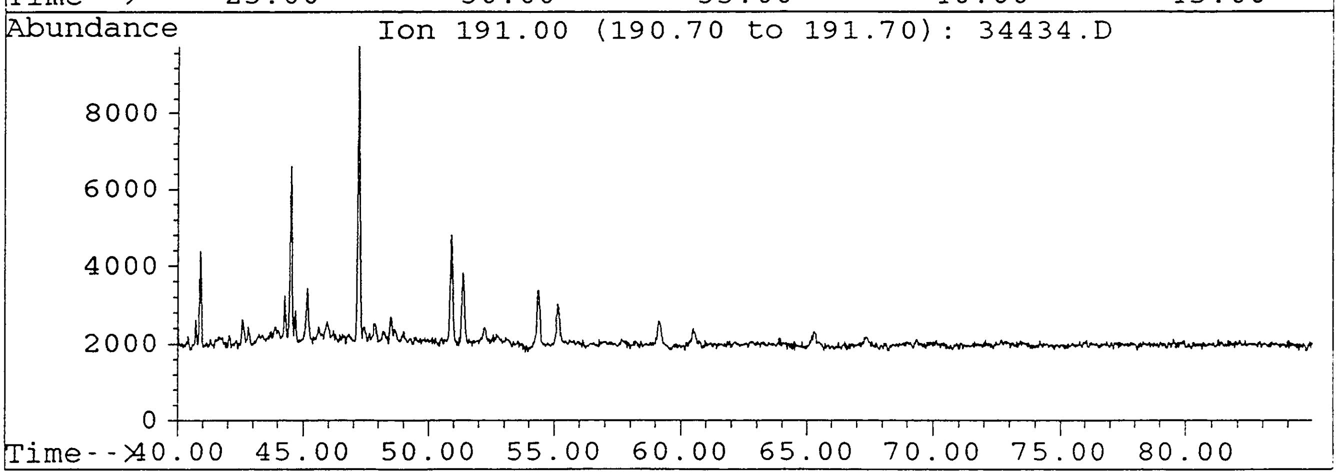

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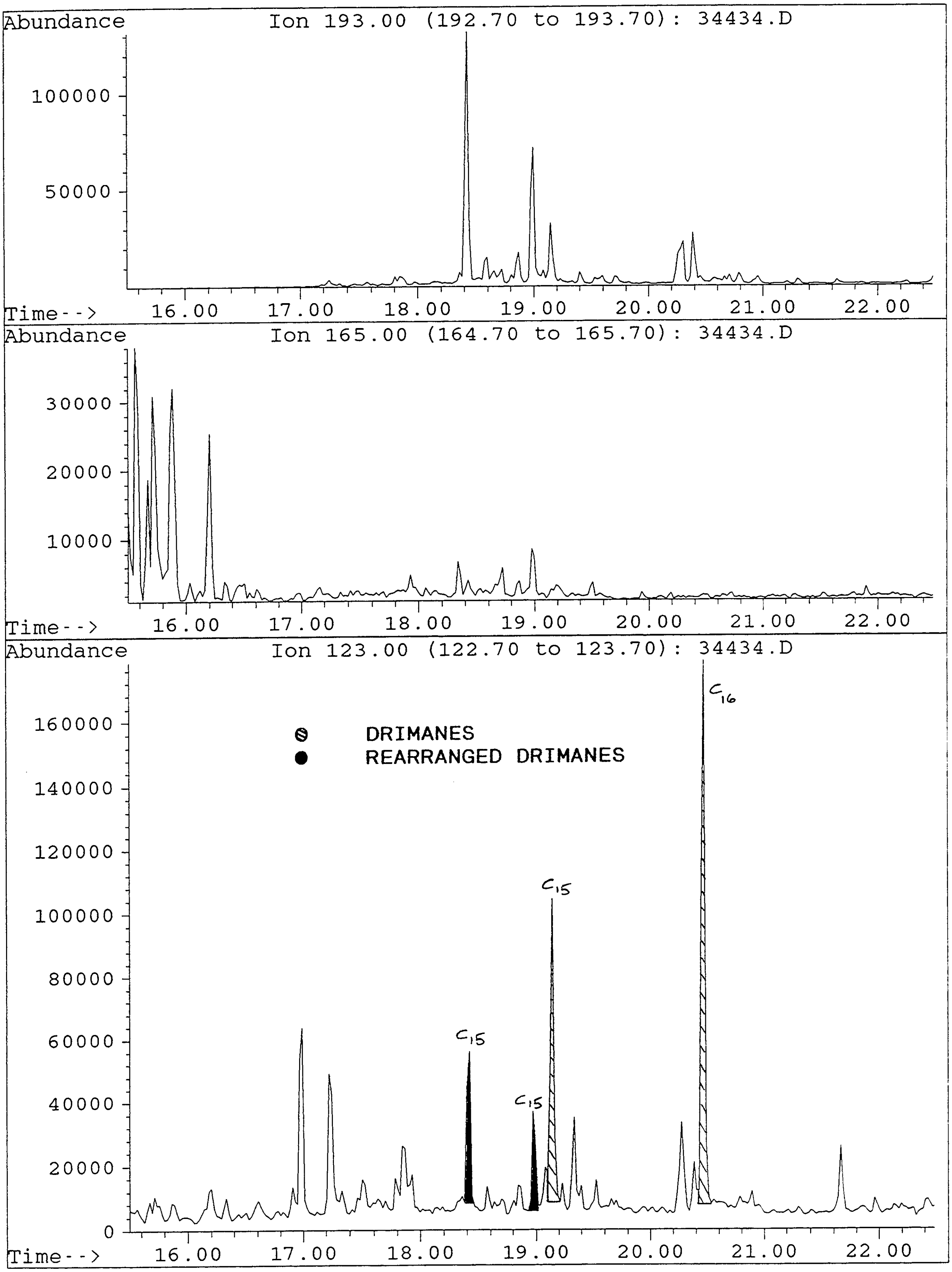
Misc. Info : COL#164. GEC/DJ. 26-7-95.



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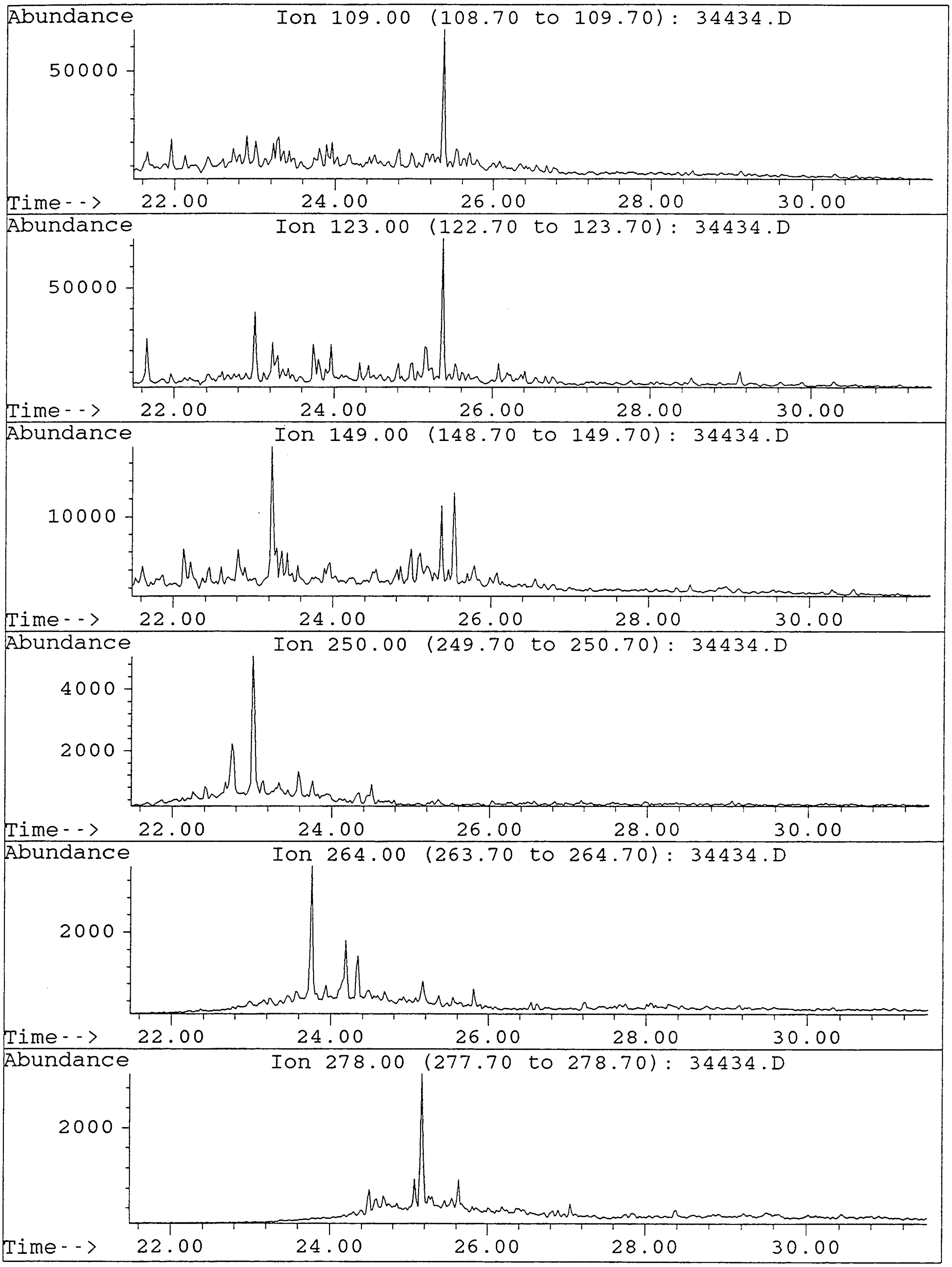

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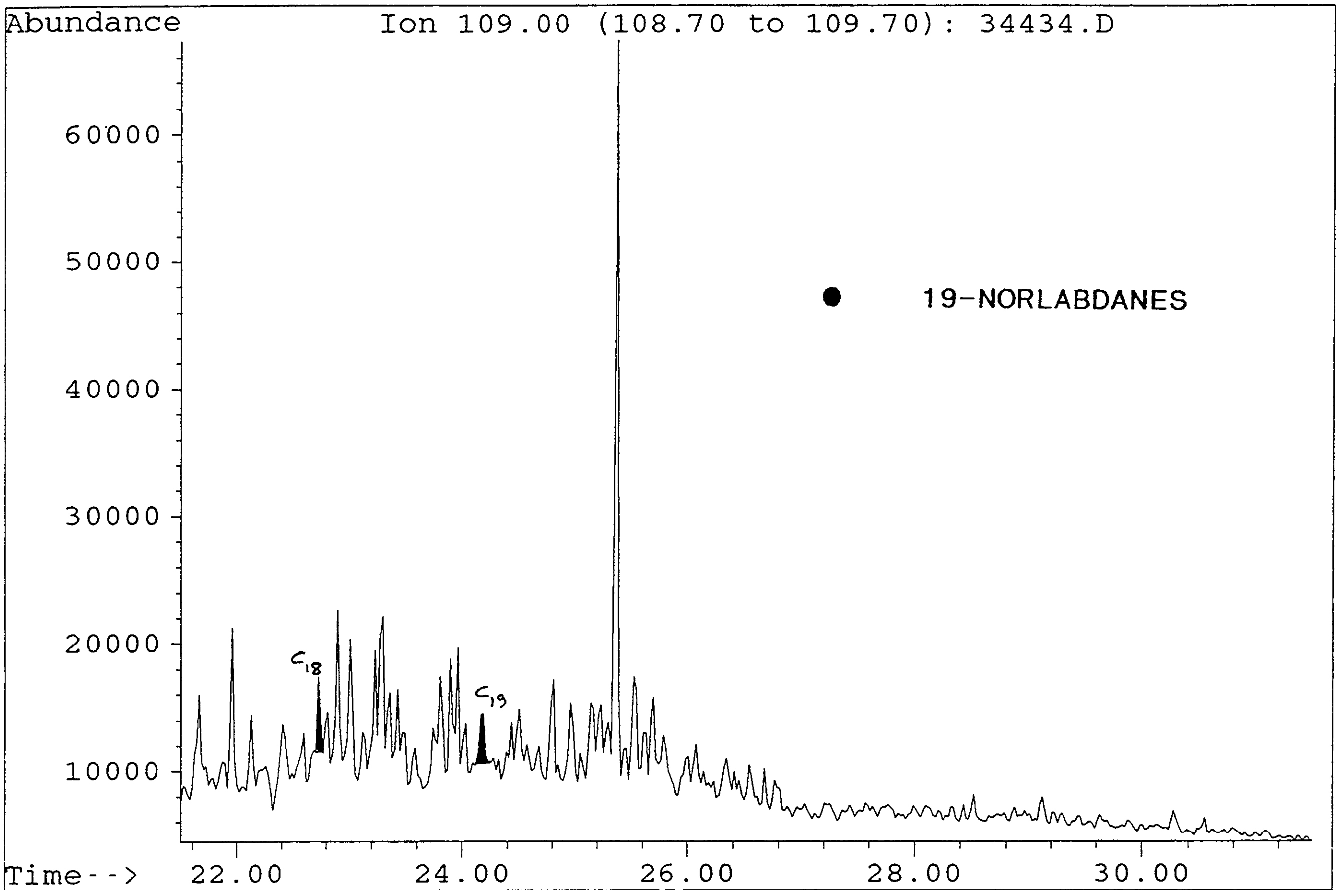

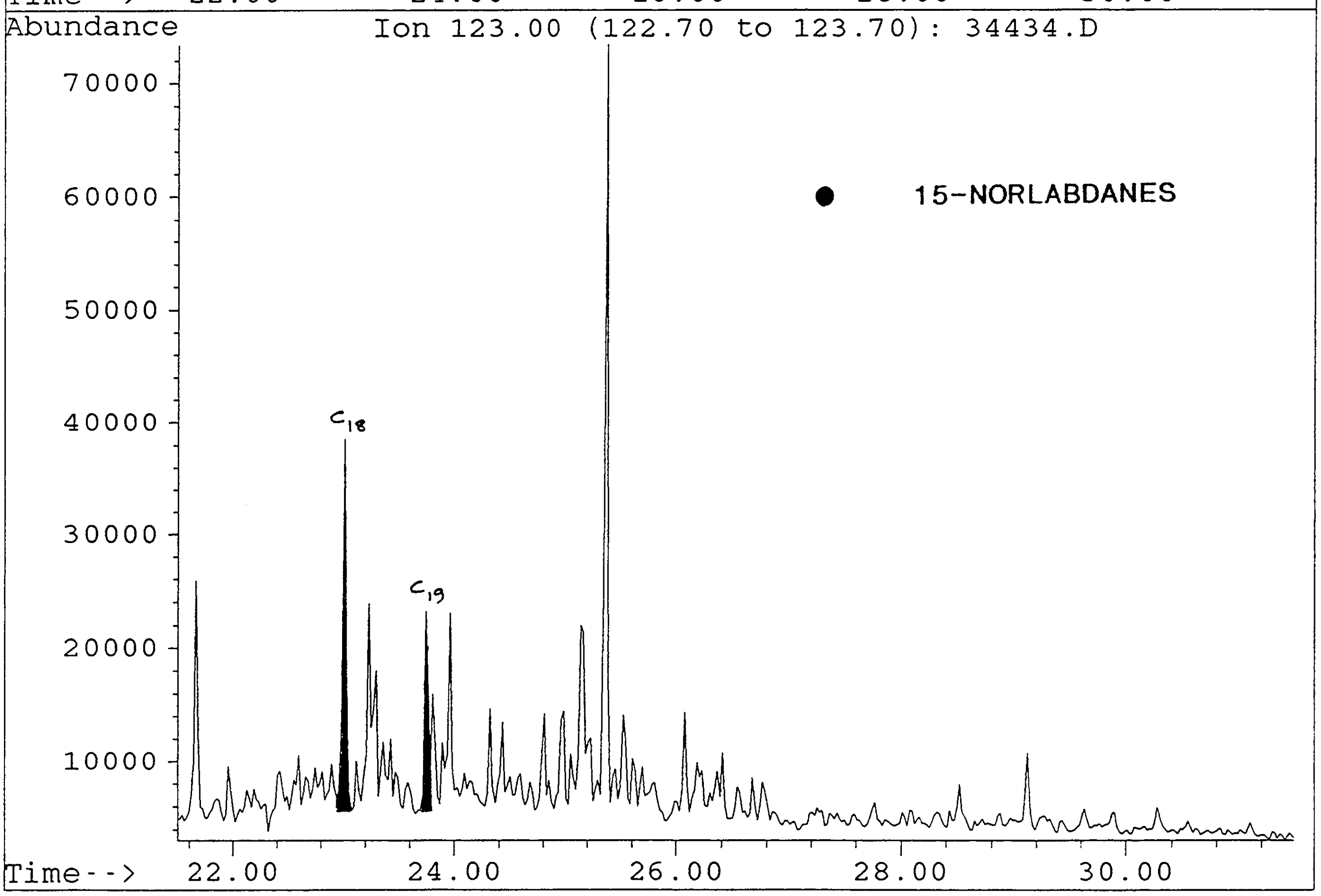

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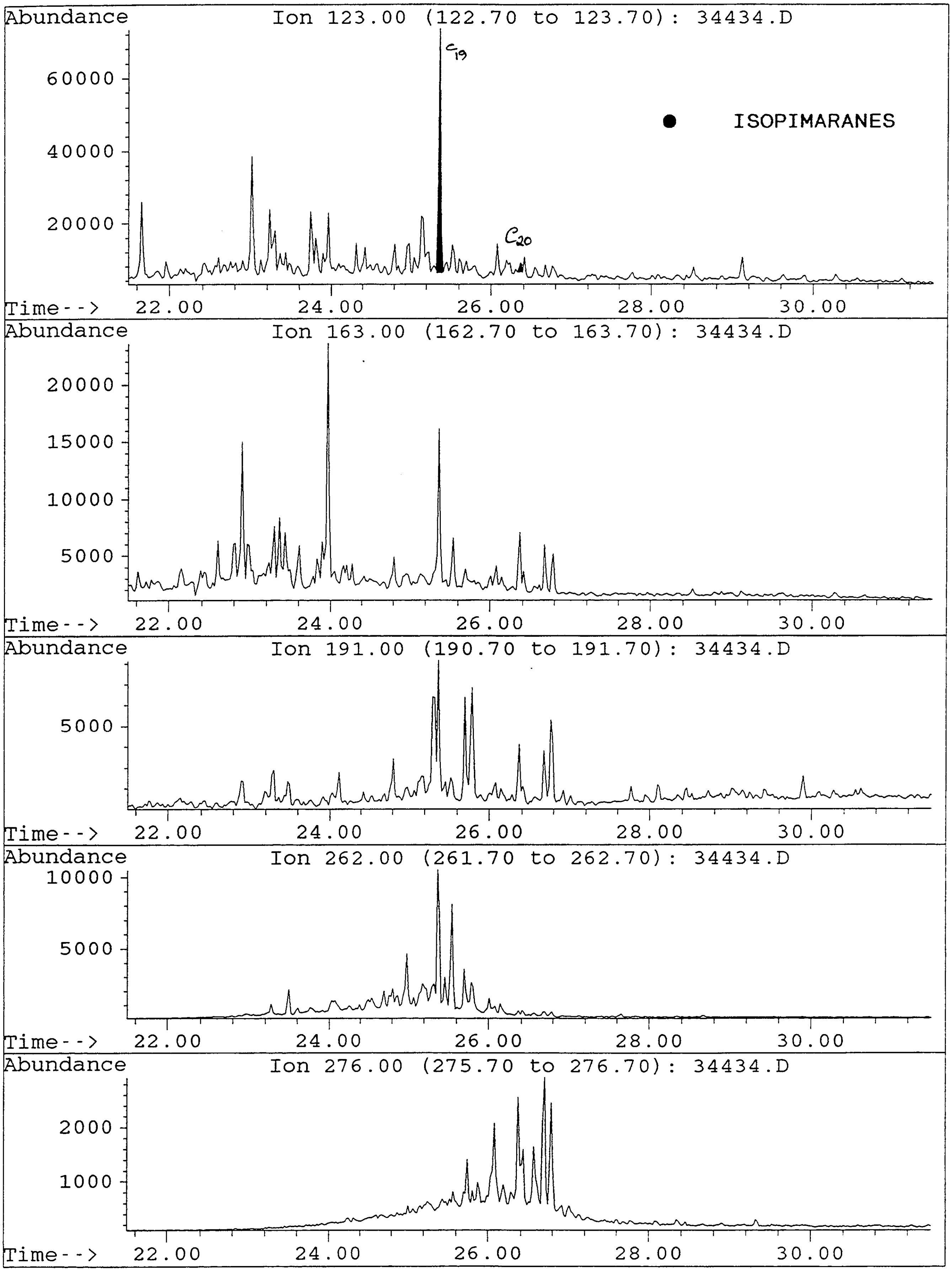

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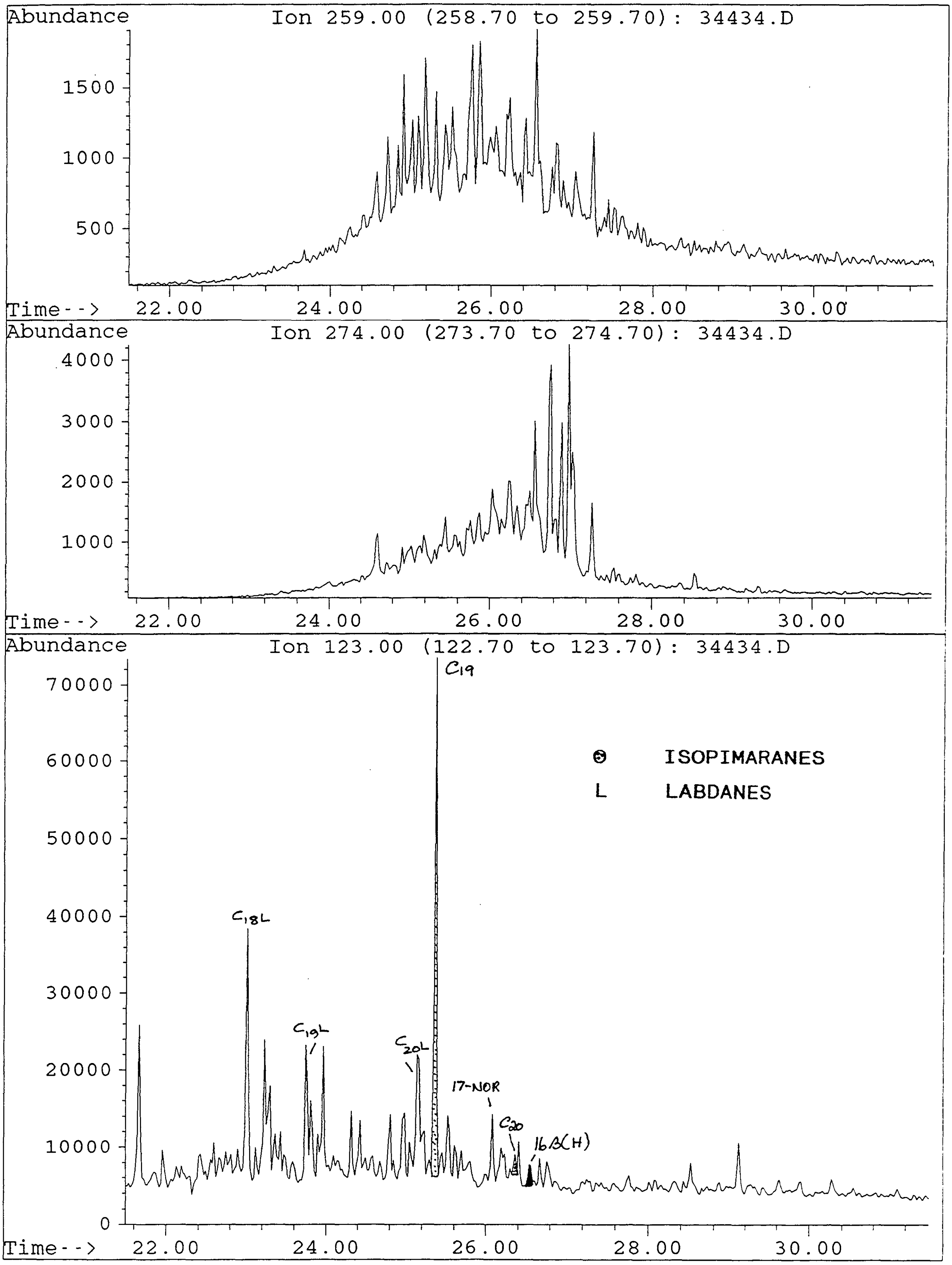

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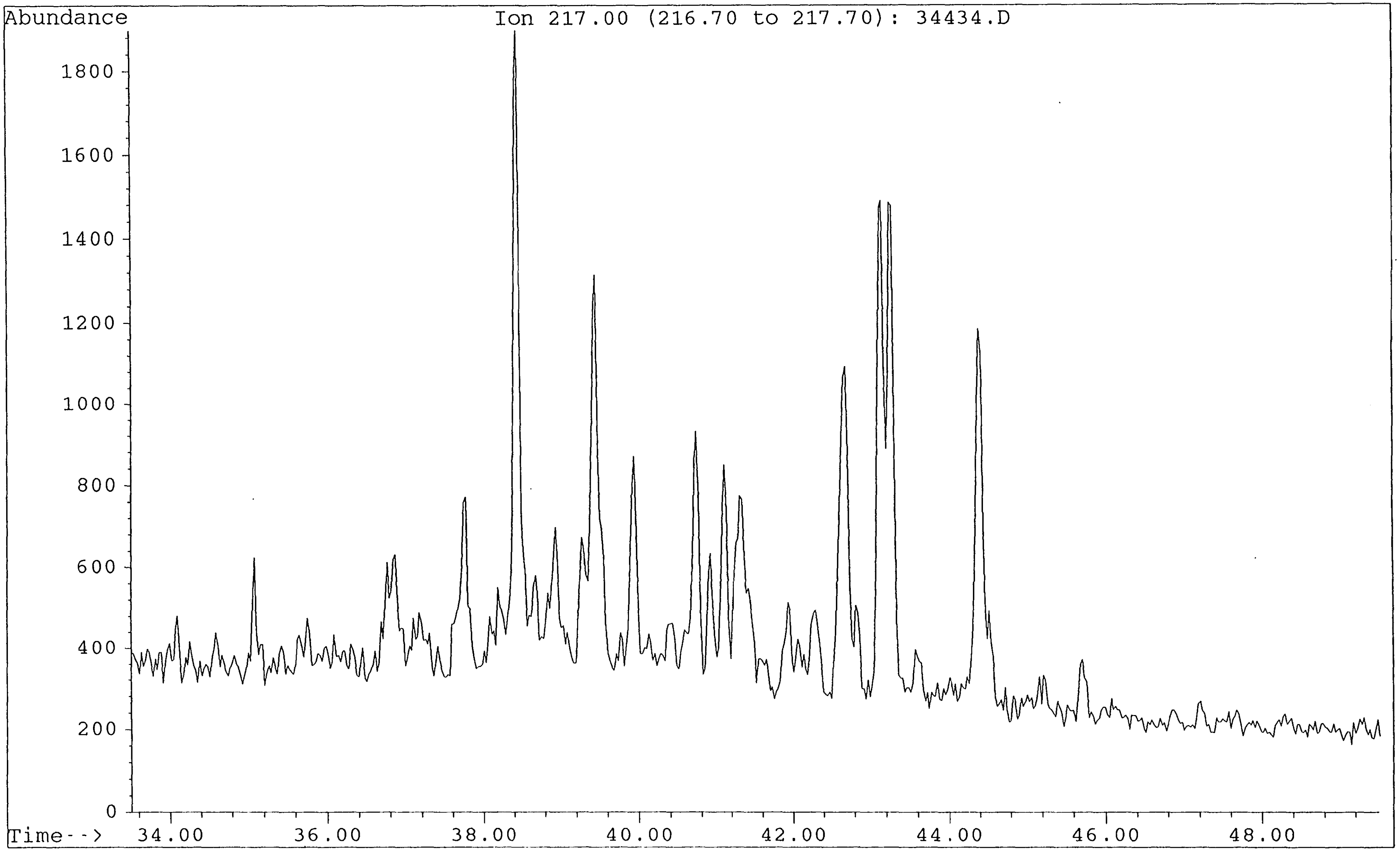

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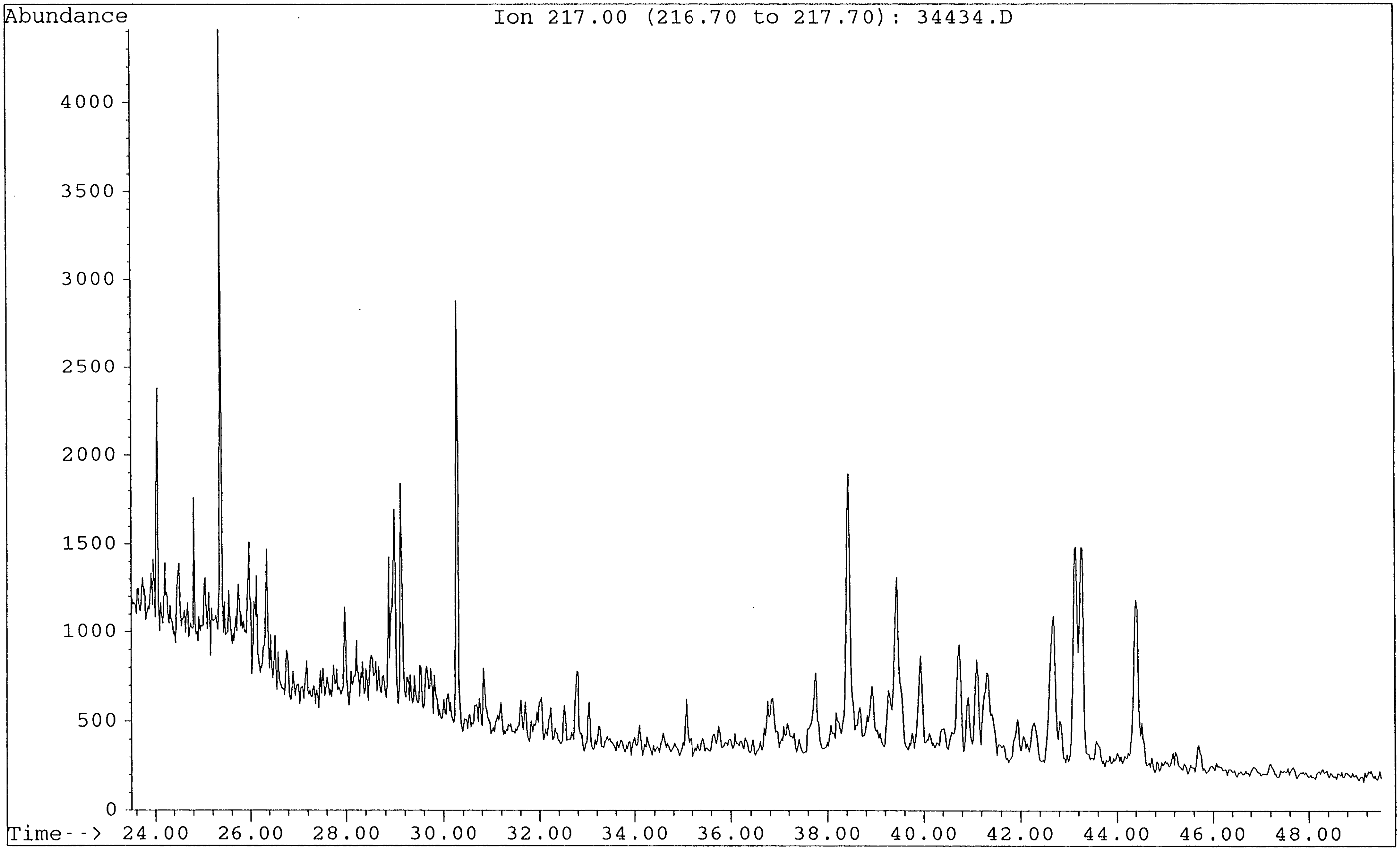

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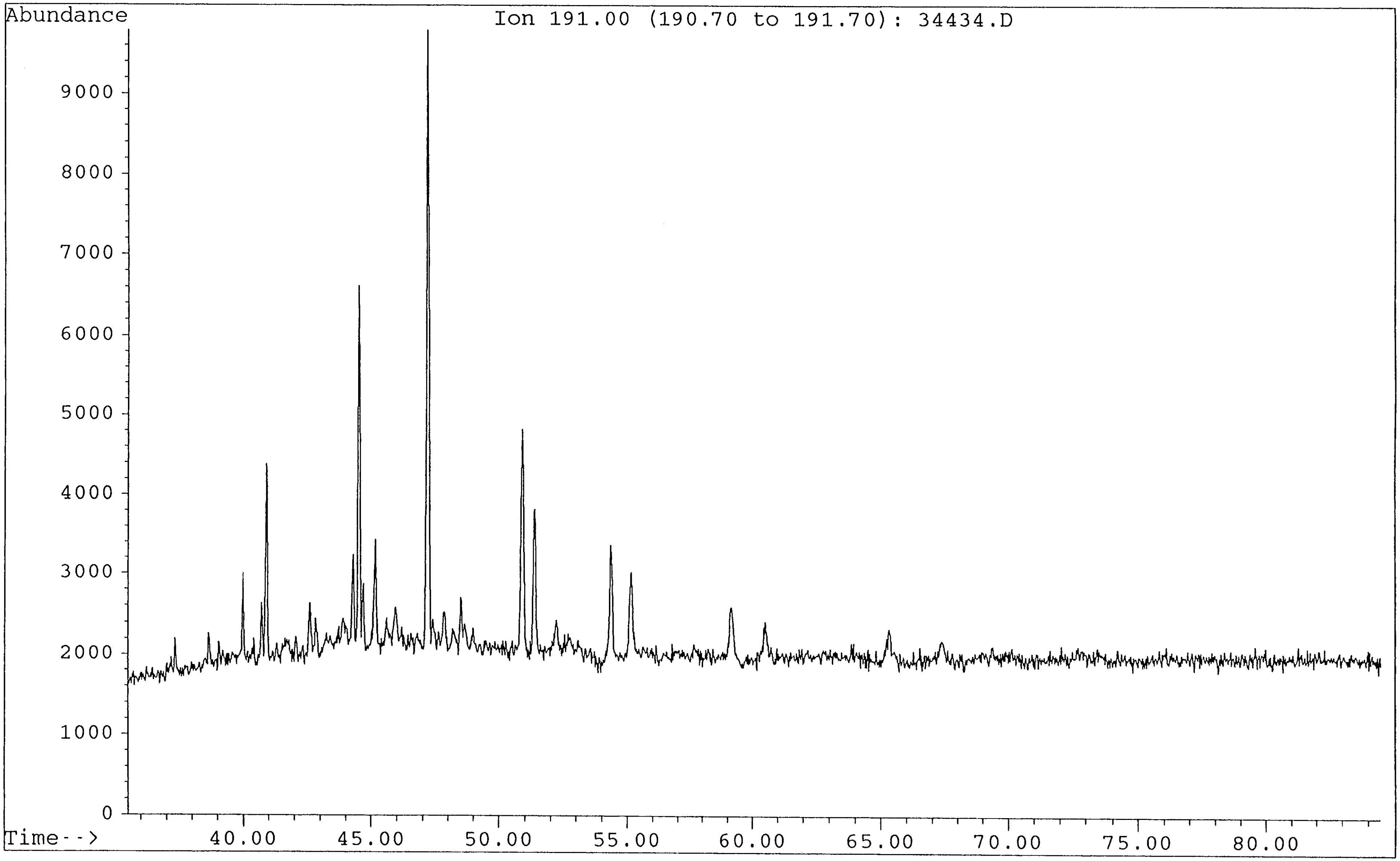

File : 34434.D
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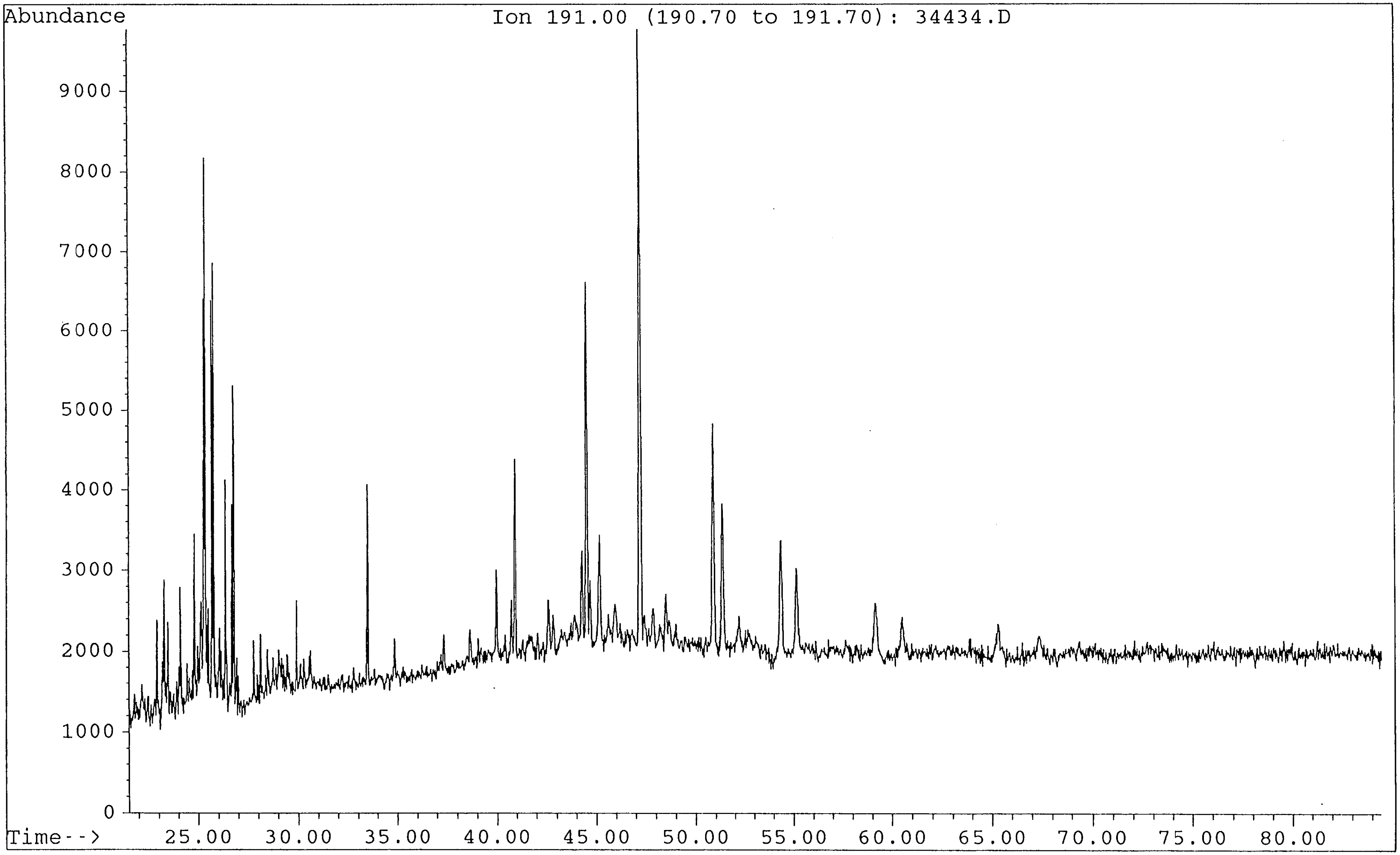
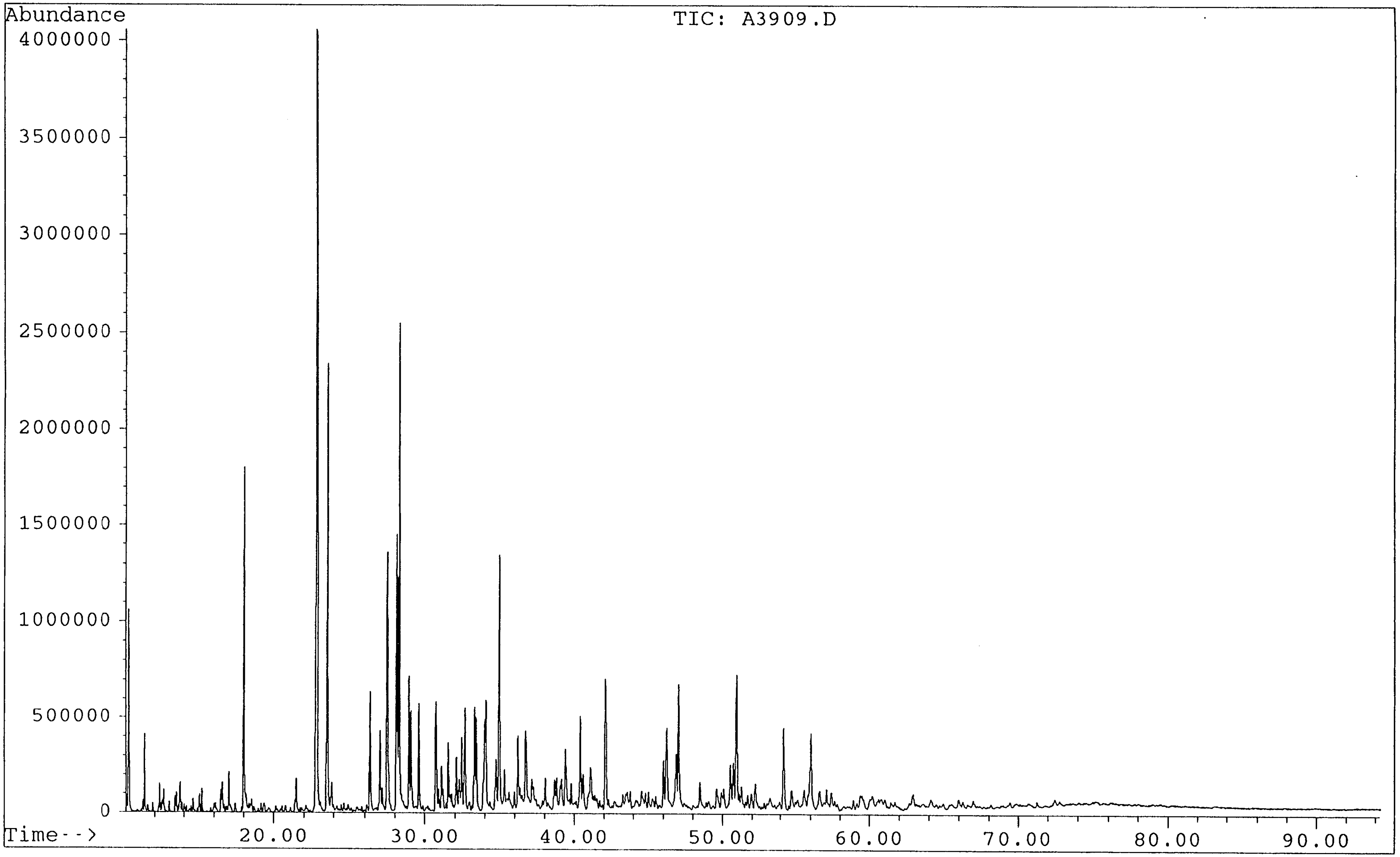
Misc. Info : COL#164. GEC/DJ. 26-7-95.



File : A3909.D
Sample : DIGBY#1, 1944m. AROS.
Misc. Info : COL#155. 28-7-95. GEC.

FIGURE 8-4



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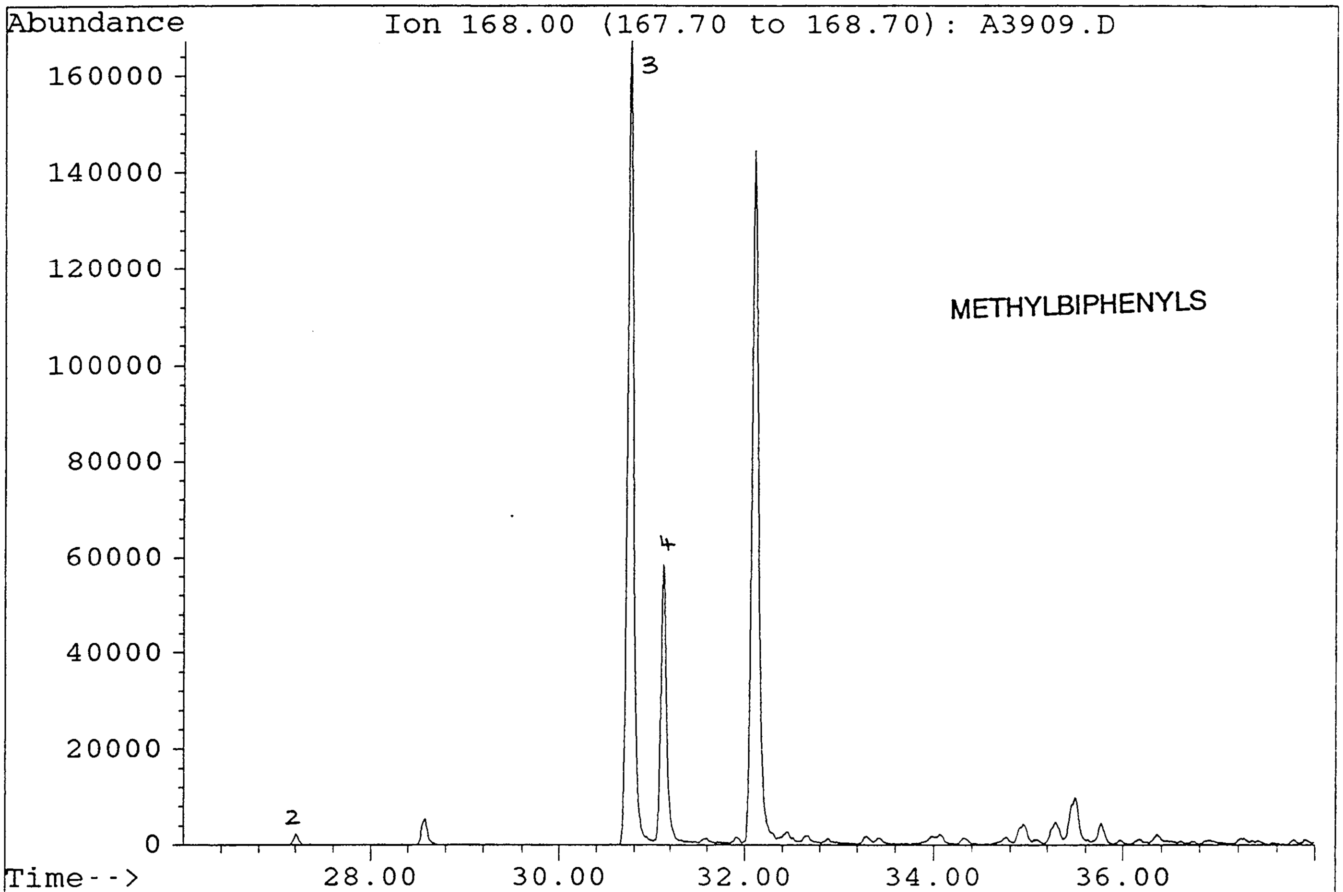

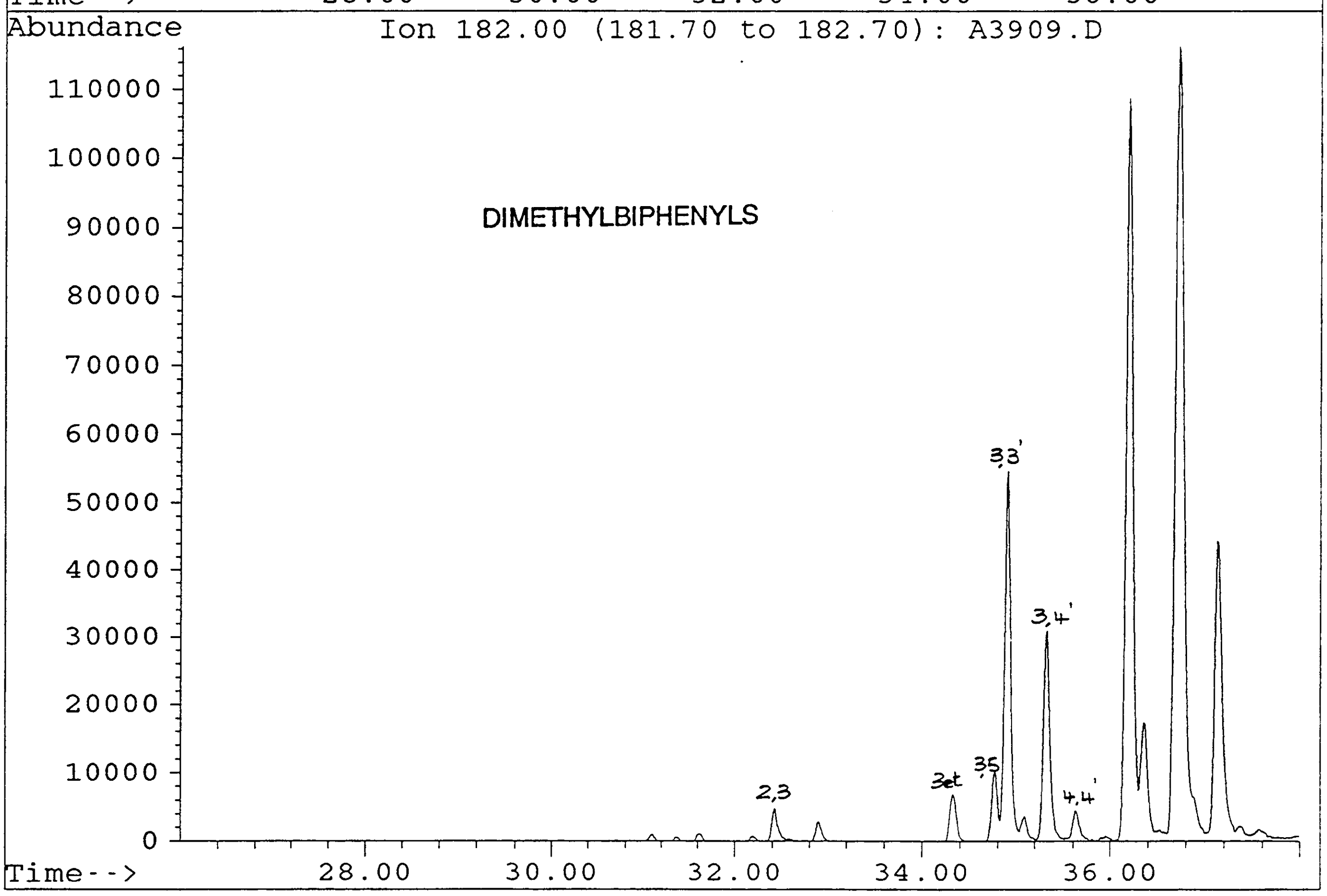

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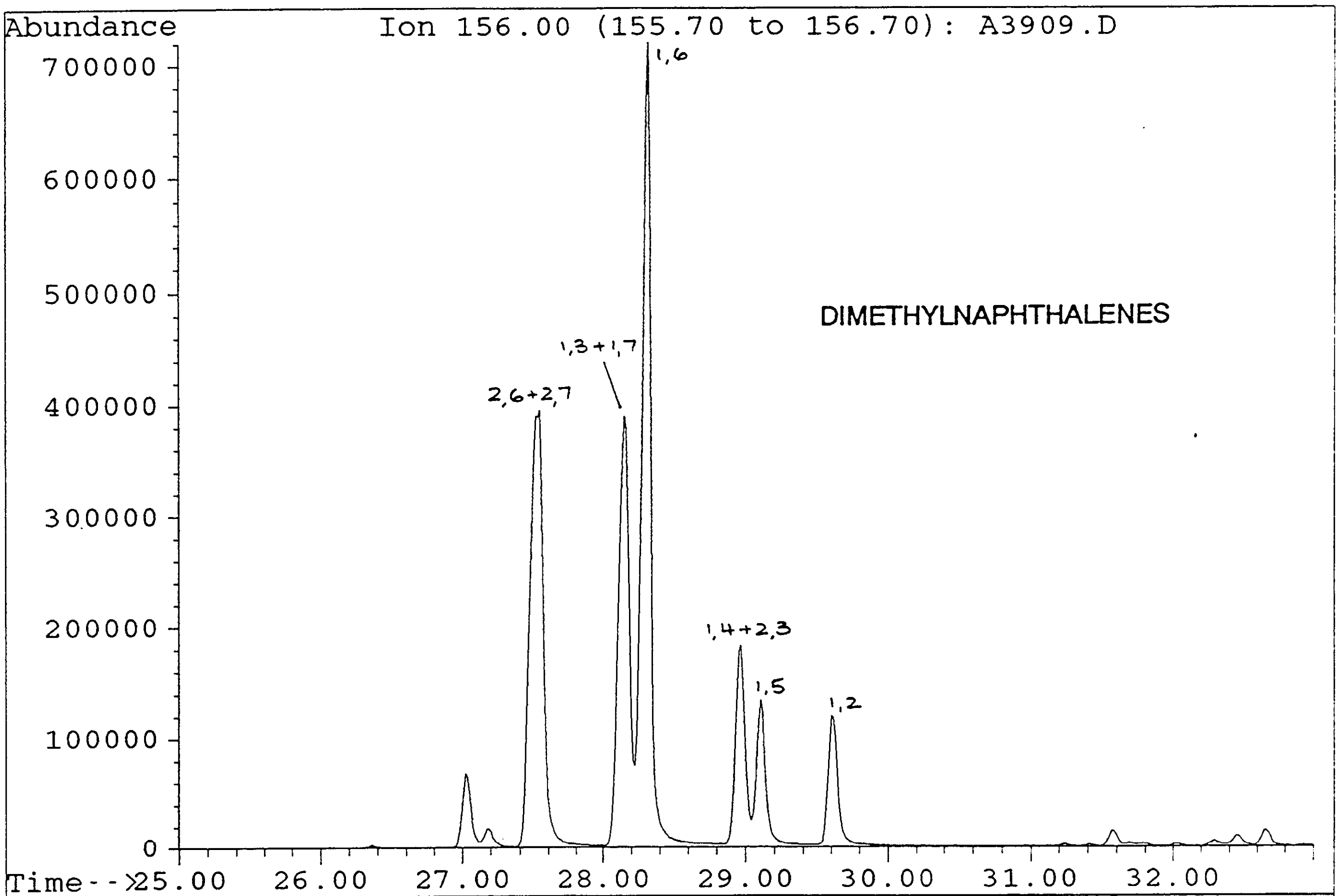

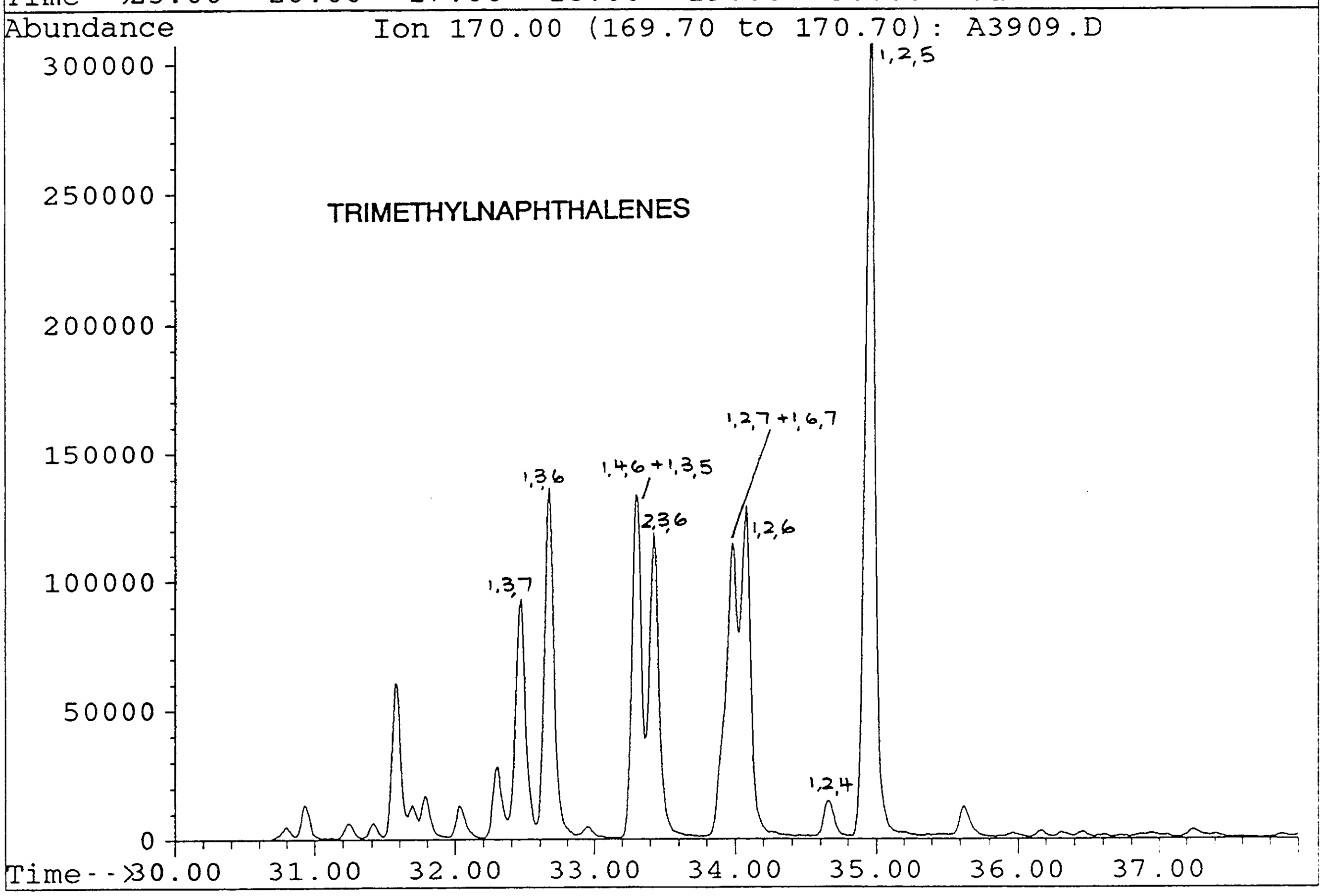

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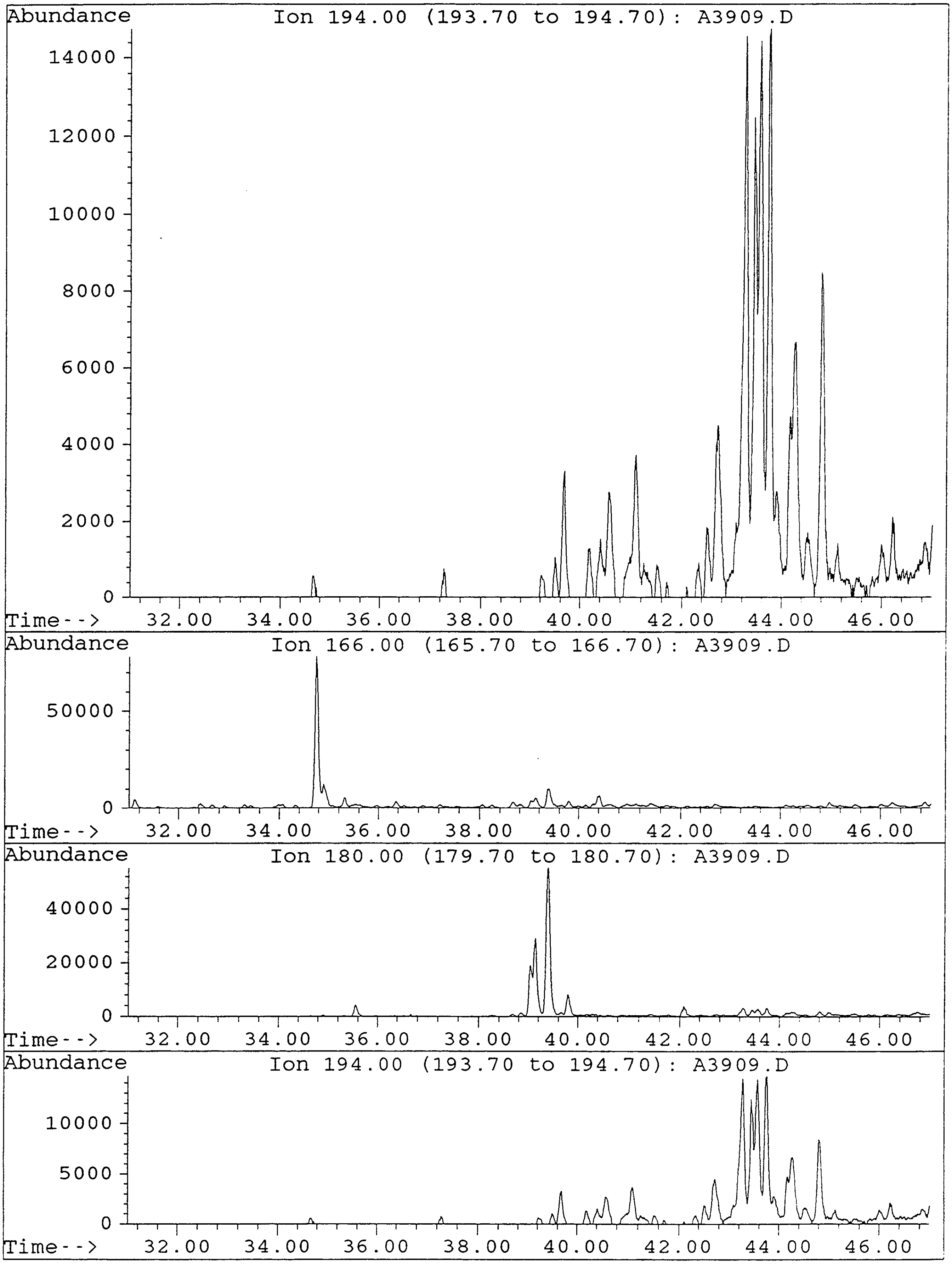
FLUORENES



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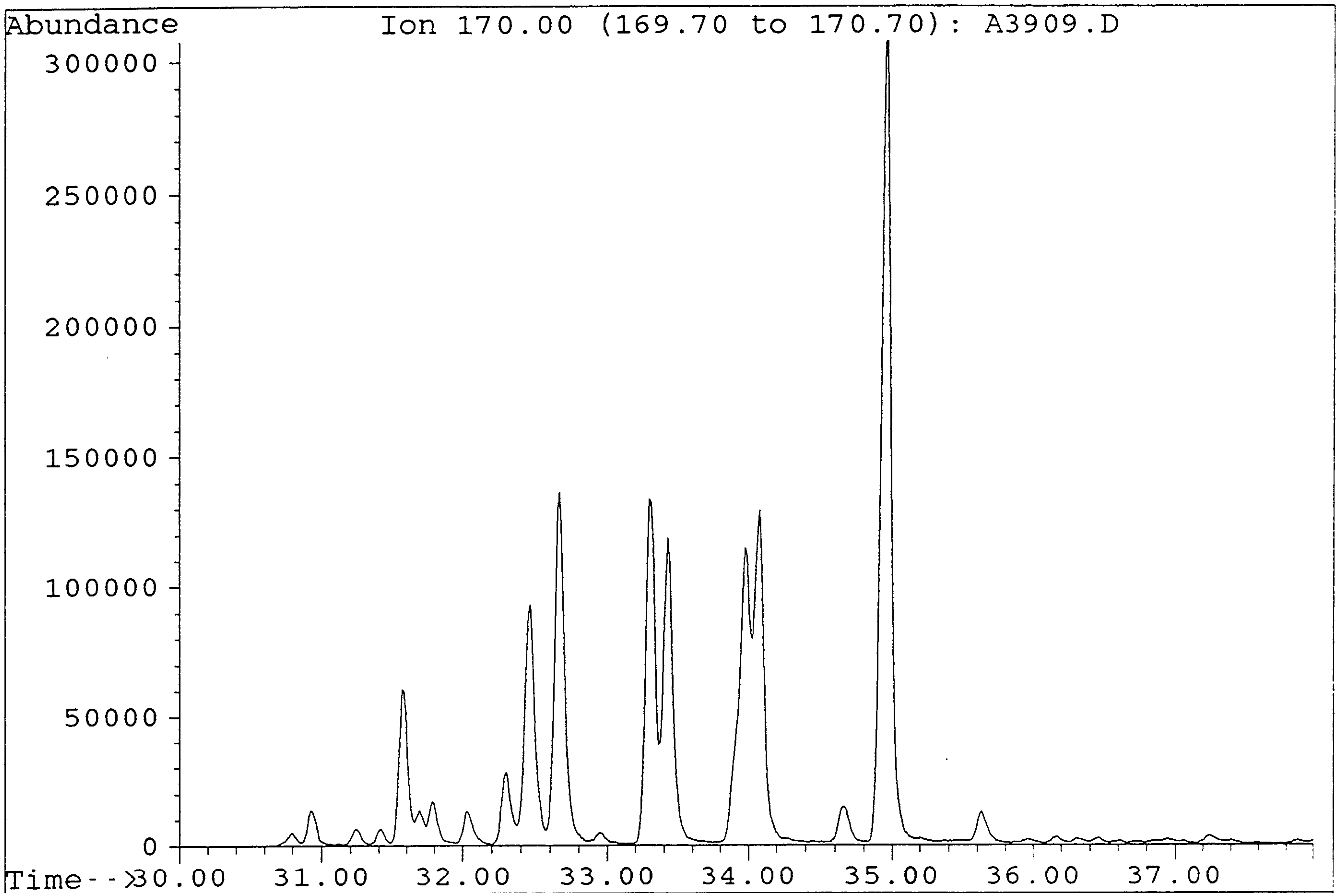

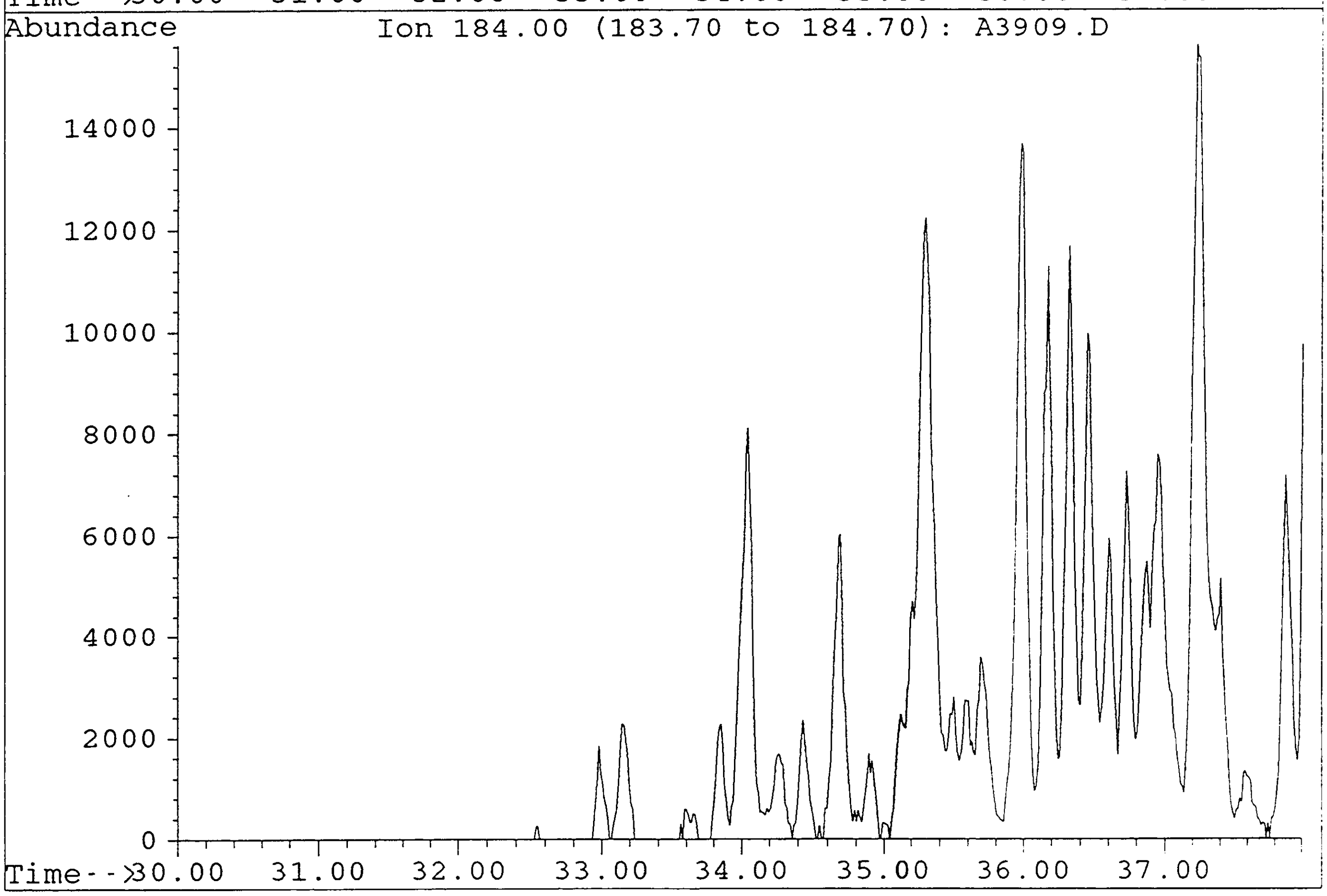

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Sample : DIGBY#1, 1944m. AROS.
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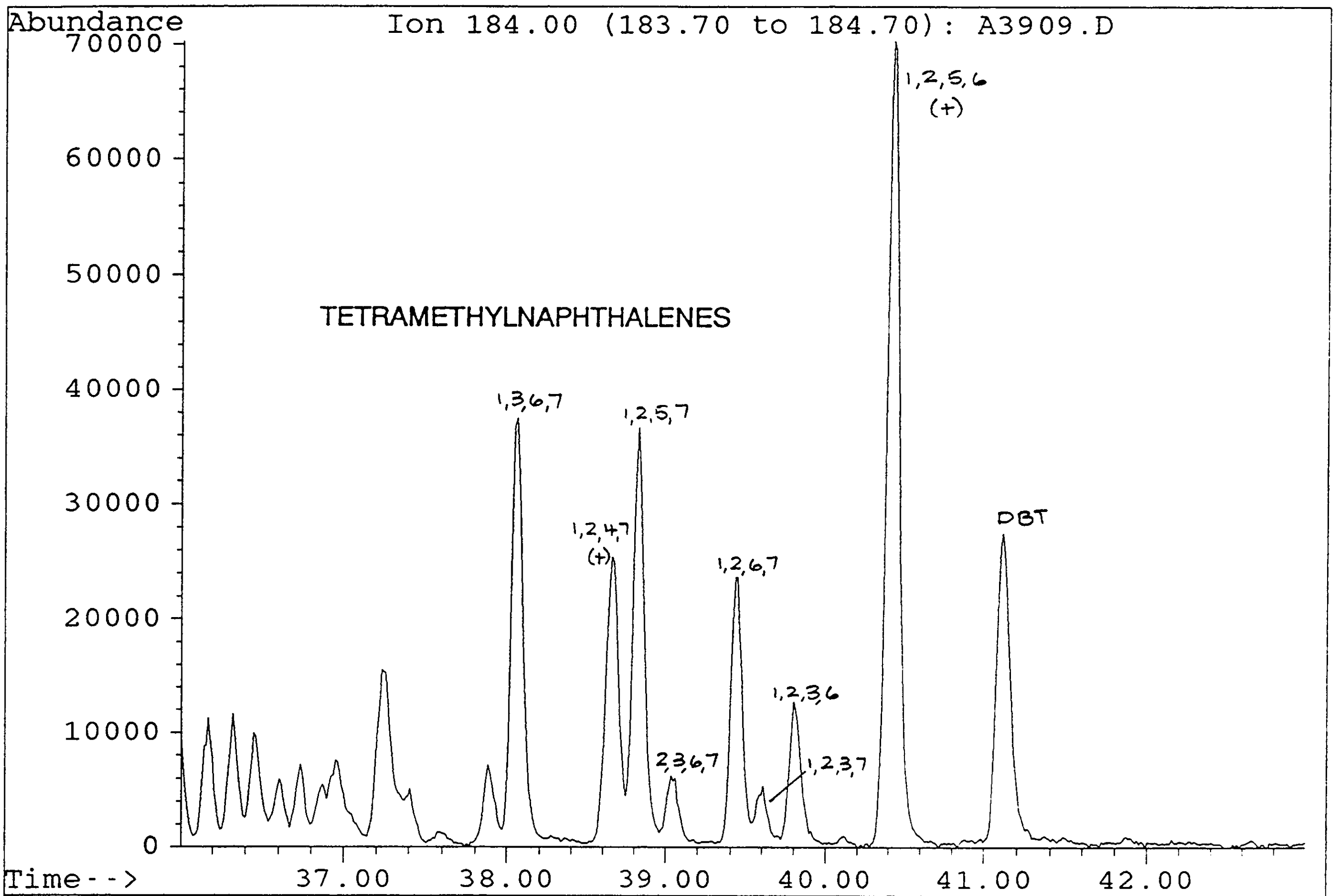

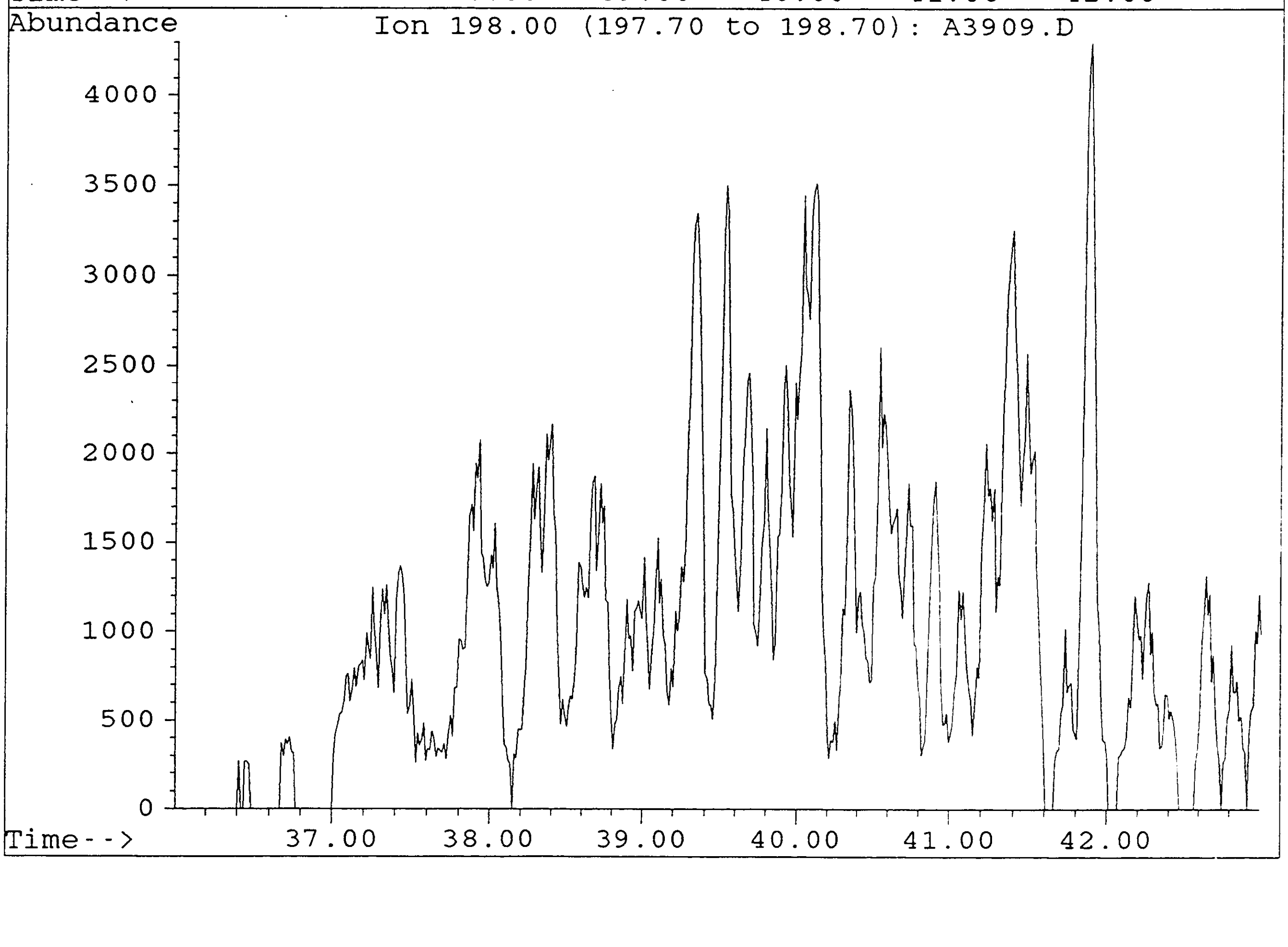

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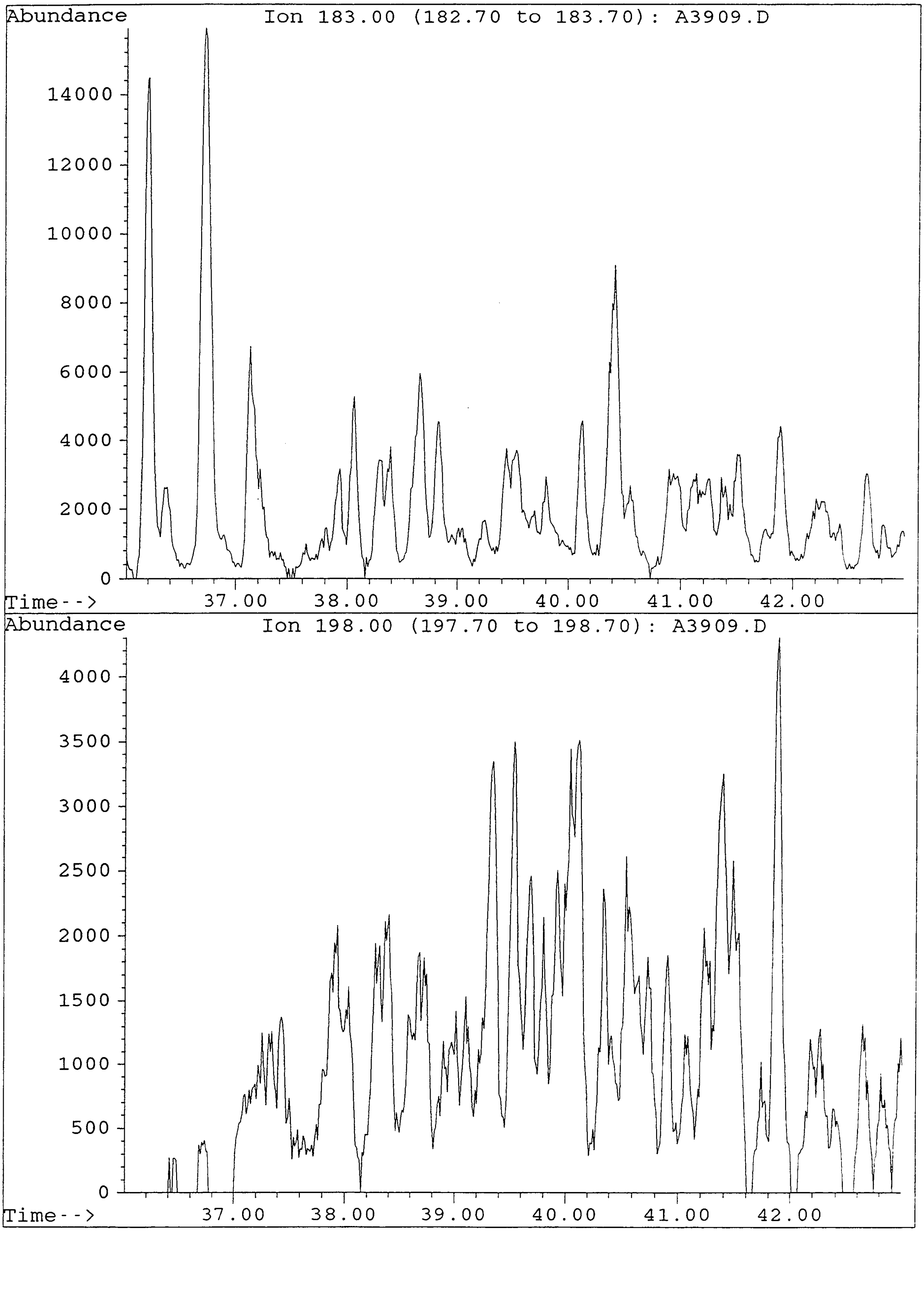
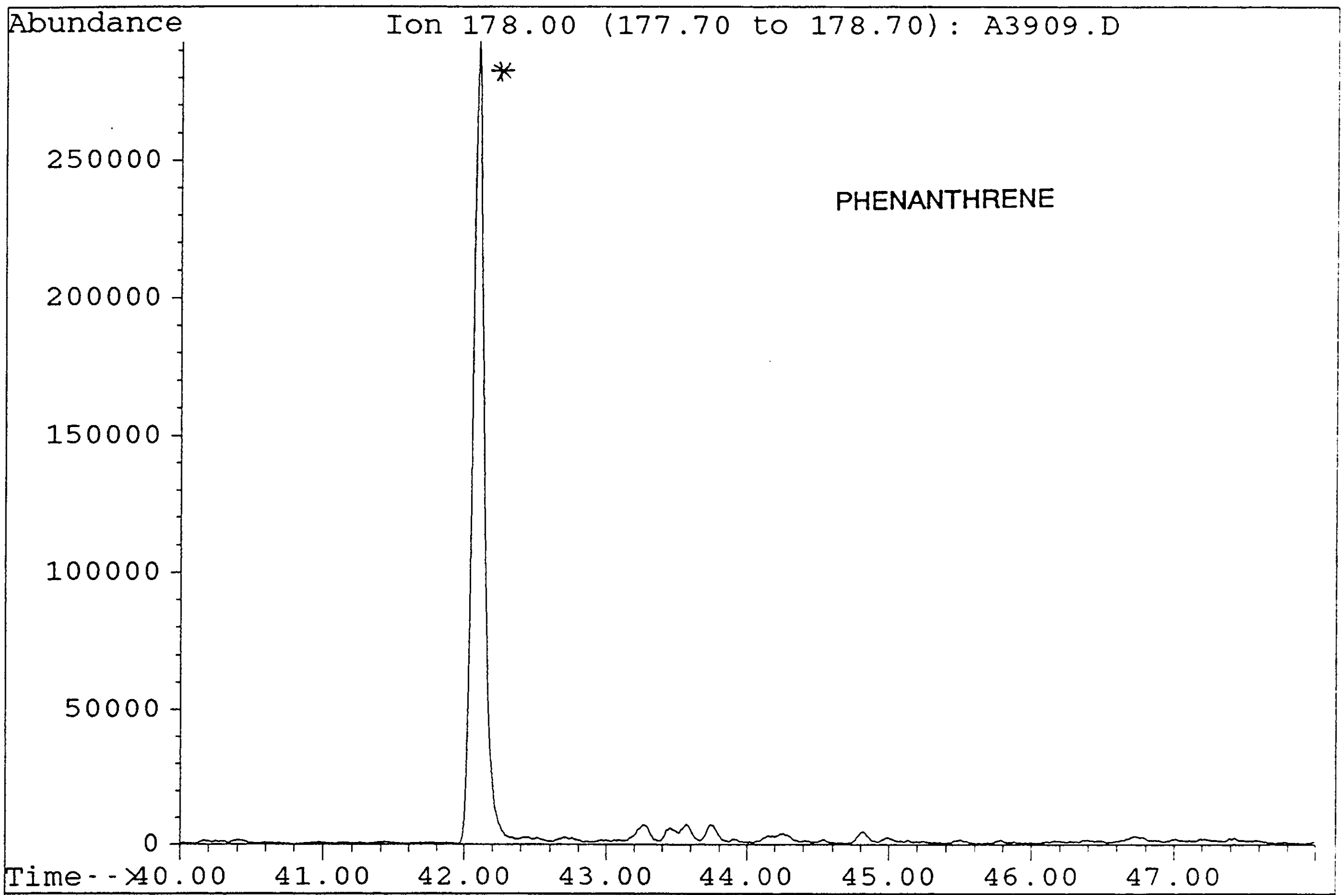
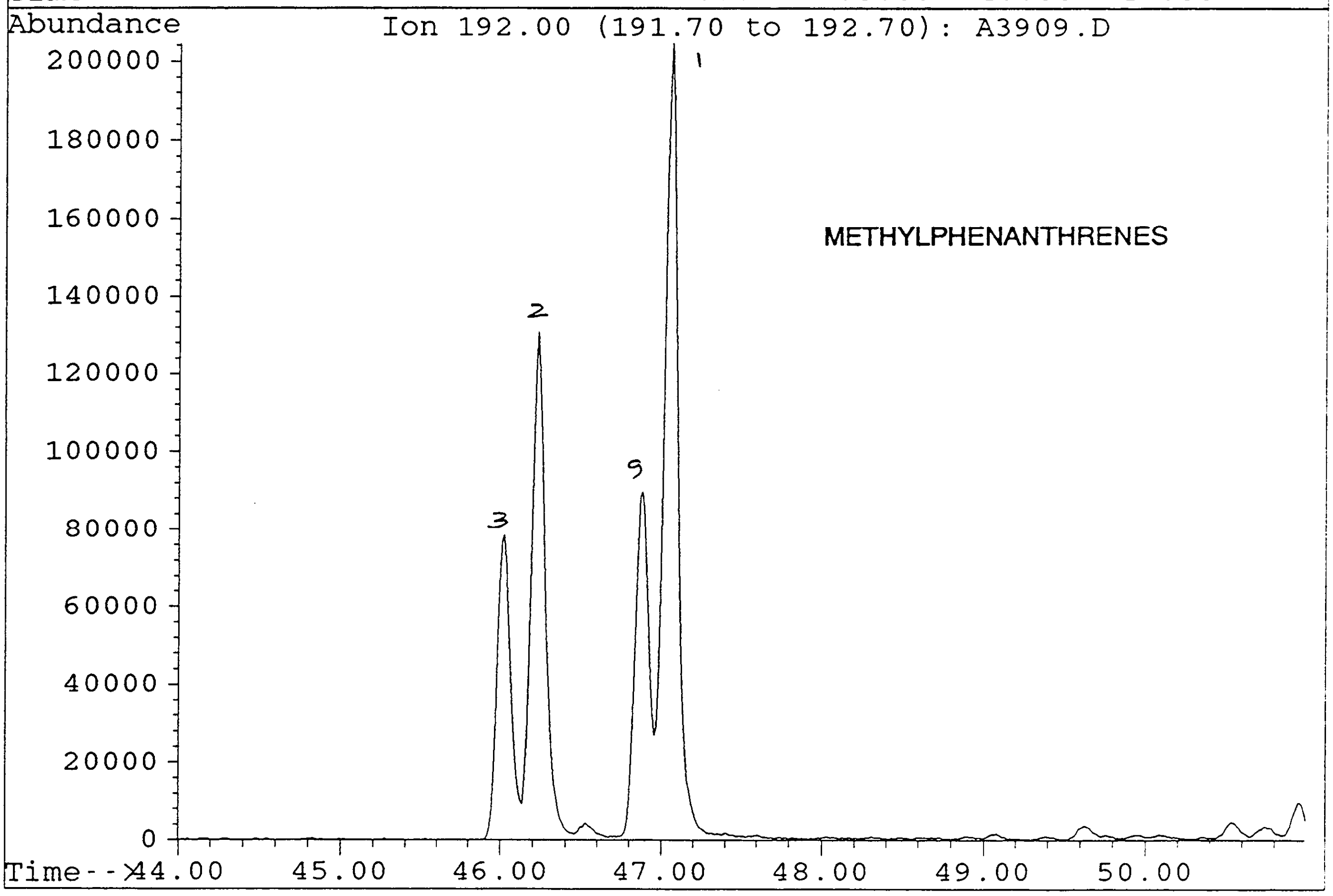
Sample : DIGBY#1, 1944m. AROS.
Misc. Info : COL#155. 28-7-95. GEC.



File : A3909.D
Sample : DIGBY#1, 1944m. AROS.
Misc. Info : COL#155. 28-7-95. GEC.





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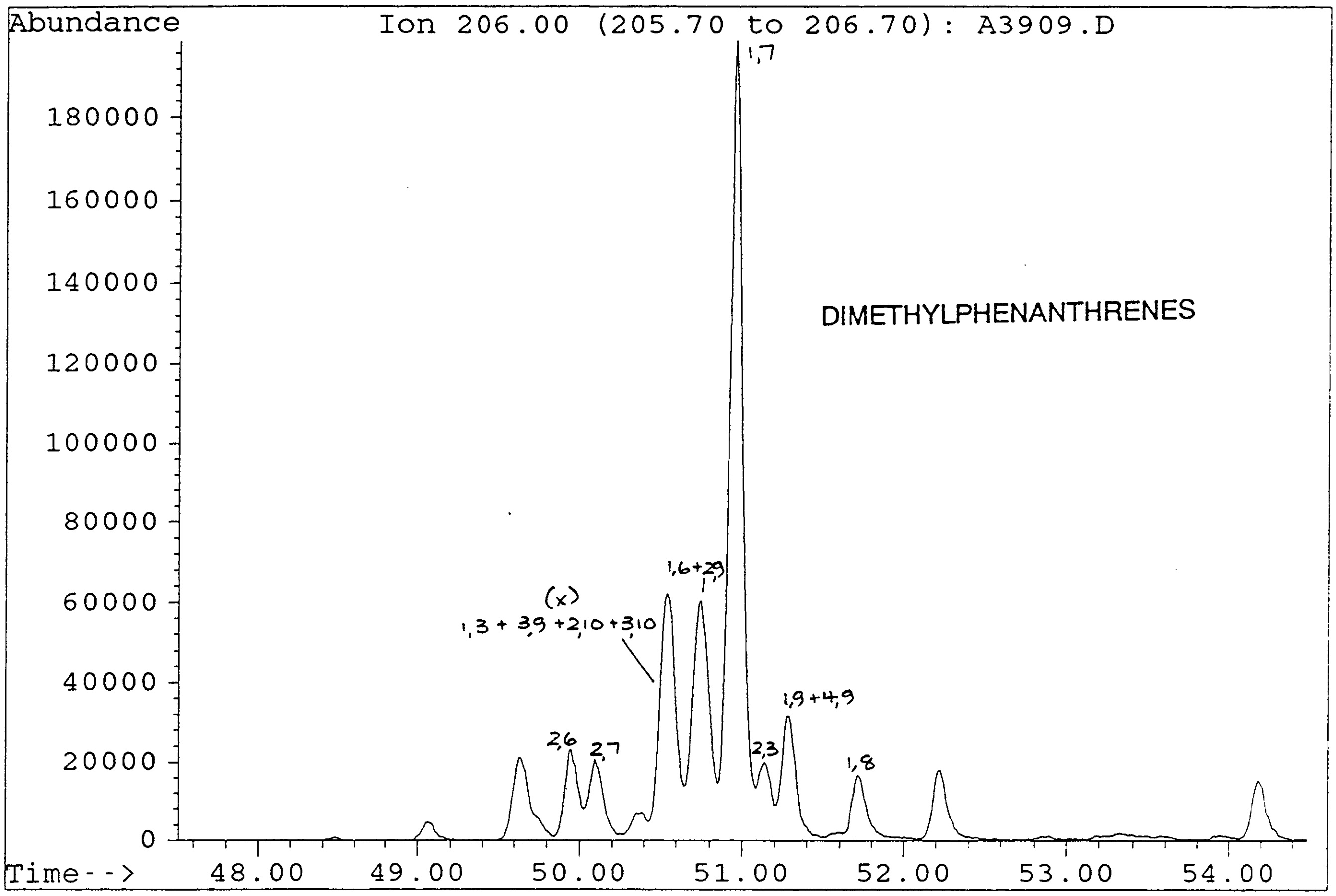

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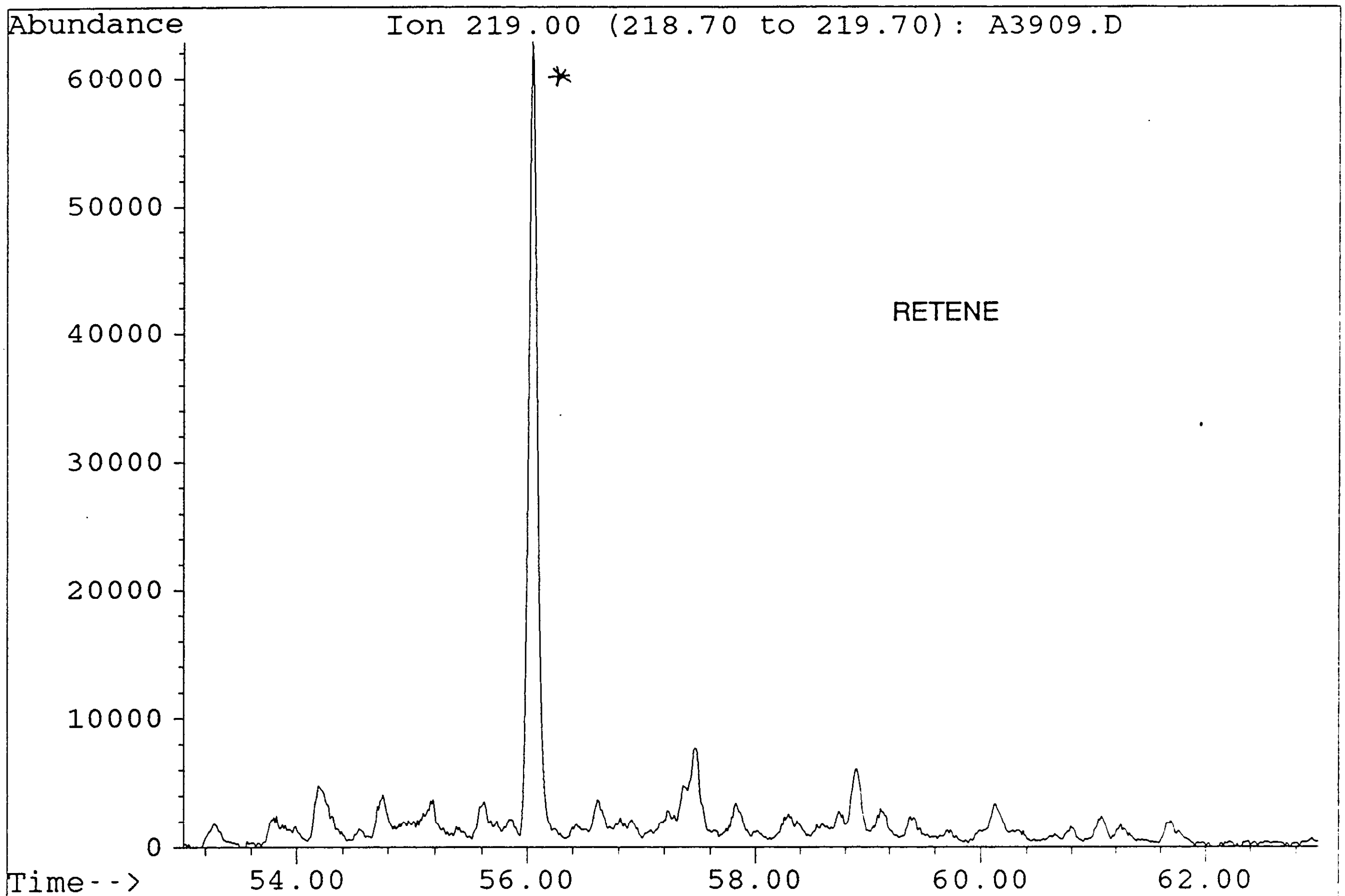
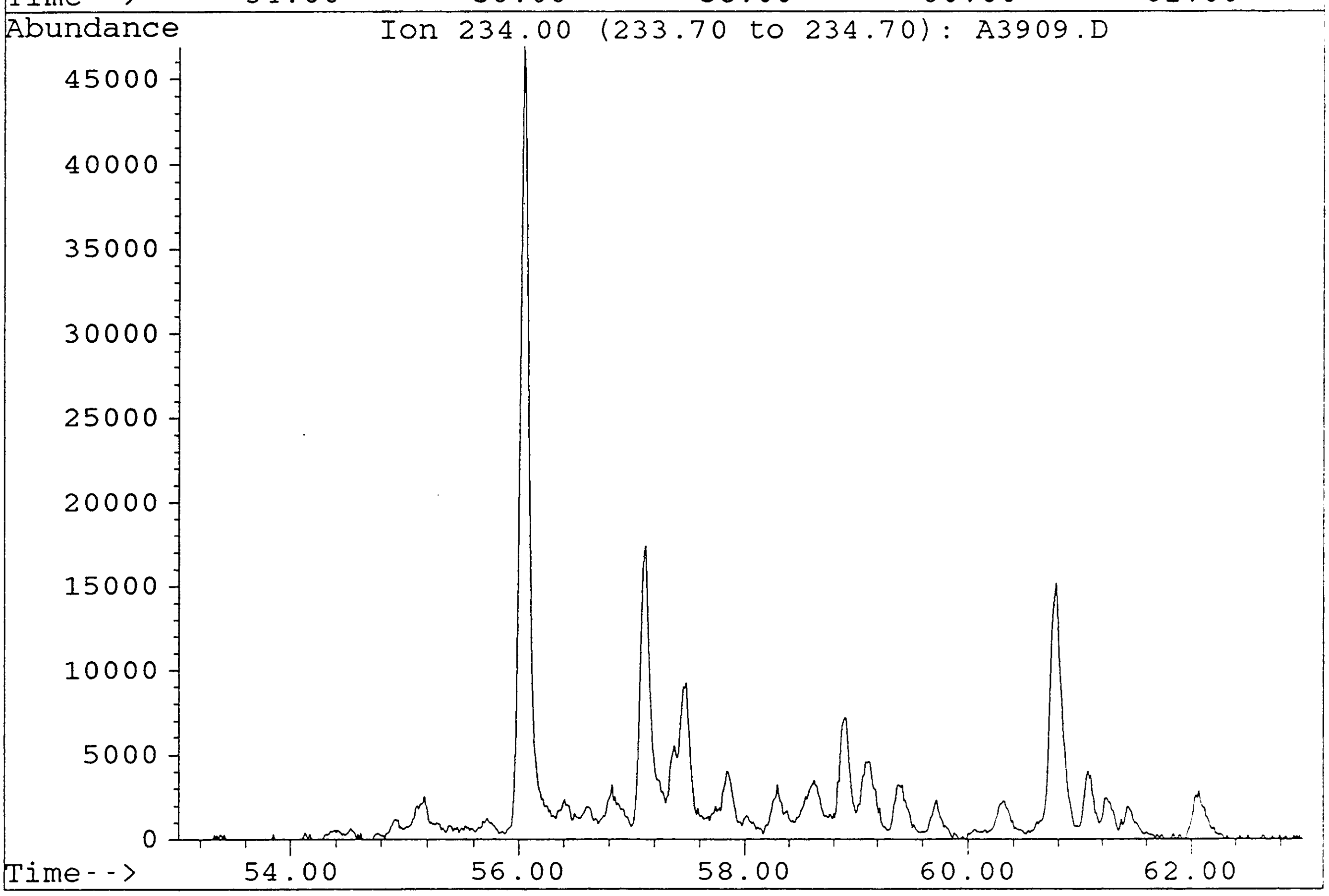
Sample : DIGBY#1, 1944m. AROS.
Misc. Info : COL#155. 28-7-95. GEC.





APPENDIX 9F

GC & GC-MS

FROM LINDON-1, 2895m

(AND CORRELATION TO DIGBY-1)

GEOCHEMICAL CORRELATION STUDY

DIGBY-1/LINDON-1

Prepared for:

GFE Resources Ltd

September, 1995

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GEOCHEMICAL CORRELATION STUDY

DIGBY-1/LINDON-1

Introduction

Two oil shows (1473.7m and 1940.8m) and two source rock samples (19~~6~~03.2m and 1944.2m) from the well Digby-1 as well as a source rock from Lindon-1 (2845m) were analysed by saturate GC and GC-MS of both branched/cyclic and aromatic fractions.

The aim of this study was to characterise the extracts in terms of its source material, depositional environment and maturity, and to correlate them with each other.

Results

I Digby-1

The oil shows at 1473.7m and 1940.8m are considerably different from each other in terms of their organic source facies. The deeper oil is significantly more terrestrial than the shallower one, as reflected in C_{27}/C_{29} diasterane and sterane ratios of 0.09 and 0.29 at 1940.8m vs 0.58 and 0.83 at 1437.7m.

Both oils were sourced from predominantly terrestrial organic matter, but the deeper one was generated from a coaly, more or less exclusively higher plant derived source, whereas the shallower one was generated from "normal" terrestrial organic matter with minor input from algae and bacteria.

The depositional environment of the coaly source for the 1940.8m oil was much more oxic than the environment during deposition of the source for the 1473.7m oil, as characterised by a higher pristane/phytane ratio (5.48 vs 3.06) and less prominent dia- and neohopanes.

The oil from 1473.7m correlates well with the source rock from 1903.2m, both in terms of its moderately terrestrial source character and the mixed oxic/anoxic depositional environment.

The oil from 1940.8m is believed to be genetically related to the coaly source rock from 1944.2m: both samples show very terrestrial, coaly biomarker signatures and markers for quite oxic depositional environments.

The high proportion of light ends (up to about n-C_{15}) in the GC trace for 1944.2m is in agreement with the coaly nature of this organic matter (which is also reflected in its PGC trace).

The lower proportions of n-alkanes up to C_{15} in the 1940.8m oil believed to be generated from this organic matter is likely to be due to migration effects.

All four samples analysed are mature at present, with sterane ratios suggesting maturities of about 1.0 to 1.1% V_R equivalent and MPIs equivalent to approximately 0.8 to 0.9% V_R.

II Lindon-1 and Digby-1/Lindon-1 Correlation

The sediment extract from 2895m depth in Lindon-1 is characterised by an organic facies dominated by very terrestrial, possibly coaly organic matter deposited under mixed oxic/anoxic conditions.

The type of organic matter is characterised by the strong predominance of C_{29} over C_{27} steranes and diasteranes, as the C_{29} compounds are attributed to higher plant derived material whereas the C_{27} compounds reflect algal/bacterial matter. The presence of isopimarane and small amounts of phyllocladane is indicative of input from resinous matter in higher plants, and weak odd-even predominances in the C_{25+} n-alkane pattern also point towards terrestrial plant waxes.

The mixed oxic/anoxic depositional environment is characterised by a pristane/phytane ratio of 3.01, the presence of dia- and neohopanes and small amounts of methylhopanes.

The sample is presently mature, equivalent to approximately 0.9 to 1% V_R equivalent, as reflected in a methylphenanthrene index (I) of 0.78, a C_{29} 20S/20R sterane ratio of 0.94 and various di- and tri-naphthalene as well as triterpane ratios.

The organic matter is quite similar to sample 1940.80m in Digby-1, based on the distribution of steranes (incl. methylsteranes), diterpanes and various aromatic parameters, however, the depositional environment characterised in the Lindon-1 sample is less oxic than the one which prevailed during deposition of the Digby-1, 1940.80m sediment.

This assessment is based mainly on pristane/phytane ratios, with a value of 5.48 as obtained in the Digby-1 sample reflecting oxic conditions whereas the value of 3.01 obtained in Lindon-1 being more indicative for a mixed oxic/anoxic environment.

Biomarker patterns for the Digby-1, 1940.80m sediment and the Digby-1, 1944.0m oil provide a considerably better match than the Lindon-1 source rock sample and the Digby-1, 1944.0m oil, and it is regarded as unlikely that the Lindon-1 sediment has generated the Digby-1, 1944.0m oil.

The Lindon sample is also believed to be too coaly to have sourced the oil at 1473.7m in Digby-1, which was probably generated from an organic facies similar to the one analysed at 1903.2m in the same well.

Analytical Methods / Data

Analytical techniques applied are summarised in the Theory and Methods chapter in the back of this report.

Analytical results are presented in the following figures and tables:

Types of Analysis	Figure	Table
I Digby-1		
TOC/Rock-Eval pyrolysis	-	1
Pyrolysis-GC	1	2,3,4
Thermal Extract GC	2	-
Extraction/Liquid chromatography	-	5
GC sat	3	6
Organic Petrology/V_R	4	7
GC-MS b/c	5,6	8,9
GC-MS arom.	7,8	10
II Lindon-2		
Extraction/Liquid chromatography	-	1
GC sat	1	2
GC-MS b/c	2	3
GC-MS arom.	3	4

TABLE 1

Summary of Extraction and Liquid Chromatography

LINDON 1

Aug-95

A. Concentrations of Extracted Material

				---Hydrocarbons---			---Nonhydrocarbons---		
	Weight of Rock Extd.	Total Extract	Loss on Column	Saturates	Aromatics	HC Total	NSO's	Asphalt.	NonHC Total
DEPTH(m)	(grams)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
2895.0	32.9	3170.2	337.9	1046.0	893.1	1939.1	893.1	nd	893.1

TABLE 1

Summary of Extraction and Liquid Chromatography

LINDON 1

Aug-95

B. Compositional Data

	---Hydrocarbons---			---Nonhydrocarbons---			EOM(mg)	SAT(mg)	SAT	ASPH	HC
DEPTH(m)	%SAT	%AROM	%HC's	%NSO'	%ASPH	%Non HC'	TOC(g)	TOC(g)	AROM	NSO	Non HC
2895.0	36.9	31.5	68.5	31.5	nd	31.5	nd	nd	1.2	nd	2.2

nd = no data

TABLE 2

LINDON 1 Summary of Gas Chromatography Data

A. Alkane Compositional Data SATURATE FRACTION

DEPTH(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
2895.0	3.01	0.64	0.24	1.11	1.10	3.79

TABLE 2

LINDON 1 Summary of Gas Chromatography Data

B. n-Alkane Distributions SATURATE FRACTION

DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
2895.0	5.6	6.3	7.5	8.7	9.6	8.7	5.5	7.5	1.8	6.1	5.3	4.8	4.4	4.0	3.3	3.0	2.2	1.9	1.3	1.1	0.8	0.8

nd = no data

LINDON 1, 2895.0m, Cuttings
Saturate Fraction
C12+ GLC
FIGURE 1

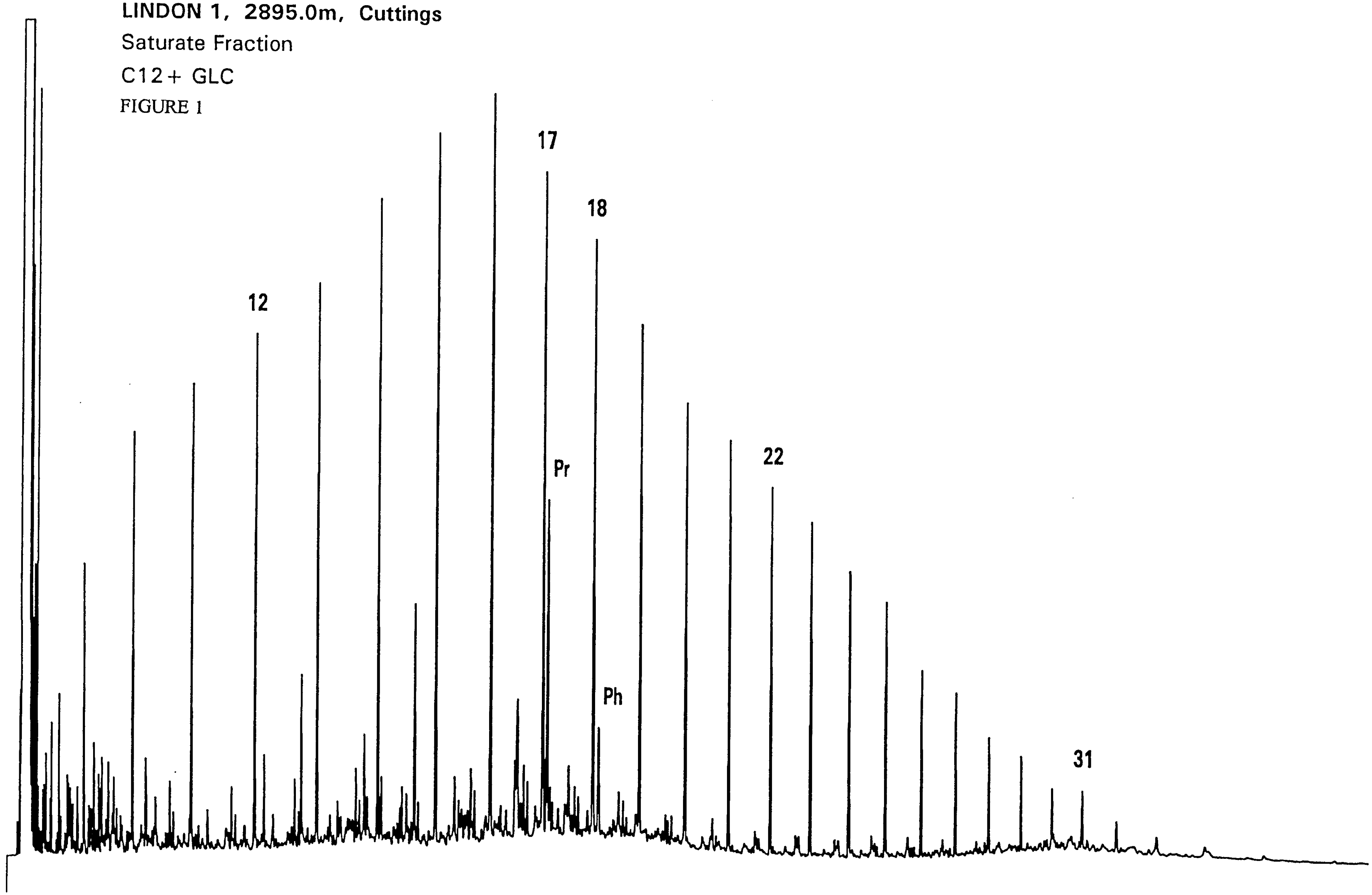

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TABLE 3

SELECTED PARAMETERS FROM GC/MS ANALYSIS

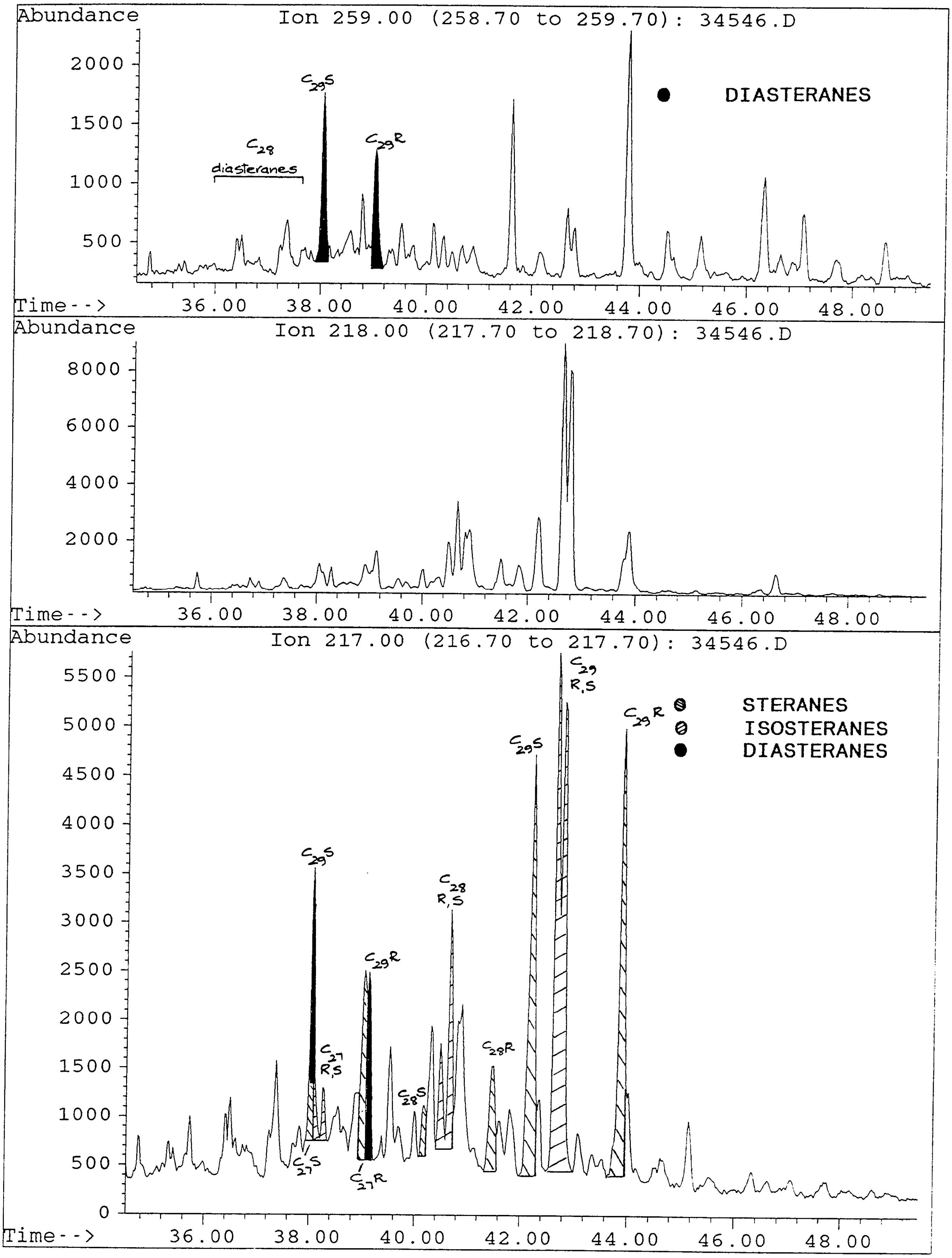
LINDON 1, 2895m, Cuttings

	Parameter	Ion(s)	Value
1.	18 α (H)- hopane/17 α (H)-hopane (Ts/Tm)	191	0.67
2.	C30 hopane/C30 moretane	191	11.26
3.	C31 22S hopane/C31 22R hopane	191	1.52
4.	C32 22S hopane/C32 22R hopane	191	1.36
5.	C29 20S $\alpha\alpha\alpha$ sterane/C29 20R $\alpha\alpha\alpha$ sterane	217	0.94
6.	C29 $\alpha\alpha\alpha$ steranes (20S / 20S+20R)	217	0.48
7.	C29 $\alpha\beta\beta$ steranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.53
8.	C27/C29 diasteranes	259	nd
9.	C27/C29 steranes	217	0.41
10.	18 α (H)-oleanane/C30 hopane	191	nd
11.	C29 diasteranes / (C29 $\alpha\alpha\alpha$ steranes + C29 $\alpha\beta\beta$ steranes)	217	0.25
12.	C30 (hopane + moretane) / C29 (steranes + diasteranes)	191/217	0.89
13.	C15 drimane/C16 homodrimane	123	0.46
14.	Rearranged drimanes/normal drimanes	123	0.34

nd = not detectable

File : 34546.D
Sample : LINDON#1, 2895m. B/C.
Misc. Info : COL#164. 21-8-95. GEC.

FIGURE 2



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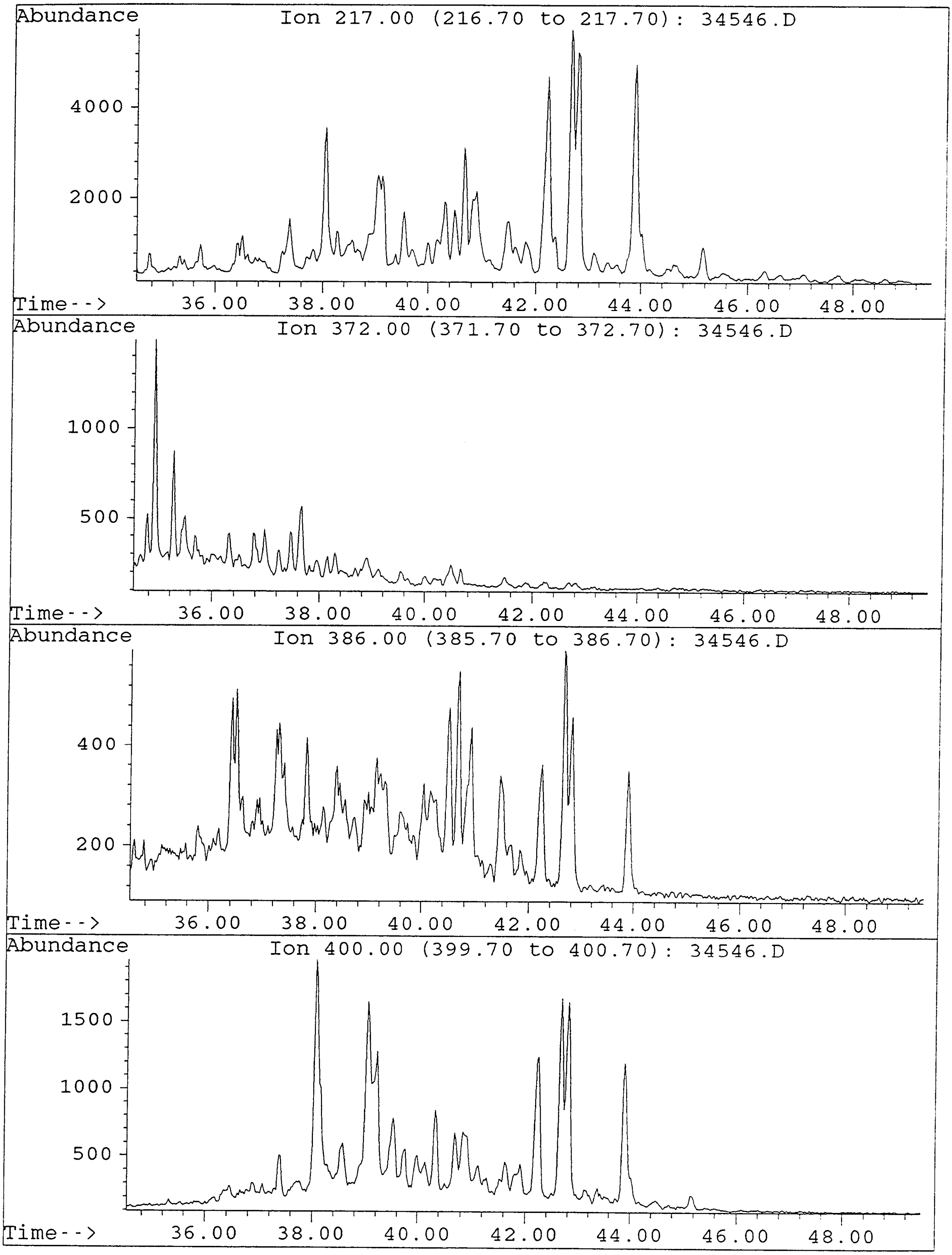

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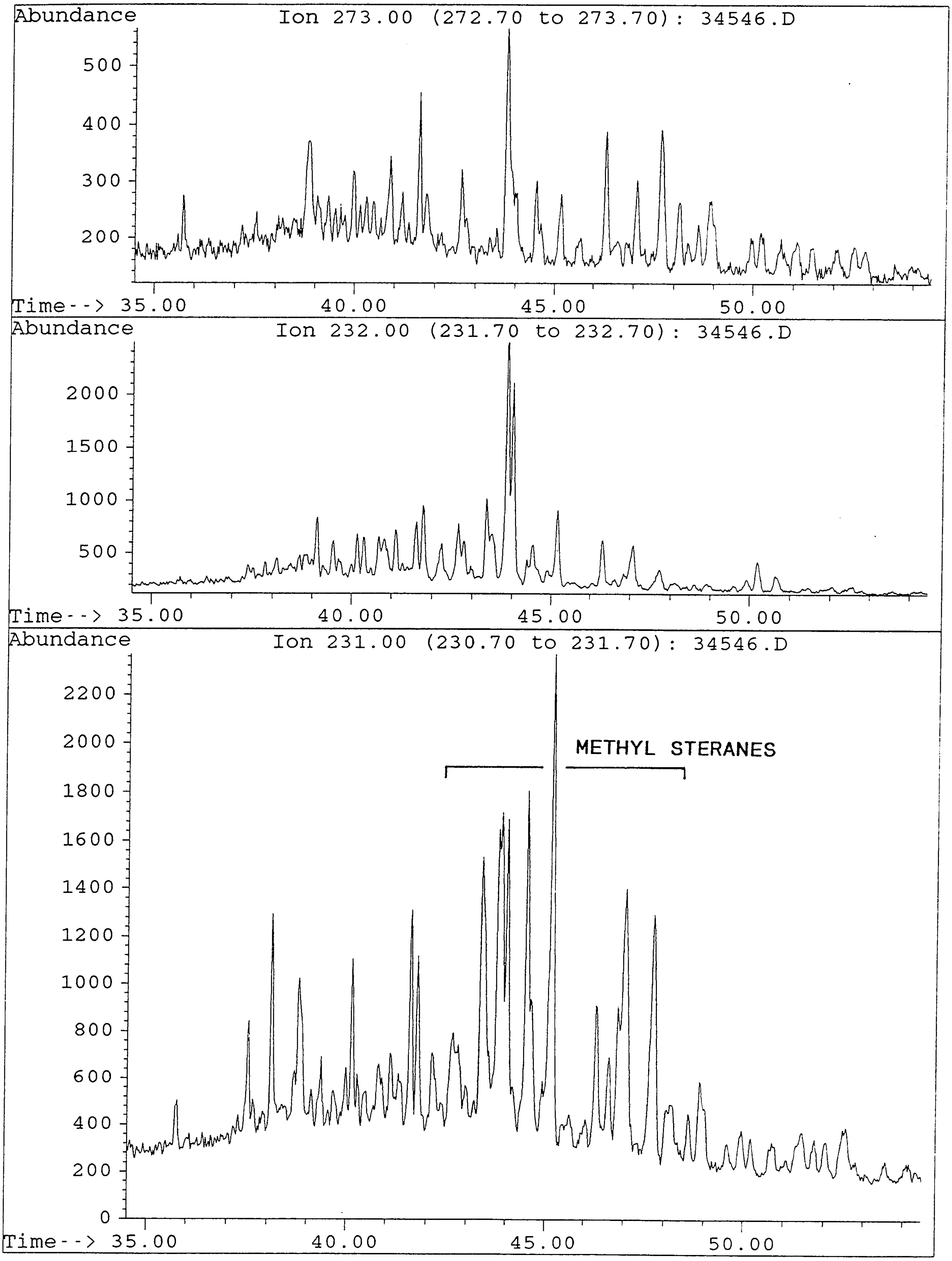

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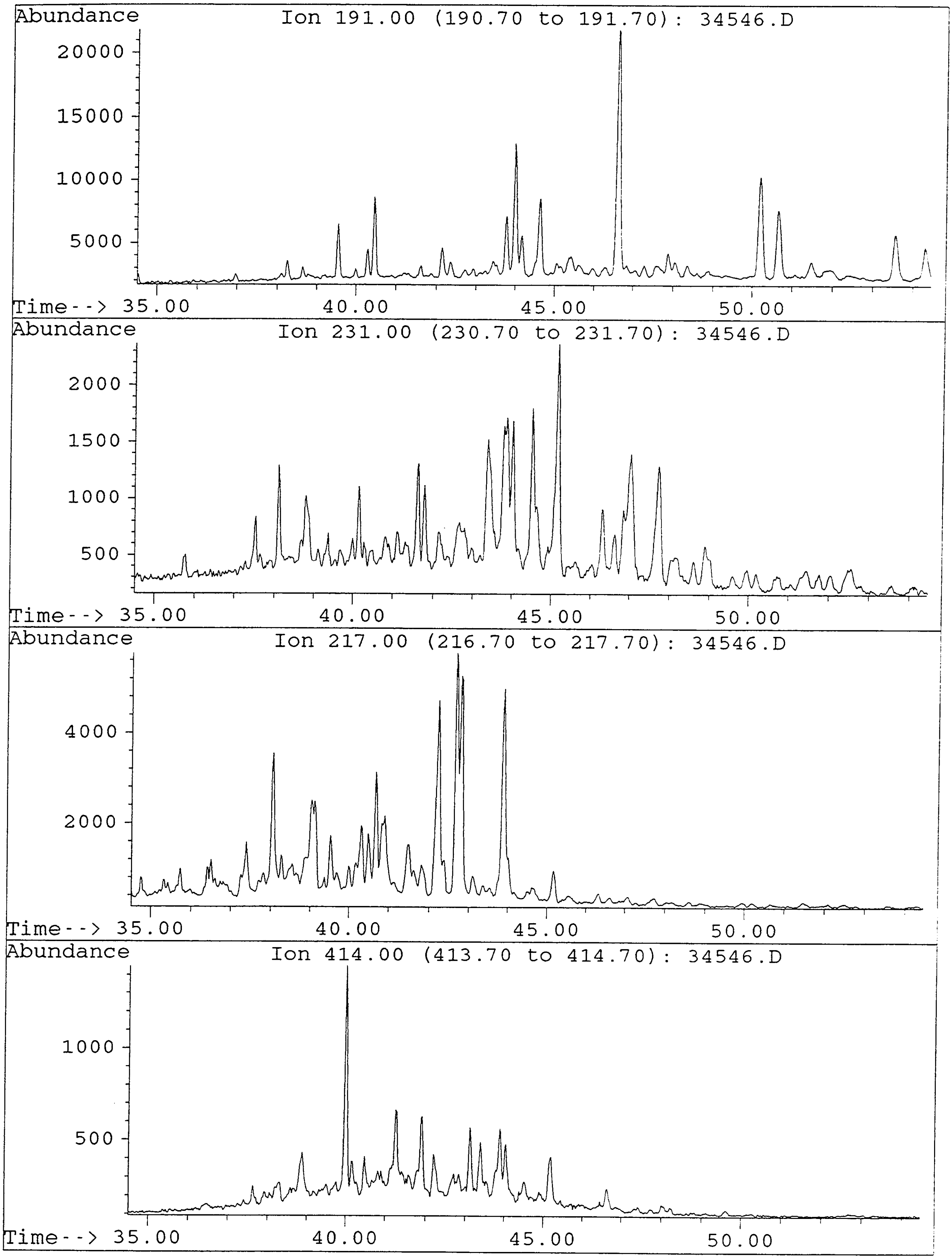

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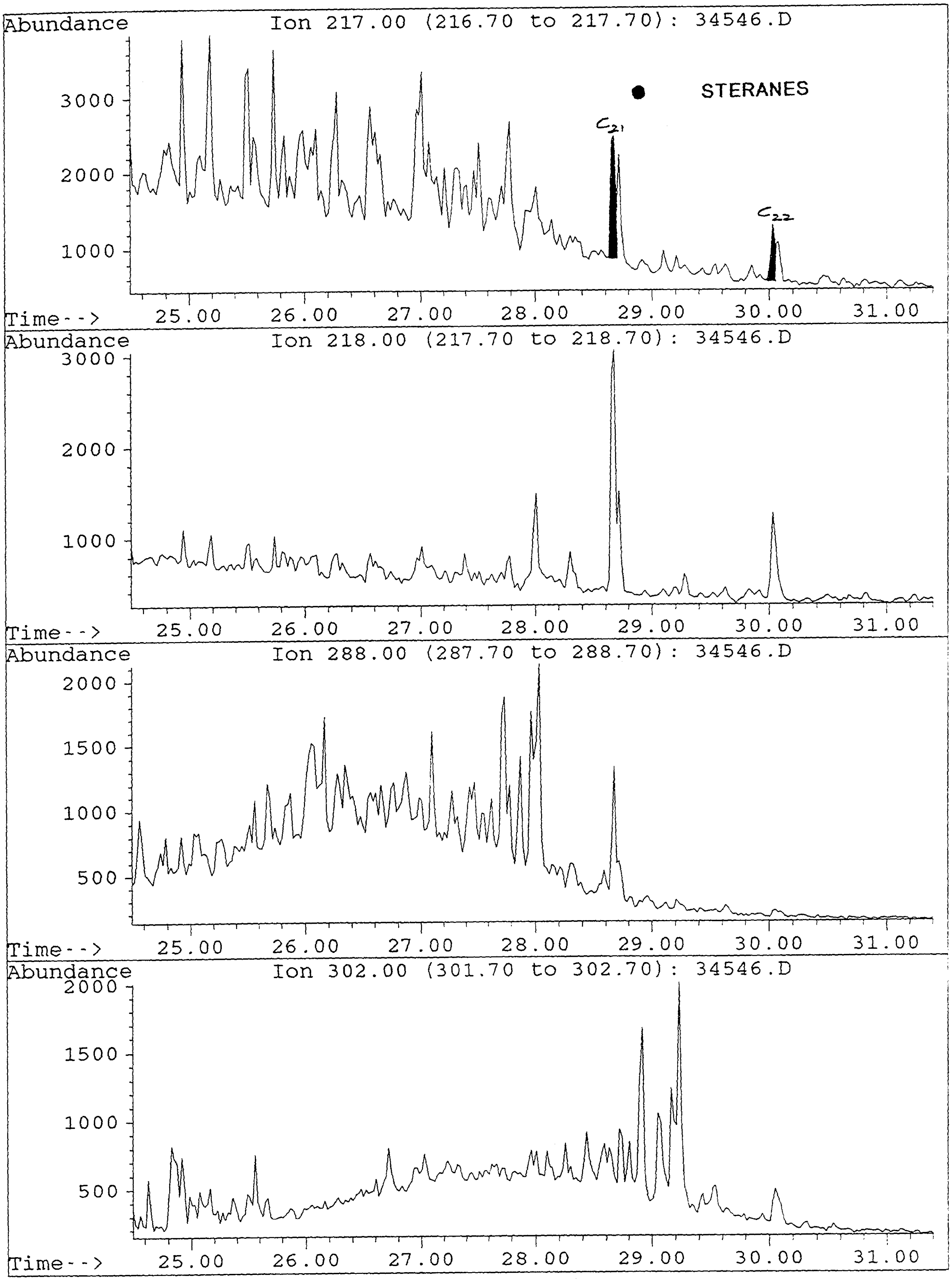

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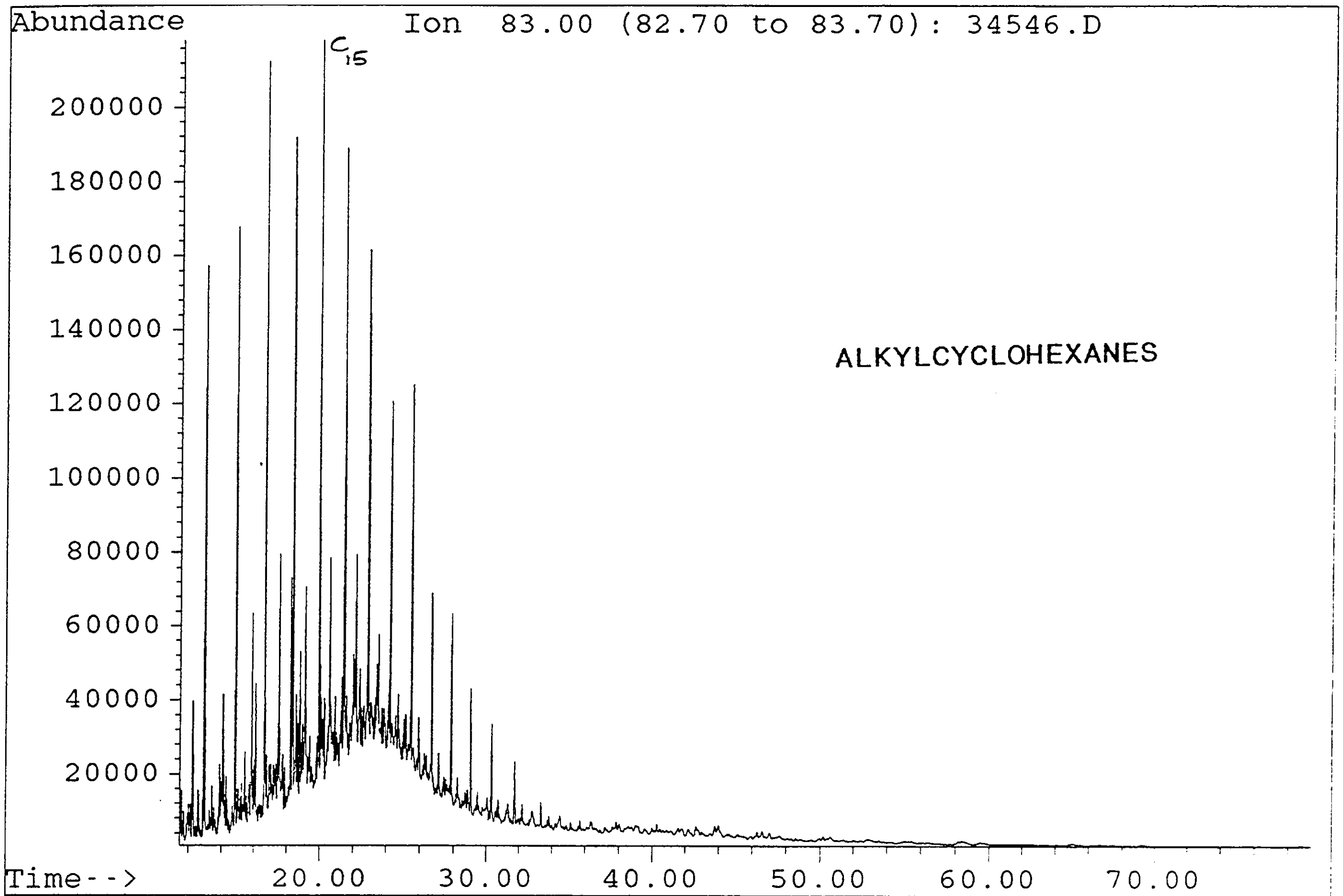

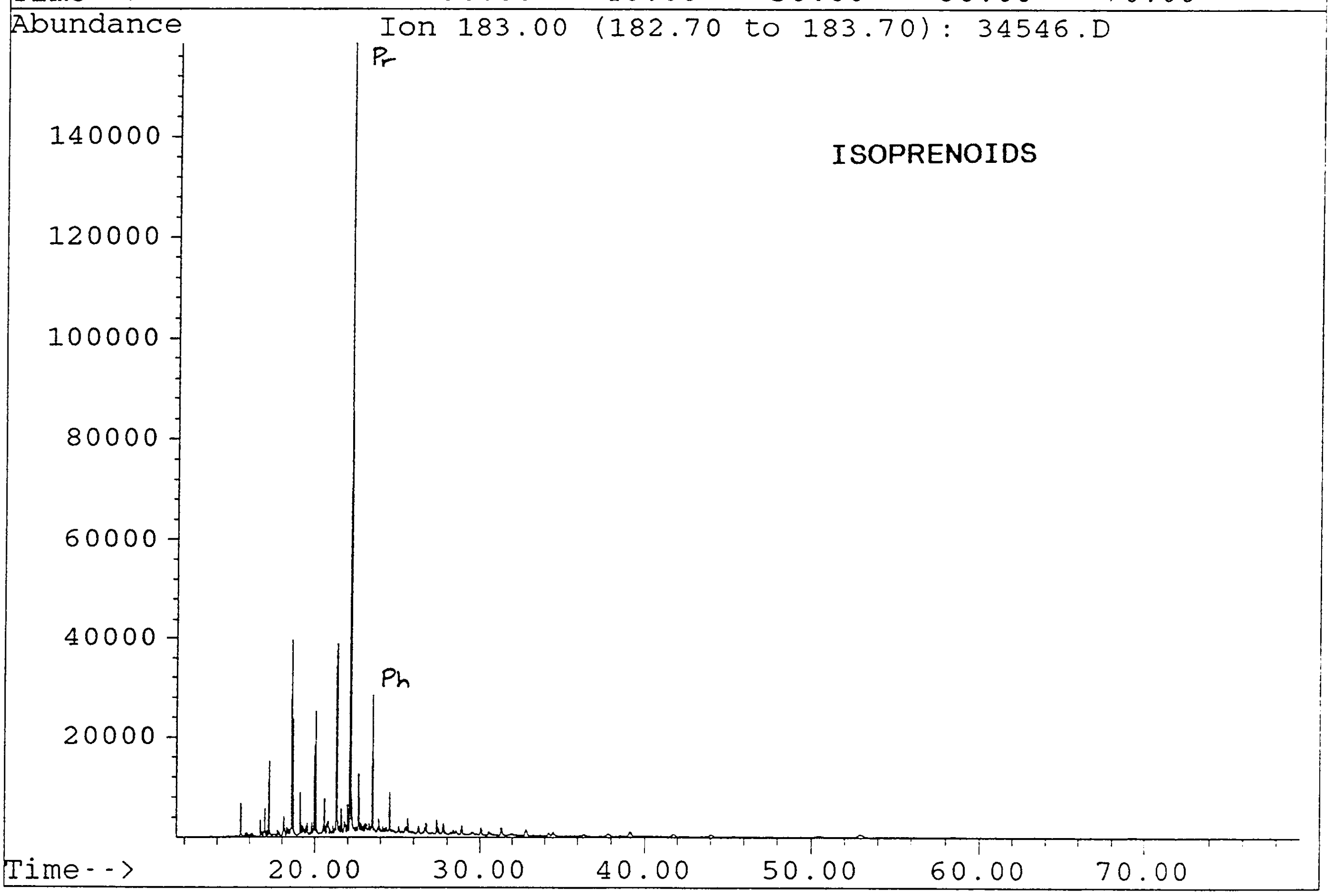

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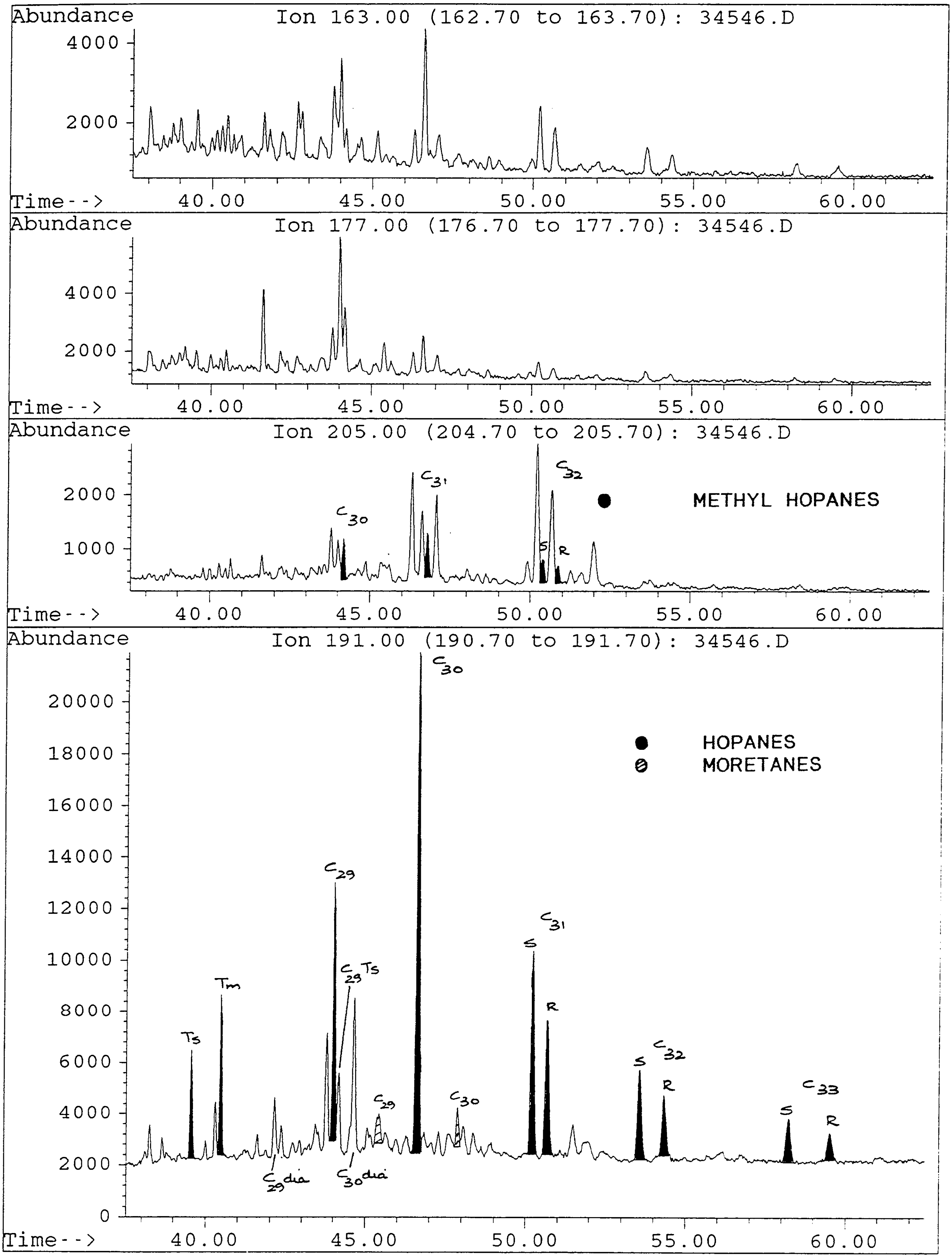

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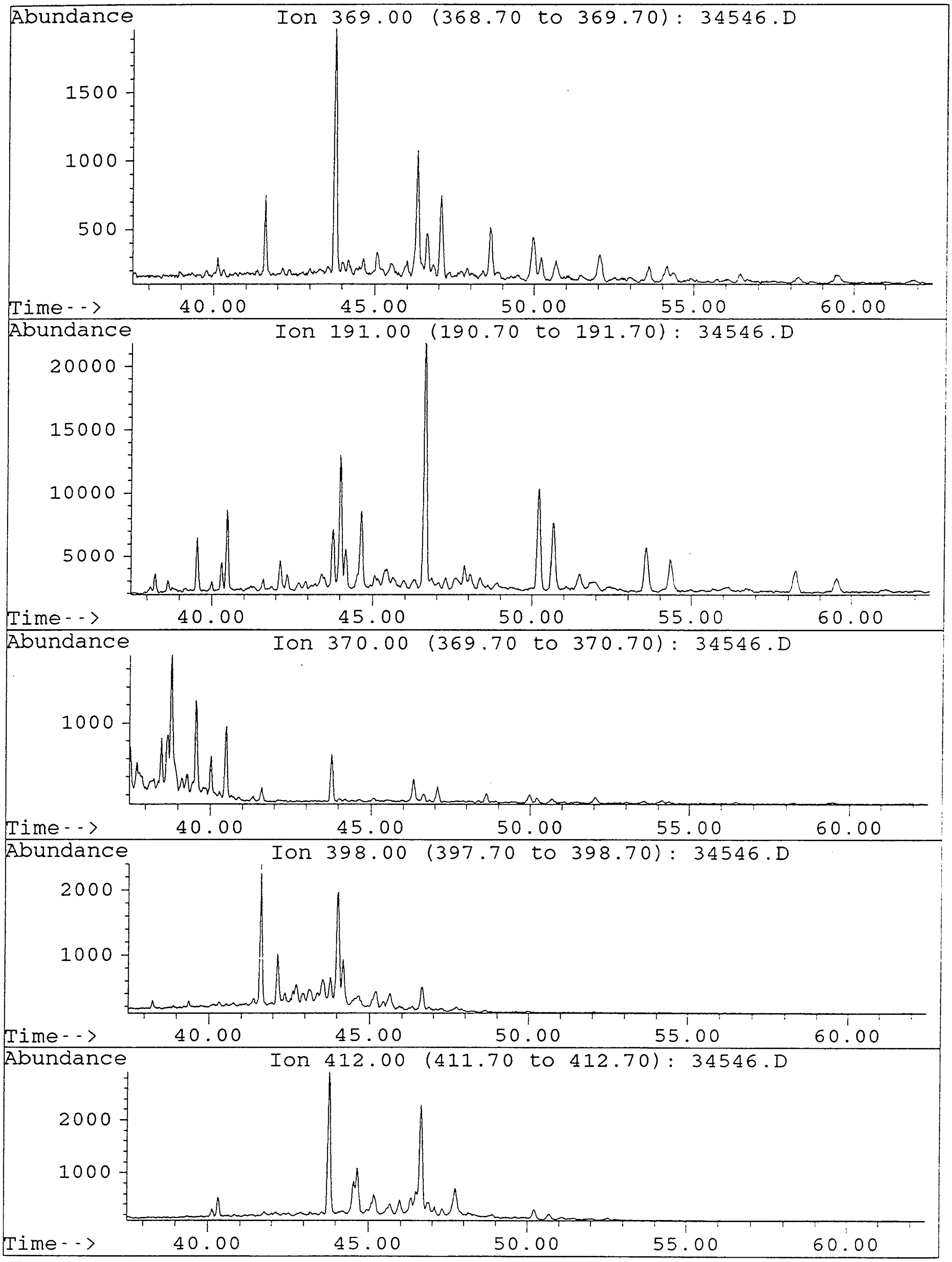

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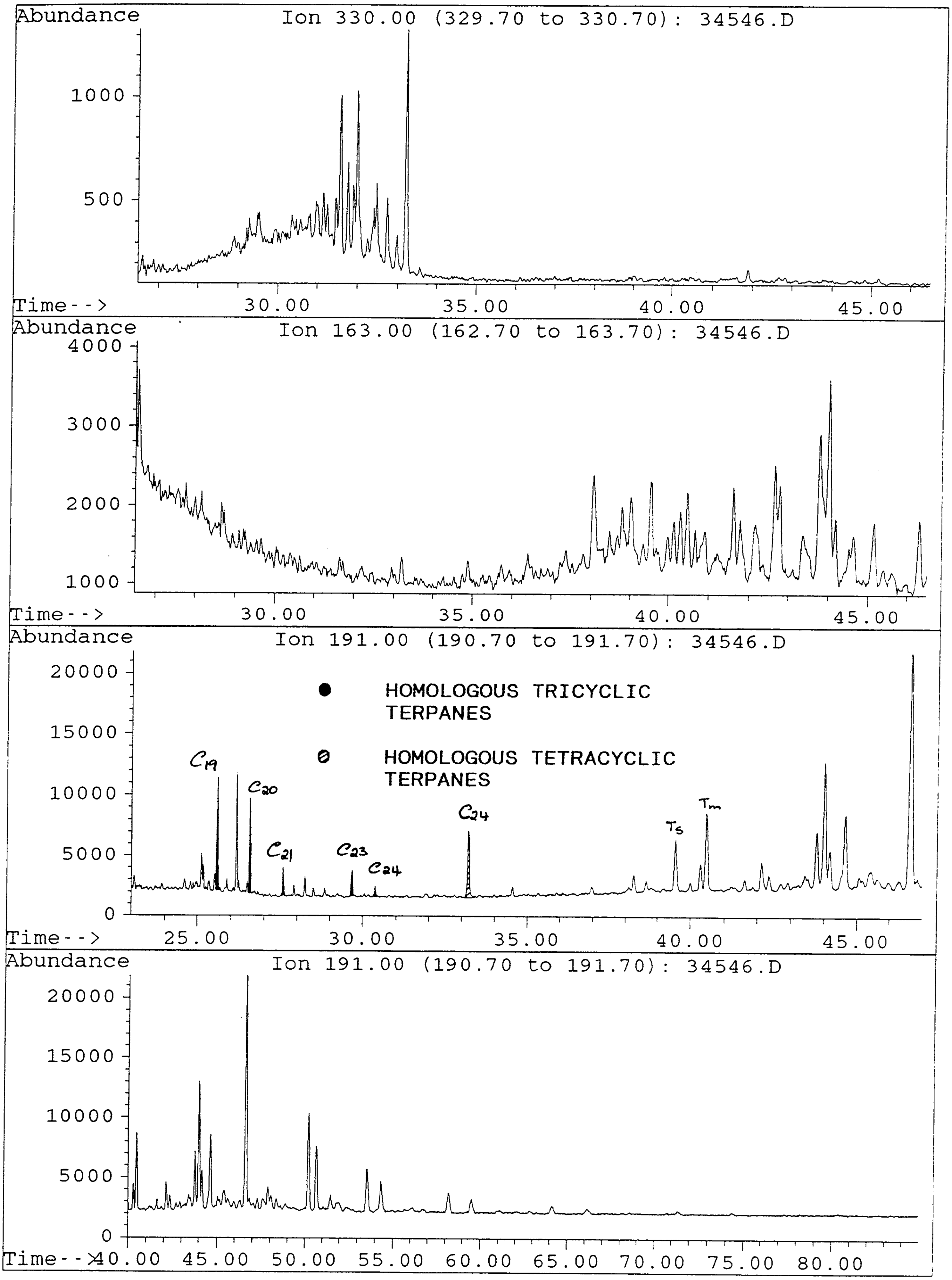

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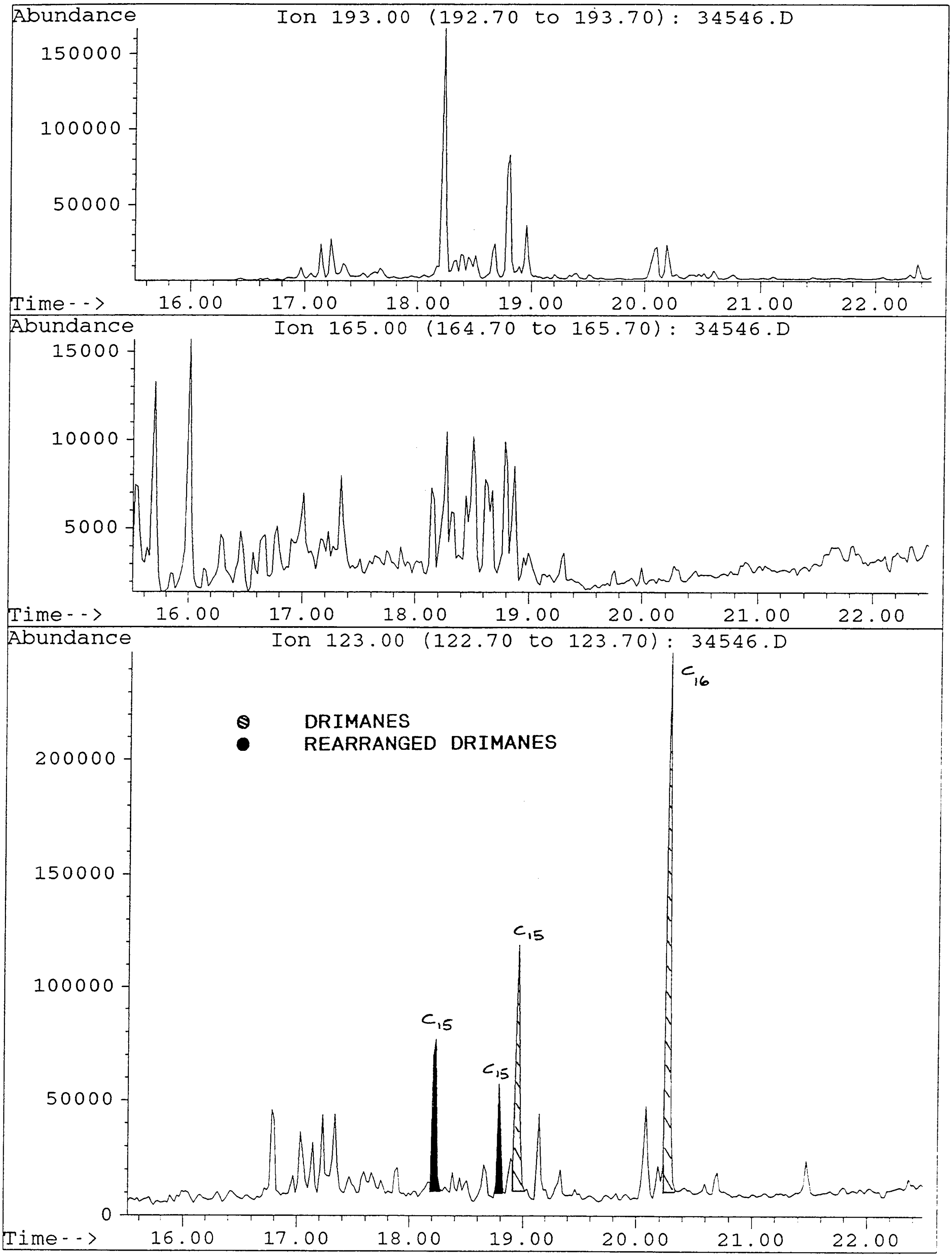

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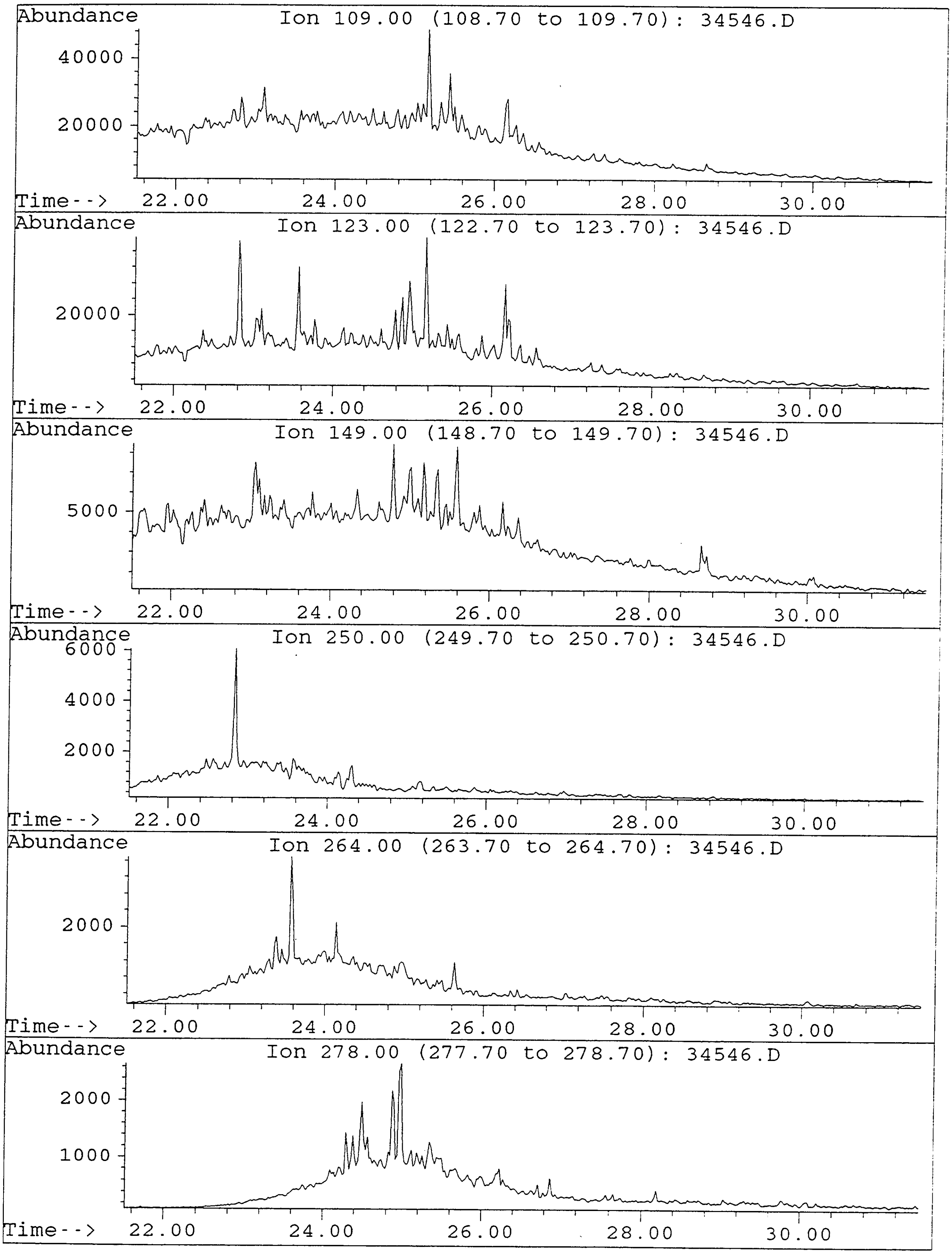

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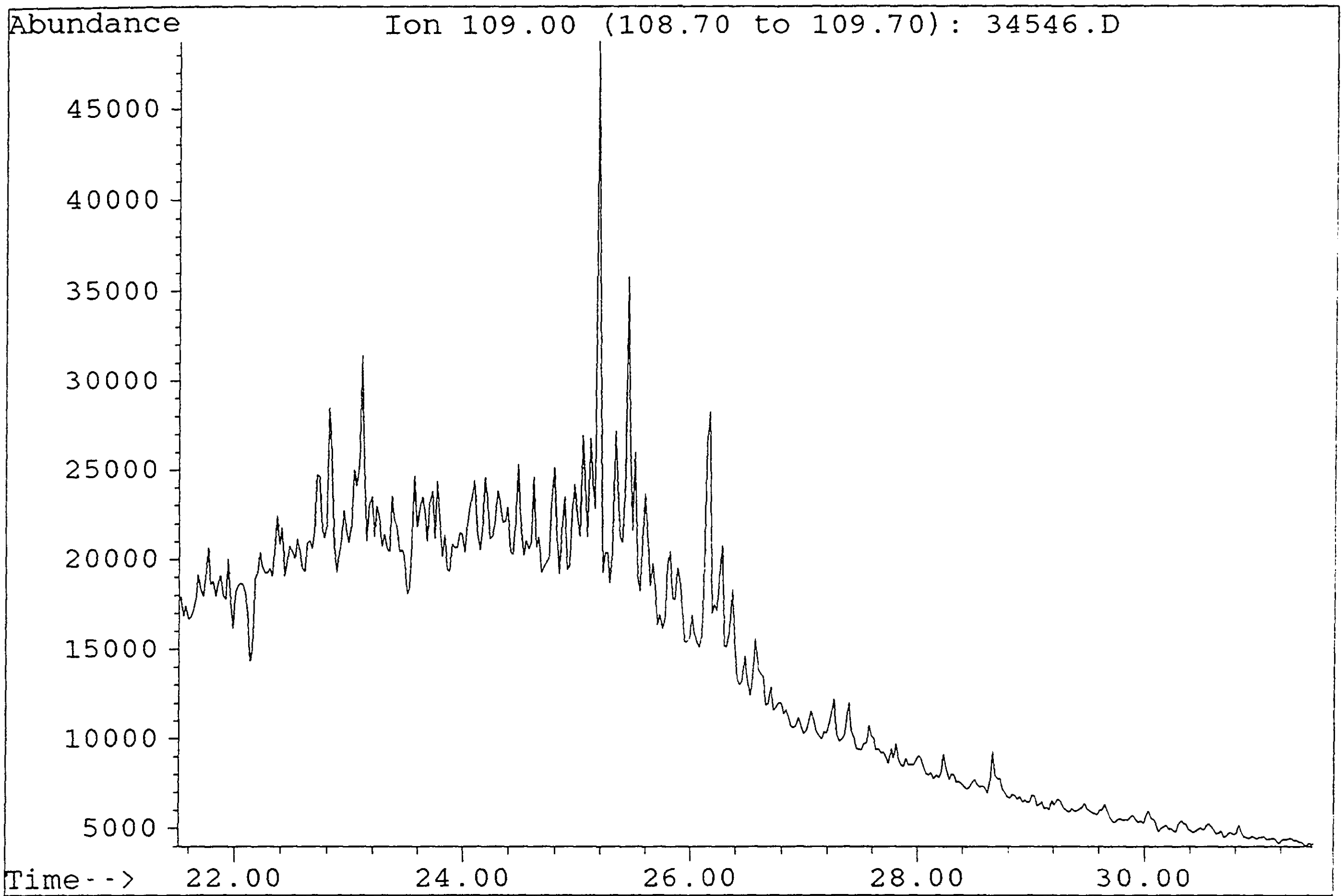

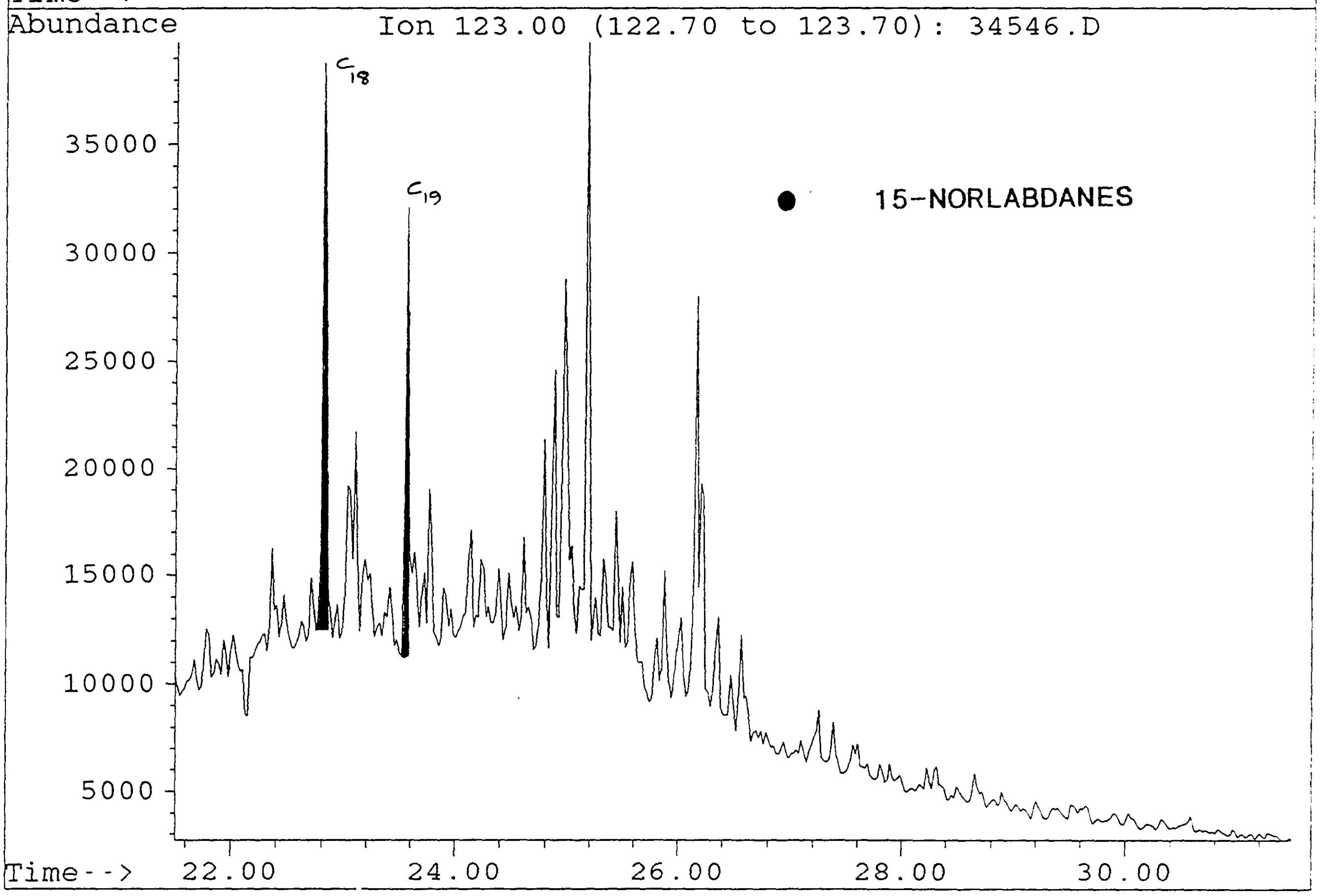

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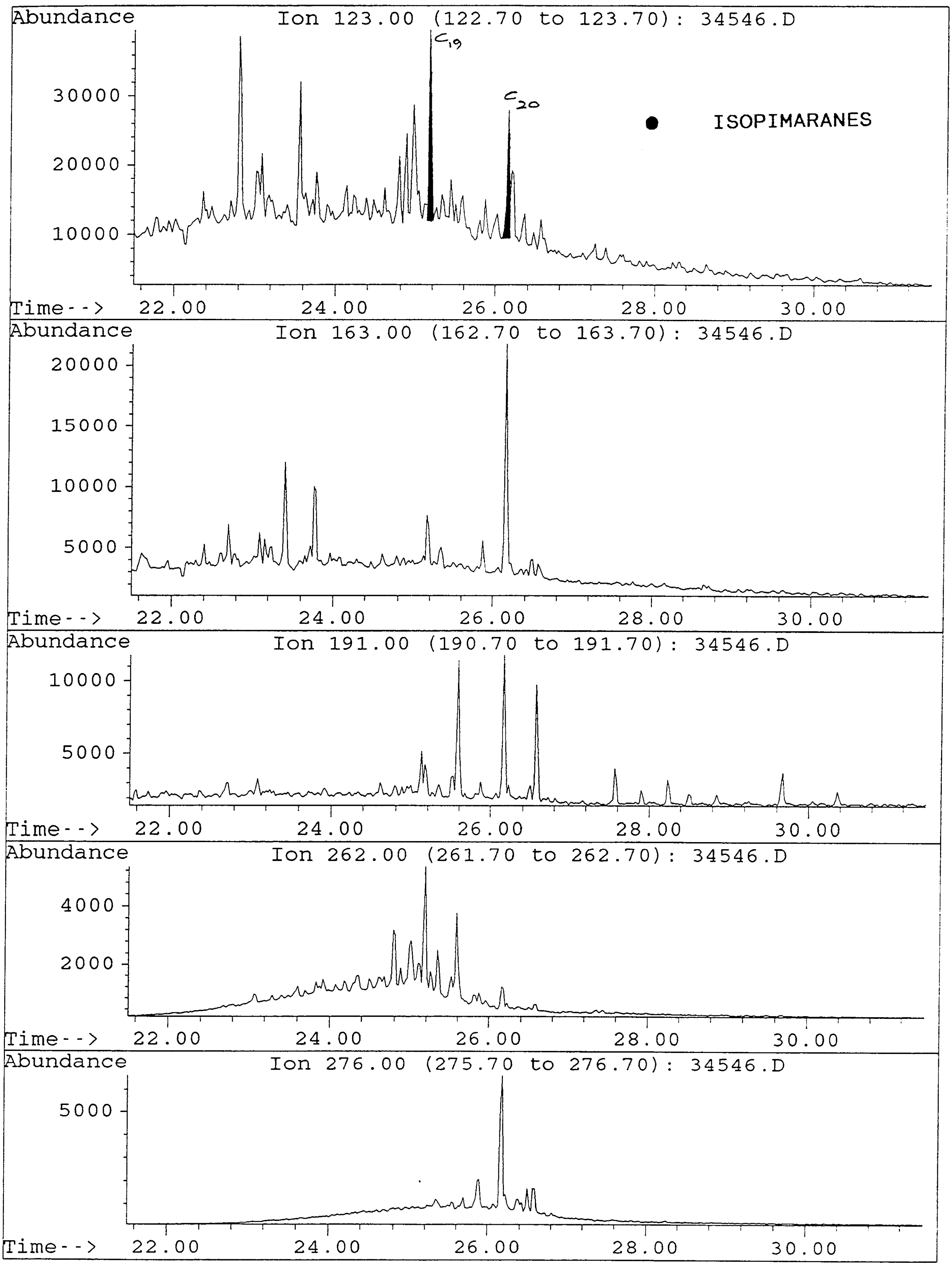

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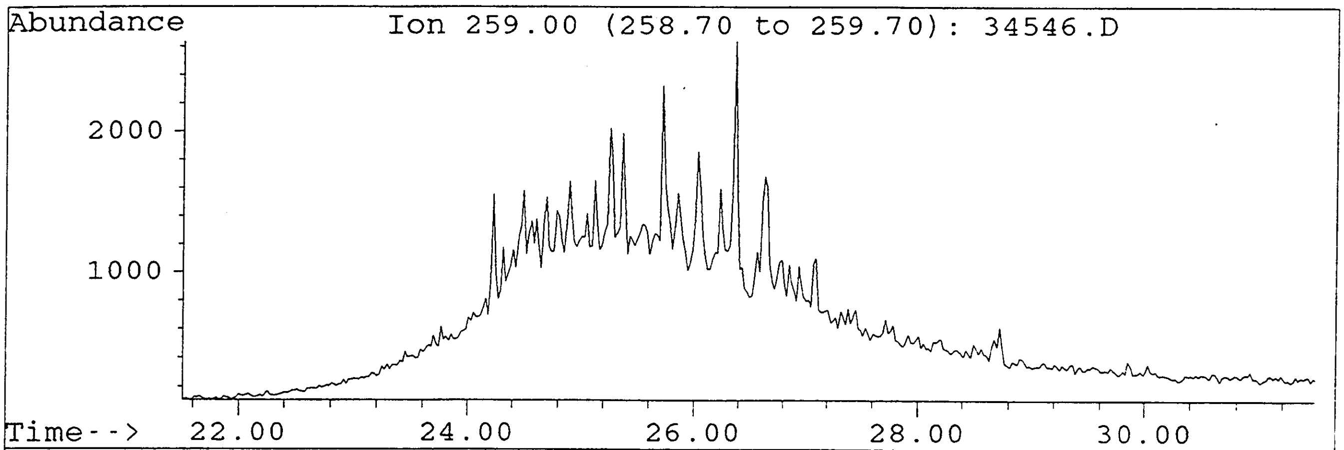

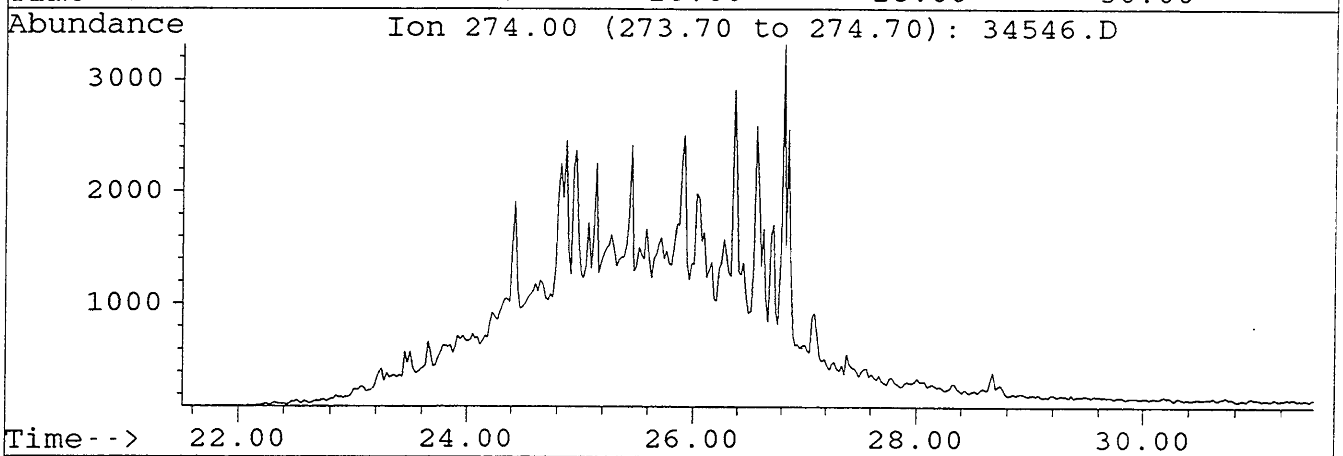

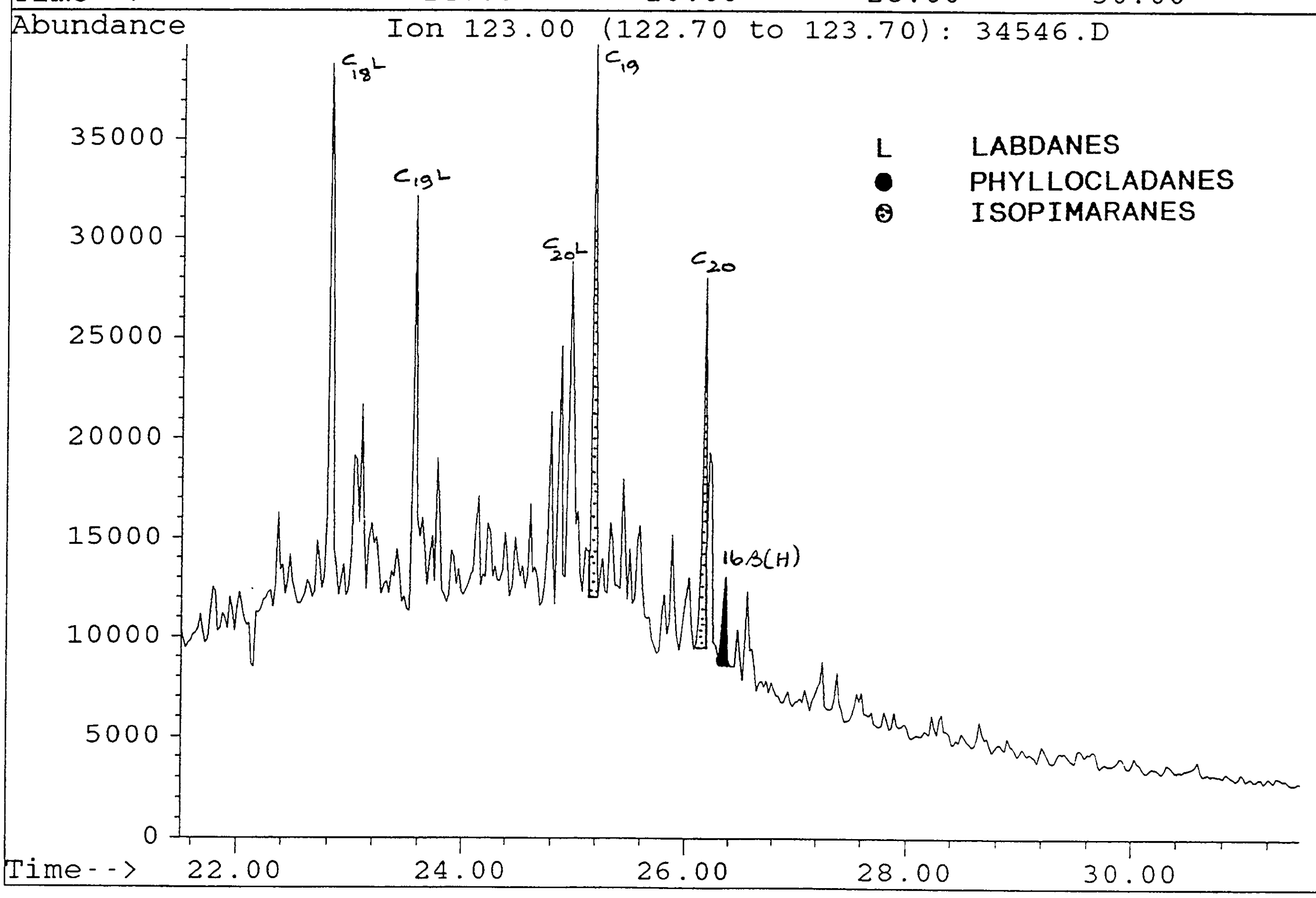

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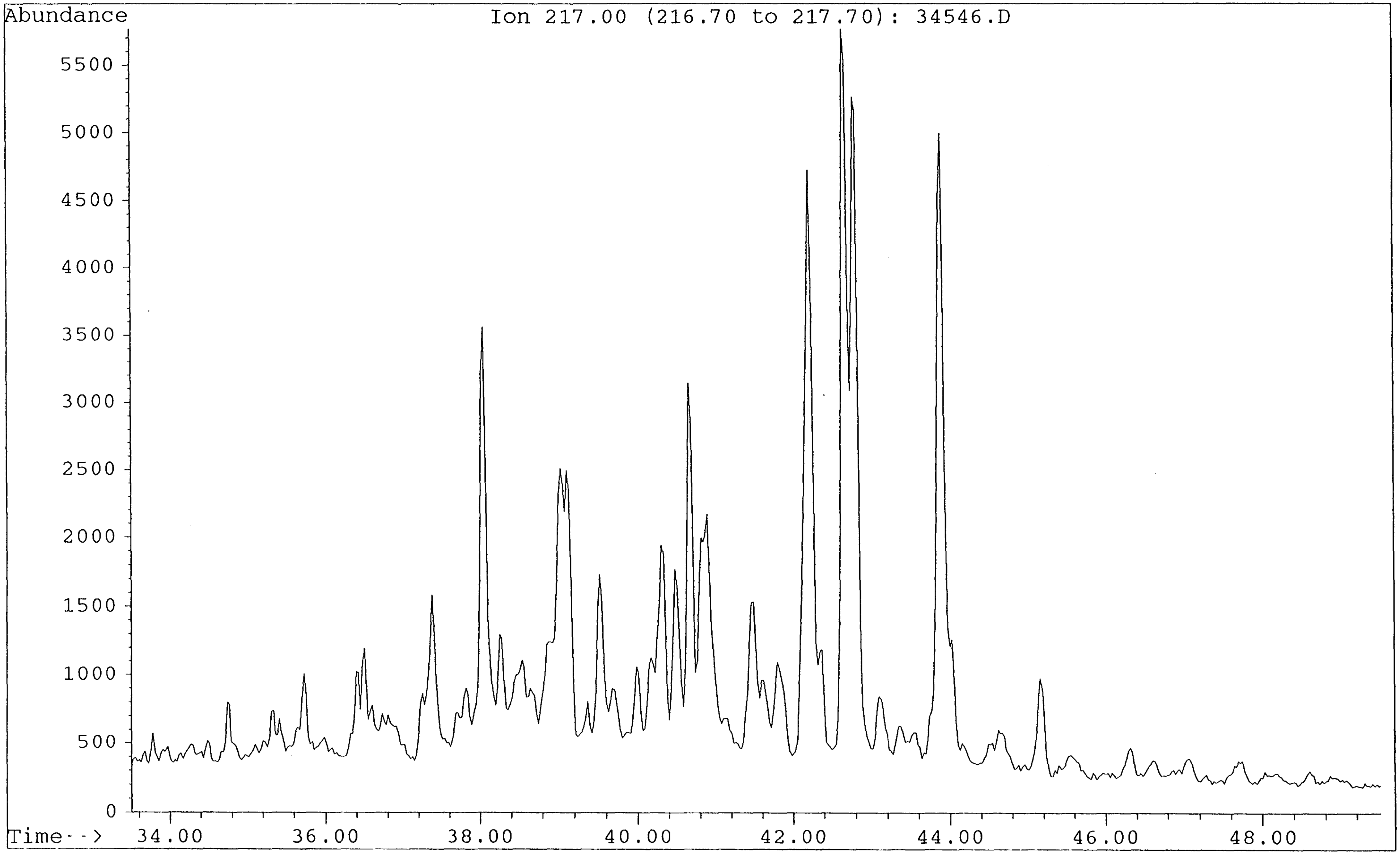

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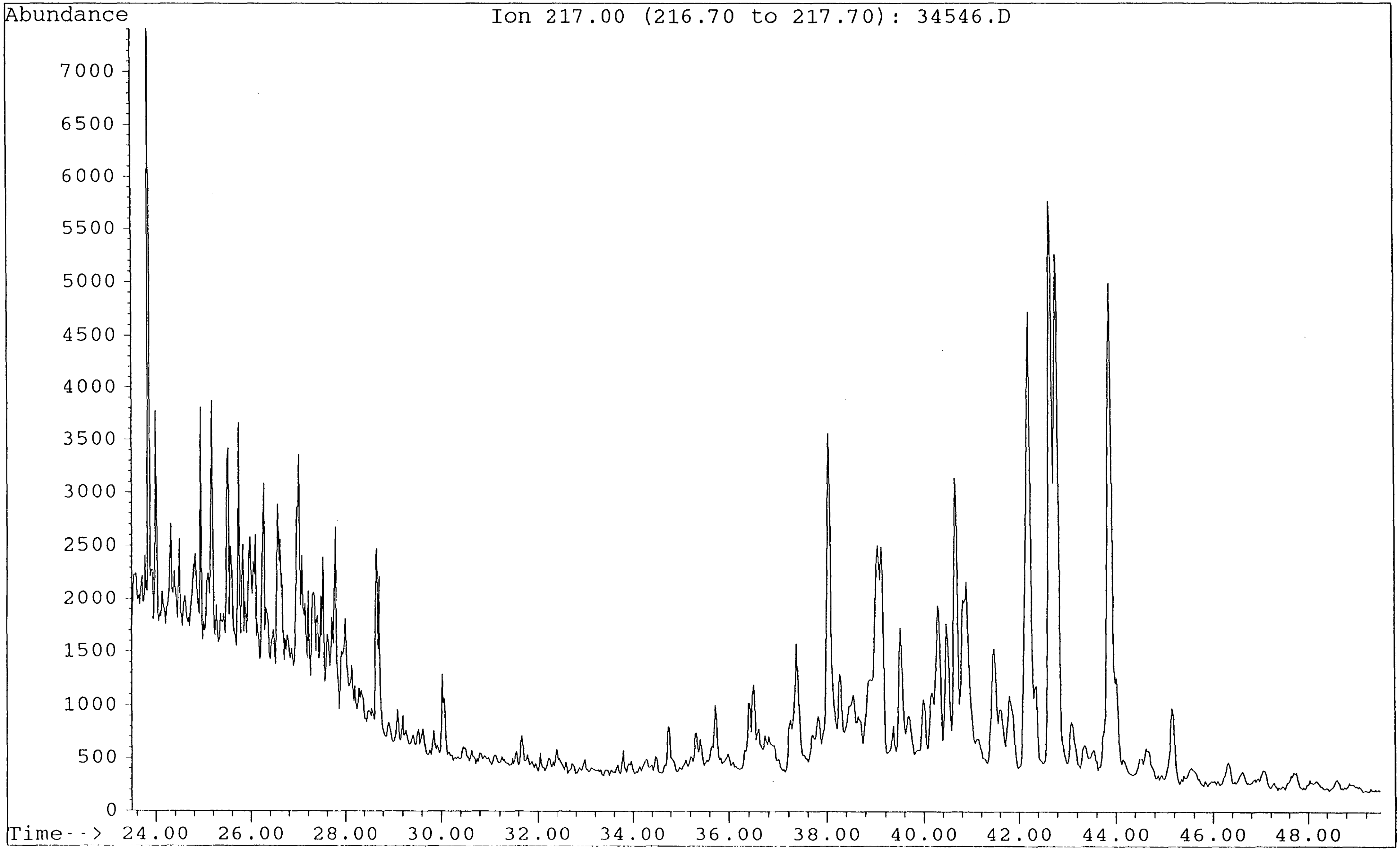

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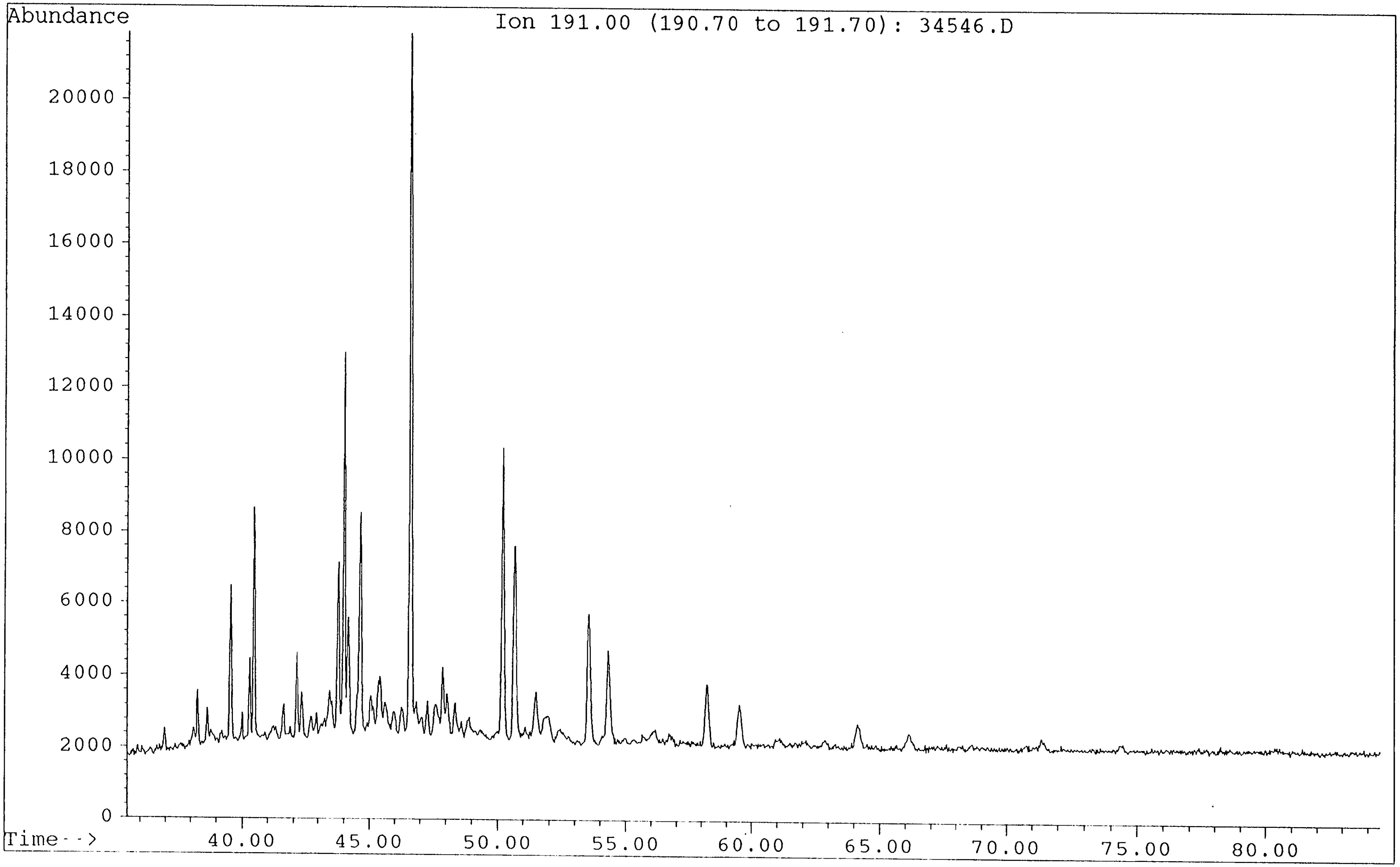

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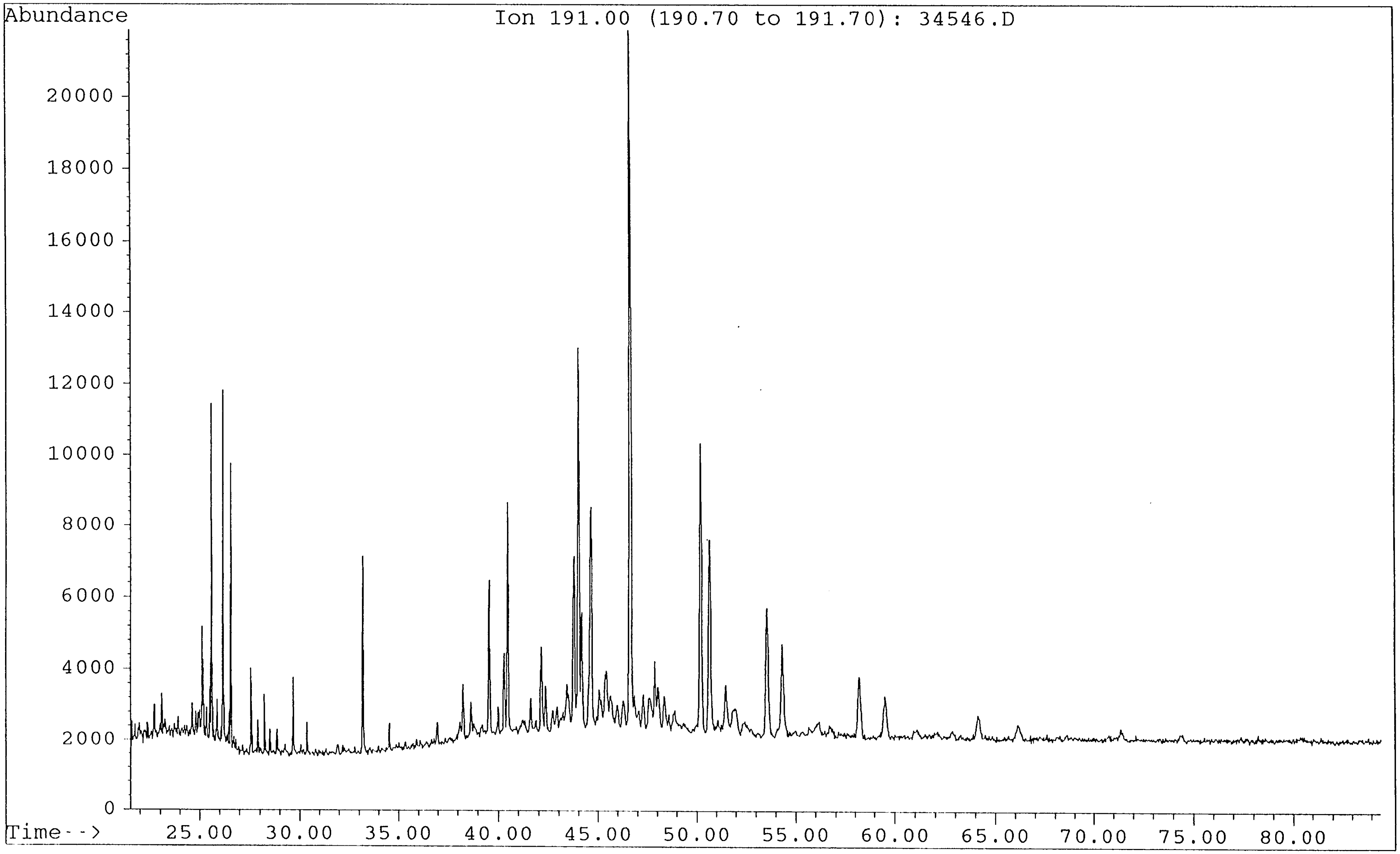


TABLE 4

SELECTED AROMATIC PARAMETERS

LINDON 1 Sep-95

DEPTH	TYPE	DNR-1	DNR-5	DNR-6	TNR-1	TNR-5	TNR-6	MPR-1	MPI-1	MPI-2	Rc(a)	Rc(b)
2895.0m	Cuttings	6.05	nd	2.64	0.81	0.71	nd	1.64	0.78	0.93	0.87	1.83

response factors have been applied to DNR 6, TNR 1, TNR 5, MPI 1 and MPI 2

TABLE 4

SELECTED AROMATIC PARAMETERS CONT.

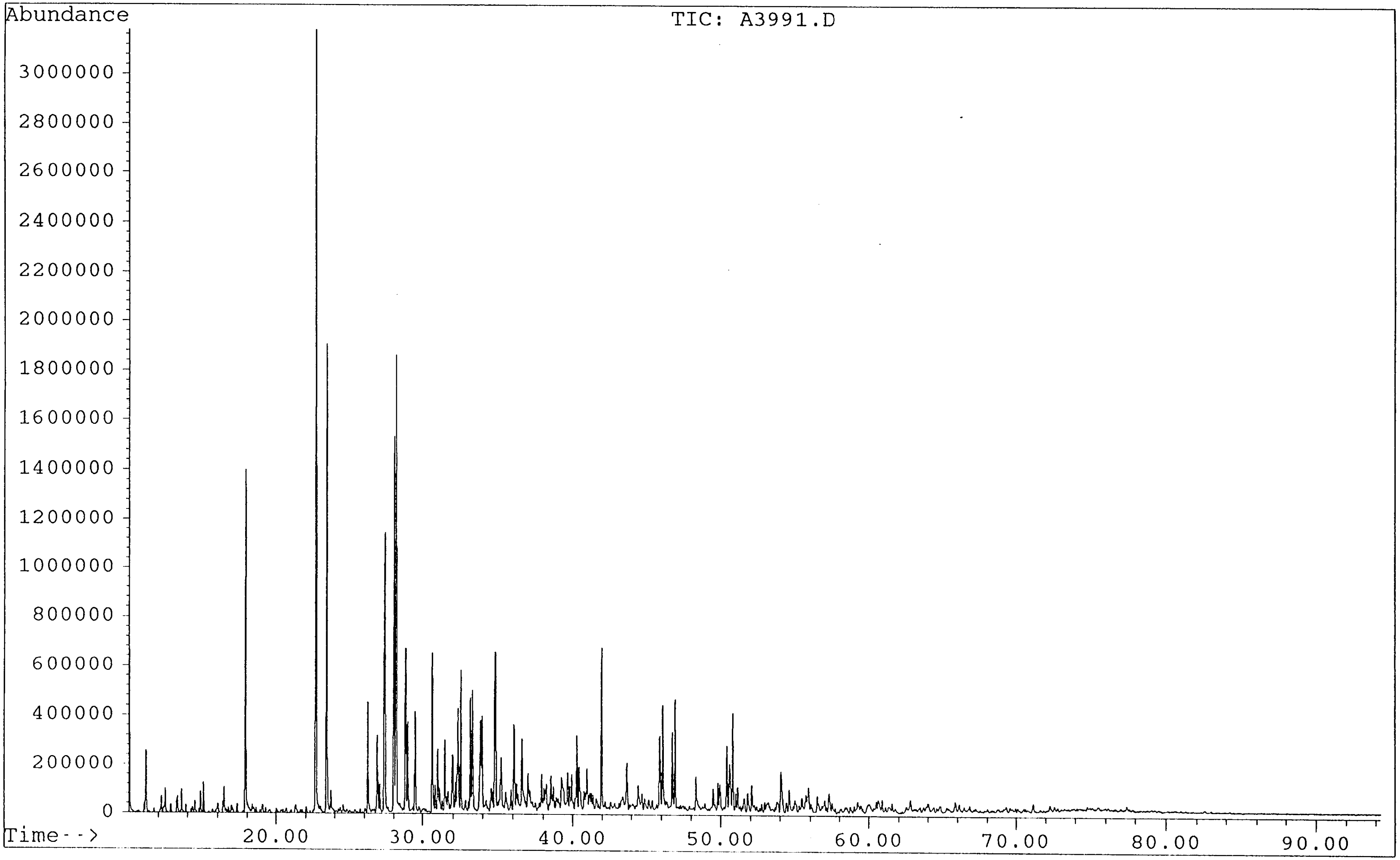
LINDON 1 Sep-95

DEPTH	TYPE	1,7-DMP/X (m/z 206)	RETENE/9-MP (m/z 219,192)	1MP/9MP
2895.0m	Cuttings	1.25	0.16	1.30

nd = no data

File : A3991.D
Sample : LINDON#1, 2895m. AROS.
Misc. Info : COL#155. 30-8-95. GEC.

FIGURE 3



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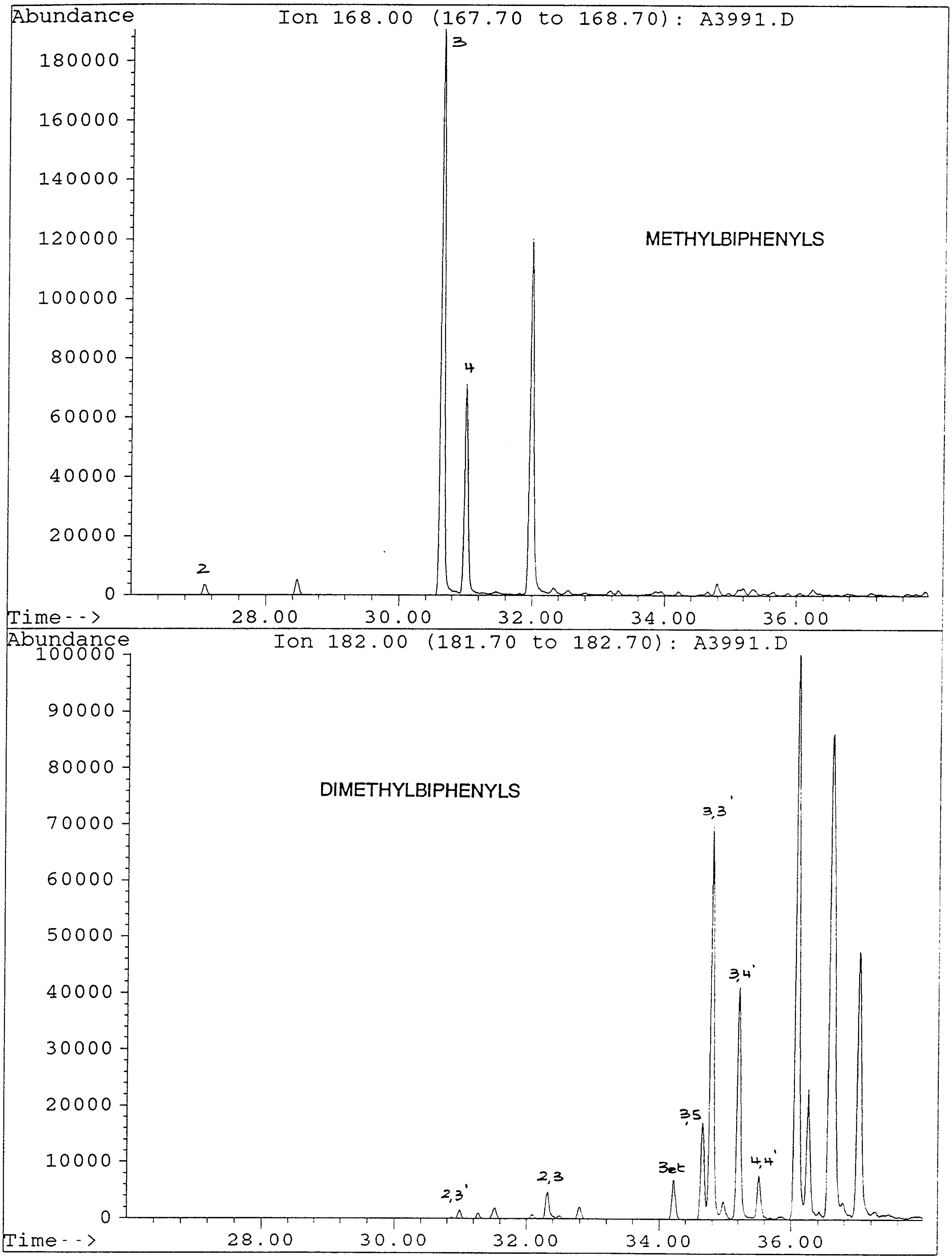

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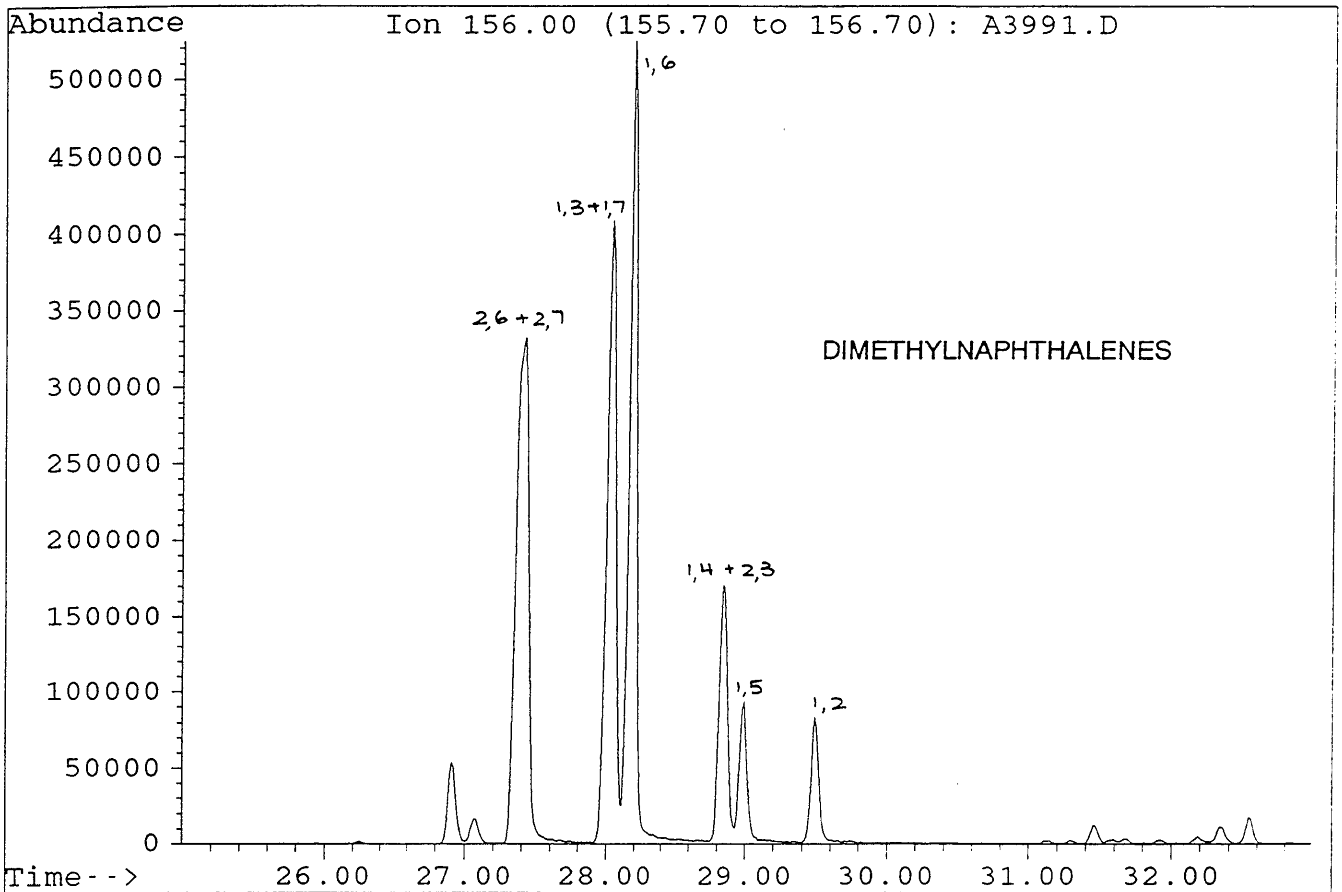

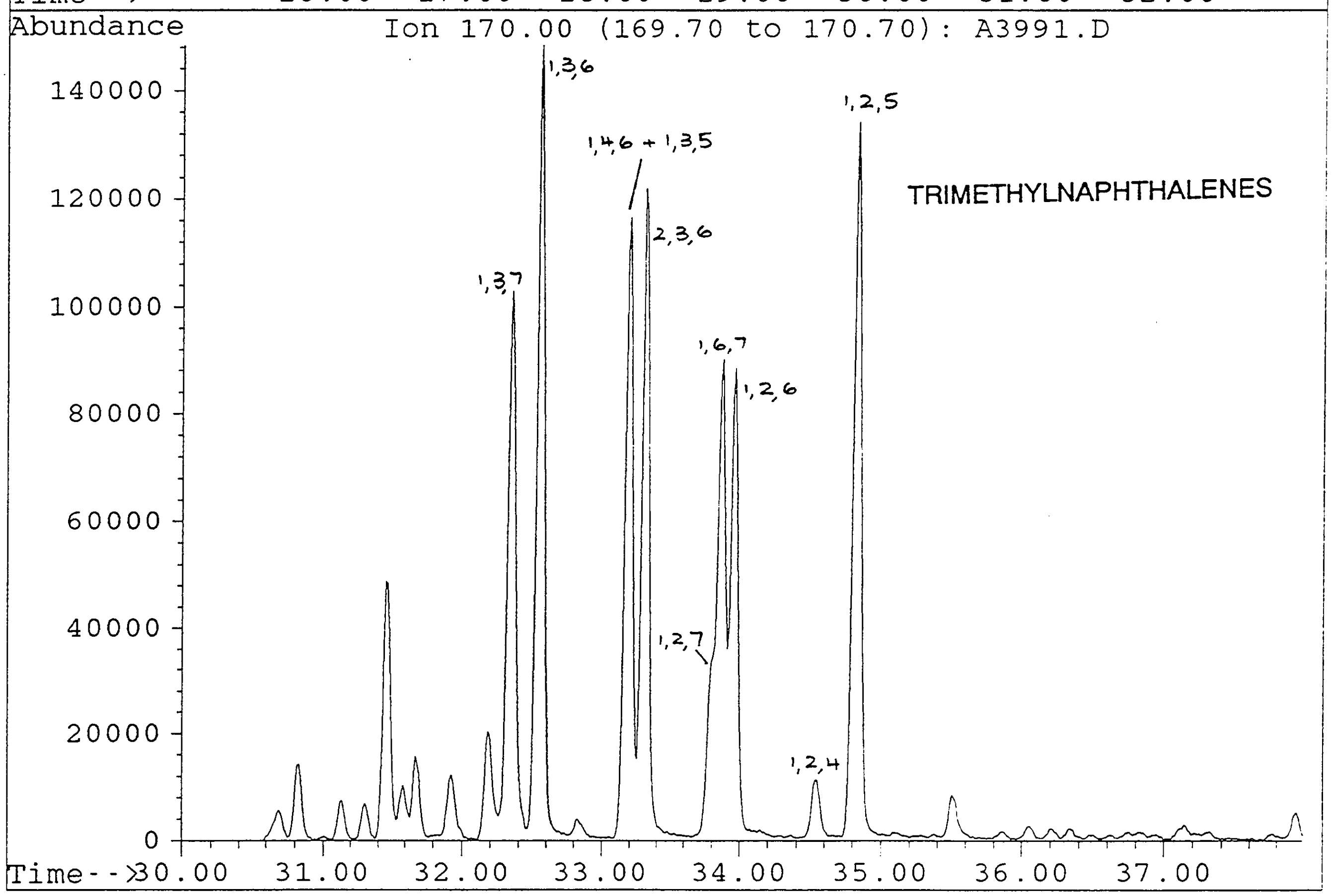

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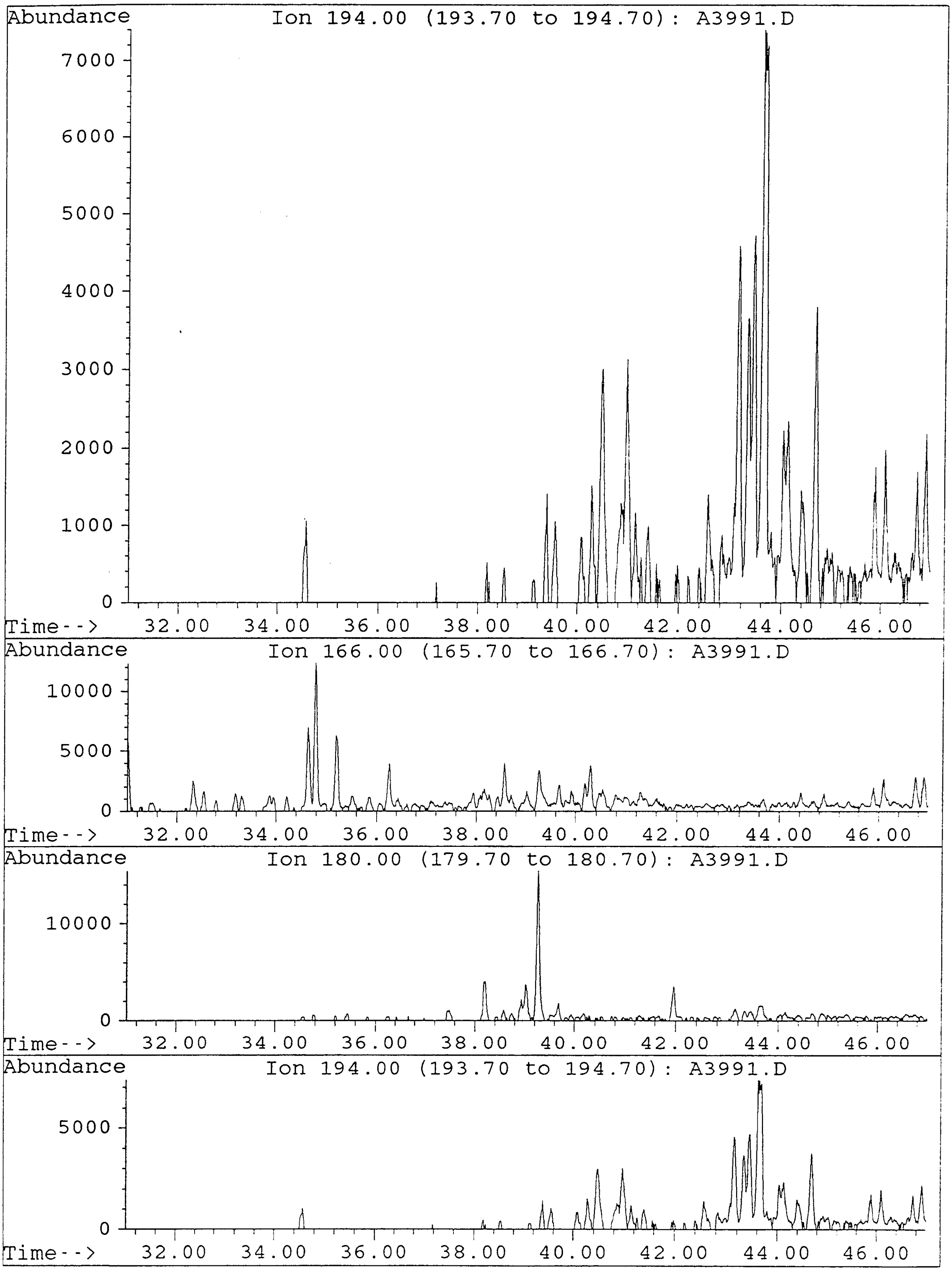
Misc. Info : COL#155. 30-8-95. GEC.

FLUORENES



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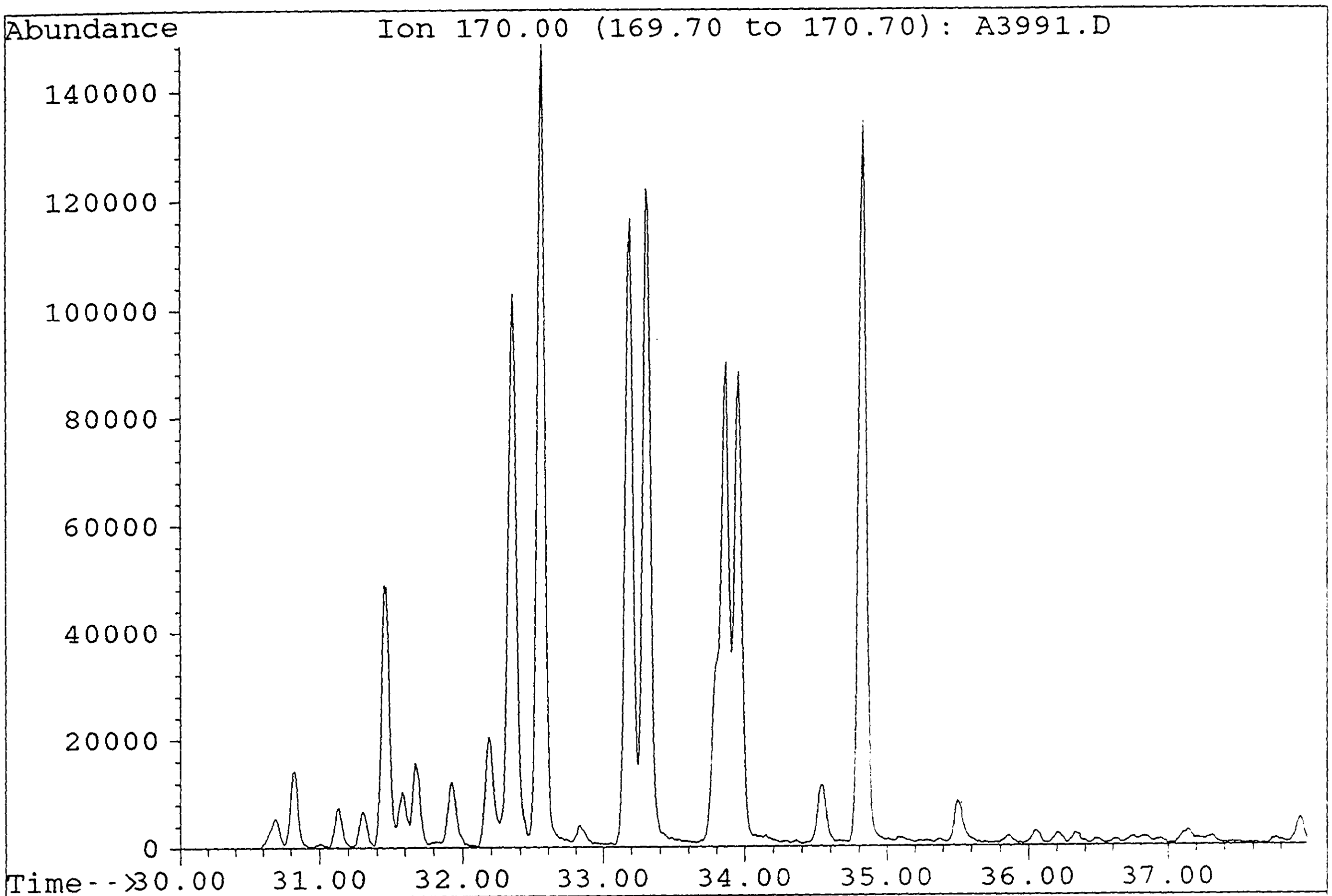
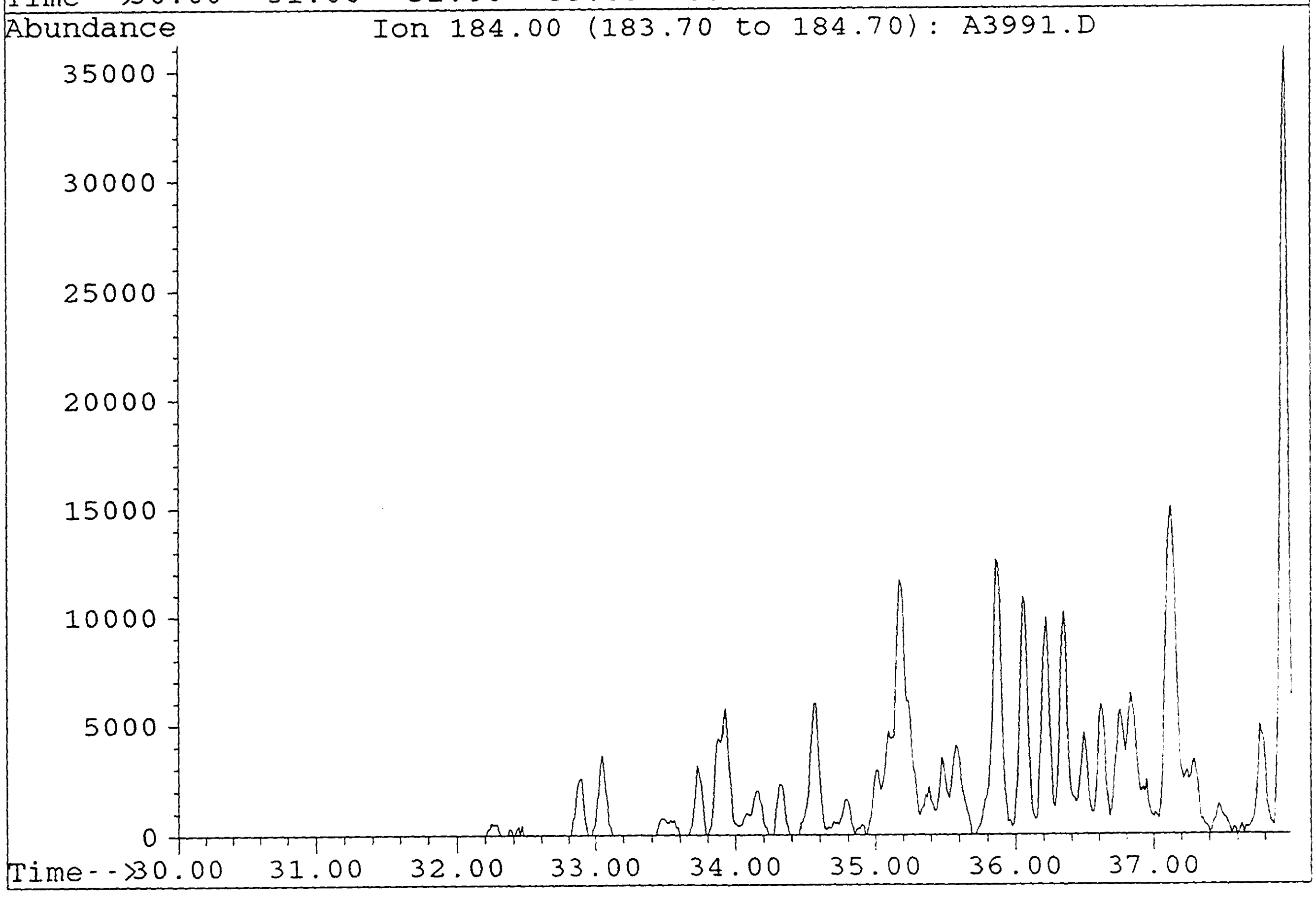
Misc. Info : COL#155. 30-8-95. GEC.





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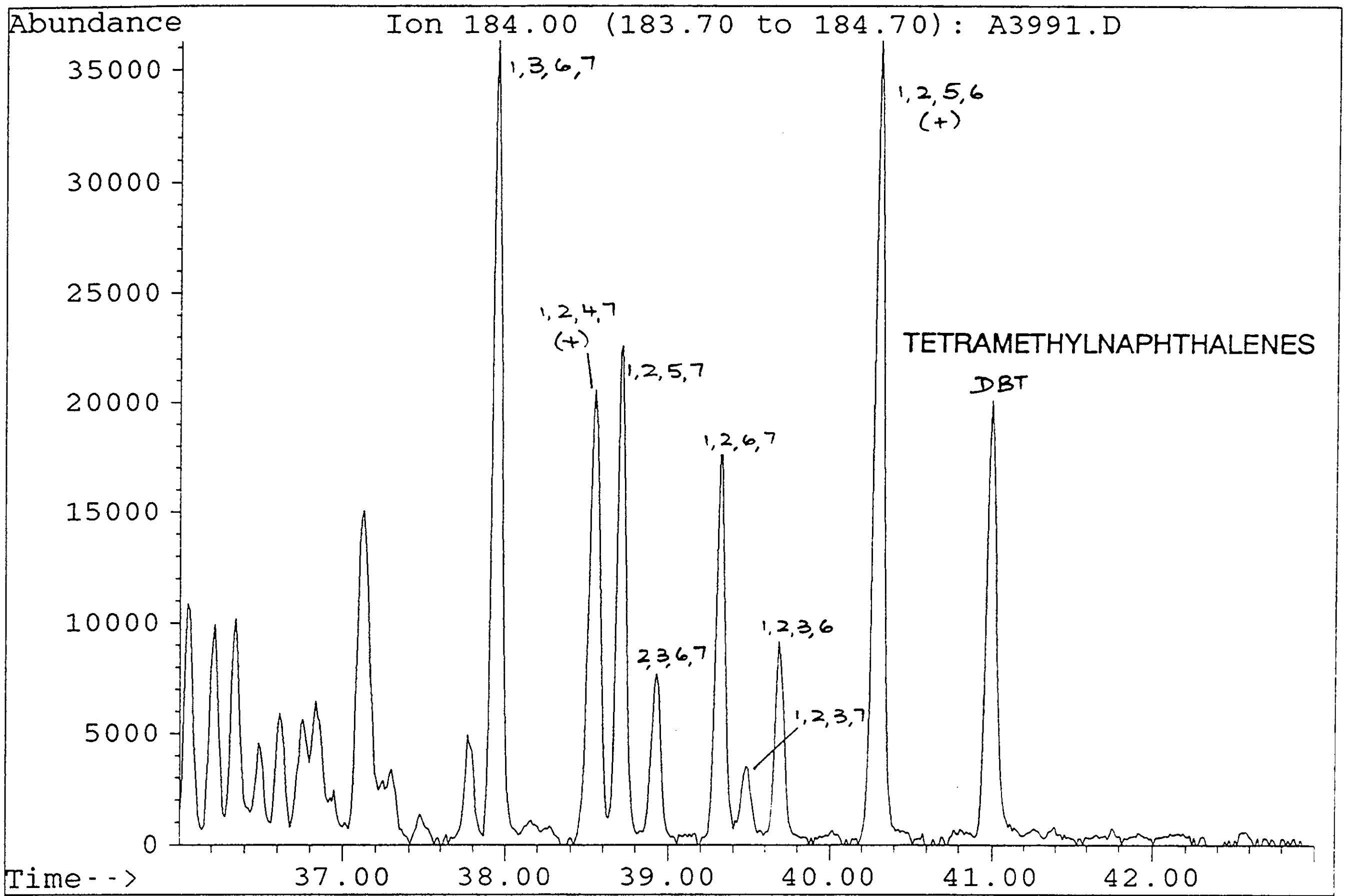
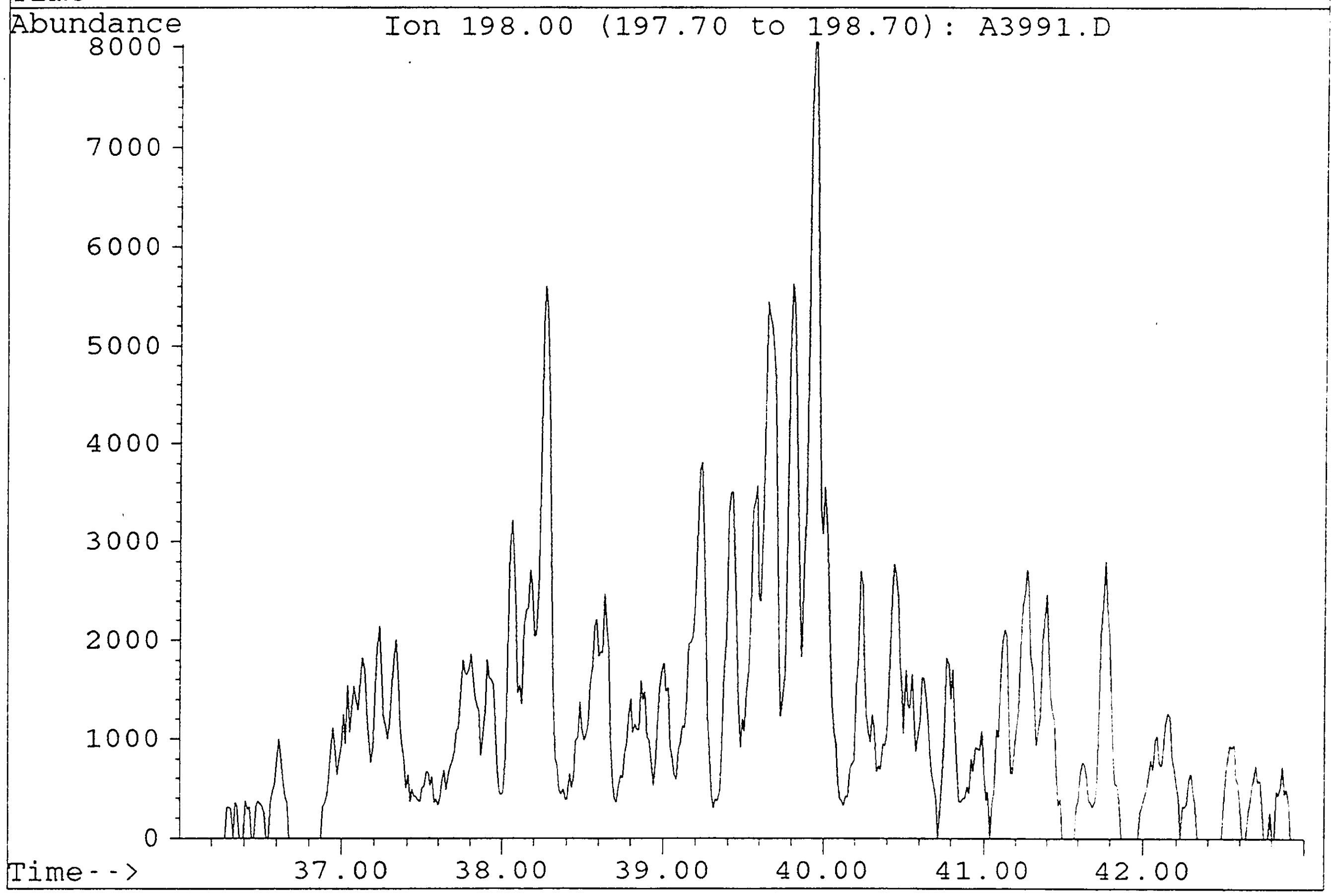
Sample : LINDON#1, 2895m. AROS.
Misc. Info : COL#155. 30-8-95. GEC.





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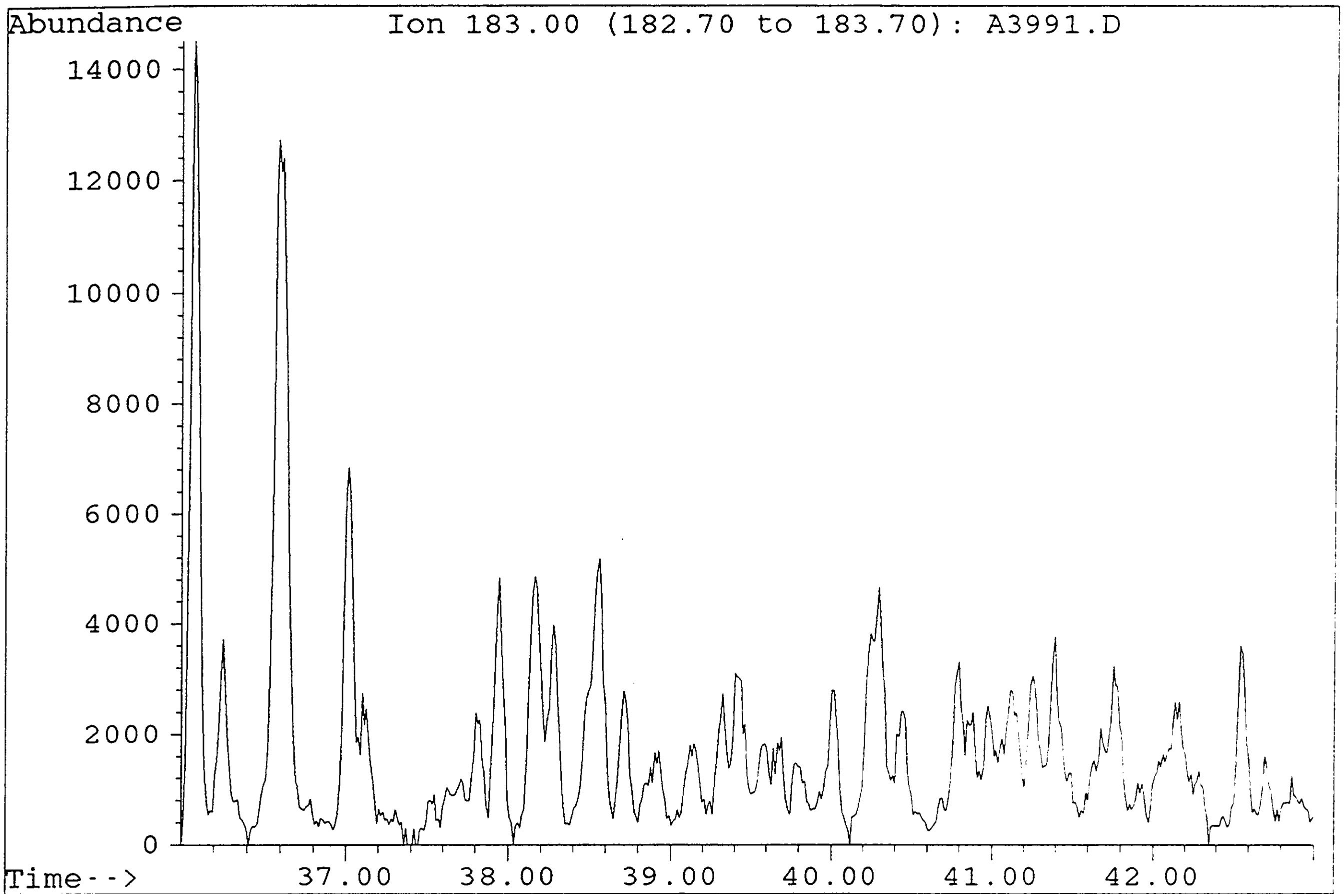

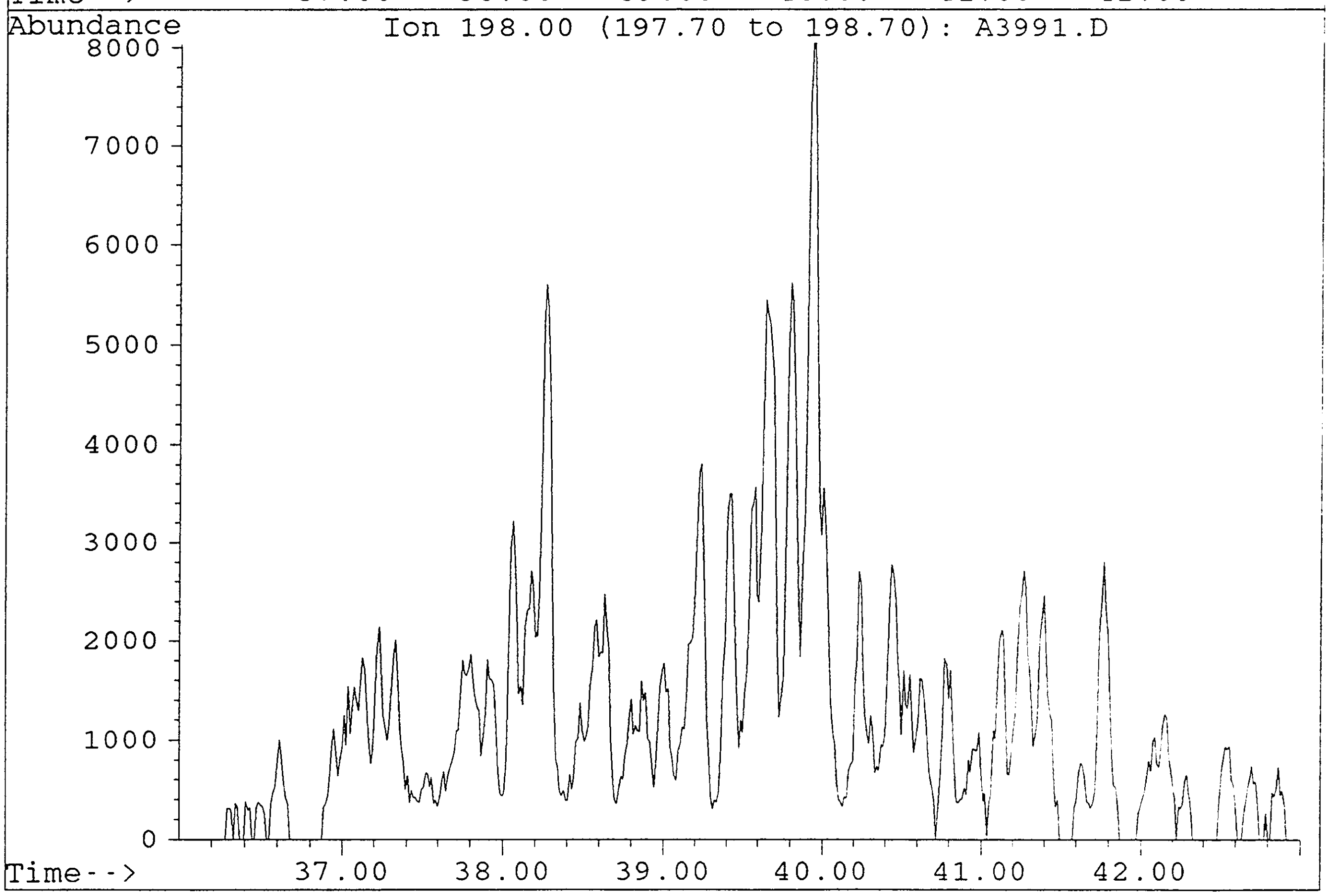

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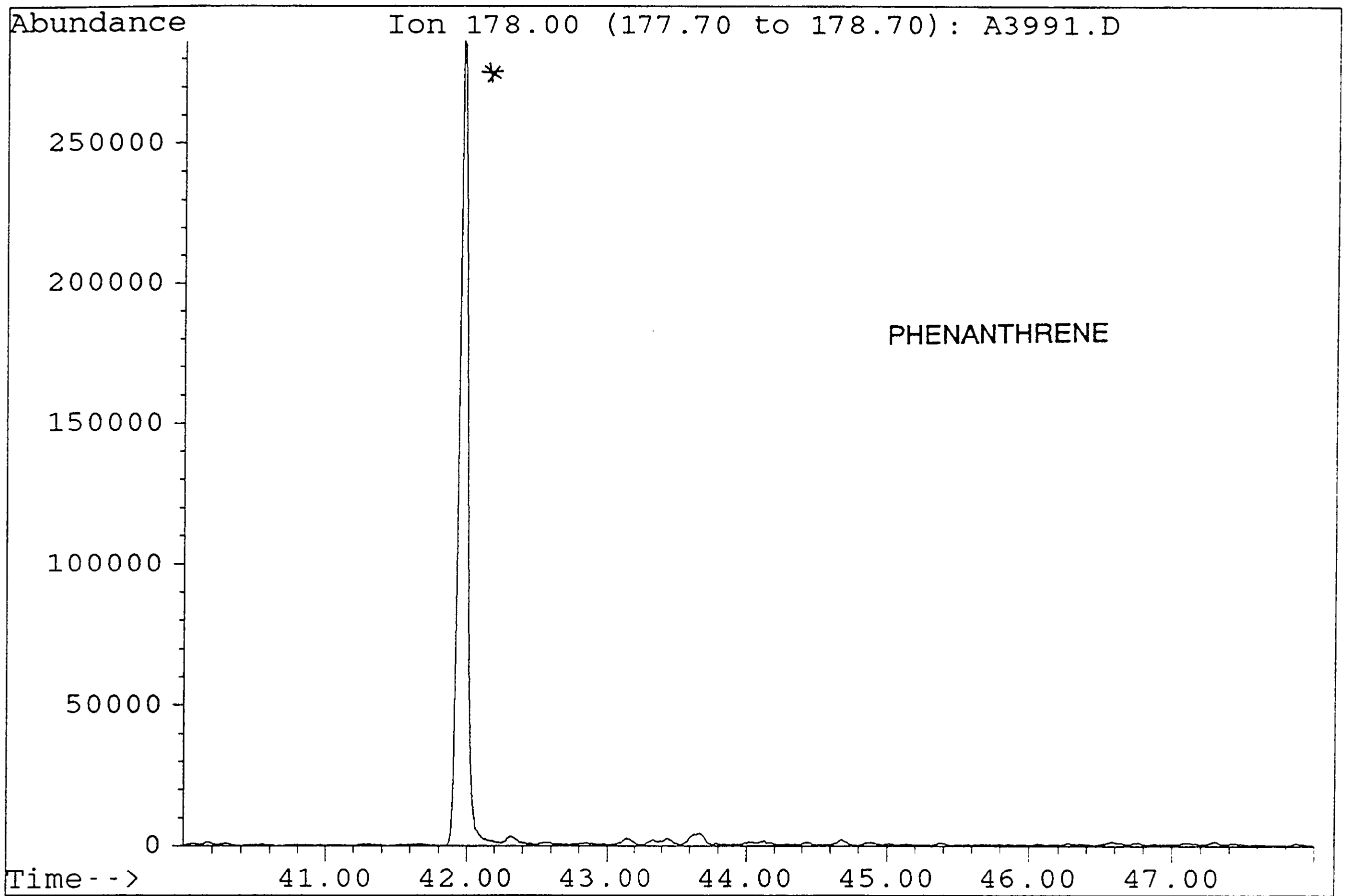

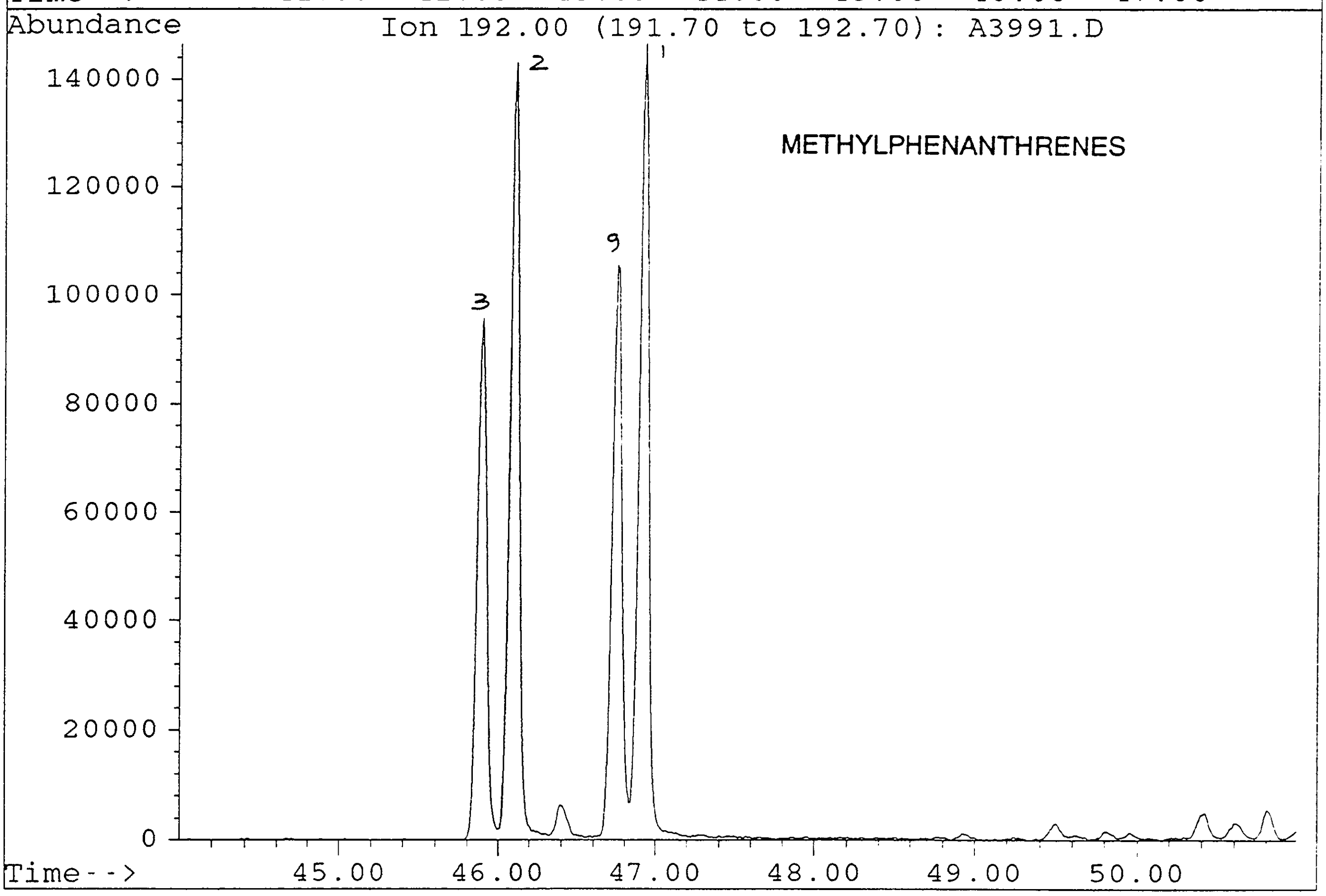

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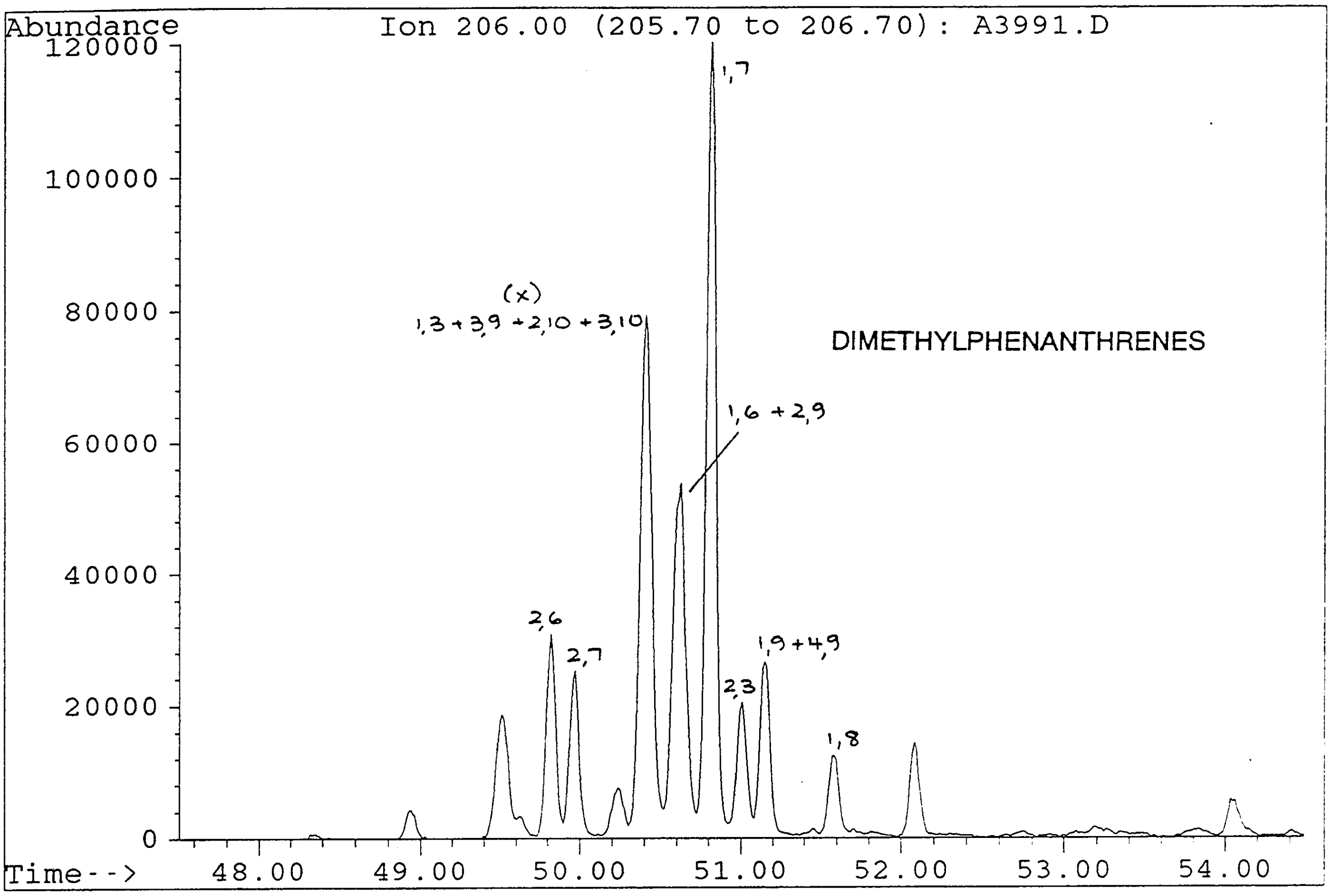
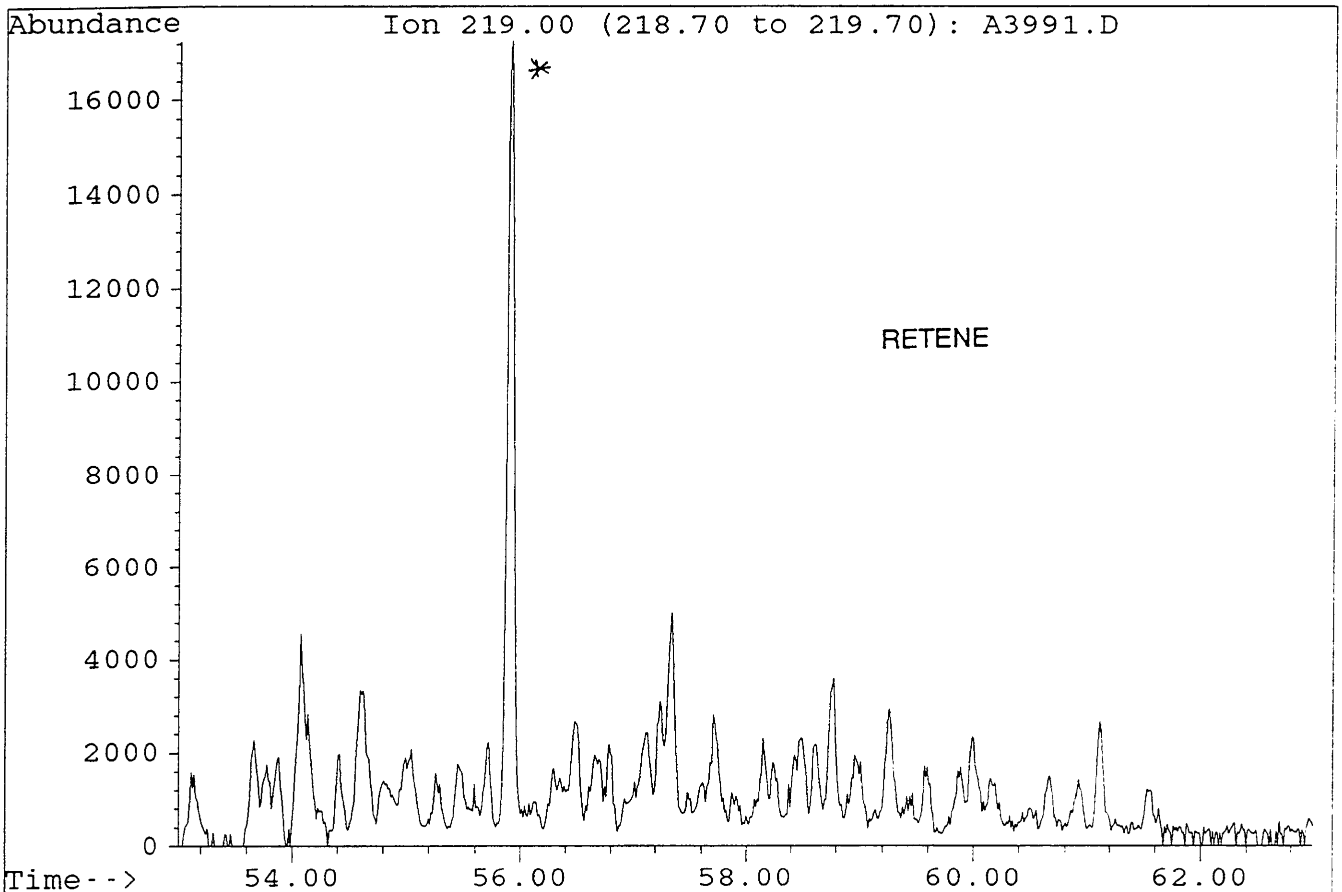
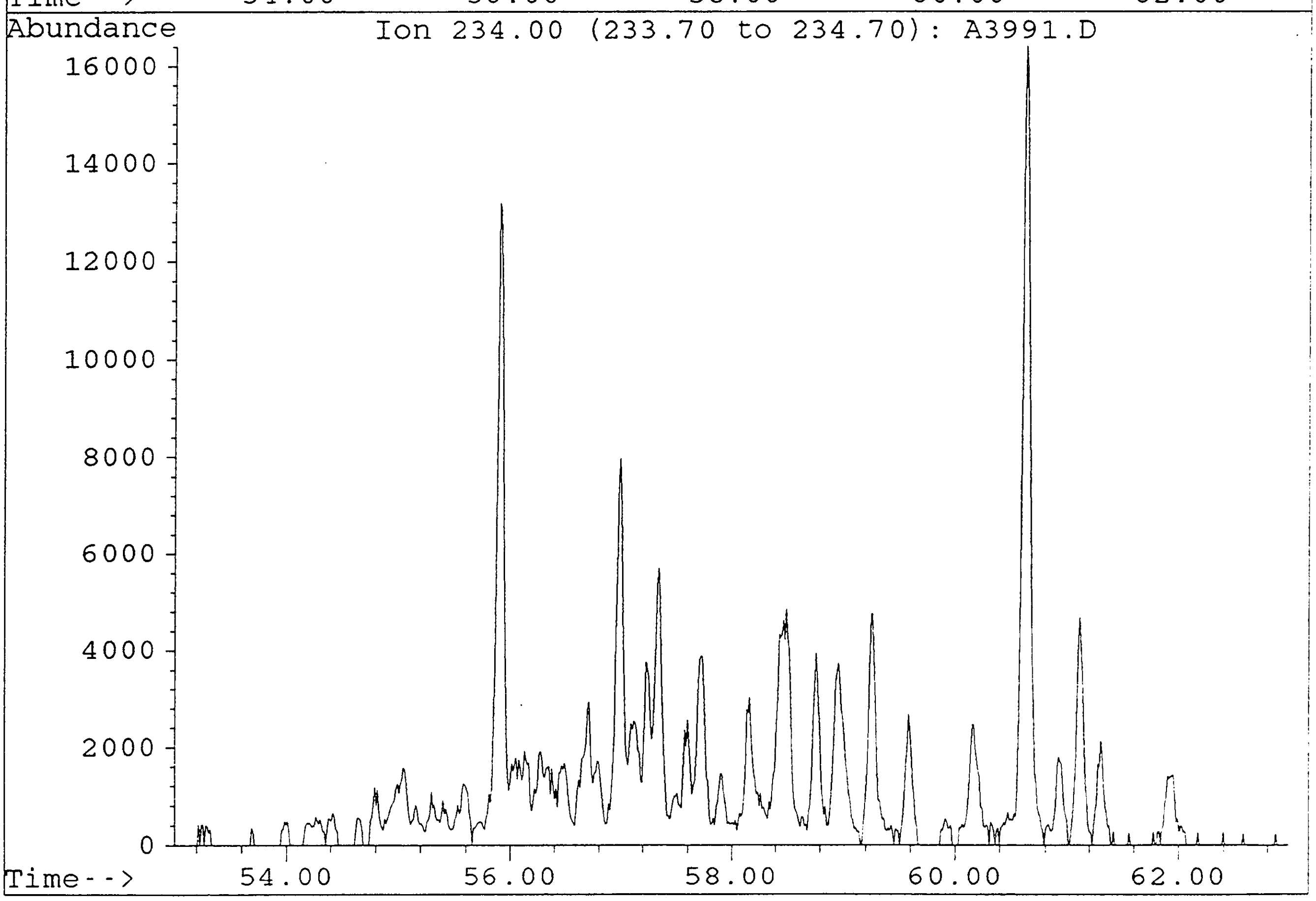


File : A3991.D
Sample : LINDON#1, 2895m. AROS.
Misc. Info : COL#155. 30-8-95. GEC.





PETROLEUM GEOCHEMISTRY

1.0 INTRODUCTION

Petroleum geochemistry is primarily concerned with the application of organic chemistry to samples of geological interest in hydrocarbon exploration.

Analyses can be carried out on cuttings, sidewall cores, conventional cores, relatively unweathered outcrop samples and fluid hydrocarbons (oil, condensate, gas).

Source rock evaluation is best performed on sidewall cores, since cuttings are more susceptible to contamination from both cavings and organic additives in the mud system. In petroleum geochemical studies it is vitally important for the geochemist/geologist to be aware of the type of mud additives used and the stage at which they are used during the drilling program. Any anomalous results must be carefully considered in conjunction with mud system records.

Petroleum geochemistry in exploration is applied for three major purposes:

1. Identification of richness, maturity and type of kerogen in (a large number of) whole rock samples by screening analyses.

2. Semi-detailed characterisation of kerogen in sediments from selected source intervals, to determine maturity, source type and genetic potential.

3. Detailed characterisation of petroleum fluids (extracts, oils and condensates) by assessment of thermal maturity, source type and depositional environment to enable oil-to-oil and oil-to-source rock correlation studies.

2.0 THEORY & METHODS

Samples are analysed according to the scheme illustrated in Figure 1 which shows the order and type of analysis for both screening and detailed tests.

2.1 Screening Analyses of Whole Rock Samples

2.1.1 Headspace/Cuttings Gas Analysis

The headspace sample is usually provided in a sealed tin can which holds both cuttings and water to approximately three quarters capacity. This allows the volatile hydrocarbons to diffuse easily into an appreciable headspace.

The gas is taken into a syringe through a silicone seal on the lid of the container and analysed by packed column gas chromatography using the following conditions:

Instrument:	Shimadzu GC-8APF
Column:	6'x 1/8" Chromosorb 102
Injector/Detector Temperature:	120oC
Column Temperature:	110oC
Carrier Gas:	Nitrogen

Cuttings gas analysis is performed in the same manner but on samples which do not liberate volatile gases readily. These sediments are subjected to very vigorous agitation prior to sampling.

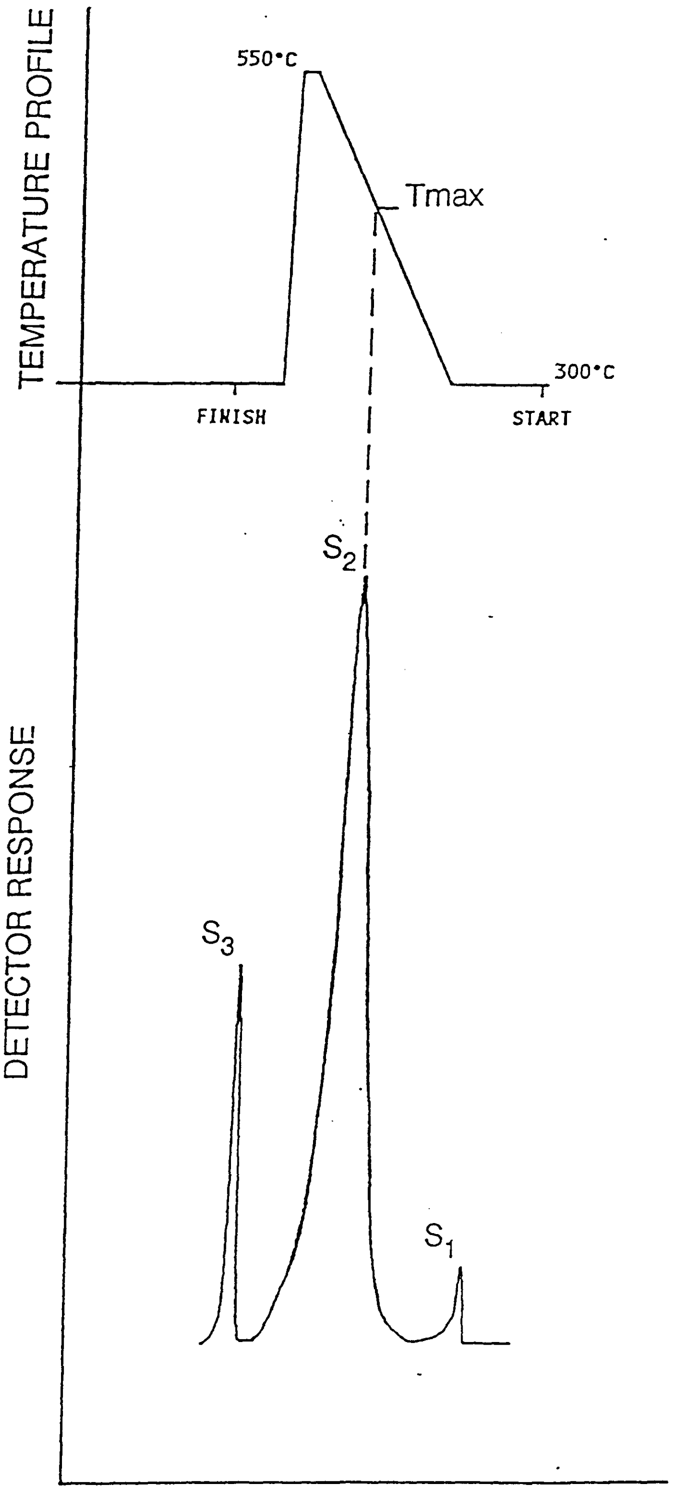
Values are given as volume of gas per million volumes of sediment (ppm) for each hydrocarbon (methane, ethane, propane, iso- and n-butane), as composite values including C_5-C_7, and as ratios.

Headspace/cuttings gas analyses are used as a screening technique to identify zones of significant gas generation and out-of-place gas (Letran et al, 1974). The classification for gas content is listed below:

Total gas content (C_1;C_2-C_4; or C_5-C_7)	Description
10 - 100ppm	very lean - lean
100 - 1,000	lean - moderate
1,000 - 10,000	moderate - rich
10,000 - 100,000	rich - very rich

FIGURE 2

SCHEMATIC PYROGRAM OF ROCK-EVAL PYROLYSIS



The abundance of C_2-C_4 components (wet gas) is used to locate the zone of oil generation, since wet gas is commonly associated with petroleum (Fuex, 1977).

It is important to ensure that the gases analysed are not of a biogenic origin, so an anti-bacterial agent must be added to the cuttings when they are stored in water.

2.1.2 Sample Preparation

Depending on drilling mud content, cuttings samples may be water washed before they are air dried, picked free of contaminants and cavings, and then crushed to 0.1mm using a ring pulveriser.

Sidewall cores are freed of mud cake and other visible contaminants, sampled according to homogeneity, air dried and hand crushed to 0.1mm grain size.

Conventional core and outcrop samples are inspected for visible contaminants and crushed to 1/8" chips using a jaw crusher. After air drying, the chips are crushed with a ring pulveriser to small particle size (0.1mm).

Petroleum aqueous mixtures are separated into oil and water/mud fractions by decanting off the oil layer and producing a clean separation by gently centrifuging the oil. If separation by this method is not effective, the petroleum is solvent extracted.

2.1.3 Total Organic Carbon(TOC)

The TOC value is determined on crushed sediment. The minimum sample requirement is one gram, however, results may be obtained from as little as 0.2mg in very rich samples. Carbonate minerals are first removed by acid digest (HC1) and the remaining sample heated to 1700^{o}C (Leco Induction Furnace) in an atmosphere of pure oxygen. The CO_2 produced is measured with an infra-red detector, and values calculated according to standard calibration.

TOC is expressed as % of rock and is used as a screening procedure to classify source rock richness:

Classification	Clastics	Carbonates
Poor	0.00 – 0.50	0.00 – 0.25
Fair	0.50 – 1.00	0.25 – 0.50
Good	1.00 – 2.00	0.50 – 1.00
Very Good	2.00 – 4.00	1.00 – 2.00
Excellent	> 4.00	> 2.00

2.1.4 Rock–Eval Pyrolysis

Although a preliminary source rock classification is made using TOC data, a more accurate assessment of organic source type and maturity is possible by Rock–Eval pyrolysis. Two types of Rock–Eval analyses are offered: "one run" which involves pyrolysis of the crushed but otherwise untreated sediment and "two run" which involves pyrolysis of both the crushed, untreated sediment and the decarbonated sediment. The "two run" method provides more accurate S_3 values that the "one run" method. S_1 and S_2 values are of the same accuracy in both methods.

The method requires 0.4g of sample material, although reliable results can often be obtained from smaller amounts.

The crushed sediment is heated in an inert atmosphere of helium over a programmed temperature range. The resulting pyrogram is shown in Figure 2.

Hydrocarbons present in the free or adsorbed state (S_1) are thermally distilled at 300°C and measured by a flame ionisation detector (FID). Hydrocarbons are then cracked from the kerogen (S_2) during a temperature ramp from 300° to 550°C and also measured by FID. CO_2 released during the kerogen cracking process (S_3) is trapped and subsequently measured by a thermal conductivity detector.

The amount of free hydrocarbons in the sediment (S_1) represents milligrams of hydrocarbons distilled from one gram of rock and is a measure of both in situ and out–of–place petroleum.

Free hydrocarbon richness is described by the following:

S_1 (mg/g or kg/tonne)	
0.20 – 0.40	fair
0.40 – 0.80	good
0.80 – 1.60	very good
> 1.60	excellent

The total amount of hydrocarbons present in the free state and as kerogen is a measure of the potential yield (genetic potential) of the sample ($S_1 + S_2$) and is expressed as mg/g or rock.

Source rocks are classified accordingly:

$S_1 + S_2$ (mg/g)	Source Rock Quality
0.00 - 1.00	poor
1.00 - 2.00	marginal
2.00 - 6.00	moderate
6.00 - 10.00	good
10.00 - 20.00	very good
> 20.00	excellent

The Production Index (PI) represents the amount of petroleum generated relative to the total amount of hydrocarbons present ($S_1/S_1 + S_2$). It is a measure of the level of maturity of the sample. For oil prone sediments PI ranges from 0.1 at the onset of oil generation to 0.4 at peak oil generation. For gas prone sediments, PI shows only a small change with increasing maturity.

The temperature at which the maximum amount of S2 hydrocarbons is generated is called Tmax (Figure 2). This temperature increases with the increasing maturity of sediments.

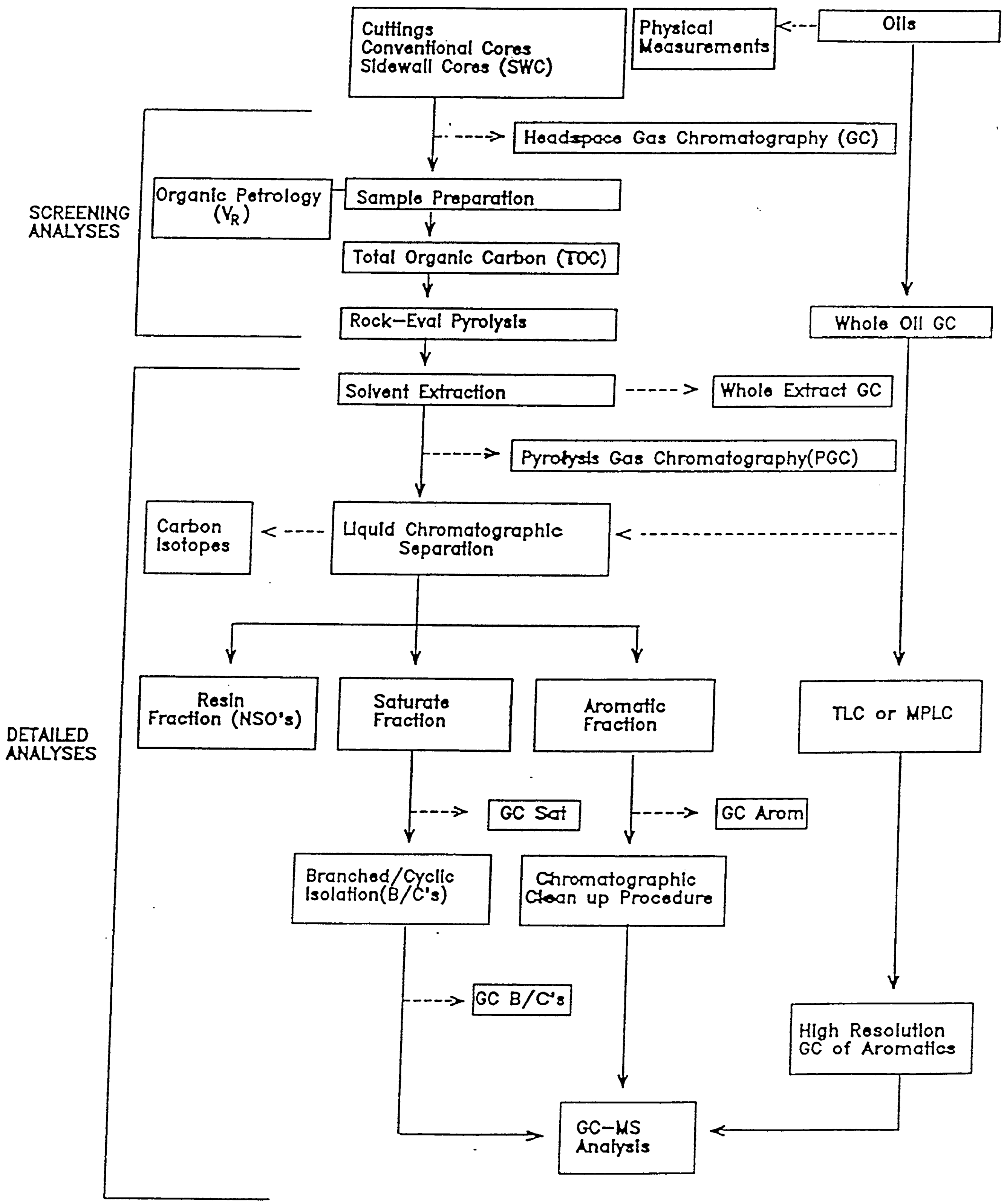
The variation of Tmax is summarised as

$< 430^{o}C$	immature
$430/435^{o} - 460^{o}C$	mature (oil window)
$> 460^{o}C$	overmature

Hydrogen Index (HI = S2 x 100/TOC) and Oxygen Index (OI = S3 x 100/TOC), when plotted against one another, provide information about the type of kerogen and the maturity of the sample. Both parameters decrease in value with increasing maturity. Samples with high HI and low OI are dominantly oil prone and samples with low HI and high OI are gas prone.

FIGURE 1

FLOW DIAGRAM FOR PETROLEUM GEOCHEMICAL ANALYSES



2.2 Analysis of Kerogen

2.2.1 Organic Petrology - Vitrinite Reflectance

Vitrinite is a coal maceral which responds to increasing levels of thermal maturity. This response is measured microscopically by the percent of light reflected off the polished surface of a vitrinite particle immersed in oil.

Measurement of vitrinite reflectance can be carried out on uncrushed, washed and dried cuttings (10–50gms of sample material required), sidewall cores (2–10gms), conventional cores (2–10 gms) or outcrop samples (2–10gms).

The values given are for standard lower size limits. In special cases, however, useful data may be obtained from as little as 0.1gm.

For each sample a minimum of 25 fields is measured in order to establish a range and mean for reflectance values.

Maturity classifications according to vitrinite reflectance values are:

% V_R (approx)	Maturity
0.2 - 0.55	immature
0.55 - 1.2	mature
1.2 - 1.8	overmature
> 1.8	severely altered

Following vitrinite reflectance measurements, microscopic examination in fluorescence mode allows the description of liptinite macerals and an estimate of their abundances. The amount of dispersed organic matter is reported and its composition described.

Vitrinite reflectance results and maceral descriptions are best obtained from coals or rocks deposited in environments which received large influxes of terrestrially derived organic matter. Vitrinite reflectance cannot be measured in rocks older than Devonian age, since land plants had not evolved prior to this time.

2.2.2 Pyrolysis Gas Chromatography

Pyrolysis gas chromatography (PGC) is performed on solvent extracted source rocks or isolated kerogens. The sample is pyrolysed by an SGE pyrojector which is coupled directly to a Hewlett Packard 5890 gas chromatograph. The operating conditions are:

Pyrolysis temperature:	600^{o}C
Column:	25m x 0.22mm ID BP-1 (SGE)
Carrier gas:	helium
Oven conditions:	-20^{o} to 280^{o}C @ 4^{o}/min

Data are collected and recovered using DAPA scientific software.

Pyrolysis GC allows the examination of kerogen on the molecular level and thereby a better classification of source rocks with regard to source type and generative capacity than conventional bulk pyrolysis (ie. Rock-Eval). The analytical procedure is semi quantitative (with yield related to S_2 of Rock-Eval).

Samples are characterised according to the amounts of aliphatic, aromatic and phenolic components in the kerogen. The aliphatic carbon content of a kerogen is the critical factor in determining catagenic hydrocarbon yields in the earth's crust, while the gas/oil ratio is dictated by the distribution of the various structural elements in the kerogen (Larter, 1985). Using pyrogram fingerprint data, it is possible to distinguish substantial variations between kerogens, even those of the same bulk chemical type.

A major strength of pyrolysis methods is that, while quantitative yields of kerogens are maturity related, the qualitative pyrogram fingerprints obtained are relatively rank independent over much of the oil window (Espitatlie et al, 1977; Van Graas et al, 1980; Larter, 1985). At high maturities (>1.2% V_R) characteristics for all kerogen types tend to converge (Horstfield, 1984).

Data are presented by percentage and mg/g of individual substances as well as groups of compounds.

Significant parameters are:

$(C_1 - C_5)/C_6$ + abundance	gas/oil ratio
$C_9 - C_{31}$ (alkenes + alkanes)	oil yield
Type Index R:	aromaticity

(Larter & Douglas 1979, Larter and Senftle, 1985).

2.3 Detailed Analyses of Petroleum Fluids

2.3.1 Solvent Extraction of Sediment

The finely crushed sample (up to 100g) is extracted with dichloromethane (300mL) using sonic vibration. After Buchner flask filtration, the filtrate is re-vibrated with activated copper powder (1g) to remove elemental sulphur. The extractable organic matter (EOM) is afforded by further filtration and fractional distillation of the solvent.

Source rock richness based upon EOM is classified accordingly:

Yield	ppm
Poor	< 500
Fair/Good	500 - 2000
Very Good	2000 - 4000
Excellent	>4000

2.3.2 Liquid Chromatography Separation

Sediment extracts, crude oil and condensate samples are separated into fractions corresponding to three structural types:

saturated hydrocarbons (SAT)
aromatic hydrocarbons (AROM)
resins plus ashphaltenes (NSO)

This separation is achieved by liquid column chromatography using activated silicic acid adsorbent and eluting solvents of varying polarity. Saturated, aromatic and NSO concentrates are recovered by fractional distillation/evaporation of the solvent and quantitative transfer to a small vial.

The amount of hydrocarbons (SAT plus AROM) can be used to classify source rock richness and the amount of saturates to classify oil source potential, according to the following criteria:

Classification	ppm HC	ppm SAT
Poor	0 - 300	0 - 200
Fair	300 - 600	200 - 400
Good	600 - 1200	400 - 800
Very Good	1200 - 2400	800 - 1600
Excellent	>2400	>1600

The composition of the extracts can also provide information about their levels of maturity and/or source type (LeTran et. al., 1974; Philippi, 1974). Generally, marine extracts have relatively low concentrations of saturated and NSO compounds at low levels of maturity, but these concentrations increase with increasing maturation. Terrestrially derived organic matter often has a low level of saturates and large amount of aromatic and NSO compounds, irrespective of the level of maturity.

Specific ratios are measured from solvent extraction and liquid chromatography data which give an indication of source type and maturity. EOM (mg)/TOC(g) can be used as a maturation indicator when plotted against depth for a given sedimentary sequence. Generally an EOM/TOC value of >100 indicates high maturity. If such a sample has a SAT (mg)/TOC(g) ratio <20, it is likely that the organic matter is gas prone. A value for SAT (mg)/TOC (g) >40 suggests an oil prone source type.

2.2.2 Capillary Gas Chromatography (GC)

C_{12}+ gas chromatography is most commonly carried out on saturate fractions, but in certain instances it is used to examine whole extracts/oils, aromatic or branched/cyclic fractions. It is also used as a tool to identify contamination. The analyses are performed under the following conditions:

Instruments:	Hewlett Packard 5890 Gas Chromatography
Injector:	SGE OCI–3 on column
Column:	25m x 0.2mm ID BP–1
Injector Temp:	280^{o}C
Detector Temp:	320^{o}C
Column Temp:	45^{o}C to 280^{o}C at 4^{o}/min
Carrier Gas:	hydrogen

Data are collected using an IBM compatible PC and DAPA scientific software.

2.3.3.1 C_{12}+ Saturate Gas Chromatography

Saturate GC results provide information pertaining to source type, maturity and depositional environment.

The n-alkane distribution from n-C_{12} to n-C_{31} is determined from the area under the peaks representing each of these n-alkanes. The profile can yield information about maturity and source type and is quantified in the $C_{21} + C_{22}/C_{28} + C_{29}$ ratio and Carbon Preference Indices (CPI 1 and 2).

$$CPI\,(1) = \frac{(C_{23}+C_{25}+C_{27}+C_{29})\ wt\% + (C_{25}+C_{27}+C_{29}+C_{31})\ wt\%}{2 \times (C_{24}+C_{26}+C_{28}+C_{30})\ wt\%}$$

$$CPI\,(2) = \frac{(C_{23}+C_{25}+C_{27})\ wt\% + (C_{25}+C_{27}+C_{29})\ wt\%}{2 \times (C_{24}+C_{26}+C_{28})\ wt\%}$$

- carbon preference indices are approximately 1 for marine samples, regardless of maturity
- decrease from 20--> 1 for terrestrial samples as maturity increases

The $C_{21} + C_{22}/C_{28} + C_{29}$ ratio is generally >1.5 for aquatic source material and <1.2 for terrestrial organic matter, however, the values increase with maturity.

Pristane/phytane (Pr/Ph) ratios can indicate depositional environments:

- <3.0 – relatively reducing depositional environments;
- 3.0–4.5 – mixed (reducing/oxidising) environments;
- >4.5 – relatively oxidising depositional environments.

2.3.3.2 C_1 - C_{31} Whole Oil Gas Chromatography

This analytical method is applied to oil and condensate samples. It provides a picture of the whole oil up to n-C_{31} and allows quantitation of components with more than 4 carbon atoms. Several parameters are measured which illustrate changes in the degree of biodegradation and water washing in the reservoir. Because these measurements are performed on very volatile components in the oil, care should be taken during sampling, transportation and storage of the fluid to minimise evaporation.

Whole oil analytical conditions are listed below:

Instrument:	Shimadzu GC-9A
Column:	25m x 0.2mm ID BP-1
Injector/Detector Temperature:	290°C
Column Temperature:	-20°C to 280°C at 4°/min
Carrier Gas:	hydrogen

2.3.4 Carbon Isotope Analysis

This measurement is normally carried out on one or more of the following mixtures: topped oil, saturate fraction, aromatic fraction, NSO fraction. The organic matter is combusted in oxygen to produce carbon dioxide which is purified and transferred to an isotope mass spectrometer. The carbon isotope ratio ($\delta C13/\delta C12$) is measured and compared to an international standard (the Peedee Belemnite Limestone - PDB).

Carbon isotope analysis is most commonly used to identify the source of methane according to the following criteria (Fuex 1977):

$\delta^{13}C$ ‰ PDB

-75 to -55	Biogenic methane
-58 to -40	Methane associated with oil
-40 to -25	Thermal methane

Source rock-crude oil correlations have been attempted by observing the change in $\delta^{13}C$ values of components of oils and rocks (Stahl 1977). Source rock extracts are usually isotopically heavier than the corresponding crude oil but are lighter than the asphaltenes of the oil and the kerogen of the rock (Hunt 1979). It has also been observed that marine organic carbon is generally isotopically heavier than contemporaneous terrestrial organic carbon (Tissot & Welte 1978). However, it should be noted that increasing maturity and biodegradation produce a shift toward heavier isotope values.

2.3.5 Gas Chromatography – Mass Spectrometry (GC/MS)

GC/MS analysis is normally performed on the branched and cyclic alkane fraction and/or the aromatic fraction of oils, condensates and sediment extracts. The specific fraction is first isolated and then injected into a gas chromatograph which is linked in series with a mass spectrometer. As compounds are eluted from the chromatography column they are bombarded with high energy electrons. This causes them to fragment into a number of ions each with a molecular weight less than that of the parent molecule. Individual compounds give a characteristic fragmentation pattern (mass spectrum), the major ions of which are presented in a series of mass fragmentograms [ie. plots of ion concentration against GC retention time].

GC/MS analysis can be carried out using one of the following modes of operation:

(i) Acquire mode – in which all ions (within a broad range) in each mass spectrum are memorised by the data system.

(ii) Selective Ion Monitoring (SIM) mode – in which only selected ions of interest are memorised by the data system.

2.3.5.1 GC/MS Analysis of Branched/Cyclic Alkanes

The group of compounds to be analysed is first isolated from the saturate fraction by refluxing the sample with activated 5Å molecular sieves in cyclohexane for 24 hours. Branched/ cyclic alkanes, including alkylcyclohexanes, are recovered from the solvent by fractional distillation.

For condensates, and samples where information about alkylcyclochexanes is not required, the saturate fraction is passed through a small column packed with _________? adsorbent. The branched/cyclic alkanes are recovered from the eluting solvent by fractional distillation.

Analysis is carried out in the SIM mode with a total of 33 ions being recorded over different time spans.

Operating conditions are:

Instrument:	5987HP GC mass spec data system
Column:	60m x 0.25mm ID cross linked methyl-silicone DB-1 (J&W) column of 0.25 micron film thickness connected directly to the ion source
Injector:	OCI-3(SGE)
Carrier gas:	hydrogen
Oven Conditions:	50^{o} to $274^{o}C$ at 8^{o} /min 274^{o} to $280^{o}C$ at 1^{o} /min
EM Voltage:	2,000 - 2,300V
Electron Energy:	70eV
Source temperature:	$250^{o}C$

GC/MS mass fragmentograms are examined for particular 'biomarker' compounds which can be related to biological precursors. These allow the characterisation of petroleum with regard to thermal maturity, source, depositional environment and biodegradation.

The significance of selected parameters from branched/cyclic GC/MS analysis is outlined below:

1. 18α (H)-hopane/17α (H)-hopane (Ts/Tm)

Maturity indicator. The ratio of 18α (H) trisnorhopane to 17α (H) trisnorhopane increases exponentially with increasing maturity from approximately 0.2 at the onset to approximately 1.0 at the peak of oil generation, ie. Tm decreases with maturity. This parameter is not reliable in very immature samples.

2. C30 hopane/C30 moretane

Maturity indicator. The conversion of C30 17β, 21β hopane to 17β, 21α moretane is maturity dependent. Values increase from approximately 2.5 at the onset of oil generation to approximately 10. Once the hopane/moretane ratio has reached 10, no further changes occur. A value of 10 is believed to represent a maturity stage just after the onset of oil generation and hopane/moretane ratios are therefore useful mainly as indicators of immaturity in a qualitative sense.

3&4. C_{31} and C_{32} 22S/22R hopanes

Maturity indicator. An equilibrium between the biological R– and the geological S– configuration occurs on mild thermal maturation. A ratio of S:R = 60:40, ie, a value of 1.5, characterises this equilibrium which occurs before the onset of oil generation. The C_{32} hopane pair is often more reliable for this purpose since co-elution sometimes affects the C_{31} ratio.

5. C_{29}20S *ααα*/C_{29}20R *ααα* steranes

Maturity indicator. Upon maturation, the biologically produced 20R sterioisomer is diminished relative to the 20S form and a stabilisation is reached at approximately 55% 20R and 45% 20S compounds. VR equivalents are approximately 0.45% for a 20S/20R value of 0.2 and 0.8% for a 20S/20R value of 0.75. This parameter is most useful between maturity ranges equivalent to 0.4% to 1.0 VR.

6. C_{29}20S *ααα*/C_{29}20R *ααα* + C_{29}20S *ααα* steranes

Maturity indicator. This ratio is a different way of expressing the relative abundance of the biological 20R to the geological 20S normal sterane (see parameter 5). Expressed as a percentage, a value of about 25% indicates the onset of oil generation, and of about 50% the peak of oil generation.

7. C29 *αββ*/C_{29}*ααα* + C29 *αββ* steranes

Maturity indicator. The *αα* form is produced biologically. Its abundance diminishes upon maturation until a mixture of 65% *ββ* (iso) steranes and 35% *αα* (normal) steranes is reached, which is equivalent to approximately 0.9% V_R.

8&9. C_{27}/C_{29} diasteranes and steranes

Source indicator. It has been suggested that marine phytoplankton is characterised by a dominance of C_{27} steranes and diasteranes whereas a preponderance of C_{29} compounds indicates strong terrestrial contributions. Values smaller than 0.85 for C_{27}/C_{29} diasterane and sterane ratios are believed to be indicative for terrestrial organic matter, values between 0.85 and 1.43 for mixed organic material, and values greater than 1.43 for an input of predominantly marine organic matter.

It has been suggested, however, that marine sediments can also contain a predominance of C_{29} steranes, so the above rules have to be applied with caution. Any simplistic interpretation of C_{27}/C_{29} steranes and diasteranes can be dangerous and the interpretation of these data should be consistent with other geological evidence.

10. 18α (H) - oleanane/C_{30} hopane

Source indicator. Oleanane is a triterpenoid compound which has often been reported from deltaic sediments of Late Cretaceous to Tertiary age. It is thought to be derived from certain angiosperms which developed in the late Cretaceous. If the 18α (H) – oleanane/C_{30} hopane ratio is below 10, no significant proportions of oleanane are present. At higher values, it can be used as indicator for a reducing environment during deposition of land plant–derived organic matter.

11. C_{29} diasteranes/C_{29} $\alpha\alpha\alpha$ steranes + C_{29} $\alpha\beta\beta$ steranes

Source indicator. This parameter is used to characterise the oxidity of depositional environments. High values (up to 10) indicate oxic conditions, low values (down to 0.1) indicate reducing environments.

12. C_{30} (hopanes + moretanes)/C_{29} (steranes + diasteranes)

Source indicator. Triterpanes are believed to be of prokariotic (bacterial) origin, whereas steranes are derived from eukariotic organisms. This ratio reflects the preservation of primary organic matter derived from eukariots, relative to growth and preservation of bacteria in the sediment after deposition.

13. C_{15} drimane/C_{16} homodrimane

Drimanes and homodrimanes are ubiquitous compounds most likely derived from microbial activity in sediments. The C_{15} drimane/C_{16} homodrimane ratio is a useful parameter for correlation purposes in the low molecular weight region, especially for condensates which lack most conventional biomarkers. Drimanes are also useful to assess the degree of biodegradation as the removal of C_{15} to C_{16} bicyclics characterises an extensive level of biodegradation.

14. Rearranged/normal drimanes

Like parameter 13, this ratio can be used for correlation purposes in samples without conventional biomarkers, and to assess levels of biodegradation.

2.3.5.2 GC/MS Analysis of Aromatics

The aromatic fraction or the oil to be analysed is first subjected to thin laye chromatography (TLC) or medium pressure liquid chromatography (MPLC) depending upon the analytical requirements.

1. Di– and tri– nuclear aromatic compounds are isolated by TLC. To effec this separation, the sample is applied to an alumina coated glass plate (0.6mm thickness). The plate is developed with hexane and the requirec band located using short wavelength UV light. The fraction is recovered by extraction and fractional distillation.

   This aromatic fraction may be analysed by GC–FID, but GC/MS is recommended because of possible co–elution problems during GC.

   Samples are analysed by GC/MS in the acquire mode scanning from 50 to 450 atomic mass units (amu).

Analytical conditions are:

Instrument:	HP5970 MSD
Column:	60m x 0.25mm ID, 0.25 micron film thickness, 5% phenylmethyl silicone column DB–5 (J&W) connected directly to the ion source
Injector:	automatic on–column
Carrier Gas:	helium
Oven Conditions:	70°C for 1 min 70°C ––> 300°C at 3°/min
Data collection commences at 10 mins	
Mass spectrometry	
Em Voltage	1500 - 1800V
Electron Energy	70eV

Mass fragmentograms are presented for alkylbiphenyls, alkylnaphthalenes, alkylfluorenes and alkylphenanthrenes from a comprehensive data base. Aromatic compounds provide valuable information concerning thermal maturity since they can be applied outside the dynamic range of saturate biomarker indicators and are particularly useful when conventional biomarkers are present in low amounts (Radke & Welte, 1983; Alexander et al, 1985). Maturity ratios are tabled below:

Aromatic Maturity Indicators

Abbrev.	Definition	Range oil onset	Range Wet gas
DNR 1	(2,6DMN, + 2,7DMN)/1,5DMN	1.5	10
DNR 2	2,7DMN/1,8DMN	50	2500
DNR 5	1,5DMN/1,8DMN	50	>3000
DNR 6	(2,6DMN + 2,7DMN)/(1,4DMN + 2,3 DMN)	0.8	2
TNR 1	(1,4,6TMN + 1,3,5TMN)/2,3,6TMN	0.5	4
MPR 1	(2MP + 3MP)/1MP	1.5	3
MPI 1	1.5 x (2MP + 3MP)/(PH + 1MP + 9MP)	0.3	1
MPI 2	(3 x 2MP)/(PH + 1MP + 9MP)	0.3	2
Rc(a)	0.6(MPI−1) + 0.4 (for % Rm <1.35)		
Rc(b)	−0.6(MPI−1) + 2.3 (for % Rm ≥1.35)		

(from Radke et al, 1982; Radke & Welte, 1983; Alexander et al, 1985)

Some aromatic marker compounds have specific natural product precursors and can be used as signatures for sediments of a particular source, depositional environment or geological age:

TNR 5	1,2,5TMN/1,3,6TMN	
TNR 6	1,2,7TMN/1,3,7TMN	(Strachen et al, 1988)
1,7/X	1,7DMP/(1,3 + 3,9 + 2,10 + 3,10 DMP)	
Retene/9MP		
1MP/9MP		(Alexander et al, 1988)

2. Mono– and triaromatic steranes are analysed by GC/MS under the same analytical conditions as used for di– and tri–nuclear aromatics. However, isolation of this fraction is performed by MPLC. To achieve this, the saturate plus aromatic mixture is injected onto a Merck Si60 column. The separation is monitored with a refractive index detector for saturates and a UV absorbance detector for aromatics.

As aromatic steranes are generally present in low abundances, especially in oils, samples are analysed in the SIM mode and 16 ions are recorded.

The conversion of monoaromatic steranes to triaromatic steranes and the dimethylation of triaromatic steranes in sediments are considered to be maturity dependent (Mackenzie et al, 1981; Mackenzie, 1984). The triaromatic sterane maturity indicator should, however, not be applied to crude oils because migration effects appear to selectively deplete the triaromatic steranes.

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APPENDIX 10

GFE RESOURCES LTD

APPENDIX 10

PALYNOLOGICAL REPORTS

10A. PALYNOSTRATIGRAPHY AND ORGANIC FACIES
10B. REVIEW OF SELECTED OTWAY BASIN WELLS

DIGBY-1

APPENDIX 10A

PALYNOSTRATIGRAPHY

AND ORGANIC FACIES

DIGBY-1

APG Consultants

Report 634/01

GFE Resources

Palynostratigraphy and Organic Facies Analysis of **Digby #1**

Otway Basin

P.L. Price
September, 1995

APG Consultants, PO Box 682, Kenmore Q'ld 4069
Phone (07) 3878 1862; Fax (07) 3878 1881

APG Consultants

Report 634/01

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Part 1
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DIGBY #1
SUMMARY OF CONCLUSIONS

Biostratigraphy

Interval	Palynostratigraphic	Units	Inferred Lithostratigraphy
◆ 449.2 - 735.6m	APK4	*C. striatus*	Eumeralla Fm
◆ 1096.8m	APK321	upper Lower *P notensis*	Eumeralla Fm
◆ 1096.8 - 1220.8m	**UNCONFORMITY**		
◆ 1220.8m	APK22	lower Lower *P. notensis*	uppermost Laira Fm
◆ 1318.1m	APK212	Upper *F. wonthaggiensis*	Laira Fm
◆ 1364.4 - 1445.2m	APK21	*F. wonthaggiensis*	Laira Fm - u. Pretty Hill Fm
◆ 1457.5 - 1536.4m	APK211	upper Lower *F. wonthaggiensis*	b. Laira Fm - u. Pretty Hill
◆ 1591m	APK12	lower Lower *F. wonthaggiensis*	Pretty Hill Fm
◆ 1600 - 1900m	**Unassigned Section**		
◆ 1903.2 - 2002m	APK1	Lower *C. australiensis*	Casterton Fm
◆ 2048.2m	APJ62	upper *R. watherooensis*	Casterton Fm

Depositional Environment

◆ Eumeralla Formation	Fluvial - lagoonal; Coastal Plain.
◆ Laira Fm & upper Pretty Hill Fm	Fluvial - lagoonal; Coastal Plain.
◆ Lower Pretty Hill Formation	Braided stream, swamp.
◆ Casterton Formation	Lacustrine, fluvial - lagoonal, swamp; Coastal Plain.

Maturity ("Spore Colour" Estimate)

◆ 449.2 - 1318.1m	"Oil Window"; early mature
◆ 1364.4 - 1536.4m	"Oil Window"; peak generation
◆ 1591 - 1936.4m	"Oil Window"; late mature
◆ 2002 - 2048.2m	Mature Wet Gas & Condensate Zone

Hydrocarbon Source Potential

◆ Eumeralla Fm	Marginal organic content and largely Gas Prone; Organic Matter partly oxidised.
◆ Laira Fm	Adequate organic content but largely Gas Prone.
◆ Pretty Hill Fm	Insufficient to marginal organic content; limited or no hydrocarbon source potential.
◆ upper Casterton Fm	Abundant organic content but OIL source potential may have been largely achieved at the advanced stage of maturity.
◆ lower Casterton Fm	Adequate to abundant organic content but mostly gas prone.

SCOPE OF STUDY

The Otway Group and Casterton Formation penetrated by Digby #1 were sampled by a suite of forty eight Sidewall Cores of which twenty were selected for palynological investigation to determine the age, biostratigraphy, depositional environment, organic facies and hydrocarbon source potential of the Otway Group and Casterton Formation sediments. Vitrinite Reflectance values (Keiraville Konsultants) Rock-Eval Pyrolysis analysis (Geotechnical Services) and more detailed Pyrolysis Gas Chromatography and geochemical biomarker analysis (Geotechnical Services) were conducted on some of the samples; the results of these geochemical investigations were made available during the course of the palynological investigations.

The discussion on results and interpretation of the biostratigraphy, organic facies and hydrocarbon source potential are presented in Part 1 together with some notes on the correlation of the Digby #1 section with some other exploration wells in the region. The results of the study are presented in the Data Tables (Part 2) and the Species Distribution Lists, Species Diversity and Abundance Charts and Group Abundance and Diversity Charts are appended as Enclosures (Part 3).

BIOSTRATIGRAPHY

Introduction

The biostratigraphic nomenclature adopted for this study is based upon that of Price *et al*, 1985 and Filatoff & Price, 1988 developed primarily for the Surat and Eromanga Basin sections but adapted for the Otway Basin by Price, 1993. The units and their relationship to the nomenclatures of Morgan, 1985 and 1992, Dettmann, 1986 and Dettmann and Playford, 1969 and Morgan *et al*, 1995 are summarised on Page 9 and the relationship of the palynostratigraphic units used in this study to the Otway Lithostratigraphy is presented on Page 10.

The units of Dettmann, 1963 and 1986, Dettmann and Playford, 1969, Morgan, 1985, 1988, 1989 and 1992 have been used widely in Otway Basin studies. These nomenclatures however, have been applied in different ways in the various well sections giving some confusion as to what is represented by a particular unit in any given study.

Morgan *et al*, 1995 reviewed and revised the Otway Basin palynostratigraphy as part of the comprehensive stratigraphic review of the western Otway Basin by MESA (Morton and Drexel Eds., 1995). Although the revised nomenclature of Morgan *et al*, 1995 gives some stability to the Otway Basin palynostratigraphy, the units of Price *et al*, 1985 and Price, 1993 (with some revisions) have been used in this study in an attempt to increase the biostratigraphic resolution and to lessen any possible ambiguity with the earlier nomenclatures. The equivalent units of Morgan *et al*, 1995 however, are given also in the text to assist in relating the results of this study to the stratigraphic interpretation given in the 1995 MESA compilation; reference should be made to Page 9 if there is a need to relate an earlier nomenclature to this study.

In relating this study to earlier subdivisions, particular care should be taken with the *F. wonthaggiensis* Zone, the *C. hughesii* Zone and their stratigraphic relationship as their definition and application have varied from study to study (see

Page 9). This variation in interpretation reflects their development as reliable Otway Basin palynostratigraphic units with additional data becoming available and relates also to regional differences between the Early Cretaceous palynofloras of the Otway Basin and other basins (see Dettmann, 1986 and Dettmann *et al*, 1991); certain of the "index" species prominent in areas such as the Surat/Eromanga Basins, are very scarce and sporadic in their distribution within the Otway Basin.

Dettmann, 1986 and Dettmann *et al*, 1991 also consider the time taken for migration of the parent plants from their point of evolution to the various basins as being discernible and resulted in different order of appearances for the index forms in these basins. The recent well section studies (eg Morgan, 1989, 1990, 1991, 1992, 1993, 1993; Price, 1993; Morgan *et al*, 1995) however, record a similar order of appearance of the index forms in the Otway Basin as Price *et al*, 1985 and Filatoff and Price, 1988 do for the Eromanga Basin. It is likely that facies and environmental variations (giving rise to more subtle and less systematic differences in the distribution of the index forms) are at least as significant as the migration processes suggested by Dettmann, 1986 and Dettmann *et al*, 1991. The application of the Early Cretaceous and Late Jurassic palynostratigraphic units in the Otway Basin, as in other basins, requires the recognition of the facies and preservational constraints upon the distribution of "marker" taxa in order to achieve a reliable biostratigraphic correlation; these factors are still not well understood. Thus the down hole logging of the various "index" taxa must be tempered by palynofacies considerations before a palynostratigraphic unit is assigned.

The Laira Shale/Pretty Hill section palynofloras seem less diverse than the equivalent Cadna-Owie/Murta/Namur Eromanga section perhaps reflecting a more restricted range of environments within the Otway Basin catchment. Ferns, although prominent, are less diverse in the Crayfish Group of the Otway than they are in the Eromanga and the fern derived index group *Cicatricosisporites spp* is scarce in the APK2 and APK1 (*Foraminisporis wonthaggiensis* Zone and *C. australiensis* Zone) assemblages. It is considered therefore, that the distribution of *Cicatricosisporites spp.* (including *C. australiensis*) is often too sporadic in the Otway to be a reliable biostratigraphic marker and a greater reliance is placed on *Dictyotosporites speciosus*, *Cyclosporites hughesii* and *Ceratosporites equalis*; it is worth noting that, in certain facies within the Surat and Eromanga Basins, the distribution of *Cicatricosisporites* can be erratic also. Some caution is held for the distribution of *Foraminisporis wonthaggiensis* although the consistent occurrence and persistence of similar bryophyte spores such as *Foraminisporis dailyi* and *F. "antewonthaggiensis"* lower in the section perhaps attests to its reliability.

The reliance on the extinction (youngest occurrence) of *Cyclosporites hughesii* as an indication of the top of the *P. notensis* Zone - base of the *C. striatus* Zone boundary (base APK4) in the Otway Basin should be accepted with caution as *C. hughesii* is known to persist up through the *C. paradoxa* Zone (APK5) in the Eromanga Basin; the data from Digby #1 suggests that it may do the same in parts of the Otway Basin.

The relationship of the oldest occurrence of *Pilosisporites notensis* to that of *Foraminisporis asymmetricus* and the *P. notensis* Zone - *F. wonthaggiensis* Zone boundary (base APK22) and the disconformable boundary between the Eumeralla and the Katnook Sandstone - Laira Formation is perhaps blurred by differing applications of the earlier nomenclatures. In Katnook 2 (which seems to represent the most complete section at the basal Eumeralla Formation - Katnook Sandstone - Laira Formation interval) Morgan, 1989 placed the base of the "lower *C. hughesii* Zone" near the base of the Eumeralla Formation at 1896.5m but records *F. asymmetricus* down to 1925m (perhaps within the Windermere Sandstone or the top of the Katnook Sandstone) and *P. notensis* at 2103m (within the uppermost Laira Formation just below the Katnook Sandstone); both taxa are recorded from SWC samples. Thus, while the MESA correlations show the *P. notensis* Zone to be equivalent to the "*C. hughesii* Zone" and show it extending to the base of the Eumeralla Formation, the distribution of *P. notensis* and perhaps *F. asymmetricus* in Katnook 2 suggests that the *P. notensis* Zone and APK22 should extend into the Crayfish Group where the top of that unit is fully preserved. In most other areas (eg Sawpit #1 and Zema #1), lithological evidence, including the absence of the Windermere Sandstone and Katnook Sandstone, suggests there is an erosional break between the Eumeralla Formation and Crayfish Group and the confinement of the *P. notensis* Zone to the Eumeralla Formation (with the lower part, the APK22 equivalent, being eroded) is to be expected.

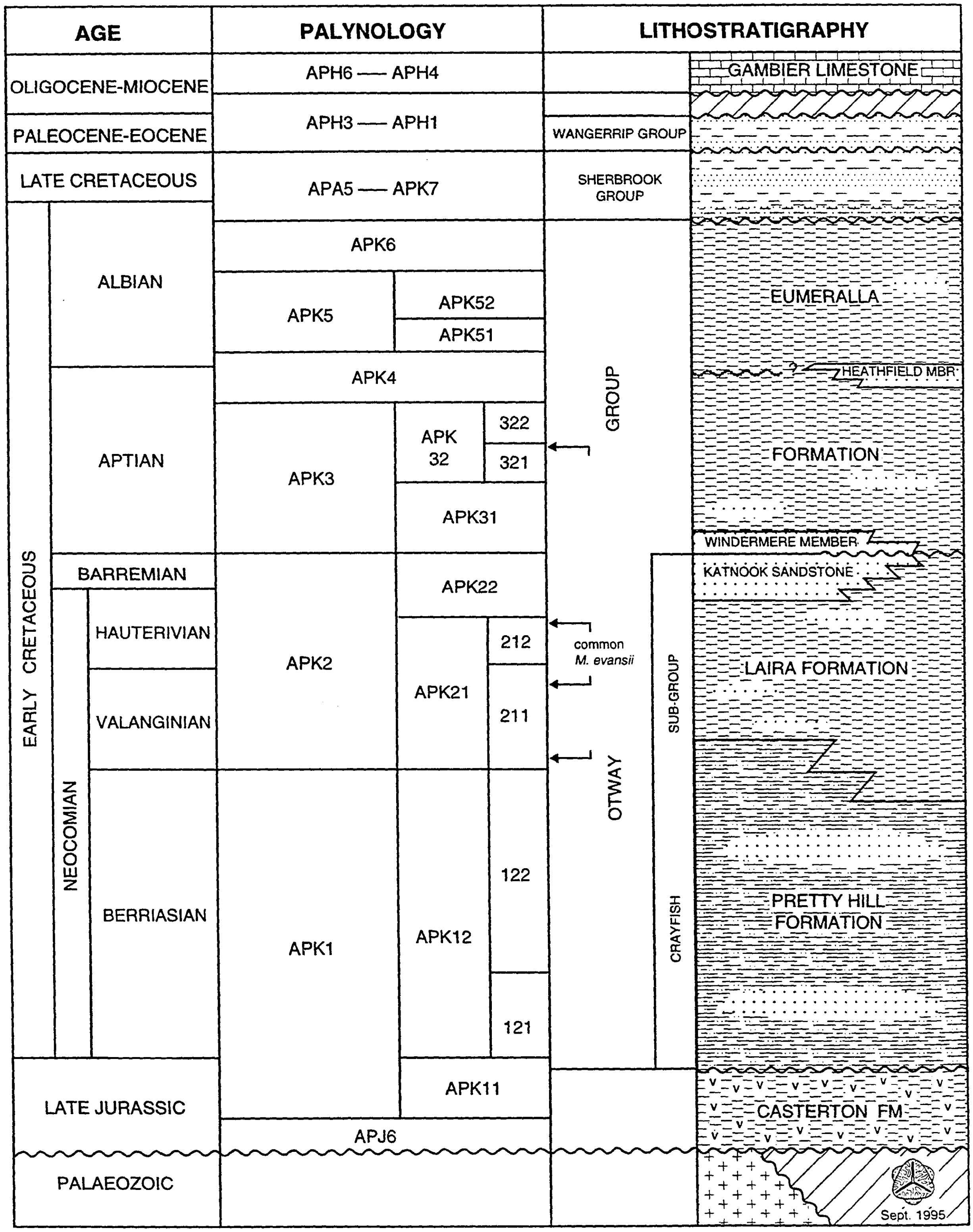
Notwithstanding these differences of interpretation, certain of the marker species have a regional consistency recognised by most students of the Otway and Eromanga palynology and these have been given greater emphasis in this study. These include the oldest (initial) occurrence of *Pilosisporites grandis* (base APK52), *Coptospora paradoxa* (base APK51), *Crybelosporites striatus* (base APK4), *Pilosisporites notensis* (base APK22), *Foraminisporis wonthaggiensis* (base APK21), *Dictyotosporites speciosus* (base APK122), *Cyclosporites hughesii* (base APK121). Of particular interest in terms of increased reliability of unit APK321 (uppermost part of the Lower *P. notensis Zone*) is the presence of a distinctive undescribed *Foraminisporis* (*F. wonthaggiensis "lunaris"* sp 1519 which, most probably, is conspecific with *F. "reticulowonthaggiensis"* of Morgan) which has a restricted range in both the Otway and Eromanga Basin being confined to about the introduction of *Pilosisporites parvispinosus* and not extending up the section much beyond the top of APK3. (It should be noted that the specimen assigned to *F. wonthaggiensis "lunaris"* in Sawpit #1 by Price, 1993 is better placed within *Stoverisporites microverrucatus* which is known from higher in the sequence). The presence of *F. wonthaggiensis "lunaris"* or *F. "reticulowonthaggiensis"* at the base of the range of *P. parvispinosus* more or less at the top of the range *Cooksonites variabilis* (ie within APK321 or just below the Upper *P. notensis* Zone) is a consistent feature of many Otway Basin wells and enhances the *P. parvispinosus* oldest occurrence as a reliable datum.

OTWAY BASIN NOMENCLATURE

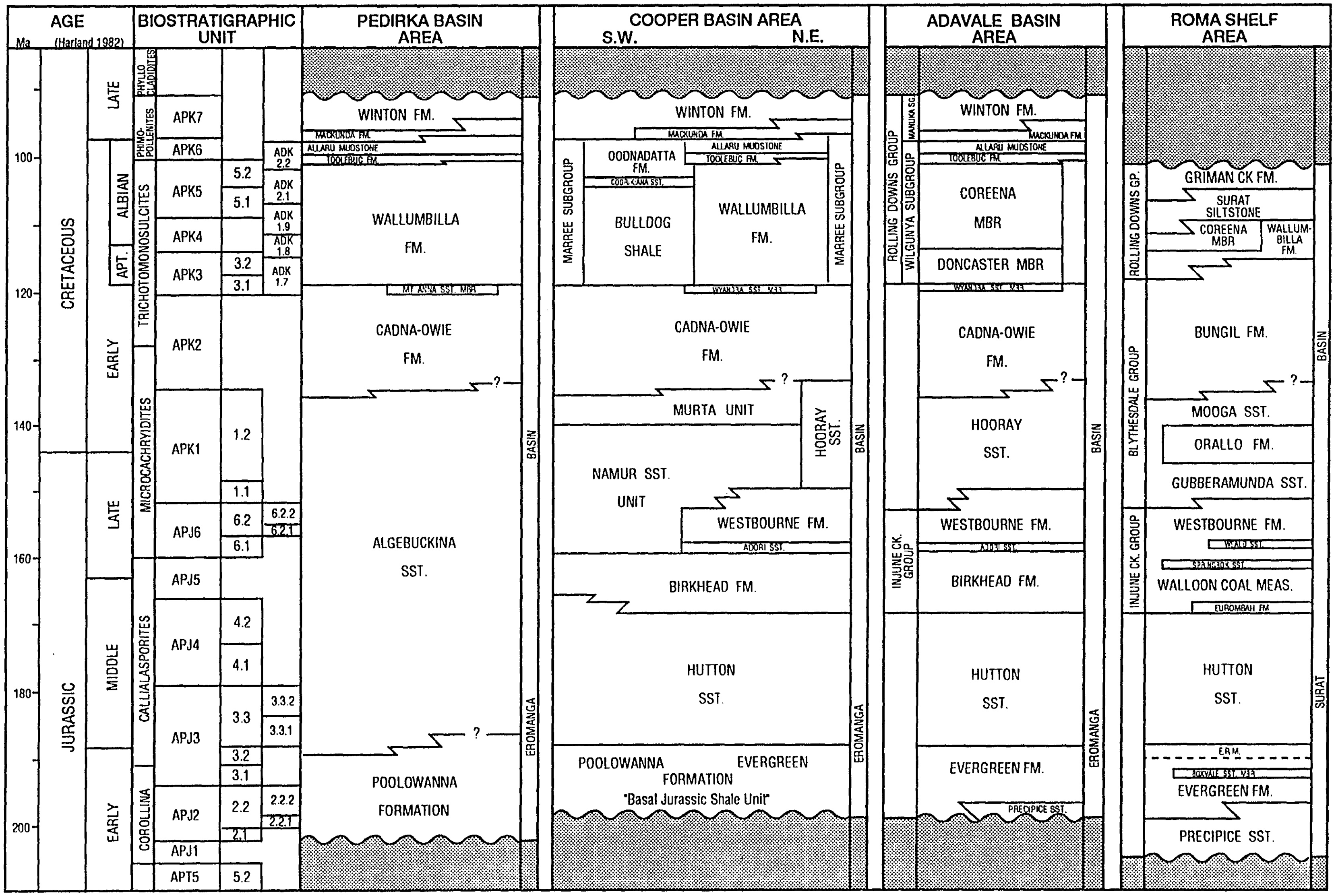
Dettman & Playford, 1969	Dettman 1986	Morgan, 1985 (Otway Basin Review)	Morgan, 1992 (Zema 1)	Morgan *et al*; 1995 (MESA Otway Volume)	APG Consultants			
								↲ *Phyllocladidites mawsonii*
A. distocarinatus	*A. distocarinatus*	*A. distocarinatus*	*A. distocarinatus*	*A. distocarinatus*	APK7			↰ *C. paradoxa* ↲ *Crybelosporites* sp. cf. *C. brenner* (sp. 1255)
P. pannosus	*P. pannosus*	*P. pannosus*	*P. pannosus*	*P. pannosus*	APK6			↲ *Phimopollenites pannosus*
C. paradoxa	*C. paradoxa* U	*C. paradoxa* U	*C. paradoxa* U	*C. paradoxa* U	APK5	APK52		↲ *Pilosisporites grandis*
	L	L	L	L		APK51		↲ *Coptospora paradoxa*
D. speciosus: *C. striatus*	*D. speciosus*: *C. striatus*	*C. striatus*	*C. striatus*	*C. striatus*	APK4			↲ *Crybelosporites striatus*
D. speciosus: *C. hughesii*	*D. speciosus*: *C. hughesii* Upper	*C. hughesii* U	*C. hughesii* U	*P. notensis* U	APK3	APK32	APK322 APK321	↰ *Cooksonites variabilis* ↲ *Pilosisporites parvispinosus* ↰ *M. evansii* ↲ *F. wonthaggensis lunaris*
	Mid.	M	L	L		APK31		↲ *Foraminisporis asymmetricus*
	Lower				APK2	APK22		↲ *Pilosisporites notensis*
		L	*F. wonthaggiensis* U	*F. wonthaggiensis* U		APK21	APK212	↰ *M. evansii* consistent to frequent ↲ *Triporoletes reticulatus*
							APK211	↲ *Foraminisporis wonthaggiensis* ↲ *Microfaster evansii*
C. stylosus	*C. stylosus*		L	L	APK1	APK12	APK122	↲ *Dictyotosporites speciosus*
		C. stylosus	*C. australiensis*	*C. australiensis* U			APK121	↲ *Cyclosporites hughesii*
				L		APK11		↲ *Cicatricosisporites* spp.
			R. watherooensis	*R. watherooensis*	APJ6	APJ62	APJ622	↲ *Foraminisporis dailyi*
							APJ621	↲ *Ceratosporites equalis*
						APJ61		↲ *Retitriletes watherooensis*
					APJ5			↲ *Murospora florida*

August 1995

STRATIGRAPHIC NOMENCLATURE



JURASSIC-CRETACEOUS STRATIGRAPHY - SOUTHERN GREAT ARTESIAN BASIN



Digby #1 Palynostratigraphic Subdivision

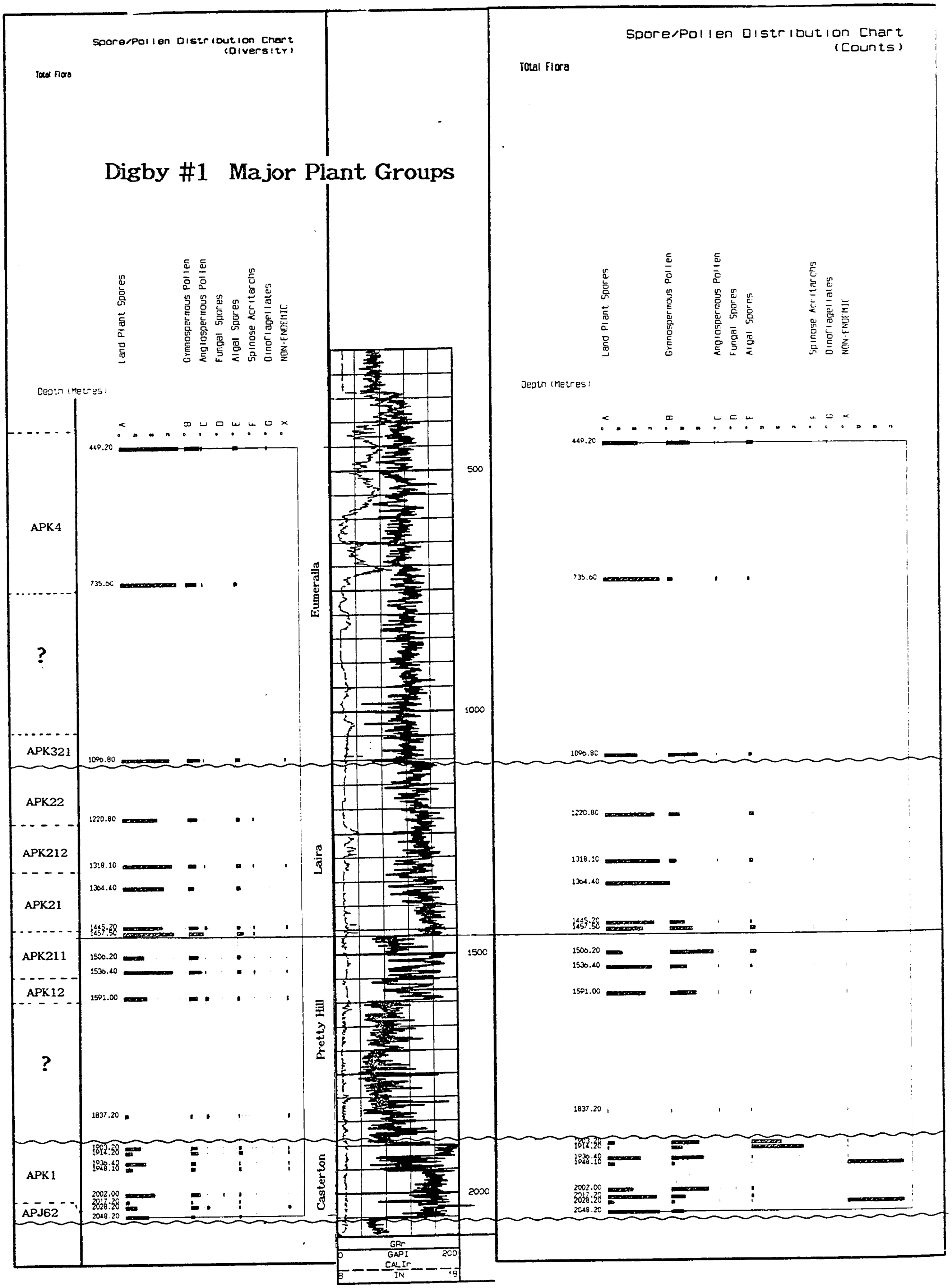
Introduction

The relationship of the palynostratigraphic nomenclature to the lithostratigraphy of the Otway Basin is tabulated on Page 10 and, for comparison, to that of the Surat and Eromanga on Page 11.

The samples were examined in detail from unoxidized total residue, unoxidized greater than 15μm fraction, oxidised total organic residue, and from the less than 1.65 s.g. oxidised fraction. The results of the palynostratigraphic study are presented on a sample by sample basis in the Palynostratigraphical Data Tables in Part 2. It should be noted that on these Tables, the initial biostratigraphic assignment given represents a range in which the sampled horizon is considered to be almost certainly within and the specific assignment that follows is the "best estimate" (often with considerably less certainty) of the horizon's palynostratigraphic position within that range. The Chronostratigraphic and inferred lithostratigraphic assignment given reflect the "best estimate" palynostratigraphic assignment and should be accepted with appropriate caution. The distribution of taxa identified is given on the Total Palynoflora Check List, Total Palynoflora Abundance Chart and Total Palynoflora Oldest Occurrence List (Part 3, Enclosures).

Relative abundance of the forms was established from counts of between 50 to 4,000 specimens, but these counts resolved only the variation in the dominant and major subordinate forms. Significantly higher counts would be required to define the frequency of the minor constituents of the palynofloras and this was considered not to be warranted given the bias introduced by variation in predepositional transport, preservation, processing techniques and sample selection. The statistical data were applied to the relative abundance form species (Land Plant Flora Chart and Aquatic Plant Flora Chart Enclosures) and the relative abundance and diversity (number of species within a group) of the major plant groups (Enclosures and Page 13); the latter defined trends reflecting variation in the depositional environment.

Major Plant Group Diversity & Abundance



Eumeralla Formation

Unit APK4 (*C. striatus* Zone)

The stratigraphically highest two samples (SWC48 449.2m and SWC47 735.6m) from Digby #1 yielded a diverse association including an abundance and diversity of fern spores with lycopods and liverworts being diverse; the associations included some of the early flowering plant pollen. Such assemblages are typical of the late Early Cretaceous palynofloras of eastern Australia. The presence of *Pilosisporites parvispinosus* and *Crybelosporites striatus* in the absence *Coptospora paradoxa* indicates an assignment to Unit APK4 (*C. striatus* Zone) and indicates a position within the mid Eumeralla Formation.

In the immediate region of Digby #1, unit APK4 palynofloras have been recovered in Mocamboro #11 (213m - 360m), possibly Bus Swamp #1 (?465m) and McEachern #1 (699.6m); the 300m or so thickness of APK4 in Digby #1 is perhaps comparable with that at Mocamboro #11 (150 to 300m) and possibly that at McEachern #1. In the Katnook region, APK4 was recognised in Katnook #1 (1498m) and Zema #1 (1556m) but it is difficult to form an opinion as to a typical thickness of the palynostratigraphic unit due to the sparse sample distribution.

Unit APK3 (Upper and upper Lower *P. notensis* Zone)

The assemblage from SWC43 1096.8m included a similar diversity of cryptogams, but included a much higher proportion of Gymnosperm pollen. The association of *Pilosisporites parvispinosus, P. notensis, Cooksonites variabilis* and *Foraminisporis wonthaggiensis "lunaris"* in the absence of *Crybelosporites striatus* indicates an assignment to APK321 (upper Lower *P. notensis* Zone).

Although probably represented by a relatively thin interval in the Otway Eumeralla Formation, unit APK321 is widely distributed; it is present in Zema #1 (1823.5m - ?1896m), Katnook #2 (1857m - 1861.6m), Bus Swamp #1 (756m - 886m) and possibly Mocamboro #11 (?705m - ?778.0m). APK321 palynofloras were recovered and described in detail by Dettmann, 1986 from the Koonwarra Fossil Beds of the onshore Gippsland Basin section. The presence of the distinctive form *Microfasta evansii* at this level in Digby #1 is of interest as, in the Otway Basin, it is generally regarded as being confined to the upper Crayfish Group; it also has been recorded in the lower Eumeralla Formation in Katnook #2 (1877.24m) and possibly Zema #1 (1905m) and is recorded in APK3 associations in the Eromanga Basin and in the Gippsland Koonwarra palynoflora.

Eumeralla - Laira Formation Transition

Unit APK22 - APK31 (Lower *P. notensis* Zone)

The palynoflora from SWC42 1220.8m was a somewhat restricted, poorly preserved *Osmundacidites* dominated assemblage; however, the presence of *Pilosisporites notensis* indicates the association is no older than APK22 (lower Lower *P. notensis* Zone). The general association perhaps suggests it is from APK22 and probably no younger than APP31 (mid Lower *P. notensis* Zone). The presence of *Microfasta evansii* could be taken as an indication of its association with older section but, as noted above, this algal form has been recorded in the lower Eumeralla in other parts of the Otway Basin and is present in APK3 assemblages in the Eromanga Basin; in the Otway Basin the form is more typical of and consistent in the upper Laira Formation palynofloras. Accepting a tentative APK22 assignment, then a position (relative to the Katnook #2 section) in the uppermost Laira Formation or Katnook Sandstone is suggested; however, a position in the basal Eumeralla Formation can not be eliminated entirely.

The palynofloras from this crucial interval in most parts of the Otway Basin are "tatty" and difficult to assign making precise correlation difficult. Nevertheless, a tentative correlation between Digby #1, Bus Swamp #1 and Mocamboro #11 can be suggested. The base of unit APK321 seems to be associated with a slight log change at 775m in Mocamboro #11, at 1110m in Digby #1 and at 820m in Bus Swamp #1. Unit APK22 seems to extend to immediately above the marked log break at 965m in Mocamboro #11 but in Digby #1 the APK22 seems to bottom some 240m above a similar log break to that at 965m in Mocamboro #11 with the

240m section (between 1220.8m and 1460m) being assigned (albeit with some reservation) to the older unit APK21 (Upper *F. wonthaggiensis* Zone). The simple explanation for the different distribution of APK22 in Digby #1 relative to Mocamboro #11 is that this 240m APK21 section is in fact equivalent to the APK22 section in Mocamboro #11 and the Digby #1 APK21 associations from this interval are merely impoverished APK22 palynofloras. It should be noted however, that even though cores and SWCs were used in Mocamboro #11, there were considerable problems with contamination in the samples from 609m and below; clearly younger forms, such as *Coptospora paradoxa* (from APK5), were recorded and the APK3 (*P. notensis* Zone) form, *Foraminisporis asymmetricus*, being recorded at 1006m which is below the significant log character change at 965m thought to represent the top of the Pretty Hill Formation. It believed that the Mocamboro #11 results need to viewed with some caution due to the possibility of misinterpretation from contamination; perhaps the cored section should be re-sampled to help to resolve the correlation.

Being mindful of the doubt held for the Mocamboro #11 palynostratigraphy and giving emphasis to the correlation of unit APK321 relative to the base of the Eumeralla Formation together with the consistency with which *Microfasta evansii* is present between 1096m and 1457m in Digby #1, then the Eumeralla - Laira boundary may be at about 1110m in Digby #1, 775m in Mocamboro #11 (accepting that *F. "reticulowonthaggiensis"* is in place) and 820m in Bus Swamp #1. Accepting this correlation then, apart from the absence of the APK31 to APK22 Windermere Sandstone - Katnook Sandstone interval, minimal section appears to be lost AT THIS LEVEL as the APK22 and APK21 *Microfasta evansii* Laira associations seem to be represented in the Digby #1 well section (APK21 was not recognised Bus Swamp #1).

Laira Formation and Pretty Hill Formation

Unit APK21 (Upper and upper Lower *F. wonthaggiensis* Zone)

A moderately diverse *Osmundacidites* dominated palynoflora which included *Microfasta evansii* was recovered from SWC41 1318.1m; the association of

Foraminisporis wonthaggiensis and *Triporoletes reticulatus* in the absence of *Pilosisporites spp*, *Foraminisporis asymmetricus*, *Crybelosporites striatus* or other younger forms indicates an assignment to APK212 (Upper *F. wonthaggiensis* Zone). While it could be argued that the association may represent an impoverished APK3 (basal Eumeralla) association, the yield and diversity of the recovered palynoflora suggest this is unlikely. The APK212 assignment places it within the upper Laira Shale. It should be noted that this palynoflora is different to the equivalent APK2 association in the Surat or Eromanga Basin where forms such as *Cicatricosisporites spp* and *Contignisporites spp* are more prominent.

The association from SWC39 1364.4m was a rich fairly well preserved association but dominated by essentially one taxon (*Cyathidites minor*); nonetheless, the yield was sufficiently high to gain an impression of the distribution of other taxa. The presence of *Foraminisporis wonthaggiensis* in the recovered association indicates a position in APK21, but the assignment to either of the subunits of APK21 based on the presence or absence of *Triporoletes reticulatus* would be hazardous given the scarcity of other Bryophytes in the assemblage. A scant association from SWC37 1445.2m which included *Microfasta evansii* could be assigned only broadly to APK21.

The associations recovered from SWC36 1457.5m and SWC29 1536.4m were balanced and moderately diverse. The presence of *Foraminisporis wonthaggiensis* in the absence of *Triporoletes reticulatus* in the context of these palynofloras favours an assignment to unit APK211 (upper Lower *F. wonthaggiensis* Zone). Unit APK211 spans the lower Laira Formation and the upper Pretty Hill Formation; the common occurrence of *Microfasta evansii* at 1457.5m perhaps suggests the upper part of the unit is represented and a position within the mid to lower Laira Formation is favoured. *Microfasta evansii* was present (but scarce) at 1536.4m and this horizon may be as low in the Otway sequence as the upper Pretty Hill Formation.

SWC27 1591m yielded a sparse restricted palynoflora which included

Cyclosporites hughesii; as such it is no older than APK121 (Upper *C. australiensis* Zone) but the possibility of it being as young as APK122 (lower Lower *F. wonthaggiensis* Zone) or APK211 (upper Lower *F. wonthaggiensis* Zone) can not be eliminated. The relative abundance of the "common" taxa in SWC27 differs to some extent from that in the overlying APK2 associations; perhaps a APK12 assignment is suggested. As such, a position within the basal Laira Formation or Pretty Hill Formation is indicated.

Unit APK21 is best developed in the Katnook - Sawpit - Zema region where it spans the Laira Formation and, in at least some places (Zema #1), extends into the uppermost Pretty Hill Formation; the relationship of the subunits of APK2 to the lithostratigraphy is given on Page 10. As noted by Morgan, 1993, *Microfasta evansii* is a useful guide to the stratigraphic resolution of this part of the section in addition to the land plant derived marker taxa. In the Katnook - Sawpit - Zema region there is clear evidence of truncation of the top of the Laira Formation. In the Digby region however, although the section is significantly thinner, the APK2 unit seems to be almost fully represented (only the Katnook Sandstone missing) suggesting the rates of subsidence in the Digby area at this time were less than in the Katnook region. Accepting the limitations of the palynostratigraphic determinations imposed by poor preservation in the deeper sections, perhaps there is some suggestion of a facies relationship between the top of the Pretty Hill Formation and the base of the Laira Formation.

Pretty Hill Formation

Unassigned Section

The sand unit spanning from about 1600m to 1900m was represented by only one sample, (SWC22 1837.0m) which, although including a moderate proportion of humic palynodebris, included almost no recognisable spores or pollen (the few that were present were unlikely to be endemic). Both in terms of its lithology and the stratigraphic position of this sand unit, it represents some part of the Pretty Hill Formation; however, it is impossible to indicate on direct palynostratigraphic evidence whether it represents an upper unit conformable with the overlying APK211 section, or if it is conformable with the underlying APK1 Casterton Formation.

Casterton Formation

Unit APK1

The recovered palynofloras from below 1900m lacked the diversity of the assemblages recovered higher in the section (see Page 13) reflecting, in part, the poor preservation at this level. Of the assemblages recovered from this interval, only those from SWC22 1903.2m, SWC21 1914.2m, SWC16 1936.4m, SWC6 2002m and SWC3 2048.2m held any promise of palynostratigraphic resolution with SWC21 1914.2m, SWC6 2002m and SWC3 2048.2m being the most definitive.

The palynomorph and organic facies associations recovered from SWC22 1903.2m and SWC21 1914.2 were distinctive, being characterised by relative high organic yields, a prominence of diaphanous leiosphere remnants and restricted land plant palynoflora with a prominence of wind dispersed gymnosperm pollen and the presence of *Ceratosporites equalis*. The palynofloral association can only be broadly assigned as being no older than APJ621 (upper *R. watherooensis* Zone) and perhaps as young as APK121 (Upper *C. australiensis* Zone). The palynofacies association however, indicates a strong affinity to the lacustrine or lagoonal facies of the Casterton Formation encountered in Sawpit #1 at 2498m and 2505m. The palynofloras from the lagoonal facies in Sawpit #1 were also restricted in diversity (probably reflecting the depositional environment) and broadly assigned as APK121 - APJ62. It should be noted that a thin more fluvial - coastal plain shale sequence assigned to APK122 (Upper *C. australiensis* Zone) overlay the lacustrine facies in Sawpit #1 was regarded by Price, 1993 as being part of the Casterton Formation. This shale unit lacks the pyroclastic sediment which characterises the Casterton and thus, is better placed as a basal unit of the Pretty Hill Formation and unit APK122 is therefore confined to the Pretty Hills Formation.

In Digby #1 at 1936m and 1948m, the organic facies changes down section from a lacustrine - lagoonal facies to a peat bog or dystrophic swamp environment; this older section yielded sparse non-diagnostic palynofloras. Further down section at 2002m a more fluvial lacustrine setting prevails and the palynoflora seemed to regain its diversity and abundance; however, most forms were carbonised and corroded and could not be assigned to species. The assemblage from SWC6 2002m was dominated by gymnosperm pollen and included *Ceratosporites equalis*, *Retitriletes watherooensis*, *Cyclosporites "quasihughesii"*, *Cicatricosisporites ludbrookiae* and *Foraminisporis "antewothaggiensis"*. The association indicates the palynoflora is no older than APK11 (Lower *C. australiensis* Zone) but may be as young as APK12 (Upper *C. australiensis* Zone); the APK11 assignment is very tentatively favoured. In most parts of the Otway Basin, the palynostratigraphic resolution of the lower Pretty Hill Formation and Casterton Formation has been vague due to the poor palynomorph preservation and recoveries. In Sawpit #1 there is an indication that unit APK121 (Upper *C. australiensis* Zone) extends into the basal shale unit of the Pretty Hill Formation. In other sections APK11 (Lower *C. australiensis* Zone) and older have been inferred for the lower Pretty Hill Formation sand units but the inferred antiquity may be a reflection of the impoverished poorly preserved palynofloras recovered at depth.

Unit APJ62

SWC3 2048.2m yielded a sparse poorly preserved (carbonised and corroded) palynoflora in which only the more robust and distinctive forms could be identified. The presence of *Ceratosporites equalis* and *Retitriletes watherooensis* indicates that the section is no older than APJ62 (upper *R. watherooensis* Zone) and, in contrast to the palynoflora at 2002m, the prominence and diversity of *Contignisporites* gives the assemblage a Late Jurassic character suggesting it may slightly older than that at 2002m and perhaps supports an APJ62 assignment.

The Casterton section in Digby #1 seems more extensive than at Sawpit #1 with the sequence at and below 1936.4m in Digby #1 perhaps not being present in Sawpit #1.

Depositional Environment

Environmental Nomenclature

The environmental interpretation given in the Palynostratigraphical Data Tables relates solely to the proportion and association of palynomorphs and palynodebris. The nomenclature used, is as follows:

Fluvial, braided stream or Beach	Extremely low organic yield; inertinitic kerogen; few, if any, recognisable palynomorphs.
Fluvial, overbank	Low to moderate organic yield; abundant and diverse land plant flora; few, if any, non marine aquatic forms. (A=0-1%)
Peat bog or Dystrophic swamp	Moderate to high organic yield; humic kerogen; abundant but restricted land plant flora; few, if any, non marine aquatic forms. (A=0-1%)
Fluvial - Lacustrine	Rare to frequent non marine algae. (A=1-5%)
Lacustrine	Frequent to very abundant non marine algae. (A>5%)
Inland Sea	Frequent to very abundant non marine algae ± frequent to abundant but very restricted brackish water algae (including spinose acritarchs) (A>5%)
Coastal Plain	Rare to frequent leiospheres. (L=1-5%)
Paralic Coastal Plain	Rare to frequent leiospheres; isolated spinose acritarchs (or dinoflagellates). (L=1-5%; SA=+)
Coastal Lagoon	Frequent to very abundant leiospheres (or *Botryococcus*, or *Pediastrum*). (L=5%)
Paralic Coastal Lagoon	Frequent to very abundant leiospheres (or *Botryococcus* , or *Pediastrum*) ; isolated to rare spinose acritarchs. (L=5%;SA=+)
Specialised Marine or Bay	Frequent to abundant leiospheres; subordinate, restricted spinose acritarchs (or dinoflagellates). (L≈5%; SA=1-5%)
Restricted Marine	Rare to frequent leiospheres; restricted to moderately diverse spinose acritarchs (or dinoflagellate) association; spinose acritarchs (or dinoflagellates) dominant aquatic group but subordinate component of total flora. (L=+; SA=1-5%)
Nearshore Marine	Spinose acritarchs (or dinoflagellates) diverse but subordinate to land plant flora. (L=+; SA=5-35%)
Open Marine	Spinose acritarchs (or dinoflagellates) diverse and the dominant floral element. (SA>35%)

It is emphasised that, as the assignments are based upon gross palynofloral and palynofacies characters which reflect water salinity, nutrient levels and transport, other interpretations are possible. For example, the abundant leiospheres with subordinate spinose acritarch associations may represent brackish conditions of a back barrier lagoon or, alternatively, more open marine conditions but with low salinities which could occur opposite a river mouth. Other floral characters, such as the extreme dominance of saccate pollen over other land plant elements may indicate that wind and surface water rafting of the land plant floral elements prevailed suggesting calm water conditions.

Clearly therefore, the environmental interpretations set out on the Data Tables and discussed below should be regarded as a general indication and a starting point for an integrated interpretation rather than a definitive statement. For reliable palaeo-environmental interpretations, it is essential that the palynofloral data be assessed in the context of detailed sedimentological studies.

Digby #1 Section

Eumeralla Formation

The Eumeralla Formation was not closely sampled in Digby #1 and only a general indication can be given of the depositional environment as it relates to the sampled horizons. In SWC48 449.2m, the aquatic association was notable including mostly leiospheres and a small dinoflagellate but was subordinate to the diverse land plant derived component; the organic content of the sediment was low and the palynodebris seemed partly oxidised and dominated by humic elements. A shallow coastal lagoonal environment is suggested by the palynofacies. A similar palynofacies association is represented in SWC47 735.6m and SWC43 1096.8m although the aquatic association is less conspicuous suggesting a more fluvial regime.

Laira and upper Pretty Hill Formation

As with the Eumeralla Formation sampled in Digby #1, the palynofacies association of the Laira and upper Pretty Hill Formations suggests shallow water lagoonal to fluvial coastal plain deposition. The palynofloras of most samples include a subordinate aquatic association of mostly leiospheres together with *Microfasta evansii* and sporadic occurrences of isolated small spinose acritarchs. Dettmann, 1987 considers *Microfasta evansii* may represent a filamentous member of Zygnemataceae (a green algae group, often from riverine and shallow lacustrine environments) or Rivulariaceae (a Cyanophyte group typical of shallow estuarine environments); the form is widely distributed in fluvial - lacustrine and marginal marine Neocomian to Aptian sediments of eastern Australia. The organic yields are low to moderate dominated by humic kerogen groups with the palynodebris showing some evidence of oxidation; this is consistent with a shallow water depositional setting.

The single sample from the lower Pretty Hill sand unit included few recognisable palynomorphs but included a moderate yield of organic matter dominated by "coaly" palynodebris. The sampled horizon may represent an ephemeral swamp (perhaps of transported wood debris) within a braided stream system.

Casterton Formation

The upper Casterton section in Digby #1 represented by SWC22 1903 and SWC21 1914.2, although thermally altered, are characterised by a distinctive palynofacies of rich organic content with the kerogen groundmass having a micro-texture reminiscent of "granular" oil shale kerogen; leiosphere remnants seemed prevalent and the land plant palynoflora seemed restricted perhaps dominated by wind transported conifer pollen. The palynofacies is reminiscent of that from the Casterton in Sawpit #1 at 2498m and 2505m and is indicative of a fresh to brackish water coastal lagoon with a substantial water depth. The Casterton below this deeper water facies seems to represent a fluvial to shallow water lacustrine system with some dystrophic swamps and peat bogs; again, the advanced stage of thermal alteration makes any environmental interpretation tentative.

MATURITY

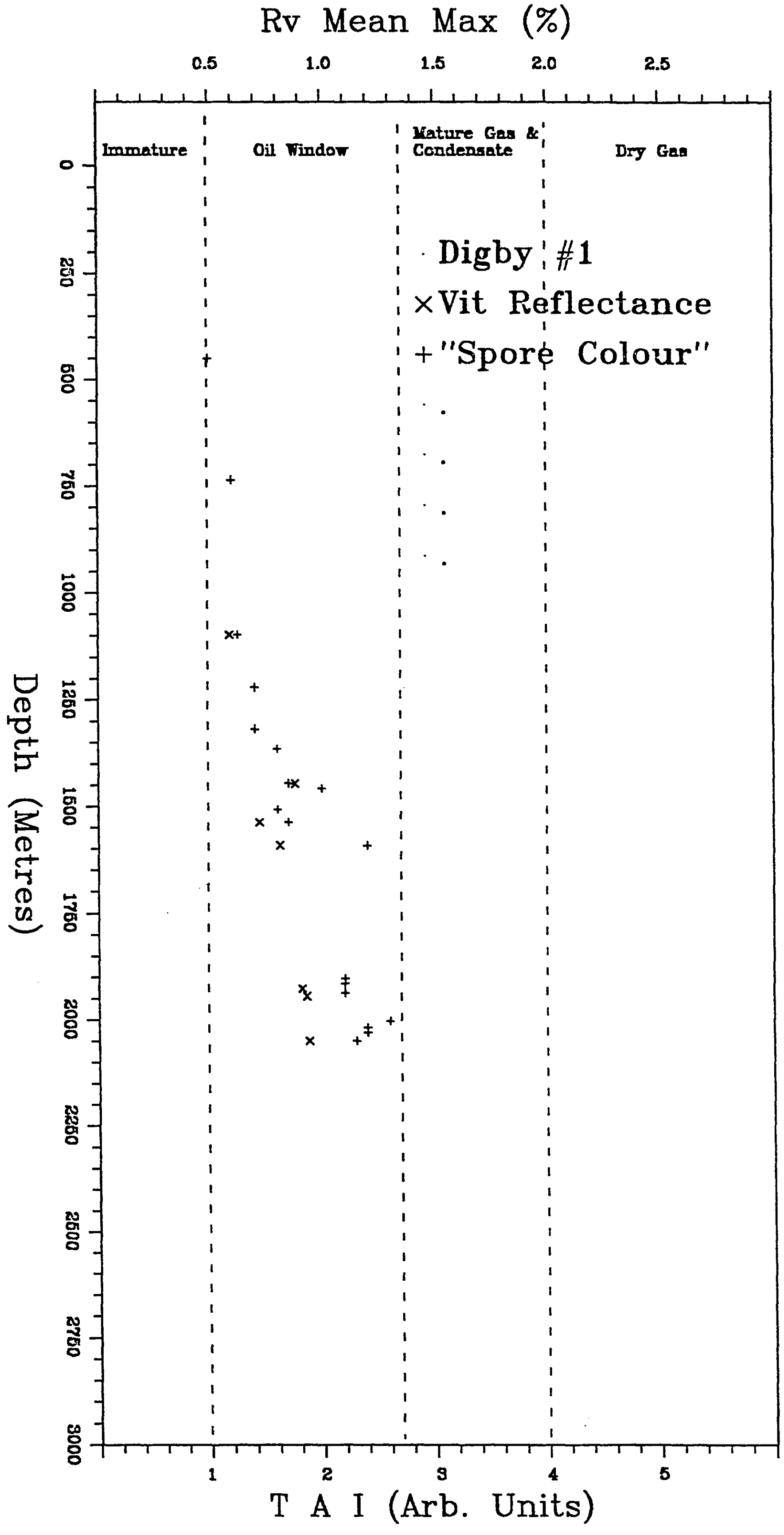
Maturity Estimates

"Spore Colour" Estimates

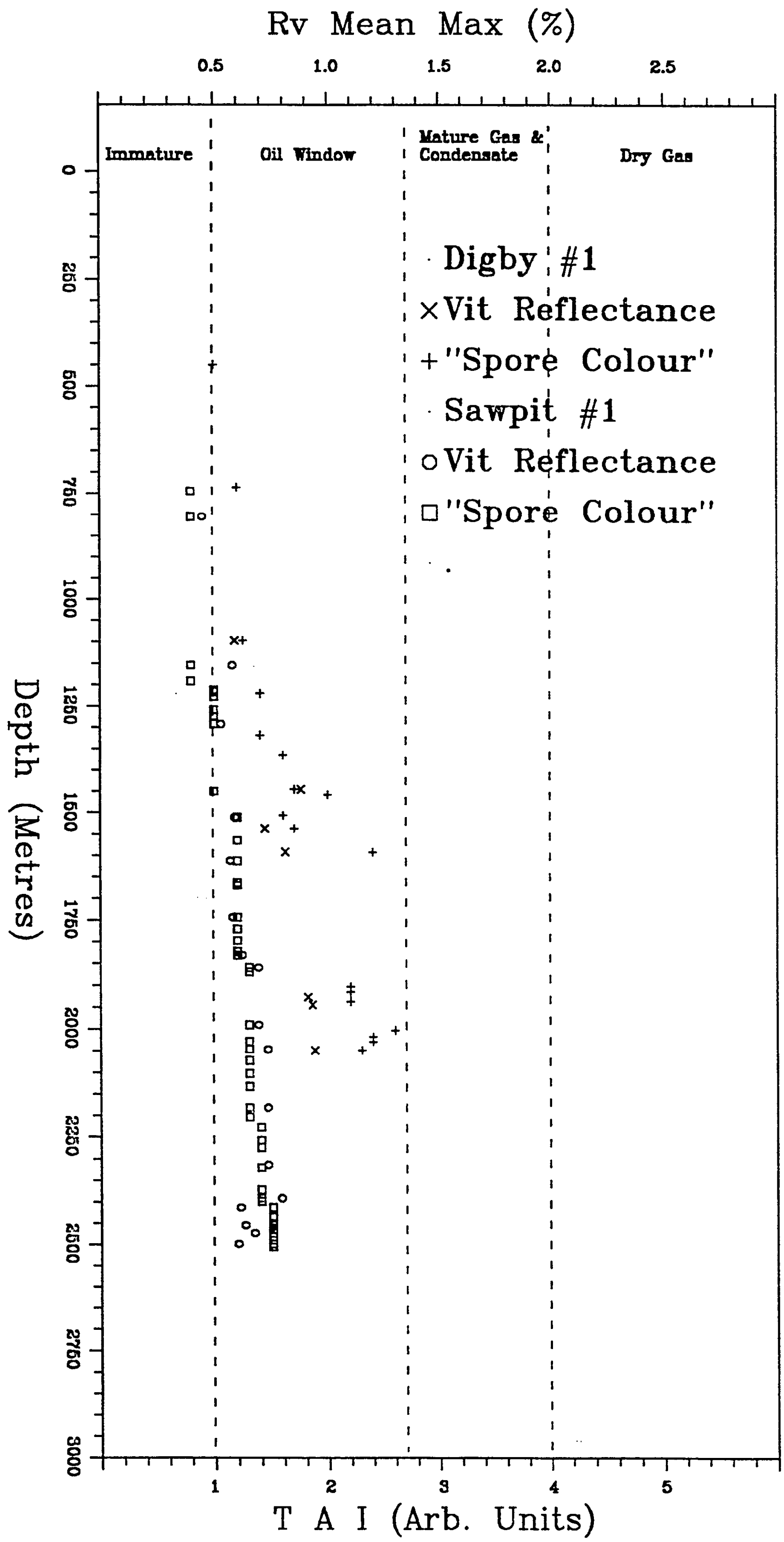
The degree of thermal alteration has been established on the basis of both changes in spore colour and exine structure. These estimates are more reliable if established on sequences of samples. Clearly, the precise colours assumed by the spores, pollen and cuticle during the mature phase of diagenesis are also influenced by environmental/depositional factors (e.g. amount of oxidation, presence of humic compounds) rendering schemes based upon specific spore colours unreliable. For example, when the spores are stained by humic compounds, the colours of the early mature phase spores can be similar to those from the late mature phase. Nevertheless, in a sequence of samples, where the progression or relative sequence of changes is always discernible, it can be a sensitive technique agreeing well with the geochemical rank estimation techniques (e.g. gas chromatography-mass spectroscopy).

Maturity estimates derived from spore colour are sometimes expressed as a "Thermal Alteration Index" (TAI) which is an arbitrary, somewhat ill defined scale with no accepted or consistent Industry standard. It was initially defined by Staplin (1969) using a scale of 1 to 5 but, although widely adopted, it has been variously interpreted and modified so that each organisation has its own version and calibration to the "oil window". The variation is such that the only reliable way of translating spore colour data from one TAI system to another is via an estimate of vitrinite reflectance. Consequently, spore colour standards used in this study are related to known vitrinite reflectance profiles and the Spore Colour maturity data is expressed as an "Estimate of Vitrinite Reflectance"; these values are tabulated on the "Organic Facies Data Tables" (Part 2). The TAI scale (1 to 6) at the base of the Maturity Depth Plot on Pages 25 and 26 is based (very loosely) upon a Robertson Research calibration which ranges from 1 to 10.

Digby #1 Maturity Depth Plot



Digby #1 and Sawpit #1 Maturity Depth Plot



Digby #1 Maturity Estimate

The "spore colour" estimates of thermal maturity are give on the Organic Facies Data Tables (Part 2) and presented graphically on Pages 25 and 26. These estimates suggest the top of the section (449.2m to 1936.4m) is within the "Oil Window" with the base of the section (2002m to 2048,2m) being within the "Mature Wet Gas and Condensate" Zone. The down section progression in the exinal changes was unusually erratic with that at 1457.5m and 1591m being well off trend. Additionally, the maturity increase with depth was significantly higher than that of other wells in the region (eg Sawpit #1; see Page 26).

A similar rather erratic and high maturity trend was recorded by the Vitrinite Reflectance values but was significantly less than the "Spore Colour" estimates. The discrepancy was a unexpected as there was a close correlation between the estimates from "Spore Colour" and Vitrinite Reflectance in Sawpit #1 and the Sawpit #1 material was used as a reference standard for the Digby #1 "Spore Colour" data. One possible explanation is that there has been some igneous activity in the Digby region rapidly heating the section for a short period of time. The activation energies for the various reactions that relate to exinal breakdown and vitrinite reflectance differ and an abnormal heating event could explain the divergence between the two maturity estimates, the higher maturity profile relative to other wells in the region and the somewhat erratic maturity trends. In this regard, it is worth noting that the two more extreme "Spore Colour" estimates (1457.5m and 1591m) are at the top of sand intervals and may have been influenced by migrating hydrothermal solutions if igneous activity near Digby #1 is considered as a possibility.

The RockEval T_{max} values indicate the section is mature and, as the values are higher than those recorded in Sawpit #1, support the Vitrinite Reflectance and "Spore Colour" inference of a higher maturity profile than the regional trend. The geochemical Aromatic compound estimates taken between 1473m and 1944 suggest little maturity variation down section and indicate a moderate degree of thermal alteration; the upper value is consistent with the Vitrinite Reflectance estimates but those from deeper in the section (especially the source rock extracts) seem low.

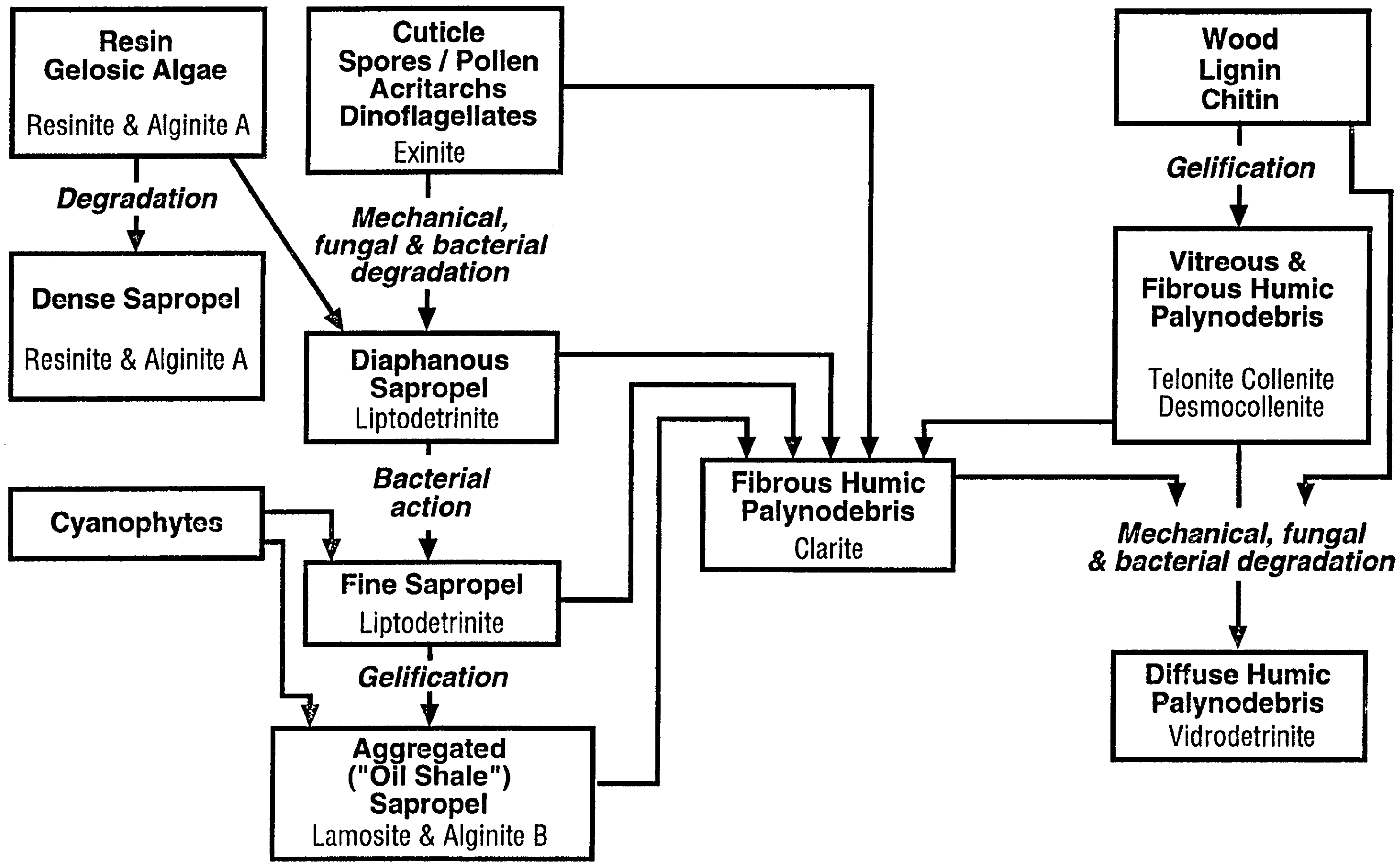
ORGANIC FACIES

Kerogen Classification

As there is no widely accepted standard terminology for the description and classification of palynodebris and for the interpretation of palynofacies and organic facies associations, a brief outline of the terminology used in the present study seems necessary. Traverse, 1994 published a collection of papers relating to the description of dispersed organic particles but these studies mainly addressed palynofacies interpretation, neglecting organic facies considerations and there was still no clear consensus as to terminology amongst the contributors.

The kerogen classification used in this study for the palynofacies and organic facies interpretation is based upon transmitted white light and ultra-violet/blue-violet fluorescence examination of the extracted organic matter. As the classification is aimed at providing both an environmental reconstruction (palynofacies) and an assessment of the hydrocarbon potential (organic facies) of the sampled lithology, it attempts to define the chemical characteristics of the organic matter components by identifying their biological origins and alteration pathways. The organic matter Groups are placed in categories more or less reflecting the degree of alteration of the original biological entity. In contrast to coal petrological classifications, emphasis is given to the translucent lipid organic matter as this group is readily differentiated in transmitted light and because of its significance to liquid hydrocarbon generation.

RELATIONSHIP OF KEROGEN TYPES & COAL MICROLITHOTYPES



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Primary Kerogen Types

The primary kerogen groups represent the structured organic material whose biological origins can be established readily on the basis of their morphology. They are grouped together on extremely generalised considerations of their biological affinities, chemical nature and fluorescence characteristics. It should be noted that the name adopted for each group is intended merely to convey the general extent of the group and is not used in a strict sense nor is it intended to define the limits of the group.

The **Gelosic Algae Group** includes such forms as *Gloeocapsomorpha,* (cyanophyte) *Botryococcus* and *Tasmanites* (green algae) which are characterised by isolated or clustered cells with strongly fluorescent thick walls. In the tabulated data sheets, the strongly fluorescent secondary kerogen type **Dense Sapropel** (D) (see below) is grouped with Gelosic Algae (G) but is shown as a separate value where both are a significant proportion of the dispersed organic matter.

The **Dinocyst and Acritarch Group** comprises the thin-walled marine and fresh water phytoplankton (dinoflagellates, spinose acritarchs, leiospheres, etc.) and sedentary algal spore and cyst walls with moderate to strong fluorescent characteristics (when not oxidised).

The **Cuticle and Suberin Group** represents the waxy tissue of land plants. It includes identifiable cuticle, cutinised epidermal tissue, cork and suberinised tissue. Such tissue has a dull to moderate fluorescence when not oxidised or thermally altered.

Spores and Pollen Group comprises identifiable spore and pollen walls from land plants but excludes fungal spores. Variation in chemical composition of spores and pollen may require their separate listing. In the tabulation of the spore/pollen group, spores (S) and pollen (P) may be listed separately if either is a significant proportion of the dispersed organic matter.

Identifiable **Wood Fibres** and lignified tissue are grouped with their alteration products (**Fibrous Humic Palynodebris Group**) as it is unusual to see significant proportions of unaltered wood. Where there is an abundance of wood (W), its proportion is shown separately. Included in this group are the identifiable chitinous forms, including chitinozoa, microforaminifera and scolecodonts, together with fungal spores.

Secondary Kerogen Groups

The secondary kerogen groups include the altered products of the primary kerogen groups or organic matter whose origins are inferred rather than being identified totally by virtue of a preserved, recognisable morphology. The alteration may be mechanical fragmentation, anaerobic and aerobic bacterial and fungal degradation, gelification, together with the bi-products of atmospheric oxidation. A schematic diagram of the alteration pathways and comparison to the Coal Petrological Maceral Classification is given on Page 29.

Dense Sapropel Group represents the highly fluorescent remnants of gelosic algae together with vascular plant resins and "live" bitumen. They are included with Gelosic Algae Group but the proportion of Dense Sapropel (D) will be shown separately when the group represents a significant proportion of the organic residue.

Diaphanous Sapropel Group includes the translucent to diaphanous fragments of about 2 to 20+μm size derived from the initial breakdown of the waxy tissue of aquatic and land plants (including cuticle, spores, pollen and algal cysts) where the original plant structure is barely discernible. At low to moderate levels of maturity, or where not partially oxidised during transport prior to deposition, Diaphanous Sapropel palynodebris is moderately fluorescent although typically less so than the parent primary kerogen type.

Fine Sapropel Group represents a further stage of breakdown of the lipid rich tissue derived from higher plants, algae and cyanophytes. It is recognised by small particle size (less than 2μm) its translucency and moderate fluorescence. When partially oxidised or at high levels of maturity, such fine detritus is indistinguishable from fine humic palynodebris.

Under certain depositional conditions, the altered lipid detritus derived from higher plants, algae, cyanophytes and bacteria may "gelify", forming granular sapropelic or fibrous sapropelic ground mass referred to in this classification as **Aggregated Sapropel** or **"Oil Shale" Sapropel**. Such kerogen forms diffuse, translucent clumps characterised by mottled, moderate to strong fluorescence and with either a granular (G) (e.g. Toolebuc or Moaming oil shale) or a fibrous (F) (e.g. Rundle oil shale) microtexture.

Vitreous Humic Palynodebris is used to describe the "glassy" non-structured material with a sharp translucent edge and conchoidal fracture; it is presumed to represent humic compounds which result from the gelification of lignin. It does not however, correspond exactly to vitrain in the coal petrological sense but may be considered to represent collinite in a general way. It may also include certain forms of inertinite.

Fibrous Humic Palynodebris material represents other forms of modified humic material which are characterised by being nearly opaque, only extremely weakly fluorescent at very low levels of maturity, with fibrous to granular microtexture and lacking a sharp edge to the clasts. This group includes telinite, desmocollinite and inertinite for which no reliable distinction can be made on the basis of transmitted light observations.

As noted above, and although structured, the primary "humic" organic types (wood fibres, chitinous animal tissue, fungal spores), also are included in the fibro-granular humus group; however, if present, they are noted as such in the remarks.

Fine Humic Palynodebris is weakly translucent humic material which occurs as finely disseminated particles while **Diffuse Humic Palynodebris** is a gel-like, dull, translucent, non-fluorescent groundmass. These may represent, in part, the precipitation of dissolved humic compounds from the water column at the time of sediment deposition, or, in the case of diffuse humus, from solution during slide preparation. Oxidised or "over mature" finely divided, lipid detritus is indistinguishable from fine humus detritus and therefore is included in this group.

Fusinitic Palynodebris and **Fine Inert Palynodebris** represents the completely opaque non-fluorescent black fragments. It includes fusain (charcoal) in the strict sense, together with micrinite and, in the case of certain oil shale kerogen, haematite and other finely disseminated opaque mineral intimately bound within the kerogen.

Effects of Thermal Alteration

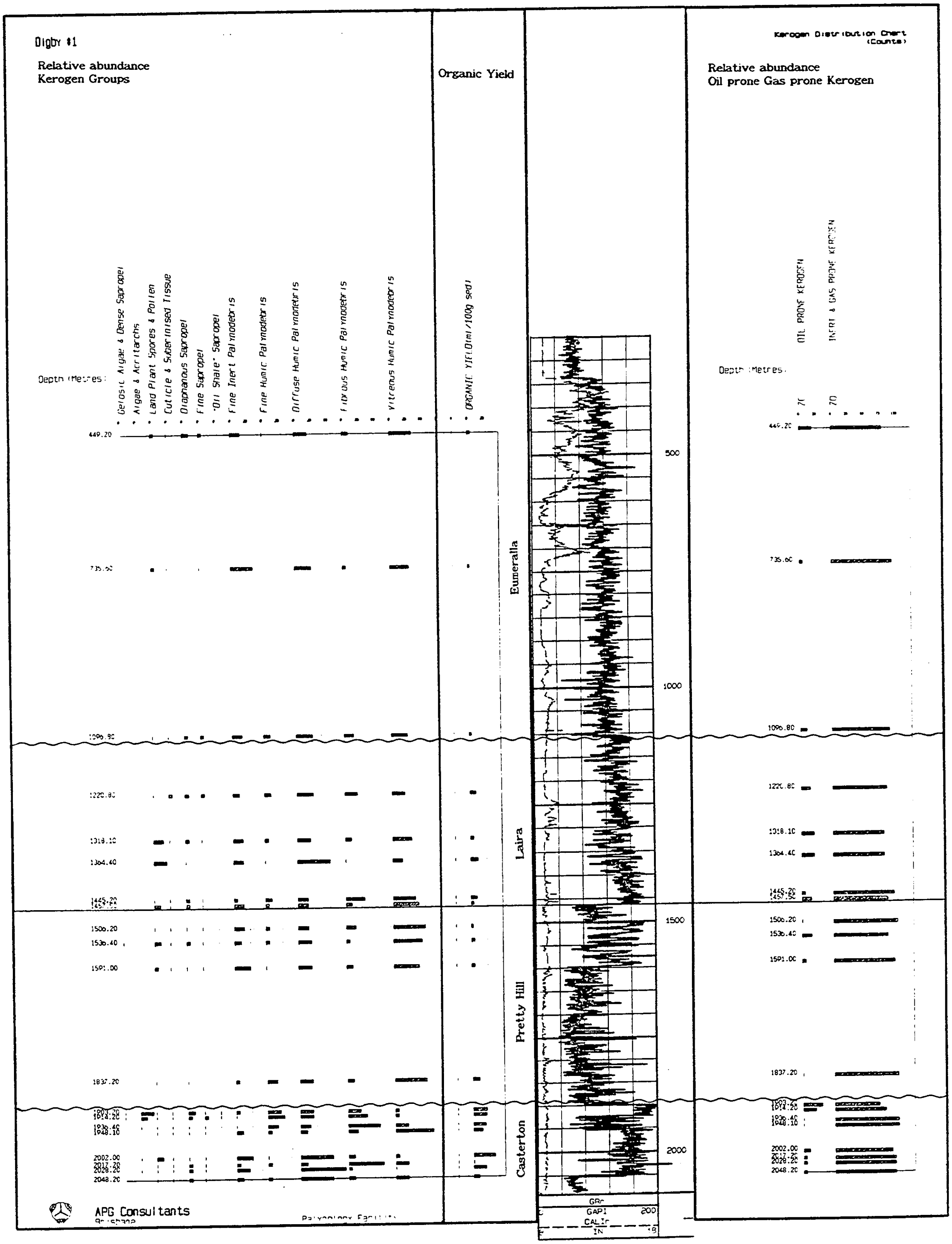
In applying the above classification, some modification to the groupings has to be made with increasing thermal alteration of the organic matter. In broad terms, little distinction can be made between Vitreous Humic Palynodebris, Fibrous Humic Palynodebris groups above Vitrinite Reflectance of about 1% to 1.5%. In such cases, the organic matter is assigned to Fibrous Humic Palynodebris. Similarly, Fine Sapropel, "Oil Shale" Sapropel and Diaphanous Sapropel lose their identity as they yield hydrocarbons with increasing maturation and become indistinguishable from either Diffuse Humic Palynodebris, Fine Humic Palynodebris or Fibrous Humic Palynodebris. Even the structured primary kerogen types, such as spores, pollen and cuticle, cannot be recognised readily at maturity levels much beyond the "oil window"; however, at that stage of maturation the recognition of the lipid kerogen groups has little relevance in terms of oil formation as what oil that could have formed from such kerogen has been formed.

Total Hydrocarbon Yield

An estimate of hydrocarbon yield has been established on the basis of the volume of acid insoluble organic matter recovered from the sediments. These estimates, which are expressed as ml of organic matter per 5mL or 100gms of sediment, are given in Organic Facies Data Tables. These estimates have a strong correlation with the total organic carbon values established by pyrolysis. Predictable variations however come from the presence of some gel-like Diffuse Humic kerogen; where the organic matter includes a high proportion of pyrite; and with certain clay lithologies.

Yield Estimate	Acid-insoluble Organic Yield		Total Organic Carbon
	ml/5mL sed.	mL/100g sed.	% sediment
Extremely low	0.0 - 0.10	0.0 - 0.5	0.2% or less
Very low	0.1 - 0.25	0.5 - 2.5	0.1% to 0.6%
Low	0.25 - 0.50	2.5 - 7.5	0.3% to 1.0%
Moderate	0.50 - 1.0	7.5 - 20	0.7% to 2.0%
High	1.0 - 2.0	20 - 50	1.30% to 2.5%
Very High	2.0 - 4.0	50 - 75	1.5% to 4.0%
Extremely High	>4.0	>75	2.0% or more

The propensity for a sediment to yield liquid hydrocarbon can be estimated on the basis of the proportion of lipid/waxy detritus present in the recovered acid insoluble organic matter. This estimate however, should be tempered and take into account several factors. It is believed that the waxy lipid detritus intimately associated with humic organic matter may not expel oil except under conditions of high thermal stress such as that experienced with pyrolysis analysis techniques (including that of RockEval). In this respect (amongst others) the oil proneness estimates from the RockEval analysis may not exactly parallel those given here. Allowance should be made for the proportion of lipid/waxy detritus partially oxidised (as evidenced by its poor fluorescence response, thinness and dull transmitted light colour) as the potential for such organic matter to yield hydrocarbons is lost or reduced by predepositional oxidation.


Digby #1
Relative abundance
Kerogen Groups
Organic Yield
Kerogen Distribution Chart (Counts)
Relative abundance
Oil prone Gas prone Kerogen
Depth (Metres)
Gelosic Algae & Dense Sapropel
Algae & Acritarchs
Land Plant Spores & Pollen
Cuticle & Suberinised Tissue
Diaphanous Sapropel
Fine Sapropel
'Oil Shale' Sapropel
Fine Inert Palynodebris
Fine Humic Palynodebris
Diffuse Humic Palynodebris
Fibrous Humic Palynodebris
Vitreous Humic Palynodebris
ORGANIC YIELD(ml/100g sed)
OIL PRONE KEROGEN
INERT & GAS PRONE KEROGEN
449.20
735.60
1096.80
1220.80
1318.10
1364.40
1506.20
1536.40
1591.00
1837.20
2002.00
2048.20
500
1000
1500
2000
Eumeralla
Laira
Pretty Hill
Casterton
GAPI
200
APG Consultants

Digby #1 Organic Facies Interpretation

Eumeralla Formation

The sediments sampled in the Eumeralla Formation included low proportions of organic matter and this was dominated by the humic kerogen groups. Waxy material was present in minor amounts and showed some evidence of oxidation. The hydrocarbon potential for the section seems marginal and limited to mostly gas.

Laira Formation

The Laira Formation sediments (1220.8m to 1445.2m) tended to include moderate proportions of organic matter, but like the Eumeralla sediments, the palynodebris tended to be humic with little waxy or lipid rich kerogen. Although its potential to yield hydrocarbon is perhaps better than the Eumeralla Formation, the potential is likely to be mostly for gas.

Pretty Hill Formation

In keeping with the sandy nature of the Pretty Hill section, the sampled sediments tended to be organically lean and considered to be marginal, gas prone source rocks at best.

Casterton Formation

The Casterton sediments were mostly organically rich and as such represent (or may have) good hydrocarbon source rocks. The mature of the organic matter is difficult to determine as it appears (in the palynological preparations) to be at an advanced stage of thermal alteration (late mature). The upper samples (1903.2m and 1914m) seem to include moderate proportions of lipid rich palynodebris (perhaps of algal origin) and as such may have been a good oil prone source rocks. The lower part of the Casterton Formation in Digby #1 included sediments with high organic yields but these seemed more humic and thus, less oil prone.

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APG Consultants

Report 634/01

GFE Resources

Palynostratigraphy and Organic Facies Analysis of **Digby #1**

Otway Basin

Part 2
(Data Tables)

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September, 1995

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Sample Sample number Depth Preparation Number	Palynostratigraphic Unit Age	Inferred Lithostratigraphy (*Log Interp*)	Inferred Depositional Environment	Palynomorph			Remarks
				Preservatn	Yield	Diversity	
SWC 48 449.2m P18659	APK4 - APK5 Probably APK4 Early Albian to late Aptian	Eumeralla Formation *(Eumeralla Formation)*	Mostly land plant forms; fresh to brackish water forms notable. ***Fluvial, coastal plain. lagoonal.***	Fair	High	High	A rich palynoflora with a dominance of ferns (*Cyathidites, Cicatricosisporites* and *Osmundacidites* prominent); liverworts notable and diverse (*Foraminisporis* and *Aequitriradites*); conifers prominent (mostly Podocarps). Algal forms conspicuous and moderately diverse (leiospheres and *Sigmopollis* notable). The co association of *C. hughesii* and *C. striatus* has not been recognised in the Otway Basin but is known the Eromanga Basin.
SWC 47 735.6m P18660	APK4 Early Albian to late Aptian	Eumeralla Formation *(Eumeralla Formation)*	Mostly land plant forms; few fresh to brackish water forms. ***Fluvial; coastal plain.***	Poor	Low	Moderate	Palynoflora dominated by ferns (mostly *Cyathidites*); lycopods prominent (*Retitriletes* conspicuous, *Dictyotosporites* notable and diverse; both *C. hughesii* and *C. striatus* present). Conifers sparse. Few algae (mostly *Sigmopollis* and leiospheres).
SWC 43 1096.8m P18661	APK3 Probably APK321. ["*F.w.l.*" datum] Mid Aptian	Eumeralla Formation *(Eumeralla Formation)*	Mostly land plant forms; few fresh to brackish water algae. ***Fluvial; coastal plain.***	Poor	Low	Moderate	Palynoflora dominated by saccate and inaperturate (Conifer) pollen remnants; *Corollina* notable. Spores prominent; mostly ferns (*Cyathidites* and *Osmundacidites*). Lycopods and bryophytes subordinate but relatively diverse. Few leiospheres. Highest stratigraphic observation of *M. evansii* and *C. variabilis* in Digby #1. *Foraminisporis wonthaggiensis "lunaris"* present.
SWC 42 1220.8m P18662	APK22 - APK3 Probably APK22 - APK31 Tentatively APK22 Barremian to late Hauterivian	Laira Formation [note *P. notensis* present in the Laira in Katnook #2] *(Laira Formation)*	Mostly land plant forms; few fresh to brackish water algae. ***Fluvial; coastal plain.***	Very poor	Low	Low	Fern dominated (mostly *Osmundacidites*) palynoflora. Lycopods and Bryophytes scarce but moderately diverse. Conifer pollen scarce; mostly inaperturate pollen. Algae notable; mostly *Sigmopollis* and leiospheres together with an isolated small spinose acritarch and *M. evansii*.

Sample Sample number Depth Preparation Number	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Inferred Depositional Environment**	**Palynomorph**			**Remarks**
				Preservatn	**Yield**	**Diversity**	
SWC 41 1318.1m P18663	APK2 - APK3 Probably APK212 Hauterivian	Laira Formation *(Laira Formation)*	Mostly land plant forms; few fresh to brackish water forms. ***Fluvial; coastal plain.***	Poor	Moderate	Low	Fern dominated (mostly *Osmundacidites*) palynoflora. Lycopods scarce but moderately diverse. Bryophyte spores sparse. Conifer pollen scarce; mostly inaperturate pollen. Few algae; mostly *Sigmopollis* and leiospheres together with an isolated spinose acritarch and few *M. evansii.*
SWC 39 1364.4m P18664	APK2 - APK3 Possibly APK21 Early Hauterivian to Valanginian	Laira Formation or Upper Pretty Hills Formation *(Laira Formation)*	Almost entirely land plant forms. ***Fluvial, overbank.***	Fair	High	Low	Palynoflora dominated by a single fern species (*Cyathidites minor*); another fern spore (*Osmundacidites*) conspicuous. Lycopods notable and diverse. Few Bryophytes, conifers or aquatic forms.
SWC 37 1445.2m P18665	APK122 - APK3 Possibly APK21 Early Hauterivian to Valanginian	Laira Formation or Upper Pretty Hills Formation *(Laira Formation)*	Mostly land plant forms; Few fresh to brackish water forms. ***Fluvial; coastal plain.***	Very poor	Low	Low	A sparse fern dominated (mostly *Osmundacidites* and *Cyathidites*) palynoflora. Lycopods scarce but moderately diverse. Bryophyte spores sparse. Conifer pollen scarce. Few algae; mostly *Sigmopollis* and leiospheres together with an isolated spinose acritarch and *M. evansii.*
SWC 36 1457.5m P18666	APK2 Probably APK211 (possibly upper part of APK211) Valanginian	Lower Laira Formation or Upper Pretty Hills Formation *(basal Laira Formation)*	Mostly land plant forms; fresh to brackish water forms notable. ***Fluvial; coastal plain.***	Fair (?carbonised)	High	Moderate	A balanced palynoflora with a dominance and diversity of cryptogams, prominent gymnosperm pollen and a subordinate but relatively diverse fresh to brackish water algal association. Spores dominated by ferns (*Cyathidites* and *Osmundacidites*); lycopods *Retitriletes, Kekryphalospora* and *Dictyotosporites*) prominent and diverse; liverworts notable but relatively diverse. Gymnosperms dominated by Podocarps with Cheirolepidiacean forms notable. Algal association dominated by leiospheres with *Microfasta evansii* notable.
SWC 30 1506.2m P18667	APK2 Valanginian	Laira Formation or upper Pretty Hills Formation *(Pretty Hills Formation)*	Mostly land plant and riverine forms; a few fresh to brackish water algae. ***Fluvial; coastal plain.***	Fair - poor	Very low	Low	A sparse but relatively diverse palynoflora. Saccate and inaperturate pollen remnants dominant. Spores prominent and moderately diverse; Ferns (*Cyathidites*) lycopods (*Retitriletes*) and liverworts (*Aequitriradites, Januasporites*) notable. A very sparse leiosphere - algal association.

Sample Sample number Depth Preparation Number	Palynostratigraphic Unit Age	Inferred Lithostratigraphy (*Log Interp*)	Inferred Depositional Environment	Palynomorph			Remarks
				Preservatn	Yield	Diversity	
SWC 29 1536.4m P18668	APK21 Probably APK211 Valanginian	Lower Laira Formation or upper Pretty Hills Formation *(Pretty Hills Formation)*	Mostly land plant forms; a few brackish to fresh water algae. ***Fluvial, coastal plain.***	Fair	Moderate	Moderate	Diverse spore dominated assemblage. *Osmundacidites* dominate; *Cyathidites* and bisaccate pollen prominent; Lycopod spores (*Retitriletes, Kekryphalospora* and *Dictyotosporites*) prominent and diverse. Sparse leiosphere - algal association; *M. evansii* present.
SWC 27 1591m P18669	APK121 - APK2 Tentatively APK122 ?Berriasian	Pretty Hills Formation *(Pretty Hills Formation)*	Almost entirely land plant forms. ***Fluvial, overbank.***	Fair - poor carbonised	Low	Very low	Spore dominated palynoflora including a prominence of relative few taxa; *Cyathidites, Osmundacidites, Neoraistrickia coalita Ceratosporites equalis* and *Retitriletes nodosus* common. Bisaccate pollen prominent but very restricted in diversity; mostly *Alisporites lowoodensis*. Isolated leiospheres present.
SWC 24 1837.0m P18670	Indeterminate	Indeterminate	Almost entirely coaly palynodebris. ***Peat Bog or Dystrophic Swamp.***	Fair	Almost nil	Almost nil	An extremely scant palynoflora comprising mud borne contamination.
SWC 22 1903.2m P18671	APJ62 - APK4 "Casterton" lagoonal palynofacies Tentatively APK1 ?Berriasian - Tithonian	Casterton Formation *(Casterton Formation)*	Mostly wind dispersed land plant forms and fresh to brackish water algae. ***Coastal lagoon or lacustrine.***	Very poor	Low	Very low	Sparse palynoflora of mostly poorly preserved ?leiosphere and inaperturate pollen remnants. Few recognisable spores; *Osmundacidites, Cyathidites* and *Ceratosporites equalis* notable. Common diffuse tissue (?algal or inaperturate pollen remnants).
SWC 21 1914.2m P18672	APJ62 - APK4 "Casterton" lagoonal palynofacies Tentatively APK1 ?Berriasian - Tithonian	Casterton Formation *(Casterton Formation)*	Mostly fresh to brackish water algae with wind dispersed land plant elements. ***Coastal lagoon or lacustrine.***	Leiospheres fair. Spore-Polln Very poor	High	Extremely low	Leiospheres abundant but are almost the only recognisable palynomorph. Inaperturate and saccate pollen notable and may have been more abundant but few could be positively identified. Spores scarce; *Osmundacidites* and *Ceratosporites equalis* notable. Abundant diffuse tissue (?algal or inaperturate pollen remnants).

Sample Sample number Depth Preparation Number	Palynostratigraphic Unit Age	Inferred Lithostratigraphy (*Log Interp*)	Inferred Depositional Environment	Palynomorph			Remarks
				Preservatn	Yield	Diversity	
SWC 16 1936.4m P18673	APJ62 - APK4 Very tentatively APK1 ?Berriasian - Tithonian	Casterton Formation *(Casterton Formation)*	Almost entirely humic palynodebris. ***Peat Bog or Dystrophic Swamp.***	Poor	Extremely low	Extremely low	Extremely sparse palynoflora; mostly ?inaperturate pollen with *Osmundacidites* and *Cyathidites* prominent. Degraded wood fibres and cuticle abundant. Few ?leiospheres present.
SWC 10 1948.1m P18674	Indeterminate	Indeterminate	Almost entirely humic palynodebris. ***Peat Bog.***	Fair	Almost nil	Almost nil	Palynoflora extremely sparse and probably almost entirely derived from mud borne contamination.
SWC 6 2002.0m P18675	APK1 Probably APK11 Tithonian	Casterton Formation *(Casterton Formation)*	Mostly wind dispersed land plant forms; ?Leiospheres notable. ***Fluvial - Lacustrine.***	Extremely poor	High	Low (*see remarks*)	A rich palynoflora dominated by saccate and ?inaperturate pollen remnants. Spores prominent and may have been diverse but few could be identified (exinal detail lost due to advanced stage of thermal alteration); *Osmundacidites, Cyathidites* and *Retitriletes* notable. ?Leiospheres notable but difficult to distinguish from the inaperturate pollen remnants. [*The palynoflora has an Early Cretaceous character; cf SWC 2/2048.2m*]
SWC 5 2017.2m P18676	Mesozoic	Indeterminate *(Casterton Formation)*	Low organic yield of mostly humic palynodebris. ***Fluvial, braided stream or Beach.***	Extremely poor	Almost nil	Almost nil	A few corroded spore and pollen remnants recovered; few of which could be identified.
SWC 4 2028.2m P18677	Tentatively APJ6-APK1 [*see remarks*] ?Tithonian - Kimmeridgian	? Casterton Formation *(Casterton Formation)*	Most of the palynoflora is exotic. ***Indeterminate***	Fair to Extremely poor	Extremely low	very low	A sparse palynoflora which included a few carbonised spore and pollen remnants of similar preservation to the underlying assemblage; these forms may be endemic to the sampled horizon. The majority of the palynomorphs (saccate pollen, inaperturate pollen, Angiosperm pollen, cryptogam spores and acritarchs) and coarse palynodebris (cuticle and wood fibres) were fresh to moderately thermally altered and likely to have been deriver from both a mud additive and from higher in the section. No biostratigraphic reliance can be placed upon the recovered palynoflora.

Sample Sample number Depth Preparation Number	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Inferred Depositional Environment**	**Palynomorph**			**Remarks**
				Preservatn	**Yield**	**Diversity**	
SWC 3 2048.2m P18678	APJ62 - APK11 Possibly APJ62 Tithonian - Kimmeridgian	Casterton Formation *(Casterton Formation)*	Mostly land plant forms; few fresh to brackish algae. ***Fluvial - Lacustrine.***	Very low	Extremely poor	Extremely low	Palynoflora strongly carbonised with only the more robust forms identifiable. Spore remnants dominant; *Osmundacidites* and *Retitriletes* prominent, *Contignisporites* notable. Saccate and Inaperturate pollen remnants prominent. Leiospheres notable. *[The palynoflora has a Late Jurassic character; cf SWC 6/2002m]*

APG Consultants

Report 634/01

GFE Resources

Palynostratigraphy and Organic Facies Analysis of **Digby #1**

Otway Basin

Part 3
(Enclosures)

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September, 1995

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Organic Facies Data

GFE Digby #1

Sample Sample Number Depth Preparation Num.	Lithology	Gelosic Algae & Dense Sapropel	Dinocysts & Acritarch	Cuticle & Suberin	Spores & Pollen	Diaphanous Sapropel	Fine Sapropel	Aggregated (Oil Shale) Sapropel	Fine Inert Debris	Fine Humic Debris	Diffuse Humic Debris	Fibrous Humic Debris	Vitreous Humic Debris	Maturity Spore colour; Est. Vit. Ref UV Fluorescence Response	Organic Yield mL/100g Sed	Remarks
SWC 48 449.2m P18659	Claystone, mid green grey, silty, carbonaceous flecks.			+	5	10	5		15	+	20	10	35	Translucent lt yllw - lt brwn yllw 0.5 Sp VD-M Gm N-ED *"Oil Window; Early Mature"*	5.2 Low	Spores mostly entire and fresh, some thin. Saccate pollen entire to corroded and fragmented. Cuticle mostly corroded; some humic impregnation; some fresh large laths. Macerated wood fibres notable. Palynodebris mostly finely divided and partly oxidised.
		***Gas prone** with limited oil potential. Source potential likely to be limited by low organic content.*														
SWC 47 735.6m P18660	Claystone, mid grey, silty, minor carbonaceous flecks.			+	5	+	+		35		25	5	30	Dull translucent yllw brwn 0.6 Sp ED-D Gm N *"Oil Window; Early Mature"*	2.6 Low	Spores entire to fragmented, mostly corroded. Saccate pollen scarce, mostly fragmented and corroded. Cuticle thin, corroded and fragmented. Palynodebris fine to moderately finely divided and strongly oxidised.
		***Gas prone.** Source potential likely to be limited by low organic content.*														
SWC 43 1096.8m P18661	Claystone, mid grey, silty, minor carbonaceous flecks.			+	+	5	5		15	10	25	15	25	Dull yllw brwn 0.6 - 0.65 Sp ED-D/M Gm N *"Oil Window; Early Mature"*	3.1 Low	Spores entire to fragmented, mostly thin, corroded. Saccate pollen mostly thin, corroded and fragmented. Cuticle corroded and fragmented. Some macerated wood fibres. Palynodebris mostly finely divided and partly oxidised.
		***Gas prone** with very limited oil potential. Source potential likely to be limited by low organic content.*														
SWC 42 1220.8m P18662	Claystone, mid brown grey, silty, minor carbonaceous flecks.			5	+	5	5		10	10	25	20	20	Dull yllw brwn 0.65 - 0.7 Sp Ed-d Gm N *"Oil Window; Early Mature"*	8.9 Mod.	Spores mostly entire but thin and stained; some fragmented and corroded. Pollen scarce, thin corroded and fragmented. Cuticle fragmented; some humic impregnation. Macerated wood fibres notable. Palynodebris fine to moderately finely divided and partly oxidised
		***Gas prone** with very limited oil potential.*														

APG Consultants

Organic Facies Data

GFE Digby #1

Sample Sample Number Depth Preparation Num.	Lithology	Gelosic Algae & Dense Sapropel	Dinocysts & Acritarch	Cuticle & Suberin	Spores & Pollen	Diaphanous Sapropel	Fine Sapropel	Aggregated (Oil Shale) Sapropel	Fine Inert Debris	Fine Humic Debris	Diffuse Humic Debris	Fibrous Humic Debris	Vitreous Humic Debris	Maturity Spore colour; Est. Vit. Ref UV Fluorescence Response	Organic Yield mL/100g Sed	Remarks
SWC 41 1318.1m P18663	Claystone, mid grey, silty, minor carbonaceous flecks. *[SWC fractured; possible contamination.]*			+	15	5	+		15	5	20	10	30	Dull translucent brwn 0.7 Sp N-VD Gm N ***"Oil Window; Early Mature"***	4.3 Low	Spores mostly entire but stained; some thin and corroded. Saccate pollen scarce mostly thin corroded and fragmented. Cuticle mostly corroded and fragmented. Palynodebris fine to moderately finely divided and partly oxidised.
		***Gas prone** with limited oil potential.* *Source potential likely to be limited by low organic content.*														
SWC 39 1364.4m P18664	Claystone, mid to dark grey, silty.				20	+			15	+	50	+	15	Dull translucent brwn 0.8 Sp N-ED Gm N ***"Oil Window; Peak Generation"***	11.5 Mod.	Spores entire, but thin (not corroded). Saccate pollen scarce mostly entire and fresh. Cuticle scarce, highly corroded and fragmented. Palynodebris very finely divided and partly oxidised.
		***Gas prone** with limited oil potential.*														
SWC 37 1445.2m P18665	Siltstone, mid grey, argillaceous, carbonaceous laminations and flecks.			+	+	5	+		5	10	15	30	35	Dull brwn 0.85 Sp N-ED Gm N ***"Oil Window; Peak Generation"***	9.3 Mod.	Spores and saccate pollen scarce, mostly entire to fragmented. Cuticle highly corroded and fragmented. Macerated wood fibres and fusain notable. Palynodebris fine to coarsely divided and partly oxidised.
		Gas prone.														
SWC 36 1457.5m P18666	Claystone, mid grey, silty.			+	10	5	+		15	5	15	10	40	Dull brwn to brwn blk ?1.0 *[see remarks]* Sp N-ED Gm N ***"Oil Window"***	3.8 Low	Spores mostly entire: some thin corroded and stained,. Saccate pollen mostly entire and fresh, some stained. Cuticle mostly thin corroded and fragmented, some humic impregnation. Palynodebris fine to moderately finely divided and partly oxidised. *[The dark colour of the palynomorphs suggests a high degree of thermal alteration but there is little exinal breakdown.]*
		***Gas prone** with very limited oil potential.* *Source potential likely to be limited by low organic content.*														

<table>
<tr><th>Sample
Sample Number
Depth
Preparation Num.</th><th>Lithology</th><th>Gelosic Algae & Dense Sapropel</th><th>Dinocysts & Acritarch</th><th>Cuticle & Suberin</th><th>Spores & Pollen</th><th>Diaphanous Sapropel</th><th>Fine Sapropel</th><th>Aggregated (Oil Shale) Sapropel</th><th>Fine Inert Debris</th><th>Fine Humic Debris</th><th>Diffuse Humic Debris</th><th>Fibrous Humic Debris</th><th>Vitreous Humic Debris</th><th>Maturity
Spore colour;
Est. Vit. Ref
UV Fluorescence Response</th><th>Organic Yield
mL/100g Sed</th><th>Remarks</th></tr>
<tr><td rowspan="2">SWC 30
1506.2m
P18667</td><td rowspan="2">Claystone, mid grey, silty, minor carbonaceous flecks.</td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td></td><td>15</td><td>5</td><td>15</td><td>15</td><td>50</td><td rowspan="2">Dull brwn
0.8
Sp N
Gm N
"Oil Window; Peak Generation"</td><td rowspan="2">1.9
Very low</td><td rowspan="2">Spores and saccate pollen scarce and mostly thin corroded and fragmented. Cuticle scarce and highly corroded and fragmented. Palynodebris fine to moderately coarsely divided and partly oxidised.</td></tr>
<tr><td colspan="12">Not a source rock.</td></tr>
<tr><td rowspan="2">SWC 29
1536.4m
P18668</td><td rowspan="2">Claystone, mid grey, silty, minor carbonaceous flecks.</td><td>+</td><td></td><td>+</td><td>10</td><td>5</td><td>+</td><td></td><td>10</td><td>5</td><td>20</td><td>5</td><td>45</td><td rowspan="2">Dull Brwn.
0.85
Sp ED-D/M
Gm N
"Oil Window; Peak Generation"</td><td rowspan="2">4.3
Low</td><td rowspan="2">Spores and saccate pollen mostly entire, fresh to thin and corroded. Cuticle mostly corroded and fragmented, some large laths. Palynodebris fine to moderately coarsely divided. and partly oxidised.</td></tr>
<tr><td colspan="12">Gas prone with very limited oil potential.
Source potential likely to be limited by low organic content.</td></tr>
<tr><td rowspan="2">SWC 27
1591m
P18669</td><td rowspan="2">Claystone, mid green grey, minor carbonaceous flecks.
[SWC small; possible contamination]</td><td></td><td></td><td>+</td><td>5</td><td>+</td><td>+</td><td></td><td>25</td><td>+</td><td>20</td><td>10</td><td>40</td><td rowspan="2">Dull brwn to brwn blk
1.2
Sp N
Gm N
"Oil Window; Late Mature"</td><td rowspan="2">4.3
Low</td><td rowspan="2">Spores and saccate pollen entire to fragmented, somewhat carbonised, some fresh but mostly corroded. Cuticle highly corroded and fragmented. Some contamination from higher in the section. Palynodebris mostly finely divided and partly oxidised.</td></tr>
<tr><td colspan="12">Gas prone.
Source potential likely to be limited by low organic content.</td></tr>
<tr><td rowspan="2">SWC 24
1837.2m
P18670</td><td rowspan="2">Sandstone, mid grey, very fine grained, silty, common carbonaceous laminations.</td><td></td><td></td><td></td><td>+</td><td>+</td><td></td><td></td><td>5</td><td>15</td><td>20</td><td>10</td><td>50</td><td rowspan="2">Few free spores.
Vitrinite with very narrow translucent rim.</td><td rowspan="2">10.6
Mod</td><td rowspan="2">Spores, saccate pollen and cuticle very scarce, fresh to highly corroded and fragmented. Most, if not all, the palynomorphs are contaminants. Palynodebris fine to coarsely divided.</td></tr>
<tr><td colspan="12">Gas prone.</td></tr>
</table>

Sample Sample Number Depth Preparation Num.	**Lithology**	Gelosic Algae & Dense Sapropel	Dinocysts & Acritarch	Cuticle & Suberin	Spores & Pollen	Diaphanous Sapropel	Fine Sapropel	Aggregated (Oil Shale) Sapropel	Fine Inert Debris	Fine Humic Debris	Diffuse Humic Debris	Fibrous Humic Debris	Vitreous Humic Debris	**Maturity** Spore colour; Est. Vit. Ref UV Fluorescence Response	**Organic Yield** mL/100g Sed	**Remarks**
SWC 22 1903.2m P18671	Claystone, very dark brown grey - brown black, very carbonaceous, silty.	+	?10	?	?10	10	+	+	5	20	20	20	5	Dull translucent dk brwn 1.0 Sp N ?L ED-D/M Gm N-ED ***"Oil Window; Late Mature"***	21.6 High	Spores, saccate pollen and ?inaperturate pollen, very thin, highly corroded ("dissolved"). ?Leiospheres entire to fragmented and corroded. ?Cuticle very thin, highly corroded, fragmented. Palynodebris fine to moderately finely divided. *[The kerogen has the micro-texture of "granular" oil shale sapropel but lacks the fluorescence response; ??too mature or too oxidised]*
		Gas prone *with some oil potential. May have had greater oil potential but this may have been expended given the thermal alteration.*														
SWC 21 1914.2m P18672	Claystone, dark brown black, very carbonaceous.	+	15	?	+	5	5	+	+	25	20	25	5	Dull translucent dk brwn 1.0 Sp N-ED ?L ED-D/M mttld Gm N-ED ***"Oil Window; Late Mature"***	20.9 High	Spores, saccate pollen and inaperturate pollen, very thin, highly corroded ("dissolved"). ?Cuticle very thin, highly corroded, fragmented; some humic impregnation. Leiospheres mostly entire, fresh to strongly corroded. Corroded macerated wood fibres notable. Minor fungal remnants. Palynodebris fine to moderately finely divided. *[The kerogen has the micro-texture of "granular" oil shale sapropel but lacks the fluorescence response; ??too mature or too oxidised]*
		Gas prone *with limited oil potential. May have had greater oil potential but this may have been expended given the thermal alteration.*														
SWC 16 1936.4m P18673	Claystone, very dark brown grey to brown black, very carbonaceous.		?	+	+	+	+		+	15	15	50	20	Dull translucent brwn to dull dk brown 1.0 Sp N Gm N ***"Oil Window; Late Mature"***	19.2 Mod.	Spores and saccate pollen thin, corroded. Cuticle fragmented, corroded; some humic impregnation; some large laths. Corroded macerated wood prominent. Palynodebris fine to moderately coarsely divided.
		Gas prone. *May have had greater oil potential but this may have been expended given the thermal alteration.*														

<table>
<tr><th>Sample
Sample Number
Depth
Preparation Num.</th><th>Lithology</th><th>Gelosic Algae & Dense Sapropel</th><th>Dinocysts & Acritarch</th><th>Cuticle & Suberin</th><th>Spores & Pollen</th><th>Diaphanous Sapropel</th><th>Fine Sapropel</th><th>Aggregated (Oil Shale) Sapropel</th><th>Fine Inert Debris</th><th>Fine Humic Debris</th><th>Diffuse Humic Debris</th><th>Fibrous Humic Debris</th><th>Vitreous Humic Debris</th><th>Maturity -
Spore colour;
Est. Vit. Ref
UV Fluorescence Response</th><th>Organic Yield
mL/100g Sed</th><th>Remarks</th></tr>
<tr><td rowspan="2">SWC 10
1948.1m
P18674</td><td rowspan="2">Claystone, mid-dark brown grey to grey black, very carbonaceous, sandy in part.
[SWC small; possible contamination.]</td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td></td><td>10</td><td>5</td><td>10</td><td>15</td><td>60</td><td rowspan="2">Few, if any, palynomorphs endemic.
Vitrain with very narrow translucent rim.</td><td rowspan="2">14.2
Mod.</td><td rowspan="2">Spores, saccate pollen and cuticle scarce, corroded; some humic impregnation. Some mud borne contamination; few, if any, palynomorphs endemic. Palynodebris fine to coarsely divided.</td></tr>
<tr><td colspan="12">Gas prone.
May have had greater oil potential but this may have been expended given the thermal alteration.</td></tr>
<tr><td rowspan="2">SWC 6
2002.0m
P18675</td><td rowspan="2">Siltstone, brown grey, very argillaceous, carbonaceous.</td><td></td><td>+</td><td>+</td><td>10</td><td>+</td><td>+</td><td></td><td>25</td><td>+</td><td>50</td><td>10</td><td>5</td><td rowspan="2">Dull dk brwn. to brwn black
1.3
No fluor response
"Condensate Zone"</td><td rowspan="2">33.3
High</td><td rowspan="2">Spores and saccate pollen mostly entire but thin and strongly corrode, (carbonised). Cuticle highly corroded and fragmented. Palynodebris very finely divided.</td></tr>
<tr><td colspan="12">Gas prone with very limited oil potential.
May have had greater oil potential but this may have been expended given the thermal alteration.</td></tr>
<tr><td rowspan="2">SWC 5
2017.2m
P18676</td><td rowspan="2">Siltstone, dark brown, carbonaceous:
Sandstone, light brown, very fine grained.
[SWC small; possible contamination.]</td><td></td><td></td><td>+</td><td>+</td><td>?5</td><td>+</td><td></td><td>5</td><td>5</td><td>10</td><td>55</td><td>20</td><td rowspan="2">Dull dk brwn to brwn black.
1.2
No fluor. response
"Condensate Zone"</td><td rowspan="2">0.7
Very low</td><td rowspan="2">Spores and saccate pollen scarce, corroded, thin. Cuticle highly corroded, fragmented; some humic impregnation. Palynodebris mostly finely divided with some coarse fragments. ?Organic matter partly oxidised.</td></tr>
<tr><td colspan="12">Not a source rock.</td></tr>
</table>

APG Consultants

Organic Facies Data

GFE Digby #1

Sample Sample Number Depth Preparation Num.	**Lithology**	Gelosic Algae & Dense Sapropel	Dinocysts & Acritarch	Cuticle & Suberin	Spores & Pollen	Diaphanous Sapropel	Fine Sapropel	Aggregated (Oil Shale) Sapropel	Fine Inert Debris	Fine Humic Debris	Diffuse Humic Debris	Fibrous Humic Debris	Vitreous Humic Debris	**Maturity** Spore colour; Est. Vit. Ref UV Fluorescence Response	**Organic Yield** mL/100g Sed	**Remarks**
SWC 4 2028.2m P18677	Claystone, dark brown grey, silty. *[SWC friable; possible contamination]*		+	+	+	5	+		20		70	5	+	Dull dk brwn to brwn black. 1.2 Sp N L N-ED Gm N *"Condensate Zone"*	19.7 Mod	Spores and saccate pollen mostly entire but thin, corroded. ?Leiospheres entire, thin. Cuticle scarce, highly corroded. Some macerated wood fibres. **Significant contamination (most of the palynoflora) from a mud additive and mud borne forms from higher in the section.** Palynodebris very finely divided. *[The kerogen has the micro-texture of "granular" oil shale sapropel but lacks the fluorescence response; ??too mature or too oxidised]*
		Gas prone. *May have had greater oil potential but this may have been expended given the thermal alteration.*														
SWC 3 2048.2m P18678	Claystone, mid brown grey, silty. *[SWC small; possible contamination]*			+	+	5	+		10	5	50	10	20	Dull dk brwn to brwn blk. 1.1 - 1.2 No fluor response *"Condensate Zone"*	8.5 Mod.	Spores and saccate pollen scarce, entire to fragmented, strongly corroded. Cuticle strongly corroded, fragmented; some humic impregnation; some large laths. Macerated wood fibres notable. Palynodebris very fine to moderately coarsely divided. *[The kerogen has the micro-texture of "granular" oil shale sapropel but lacks the fluorescence response; ??too mature or too oxidised]*
		Gas prone. *May have had greater oil potential but this may have been expended given the thermal alteration.*														

PE800751

This is an enclosure indicator page.
The enclosure PE800751 is enclosed within the container PE903969 at this location in this document.

The enclosure PE800751 has the following characteristics:

ITEM_BARCODE = PE800751
CONTAINER_BARCODE = PE903969
NAME = Spore/Pollen Distribution Chart
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Spore/Pollen Distribution Chart; oldest occurrence list; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE800745

This is an enclosure indicator page.
The enclosure PE800745 is enclosed within the container PE903969 at this location in this document.

The enclosure PE800745 has the following characteristics:

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CONTAINER_BARCODE = PE903969
             NAME = Spore/Pollen Distribution Chart
            BASIN = OTWAY BASIN
           PERMIT = PEP/134
             TYPE = WELL
          SUBTYPE = DIAGRAM
      DESCRIPTION = Spore/Pollen Distribution Chart;
                    species checklist; (enclosure from
                    appendix 10 of WCR) for Digby-1
          REMARKS =
     DATE_CREATED =
    DATE_RECEIVED =
             W_NO = W1130
        WELL_NAME = DIGBY-1
       CONTRACTOR =
    CLIENT_OP_CO = GFE RESOURCES
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE900730

This is an enclosure indicator page.
The enclosure PE900730 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900730 has the following characteristics:

ITEM_BARCODE = PE900730
CONTAINER_BARCODE = PE903969
NAME = Spore/Pollen Distribution Chart
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Spore/Pollen Distribution Chart; oldest occurrence list; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE900729

This is an enclosure indicator page.
The enclosure PE900729 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900729 has the following characteristics:

ITEM_BARCODE = PE900729
CONTAINER_BARCODE = PE903969
NAME = Spore/Pollen Distribution Chart
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Spore/Pollen Distribution Chart; total flora checklist; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE900736

This is an enclosure indicator page.
The enclosure PE900736 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900736 has the following characteristics:

ITEM_BARCODE = PE900736
CONTAINER_BARCODE = PE903969
NAME = Spore/Pollen Distribution Chart
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Spore/Pollen Distribution Chart; total flora ; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE900731

This is an enclosure indicator page.
The enclosure PE900731 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900731 has the following characteristics:

ITEM_BARCODE =	PE900731
CONTAINER_BARCODE =	PE903969
NAME =	Spore/Pollen Distribution Chart
BASIN =	OTWAY BASIN
PERMIT =	PEP/134
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Spore/Pollen Distribution Chart; total palynoflora ; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =	
DATE_CREATED =	
DATE_RECEIVED =	
W_NO =	W1130
WELL_NAME =	DIGBY-1
CONTRACTOR =	
CLIENT_OP_CO =	GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE900732

This is an enclosure indicator page.
The enclosure PE900732 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900732 has the following characteristics:

ITEM_BARCODE =	PE900732
CONTAINER_BARCODE =	PE903969
NAME =	Spore/Pollen Distribution Chart
BASIN =	OTWAY BASIN
PERMIT =	PEP/134
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Spore/Pollen Distribution Chart; total flora diversity ; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =	
DATE_CREATED =	
DATE_RECEIVED =	
W_NO =	W1130
WELL_NAME =	DIGBY-1
CONTRACTOR =	
CLIENT_OP_CO =	GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE900735

This is an enclosure indicator page.
The enclosure PE900735 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900735 has the following characteristics:

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CONTAINER_BARCODE = PE903969
             NAME = Spore/Pollen Distribution Chart
            BASIN = OTWAY BASIN
           PERMIT = PEP/134
             TYPE = WELL
          SUBTYPE = DIAGRAM
      DESCRIPTION = Spore/Pollen Distribution Chart; total
                    flora plant class groups ; (enclosure
                    from appendix 10 of WCR) for Digby-1
          REMARKS =
     DATE_CREATED =
    DATE_RECEIVED =
             W_NO = W1130
        WELL_NAME = DIGBY-1
       CONTRACTOR =
     CLIENT_OP_CO = GFE RESOURCES
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE900734

This is an enclosure indicator page.
The enclosure PE900734 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900734 has the following characteristics:

ITEM_BARCODE = PE900734
CONTAINER_BARCODE = PE903969
NAME = Spore/Pollen Distribution Chart
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Spore/Pollen Distribution Chart; total flora plant division groups ; (enclosure from appendix 10 of WCR) for Digby-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES

(Inserted by DNRE - Vic Govt Mines Dept)

PE900733

This is an enclosure indicator page.
The enclosure PE900733 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900733 has the following characteristics:

ITEM_BARCODE =	PE900733
CONTAINER_BARCODE =	PE903969
NAME =	Spore/Pollen Distribution Chart (Diversity)
BASIN =	OTWAY BASIN
PERMIT =	PEP/134
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Spore/Pollen Distribution Chart, Diversity and Abundance Charts, (from appendix 10 of WCR--Palynology Reports) for Digby-1
REMARKS =	
DATE_CREATED =	30/11/95
DATE_RECEIVED =	
W_NO =	W1130
WELL_NAME =	DIGBY-1
CONTRACTOR =	APG CONSULTANTS
CLIENT_OP_CO =	GFE

(Inserted by DNRE - Vic Govt Mines Dept)

PE900737

This is an enclosure indicator page.
The enclosure PE900737 is enclosed within the container PE903969 at this location in this document.

The enclosure PE900737 has the following characteristics:

ITEM_BARCODE =	PE900737
CONTAINER_BARCODE =	PE903969
NAME =	Relative Abundance Kerogen Groups Chart
BASIN =	OTWAY BASIN
PERMIT =	PEP/134
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Relative Abundance Kerogen Groups Chart (from appendix 10 of WCR--Palynology Reports) for Digby-1
REMARKS =	
DATE_CREATED =	30/11/95
DATE_RECEIVED =	
W_NO =	W1130
WELL_NAME =	DIGBY-1
CONTRACTOR =	APG CONSULTANTS
CLIENT_OP_CO =	GFE

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 10B

REVIEW OF SELECTED

OTWAY BASIN WELLS

DIGBY-1

APG Consultants

Report 634/02

GFE Resources

A Review of the Palynostratigraphy of some Otway Basin Wells

P.L. Price
September, 1995

APG Consultants, PO Box 682, Kenmore Q'ld 4069
Phone (07) 3878 1862; Fax (07) 3878 1881

TABLE OF CONTENTS

PART 1

PART 2 (Data Tables)

SCOPE OF STUDY

The palynostratigraphic data for the Eumeralla, Laira, Pretty Hill and Casterton Formation established in the well completion studies of several Otway Basin wells were reinterpreted and expressed in terms of the nomenclature of Price *et al*, 1985, Filatoff and Price, 1988 and Price, 1993, 1995. The objective was to provide a consistent interpretation with increased palynostratigraphic resolution section perhaps giving a different view of the correlation of the section.

The reinterpretation was based upon the taxa occurrences given for the Conventional Core and Side Wall Core samples presented in the species distribution tables or text of the original studies; the distribution data for cuttings was usually not used except to determine the approximate extent of abundant *Microfasta evansii* and the extinction or range of some short ranging taxa. One to five thousand scale logs were used to relate the taxa distribution to the lithostratigraphy.

A discussion on biostratigraphic nomenclature and its relation to other palynostratigraphic schemes is given in Part 1 . The results of the study are presented in the Data Tables (Part 2). Reference to the original studies should be made for the taxa distribution data.

BIOSTRATIGRAPHY

The biostratigraphic nomenclature adopted for this study is based upon that of Price *et al*, 1985 and Filatoff & Price, 1988 developed primarily for the Surat and Eromanga Basin sections but adapted for the Otway Basin by Price, 1993 and 1995. The units and their relationship to the nomenclatures of Morgan, 1985 and 1992, Dettmann, 1986 and Dettmann and Playford, 1969 and Morgan *et al*, 1995 are summarised on Page 10 and the relationship of the palynostratigraphic units used in this study to the Otway Lithostratigraphy is presented on Page 11.

The units of Dettmann, 1963 and 1986, Dettmann and Playford, 1969 and Morgan, 1985, 1988, 1989 and 1992 have been used widely in Otway Basin studies. These nomenclatures however, have been applied in different ways in the various well sections giving some confusion as to what is represented by a particular unit in any given study. For example, in the Bus Swamp #1 well completion palynostratigraphic study, the "Upper *C. australiensis* Zone" of Burger, 1993 includes the lower part of the "Lower *F. wonthaggiensis* Zone" of Morgan, 1993 or Alley, 1993 and is not the equivalent of the "Upper *C. australiensis* Zone" of the latter authors.

Morgan *et a*l, 1995 reviewed and revised the Otway Basin palynostratigraphy as part of the comprehensive stratigraphic review of the western Otway Basin by MESA (Morton and Drexel Eds., 1995). Although the revised nomenclature of Morgan *et al*, 1995 gives some stability to the Otway Basin palynostratigraphy, the units of Price *et al*, 1985 and Price, 1993 and 1995 have been used in this study in an attempt to increase the biostratigraphic resolution and to lessen any possible ambiguity with the earlier nomenclatures; reference should be made to Page 10 if there is a need to relate an earlier nomenclature to this study.

In relating this study to earlier subdivisions, particular care should be taken with the *F. wonthaggiensis* Zone, the *C. hughesii* Zone and their stratigraphic relationship as their definition and application have varied from study to study (see

Page 10). This variation in interpretation reflects their development as reliable Otway Basin palynostratigraphic units with additional data becoming available and relates also to regional differences between the Early Cretaceous palynofloras of the Otway Basin and other basins (see Dettmann, 1986 and Dettmann *et al*, 1991); certain of the "index" species prominent in areas such as the Surat/Eromanga Basins, are very scarce and sporadic in their distribution within the Otway Basin.

Dettmann, 1986 and Dettmann *et al*, 1991 also consider the time taken for migration of the parent plants from their point of evolution to the various basins as being discernible and resulted in different order of appearances for the index forms in these basins. The recent well section studies (eg Morgan, 1989, 1990, 1991, 1992 & 1993; Price, 1993 & 1995; Morgan *et al*, 1995) however, record a similar order of appearance of the index forms in the Otway Basin as Price *et al*, 1985 and Filatoff and Price, 1988 do for the Eromanga Basin. It is likely that facies and environmental variations (giving rise to more subtle and less systematic differences in the distribution of the index forms) are at least as significant as the migration processes suggested by Dettmann, 1986 and Dettmann *et al*, 1991. The application of the Early Cretaceous and Late Jurassic palynostratigraphic units in the Otway Basin, as in other basins, requires recognition of the facies and preservational constraints upon the distribution of "marker" taxa in order to achieve a reliable biostratigraphic correlation; these factors are still not well understood. Thus, the down hole logging of the various "index" taxa must be tempered by palynofacies considerations before a palynostratigraphic unit is assigned. Clearly, in this study, this was difficult as the original assemblages were not examined and a first hand assessment of the palynofacies was not taken into consideration.

The Crayfish Group section palynofloras seem less diverse than the equivalent Cadna-Owie/Murta/Namur Eromanga section perhaps reflecting a more restricted range of environments within the Otway Basin catchment. Ferns, although prominent, are less diverse in the Crayfish Group than they are in the Eromanga and the fern derived index group *Cicatricosisporites spp* is scarce in the APK2 and APK1 (*Foraminisporis wonthaggiensis* Zone and *C. australiensis* Zone) assemblages. It is considered therefore, that the distribution of *Cicatricosisporites spp.* (including *C. australiensis*) is often too sporadic in the Otway to be a reliable biostratigraphic marker and a greater reliance is placed on *Dictyotosporites speciosus, Cyclosporites hughesii* and *Ceratosporites equalis*; it is worth noting that, in certain facies within the Surat and Eromanga Basins, the distribution of *Cicatricosisporites* can be erratic also. Some caution is held for the distribution of *Foraminisporis wonthaggiensis* although the consistent occurrence and persistence of similar bryophyte spores such as *Foraminisporis dailyi* and *F. "antewonthaggiensis"* lower in some of the Otway sections perhaps attests to its reliability in facies where the preservation is not adverse.

The reliance on the extinction (youngest occurrence) of *Cyclosporites hughesii* as an indication of the top of the *P. notensis* Zone - base of the *C. striatus* Zone boundary (base APK4) in the Otway Basin should be accepted with caution as *C. hughesii* is known to persist up through the *C. paradoxa* Zone (APK5) in the Eromanga Basin; the data from Digby #1 suggests that it may do the same in parts of the Otway Basin.

The relationship of the oldest occurrence of *Pilosisporites notensis* to that of *Foraminisporis asymmetricus* and the *P. notensis* Zone - *F. wonthaggiensis* Zone boundary (base APK22) and the disconformable boundary between the Eumeralla and the Katnook Sandstone - Laira Formation is perhaps blurred by differing applications of the earlier nomenclatures. In Katnook 2 (which seems to represent the most complete section at the basal Eumeralla Formation - Katnook Sandstone - Laira Formation interval) Morgan, 1989 placed the base of the "lower *C. hughesii* Zone" near the base of the Eumeralla Formation at 1896.5m but records *F. asymmetricus* down to 1925m (perhaps within the Windermere Sandstone or the top of the Katnook Sandstone) and *P. notensis* at 2103m (within the uppermost Laira Formation just below the Katnook Sandstone); both taxa are recorded from SWC samples. Thus, while the MESA correlations show the *P. notensis* Zone to be equivalent to the "*C. hughesii* Zone" and show it extending to the base of the Eumeralla Formation, the distribution of *P. notensis* and perhaps *F. asymmetricus* in Katnook 2 suggests that the *P. notensis* Zone and APK22 should extend into the Crayfish Group where the top of that unit is fully preserved. In most other areas (eg Sawpit #1 and Zema #1), lithological evidence, including the absence of the Windermere Sandstone and Katnook Sandstone, suggests there is an erosional break between the Eumeralla Formation and Crayfish Group and the confinement of the *P. notensis* Zone to the Eumeralla Formation (with the lower part, the APK22 equivalent, being eroded) is to be expected.

The order of the oldest occurrence of *Pilosisporites notensis* and *Foraminisporis asymmetricus* may not be totally resolved as *F. asymmetricus* has been reported below *P. notensis* in several wells in the Otway Basin. In the case of Mocamboro #11 and possibly Lake Hawdon #1 the occurrence of *F. asymmetricus* in what seems to be Pretty Hill Formation probably represents contamination. In others it is possibly a reflection of the varying facies favouring the presumed liverwort spore group *Foraminisporis* and not the presence of the fern spore *Pilosisporites*. Neither taxa are particularly consistent in their distribution and the palynomorph preservation at this level (the Eumeralla - Laira boundary) is often poor; thus, care must be taken in their application as biostratigraphic indicators. The overlying unit, APK321, (based upon the co-occurrence of *Pilosisporites parvispinosus* and *Cooksonites variabilis* and often including the distinctive *Foraminisporis wonthaggiensis* var *"lunaris" = F. "reticulowonthaggiensis"*) seems to be a more consistent palynostratigraphic reference horizon for the basal Eumeralla.

Notwithstanding these differences of interpretation and facies problems, certain of the marker species have a regional consistency recognised by most students of the Otway and Eromanga palynology and these have been given greater emphasis in this study. These include the oldest (initial) occurrence of *Pilosisporites grandis* (base APK52), *Coptospora paradoxa* (base APK51), *Crybelosporites striatus* (base APK4) *Pilosisporites parvispinosus* (base APK321), *Dictyotosporites speciosus* (base APK122) and *Cyclosporites hughesii* (base APK121). Of particular interest in terms of increased reliability of unit APK321 (uppermost part of the Lower *P. notensis Zone*) is the presence of a distinctive undescribed *Foraminisporis* (*F.*

wonthaggiensis "lunaris" sp 1519 and, most probably, is conspecific with *F. "reticulowonthaggiensis"* of Morgan) which has a restricted range in both the Otway and Eromanga Basin being confined to about the introduction of *Pilosisporites parvispinosus* and not extending up the section much beyond the top of APK3. (It should be noted that the specimen assigned to *F. wonthaggiensis "lunaris"* in Sawpit #1 by Price, 1993 is better placed within *Stoverisporites microverrucatus* which is known from higher in the sequence). The presence of *Foraminisporis wonthaggiensis "lunaris"* or *F. "reticulowonthaggiensis"* at the base of the range of *Pilosisporites parvispinosus* more or less at the top of the range *Cooksonites variabilis* (ie within APK321 or just below the Upper *P. notensis* Zone) is a consistent feature of many Otway Basin wells and enhances the *Pilosisporites parvispinosus* oldest occurrence as a reliable datum in the basal Eumeralla Formation.

The oldest occurrence of *Foraminisporis wonthaggiensis* is generally the most reliable of the *Foraminisporis* based palynostratigraphic horizons. In the Otway Basin its introduction seems to be near the Laira Formation - Pretty Hill Formation boundary; at this level in the Otway sequence the palynomorph preservation is often indifferent perhaps accounting for the sporadic distribution of this taxa.

The distribution of *Microfasta evansii* has proved to be a useful guide for the correlation of the Laira Formation. Morgan, 1993 noted its distribution in the Katnook section and related this to similar occurrences in other wells. Price, 1993 inferred the loss of a substantial part of the Laira Formation in Sawpit relative to Katnook based, in part, upon the absence of *M. evansii* in the Sawpit upper Crayfish Group. Burger, 1976 suggested these isolated ring like palynomorphs may have been joined together and thus, the taxa may represented a filamentous algae; Archangelsky *et al*, 1984 demonstrated its filamentous morphology. Dettmann, 1987 considers *Microfasta evansii* may represent a filamentous member of Zygnemataceae (a green algae group, often from riverine environments and the shallow margins of lakes) or Rivulariaceae (a Cyanophyte group typical of shallow estuarine environments) similar to that described by Batten & van Geel, 1985.

The facies distribution of *Microfasta evansii* seems not to be limited to deep lacustrine environments, as the form is widely distributed in fluvial to shallow lacustrine coastal plain sediments of Neocomian to Aptian age from eastern Australia (Burger, 1976; Morgan, 1975 and 1980). This general coastal plain distribution is perhaps more in keeping with the shallow water habitat characteristic of filamentous algae such as the Zygnemataceae (see Tappan, 1980) rather than that of a planktonic lacustrine form and, if so, is likely to be less facies sensitive in its distribution. In the Otway Basin, it is generally regarded (Morgan *et al*, 1995) as being confined to the upper Crayfish Group but it also has been recorded in the lower Eumeralla Formation (eg Digby #1, Katnook #2, Casterton #1 and possibly Zema #1) and is recorded in APK3 associations in the Eromanga Basin (Morgan, 1975; Burger, 1976) and in the Gippsland Koonwarra palynoflora (Dettmann, 1986). As noted above, it is most abundant and persistent in the upper Laira Formation where it may reach up to 40% of the palynoflora (Morgan, 1993) and seems to occur occasionally as a very rare component of the palynoflora in the upper Pretty Hill Formation.

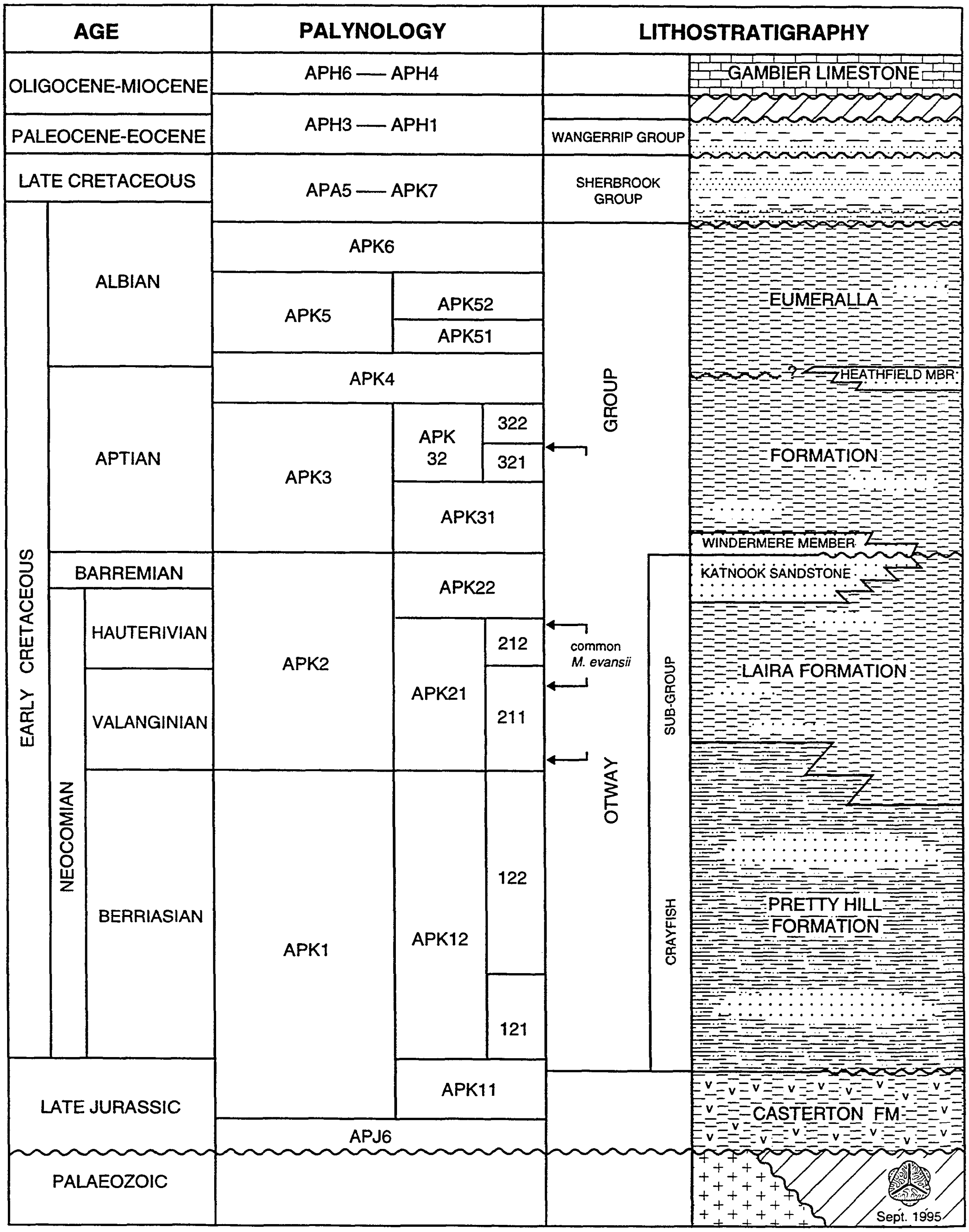
The palynostratigraphic resolution of the Pretty Hill Formation and Casterton Formation is hampered by poor preservation associated with a more arenaceous facies and the thermal degradation (depth related) of palynomorph exinal structure and sculpture. In these circumstances, the more distinctive and robust forms, such as *Cyclosporites hughesii*, *Ceratosporites equalis* and *Retitriletes watherooensis*, are more reliable than the more delicately ornamented forms, such as *Dictyotosporites speciosus*. The Casterton Formation is particularly difficult to resolve as, in addition to the depth at which it is usually encountered, the palynofloras of the lagoonal - lacustrine facies are restricted diversity reflecting the specialised flora associated with that depositional environment. It is difficult therefore, to demonstrate that the Jurassic unit APJ6 (*F. watherooensis* Zone) is represented rather than impoverished APK11 (Lower *C. australiensis* Zone) palynofloras. Digby #1 perhaps has APJ62 represented at its base but this is still a tentative assignment.

OTWAY BASIN NOMENCLATURE

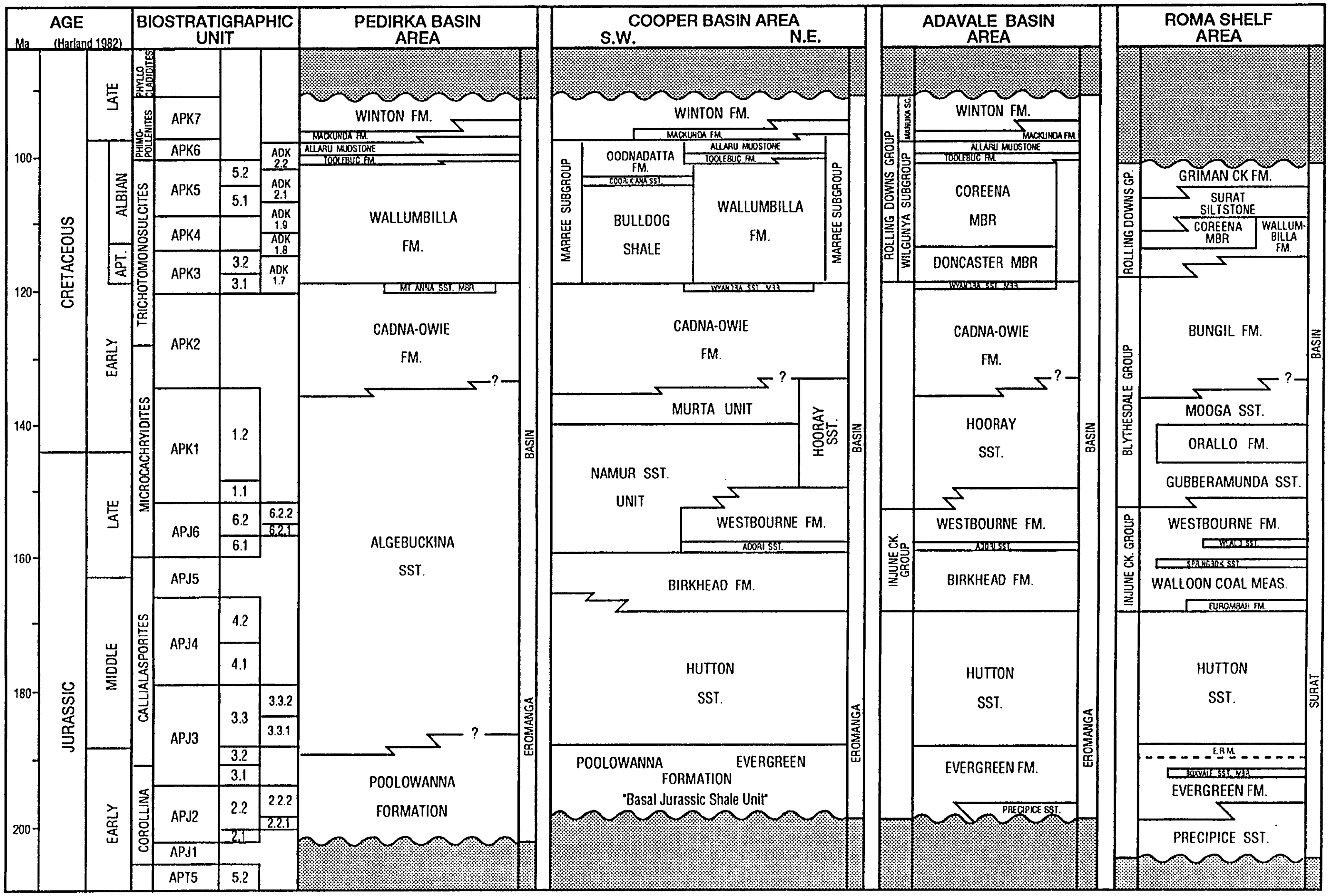
Dettman & Playford, 1969	Dettman 1986	Morgan, 1985 (Otway Basin Review)	Morgan, 1992 (Zema 1)	Morgan *et al*; 1995 (MESA Otway Volume)	APG Consultants			
								↲ *Phyllocladidites mawsonii*
A. distocarinatus	*A. distocarinatus*	*A. distocarinatus*	*A. distocarinatus*	*A. distocarinatus*	APK7			↰ *C. paradoxa* ↲ *Crybelosporites* sp. cf. *C. brenner* (sp. 1255)
P. pannosus	*P. pannosus*	*P. pannosus*	*P. pannosus*	*P. pannosus*	APK6			↲ *Phimopollenites pannosus*
C. paradoxa	*C. paradoxa* U	*C. paradoxa* U	*C. paradoxa* U	*C. paradoxa* U	APK5	APK52		↲ *Pilosisporites grandis*
	C. paradoxa L	*C. paradoxa* L	*C. paradoxa* L	*C. paradoxa* L		APK51		↲ *Coptospora paradoxa*
D. speciosus: *C. striatus*	*D. speciosus*: *C. striatus*	*C. striatus*	*C. striatus*	*C. striatus*	APK4			↲ *Crybelosporites striatus*
D. speciosus: *C. hughesii*	*D. speciosus*: *C. hughesii* Upper	*C. hughesii* U	*C. hughesii* U	*P. notensis* U	APK3	APK32	APK322	↰ *Cooksonites variabilis* — ↰ *M. evansii*
							APK321	↲ *Pilosisporites parvispinosus* — ↲ *F. wonthaggensis lunaris*
	C. hughesii Mid.	*C. hughesii* M	*C. hughesii* L	*P. notensis* L		APK31		↲ *Foraminisporis asymmetricus*
	C. hughesii Lower				APK2	APK22		↲ *Pilosisporites notensis* — ↰ *M. evansii* consistent to frequent
		C. hughesii L	*F. wonthaggiensis* U	*F. wonthaggiensis* U		APK21	APK212	↲ *Triporoletes reticulatus*
							APK211	↲ *Foraminisporis wonthaggiensis* — ↲ *M. evansii*
C. stylosus	*C. stylosus*		*F. wonthaggiensis* L	*F. wonthaggiensis* L	APK1	APK12	APK122	↲ *Dictyotosporites speciosus*
							APK121	↲ *Cyclosporites hughesii*
		C. stylosus	*C. australiensis*	*C. australiensis* U / L		APK11		↲ *Cicatricosisporites* spp.
			R. watherooensis	*R. watherooensis*	APJ6	APJ62	APJ622	↲ *Foraminisporis dailyi*
							APJ621	↲ *Ceratosporites equalis*
						APJ61		↲ *Retitriletes watherooensis*
					APJ5			↲ *Murospora florida*

September 1995

STRATIGRAPHIC NOMENCLATURE



JURASSIC-CRETACEOUS STRATIGRAPHY - SOUTHERN GREAT ARTESIAN BASIN



CONCLUSIONS

Although often difficult to apply particularly in the deeper parts of the section, a reliable palynostratigraphic subdivision of the Eumeralla Formation, Laira Formation, Pretty Hill Formation and Casterton Formation can be achieved and, together with lithological, log and seismic correlation, give an accurate reconstruction of the basin. As a result of the preservation and facies problems often encountered in the Crayfish Group, this resolution can only be achieved by the use of closely spaced, uncontaminated samples (Side Wall Cores and Conventional Cores). A closer sampling of the Eumeralla Formation could be useful if the timing and extent of mid Cretaceous structuring and subsidence are important to the basin's reconstruction and hydrocarbon generation history.

In terms of the correlation of the Crayfish Group and Casterton Formation, a re-sampling and re-examination of cores from Casterton #1 and Mocamboro #11 would augment the detailed data from Katnook #2, Sawpit #1, Zema #1 and Digby #1 as reference sections covering the range of facies represented in the basal Eumeralla Formation, Crayfish Group and Casterton Formation.

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Report 634/02

GFE Resources

A Review of the Palynostratigraphy of some Otway Basin Wells

Part 2
Data Tables

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Phone (07) 3878 1862; Fax (07) 3878 1881

Bus Swamp #1

(Species distribution data from Morgan, 1993; Burger, 1993; Alley, 1993)

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 300	APK5	Eumeralla Formation	Base *C. paradoxa*	*C. paradoxa* recorded lower in the section from cuttings.
SWC 756	APK3 APK321	Eumeralla Formation	Top *C. variabilis*	
SWC 862	APK3 APK321	Eumeralla Formation	Base *P. parvispinosus*	*F. "reticulowonthaggiensis"* present in cuttings at 856 - 870m
SWC 886	APK22 - APK31 ??APK22	?Laira Formation	Base *P. notensis*	
SWC 30 913	APK2 APK211	Laira Formation or upper Pretty Hills Formation		Note that "Upper *C. australiensis*" zone of Burger, 1993 includes the lower part of the "Lower *F. wonthaggiensis*" zone of Morgan, 1993 and Alley, 1993 and is not the equivalent of the "Upper *C. australiensis*" zone of the latter authors
957	APK2 APK211	Laira Formation or upper Pretty Hill Formation		
Core 2 1510m	APK2	Laira Formation or upper Pretty Hill Formation	Base & Top *M. evansii*	Only one specimen recorded in this well section
SWC 1515	APK2 APK21	Laira Formation or upper Pretty Hill Formation	Base *F. wonthaggiensis*	Doubtful specimen of *F. wonthaggiensis* recorded at 1790m
Core 3 1785	APK122 - APK21 ?APK122	basal Laira Formation or Pretty Hill Formation	Base *D. speciosus*	Core and SWC samples palynofloras below 1750m very restricted
SWC 1790	APK121 - APK21 ?APK121	Pretty Hill Formation	Base *C. hughesii*	

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Palynostratigraphic Data

Casterton #1
(Species distribution data from Morgan, 1986)

Sample Sample Type Depth (Metres)	Palynostratigraphic Unit Age	Inferred Lithostratigraphy (*Log Interp*)	Palynostratigraphic Datum Reference	Remarks
Core 614.5	APK4 - APK5 APK4	Eumeralla Formation	Top *C. hughesii*	Highest sample examined. No species distribution list available for the well section.
Core 627	APK4 - APK5 APK4	Eumeralla Formation	Base *C. striatus*	
Core 740.7	APK31 - APK321 APK31	Eumeralla Formation	Top *C. variabilis* Top *M. evansii*	
Core 1096.1	APK22 - APK321 APK31	Eumeralla Formation	Base *F. asymmetricus* Base *P. notensis* Top & base abundant *M. evansii*	An unusual association of **abundant** *M. evansii* present within an APK31 palynoflora.
Core 1496	APK122 APK3 ??APK122 - APK211	Laira Formation or Pretty Hill Formation		Sparse palynoflora
Core 1819.1	APK122 - APK3 APK122	Base Laira Formation or Pretty Hill Formation	Base *D. speciosus*	
Core 2063.2	APK121 - APK21 ?APK12	Pretty Hill Formation	Base *C. hughesii*	
Core 2425.3	APJ62 - APK21 ??APK1	Pretty Hill Formation or Casterton Formation	Base *C. equalis*	"Microforaminifera" present at 2210.7.
Core 2447.2 - 2450.3		Basement	Barren	

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit** **Age**	**Inferred Lithostratigraphy** ***(Log Interp)***	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 48 499.2	APK4 - APK5 APK4	Eumeralla Formation	Top *C. striatus* Top *C. hughesii*	Highest sample examined.
SWC 47 735.6	APK4	Eumeralla Formation	Base *C. striatus*	
SWC 43 1096.8	APK3 APK321	Eumeralla Formation	Top *C. variabilis* Top *M. evansii* Top & Base *F. wonthaggiensis* var *"lunaris"* Base *P. parvispinosus*	
SWC 42 1220.8	APK22 - APK3 ??APK22	Upper Laira Formation	Base *P. notensis*	
SWC 41 1318.1	APK2 - APK3 APK212	Laira Formation	Base *T. reticulatus*	
SWC 29 1536.4	APK21 APK211	Laira Formation or Upper Pretty Hill Formation	Base *F. wonthaggiensis* Base *M. evansii* Base *D. speciosus*	
SWC 27 1593	APK121 - APK2 ??APK122	Basal Laira Formation or Pretty Hill Formation	Base *C. hughesii*	Impoverished palynoflora. Sample gap of 312m with the sample at 1837m being near barren.
SWC 21 1914.2	APJ62 - APK1 APK1	Casterton Formation	"Casterton" palynofacies	
SWC 6 2002	APK1 APK11	Casterton Formation	Base *Cicatricosisporites spp.*	
SWC 3 2048.2	APJ62 - APK11 ?APJ62	Casterton Formation	Base *C. equalis*	

APG Consultants
Palynostratigraphic Data

Greenbanks #1
(Species distribution data from Archer, 1983)

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy** ***(Log Interp)***	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 454	APA5 *T. longus* Zone	Sherbrook Group	Top *Q. brossus* Base *T. longus*	
SWC 569.5	APK5 - APK6 APK5	Eumeralla Formation	Top *C. striatus*	
SWC 812	APK5	Eumeralla Formation	Base *C. paradoxa*	
SWC 1155	APK22 - APK5 ??APK3	Eumeralla Formation	Top *P. notensis* Top & base *C. hughesii*	Sparse palynofloras
SWC 1195	APK22 - APK5 ??APK3	Eumeralla Formation	Base *P. notensis*	Sparse palynofloras
SWC 1207.5	APK2 - APK4 ??APK3	Eumeralla Formation		Sparse palynoflora. Form compared to *C. variabilis* present

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy** ***(Log Interp)***	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 1727	APK3 APK322	Eumeralla Formation	Top *F. "reticulowonthaggiensis"*	
SWC 1857	APK3 APK321	Eumeralla Formation	Top *C. variabilis*	
Core 1861.6	APK3 APK321	Eumeralla Formation	Base *F. "reticulowonthaggiensis"* Base *P. parvispinosus*	
Core 1877	APK3 APK31	Eumeralla Formation	Top *M. evansii*	
SWC 1896	APK3 APK31	Eumeralla Formation	Base common *P. notensis*	The assemblages between 1900m and 2000m are from a sandy interval and may be somewhat impoverished.
SWC 1909	APK212 - APK3	Eumeralla Formation	Top consistent *M. evansii*	? Impoverished palynoflora.
SWC 1925	APK3 APK31	Eumeralla Formation	Base *F. asymmetricus*	? Impoverished palynoflora..
2070	APK212 - APK31 APK22		Top abundant *M. evansii*	
SWC 2103	APK2 - APK3 APK22	Laira Formation	Base *P. notensis*	
SWC 2595	APK21 APK212	Laira Formation	Base abundant *M. evansii* Base *T. reticulatus* Base *F. wonthaggiensis*	Below 2600m the diversity of the palynofloras falls off markedly reflecting poor preservation and advancing thermal alteration. The distribution of the marker taxa may be influenced also.
Cuttings 2840	APK122 - APK21 ??APK211	Laira Formation or Upper Pretty Hill Formation	Base consistent *M. Evansii*	

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Palynostratigraphic Datum Reference**	**Remarks**
Core 2870	APK122 - APK21 ??APK211	Laira Formation or upper Pretty Hill Formation	Base *M. evansii*	Palynoflora impoverished. The deeper records of *M. evansii* are from cuttings
SWC 3035	APK122 - APK21 ??APK122	Basal Laira Formation or upper Pretty Hill Formation	Base *D. speciosus*	Palynoflora impoverished. The deeper records of *D. speciosus* are from cuttings
SWC 3440	APK121 - APK21 ?APK121	Pretty Hill Formation	Base *C. hughesii* Base of section examined	Palynoflora impoverished

APG Consultants
Palynostratigraphic Data

M^c^Eachern #1
(Species distribution data from Morgan, 1990)

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy** (***Log Interp***)	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 504	APK5	Eumeralla Formation	Base *C. paradoxa*	Highest sample examined
SWC 699.6	APK4	Eumeralla Formation	Base *C. striatus*	
SWC 905.6	APK3 ??APK32	Eumeralla Formation	Base *F. asymmetricus* Base *T. reticulata* Base *F. wonthaggiensis*	A possible *P. parvispinosus* recorded
SWC 1048.6	APK22 - APK31 ??APK31	Eumeralla Formation or Laira Formation	Base *P. notensis*	Restricted palynoflora
SWC 1174.5	APK122 - APK2 ??APK122	Laira Formation or upper Pretty Hill Formation	Top *M. evansii*	*M evansii* is rare and intermittent.
SWC 1523.6	APK122 - APK2 ??APK122	Laira Formation or upper Pretty Hill Formation	Base *M. evansii*	*M. evansii* recorded lower in the section in cuttings.
SWC 1946.1	APK122 - APK2 APK122	Laira Formation or upper Pretty Hill Formation	Base *D. speciosus*	Only cuttings examined below 1950m

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Palynostratigraphic Datum Reference**	**Remarks**
Core 9.8 - 12.8m	APK5	Eumeralla Formation	Top *C. paradoxa*	Uppermost sample examined
Core 25.9 - 28.8	APK52	Eumeralla Formation	Base *P. grandis*	
Core 96.7 - 103.0	APK4 - APK5 APK51	Eumeralla Formation	Base *C. paradoxa*	*C. paradoxa* recorded from lower in the section but is considered to be contamination.
SWC 360	APK4	Eumeralla Formation	Base *C. striatus*	Core sample at 342.5 - 328.5m strongly contaminated with Late Cretaceous to Tertiary taxa.
SWC 550	APK3	Eumeralla Formation	Top *F. "reticulowonthaggiensis"*	
Core 705.1 - 706.3	APK3	Eumeralla Formation	Base *F. "reticulowonthaggiensis"*	
Core 777.8 - 778.0	APK32	Eumeralla Formation	Base *P. parvispinosus*	
The assemblages from 750m to 1050m seem to be a little odd including *C. paradoxa* (clearly a contaminant) and the presence of *F. asymmetricus* in the sand unit below 1000m (a Pretty Hill sand) suggest there is a contamination problem even though the section was sampled by Conventional Cores and Side Wall Cores. The presence (at 965m) of the APK22 marker (*P. notensis*) in what is otherwise a very lean palynoflora just above the sand perhaps should be accepted cautiously.				
SWC 1006	APK2 ??APK21	Laira Formation or Pretty Hill Formation	Base *F. wonthaggiensis* Top & Base *M. evansii*	Some contamination
Core 1061.1 - 1066	APK122 - APK2 ??APK122	Basal Laira Formation or Pretty Hill Formation	Base *D. speciosus*	

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy** (***Log Interp***)	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 1346	APK121 - APK2 ?APK12	Basal Laira Formation or Pretty Hill Formation	Base *C. hughesii*	Deepest sample examined

Sample Sample Type Depth (Metres	**Palynostratigraphic** **Unit** **Age**	**Inferred** **Lithostratigraphy** *(Log Interp)*	**Palynostratigraphic** **Datum Reference**	**Remarks**
SWC 96 745m	APK1 - APK6			Sparse palynoflora
SWC 95 805	APK4 - APK52 APK52	Eumeralla Formation	Base *P. notensis*	
SWC 1155 - 1217	APK1 - APK4 ??APK3	Eumeralla Formation		Sparse palynofloras
SWC 1228	APK2 APK211	Laira Formation or upper Pretty Hill Formation	Base *F. wonthaggiensis*	
SWC 1259	APK122 - APK21 ???APK211	Laira Formation or Pretty Hill Formation		Impoverished palynofloras
SWC 1293	APK122 - APK2 APK122	Basal Laira Formation or Pretty hills Formation		Palynofloras with moderate diversity. "Microforaminifera" present at 1564m
SWC 1669	APK122 - APK2 APK122	Basal Laira Formation or Pretty Hill Formation	Base *C. variabilis*	
SWC 2313	APK122 - APK2 APK122	Basal Laira Formation or Pretty Hill Formation	Base *D. speciosus* var *"speciosus"* 824	*D. speciosus* var *"cloisonne"* 4680 recovered at 2455m may be contamination. (Single specimen in "Kerogen" slide seem a bit fresher than other forms)
SWC 2320.5	APK12 - APK2 APK122	Basal Laira Formation or Pretty Hill Formation	Base *D. speciosus* var *"strigosus"* 4668	

APG Consultants
Palynostratigraphic Data

Sawpit #1
(Species distribution data from Price, 1993)

Sample Sample Type Depth (Metres	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 2391	APK12 APK121	Pretty Hill Formation	Base *C. hughesii* var *"hughesii"* 693	
SWC 2461	APK1 APK121	Pretty Hills Formation	Base *C. hughesii* var *"cuneiformis"* 4662	*C. "quasihughesii"* 839 recorded down to 2482m.
SWC 2482	APJ62 - APK1 APK11 "Casterton" palynofacies	Casterton Formation		
SWC 2505	APJ62 - APK1 APK11 "Casterton" palynofacies	Casterton Formation	Base *C. equalis* Base *F. dailyi*	Deepest sample examined

APG Consultants
Palynostratigraphic Data

Zema #1
(Species distribution data from Morgan, 1992)

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy (*Log Interp*)**	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 1556	APK4 - APK5 APK4	Eumeralla Formation	Base *C. striatus* Highest sample examined	Younger forms including *P. grandis* and *C. paradoxa* recorded from deeper cuttings samples.
SWC 1832.5	APK3 APK321	Eumeralla Formation	Top *C. variabilis*	
SWC 1884	APK3 APK321	Eumeralla Formation	Base *P. parvispinosus*	*F. "reticulowonthaggiensis"* deeper (1896m) but in cuttings
SWC 1905	APK3 APK31	Eumeralla Formation	Base *F. asymmetricus* Base *P. notensis*	Both *F asymmetricus* and *P. notensis* deeper (1911m) but in cuttings samples.
Cuttings 1905 - 1908	APK21 - APK3 ??APK321	??Eumeralla Formation	Top *M. evansii*	
Cuttings 1911	APK21 - APK31 APK21	Laira Formation	Top abundant *M. evansii*	Significant Eumeralla Formation contamination.
SWC 1926	APK2 APK212	Laira Formation	Base *T. reticulatus*	
SWC 2093	APK2 ?APK212	Lower Laira Formation or upper Pretty Hills Formation	Base abundant *M. evansii*	
SWC 2389.5	APK2 APK211	Laira Formation or upper Pretty Hill Formation	Base *M. evansii*	Below 2400m the species diversity of the recovered palynofloras declines markedly reflecting the poor preservation (more arenaceous lithology) and increased thermal alteration.
Core 2451.5	APK2 APK211	Laira Formation or upper Pretty Hill Formation	Base *F. wonthaggiensis*	

Sample Sample Type Depth (Metres)	**Palynostratigraphic Unit Age**	**Inferred Lithostratigraphy** (*Log Interp*)	**Palynostratigraphic Datum Reference**	**Remarks**
SWC 2578	APP122 - APK211 ??APK122	Basal Laira Formation or Pretty Hill Formation	Base *D. speciosus* Base *C. hughesii*	Deepest moderately diverse palynoflora
SWC 2587.6 SWC 2589	APJ6 - APK211 ??APK12	Pretty Hill Formation		Sparse non-diagnostic palynofloras

APPENDIX 11

GFE RESOURCES LTD

APPENDIX 11

VELOCITY SURVEY REPORT

DIGBY-1

Velocity Data

VELOCITY SURVEY

DIGBY No. 1

VICTORIA

AUSTRALIA

for

GFE RESOURCES

recorded by

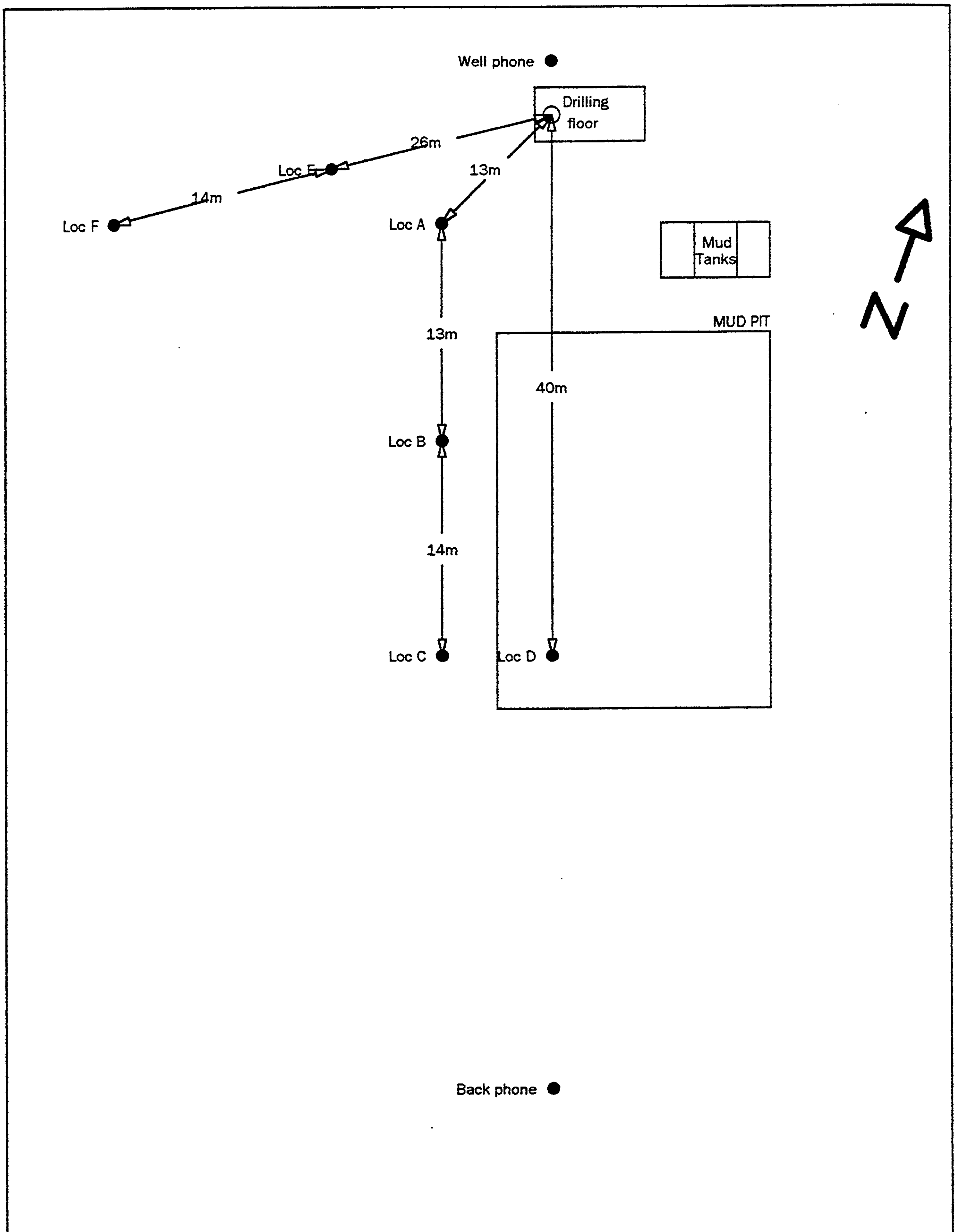
VELOCITY DATA PTY. LTD.

processed by

Integrated Seismic Technologies

Brisbane, Australia
18 July, 1995

CONTENTS



DIGBY 1

SHOT POINT LOCATION SKETCH

G.F.E.

Figure 1

SUMMARY

Velocity Data Pty Ltd conducted a velocity survey for GFE Resources in the Digby No. 1 well, Victoria, Australia. The date of the survey was the 2nd June 1995.

Explosives were used as an energy source with shots being fired in the mud pit in the majority of instances.

GENERAL INFORMATION

Name of Well	: Digby No. 1
Location	: Victoria
Coordinates	: Latitude 37 50 46.18 S : Longitude 141 30 11.25E
Date of Survey	: 2nd June 1995
Weather	: Fine
Operational Base	: Brisbane
Operator	: D. Blick
Shooter	: J. Brown
Client Representative	: Mr. D. Horner

EQUIPMENT

Downhole Tool

Veldata Camlock 100 (90 mm)

Sensors:

6 HSI 4.5 Hz 215 ohm, high temperature (300 degrees F) detectors connected in series parallel. Frequency response 8-300 Hz within 3 dB.

Preamplifier:

48 dB fixed gain.
Frequency response 5-200 Hz within 3 dB.

Reference Geophone

Mark Products L1 4.5 Hz

Recording Instruments

System VDL 16

Windows based high resolution seismic acquisition instruments

Computer :	386 Portable computer
Resolution :	A/D conversion 16 bits
Dynamic Range :	96dB
Total Gain :	136dB
Data channels :	8
Display :	A4 Bubble Jet Printer 300 D.P.I.

RECORDING

Energy Source	: Explosive, Powergel
Shot Location	: Mud pit
Charge Size	: .2/6 sticks
Average Shot Depth	: 2.5 metres
Mud Pit Shot Offset	: 40.0 metres
Recording Geometry	: Figure 1

Acquisition of the survey was carried out using the VDLS 16 recording system.

Shots were recorded on $3^1/_2$" floppy disc. The sample rate was 0.5 msec for the entire survey.

The scale of the graphic display varies with signal strength and is noted on each playout.
The times were picked from a sample by sample screen plot, a full set of these trace displays can be seen at the rear of the report.

PROCESSING

Elevation Data

Elevation of KB	: 143.7m above sea level
Elevation of Ground	: 138.0m above sea level
Elevation of Seismic Datum	: 0.0m above sea level
Depth Surveyed	: 2085.0m below KB
Depth of Casing	: 337.0m below KB

PROCESSING

Recorded Data

Number of Shots Used : 32

Number of Levels Recorded : 21

Data Quality : Good

Noise Level : Moderate

Corrections to Obtain Vertically Corrected Time

The 'corrected' times shown on the calculation sheet have been obtained by:

(1) Pit Fatigue Correction

An examination of the surface channel information indicated pit fatigue did exist across the survey. This resulted from collapse of the mud pit. To compensate for this effect both the Well phone and Back phone were analysed for a difference in travel time between the two. This difference represents the shift applied to a shot prior to calculating the vertically corrected time.

The shots and associated shifts are illustrated in the table below.

Shot Number	Fatigue Correction (ms)
12	-3.0
13	-4.0
14	-8.0
15	-7.5
16	-7.5
17	-8.5
18	-6.0
19	-6.0
20	-9.0
21	-10.5
22	-7.5
23	-9.0
24	-8.0
25	-11.0
26	-9.0
27	-10.5
28	-9.5
29	-10.0
30	-11.0
31	-11.0
32	-11.0

(2) Subtraction of the instrument delay (2msec) from the recorded arrival times.

(3) Geometric correction for non-verticality of ray paths resulting from shot offset.

(4) Addition of an Uphole correction time which corrects for the depth of shot below ground level for shots external to the pit using an uphole time (1.5msec) determined from surface channel information.

(5) Replacement velocity to correct for variation in elevation between the ground level of the shot and ground level of the well head.

(6) re-addition of the instrument delay (2msec).

Mud Pit Calibration

Due to a variation in shooting conditions between shots discharged within the pit to those external to the pit, It is necessary to tie the mud pit shots to the external shots. Thus a bulk shift of 7.9msec has been applied which has been calculated from the difference in corrected vertical time for pit and external shots at the 143.7m below KB level.

Correction to Datum

The datum chosen was 0.0 metres ASL that is 143.7 metres below KB. This level was shot eight times during the survey, all of which have been used to calculate an effective datum correction time of 85msec. Please note this time includes a 2msec instrument delay which must be subtracted to obtain the raw pick time.

Calibration of Sonic Log - Method

A sonic log was not provided by GFE Resources. As a result all values appearing on the calculation sheet are un-calibrated.

PROCESSING

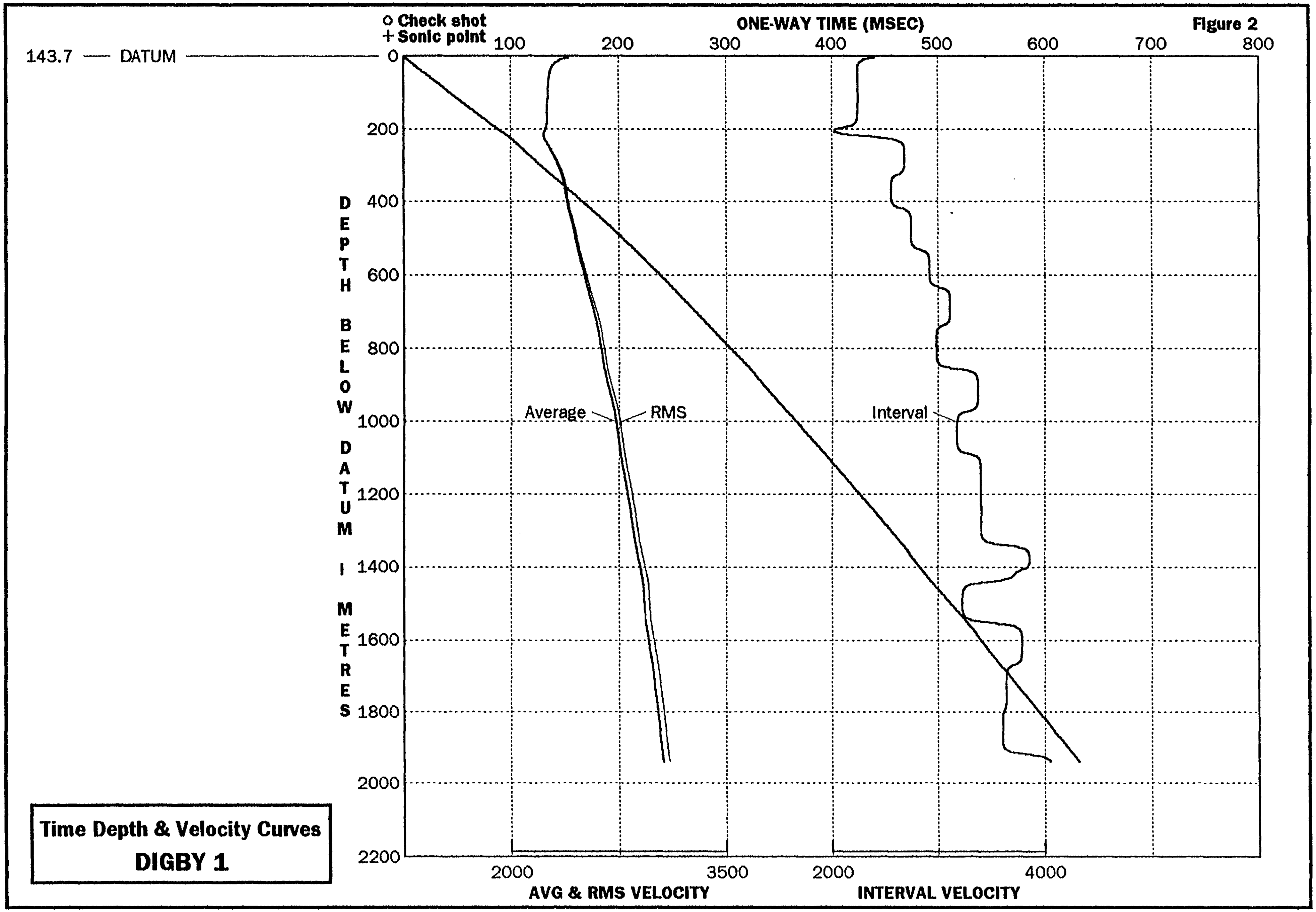
Trace Playouts (Figure 3)

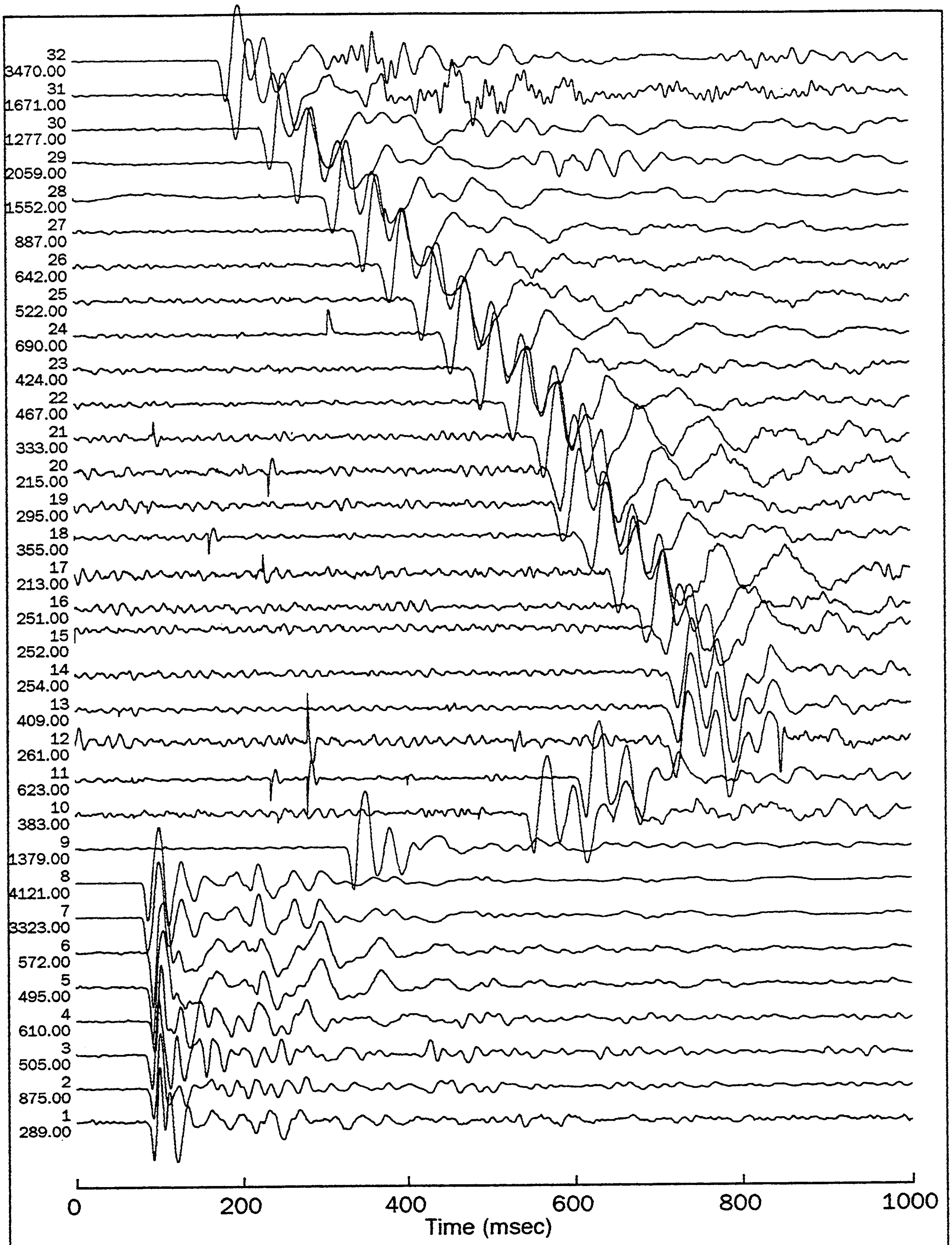
Figure 3A is a plot of all raw data traces used.

Figure 3B is a plot to scale in depth and time of selected traces.

Figure 3C is a plot of selected surface traces. .

Troy Peters
Geophysicist.

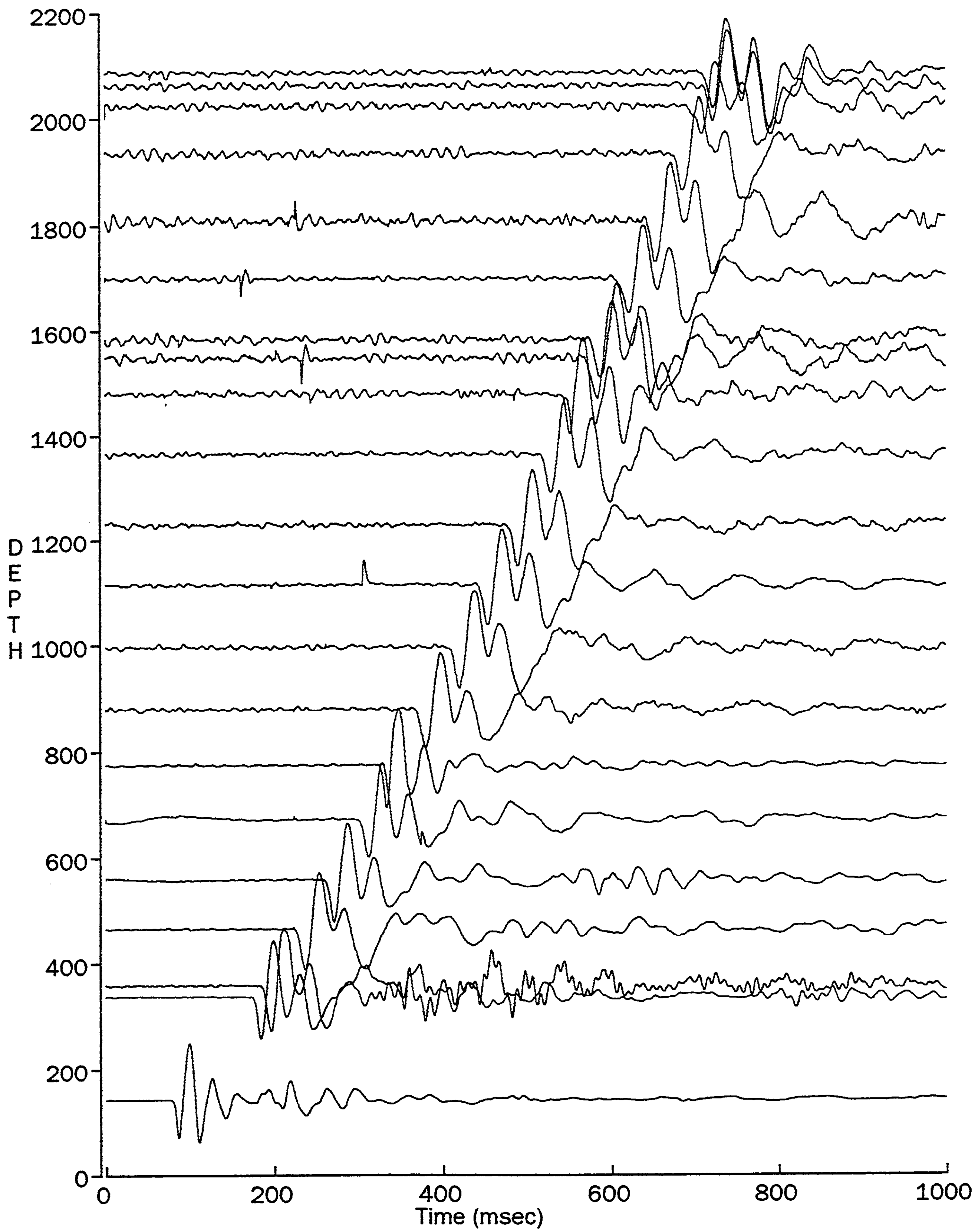

○ Check shot
+ Sonic point
ONE-WAY TIME (MSEC)
Figure 2
100
200
300
400
500
600
700
800
143.7 — DATUM
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
DEPTH BELOW DATUM I METRES
Average
RMS
Interval
2000
3500
AVG & RMS VELOCITY
2000
4000
INTERVAL VELOCITY
Time Depth & Velocity Curves
DIGBY 1



DIGBY 1

VELOCITY SURVEY TRACE DISPLAY

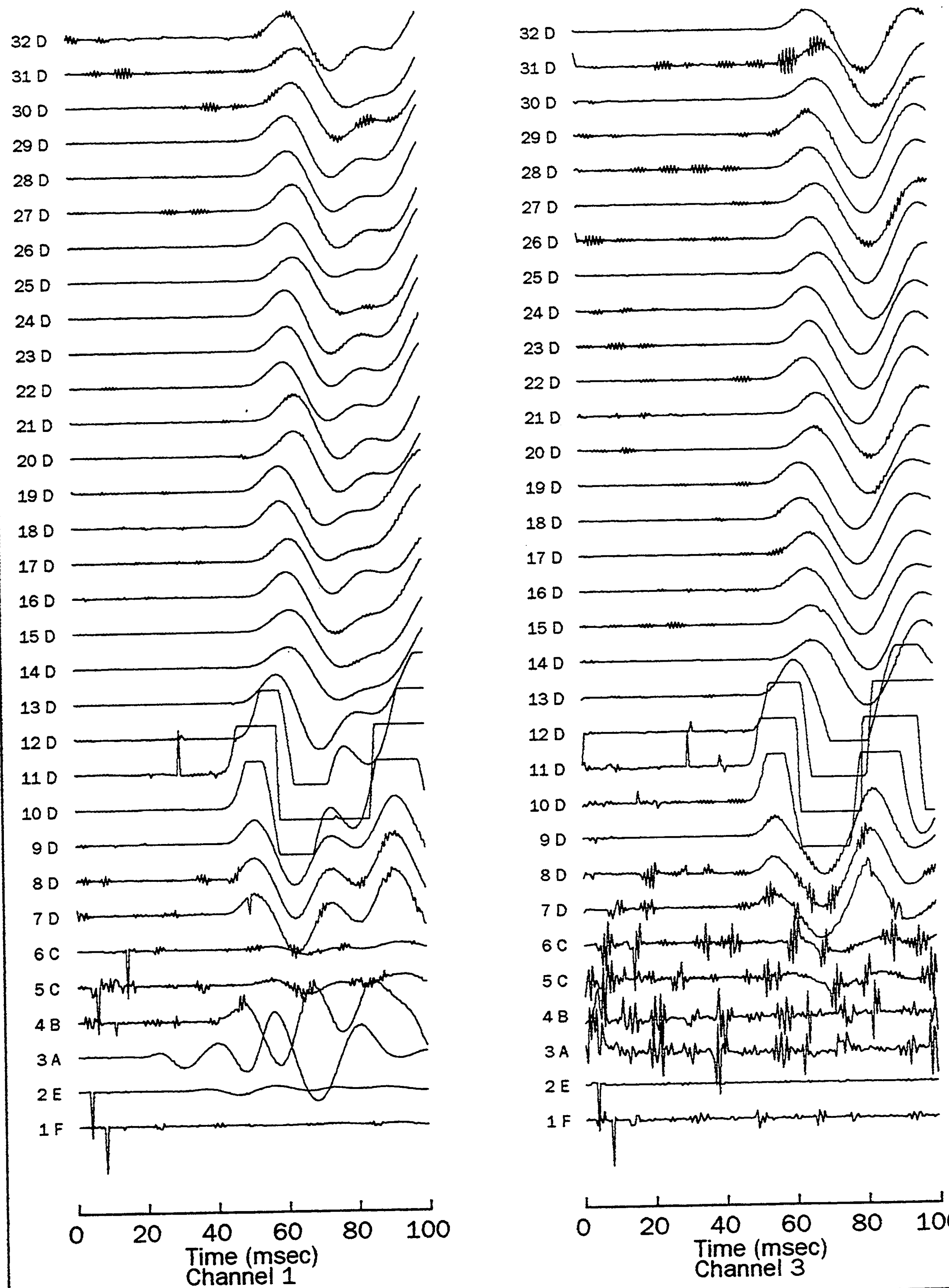
Figure 3A



DIGBY 1

VELOCITY SURVEY TRACE DISPLAY

Figure 3B



DIGBY 1

VELOCITY SURVEY TRACE DISPLAY
AUXILIARY CHANNELS

Figure 3C

COMPANY : G.F.E.
WELL : DIGBY 1

Latitude : 37 50 46.183 S   Longitude : 141 30 11.257E   Survey date : 02-Jun-95   Survey units : METRES
Elevations : Datum : 0   Ground : 138   Kelly : 143.7   Times : MILLISECONDS

Shot data : Location	Elevation	Offset
A	138.0	13.0
B	138.0	26.0
C	135.0	40.0
E	138.0	26.0
F	137.5	40.0
D	134.5	40.0

Rig Identification : CENTURY 11
Energy source : POWERGEL
Logger : B.P.B
Elevation velocity for shot statics : 1700
Instrument delay : 2.0 msec

SHOT CALCULATIONS :

Shot no.	Geophone depth Kelly	Geophone depth Datum	Shot Locn	Shot Depth	TIMES Record	TIMES Corr.	TIMES Avg.	TIMES Datum	Check shot interval distance	Check shot interval time	Velocities Average	Velocities RMS	Velocities Interval
DATUM													
1	143.7	0.0	F	0.6	86.5	84.9							
2	143.7	0.0	E	0.6	84.5	84.6							
3	143.7	0.0	A	0.6	83.5	84.6							
4	143.7	0.0	B	0.6	86.0	86.0							
5	143.7	0.0	C	0.6	85.0	84.8							
6	143.7	0.0	C	0.6	85.0	84.8							
7	143.7	0.0	D	2.5	78.5	85.2							
8	143.7	0.0	D	2.5	78.0	84.7	85.0	0.0					
									194.3	86.3			2251.4
32	338.0	194.3	D	1.0	162.5	171.3	171.3	86.3			2251.4	2251.4	
									22.0	10.6			2075.5
31	360.0	216.3	D	1.0	173.0	181.9	181.9	96.9			2232.2	2232.9	
									107.0	40.3			2655.1
30	467.0	323.3	D	1.0	213.0	222.2	222.2	137.2			2356.4	2364.7	
									93.0	36.1			2576.2
29	560.0	416.3	D	1.0	249.0	258.3	258.3	173.3			2402.2	2410.3	
									113.0	41.1			2749.4
28	673.0	529.3	D	1.0	290.0	299.4	299.4	214.4			2468.8	2478.9	

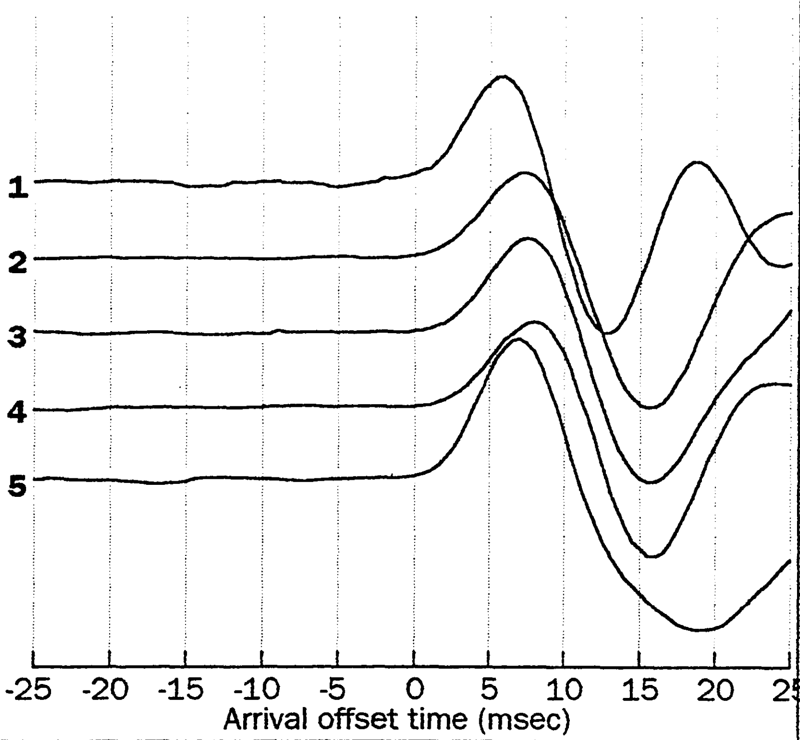
SHOT CALCULATIONS : (cont)

Shot no.	Geophone depth Kelly	Geophone depth Datum	Shot Locn	Shot Depth	TIMES Record	TIMES Corr.	TIMES Avg.	TIMES Datum	Check shot interval distance	Check shot interval time	Velocities Average	Velocities RMS	Velocities Interval
9	775.0	631.3	D	2.5	324.0	333.5			102.0	34.9			2922.6
27	775.0	631.3	D	0.5	325.5	335.0	334.3	249.3			2532.3	2545.7	
									105.0	33.8			3106.5
26	880.0	736.3	D	1.0	358.5	368.1	368.1	283.1			2600.8	2619.0	
									117.0	39.0			3000.0
25	997.0	853.3	D	0.5	397.5	407.1	407.1	322.1			2649.2	2668.0	
									118.0	35.1			3361.8
24	1115.0	971.3	D	1.0	432.5	442.2	442.2	357.2			2719.2	2744.0	
									115.0	36.0			3194.4
23	1230.0	1086.3	D	1.0	468.5	478.2	478.2	393.2			2762.7	2788.2	
									136.0	40.0			3400.0
22	1366.0	1222.3	D	1.2	508.5	518.2	518.2	433.2			2821.6	2850.2	
10	1481.0	1337.3	D	2.5	542.0	551.8			115.0	33.6			3422.6
21	1481.0	1337.3	D	0.8	542.0	551.8	551.8	466.8			2864.8	2895.2	
									69.0	18.0			3833.3
20	1550.0	1406.3	D	1.2	560.0	569.8	569.8	484.8			2900.8	2935.4	
									35.0	9.5			3684.2
19	1585.0	1441.3	D	1.5	569.5	579.3	579.3	494.3			2915.8	2951.6	
11	1695.0	1551.3	D	2.5	603.0	612.8			110.0	33.7			3264.1
18	1695.0	1551.3	D	1.5	603.5	613.3	613.0	528.0			2938.1	2972.5	
									116.0	30.8			3766.2
17	1811.0	1667.3	D	1.0	634.0	643.8	643.8	558.8			2983.7	3021.7	
									124.0	34.0			3647.1
16	1935.0	1791.3	D	1.2	668.0	677.8	677.8	592.8			3021.8	3061.0	
15	2000.0	1856.3	D	1.5	693.5	703.3 n/u							

SHOT CALCULATIONS : (cont)

Shot no.	Geophone depth Kelly	Geophone depth Datum	Shot Locn	Shot Depth	TIMES Record	TIMES Corr.	TIMES Avg.	TIMES Datum	Check shot interval distance	Check shot interval time	Velocities Average	Velocities RMS	Velocities Interval
									125.0	34.5			3623.2
14	2060.0	1916.3	D	1.5	702.5	712.3	712.3	627.3			3054.8	3094.6	
12	2085.0	1941.3	D	2.0	708.5	718.3			25.0	6.3			4000.0
13	2085.0	1941.3	D	2.0	709.0	718.8	718.5	633.5			3064.2	3104.8	

First arrivals plot : DIGBY 1



Shot 1 Location : F
Charge depth 0.6 Size 0.2
Phone depth : 143.7
Arrival time : 86.5 msec

Shot 2 Location : E
Charge depth 0.6 Size 0.2
Phone depth : 143.7
Arrival time : 84.5 msec

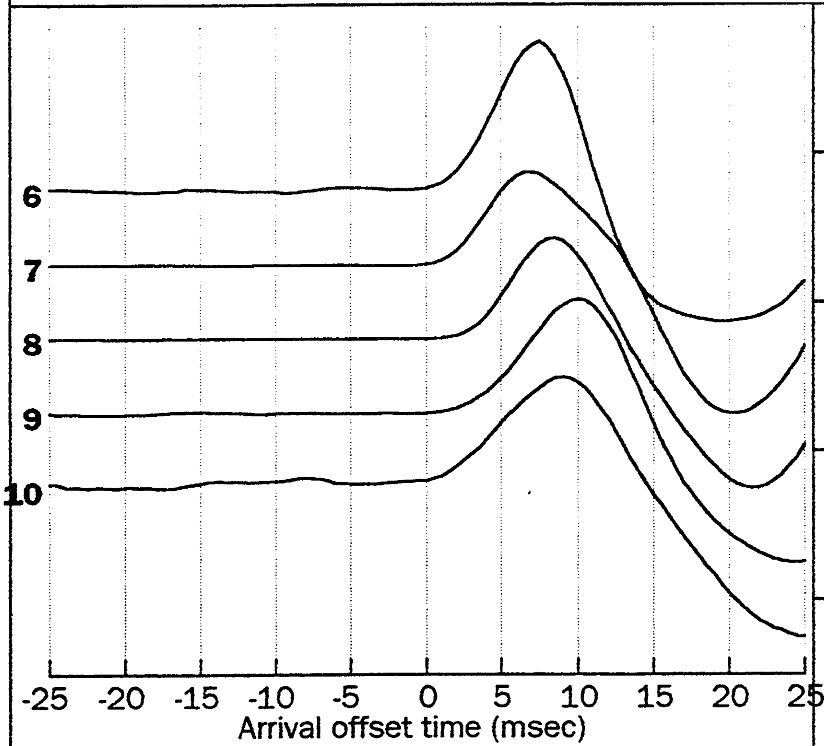
Shot 3 Location : A
Charge depth 0.6 Size 0.2
Phone depth : 143.7
Arrival time : 83.5 msec

Shot 4 Location : B
Charge depth 0.6 Size 0.2
Phone depth : 143.7
Arrival time : 86.0 msec

Shot 5 Location : C
Charge depth 0.6 Size 0.2
Phone depth : 143.7
Arrival time : 85.0 msec

SHOT 1		SHOT 2		SHOT 3		SHOT 4		SHOT 5	
Time	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**
76.0	0.00	74.0	0.00	72.0	0.00	75.0	-2.00	74.0	-13.00
76.5	-1.00	74.5	3.00	72.5	2.00	75.5	-3.00	74.5	-12.00
77.0	-3.00	75.0	6.00	73.0	2.00	76.0	-4.00	75.0	-11.00
77.5	-1.00	75.5	7.00	73.5	1.00	76.5	-6.00	75.5	-10.00
78.0	-3.00	76.0	5.00	74.0	-7.00	77.0	-7.00	76.0	-9.00
78.5	0.00	76.5	4.00	74.5	-5.00	77.5	-9.00	76.5	-9.00
79.0	-1.00	77.0	1.00	75.0	-3.00	78.0	-10.00	77.0	-6.00
79.5	1.00	77.5	-2.00	75.5	-2.00	78.5	-8.00	77.5	-4.00
80.0	-1.00	78.0	-5.00	76.0	-3.00	79.0	-9.00	78.0	-5.00
80.5	2.00	78.5	-5.00	76.5	-3.00	79.5	-9.00	78.5	-6.00
81.0	3.00	79.0	-6.00	77.0	-3.00	80.0	-4.00	79.0	-8.00
81.5	8.00	79.5	-8.00	77.5	-4.00	80.5	-4.00	79.5	-8.00
82.0	7.00	80.0	-10.00	78.0	-3.00	81.0	-7.00	80.0	-12.00
82.5	6.00	80.5	-10.00	78.5	-2.00	81.5	-8.00	80.5	-11.00
83.0	4.00	81.0	-9.00	79.0	-2.00	82.0	-6.00	81.0	-12.00
83.5	2.00	81.5	0.00	79.5	-1.00	82.5	-6.00	81.5	-12.00
84.0	0.00	82.0	-1.00	80.0	-3.00	83.0	-6.00	82.0	-12.00
84.5	-2.00	82.5	0.00	80.5	-4.00	83.5	-6.00	82.5	-13.00
85.0	-9.00	83.0	-2.00	81.0	-4.00	84.0	-6.00	83.0	-13.00
85.5	-8.00	83.5	-3.00	81.5	-4.00	84.5	-5.00	83.5	-13.00
86.0	-10.00	84.0	-6.00	82.0	-2.00	85.0	-6.00	84.0	-15.00
86.5	**-13.00**	**84.5**	**-10.00**	82.5	-3.00	85.5	-5.00	84.5	-17.00
87.0	-17.00	85.0	-17.00	83.0	-7.00	**86.0**	**-7.00**	**85.0**	**-20.00**
87.5	-24.00	85.5	-25.00	**83.5**	**-10.00**	86.5	-11.00	85.5	-28.00
88.0	-27.00	86.0	-38.00	84.0	-16.00	87.0	-14.00	86.0	-39.00
88.5	-42.00	86.5	-56.00	84.5	-25.00	87.5	-24.00	86.5	-53.00
89.0	-58.00	87.0	-81.00	85.0	-35.00	88.0	-36.00	87.0	-81.00
89.5	-80.00	87.5	-108.00	85.5	-52.00	88.5	-52.00	87.5	-110.00
90.0	-105.00	88.0	-145.00	86.0	-74.00	89.0	-70.00	88.0	-151.00
90.5	-127.00	88.5	-192.00	86.5	-101.00	89.5	-96.00	88.5	-203.00
91.0	-154.00	89.0	-232.00	87.0	-128.00	90.0	-127.00	89.0	-258.00
91.5	-175.00	89.5	-287.00	87.5	-163.00	90.5	-158.00	89.5	-306.00
92.0	-189.00	90.0	-343.00	88.0	-201.00	91.0	-197.00	90.0	-363.00
92.5	-202.00	90.5	-396.00	88.5	-232.00	91.5	-237.00	90.5	-413.00
93.0	-203.00	91.0	-437.00	89.0	-265.00	92.0	-275.00	91.0	-444.00
93.5	-192.00	91.5	-468.00	89.5	-294.00	92.5	-302.00	91.5	-469.00
94.0	-173.00	92.0	-492.00	90.0	-312.00	93.0	-325.00	92.0	-476.00
94.5	-139.00	92.5	-492.00	90.5	-319.00	93.5	-345.00	92.5	-461.00
95.0	-96.00	93.0	-476.00	91.0	-314.00	94.0	-351.00	93.0	-435.00
95.5	-52.00	93.5	-433.00	91.5	-293.00	94.5	-342.00	93.5	-382.00
96.0	7.00	94.0	-366.00	92.0	-262.00	95.0	-317.00	94.0	-316.00
96.5	66.00	94.5	-293.00	92.5	-213.00	95.5	-274.00	94.5	-249.00
97.0	122.00	95.0	-188.00	93.0	-149.00	96.0	-224.00	95.0	-166.00
97.5	166.00	95.5	-64.00	93.5	-79.00	96.5	-148.00	95.5	-79.00
98.0	213.00	96.0	48.00	94.0	-4.00	97.0	-59.00	96.0	2.00

First arrivals plot : DIGBY 1



Shot 6 Location : C
Charge depth 0.6 Size 0.2
Phone depth : 143.7
Arrival time : 85.0 msec

Shot 7 Location : D
Charge depth 2.5 Size 0.2
Phone depth : 143.7
Arrival time : 78.5 msec

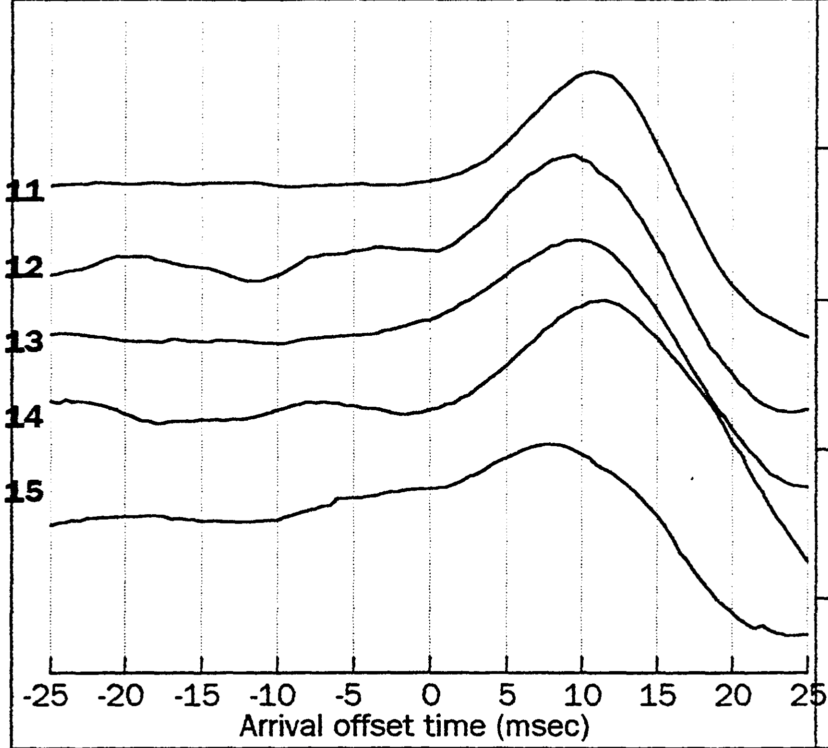
Shot 8 Location : D
Charge depth 2.5 Size 0.5
Phone depth : 143.7
Arrival time : 78.0 msec

Shot 9 Location : D
Charge depth 2.5 Size 1.0
Phone depth : 775.0
Arrival time : 324.0 msec

Shot 10 Location : D
Charge depth 2.5 Size 2.0
Phone depth : 1481.0
Arrival time : 542.0 msec

SHOT 6		SHOT 7		SHOT 8		SHOT 9		SHOT 10	
Time	Ampl	Time	Ampl	Time	Ampl	Time	Ampl	Time	Ampl
74.0	2.00	68.0	-3.00	67.0	-1.00	313.0	2.00	531.0	-16.00
74.5	3.00	68.5	-3.00	67.5	-3.00	313.5	0.00	531.5	-17.00
75.0	3.00	69.0	-2.00	68.0	-3.00	314.0	-3.00	532.0	-17.00
75.5	9.00	69.5	-3.00	68.5	-5.00	314.5	-4.00	532.5	-19.00
76.0	7.00	70.0	-3.00	69.0	-3.00	315.0	-5.00	533.0	-22.00
76.5	4.00	70.5	-4.00	69.5	-5.00	315.5	-6.00	533.5	-25.00
77.0	1.00	71.0	-4.00	70.0	-6.00	316.0	-5.00	534.0	-27.00
77.5	-2.00	71.5	-5.00	70.5	-8.00	316.5	-4.00	534.5	-25.00
78.0	-6.00	72.0	-7.00	71.0	-6.00	317.0	-4.00	535.0	-24.00
78.5	-10.00	72.5	-5.00	71.5	-10.00	317.5	-2.00	535.5	-20.00
79.0	-11.00	73.0	-5.00	72.0	-8.00	318.0	-1.00	536.0	-13.00
79.5	-12.00	73.5	-4.00	72.5	-7.00	318.5	1.00	536.5	-12.00
80.0	-12.00	74.0	-3.00	73.0	-5.00	319.0	-1.00	537.0	-12.00
80.5	-11.00	74.5	-2.00	73.5	-4.00	319.5	0.00	537.5	-10.00
81.0	-10.00	75.0	2.00	74.0	-3.00	320.0	-1.00	538.0	-11.00
81.5	-9.00	75.5	3.00	74.5	-3.00	320.5	-2.00	538.5	-11.00
82.0	-8.00	76.0	6.00	75.0	-3.00	321.0	-4.00	539.0	-12.00
82.5	-4.00	76.5	7.00	75.5	-2.00	321.5	-5.00	539.5	-14.00
83.0	-3.00	77.0	7.00	76.0	-3.00	322.0	-5.00	540.0	-15.00
83.5	-3.00	77.5	7.00	76.5	-2.00	322.5	-2.00	540.5	-18.00
84.0	-3.00	78.0	1.00	77.0	-4.00	323.0	0.00	541.0	-17.00
84.5	-8.00	**78.5**	**-10.00**	77.5	-5.00	323.5	0.00	541.5	-20.00
85.0	**-9.00**	79.0	-31.00	**78.0**	**-9.00**	**324.0**	**-4.00**	**542.0**	**-19.00**
85.5	-20.00	79.5	-60.00	78.5	-17.00	324.5	-9.00	542.5	-25.00
86.0	-30.00	80.0	-121.00	79.0	-31.00	325.0	-20.00	543.0	-31.00
86.5	-51.00	80.5	-212.00	79.5	-60.00	325.5	-35.00	543.5	-43.00
87.0	-77.00	81.0	-320.00	80.0	-97.00	326.0	-49.00	544.0	-56.00
87.5	-111.00	81.5	-488.00	80.5	-171.00	326.5	-76.00	544.5	-73.00
88.0	-149.00	82.0	-697.00	81.0	-285.00	327.0	-110.00	545.0	-88.00
88.5	-199.00	82.5	-940.00	81.5	-421.00	327.5	-154.00	545.5	-103.00
89.0	-257.00	83.0	-1157.00	82.0	-627.00	328.0	-197.00	546.0	-124.00
89.5	-309.00	83.5	-1420.00	82.5	-898.00	328.5	-256.00	546.5	-146.00
90.0	-374.00	84.0	-1662.00	83.0	-1215.00	329.0	-327.00	547.0	-167.00
90.5	-436.00	84.5	-1833.00	83.5	-1502.00	329.5	-395.00	547.5	-187.00
91.0	-490.00	85.0	-1982.00	84.0	-1853.00	330.0	-485.00	548.0	-205.00
91.5	-532.00	85.5	-2065.00	84.5	-2186.00	330.5	-583.00	548.5	-226.00
92.0	-557.00	86.0	-2075.00	85.0	-2427.00	331.0	-685.00	549.0	-242.00
92.5	-572.00	86.5	-2033.00	85.5	-2648.00	331.5	-771.00	549.5	-257.00
93.0	-553.00	87.0	-1933.00	86.0	-2778.00	332.0	-867.00	550.0	-272.00
93.5	-513.00	87.5	-1797.00	86.5	-2805.00	332.5	-951.00	550.5	-282.00
94.0	-453.00	88.0	-1664.00	87.0	-2743.00	333.0	-1004.00	551.0	-285.00
94.5	-383.00	88.5	-1493.00	87.5	-2578.00	333.5	-1048.00	551.5	-282.00
95.0	-293.00	89.0	-1319.00	88.0	-2326.00	334.0	-1062.00	552.0	-271.00
95.5	-195.00	89.5	-1167.00	88.5	-2053.00	334.5	-1049.00	552.5	-257.00
96.0	-92.00	90.0	-996.00	89.0	-1688.00	335.0	-1001.00	553.0	-234.00

First arrivals plot : DIGBY 1



Shot 11 Location : D
Charge depth 2.5 Size 3.0
Phone depth : 1695.0
Arrival time : 603.0 msec

Shot 12 Location : D
Charge depth 2.0 Size 4.0
Phone depth : 2085.0
Arrival time : 711.5 msec

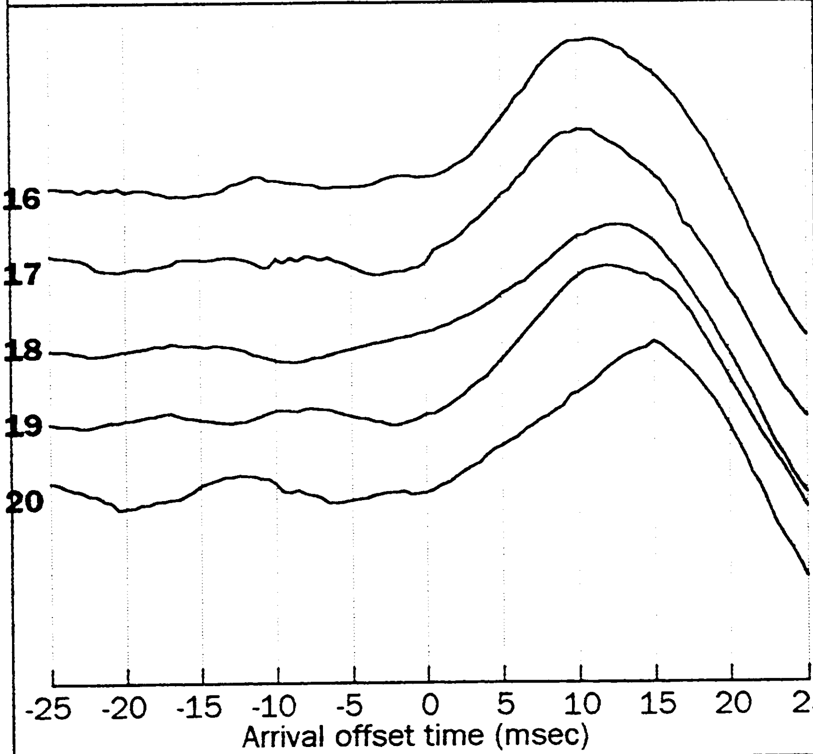
Shot 13 Location : D
Charge depth 2.0 Size 6.0
Phone depth : 2085.0
Arrival time : 713.0 msec

Shot 14 Location : D
Charge depth 1.5 Size 5.0
Phone depth : 2060.0
Arrival time : 710.5 msec

Shot 15 Location : D
Charge depth 1.5 Size 3.0
Phone depth : 2000.0
Arrival time : 701.0 msec

SHOT 11		SHOT 12		SHOT 13		SHOT 14		SHOT 15	
Time	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**
592.0	-10.00	700.0	28.00	702.0	15.00	700.0	4.00	690.0	57.00
592.5	-5.00	700.5	24.00	702.5	16.00	700.5	1.00	690.5	57.00
593.0	-2.00	701.0	20.00	703.0	17.00	701.0	-4.00	691.0	55.00
593.5	1.00	701.5	14.00	703.5	16.00	701.5	-6.00	691.5	51.00
594.0	3.00	702.0	7.00	704.0	11.00	702.0	-10.00	692.0	47.00
594.5	0.00	702.5	0.00	704.5	7.00	702.5	-11.00	692.5	44.00
595.0	1.00	703.0	-9.00	705.0	4.00	703.0	-15.00	693.0	40.00
595.5	-3.00	703.5	-10.00	705.5	2.00	703.5	-13.00	693.5	37.00
596.0	-2.00	704.0	-13.00	706.0	0.00	704.0	-15.00	694.0	32.00
596.5	-6.00	704.5	-13.00	706.5	0.00	704.5	-13.00	694.5	31.00
597.0	-5.00	705.0	-14.00	707.0	-3.00	705.0	-13.00	695.0	19.00
597.5	-8.00	705.5	-15.00	707.5	-4.00	705.5	-9.00	695.5	20.00
598.0	-6.00	706.0	-19.00	708.0	-6.00	706.0	-10.00	696.0	18.00
598.5	-13.00	706.5	-20.00	708.5	-7.00	706.5	-7.00	696.5	18.00
599.0	-7.00	707.0	-22.00	709.0	-8.00	707.0	-5.00	697.0	15.00
599.5	-5.00	707.5	-25.00	709.5	-11.00	707.5	-5.00	697.5	14.00
600.0	-4.00	708.0	-24.00	710.0	-17.00	708.0	-3.00	698.0	11.00
600.5	-5.00	708.5	-23.00	710.5	-21.00	708.5	1.00	698.5	8.00
601.0	-6.00	709.0	-22.00	711.0	-28.00	709.0	2.00	699.0	7.00
601.5	-9.00	709.5	-21.00	711.5	-32.00	709.5	3.00	699.5	5.00
602.0	-12.00	710.0	-21.00	712.0	-39.00	710.0	1.00	700.0	4.00
602.5	-17.00	710.5	-19.00	712.5	-44.00	**710.5**	**0.00**	700.5	4.00
603.0	**-19.00**	711.0	-18.00	**713.0**	**-46.00**	711.0	-4.00	**701.0**	**3.00**
603.5	-27.00	**711.5**	**-18.00**	713.5	-55.00	711.5	-6.00	701.5	1.00
604.0	-33.00	712.0	-23.00	714.0	-67.00	712.0	-11.00	702.0	0.00
604.5	-44.00	712.5	-29.00	714.5	-76.00	712.5	-13.00	702.5	-4.00
605.0	-53.00	713.0	-39.00	715.0	-91.00	713.0	-20.00	703.0	-10.00
605.5	-66.00	713.5	-48.00	715.5	-98.00	713.5	-24.00	703.5	-18.00
606.0	-84.00	714.0	-58.00	716.0	-115.00	714.0	-34.00	704.0	-22.00
606.5	-99.00	714.5	-68.00	716.5	-128.00	714.5	-41.00	704.5	-29.00
607.0	-121.00	715.0	-81.00	717.0	-142.00	715.0	-50.00	705.0	-38.00
607.5	-148.00	715.5	-93.00	717.5	-155.00	715.5	-58.00	705.5	-44.00
608.0	-173.00	716.0	-106.00	718.0	-169.00	716.0	-66.00	706.0	-50.00
608.5	-204.00	716.5	-116.00	718.5	-185.00	716.5	-76.00	706.5	-55.00
609.0	-235.00	717.0	-128.00	719.0	-196.00	717.0	-86.00	707.0	-61.00
609.5	-266.00	717.5	-138.00	719.5	-208.00	717.5	-95.00	707.5	-66.00
610.0	-292.00	718.0	-144.00	720.0	-220.00	718.0	-105.00	708.0	-69.00
610.5	-324.00	718.5	-152.00	720.5	-231.00	718.5	-116.00	708.5	-72.00
611.0	-354.00	719.0	-160.00	721.0	-243.00	719.0	-123.00	709.0	-72.00
611.5	-380.00	719.5	-164.00	721.5	-248.00	719.5	-133.00	709.5	-72.00
612.0	-405.00	720.0	-167.00	722.0	-257.00	720.0	-140.00	710.0	-68.00
612.5	-427.00	720.5	-169.00	722.5	-259.00	720.5	-147.00	710.5	-62.00
613.0	-444.00	721.0	-162.00	723.0	-259.00	721.0	-150.00	711.0	-55.00
613.5	-451.00	721.5	-157.00	723.5	-254.00	721.5	-156.00	711.5	-49.00
614.0	-451.00	722.0	-143.00	724.0	-248.00	722.0	-157.00	712.0	-37.00

First arrivals plot : DIGBY 1



Shot 16 Location : D
Charge depth 1.2 Size 3.0
Phone depth : 1935.0
Arrival time : 675.5 msec

Shot 17 Location : D
Charge depth 1.0 Size 3.0
Phone depth : 1811.0
Arrival time : 642.5 msec

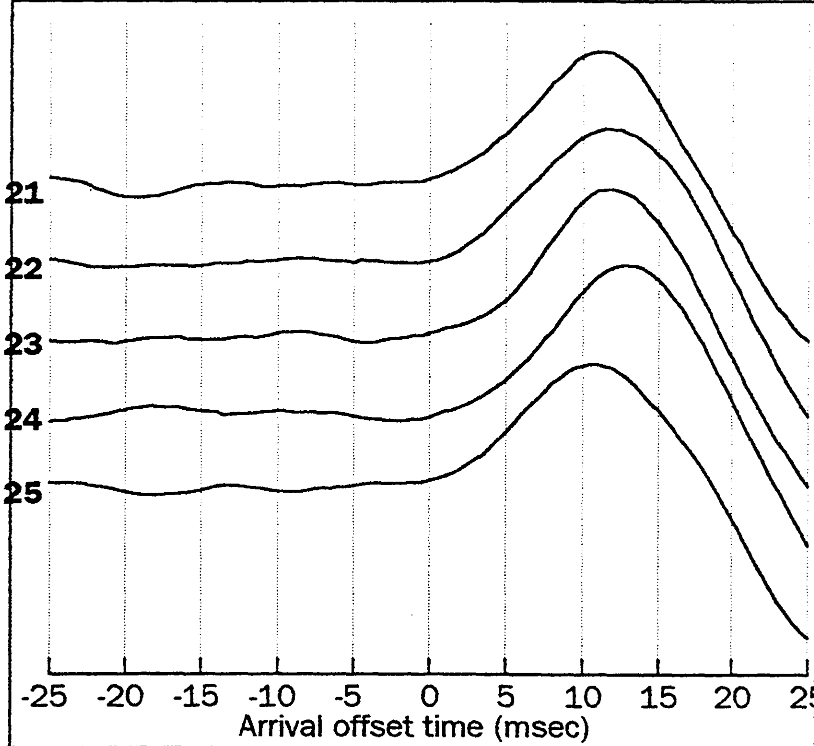
Shot 18 Location : D
Charge depth 1.5 Size 3.0
Phone depth : 1695.0
Arrival time : 609.5 msec

Shot 19 Location : D
Charge depth 1.5 Size 3.0
Phone depth : 1585.0
Arrival time : 575.5 msec

Shot 20 Location : D
Charge depth 1.2 Size 3.0
Phone depth : 1550.0
Arrival time : 569.0 msec

SHOT 16		SHOT 17		SHOT 18		SHOT 19		SHOT 20	
Time	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**
664.0	-17.00	632.0	0.00	598.0	24.00	564.0	-3.00	558.0	-16.00
664.5	-12.00	632.5	1.00	598.5	28.00	564.5	-7.00	558.5	-16.00
665.0	-12.00	633.0	-10.00	599.0	32.00	565.0	-10.00	559.0	-11.00
665.5	-11.00	633.5	-5.00	599.5	34.00	565.5	-10.00	559.5	-3.00
666.0	-9.00	634.0	-11.00	600.0	34.00	566.0	-10.00	560.0	-1.00
666.5	-9.00	634.5	-7.00	600.5	35.00	566.5	-9.00	560.5	-4.00
667.0	-7.00	635.0	-13.00	601.0	32.00	567.0	-13.00	561.0	0.00
667.5	-7.00	635.5	-11.00	601.5	27.00	567.5	-13.00	561.5	2.00
668.0	-4.00	636.0	-8.00	602.0	27.00	568.0	-12.00	562.0	4.00
668.5	-3.00	636.5	-11.00	602.5	22.00	568.5	-12.00	562.5	10.00
669.0	-5.00	637.0	-7.00	603.0	19.00	569.0	-8.00	563.0	10.00
669.5	-4.00	637.5	-4.00	603.5	15.00	569.5	-5.00	563.5	9.00
670.0	-5.00	638.0	0.00	604.0	12.00	570.0	-2.00	564.0	7.00
670.5	-5.00	638.5	4.00	604.5	8.00	570.5	0.00	564.5	6.00
671.0	-6.00	639.0	8.00	605.0	5.00	571.0	1.00	565.0	5.00
671.5	-8.00	639.5	10.00	605.5	2.00	571.5	4.00	565.5	2.00
672.0	-12.00	640.0	10.00	606.0	0.00	572.0	5.00	566.0	0.00
672.5	-15.00	640.5	7.00	606.5	-3.00	572.5	9.00	566.5	-1.00
673.0	-17.00	641.0	6.00	607.0	-7.00	573.0	10.00	567.0	-1.00
673.5	-17.00	641.5	6.00	607.5	-9.00	573.5	7.00	567.5	-3.00
674.0	-17.00	642.0	2.00	608.0	-11.00	574.0	4.00	568.0	1.00
674.5	-15.00	**642.5**	**1.00**	608.5	-16.00	574.5	1.00	568.5	0.00
675.0	-16.00	643.0	-5.00	609.0	-18.00	575.0	-5.00	**569.0**	**-1.00**
675.5	**-16.00**	643.5	-19.00	**609.5**	**-21.00**	**575.5**	**-6.00**	569.5	-4.00
676.0	-19.00	644.0	-24.00	610.0	-27.00	576.0	-11.00	570.0	-9.00
676.5	-23.00	644.5	-28.00	610.5	-31.00	576.5	-17.00	570.5	-12.00
677.0	-29.00	645.0	-33.00	611.0	-38.00	577.0	-24.00	571.0	-18.00
677.5	-33.00	645.5	-40.00	611.5	-44.00	577.5	-31.00	571.5	-24.00
678.0	-39.00	646.0	-51.00	612.0	-50.00	578.0	-41.00	572.0	-29.00
678.5	-49.00	646.5	-57.00	612.5	-57.00	578.5	-49.00	572.5	-33.00
679.0	-60.00	647.0	-67.00	613.0	-66.00	579.0	-56.00	573.0	-42.00
679.5	-71.00	647.5	-76.00	613.5	-73.00	579.5	-68.00	573.5	-48.00
680.0	-81.00	648.0	-86.00	614.0	-86.00	580.0	-79.00	574.0	-52.00
680.5	-92.00	648.5	-91.00	614.5	-92.00	580.5	-90.00	574.5	-57.00
681.0	-105.00	649.0	-104.00	615.0	-102.00	581.0	-102.00	575.0	-61.00
681.5	-113.00	649.5	-112.00	615.5	-108.00	581.5	-115.00	575.5	-69.00
682.0	-126.00	650.0	-125.00	616.0	-121.00	582.0	-127.00	576.0	-74.00
682.5	-139.00	650.5	-133.00	616.5	-132.00	582.5	-138.00	576.5	-80.00
683.0	-148.00	651.0	-144.00	617.0	-142.00	583.0	-149.00	577.0	-84.00
683.5	-156.00	651.5	-153.00	617.5	-155.00	583.5	-161.00	577.5	-90.00
684.0	-163.00	652.0	-159.00	618.0	-166.00	584.0	-173.00	578.0	-95.00
684.5	-168.00	652.5	-159.00	618.5	-178.00	584.5	-183.00	578.5	-107.00
685.0	-168.00	653.0	-163.00	619.0	-187.00	585.0	-192.00	579.0	-110.00
685.5	-169.00	653.5	-162.00	619.5	-189.00	585.5	-198.00	579.5	-115.00
686.0	-170.00	654.0	-162.00	620.0	-198.00	586.0	-201.00	580.0	-121.00

First arrivals plot : DIGBY 1



Shot 21 Location : D
Charge depth 0.75 Size 3.0
Phone depth : 1481.0
Arrival time : 552.5 msec

Shot 22 Location : D
Charge depth 1.2 Size 3.0
Phone depth : 1366.0
Arrival time : 516.0 msec

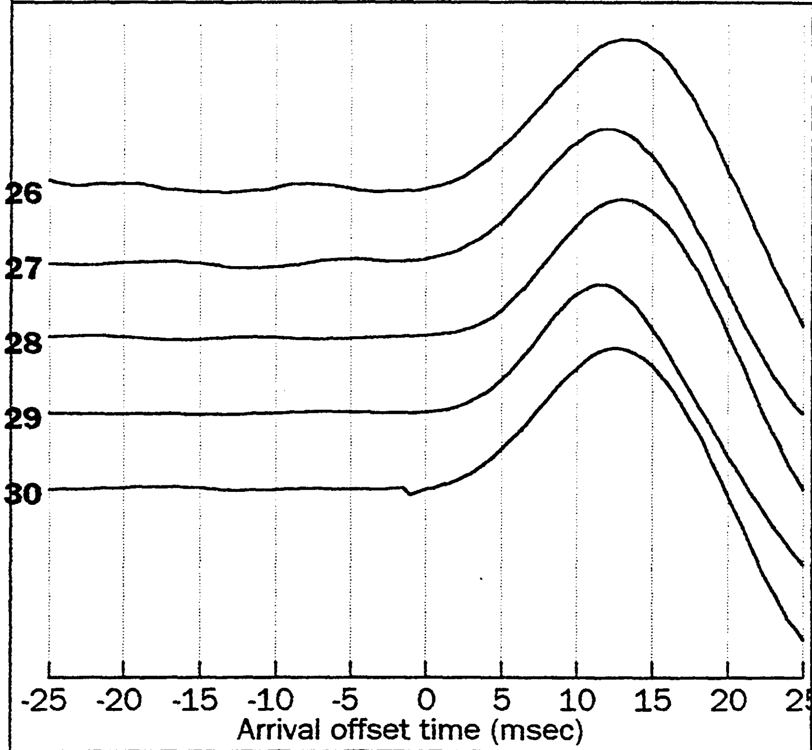
Shot 23 Location : D
Charge depth 1.0 Size 3.0
Phone depth : 1230.0
Arrival time : 477.5 msec

Shot 24 Location : D
Charge depth 1.0 Size 3.0
Phone depth : 1115.0
Arrival time : 440.5 msec

Shot 25 Location : D
Charge depth 0.5 Size 2.0
Phone depth : 997.0
Arrival time : 408.5 msec

SHOT 21		SHOT 22		SHOT 23		SHOT 24		SHOT 25	
Time	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**
542.0	-3.00	505.0	-9.00	466.0	-8.00	430.0	-12.00	398.0	-2.00
542.5	-3.00	505.5	-10.00	466.5	-11.00	430.5	-13.00	398.5	4.00
543.0	-5.00	506.0	-11.00	467.0	-15.00	431.0	-17.00	399.0	8.00
543.5	-5.00	506.5	-14.00	467.5	-17.00	431.5	-16.00	399.5	9.00
544.0	-7.00	507.0	-16.00	468.0	-17.00	432.0	-12.00	400.0	9.00
544.5	-4.00	507.5	-17.00	468.5	-18.00	432.5	-11.00	400.5	9.00
545.0	-8.00	508.0	-15.00	469.0	-17.00	433.0	-10.00	401.0	3.00
545.5	-8.00	508.5	-15.00	469.5	-14.00	433.5	-10.00	401.5	-1.00
546.0	-12.00	509.0	-12.00	470.0	-12.00	434.0	-9.00	402.0	-5.00
546.5	-11.00	509.5	-11.00	470.5	-10.00	434.5	-10.00	402.5	-2.00
547.0	-12.00	510.0	-8.00	471.0	-6.00	435.0	-7.00	403.0	-8.00
547.5	-9.00	510.5	-9.00	471.5	-1.00	435.5	-3.00	403.5	-7.00
548.0	-8.00	511.0	-5.00	472.0	3.00	436.0	2.00	404.0	-11.00
548.5	-7.00	511.5	-12.00	472.5	5.00	436.5	7.00	404.5	-14.00
549.0	-8.00	512.0	-9.00	473.0	5.00	437.0	10.00	405.0	-17.00
549.5	-10.00	512.5	-10.00	473.5	4.00	437.5	12.00	405.5	-19.00
550.0	-12.00	513.0	-6.00	474.0	0.00	438.0	14.00	406.0	-18.00
550.5	-12.00	513.5	-6.00	474.5	-4.00	438.5	16.00	406.5	-19.00
551.0	-12.00	514.0	-5.00	475.0	-4.00	439.0	18.00	407.0	-17.00
551.5	-12.00	514.5	-5.00	475.5	-6.00	439.5	15.00	407.5	-19.00
552.0	-13.00	515.0	-4.00	476.0	-9.00	440.0	13.00	408.0	-21.00
552.5	**-14.00**	515.5	-6.00	476.5	-10.00	**440.5**	**11.00**	**408.5**	**-23.00**
553.0	-19.00	**516.0**	**-8.00**	477.0	-15.00	441.0	5.00	409.0	-27.00
553.5	-23.00	516.5	-11.00	**477.5**	**-19.00**	441.5	-6.00	409.5	-33.00
554.0	-28.00	517.0	-18.00	478.0	-25.00	442.0	-14.00	410.0	-40.00
554.5	-33.00	517.5	-27.00	478.5	-29.00	442.5	-19.00	410.5	-50.00
555.0	-41.00	518.0	-36.00	479.0	-32.00	443.0	-28.00	411.0	-62.00
555.5	-48.00	518.5	-50.00	479.5	-37.00	443.5	-39.00	411.5	-77.00
556.0	-57.00	519.0	-62.00	480.0	-44.00	444.0	-51.00	412.0	-92.00
556.5	-66.00	519.5	-75.00	480.5	-51.00	444.5	-68.00	412.5	-106.00
557.0	-80.00	520.0	-94.00	481.0	-62.00	445.0	-85.00	413.0	-131.00
557.5	-92.00	520.5	-113.00	481.5	-73.00	445.5	-102.00	413.5	-155.00
558.0	-102.00	521.0	-132.00	482.0	-84.00	446.0	-120.00	414.0	-181.00
558.5	-116.00	521.5	-151.00	482.5	-101.00	446.5	-145.00	414.5	-205.00
559.0	-132.00	522.0	-171.00	483.0	-123.00	447.0	-170.00	415.0	-234.00
559.5	-147.00	522.5	-191.00	483.5	-143.00	447.5	-195.00	415.5	-260.00
560.0	-162.00	523.0	-207.00	484.0	-168.00	448.0	-225.00	416.0	-281.00
560.5	-178.00	523.5	-227.00	484.5	-193.00	448.5	-258.00	416.5	-306.00
561.0	-197.00	524.0	-248.00	485.0	-215.00	449.0	-281.00	417.0	-331.00
561.5	-208.00	524.5	-264.00	485.5	-234.00	449.5	-317.00	417.5	-347.00
562.0	-222.00	525.0	-281.00	486.0	-257.00	450.0	-353.00	418.0	-366.00
562.5	-238.00	525.5	-297.00	486.5	-279.00	450.5	-386.00	418.5	-377.00
563.0	-247.00	526.0	-312.00	487.0	-295.00	451.0	-413.00	419.0	-383.00
563.5	-253.00	526.5	-320.00	487.5	-309.00	451.5	-441.00	419.5	-388.00
564.0	-255.00	527.0	-327.00	488.0	-319.00	452.0	-464.00	420.0	-389.00

First arrivals plot : DIGBY 1



Shot 26 Location : D
Charge depth 1.0 Size 2.0
Phone depth : 880.0
Arrival time : 367.5 msec

Shot 27 Location : D
Charge depth 0.5 Size 2.0
Phone depth : 775.0
Arrival time : 336.0 msec

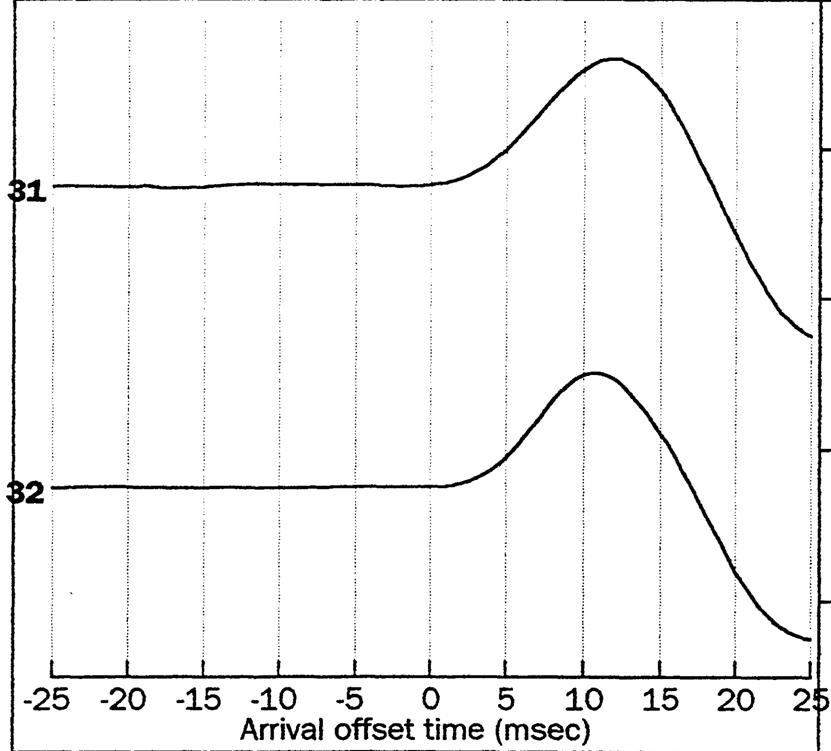
Shot 28 Location : D
Charge depth 1.0 Size 2.0
Phone depth : 673.0
Arrival time : 299.5 msec

Shot 29 Location : D
Charge depth 1.0 Size 2.0
Phone depth : 560.0
Arrival time : 259.0 msec

Shot 30 Location : D
Charge depth 1.0 Size 1.0
Phone depth : 467.0
Arrival time : 224.0 msec

SHOT 26		SHOT 27		SHOT 28		SHOT 29		SHOT 30	
Time	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**	**Time**	**Ampl**
356.0	5.00	325.0	16.00	288.0	-12.00	248.0	-10.00	213.0	5.00
356.5	1.00	325.5	15.00	288.5	-13.00	248.5	-15.00	213.5	4.00
357.0	-3.00	326.0	14.00	289.0	-12.00	249.0	-8.00	214.0	1.00
357.5	-8.00	326.5	12.00	289.5	-11.00	249.5	-13.00	214.5	-3.00
358.0	-12.00	327.0	7.00	290.0	-7.00	250.0	-18.00	215.0	-2.00
358.5	-14.00	327.5	3.00	290.5	-3.00	250.5	-20.00	215.5	-7.00
359.0	-15.00	328.0	-3.00	291.0	-2.00	251.0	-23.00	216.0	-7.00
359.5	-13.00	328.5	-9.00	291.5	-1.00	251.5	-25.00	216.5	-8.00
360.0	-12.00	329.0	-16.00	292.0	1.00	252.0	-29.00	217.0	-5.00
360.5	-10.00	329.5	-17.00	292.5	0.00	252.5	-27.00	217.5	-3.00
361.0	-7.00	330.0	-21.00	293.0	0.00	253.0	-25.00	218.0	-2.00
361.5	-5.00	330.5	-22.00	293.5	0.00	253.5	-24.00	218.5	-5.00
362.0	0.00	331.0	-24.00	294.0	-4.00	254.0	-24.00	219.0	-3.00
362.5	4.00	331.5	-25.00	294.5	-5.00	254.5	-22.00	219.5	-3.00
363.0	7.00	332.0	-23.00	295.0	-9.00	255.0	-20.00	220.0	-2.00
363.5	10.00	332.5	-20.00	295.5	-13.00	255.5	-18.00	220.5	-3.00
364.0	10.00	333.0	-17.00	296.0	-15.00	256.0	-15.00	221.0	-4.00
364.5	7.00	333.5	-13.00	296.5	-19.00	256.5	-14.00	221.5	-5.00
365.0	8.00	334.0	-12.00	297.0	-18.00	257.0	-13.00	222.0	-8.00
365.5	6.00	334.5	-13.00	297.5	-21.00	257.5	-15.00	222.5	-13.00
366.0	6.00	335.0	-16.00	298.0	-23.00	258.0	-15.00	223.0	36.00
366.5	4.00	335.5	-20.00	298.5	-27.00	258.5	-21.00	223.5	15.00
367.0	0.00	**336.0**	**-23.00**	299.0	-27.00	**259.0**	**-22.00**	**224.0**	**-2.00**
367.5	**-4.00**	336.5	-32.00	**299.5**	**-33.00**	259.5	-32.00	224.5	-11.00
368.0	-9.00	337.0	-40.00	300.0	-38.00	260.0	-42.00	225.0	-27.00
368.5	-17.00	337.5	-51.00	300.5	-45.00	260.5	-61.00	225.5	-42.00
369.0	-26.00	338.0	-64.00	301.0	-55.00	261.0	-84.00	226.0	-63.00
369.5	-35.00	338.5	-81.00	301.5	-70.00	261.5	-118.00	226.5	-88.00
370.0	-50.00	339.0	-101.00	302.0	-87.00	262.0	-159.00	227.0	-112.00
370.5	-67.00	339.5	-119.00	302.5	-111.00	262.5	-212.00	227.5	-145.00
371.0	-82.00	340.0	-146.00	303.0	-141.00	263.0	-261.00	228.0	-184.00
371.5	-103.00	340.5	-176.00	303.5	-172.00	263.5	-330.00	228.5	-222.00
372.0	-122.00	341.0	-206.00	304.0	-219.00	264.0	-414.00	229.0	-270.00
372.5	-141.00	341.5	-242.00	304.5	-273.00	264.5	-494.00	229.5	-320.00
373.0	-163.00	342.0	-282.00	305.0	-331.00	265.0	-596.00	230.0	-364.00
373.5	-190.00	342.5	-324.00	305.5	-388.00	265.5	-711.00	230.5	-424.00
374.0	-213.00	343.0	-361.00	306.0	-457.00	266.0	-805.00	231.0	-483.00
374.5	-237.00	343.5	-405.00	306.5	-531.00	266.5	-935.00	231.5	-547.00
375.0	-261.00	344.0	-449.00	307.0	-591.00	267.0	-1050.00	232.0	-602.00
375.5	-289.00	344.5	-489.00	307.5	-666.00	267.5	-1174.00	232.5	-666.00
376.0	-310.00	345.0	-528.00	308.0	-739.00	268.0	-1269.00	233.0	-726.00
376.5	-334.00	345.5	-565.00	308.5	-798.00	268.5	-1372.00	233.5	-772.00
377.0	-358.00	346.0	-590.00	309.0	-862.00	269.0	-1444.00	234.0	-817.00
377.5	-378.00	346.5	-618.00	309.5	-919.00	269.5	-1496.00	234.5	-864.00
378.0	-397.00	347.0	-639.00	310.0	-960.00	270.0	-1536.00	235.0	-899.00

First arrivals plot : DIGBY 1



Shot 31 Location : D
Charge depth 1.0 Size 1.0
Phone depth : 360.0
Arrival time : 184.0 msec

Shot 32 Location : D
Charge depth 1.0 Size 1.0
Phone depth : 338.0
Arrival time : 173.5 msec

SHOT 31		SHOT 32	
Time	**Ampl**	**Time**	**Ampl**
173.0	-27.00	162.0	0.00
173.5	-24.00	162.5	0.00
174.0	-24.00	163.0	1.00
174.5	-21.00	163.5	1.00
175.0	-19.00	164.0	3.00
175.5	-16.00	164.5	0.00
176.0	-15.00	165.0	-5.00
176.5	-15.00	165.5	-10.00
177.0	-15.00	166.0	-15.00
177.5	-17.00	166.5	-19.00
178.0	-18.00	167.0	-19.00
178.5	-17.00	167.5	-23.00
179.0	-18.00	168.0	-24.00
179.5	-16.00	168.5	-26.00
180.0	-14.00	169.0	-25.00
180.5	-11.00	169.5	-26.00
181.0	-8.00	170.0	-26.00
181.5	-5.00	170.5	-24.00
182.0	-2.00	171.0	-21.00
182.5	-3.00	171.5	-20.00
183.0	-4.00	172.0	-19.00
183.5	-10.00	172.5	-18.00
184.0	**-15.00**	173.0	-20.00
184.5	-26.00	**173.5**	**-25.00**
185.0	-40.00	174.0	-38.00
185.5	-62.00	174.5	-63.00
186.0	-87.00	175.0	-101.00
186.5	-121.00	175.5	-147.00
187.0	-165.00	176.0	-216.00
187.5	-206.00	176.5	-307.00
188.0	-265.00	177.0	-401.00
188.5	-333.00	177.5	-540.00
189.0	-395.00	178.0	-703.00
189.5	-478.00	178.5	-868.00
190.0	-565.00	179.0	-1077.00
190.5	-660.00	179.5	-1306.00
191.0	-744.00	180.0	-1504.00
191.5	-844.00	180.5	-1745.00
192.0	-944.00	181.0	-1975.00
192.5	-1027.00	181.5	-2189.00
193.0	-1115.00	182.0	-2341.00
193.5	-1190.00	182.5	-2486.00
194.0	-1249.00	183.0	-2581.00
194.5	-1302.00	183.5	-2617.00
195.0	-1343.00	184.0	-2613.00

PE600674

This is an enclosure indicator page.
The enclosure PE600674 is enclosed within the container PE903969 at this location in this document.

The enclosure PE600674 has the following characteristics:

ITEM_BARCODE =	PE600674
CONTAINER_BARCODE =	PE903969
NAME =	Synthetic Seismogram
BASIN =	OTWAY
PERMIT =	
TYPE =	WELL
SUBTYPE =	SYNTH_SEISMOGRAM
DESCRIPTION =	Synthetic Seismogram
REMARKS =	
DATE_CREATED =	01/06/1995
DATE_RECEIVED =	17/11/1995
W_NO =	W1130
WELL_NAME =	Digby-1
CONTRACTOR =	GFE Resources Ltd
CLIENT_OP_CO =	GFE Resources Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 12

GFE RESOURCES LTD

APPENDIX 12

LOG ANALYSIS DATA

DIGBY-1

Company	:	**GFE RESOURCES LTD**
Well	:	**DIGBY-1**
Field	:	**WILDCAT**

Software by Crocker Data Processing Pty Ltd
Program revision no. 5.03 1 May 1995
Software Licensed to GFE RESOURCES LTD

Hole depth M	Temperature C	Gradient Deg C / 100 M
2088.0	95.00	3.2725
.0	26.67	

Log data

Column Position	Logs Available	Logs Used
1	DEPT	DEPT
2	GR	
3	SPin	
4	LLS	LLS
5	LLD	LLD
6	CALI	
7	MSFL	MSFL
8	DT	DT
9	BIT	
10	SP	
11	SP	SP
12	PEF	
13	NPHI	NPHI
14	RHOB	RHOB
15	DRHO	DRHO
16	CALI	CALI
17	GR	GR
18	TG	
19	C1	
20	C2	
21	C3	
22	C4	
23	C5	
24	ROP	
25	LITH	
26	swc	
27		
28		
29		
30		

Caliper recorded in	:	Inches
Mud weight units	:	Lbs/gal
Density log units	:	g/cc
DRHO log units	:	g/cc
Sonic log units	:	Us/ft
Neutron log units	:	LS %
Density tool type	:	LDT
RHO (H,MA,f) units	:	g/cc
Dens. X-plots units	:	g/cc

Logs used

Log Mnemonic	Column Number	Corrected (* = YES)
DEPT	1	
LLD	5	*
LLS	4	*
SP	11	
GR	17	*
DT	8	
NPHI	13	*
CALI	16	
DRHO	15	
MSFL	7	*
RHOB	14	*
	12	

DLL Correction	Logging Company	GR Correction
0 = NONE	0 = SCHLUMBERGER	0 = NONE
1 = TYPE C	1 = HLS	1 = CENTRED
2 = D ECCENTRED	2 = DRESSER ATLAS	2 = ECCENTRED
3 = D CENTRED	3 = BPB	
	4 = SPERRY MWD	
	5 = BAKER MWD	
	6 = ANADRIL MWD	
	7 = NO CORRECTION	

Zone properties

Zone no.	1	2	3	4	5	6	7	8
Formation Name								
Depth high	1400.00	1461.30	1503.10	1595.10	1700.10	1900.00	1923.20	1954.10
Depth low	1461.20	1503.00	1595.00	1700.00	1899.90	1923.00	1954.00	2048.00
RMC	.08	.08	.08	.08	.07	.07	.07	.07
RM	.05	.05	.05	.05	.05	.05	.05	.05
ZONE Temperature	73.49	75.17	77.36	80.59	85.58	89.22	90.11	92.15
FILT SAL (KPPM)	75.08	75.08	75.08	75.08	75.08	75.08	75.08	75.08
FORM WATER(KPPM)	12.00	28.00	20.00	14.00	14.00	14.00	14.00	14.00
PRESSURE (PSI)	2216.19	2296.04	2399.68	2552.27	2788.43	2961.16	3003.14	3099.89
MUD WEIGHT	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10
Logging Company	3	3	3	3	3	3	3	3
DLL Correction	3	3	3	3	3	3	3	3
GR Correction	2	2	2	2	2	2	2	2
GR SONDE DIAM	STD	STD	STD	STD	STD	STD	STD	STD
Neutron Temp Cor	YES	YES	YES	YES	YES	YES	YES	YES
Inductn Standoff	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

Zone no. 1 DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1400.000	5.040	5.098	158.741	.239	5.454	2.527
9.356	4.557	5.118	159.707	.251	4.809	2.531
1404.000	5.893	6.187	135.660	.198	6.638	2.511
9.104	5.258	6.132	135.315	.209	5.909	2.515
1408.000	6.428	6.760	127.018	.186	8.748	2.511
9.051	5.712	6.677	126.462	.198	7.892	2.514
1412.000	4.537	4.746	152.808	.258	4.197	2.296
9.700	4.159	4.837	155.511	.271	3.653	2.301
1416.000	6.166	6.219	145.606	.185	7.155	2.518
8.862	5.472	6.101	144.013	.197	6.393	2.518
1420.000	4.892	5.387	162.130	.214	6.525	2.490
8.867	4.403	5.296	160.384	.225	5.804	2.490
1424.000	5.357	5.784	155.542	.207	6.127	2.519
8.937	4.789	5.697	154.246	.219	5.433	2.519
1428.000	5.922	6.600	149.706	.200	6.811	2.510
8.870	5.264	6.471	148.109	.212	6.071	2.510
1432.000	4.949	5.327	154.541	.210	4.022	2.515
9.319	4.479	5.337	155.287	.222	3.493	2.519
1436.000	5.884	6.248	138.089	.188	6.250	2.541
9.035	5.245	6.173	137.408	.199	5.548	2.544
1440.000	4.223	4.334	178.210	.239	2.056	2.239
9.853	3.902	4.450	182.269	.251	1.726	2.244
1444.000	6.792	6.906	150.103	.186	7.617	2.524
8.845	6.004	6.760	148.371	.197	6.826	2.524
1448.000	5.106	5.242	145.079	.205	4.050	2.486
9.180	4.600	5.223	145.089	.216	3.518	2.490
1452.000	6.933	7.356	129.856	.209	7.083	2.524
8.688	6.110	7.147	127.642	.220	6.325	2.524
1456.000	4.952	5.165	153.257	.227	.798	2.274
9.556	4.498	5.228	155.228	.238	.637	2.278
1460.000	3.802	4.166	169.203	.273	1.445	2.186
10.077	3.554	4.318	174.305	.285	1.191	2.191

Zone no. 2 DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1461.300	4.920	5.313	158.817	.243	5.590	2.541
8.951	4.425	5.241	157.571	.253	4.939	2.541
1465.300	3.693	3.280	69.043	.158	2.830	2.397
8.517	3.383	3.200	67.448	.167	2.417	2.397
1469.300	3.692	2.968	70.089	.202	2.934	2.348
8.562	3.384	2.915	68.582	.211	2.510	2.348
1473.300	1.634	1.444	61.634	.191	1.191	2.307
8.506	1.600	1.461	60.186	.200	.972	2.307
1477.300	2.861	2.675	88.947	.199	2.639	2.336
8.600	2.680	2.643	87.154	.208	2.246	2.336
1481.300	2.359	2.180	79.099	.197	1.812	2.341
8.560	2.244	2.170	77.392	.206	1.512	2.341
1485.300	6.536	6.503	108.540	.135	6.951	2.499
8.903	5.788	6.385	107.507	.144	6.207	2.499
1489.300	5.918	5.964	81.808	.153	5.243	2.436
8.826	5.254	5.843	80.810	.161	4.618	2.436
1493.300	4.056	4.103	90.646	.167	3.132	2.430
8.813	3.701	4.038	89.499	.176	2.688	2.430
1497.300	2.860	2.635	84.829	.173	1.918	2.375
8.631	2.681	2.609	83.212	.182	1.605	2.375
1501.300	6.296	6.141	75.048	.145	4.042	2.437
8.852	5.579	6.021	74.200	.154	3.514	2.437

Zone no. 3 DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1503.100	4.290	5.044	162.177	.246	3.918	2.477
8.854	3.891	4.957	160.357	.257	3.405	2.477
1507.100	4.739	5.160	153.423	.288	6.211	2.456
8.970	4.269	5.095	152.321	.300	5.522	2.456
1511.100	5.972	6.181	135.494	.212	6.576	2.523
9.062	5.314	6.112	134.953	.223	5.863	2.526
1515.100	4.995	5.122	105.548	.134	6.101	2.490
9.037	4.484	5.072	105.035	.144	5.419	2.493
1519.100	3.797	3.774	151.545	.261	2.613	2.356
9.151	3.494	3.770	151.405	.272	2.225	2.359
1523.100	4.158	4.185	163.014	.255	4.095	2.441
9.023	3.790	4.153	162.143	.267	3.567	2.444
1527.100	6.325	6.677	106.563	.154	6.432	2.533
8.971	5.609	6.570	105.801	.164	5.728	2.533

Zone no. 3 ctd DIGBY 1 GFE RESOURCES LTD

Environmental Corrections 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1531.100	17.029	16.946	84.710	.090	22.054	2.577
8.877	14.513	16.404	83.827	.100	20.821	2.577
1535.100	10.156	10.440	79.597	.111	12.976	2.496
8.952	8.841	10.204	78.976	.121	11.952	2.496
1539.100	5.298	5.448	136.389	.158	5.990	2.529
8.872	4.723	5.353	134.944	.168	5.316	2.529
1543.100	6.359	6.291	92.069	.121	5.657	2.476
8.870	5.629	6.169	91.087	.131	5.006	2.476
1547.100	5.848	6.255	144.803	.203	6.109	2.468
8.857	5.192	6.131	143.193	.213	5.427	2.468
1551.100	5.607	5.430	101.262	.139	5.490	2.464
8.786	4.981	5.316	99.884	.149	4.852	2.464
1555.100	3.937	3.444	86.697	.170	2.361	2.379
8.654	3.587	3.374	85.115	.180	2.000	2.379
1559.100	4.924	4.606	65.707	.098	2.942	2.430
8.570	4.395	4.478	64.313	.108	2.520	2.430
1563.100	5.949	5.916	86.722	.100	6.205	2.477
9.154	5.302	5.876	86.651	.109	5.516	2.481
1567.100	5.678	5.841	126.549	.184	6.072	2.532
8.870	5.048	5.733	125.199	.194	5.392	2.532
1571.100	7.013	7.103	116.836	.152	6.928	2.496
8.887	6.187	6.959	115.659	.162	6.192	2.496
1575.100	6.495	7.278	176.122	.190	6.791	2.508
8.946	5.751	7.146	174.710	.201	6.064	2.508
1579.100	6.208	6.119	103.139	.139	5.460	2.482
8.894	5.502	6.009	102.125	.149	4.824	2.482
1583.100	5.117	5.335	137.037	.189	5.199	2.513
8.937	4.577	5.258	135.896	.199	4.582	2.513
1587.100	6.057	6.275	144.055	.187	6.472	2.523
8.924	5.376	6.168	142.790	.197	5.766	2.523
1591.100	3.967	4.123	160.265	.243	3.907	2.454
9.012	3.630	4.090	159.347	.254	3.395	2.457

Zone no. 4 DIGBY 1 GFE RESOURCES LTD

Environmental Corrections 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1595.100	6.304	6.766	136.940	.194	6.180	2.511
9.023	5.588	6.669	136.208	.206	5.502	2.514
1599.100	7.755	7.021	80.112	.110	4.016	2.510
9.002	6.818	6.910	79.626	.121	3.500	2.513
1603.100	5.577	4.711	93.391	.205	2.913	2.415
9.200	4.980	4.700	93.462	.216	2.498	2.419
1607.100	8.320	6.132	78.823	.170	4.941	2.503
9.096	7.305	6.070	78.601	.181	4.351	2.506
1611.100	3.522	2.840	69.292	.221	2.063	2.351
8.881	3.240	2.824	68.580	.233	1.738	2.351
1615.100	7.028	6.889	86.584	.129	6.193	2.518
9.162	6.217	6.828	86.537	.140	5.514	2.522
1619.100	5.267	4.867	79.758	.209	2.692	2.410
8.901	4.692	4.793	78.994	.221	2.299	2.410
1623.100	4.125	3.375	80.897	.202	2.181	2.343
8.539	3.726	3.289	79.091	.214	1.843	2.343
1627.100	7.602	6.206	59.084	.188	3.510	2.437
8.500	6.640	5.989	57.683	.200	3.039	2.437
1631.100	3.169	2.783	53.361	.228	1.196	2.293
8.507	2.927	2.728	52.109	.240	.979	2.293
1635.100	2.226	1.557	44.178	.228	.781	2.232
8.444	2.116	1.563	43.042	.240	.625	2.232
1639.100	3.180	2.828	55.238	.170	1.189	2.365
8.508	2.936	2.770	53.944	.181	.973	2.365
1643.100	5.291	4.801	72.313	.226	1.963	2.436
8.561	4.689	4.661	70.755	.238	1.650	2.436
1647.100	3.878	3.378	63.773	.253	1.490	2.323
8.533	3.522	3.291	62.336	.265	1.234	2.323
1651.100	3.872	3.354	64.622	.189	1.673	2.338
8.529	3.516	3.268	63.157	.201	1.394	2.338
1655.100	3.639	3.338	91.238	.215	1.903	2.458
8.549	3.323	3.255	89.234	.227	1.597	2.458
1659.100	9.925	8.288	113.874	.196	7.776	2.556
8.683	8.604	8.030	111.913	.207	7.000	2.556
1663.100	9.248	6.901	78.008	.158	3.955	2.427
8.527	8.021	6.658	76.234	.169	3.444	2.427
1667.100	2.741	2.177	66.363	.207	1.102	2.309
8.441	2.560	2.153	64.650	.219	.899	2.309

Zone no. 4 ctd DIGBY 1 — GFE RESOURCES LTD — Environmental Corrections 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1671.100	3.132	2.701	69.059	.162	1.603	2.402
8.461	2.894	2.646	67.326	.173	1.333	2.402
1675.100	2.887	2.368	66.863	.219	1.180	2.288
8.450	2.685	2.333	65.159	.231	.966	2.288
1679.100	4.231	3.262	67.939	.195	1.794	2.316
8.515	3.812	3.177	66.365	.207	1.501	2.316
1683.100	4.040	3.475	49.136	.135	2.974	2.535
8.473	3.653	3.376	47.924	.146	2.553	2.535
1687.100	2.437	1.849	70.711	.256	.929	2.254
8.439	2.299	1.842	68.881	.268	.751	2.254
1691.100	3.200	2.352	86.253	.215	1.309	2.301
8.456	2.951	2.319	84.073	.227	1.077	2.301
1695.100	3.937	3.139	89.802	.245	1.566	2.368
8.460	3.567	3.054	87.545	.257	1.301	2.368
1699.100	3.280	2.695	77.672	.191	1.531	2.326
8.447	3.018	2.639	75.684	.203	1.270	2.326

Zone no. 5 DIGBY 1 — GFE RESOURCES LTD — Environmental Corrections 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1700.100	4.619	3.682	120.357	.224	2.244	2.388
8.472	4.111	3.572	117.384	.236	1.904	2.388
1704.100	2.283	1.878	61.620	.172	.953	2.301
8.390	2.155	1.862	59.917	.184	.773	2.301
1708.100	1.863	1.478	49.046	.198	.713	2.242
8.424	1.789	1.483	47.750	.210	.569	2.242
1712.100	2.672	2.028	48.715	.218	.973	2.307
8.390	2.490	2.004	47.369	.230	.790	2.307
1716.100	2.186	1.601	45.693	.204	.801	2.255
8.400	2.071	1.600	44.447	.216	.644	2.255
1720.100	3.474	2.896	50.569	.136	1.884	2.349
8.442	3.168	2.820	49.266	.147	1.584	2.349
1724.100	5.733	4.806	72.770	.123	2.144	2.363
8.525	5.054	4.656	71.110	.135	1.815	2.363
1728.100	7.978	6.584	91.682	.110	3.885	2.474
8.447	6.938	6.330	89.335	.121	3.388	2.474
1732.100	6.727	5.549	50.997	.108	2.594	2.405
8.438	5.887	5.346	49.675	.119	2.217	2.405
1736.100	8.217	6.491	55.337	.203	3.094	2.517
8.429	7.136	6.237	53.885	.216	2.668	2.517

Zone no. 5 ctd DIGBY 1
GFE RESOURCES LTD

Environmental Corrections
21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1740.100	7.297	5.976	110.902	.234	4.114	2.439
8.575	6.379	5.785	108.568	.247	3.598	2.439
1744.100	5.569	3.931	44.057	.096	2.144	2.405
8.295	4.897	3.781	42.689	.107	1.815	2.405
1748.100	5.801	4.645	43.162	.127	2.200	2.371
8.336	5.097	4.466	41.886	.138	1.864	2.371
1752.100	8.273	6.044	60.471	.125	3.429	2.447
8.432	7.183	5.814	58.891	.136	2.972	2.447
1756.100	5.061	3.862	47.671	.112	3.267	2.409
8.467	4.478	3.743	46.485	.123	2.825	2.409
1760.100	5.890	4.236	77.712	.101	2.999	2.432
8.459	5.182	4.099	75.756	.112	2.582	2.432
1764.100	7.265	5.951	54.847	.096	2.653	2.395
8.514	6.346	5.746	53.574	.107	2.270	2.395
1768.100	9.632	7.815	65.401	.136	3.893	2.449
8.739	8.351	7.591	64.403	.148	3.396	2.449
1772.100	8.477	6.738	40.979	.121	3.696	2.434
8.521	7.363	6.497	40.038	.133	3.215	2.434
1776.100	5.856	4.674	58.301	.114	2.244	2.363
8.535	5.159	4.532	56.991	.126	1.904	2.363
1780.100	8.273	6.150	49.055	.099	2.839	2.399
8.408	7.181	5.909	47.731	.110	2.437	2.399
1784.100	2.373	1.914	64.422	.193	1.007	2.279
8.442	2.234	1.900	62.762	.206	.819	2.279
1788.100	2.787	2.308	74.068	.221	1.015	2.286
8.431	2.589	2.270	72.130	.233	.826	2.286
1792.100	2.485	1.784	51.267	.198	.892	2.270
8.446	2.331	1.777	49.953	.210	.721	2.270
1796.100	3.167	2.588	58.883	.217	1.384	2.337
8.765	2.923	2.566	58.039	.229	1.145	2.337
1800.100	2.070	1.570	55.725	.231	.783	2.217
8.869	1.981	1.596	55.129	.244	.628	2.217
1804.100	2.930	2.177	72.502	.205	1.136	2.295
8.886	2.727	2.185	71.769	.217	.930	2.295
1808.100	2.345	1.791	77.332	.188	.870	2.266
8.646	2.216	1.796	75.899	.200	.702	2.266
1812.100	4.223	3.515	97.249	.187	2.278	2.394
8.457	3.787	3.410	94.795	.199	1.934	2.394
1816.100	4.273	3.571	79.426	.151	2.534	2.366
8.562	3.834	3.479	77.718	.163	2.163	2.366

Zone no. 5 ctd DIGBY 1 GFE RESOURCES LTD

Environmental Corrections 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1820.100	5.337	4.532	90.883	.189	3.885	2.442
8.536	4.718	4.396	88.845	.201	3.388	2.442
1824.100	3.796	3.115	68.948	.177	1.671	2.322
8.365	3.431	3.015	66.981	.189	1.396	2.322
1828.100	6.191	5.960	87.734	.145	6.078	2.446
8.500	5.440	5.751	85.654	.156	5.419	2.446
1832.100	3.836	3.198	75.001	.194	2.180	2.401
8.565	3.474	3.121	73.396	.206	1.847	2.401
1836.100	4.016	3.503	73.760	.197	1.467	2.316
8.515	3.620	3.407	72.051	.209	1.217	2.316
1840.100	5.351	4.477	85.650	.158	2.257	2.388
8.517	4.728	4.340	83.671	.170	1.915	2.388
1844.100	4.507	3.850	75.336	.213	1.772	2.386
8.490	4.021	3.735	73.523	.225	1.485	2.386
1848.100	10.310	10.011	93.412	.161	5.298	2.481
8.843	8.929	9.735	92.328	.173	4.692	2.481
1852.100	7.640	7.676	97.165	.156	4.529	2.447
8.672	6.677	7.436	95.454	.168	3.980	2.447
1856.100	8.602	7.846	100.268	.171	5.234	2.482
8.514	7.467	7.548	97.941	.183	4.633	2.482
1860.100	5.950	5.099	73.849	.144	2.106	2.393
8.478	5.234	4.926	72.040	.156	1.781	2.393
1864.100	7.789	6.909	63.476	.110	4.635	2.470
8.466	6.782	6.644	61.894	.121	4.078	2.470
1868.100	15.005	15.642	91.826	.104	10.443	2.514
8.737	12.788	15.051	90.419	.115	9.556	2.514
1872.100	8.332	8.387	109.754	.096	9.666	2.535
8.656	7.256	8.110	107.759	.107	8.813	2.535
1876.100	5.304	4.382	80.114	.146	3.136	2.414
8.524	4.689	4.250	78.283	.157	2.706	2.414
1880.100	5.698	3.955	110.256	.173	3.974	2.448
8.476	5.020	3.834	107.548	.185	3.470	2.448
1884.100	7.968	5.850	63.004	.123	4.208	2.395
8.536	6.939	5.655	61.591	.134	3.685	2.395
1888.100	6.102	4.425	72.173	.151	2.154	2.391
8.587	5.371	4.303	70.685	.163	1.823	2.391
1892.100	8.342	7.490	63.861	.101	4.919	2.413
8.683	7.267	7.262	62.761	.112	4.341	2.413
1896.100	9.656	8.798	108.335	.118	6.595	2.455
8.867	8.386	8.579	107.168	.129	5.903	2.455

Zone no. 6 DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1900.000	19.629	20.480	182.628	.274	20.893	2.627
8.868	16.559	19.736	180.668	.288	19.779	2.627
1904.000	23.863	27.150	186.253	.267	27.719	2.609
8.722	19.938	25.900	183.301	.280	26.581	2.609
1908.000	27.026	30.886	181.665	.249	29.231	2.624
8.793	22.489	29.503	179.238	.262	28.098	2.624
1912.000	18.226	19.760	175.957	.257	19.676	2.649
8.803	15.408	18.999	173.668	.270	18.575	2.649
1916.000	15.080	16.831	173.745	.291	17.918	2.574
8.753	12.835	16.183	171.180	.305	16.843	2.574
1920.000	19.609	22.119	167.818	.304	17.194	2.552
8.620	16.491	21.067	164.554	.318	16.132	2.552

Zone no. 7 DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1923.200	23.879	25.095	136.223	.341	18.392	2.519
8.685	19.936	23.925	133.886	.356	17.316	2.519
1927.200	12.211	13.558	96.084	.198	3.912	2.424
8.770	10.478	13.082	94.723	.210	3.420	2.424
1931.200	8.427	9.597	74.588	.152	3.567	2.391
8.832	7.342	9.328	73.693	.164	3.104	2.391
1935.200	30.479	33.127	164.365	.355	39.523	2.326
8.677	25.197	31.451	161.499	.370	38.523	2.326
1939.200	11.427	11.634	86.428	.147	9.108	2.482
8.693	9.821	11.212	84.970	.159	8.297	2.482
1943.200	38.254	42.932	173.053	.322	37.852	2.267
8.690	31.341	40.638	170.115	.336	36.823	2.267
1947.200	25.680	27.162	152.150	.359	31.475	2.319
8.716	21.386	25.902	149.706	.374	30.368	2.319
1951.200	20.314	22.264	144.211	.257	25.789	2.525
8.694	17.070	21.269	141.783	.270	24.658	2.525

Zone no. 8 DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1954.100	17.063	18.563	172.817	.371	24.272	2.423
8.722	14.432	17.794	170.078	.385	23.163	2.423
1958.100	12.745	13.730	156.394	.327	12.273	2.562
8.741	10.906	13.226	154.019	.342	11.349	2.562
1962.100	10.490	11.155	153.625	.314	10.756	2.626
8.633	9.031	10.726	150.708	.328	9.884	2.626
1966.100	9.535	10.050	165.446	.338	9.484	2.567
8.676	8.244	9.695	162.555	.352	8.664	2.567
1970.100	11.074	11.703	156.259	.312	10.466	2.575
8.703	9.523	11.279	153.678	.326	9.606	2.575
1974.100	9.707	10.590	141.965	.369	10.145	2.544
8.671	8.387	10.207	139.460	.384	9.297	2.544
1978.100	9.242	9.898	174.885	.345	9.392	2.528
8.689	8.002	9.556	171.910	.360	8.576	2.528
1982.100	10.974	11.914	158.750	.365	13.759	2.582
8.682	9.438	11.470	156.010	.380	12.791	2.582
1986.100	10.638	11.749	143.654	.295	13.334	2.673
8.691	9.161	11.317	141.220	.309	12.378	2.673
1990.100	11.594	13.059	133.159	.321	14.912	2.672
8.659	9.947	12.544	130.753	.336	13.915	2.672
1994.100	9.946	11.235	158.564	.312	11.495	2.554
8.608	8.578	10.790	155.413	.326	10.597	2.554
1998.100	23.991	25.411	131.689	.287	34.307	2.835
8.619	19.995	24.146	129.123	.301	33.255	2.835
2002.100	12.893	14.741	181.749	.296	14.386	2.593
8.622	11.011	14.114	178.227	.310	13.402	2.593
2006.100	11.645	13.402	151.641	.328	23.798	2.759
8.683	9.992	12.882	149.029	.342	22.690	2.759
2010.100	8.875	10.598	149.994	.323	14.260	2.652
8.689	7.696	10.222	147.442	.337	13.279	2.652
2014.100	17.231	20.682	176.836	.308	24.710	2.558
8.765	14.577	19.833	174.300	.322	23.600	2.558
2018.100	23.604	25.403	99.667	.118	17.629	2.581
8.606	19.682	24.125	97.679	.129	16.579	2.581
2022.100	31.861	34.627	147.166	.279	36.554	2.622
8.670	26.271	32.837	144.564	.292	35.534	2.622
2026.100	13.245	13.791	171.964	.307	14.003	2.738
8.691	11.310	13.256	169.050	.321	13.029	2.738

Zone no. 8 ctd DIGBY 1 Environmental Corrections
GFE RESOURCES LTD 21-09-95

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
2030.100	33.955	35.239	143.426	.275	33.722	2.590
8.582	27.897	33.281	140.443	.288	32.663	2.590
2034.100	7.130	7.461	157.095	.287	8.230	2.717
8.648	6.231	7.218	154.195	.301	7.467	2.717
2038.100	10.231	10.147	154.022	.296	10.511	2.620
8.668	8.821	9.784	151.287	.309	9.649	2.620
2042.100	13.071	12.950	131.445	.230	13.008	2.518
8.688	11.167	12.456	129.204	.243	12.061	2.518
2046.100	10.595	10.260	124.589	.213	12.266	2.598
8.685	9.125	9.899	122.452	.226	11.342	2.598

PREINTERPRETATION RESULTS

VCL flag values (If flag is set, that indicator is not used)

Indicator	Threshold (used by software to set Flag ON/OFF)
1. SP	ABS (SSP) less than 20 mV
2. GR	(GRMAX - GRMIN) less than 20 API
3. RT	R lim less than 10 * R clay
4. Neutron	(PHIN clay - PHIN min) less than 0.20
5. Sonic	(t clay - tma) less than 30.0
6. M - N	(4.545 * Mclay - 3.20 - Nclay) greater than -0.4
7. Density - Neutron	ABS ((PHIN clay -PHINMA) * (2.2-RHOMA) - (RHOBclay - RHOMA) * (PHIN 2.2 - PHIN min)) less than 0.06 Where PHINMA = ((66.67 * RHOMA) - 180.67) * 0.01
8. Density - Sonic	(t Clay - tMA min) * (2.2 - RHOMA) - (RHOB clay - RHOMA) * (t 2.2 - tMA min) less than -8.0
9. Sonic - Neutron	(PHIN clay - PHINMA) * (t 2.2 - tMA min) - (t Clay - tMA min) - (PHIN 2.2 -PHINMA) less than 5.0 Where PHINMA = ((66.67 * RHOMA) - 180.67) * 0.01

These flags may also be set by the NO CLAY parameter in the control file

VGRTYPE :Vclay from GR Equations used

0. Not Used
   IGR=(GR-GRmin)/(GRmax-GRmin)
1. Linear VGR=IGR
2. Asymmetric (S shaped)
   Defined by 2 sets of intermediate points through which the S bend passes through.
   GR1, VGR1 and GR2, VGR2.
   Steiber equation: VGR= IGR/(A + (A-1.0)*IGR)
3. Steiber 1 A = 2.0
4. Steiber 2 A = 3.0
5. Steiber 3 A = 4.0
6. Steiber 50%
   A is computed to give VGR= 0.5 when GR = GR50%)
7. Larinov Old Rocks: VGR= (2**(2*IGR)-1.0)/3.0
8. Larinov Tertiary : VGR= 0.083*(2.0*(3.7058*IGR)-1.0)
9. Clavier : VGR= 1.7-SQRT(3.38-(IGR+0.7)**2.0)

PRE flag values

1. Bad hole - Caliper
2. Bad hole - DRHO
3. Bad hole - RUGOSITY

Sonic option

0. Wyllie formula
1. Raymer - Hunt - Gardner formula

DIGBY 1
GFE RESOURCES LTD

Preinterpretation Results
21-09-95

Logging Company

0. Schlumberger
1. HLS
2. Dresser
3. BPB
4. Sperry MWD
5. Baker MWD
6. Anadril MWD

Mud type

0. NaCl
1. KCl %
2. Oil-base
3. Barite

Neutron log type

0. CNL
1. TNPH
2. SNP
3. N
4. DSN2

RT Determination Flags by priority

1. Dual Laterolog - RXO
20. PHASOR-SFL
21. PHASOR-RXO
2. Dual Induction - LL8
3. ILD-SFL-RXO
10. DIL-SFL
11. DIL-LL3
8. ILD and 16 inch Normal
17. LLD-LLS
18. ID PHASOR
4. ILD
5. LLD
6. LL3 or LL7
7. Dual Laterolog
13. LLS
19. IM PHASOR
14. ILM
15. LL8
9. 64 inch Normal Log
12. SFL
16. RXO
0. No RT logs

Formation Water	CNL Chart
0=NaCl	0=1988
1=NaHCO3	1=1987

Zone no.	1	2	3	4	5	6	7	8
Formation Name								
Top depth M	1400.000	1461.300	1503.100	1595.100	1700.100	1900.000	1923.200	1954.100
Bottom depth M	1461.200	1503.000	1595.000	1700.000	1899.900	1923.000	1954.000	2048.000
Logging Company	3	3	3	3	3	3	3	3
Mud type	1	1	1	1	1	1	1	1
Formation Water Type	0	0	0	0	0	0	0	0
Neutron Log Type	0	0	0	0	0	0	0	0
Density-CNL Chart	0	0	0	0	0	0	0	0
RT derivation	1	1	1	1	1	1	1	1
Sonic option	0	0	0	0	0	0	0	0
Vclay flags	1 6 89	1 6 89	1 6 89	1 6 89	1 6 89	45 89	1 6 89	1 6 89

DIGBY 1
GFE RESOURCES LTD

Preinterpretation Results
21-09-95

INPUT PARAMETERS

	Zone no.	1	2	3	4	5	6	7	8
	Formation	Laira	-------------Pretty Hill			--------------	---------Casterton		----------
1.	Top depth	1400.000	1461.300	1503.100	1595.100	1700.100	1900.000	1923.200	1954.100
2.	Bottom depth	1461.200	1503.000	1595.000	1700.000	1899.900	1923.000	1954.000	2048.000
3.	No logs						SP		
4.	RM	.130	.130	.130	.130	.130	.130	.130	.130
5.	Temp. RM	18.300	18.300	18.300	18.300	18.300	18.300	18.300	18.300
6.	RMF	.111	.111	.111	.111	.111	.111	.111	.111
7.	Temp. RMF	17.600	17.600	17.600	17.600	17.600	17.600	17.600	17.600
8.	RMC	.198	.198	.198	.198	.198	.198	.198	.198
9.	Temp. RMC	18.400	18.400	18.400	18.400	18.400	18.400	18.400	18.400
10.	Bit size	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
11.	Mud wt	9.100	9.100	9.100	9.100	9.100	9.100	9.100	9.100
12.	SSP	-22.000	-22.000	-20.000	-36.000	-36.000	-28.000	-28.000	-28.000
13.	RW (SP)	.028	.028	.028	.022	.022	.023	.023	.022
14.	FT=Form temp	73.486	75.173	77.363	80.586	85.575	89.224	90.111	92.154
15.	RW @ FT	.234	.106	.141	.189	.180	.174	.173	.170
16.	RW@75F(23.9C	.490	.226	.306	.425	.425	.425	.425	.425
17.	KPPM (RW)	12.000	28.000	20.000	14.000	14.000	14.000	14.000	14.000
18.	RMF @ FT	.046	.045	.044	.043	.041	.039	.039	.038
19.	KPPM (RMF)	75.077	75.077	75.077	75.077	75.077	75.077	75.077	75.077
20.	RM @ FT	.055	.054	.052	.051	.048	.047	.046	.046
21.	RHO H	.800	.800	.800	.800	.800	.800	.800	.800
22.	RHO F	1.042	1.042	1.041	1.040	1.039	1.038	1.038	1.038
23.	t F	188.980	188.980	188.980	188.980	188.980	188.980	188.980	188.980
24.	RHOMA	2.670	2.670	2.670	2.670	2.670	2.670	2.670	2.670
25.	PHIN min	-.035	-.035	-.035	-.049	-.049	-.035	-.035	-.035
26.	t MA	55.500	55.500	55.500	55.500	55.500	55.500	55.500	55.500
27.	t MA min	48.000	48.000	48.000	48.000	48.000	48.000	48.000	48.000
28.	Sonic option	.000	.000	.000	.000	.000	.000	.000	.000
29.	Compact/Over	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
30.	CAL cut off	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000

DIGBY 1 Preinterpretation Results

GFE RESOURCES LTD 21-09-95

Zone no.	1	2	3	4	5	6	7	8
Formation	Laira	-------------Pretty Hill			--------------	---------Casterton		----------
31. RUGO.cut off	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
32. DRHO cut off	.050	.050	.050	.050	.050	.050	.050	.050
33. No clay	SP	SP	SP	SP	SP	N	SP	SP
	MN	MN	MN	MN	MN	S	MN	MN
	SD	SD	SD	SD	SD	SD	SD	SD
	SN		SN	SN	SN	SN	SN	SN
34. Vclay Flag	.000	.000	.000	.000	.000	.000	.000	.000
35. Vclay type	.000	.000	.000	.000	.000	.000	.000	.000
36. Vclay inp1	.200	.200	.200	.200	.200	.200	.200	.200
37. Vclay out1	.150	.150	.150	.150	.150	.150	.150	.150
38. Vclay inp2	.800	.800	.800	.800	.800	.800	.800	.800
39. Vclay out2	.800	.800	.800	.800	.800	.800	.800	.800
40. Vclay 50%	.500	.500	.500	.500	.500	.500	.500	.500
41. VclayGR type	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
42. GR clean	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
43. GR clay	175.000	175.000	175.000	175.000	175.000	180.000	170.000	170.000
44. GR1	73.856	61.000	68.464	68.464	68.464	68.464	68.464	68.464
45. VGR1	.100	.100	.100	.100	.100	.100	.100	.100
46. GR2	145.423	84.000	151.599	151.599	151.599	151.599	151.599	151.599
47. VGR2	.800	.800	.800	.800	.800	.800	.800	.800
48. GR50%	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000
49. R clay	4.000	3.200	3.200	4.500	6.500	12.000	12.000	8.000
50. R limit	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000
51. Rclay1 flag	.000	.000	.000	.000	.000	.000	.000	.000
52. Rclay1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
53. Vcl @ Rclay1	.150	.150	.150	.150	.150	.150	.150	.150
54. RHOB clay	2.514	2.508	2.502	2.527	2.520	2.589	2.574	2.602
55. PHIN clay	.238	.252	.249	.256	.251	.298	.299	.326
56. t clay	87.962	87.710	96.914	82.639	86.317	87.962	82.263	86.317
57. M clay	.686	.691	.630	.716	.693	.651	.695	.656
58. N clay	.518	.510	.514	.501	.506	.453	.456	.431
59. PHIN 2.2	.221	.229	.221	.224	.184	.216	.222	.235
60. t 2.2	87.335	90.000	87.335	90.000	90.000	87.335	87.335	90.000
61. COER (a)	.800	.800	.800	.800	.800	.800	.800	.800

DIGBY 1 , Preinterpretation Results

GFE RESOURCES LTD 21-09-95

Zone no.	1	2	3	4	5	6	7	8
Formation	Laira	-------------Pretty Hill		--------------		---------Casterton----------		
62. MXP (m)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
63. SXP (n)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
64. Lithomod	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
65. SXO limit	.200	.200	.200	.200	.200	.200	.200	.200
66. PHI max	.286	.269	.226	.303	.282	.308	.317	.274
67. PHI min c.o.	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000
68. EXPX	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
69. Clay cut off	.300	.300	.300	.300	.300	.300	.300	.300
70. Por. cut off	.050	.050	.050	.050	.050	.050	.050	.050
71. SW cut off	.500	.500	.500	.500	.500	.500	.500	.500
72. Sat Equation	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
73. SWirr.cutoff	.300	.300	.300	.300	.300	.300	.300	.300
74. Perm Expon.	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000
93. PHINmat1	.200	.200	.200	.200	.200	.200	.200	.200
94. PHIDmat1	.240	.240	.240	.240	.240	.240	.240	.240
95. PHINmat2	.350	.350	.350	.350	.350	.350	.350	.350
96. PHIDmat2	.200	.200	.200	.200	.200	.200	.200	.200
97. PHINmat3	.050	.050	.050	.050	.050	.050	.050	.050
98. PHIDmat3	.000	.000	.000	.000	.000	.000	.000	.000
99. PHINmat4	.200	.200	.200	.200	.200	.200	.200	.200
100. PHIDmat4	-.100	-.100	-.100	-.100	-.100	-.100	-.100	-.100

Zone No. 1 DIGBY 1 Preinterpretation Results
GFE RESOURCES LTD 21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1400.0	.9	160	9.4		4.8	4.2	22.1	10.7	29.1	20.1	15.8	.290	.335	88.7	GR		89	93	99	99	99				
1404.0	-.7	135	9.1		5.9	4.6	20.2	11.7	24.9	18.1	14.8	.269	.342	70.6	GR		71	86	89	99	84				
1408.0	-.1	126	9.1		7.9	5.0	18.2	11.7	23.7	17.4	14.2	.272	.426	64.0	GR		64	79	85	99	78				
1412.0	2.2	156	9.7		3.7	3.7	26.6	24.5	31.0	26.1	16.9	.410	.407	85.6	GR		86	99	99	99					2
1416.0	-.6	144	8.9		6.4	5.0	18.1	11.5	23.6	17.3	14.2	.268	.341	77.0	GR		77	79	85	99	79				
1420.0	-.9	160	8.9		5.8	3.8	20.2	13.2	26.5	19.5	16.6	.250	.384	86.0	DN		89	86	95	99	86				
1424.0	-.1	154	8.9		5.4	4.2	21.9	11.5	25.8	18.6	15.8	.252	.329	84.6	GR		85	92	93	99	91				
1428.0	1.7	148	8.9		6.1	4.4	21.0	12.0	25.1	18.4	15.3	.262	.360	80.1	GR		80	89	90	99	84				
1432.0	1.5	155	9.3		3.5	3.9	22.7	11.4	26.1	18.8	16.4	.239	.215	85.4	GR		85	94	94	99					2
1436.0	.1	137	9.0		5.5	4.6	19.8	9.9	23.9	17.1	14.9	.238	.287	72.2	GR		72	85	86	99	88				
1440.0	1.4	182	9.9		1.7	3.5	24.4	28.0	29.0	26.8	17.3	.412	.202	100.0	S		99	99	99	99					2
1444.0	2.9	148	8.8		6.8	5.5	18.1	11.2	23.7	17.3	13.5	.290	.362	79.2	S		80	79	85	99	81				
1448.0	3.8	145	9.2		3.5	4.2	21.0	13.2	25.6	19.0	15.8	.262	.222	77.8	GR		78	89	92	99					2
1452.0	2.1	128	8.7		6.3	5.4	19.1	11.2	26.0	18.6	13.7	.326	.384	64.9	GR		65	82	93	99	93				
1456.0	3.2	155	9.6		.6	4.0	21.2	25.9	27.8	25.1	16.2	.413	.066	85.4	GR		85	89	99	99					2
1460.0	5.5	174	10.1		1.2	3.0	27.4	31.1	32.4	30.1	18.9	.436	.172	99.5	GR		99	99	99	99					12

Zone No. 2 DIGBY 1 Preinterpretation Results
GFE RESOURCES LTD 21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1461.3	10.7	158	9.0		4.9	3.9	22.6	10.1	29.3	20.0	13.0	.267	.342	87.1	GR		87	95	99	99	99				
1465.3	21.9	67	8.5	10.6	2.4	3.6	17.8	18.8	20.8	17.9	13.5	.202	.137	20.3	GR		20	79	71	99	25				
1469.3	19.8	69	8.6	56.9	2.5	3.9	19.7	21.7	25.2	21.5	12.9	.308	.197	21.2	GR		21	85	86	99	34				
1473.3	21.8	60	8.5	11.0	1.0	1.8	25.1	24.2	24.1	22.5	20.1	.149	.083	15.0	GR		15	99	82	99	16				
1477.3	13.2	87	8.6	10.1	2.2	2.7	19.9	22.4	24.9	21.8	15.8	.219	.181	28.6	DN		35	86	85	99	29				
1481.3	17.5	77	8.6	10.3	1.5	2.3	23.8	22.1	24.6	21.5	17.2	.182	.119	27.7	GR		28	99	84	99	29				
1485.3	11.4	108	8.9		6.2	5.4	16.8	12.6	18.5	14.1	10.8	.196	.227	42.6	DN		50	75	63	99	43				
1489.3	10.3	81	8.8		4.6	4.8	15.3	16.4	20.2	16.3	11.4	.232	.221	30.2	GR		30	70	69	99	33				
1493.3	13.8	89	8.8		2.7	3.5	18.1	16.8	21.6	17.4	13.8	.186	.144	36.7	GR		37	80	74	99	39				
1497.3	10.9	83	8.6	10.3	1.6	2.8	20.5	20.1	22.2	19.3	15.7	.178	.104	26.2	DN		32	88	76	99	26				
1501.3	3.0	74	8.9		3.5	5.3	15.7	16.4	19.4	16.0	10.9	.242	.161	25.3	GR		25	72	66	99	30				

Zone No. 3 DIGBY 1
GFE RESOURCES LTD

Preinterpretation Results
21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1503.1	.8	160	8.9		3.4	3.1	27.2	14.0	29.8	21.6	16.9	.249	.270	89.2	GR		89	89	99	99	97				
1507.1	-1.3	152	9.0		5.5	3.7	32.8	15.2	34.0	24.0	15.5	.355	.531	83.2	GR		83	99	99	99	99				
1511.1	2.0	135	9.1		5.9	4.8	20.1	11.0	26.3	18.8	13.4	.293	.361	70.2	S		70	70	91	99	93				
1515.1	.9	105	9.0		5.4	4.1	19.6	13.0	18.5	14.1	14.7	.150	.200	43.3	DN		48	69	63	99	43				
1519.1	-.4	151	9.2		2.2	3.3	26.3	21.0	31.3	24.9	16.5	.338	.228	82.5	GR		83	87	99	99					2
1523.1	-.1	162	9.0		3.6	3.5	24.4	15.9	30.7	22.8	15.9	.308	.311	81.8	S		90	82	99	99					2
1527.1	3.0	106	9.0		5.7	4.9	17.8	10.6	20.5	15.0	13.2	.203	.236	48.7	GR		49	64	70	99	65				
1531.1	3.7	84	8.9		20.8	13.2	6.3	8.0	14.0	9.7	7.6	.246	.388	32.5	GR		32	33	47	96	44				
1535.1	1.4	79	9.0		12.0	7.9	11.2	12.8	16.1	12.5	10.2	.234	.354	28.9	GR		29	46	55	99	32				
1539.1	.8	135	8.9		5.3	4.3	20.8	10.8	20.9	15.4	14.3	.184	.228	65.9	DN		70	72	72	99	66				
1543.1	6.5	91	8.9		5.0	5.3	17.7	14.0	17.1	13.6	12.7	.181	.173	31.6	DN		38	64	59	99	32				
1547.1	3.3	143	8.9		5.4	4.5	20.8	14.5	25.4	19.3	13.8	.293	.351	72.0	DN		76	72	87	99	72				
1551.1	12.6	100	8.8		4.9	4.7	22.9	14.7	18.9	14.9	13.5	.192	.196	37.3	DN		44	78	65	99	37				
1555.1	15.2	85	8.7	10.6	2.0	3.8	21.1	19.8	22.1	19.1	15.2	.242	.127	29.8	DN		33	73	76	99	30				
1559.1	16.6	64	8.6		2.5	4.3	17.6	16.8	14.8	14.1	14.2	.159	.092	6.5	DN		18	63	50	99	6				
1563.1	1.6	87	9.2		5.5	4.9	20.4	13.7	15.0	12.5	13.2	.144	.162	21.6	DN		35	71	51	99	22				
1567.1	.0	125	8.9		5.4	4.6	21.2	10.7	23.4	17.0	13.8	.235	.277	63.1	GR		63	73	81	99	80				
1571.1	3.3	116	8.9		6.2	5.6	17.9	12.8	20.2	15.4	12.2	.243	.267	53.2	DN		56	64	69	99	53				
1575.1	2.9	175	8.9		6.1	4.8	17.8	12.1	24.1	17.8	13.4	.268	.340	63.9	S		99	64	83	99	77				
1579.1	1.8	102	8.9		4.8	5.1	18.4	13.7	18.9	14.7	12.9	.203	.190	42.6	DN		46	66	65	99	43				
1583.1	-.6	136	8.9		4.6	4.1	22.4	11.8	24.0	17.6	14.6	.226	.252	71.0	GR		71	77	83	99	78				
1587.1	-.4	143	8.9		5.8	4.8	19.9	11.2	23.8	17.3	13.3	.257	.308	69.6	S		76	70	82	99	79				
1591.1	.1	159	9.0		3.4	3.3	26.6	15.2	29.4	21.8	16.5	.267	.274	87.8	S		88	88	99	99	90				

Zone No. 4 DIGBY 1 Preinterpretation Results

GFE RESOURCES LTD 21-09-95

DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	Clay Indicators SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1595.1	6.8	136	9.0		5.5	4.8	19.7	11.7	24.6	18.0	14.6	.275	.313	71.3	GR		71	98	84	99	74				
1599.1	24.8	80	9.0		3.5	6.8	19.1	11.8	16.1	12.0	12.1	.186	.096	29.4	GR		29	95	56	99	35				
1603.1	26.9	93	9.2	10.6	2.5	5.3	26.2	17.5	25.6	20.4	13.9	.376	.178	39.6	GR		40	99	87	99	54				
1607.1	29.6	79	9.1	40.8	4.4	10.3	15.8	12.2	22.1	16.6	9.6	.505	.214	28.6	GR		29	83	76	99	61				
1611.1	22.7	69	8.9	27.7	1.7	3.7	23.9	21.5	27.3	22.7	16.9	.322	.150	21.2	GR		21	99	92	99	43				
1615.1	21.9	87	9.2		5.5	5.8	18.0	11.3	18.0	13.4	13.2	.195	.186	34.5	GR		34	91	62	99	47				
1619.1	26.0	79	8.9		2.3	4.6	20.9	18.0	26.1	20.8	15.0	.342	.170	28.9	GR		29	99	89	99	54				
1623.1	34.2	79	8.5	23.5	1.8	4.2	22.1	22.0	25.4	21.7	15.7	.338	.148	29.0	GR		29	99	86	99	33				
1627.1	31.6	58	8.5	19.6	3.0	7.4	15.3	16.4	24.0	18.9	11.6	.460	.190	13.1	GR		13	81	82	99	51				
1631.1	30.0	52	8.5	10.7	1.0	3.1	28.0	25.0	28.0	24.6	18.5	.314	.098	9.0	GR		9	99	95	99	32				
1635.1	34.1	43	8.4	26.1	.6	2.8	28.5	28.6	28.0	26.9	19.7	.330	.073	2.3	GR		2	99	95	99	16				
1639.1	28.7	54	8.5	10.6	1.0	3.1	27.1	20.7	22.1	19.6	18.6	.207	.065	10.3	GR		10	99	76	99	24				
1643.1	29.2	71	8.6	10.1	1.6	4.7	18.8	16.4	27.8	21.4	14.8	.366	.128	22.8	GR		23	94	94	99	68				
1647.1	28.3	62	8.5	10.7	1.2	3.8	24.3	23.2	30.5	25.3	16.8	.396	.130	16.5	GR		17	99	99	99	51				
1651.1	27.4	63	8.5	10.8	1.4	3.8	22.7	22.3	24.1	21.4	16.7	.294	.108	17.2	GR		17	99	82	99	26				
1655.1	31.4	89	8.5	10.2	1.6	3.4	21.7	15.1	26.7	20.2	17.8	.239	.113	36.5	GR		36	99	90	99	69				
1659.1	29.5	112	8.7	10.7	7.0	9.2	17.1	9.2	24.7	17.4	10.2	.492	.374	53.3	GR		53	88	84	99	86				
1663.1	30.7	76	8.5	26.2	3.4	10.5	15.7	17.0	20.9	16.9	9.5	.537	.176	26.8	GR		27	82	72	99	35				
1667.1	31.0	65	8.4	21.0	.9	3.0	22.9	24.0	25.9	23.2	18.9	.273	.081	18.3	GR		18	99	88	99	26				
1671.1	32.0	67	8.5	10.9	1.3	3.2	22.7	18.4	21.3	17.9	18.5	.179	.076	20.2	GR		20	99	73	99	30				
1675.1	31.1	65	8.4	19.1	1.0	3.1	24.2	25.3	27.1	24.4	18.7	.305	.096	18.6	GR		19	99	92	99	26				
1679.1	27.4	66	8.5	23.8	1.5	4.6	23.2	23.6	24.7	22.4	15.0	.387	.127	19.5	GR		20	99	84	99	23				
1683.1	30.0	48	8.5	10.8	2.6	3.9	10.9	10.5	18.6	13.7	16.3	.137	.089	5.9	GR		6	64	64	99	52				
1687.1	32.9	69	8.4	23.0	.8	3.0	30.2	27.3	30.8	27.1	19.0	.358	.090	21.4	GR		21	99	99	99	34				
1691.1	30.1	84	8.5	26.7	1.1	3.9	28.9	24.5	26.7	23.8	16.5	.364	.102	27.9	DN		33	99	91	99	28				
1695.1	30.6	88	8.5	20.3	1.3	4.2	26.1	20.5	29.7	23.8	15.9	.394	.123	35.2	GR		35	99	99	99	59				
1699.1	27.9	76	8.4	21.0	1.3	3.4	24.7	23.0	24.3	21.9	17.6	.279	.103	23.3	DN		26	99	83	99	23				

Zone No. 5 DIGBY 1 Preinterpretation Results
GFE RESOURCES LTD 21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1700.1	31.3	117	8.5	23.6	1.9	4.7	23.3	19.3	27.6	22.2	14.2	.393	.158	57.3	GR		57	99	95	99	64				
1704.1	33.4	60	8.4	19.4	.8	2.5	24.3	24.5	22.4	22.0	20.2	.204	.063	14.8	GR		15	99	78	99	22				
1708.1	31.3	48	8.4	20.4	.6	2.3	25.8	28.0	25.0	25.2	21.2	.241	.060	5.7	GR		6	99	86	99	21				
1712.1	38.7	47	8.4	22.2	.8	3.2	21.5	24.1	27.0	23.7	17.5	.302	.074	5.5	GR		5	94	93	99	44				
1716.1	33.7	44	8.4	24.4	.6	2.7	26.9	27.2	25.6	25.0	19.3	.281	.066	3.3	GR		3	99	88	99	26				
1720.1	34.0	49	8.4	22.8	1.6	3.6	17.2	21.6	18.7	18.7	16.6	.216	.096	6.9	GR		7	79	65	99	16				
1724.1	31.3	71	8.5	10.9	1.8	5.5	15.3	20.8	17.4	17.6	13.1	.300	.099	13.8	DN		23	73	61	99	14				
1728.1	30.1	89	8.4	11.0	3.4	7.6	12.1	14.1	16.1	13.2	10.9	.248	.111	36.5	GR		37	62	57	99					2
1732.1	31.7	50	8.4	16.5	2.2	6.5	14.8	18.3	15.9	15.4	11.9	.281	.096	7.2	GR		7	71	56	99	16				
1736.1	30.1	54	8.4	19.2	2.7	8.2	12.9	11.6	25.6	18.5	10.5	.490	.160	10.3	GR		10	65	88	99	84				
1740.1	30.7	109	8.6	23.7	3.6	7.0	20.5	16.2	28.7	21.8	11.4	.566	.290	50.8	GR		51	91	99	99	80				
1744.1	33.0	43	8.3	28.5	1.8	6.5	12.8	18.3	14.7	14.9	11.9	.264	.074	2.0	GR		2	64	52	99	11				
1748.1	30.5	42	8.3	18.7	1.9	5.8	14.0	20.3	17.8	17.5	12.7	.315	.101	1.4	GR		1	68	63	99	17				
1752.1	28.1	59	8.4	27.5	3.0	9.5	15.0	15.7	17.6	14.8	9.6	.379	.119	14.0	GR		14	72	62	99	33				
1756.1	31.7	46	8.5	44.3	2.8	5.4	10.1	18.0	16.3	15.5	13.2	.232	.123	4.8	GR		5	55	57	99	19				
1760.1	34.0	76	8.5	37.2	2.6	7.1	12.0	16.6	15.2	14.2	11.3	.264	.096	19.1	DN		26	62	54	99	19				
1764.1	30.4	54	8.5	16.2	2.3	7.0	12.8	18.9	14.7	15.2	11.4	.293	.095	8.5	DN		10	64	52	99	9				
1768.1	30.0	64	8.7	17.3	3.4	9.2	15.8	15.6	18.8	15.2	9.8	.388	.144	18.1	GR		18	75	66	99	39				
1772.1	30.4	40	8.5	20.9	3.2	8.3	11.0	16.5	17.3	15.1	10.4	.345	.133	.0	GR		0	58	61	99	29				
1776.1	31.7	57	8.5	18.7	1.9	5.9	16.8	20.8	16.5	17.2	12.6	.308	.100	9.8	DN		13	78	58	99	10				
1780.1	28.2	48	8.4	21.9	2.4	9.3	11.9	18.6	14.9	15.2	9.7	.391	.102	5.7	GR		6	61	53	99	11				
1784.1	30.7	63	8.4	20.9	.8	2.6	27.2	25.8	24.6	23.7	19.7	.246	.077	16.9	GR		17	99	85	99	27				
1788.1	31.1	72	8.4	17.2	.8	2.9	25.6	25.4	27.3	24.6	18.4	.294	.082	23.8	GR		24	99	94	99	41				
1792.1	33.7	50	8.4	25.2	.7	3.1	25.8	26.3	25.0	24.2	18.0	.300	.070	7.4	GR		7	99	86	99	27				
1796.1	28.3	58	8.8	19.5	1.1	3.3	21.8	22.3	26.9	22.7	17.2	.289	.100	13.4	GR		13	95	93	99	50				
1800.1	32.0	55	8.9	22.2	.6	2.6	28.8	29.5	28.4	27.5	19.9	.316	.077	11.2	GR		11	99	98	99	30				
1804.1	32.7	72	8.9	23.8	.9	3.6	23.6	24.8	25.7	23.6	16.6	.330	.086	23.5	GR		24	99	89	99	35				
1808.1	29.6	76	8.6	21.8	.7	2.9	24.1	26.6	24.0	24.0	18.7	.274	.067	16.6	DN		27	99	83	99	22				
1812.1	30.9	95	8.5	22.0	1.9	4.2	18.6	18.9	23.9	19.6	15.1	.279	.128	40.6	GR		41	85	83	99	49				
1816.1	27.9	78	8.6	23.6	2.2	4.2	19.9	20.6	20.3	18.8	15.1	.259	.133	27.1	DN		28	89	71	99	27				
1820.1	26.4	89	8.5	10.7	3.4	5.1	18.9	16.0	24.1	18.9	13.7	.316	.212	36.2	GR		36	85	83	99	61				
1824.1	29.6	67	8.4	20.0	1.4	3.9	18.8	23.2	22.9	21.4	15.8	.305	.109	20.0	GR		20	85	79	99	29				
1828.1	28.3	86	8.5		5.4	5.2	18.6	15.8	19.6	15.7	13.4	.233	.242	33.8	GR		34	84	68	99	42				
1832.1	25.2	73	8.6	23.3	1.8	3.9	23.3	18.5	24.6	20.0	15.9	.267	.127	24.7	GR		25	99	85	99	54				
1836.1	24.2	72	8.5	10.6	1.2	3.8	21.1	23.6	24.9	22.5	15.9	.327	.104	23.7	GR		24	93	86	99	37				

Zone No. 5 DIGBY 1 GFE RESOURCES LTD

Preinterpretation Results 21-09-95

DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	Clay Indicators SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1840.1	23.4	84	8.5	10.9	1.9	5.1	20.2	19.3	21.0	18.3	13.5	.302	.112	32.3	GR		32	90	73	99	35				
1844.1	23.1	74	8.5	10.8	1.5	4.3	15.6	19.4	26.5	21.5	14.9	.340	.117	24.8	GR		25	74	92	99	59				
1848.1	15.0	92	8.8		4.7	8.4	11.1	13.7	21.3	16.4	10.3	.403	.226	38.8	GR		39	58	74	99	57				
1852.1	17.6	95	8.7		4.0	6.1	14.9	15.7	20.8	16.5	12.3	.301	.195	41.1	GR		41	71	72	99	47				
1856.1	20.9	98	8.5		4.6	7.4	12.4	13.6	22.3	17.1	11.1	.384	.240	42.9	GR		43	63	77	99	62				
1860.1	26.0	72	8.5	10.6	1.8	5.6	15.4	19.0	19.6	17.5	13.0	.301	.097	23.7	GR		24	73	68	99	30				
1864.1	25.2	62	8.5	10.2	4.1	6.9	9.8	14.4	16.1	13.3	11.5	.230	.136	16.2	GR		16	54	57	99	31				
1868.1	15.5	90	8.7		9.6	11.2	9.6	11.7	15.5	11.6	8.8	.292	.249	37.3	GR		37	53	55	99	39				
1872.1	24.5	108	8.7		8.8	6.7	9.1	10.5	14.7	10.6	11.7	.148	.195	50.2	GR		50	51	52	99					2
1876.1	26.3	78	8.5	24.5	2.7	5.2	17.0	17.7	19.7	16.8	13.5	.262	.137	28.4	GR		28	79	69	99	35				
1880.1	26.3	108	8.5	80.4	3.5	7.5	15.7	15.7	22.5	17.7	11.0	.418	.193	50.0	GR		50	74	78	99	55				
1884.1	25.4	62	8.5	36.6	3.7	9.5	12.1	18.9	17.4	16.5	9.6	.463	.179	16.0	GR		16	62	61	99					2
1888.1	21.7	71	8.6	23.7	1.8	7.0	16.5	19.1	20.3	17.9	11.4	.396	.103	22.7	GR		23	77	71	99	33				
1892.1	15.8	63	8.7	10.0	4.3	7.3	8.0	17.8	15.2	14.8	11.2	.292	.174	14.7	DN		17	48	54	99	15				
1896.1	10.1	107	8.9		5.9	8.3	15.1	15.3	16.9	14.2	10.4	.308	.220	31.7	DN		50	72	59	99	32				

Zone No. 6 DIGBY 1 GFE RESOURCES LTD

Preinterpretation Results 21-09-95

DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	Clay Indicators SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1900.0		181	8.9		19.8	14.3	16.8	5.0	32.9	19.7	10.5	.961	1.326	68.0	MN		99			99	99	68			
1904.0		183	8.7		26.6	15.8	18.1	6.0	32.2	19.8	10.0	1.070	1.803	71.3	MN		99			99	98	71			
1908.0		179	8.8		28.1	17.6	20.1	5.1	30.3	18.8	9.4	1.083	1.731	87.7	MN		99			99	94	88			
1912.0		174	8.8		18.6	12.9	18.6	3.6	31.1	18.6	11.1	.777	1.120	84.9	MN		95			99	99	85			
1916.0		171	8.8		16.8	10.5	24.6	8.1	34.6	21.5	12.5	.823	1.321	93.7	GR		94			99	99	97			
1920.0		165	8.6		16.1	13.3	23.1	9.5	35.9	22.4	11.0	1.128	1.370	82.2	MN		89			99	99	82			

Zone No. 7 DIGBY 1 Preinterpretation Results
GFE RESOURCES LTD 21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1923.2	24.8	134	8.7		17.3	17.1	21.5	11.4	39.6	24.4	7.3	1.689	1.706	72.2	GR		72	99	99	99	99				
1927.2	25.4	95	8.8		3.4	8.7	21.3	17.1	25.0	19.9	10.7	.590	.233	39.4	DN		42	99	73	99	39				
1931.2	14.9	74	8.8		3.1	6.0	20.2	19.1	20.4	17.9	13.1	.337	.176	16.5	DN		26	99	59	99	16				
1935.2	12.0	161	8.7		38.5	20.8	24.3	23.0	41.0	30.2	6.6	3.015	5.579	77.1	DN		93	99	99	99	77				
1939.2	17.7	85	8.7		8.3	8.8	15.2	13.6	19.9	15.4	10.5	.380	.357	32.5	DN		35	81	58	99	32				
1943.2	11.3	170	8.7		36.8	24.8	27.6	26.5	37.7	30.4	5.9	3.651	5.413	53.7	DN		99	99	99	99	54				
1947.2	11.8	150	8.7		30.4	18.2	26.0	23.4	41.4	30.5	7.1	2.693	4.487	77.1	DN		84	99	99	99	77				
1951.2	7.0	142	8.7		24.7	14.1	19.6	11.1	31.1	21.2	8.1	1.082	1.889	78.3	GR		78	98	91	99	80				

Zone No. 8 DIGBY 1 Preinterpretation Results
GFE RESOURCES LTD 21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
1954.1	3.0	170	8.7		23.2	12.1	26.1	17.2	42.5	27.9	8.2	1.513	2.901	86.5	DN		99	99	99	99	87				
1958.1	2.2	154	8.7		11.3	9.3	24.6	8.9	38.2	22.9	9.5	.815	.996	87.7	GR		88	99	99	99	98				
1962.1	1.1	151	8.6		9.9	7.8	21.0	5.0	36.8	20.9	10.4	.585	.737	85.2	GR		85	93	99	99	99				
1966.1	-.1	163	8.7		8.7	7.2	23.4	8.6	39.2	23.0	10.9	.642	.769	94.3	GR		94	99	99	99	99				
1970.1	1.0	154	8.7		9.6	8.3	23.4	8.1	36.6	22.1	10.1	.685	.794	87.4	GR		87	99	99	99	95				
1974.1	.4	139	8.7		9.3	7.1	26.0	9.9	42.4	24.3	11.0	.698	.912	76.5	GR		77	99	99	99	99				
1978.1	1.3	172	8.7		8.6	6.9	25.8	10.9	40.0	24.2	11.1	.674	.837	97.4	DN		99	99	99	99	97				
1982.1	1.6	156	8.7		12.8	8.0	25.5	7.7	42.0	23.2	10.3	.720	1.149	89.2	GR		89	99	99	99	99				
1986.1	3.8	141	8.7		12.4	7.7	19.9	2.2	34.8	19.2	10.5	.492	.795	77.9	GR		78	89	95	99	99				
1990.1	3.9	131	8.7		13.9	8.1	21.4	2.3	37.6	19.9	10.2	.556	.952	69.8	GR		70	94	99	99	99				
1994.1	6.3	155	8.6		10.6	7.0	23.7	9.3	36.6	22.6	11.0	.606	.913	88.8	GR		89	99	99	99	92				
1998.1	11.6	129	8.6		33.3	17.1	11.6	-7.5	34.1	15.3	6.7	.729	1.418	59.9	S		69	60	93	99	99				
2002.1	12.4	178	8.6		13.4	8.8	18.6	7.0	35.0	21.2	9.7	.675	1.024	84.5	S		99	84	96	99	93				
2006.1	5.5	149	8.7		22.7	8.0	16.4	-2.9	38.2	17.8	10.3	.447	1.271	76.9	S		84	77	99	99	99				
2010.1	9.4	147	8.7		13.3	5.9	19.3	3.5	37.7	20.4	12.1	.425	.952	82.6	GR		83	87	99	99	99				
2014.1	9.3	174	8.8		23.6	10.9	23.1	9.1	36.1	22.4	8.7	.921	1.994	90.8	DN		99	99	99	99	91				
2018.1	6.7	98	8.6		16.6	16.6	11.1	7.7	16.9	11.9	6.9	.447	.447	35.2	DN		44	58	46	99	35				
2022.1	5.8	145	8.7		35.5	21.7	14.4	5.3	33.2	19.9	5.9	1.483	2.431	69.6	S		80	70	91	99	93				
[illegible]	[illegible]	[illegible]	[illegible]		13.0	9.9	10.2	-1.7	36.1	18.0	9.1	.566	.742	55.2	S		99	55	99	99	99				

Zone No. 8 DIGBY 1 Preinterpretation Results

GFE RESOURCES LTD 21-09-95

																Clay Indicators									
DEPTH M	SP	GR	CALI	DI	RXO	RT	PHIS	PHID	PHIN	PHCP	PHRT	RWA	RMFA	VCL	FV	SP	GR	S	N	RT	DN	MN	SD	SN	FLAGS
2030.1	2.0	140	8.6		32.7	24.1	11.0	7.2	32.8	20.5	5.6	1.738	2.353	58.1	S		77	58	90	99	86				
2034.1	2.2	154	8.6		7.5	5.5	14.4	-.4	34.1	18.0	12.6	.316	.426	69.7	S		88	70	93	99	99				
2038.1	3.0	151	8.7		9.6	8.1	15.9	5.4	34.9	20.5	10.2	.588	.696	75.1	S		86	75	95	99	98				
2042.1	4.1	129	8.7		12.1	10.3	17.4	11.5	28.3	20.0	8.9	.709	.833	59.3	DN		69	80	77	99	59				
2046.1	5.4	122	8.7		11.3	8.6	12.0	6.7	26.6	17.6	9.9	.471	.623	61.4	S		63	61	72	99	68				

COMPLEX LITHOLOGY RESULTS

Lithology models

1.	Sand-Dolomite	2.62	to	2.89
2.	Sand-Limestone	2.62	to	2.75
3.	Sand	2.63	to	2.69
4.	Limestone	2.67	to	2.75
5.	Dolomite	2.75	to	2.89
6.	Limestone-Dolomite	2.68	to	2.89

CPX flag values

1. VCL greater than 0.95
2. VN greater than 0.75
3. VS greater than 0.75
4. Bad hole condition
5. Matrix density greater than Lithological model
6. Matrix density less than Lithological model
7. Porosity derived from Sonic Log
8. Porosity derived from or limited by PHIMAX
9. Porosity derived from Density Log

$. Pay zone

Water saturation equations

1. Indonesia
2. Simandoux
3. Fertl & Hammock
4. Laminar
5. Bussian
6. User defined

VGRTYPE :Vclay from GR Equations used

```
0.  Not Used
                        IGR=(GR-GRmin)/(GRmax-GRmin)
1.  Linear              VGR=IGR
2.  Asymmetric (S shaped)
        Defined by 2 sets of intermediate points
        through which the S bend passes through.
        GR1, VGR1 and GR2, VGR2.
    Steiber equation:   VGR= IGR/(A + (A-1.0)*IGR)
3.  Steiber 1  A = 2.0
4.  Steiber 2  A = 3.0
5.  Steiber 3  A = 4.0
6.  Steiber 50%
     A is computed to give VGR= 0.5 when GR = GR50%)
7.  Larinov Old Rocks: VGR= (2**(2*IGR)-1.0)/3.0
8.  Larinov Tertiary : VGR= 0.083*(2.0*(3.7058*IGR)-1.0)
9.  Clavier          : VGR= 1.7-SQRT(3.38-(IGR+0.7)**2.0)
```

DIGBY 1
GFE RESOURCES LTD

Complex Lithology Results
21-09-95

Logging Company

0. Schlumberger
1. HLS
2. Dresser
3. BPB
4. Sperry MWD
5. Baker MWD
6. Anadril MWD

Mud type

0. NaCl
1. KCl %
2. Oil-base
3. Barite

Neutron log type

0. CNL
1. TNPH
2. SNP
3. N
4. DSN2

RT Determination Flags by priority

1. Dual Laterolog - RXO
20. PHASOR-SFL
21. PHASOR-RXO
2. Dual Induction - LL8
3. ILD-SFL-RXO
10. DIL-SFL
11. DIL-LL3
8. ILD and 16 inch Normal
17. LLD-LLS
18. ID PHASOR
4. ILD
5. LLD
6. LL3 or LL7
7. Dual Laterolog
13. LLS
19. IM PHASOR
14. ILM
15. LL8
9. 64 inch Normal Log
12. SFL
16. RXO
0. No RT logs

Formation Water	CNL Chart
0=NaCl	0=1988
1=NaHCO3	1=1987

Zone no.	1	2	3	4	5	6	7	8
Top depth M	1400.000	1461.300	1503.100	1595.100	1700.100	1900.000	1923.200	1954.100
Bottom depth M	1461.200	1503.000	1595.000	1700.000	1899.900	1923.000	1954.000	2048.000
Logging Company	3	3	3	3	3	3	3	3
Mud type	1	1	1	1	1	1	1	1
Formation Water Type	0	0	0	0	0	0	0	0
Neutron Log Type	0	0	0	0	0	0	0	0
Density-CNL Chart	0	0	0	0	0	0	0	0

INPUT PARAMETERS

Zone no.	1	2	3	4	5	6	7	8
Formation	Laira	-------------Pretty	Hill-------------			---------Casterton---------		
1. Top depth	1400.000	1461.300	1503.100	1595.100	1700.100	1900.000	1923.200	1954.100
2. Bottom depth	1461.200	1503.000	1595.000	1700.000	1899.900	1923.000	1954.000	2048.000
3. No logs						SP		
4. RM	.130	.130	.130	.130	.130	.130	.130	.130
5. Temp. RM	18.300	18.300	18.300	18.300	18.300	18.300	18.300	18.300
6. RMF	.111	.111	.111	.111	.111	.111	.111	.111
7. Temp. RMF	17.600	17.600	17.600	17.600	17.600	17.600	17.600	17.600
8. RMC	.198	.198	.198	.198	.198	.198	.198	.198
9. Temp. RMC	18.400	18.400	18.400	18.400	18.400	18.400	18.400	18.400
10. Bit size	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
11. Mud wt	9.100	9.100	9.100	9.100	9.100	9.100	9.100	9.100
12. SSP	-22.000	-22.000	-20.000	-36.000	-36.000	-28.000	-28.000	-28.000
13. RW (SP)	.028	.028	.028	.022	.022	.023	.023	.022
14. FT=Form temp	73.486	75.173	77.363	80.586	85.575	89.224	90.111	92.154
15. RW @ FT	.234	.106	.141	.189	.180	.174	.173	.170
16. RW@75F(23.9C	.490	.226	.306	.425	.425	.425	.425	.425
17. KPPM (RW)	12.000	28.000	20.000	14.000	14.000	14.000	14.000	14.000
18. RMF @ FT	.046	.045	.044	.043	.041	.039	.039	.038
19. KPPM (RMF)	75.077	75.077	75.077	75.077	75.077	75.077	75.077	75.077
20. RM @ FT	.055	.054	.052	.051	.048	.047	.046	.046
21. RHO H	.800	.800	.800	.800	.800	.800	.800	.800
22. RHO F	1.042	1.042	1.041	1.040	1.039	1.038	1.038	1.038
23. t F	188.980	188.980	188.980	188.980	188.980	188.980	188.980	188.980
24. RHOMA	2.670	2.670	2.670	2.670	2.670	2.670	2.670	2.670
25. PHIN min	-.035	-.035	-.035	-.049	-.049	-.035	-.035	-.035
26. t MA	55.500	55.500	55.500	55.500	55.500	55.500	55.500	55.500
27. t MA min	48.000	48.000	48.000	48.000	48.000	48.000	48.000	48.000
28. Sonic option	.000	.000	.000	.000	.000	.000	.000	.000
29. Compact/Over	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
30. CAL cut off	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
31. RUGO.cut off	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
32. DRHO cut off	.050	.050	.050	.050	.050	.050	.050	.050
33. No clay	SP MN SD SN	SP MN SD	SP MN SD SN	SP MN SD SN	SP MN SD SN	N S SD SN	SP MN SD SN	SP MN SD SN
34. Vclay Flag	.000	.000	.000	.000	.000	.000	.000	.000
35. Vclay type	.000	.000	.000	.000	.000	.000	.000	.000
36. Vclay inp1	.200	.200	.200	.200	.200	.200	.200	.200
37. Vclay out1	.150	.150	.150	.150	.150	.150	.150	.150
38. Vclay inp2	.800	.800	.800	.800	.800	.800	.800	.800
39. Vclay out2	.800	.800	.800	.800	.800	.800	.800	.800
40. Vclay 50%	.500	.500	.500	.500	.500	.500	.500	.500
41. VclayGR type	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
42. GR clean	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
43. GR clay	175.000	175.000	175.000	175.000	175.000	180.000	170.000	170.000
44. GR1	73.856	61.000	68.464	68.464	68.464	68.464	68.464	68.464
45. VGR1	.100	.100	.100	.100	.100	.100	.100	.100
46. GR2	145.423	84.000	151.599	151.599	151.599	151.599	151.599	151.599
47. VGR2	.800	.800	.800	.800	.800	.800	.800	.800
48. GR50%	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000
49. R clay	4.000	3.200	3.200	4.500	6.500	12.000	12.000	8.000
50. R limit	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000
51. Rclay1 flag	.000	.000	.000	.000	.000	.000	.000	.000
52. Rclay1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
53. Vcl @ Rclay1	.150	.150	.150	.150	.150	.150	.150	.150
54. RHOB clay	2.514	2.508	2.502	2.527	2.520	2.589	2.574	2.602
55. PHIN clay	.238	.252	.249	.256	.251	.298	.299	.326
56. t clay	87.962	87.710	96.914	82.639	86.317	87.962	82.263	86.317
57. M clay	.686	.691	.630	.716	.693	.651	.695	.656
58. N clay	.518	.510	.514	.501	.506	.453	.456	.431
59. PHIN 2.2	.221	.229	.221	.224	.184	.216	.222	.235
60. t 2.2	87.335	90.000	87.335	90.000	90.000	87.335	87.335	90.000
61. COER (a)	.800	.800	.800	.800	.800	.800	.800	.800
62. MXP (m)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
63. SXP (n)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
64. Lithomod	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
65. SXO limit	.200	.200	.200	.200	.200	.200	.200	.200
66. PHI max	.286	.269	.226	.303	.282	.308	.317	.274
67. PHI min c.o.	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000
68. EXPX	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500

INPUT PARAMETERS (cont'd)

	Zone no.	1	2	3	4	5	6	7	8
	Formation	Laira	-------------Pretty	Hill-------------			---------Casterton---------		
	Top depth	1400.000	1461.300	1503.100	1595.100	1700.100	1900.000	1923.200	1954.100
	Bottom depth	1461.200	1503.000	1595.000	1700.000	1899.900	1923.000	1954.000	2048.000
69.	Clay cut off	.300	.300	.300	.300	.300	.300	.300	.300
70.	Por. cut off	.050	.050	.050	.050	.050	.050	.050	.050
71.	SW cut off	.500	.500	.500	.500	.500	.500	.500	.500
72.	Sat Equation	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
73.	SWirr.cutoff	.300	.300	.300	.300	.300	.300	.300	.300
74.	Perm Expon.	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000
93.	PHINmat1	.200	.200	.200	.200	.200	.200	.200	.200
94.	PHIDmat1	.240	.240	.240	.240	.240	.240	.240	.240
95.	PHINmat2	.350	.350	.350	.350	.350	.350	.350	.350
96.	PHIDmat2	.200	.200	.200	.200	.200	.200	.200	.200
97.	PHINmat3	.050	.050	.050	.050	.050	.050	.050	.050
98.	PHIDmat3	.000	.000	.000	.000	.000	.000	.000	.000
99.	PHINmat4	.200	.200	.200	.200	.200	.200	.200	.200
100.	PHIDmat4	-.100	-.100	-.100	-.100	-.100	-.100	-.100	-.100

Zone No. 1 DIGBY 1 Complex Lithology Results
GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1400.0	160	4.2	4.8	25.1	2.531	.9	.0	99.4	86.9	22.1	88.7	GR	2.670	99.4	99.4	1.1	2.911	.00	.00	8
1404.0	135	4.6	5.9	20.9	2.515	.6	.0	93.7	66.7	20.2	70.6	GR	2.670	93.7	93.7	4.2	2.845	.00	.00	
1408.0	126	5.0	7.9	19.8	2.514	.6	.0	94.6	59.3	18.2	64.0	GR	2.721	94.6	94.6	4.4	2.829	.00	.00	
1412.0	156	3.7	3.7	27.1	2.301	1.2		105.6	97.0	26.6	85.6	GR	2.670	100.0	100.0	1.6	2.852	.00	.00	4 78
1416.0	144	5.0	6.4	19.7	2.518	.4	.0	94.1	74.1	18.1	77.0	GR	2.670	94.1	94.1	2.1	2.831	.00	.00	
1420.0	160	3.8	5.8	22.5	2.490	.4	.0	104.3	77.3	20.2	86.0	DN	2.670	100.0	100.0	1.5	2.846	.00	.00	8
1424.0	154	4.2	5.4	21.9	2.519	.4	.0	99.4	78.8	21.9	84.6	GR	2.670	99.4	99.4	1.7	2.861	.00	.00	8
1428.0	148	4.4	6.1	21.2	2.510	.4	.0	96.0	71.4	21.0	80.1	GR	2.670	96.0	96.0	2.5	2.844	.00	.00	
1432.0	155	3.9	3.5	22.2	2.519	.8		102.9	99.1	22.7	85.4	GR	2.670	100.0	100.0	1.6	2.852	.00	.00	4 78
1436.0	137	4.6	5.5	19.9	2.544	.5	.0	99.4	77.2	19.8	72.2	GR	2.670	99.4	99.4	2.8	2.857	.00	.00	
1440.0	182	3.5	1.7	25.1	2.244	1.4				24.4	100.0	S	2.670	100.0	100.0	.0	2.883	.00	.00	1 4
1444.0	148	5.5	6.8	19.7	2.524	.3	.0			18.1	79.2	S	2.670	100.0	100.0	.0	2.837	.00	.00	3
1448.0	145	4.2	3.5	21.6	2.490	.7		98.4	91.1	21.0	77.8	GR	2.670	98.4	98.4	3.0	2.836	.00	.00	4 78
1452.0	128	5.4	6.3	22.0	2.524	.2	.0	85.3	59.2	19.1	64.9	GR	2.836	85.3	85.3	5.7	2.867	.00	.00	
1456.0	155	4.0	.6	23.8	2.278	1.1		101.5	231.9	21.2	85.4	GR	2.670	100.0	100.0	1.6	2.852	.00	.00	4 78
1460.0	174	3.0	1.2	28.5	2.191	1.6				27.4	99.5	GR	2.670	100.0	100.0	.0	2.882	.00	.00	1 4

Zone No. 2 DIGBY 1 Complex Lithology Results
GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1461.3	158	3.9	4.9	25.3	2.541	.5	.0	91.0	77.2	22.6	87.1	GR	2.670	91.0	91.0	1.2	2.922	.00	.00	8
1465.3	67	3.6	2.4	16.7	2.397	.0	.0	84.7	72.5	17.8	20.3	GR	2.666	84.7	84.7	14.3	2.695	.00	.00	
1469.3	69	3.9	2.5	21.1	2.348	.1	.0	67.2	58.5	19.7	21.2	GR	2.679	67.2	67.2	17.8	2.706	.00	.00	
1473.3	60	1.8	1.0	20.0	2.307	.0	.0	96.9	88.4	25.1	15.0	GR	2.656	96.9	96.9	19.9	2.679	.00	.00	
1477.3	87	2.7	2.2	20.8	2.336	.1	.0	78.9	61.9	19.9	28.6	DN	2.653	78.9	78.9	16.8	2.699	.00	.00	
1481.3	77	2.3	1.5	20.6	2.341	.1	.0	86.6	76.3	23.8	27.7	GR	2.656	86.6	86.6	16.7	2.699	.00	.00	
1485.3	108	5.4	6.2	14.4	2.499	.4	.0	89.8	68.6	16.8	42.6	DN	2.657	89.8	89.8	5.7	2.738	.00	.00	
1489.3	81	4.8	4.6	16.1	2.436	.3	.0	78.8	59.8	15.3	30.2	GR	2.664	78.8	78.8	10.9	2.708	.00	.00	
1493.3	89	3.5	2.7	17.6	2.430	.3	.0	88.0	75.7	18.1	36.7	GR	2.663	88.0	88.0	10.6	2.723	.00	.00	
1497.3	83	2.8	1.6	18.2	2.375	.1	.0	88.8	83.2	20.5	26.2	DN	2.656	88.8	88.8	14.7	2.696	.00	.00	
1501.3	74	5.3	3.5	15.4	2.437	.4	.0	77.8	69.3	15.7	25.3	GR	2.666	77.8	77.8	11.4	2.703	.00	.00	

Zone No. 3 DIGBY 1 Complex Lithology Results

GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1503.1	160	3.1	3.4	25.7	2.477	.4	.0	102.8	95.5	27.2	89.2	GR	2.670	100.0	100.0	.8	2.875	.00	.00	8
1507.1	152	3.7	5.5	30.0	2.456	.5	.0	94.9	72.7	32.8	83.2	GR	2.670	94.9	94.9	1.6	2.903	.00	.00	8
1511.1	135	4.8	5.9	22.3	2.526	.6	.0	82.8	64.5	20.1	70.2	S	2.670	82.8	82.8	3.7	2.874	.00	.00	8
1515.1	105	4.1	5.4	14.4	2.493	.5	.0	107.7	72.3	19.6	43.3	DN	2.654	100.0	100.0	5.7	2.733	.00	.00	
1519.1	151	3.3	2.2	27.2	2.359	.7		100.4	114.1	26.3	82.5	GR	2.670	100.0	100.0	1.6	2.848	.00	.00	4 78
1523.1	162	3.5	3.6	26.7	2.444	.5				24.4	81.8	S	2.670	100.0	100.0	.0	2.846	.00	.00	34
1527.1	106	4.9	5.7	16.4	2.533	.5	.0	98.7	74.6	17.8	48.7	GR	2.706	98.7	98.7	4.4	2.799	.00	.00	
1531.1	84	13.2	20.8	10.0	2.577	.4	.0	91.3	59.6	6.3	32.5	GR	2.683	91.3	91.3	2.8	2.742	.00	.00	
1535.1	79	7.9	12.0	12.1	2.496	.5	.0	87.4	50.2	11.2	28.9	GR	2.662	87.4	87.4	7.2	2.705	.00	.00	
1539.1	135	4.3	5.3	16.8	2.529	.4	.0	103.8	86.9	20.8	65.9	DN	2.653	100.0	100.0	1.4	2.801	.00	.00	
1543.1	91	5.3	5.0	13.1	2.476	.4	.0	98.1	71.1	17.7	31.6	DN	2.654	98.1	98.1	7.8	2.703	.00	.00	
1547.1	143	4.5	5.4	21.3	2.468	.4	.0	85.0	68.0	20.8	72.0	DN	2.670	85.0	85.0	3.3	2.812	.00	.00	8
1551.1	100	4.7	4.9	14.9	2.464	.3	.0	93.8	67.0	22.9	37.3	DN	2.654	93.8	93.8	8.0	2.712	.00	.00	
1555.1	85	3.8	2.0	18.0	2.379	.2	.0	83.9	75.6	21.1	29.8	DN	2.651	83.9	83.9	13.8	2.697	.00	.00	
1559.1	64	4.3	2.5	10.8	2.430	.1	.0	113.3	86.6	17.6	6.5	DN	2.654	100.0	100.0	12.9	2.664	.00	.00	
1563.1	87	4.9	5.5	10.9	2.481	.7	.0	114.6	71.8	20.4	21.6	DN	2.654	100.0	100.0	8.5	2.688	.00	.00	
1567.1	125	4.6	5.4	19.4	2.532	.4	.0	91.1	72.1	21.2	63.1	GR	2.749	91.1	91.1	3.6	2.840	.00	.00	
1571.1	116	5.6	6.2	16.2	2.496	.4	.0	86.0	67.2	17.9	53.2	DN	2.654	86.0	86.0	4.6	2.762	.00	.00	
1575.1	175	4.8	6.1	20.1	2.508	.4	.0	85.2	63.9	17.8	63.9	S	2.713	85.2	85.2	4.2	2.829	.00	.00	
1579.1	102	5.1	4.8	14.9	2.482	.4	.0	92.3	72.4	18.4	42.6	DN	2.654	92.3	92.3	6.4	2.730	.00	.00	
1583.1	136	4.1	4.6	19.9	2.513	.4	.0	92.0	77.0	22.4	71.0	GR	2.670	92.0	92.0	3.0	2.831	.00	.00	
1587.1	143	4.8	5.8	19.7	2.523	.4	.0	88.5	72.7	19.9	69.6	S	2.707	88.5	88.5	2.5	2.837	.00	.00	
1591.1	159	3.3	3.4	25.4	2.457	.5	.0			26.6	87.8	S	2.670	100.0	100.0	.0	2.855	.00	.00	3

Zone No. 4 DIGBY 1 Complex Lithology Results
GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1595.1	136	4.8	5.5	20.6	2.514	.5	.0	97.5	75.7	19.7	71.3	GR	2.670	97.5	97.5	3.4	2.841	.00	.00	
1599.1	80	6.8	3.5	12.1	2.513	.5	.0	114.3	101.6	19.1	29.4	GR	2.664	100.0	100.0	6.6	2.714	.00	.00	
1603.1	93	5.3	2.5	21.6	2.419	.7	.0	80.0	70.4	26.2	39.6	GR	2.691	80.0	80.0	12.4	2.773	.00	.00	
1607.1	79	10.3	4.4	18.1	2.506	.6	.0	72.7	66.1	15.8	28.6	GR	2.748	72.7	72.7	10.4	2.800	.00	.00	
1611.1	69	3.7	1.7	23.3	2.351	.4	.0	86.9	67.2	23.9	21.2	GR	2.697	86.9	86.9	18.6	2.736	.00	.00	
1615.1	87	5.8	5.5	14.0	2.522	.7	.0	115.4	78.4	18.0	34.5	GR	2.682	100.0	100.0	6.4	2.753	.00	.00	
1619.1	79	4.6	2.3	22.1	2.410	.4	.0	85.8	68.5	20.9	28.9	GR	2.709	85.8	85.8	14.8	2.771	.00	.00	
1623.1	79	4.2	1.8	21.4	2.343	.0	.0	81.6	68.4	22.1	29.0	GR	2.658	81.6	81.6	16.9	2.706	.00	.00	
1627.1	58	7.4	3.0	20.0	2.437	.0	.0	75.9	60.6	15.3	13.1	GR	2.741	75.9	75.9	16.2	2.765	.00	.00	
1631.1	52	3.1	1.0	24.0	2.293	.0	.0	88.1	77.8	28.0	9.0	GR	2.691	88.1	88.1	23.1	2.703	.00	.00	
1635.1	43	2.8	.6	24.0	2.232	-.1	.0	86.2	87.4	28.5	2.3	GR	2.671	87.4	86.2	26.5	2.674	.00	.00	
1639.1	54	3.1	1.0	18.1	2.365	.0	.0	110.5	99.2	27.1	10.3	GR	2.677	100.0	100.0	17.8	2.691	.00	.00	
1643.1	71	4.7	1.6	23.8	2.436	.1	.0	83.0	75.6	18.8	22.8	GR	2.787	83.0	83.0	16.7	2.817	.00	.00	
1647.1	62	3.8	1.2	26.5	2.323	.0	.0	78.7	70.3	24.3	16.5	GR	2.726	78.7	78.7	22.0	2.757	.00	.00	
1651.1	63	3.8	1.4	20.1	2.338	.0	.0	90.4	77.3	22.7	17.2	GR	2.667	90.4	90.4	18.5	2.693	.00	.00	
1655.1	89	3.4	1.6	22.7	2.458	.0	.0	102.1	88.6	21.7	36.5	GR	2.763	100.0	100.0	12.7	2.821	.00	.00	
1659.1	112	9.2	7.0	20.7	2.556	.2	.0	71.9	59.4	17.1	53.3	GR	2.831	71.9	71.9	6.3	2.878	.00	.00	
1663.1	76	10.5	3.4	16.9	2.427	.0	.0	66.1	65.9	15.7	26.8	GR	2.669	66.1	66.1	12.3	2.710	.00	.00	
1667.1	65	3.0	.9	21.9	2.309	-.1	.0	92.8	88.5	22.9	18.3	GR	2.665	92.8	92.8	20.1	2.694	.00	.00	
1671.1	67	3.2	1.3	17.3	2.402	.0	.0	116.3	96.7	22.7	20.2	GR	2.671	100.0	100.0	14.5	2.701	.00	.00	
1675.1	65	3.1	1.0	23.1	2.288	-.1	.0	87.4	80.8	24.2	18.6	GR	2.664	87.4	87.4	21.3	2.694	.00	.00	
1679.1	66	4.6	1.5	20.7	2.316	.0	.0	77.9	71.2	23.2	19.5	GR	2.655	77.9	77.9	19.1	2.688	.00	.00	
1683.1	48	3.9	2.6	14.6	2.535	.0	.0	144.4	89.2	10.9	5.9	GR	2.763	100.0	100.0	12.4	2.773	.00	.00	
1687.1	69	3.0	.8	26.8	2.254	-.1	.0	79.4	82.4	30.2	21.4	GR	2.674	82.4	79.4	23.6	2.706	.00	.00	
1691.1	84	3.9	1.1	22.7	2.301	.0	.0	78.3	80.5	28.9	27.9	DN	2.646	80.5	78.3	19.2	2.697	.00	.00	
1695.1	88	4.2	1.3	25.7	2.368	.0	.0	78.1	79.5	26.1	35.2	GR	2.712	79.5	78.1	16.7	2.784	.00	.00	
1699.1	76	3.4	1.3	20.3	2.326	-.1	.0	91.0	80.4	24.7	23.3	DN	2.648	91.0	91.0	18.0	2.689	.00	.00	

Zone No. 5 DIGBY 1 Complex Lithology Results

GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1700.1	117	4.7	1.9	23.6	2.388	.0	.0	81.5	80.8	23.3	57.3	GR	2.645	81.5	81.5	11.4	2.774	.00	.00	
1704.1	60	2.5	.8	18.4	2.301	-.1	.0	109.4	99.2	24.3	14.8	GR	2.636	100.0	100.0	19.5	2.664	.00	.00	
1708.1	48	2.3	.6	21.0	2.242	-.1	.0	99.2	96.5	25.8	5.7	GR	2.645	99.2	99.2	24.3	2.655	.00	.00	
1712.1	47	3.2	.8	23.0	2.307	-.1	.0	89.3	87.4	21.5	5.5	GR	2.695	89.3	89.3	22.8	2.702	.00	.00	
1716.1	44	2.7	.6	21.6	2.255	-.1	.0	92.1	90.8	26.9	3.3	GR	2.661	92.1	92.1	24.5	2.667	.00	.00	
1720.1	49	3.6	1.6	14.7	2.349	-.1	.3	108.4	79.5	17.2	6.9	GR	2.647	100.0	100.0	17.5	2.659	.00	.00	
1724.1	71	5.5	1.8	13.5	2.363	.0	.0	93.3	82.8	15.3	13.8	DN	2.627	93.3	93.3	15.0	2.655	.00	.00	
1728.1	89	7.6	3.4	12.1	2.474	-.1		97.0	90.9	12.1	36.5	GR	2.670	97.0	97.0	7.7	2.755	.00	.00	4 7
1732.1	50	6.5	2.2	11.9	2.405	-.1	.0	97.3	82.1	14.8	7.2	GR	2.650	97.3	97.3	14.2	2.662	.00	.00	
1736.1	54	8.2	2.7	21.6	2.517	-.1	.0	73.3	64.0	12.9	10.3	GR	2.851	73.3	73.3	16.4	2.857	.00	.00	
1740.1	109	7.0	3.6	24.7	2.439	.1	.0	70.1	60.5	20.5	50.8	GR	2.754	70.1	70.1	11.4	2.831	.00	.00	
1744.1	43	6.5	1.8	10.7	2.405	-.2	1.7	100.4	91.3	12.8	2.0	GR	2.649	100.0	100.0	14.5	2.653	.00	.00	
1748.1	42	5.8	1.9	13.8	2.371	-.2	2.5	90.3	76.0	14.0	1.4	GR	2.659	90.3	90.3	17.2	2.662	.00	.00	
1752.1	59	9.5	3.0	13.6	2.447	-.1	.0	83.8	77.6	15.0	14.0	GR	2.674	83.8	83.8	12.3	2.693	.00	.00	
1756.1	46	5.4	2.8	12.3	2.409	.0	3.7	106.7	71.5	10.1	4.8	GR	2.659	100.0	100.0	14.6	2.666	.00	.00	
1760.1	76	7.1	2.6	11.2	2.432	.0	.0	101.8	91.5	12.0	19.1	DN	2.631	100.0	100.0	10.7	2.668	.00	.00	
1764.1	54	7.0	2.3	10.7	2.395	.0	.8	96.0	84.1	12.8	8.5	DN	2.630	96.0	96.0	13.5	2.647	.00	.00	
1768.1	64	9.2	3.4	14.8	2.449	.2	.0	82.3	72.0	15.8	18.1	GR	2.679	82.3	82.3	12.1	2.703	.00	.00	
1772.1	40	8.3	3.2	13.3	2.434	.0	1.3	87.3	66.7	11.0	.0	GR	2.685	87.3	87.3	15.1	2.685	.00	.00	
1776.1	57	5.9	1.9	12.6	2.363	.0	.0	92.5	81.2	16.8	9.8	DN	2.628	92.5	92.5	15.3	2.648	.00	.00	
1780.1	48	9.3	2.4	11.0	2.399	-.1	2.2	82.9	79.4	11.9	5.7	GR	2.641	82.9	82.9	14.1	2.652	.00	.00	
1784.1	63	2.6	.8	20.6	2.279	-.1	.0	98.4	89.3	27.2	16.9	GR	2.639	98.4	98.4	20.9	2.670	.00	.00	
1788.1	72	2.9	.8	23.3	2.286	-.1	.0	89.1	87.6	25.6	23.8	GR	2.655	89.1	89.1	20.6	2.694	.00	.00	
1792.1	50	3.1	.7	21.0	2.270	-.1	.0	89.4	90.0	25.8	7.4	GR	2.657	90.0	89.4	23.0	2.669	.00	.00	
1796.1	58	3.3	1.1	22.9	2.337	.3	.0	92.2	78.7	21.8	13.4	GR	2.699	92.2	92.2	20.3	2.719	.00	.00	
1800.1	55	2.6	.6	24.4	2.217	.4	.0	87.9	87.6	28.8	11.2	GR	2.650	87.9	87.9	25.0	2.670	.00	.00	8
1804.1	72	3.6	.9	21.7	2.295	.4	.0	84.5	86.3	23.6	23.5	GR	2.645	86.3	84.5	19.7	2.686	.00	.00	
1808.1	76	2.9	.7	20.0	2.266	.1	.0	93.5	95.8	24.1	16.6	DN	2.623	95.8	93.5	21.1	2.660	.00	.00	
1812.1	95	4.2	1.9	19.9	2.394	.0	.0	94.3	81.9	18.6	40.6	GR	2.651	94.3	94.3	12.4	2.724	.00	.00	
1816.1	78	4.2	2.2	16.3	2.366	.1	.0	98.5	75.4	19.9	27.1	DN	2.623	98.5	98.5	14.0	2.678	.00	.00	
1820.1	89	5.1	3.4	20.1	2.442	.0	.0	93.7	66.9	18.9	36.2	GR	2.699	93.7	93.7	11.5	2.772	.00	.00	
1824.1	67	3.9	1.4	18.9	2.322	-.1	.0	89.2	77.3	18.8	20.0	GR	2.642	89.2	89.2	18.1	2.678	.00	.00	
1828.1	86	5.2	5.4	15.6	2.446	.0	.0	104.9	61.1	18.6	33.8	GR	2.654	100.0	100.0	9.8	2.708	.00	.00	
1832.1	73	3.9	1.8	20.6	2.401	.1	.0	98.9	76.9	23.3	24.7	GR	2.698	98.9	98.9	15.2	2.743	.00	.00	
1836.1	72	3.8	1.2	20.9	2.316	.0	.0	85.3	79.6	21.1	23.7	GR	2.650	85.3	85.3	18.5	2.690	.00	.00	
1840.1	84	5.1	1.9	17.0	2.388	.0	.0	91.0	84.7	20.2	32.3	GR	2.633	91.0	91.0	12.6	2.693	.00	.00	

Zone No. 5 DIGBY 1
GFE RESOURCES LTD

Complex Lithology Results
21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1844.1	74	4.3	1.5	22.5	2.386	.0	.0	87.6	79.7	15.6	24.8	GR	2.707	87.6	87.6	16.5	2.757	.00	.00	
1848.1	92	8.4	4.7	17.3	2.481	.3	.0	84.9	70.4	11.1	38.8	GR	2.688	84.9	84.9	8.5	2.765	.00	.00	
1852.1	95	6.1	4.0	16.8	2.447	.2	.0	93.5	72.1	14.9	41.1	GR	2.651	93.5	93.5	9.0	2.726	.00	.00	
1856.1	98	7.4	4.6	18.3	2.482	.0	.0	87.8	70.6	12.4	42.9	GR	2.693	87.8	87.8	8.2	2.781	.00	.00	
1860.1	72	5.6	1.8	15.6	2.393	.0	.0	91.9	88.0	15.4	23.7	GR	2.644	91.9	91.9	13.3	2.684	.00	.00	
1864.1	62	6.9	4.1	12.1	2.470	.0	.0	108.9	75.7	9.8	16.2	GR	2.668	100.0	100.0	10.5	2.692	.00	.00	
1868.1	90	11.2	9.6	11.5	2.514	.2	.0	98.6	72.9	9.6	37.3	GR	2.639	98.6	98.6	4.8	2.708	.00	.00	
1872.1	108	6.7	8.8	10.7	2.535	.2		109.8	69.4	9.1	50.2	GR	2.670	100.0	100.0	4.5	2.787	.00	.00	4 7
1876.1	78	5.2	2.7	15.7	2.414	.0	.0	98.6	76.6	17.0	28.4	GR	2.648	98.6	98.6	11.9	2.695	.00	.00	
1880.1	108	7.5	3.5	18.5	2.448	.0	.0	81.1	77.9	15.7	50.0	GR	2.649	81.1	81.1	8.2	2.753	.00	.00	
1884.1	62	9.5	3.7	13.4	2.395	.0		95.0	81.6	12.1	16.0	GR	2.670	95.0	95.0	10.2	2.707	.00	.00	4 7
1888.1	71	7.0	1.8	16.3	2.391	.1	.0	79.8	84.1	16.5	22.7	GR	2.653	84.1	79.8	14.0	2.689	.00	.00	
1892.1	63	7.3	4.3	11.2	2.413	.2	4.0	96.6	65.2	8.0	14.7	DN	2.630	96.6	96.6	12.1	2.659	.00	.00	
1896.1	107	8.3	5.9	12.9	2.455	.4	.0	93.5	66.4	15.1	31.7	DN	2.632	93.5	93.5	8.5	2.692	.00	.00	

Zone No. 6 DIGBY 1
GFE RESOURCES LTD

Complex Lithology Results
21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1900.0	181	14.3	19.8	28.8	2.627	.4	.0	71.0	42.0	16.8	68.0	MN	3.058	71.0	71.0	5.5	3.021	.00	.00	5
1904.0	183	15.8	26.6	28.0	2.609	.2	.0	70.1	38.8	18.1	71.3	MN	2.670	70.1	70.1	4.8	3.002	.00	.00	8
1908.0	179	17.6	28.1	26.2	2.624	.3	.0	100.0	100.0	20.1	87.7	MN	2.670	100.0	100.0	.5	2.995	.00	.00	
1912.0	174	12.9	18.6	27.0	2.649	.3	.0	97.6	74.7	18.6	84.9	MN	2.670	97.6	97.6	.8	3.020	.00	.00	
1916.0	171	10.5	16.8	30.5	2.574	.3	.0	100.0	100.0	24.6	93.7	GR	2.670	100.0	100.0	.5	2.996	.00	.00	8
1920.0	165	13.3	16.1	31.8	2.552	.1	.0	85.9	64.2	23.1	82.2	MN	2.670	85.9	85.9	2.3	2.990	.00	.00	8

Zone No. 7 DIGBY 1 Complex Lithology Results
GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1923.2	134	17.1	17.3	35.6	2.519	.2	.0	67.2	48.3	21.5	72.2	GR	2.670	67.2	67.2	4.6	2.992	.00	.00	8
1927.2	95	8.7	3.4	21.0	2.424	.3	.0	74.3	66.5	21.3	39.4	DN	2.652	74.3	74.3	11.9	2.769	.00	.00	
1931.2	74	6.0	3.1	16.4	2.391	.3	.0	89.3	62.6	20.2	16.5	DN	2.654	89.3	89.3	15.0	2.690	.07	.04	
1935.2	161	20.8	38.5	37.0	2.326	.2	.0	64.5	36.3	24.3	77.1	DN	2.670	64.5	64.5	3.5	2.874	.07	.04	8
1939.2	85	8.8	8.3	15.9	2.482	.2	.0	96.3	56.8	15.2	32.5	DN	2.655	96.3	96.3	8.8	2.745	.07	.04	
1943.2	170	24.8	36.8	33.6	2.267	.2	.0	34.8	16.2	27.6	53.7	DN	2.622	34.8	34.8	14.7	2.800	.11	.06	8
1947.2	150	18.2	30.4	37.4	2.319	.2	.0	69.0	41.0	26.0	77.1	DN	2.670	69.0	69.0	3.5	2.872	.16	.10	8
1951.2	142	14.1	24.7	27.0	2.525	.2	.0	79.4	46.8	19.6	78.3	GR	2.670	79.4	79.4	3.2	2.928	.16	.10	8

Zone No. 8 DIGBY 1 Complex Lithology Results

GFE RESOURCES LTD 21-09-95

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1954.1	170	12.1	23.2	38.5	2.423	.2	.0	79.4	51.5	26.1	86.5	DN	2.670	79.4	79.4	1.4	2.948	.00	.00	8
1958.1	154	9.3	11.3	34.2	2.562	.2	.0	91.0	74.9	24.6	87.7	GR	2.670	91.0	91.0	1.2	3.012	.00	.00	8
1962.1	151	7.8	9.9	32.8	2.626	.1	.0	97.8	77.2	21.0	85.2	GR	2.670	97.8	97.8	1.6	3.047	.00	.00	8
1966.1	163	7.2	8.7	35.2	2.567	.2	.0	100.0	100.0	23.4	94.3	GR	2.670	100.0	100.0	.4	3.022	.00	.00	8
1970.1	154	8.3	9.6	32.6	2.575	.2	.0	96.2	81.1	23.4	87.4	GR	2.670	96.2	96.2	1.2	3.011	.00	.00	8
1974.1	139	7.1	9.3	38.4	2.544	.2	.0	97.5	68.6	26.0	76.5	GR	2.670	97.5	97.5	3.1	3.023	.00	.00	8
1978.1	172	6.9	8.6	36.0	2.528	.2	.0			25.8	97.4	DN	2.670	100.0	100.0	.0	3.000	.00	.00	1
1982.1	156	8.0	12.8	38.0	2.582	.2	.0	98.6	72.2	25.5	89.2	GR	2.670	98.6	98.6	1.0	3.044	.00	.00	8
1986.1	141	7.7	12.4	30.9	2.673	.2	.0	97.0	63.3	19.9	77.9	GR	2.670	97.0	97.0	2.5	3.065	.00	.00	
1990.1	131	8.1	13.9	33.6	2.672	.2	.0	85.3	48.1	21.4	69.8	GR	3.178	85.3	85.3	4.8	3.082	.00	.00	5
1994.1	155	7.0	10.6	32.6	2.554	.1	.0	105.1	78.8	23.7	88.8	GR	2.670	100.0	100.0	1.0	2.997	.00	.00	8
1998.1	129	17.1	33.3	30.1	2.835	.1	.0	73.5	41.2	11.6	59.9	S	3.359	73.5	73.5	3.0	3.160	.00	.00	5
2002.1	178	8.8	13.4	31.0	2.593	.1	.0			18.6	84.5	S	2.670	100.0	100.0	.0	3.013	.00	.00	3
2006.1	149	8.0	22.7	34.2	2.759	.2	.0			16.4	76.9	S	2.670	100.0	100.0	.0	3.132	.00	.00	3
2010.1	147	5.9	13.3	33.7	2.652	.2	.0	111.0	63.9	19.3	82.6	GR	2.670	100.0	100.0	2.0	3.069	.00	.00	8
2014.1	174	10.9	23.6	32.2	2.558	.3	.0	100.0	100.0	23.1	90.8	DN	2.670	100.0	100.0	.8	2.996	.00	.00	8
2018.1	98	16.6	16.6	12.9	2.581	.1	.0	101.8	71.6	11.1	35.2	DN	2.657	100.0	100.0	3.4	2.790	.00	.00	
2022.1	145	21.7	35.5	29.2	2.622	.2	.0	52.4	30.2	14.4	69.6	S	2.977	52.4	52.4	4.8	3.020	.00	.00	5
2026.1	169	9.9	13.0	32.1	2.738	.2	.0	79.5	47.2	10.2	55.2	S	3.207	79.5	79.5	6.2	3.111	.00	.00	5
2030.1	140	24.1	32.7	28.8	2.590	.1	.0	45.1	25.5	11.0	58.1	S	2.928	45.1	45.1	7.8	2.994	.00	.00	5
2034.1	154	5.5	7.5	30.1	2.717	.1	.0	114.6	77.6	14.4	69.7	S	3.225	100.0	100.0	3.4	3.087	.00	.00	5
2038.1	151	8.1	9.6	30.9	2.620	.2	.0			15.9	75.1	S	2.670	100.0	100.0	.0	3.032	.00	.00	3
2042.1	129	10.3	12.1	24.3	2.518	.2	.0	74.2	46.8	17.4	59.3	DN	2.660	74.2	74.2	6.5	2.893	.00	.00	
2046.1	122	8.6	11.3	22.6	2.598	.2	.0	105.2	73.4	12.0	61.4	S	2.707	100.0	100.0	2.7	2.935	.00	.00	

DIGBY 1 GFE RESOURCES LTD Complex Lithology Results 21-09-95

Hydrocarbon Volume Report

ZONE #	2	3	4	5	7	8
FORMATION	-------------Pretty Hill			-------------	----Casterton----	
FROM M	1461.300	1503.100	1595.100	1700.100	1923.200	1954.100
TO M	1503.000	1595.000	1700.000	1899.900	1954.000	2048.000
INTERVAL M	41.700	91.900	104.900	199.800	30.800	93.900
PHIE Cut off	.050	.050	.050	.050	.050	.050
SW Cut Off	1.000	1.000	1.000	1.000	1.000	1.000
Vclay Cut Off	.400	.400	.400	.400	.400	.400
Net Pay M	28.800	20.900	94.200	176.400	15.300	1.600
Average PHIE %	13.798	9.979	17.192	15.720	12.112	7.505
Average SW %	84.834	87.906	84.860	92.227	78.118	97.942
Average Vclay %	27.035	27.330	21.825	16.943	26.925	22.242
Integrated PHI M	3.974	2.086	16.195	27.729	1.853	.120
Sum PHI*(1-SW) M	.588	.263	2.409	2.134	.474	.002

ZONE #	2	3	4	5	7	8
FORMATION	-------------Pretty Hill			-------------	----Casterton----	
FROM M	1461.300	1503.100	1595.100	1700.100	1923.200	1954.100
TO M	1503.000	1595.000	1700.000	1899.900	1954.000	2048.000
INTERVAL M	41.700	91.900	104.900	199.800	30.800	93.900
PHIE Cut off	.050	.050	.050	.050	.050	.050
SW Cut Off	.500	.500	.500	.500	.500	.500
Vclay Cut Off	.400	.400	.400	.400	.400	.400
Net Pay M	.000	.000	.100	.000	1.300	.000
Average PHIE %	.000	.000	14.199	.000	20.086	.000
Average SW %	.000	.000	48.354	.000	35.899	.000
Average Vclay %	.000	.000	35.631	.000	28.280	.000
Integrated PHI M	.000	.000	.014	.000	.261	.000
Sum PHI*(1-SW) M	.000	.000	.007	.000	.169	.000

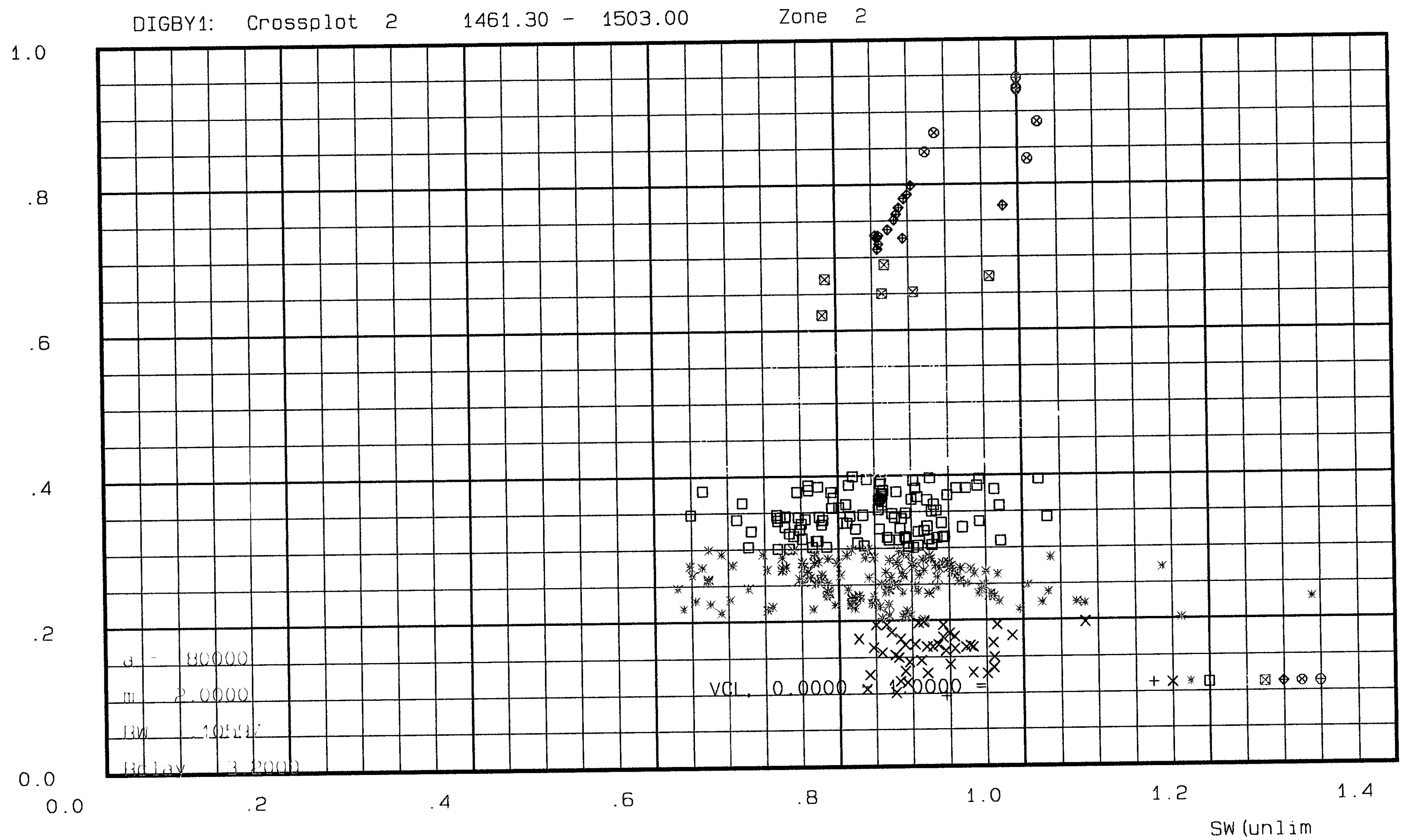
PE905921

This is an enclosure indicator page.
The enclosure PE905921 is enclosed within the container PE903969 at this location in this document.

The enclosure PE905921 has the following characteristics:

ITEM_BARCODE = PE905921
CONTAINER_BARCODE = PE903969
NAME = Crossplot
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Cross Plot 2, 1461.3-1503, Zone 2 (from appendix 12 of WCR--Log Analysis Data) for Digby-1
REMARKS =
DATE_CREATED = 30/11/95
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR = GFE
CLIENT_OP_CO = GFE

(Inserted by DNRE - Vic Govt Mines Dept)


DIGBY1: Crossplot 2 1461.30 - 1503.00 Zone 2
VCL
1.0
.8
.6
.4
.2
0.0
0.0
.2
.4
.6
.8
1.0
1.2
1.4
SW(unlim
VCL 0.0000 X 1.0000 =
m 2.0000
Rclay 3.2000

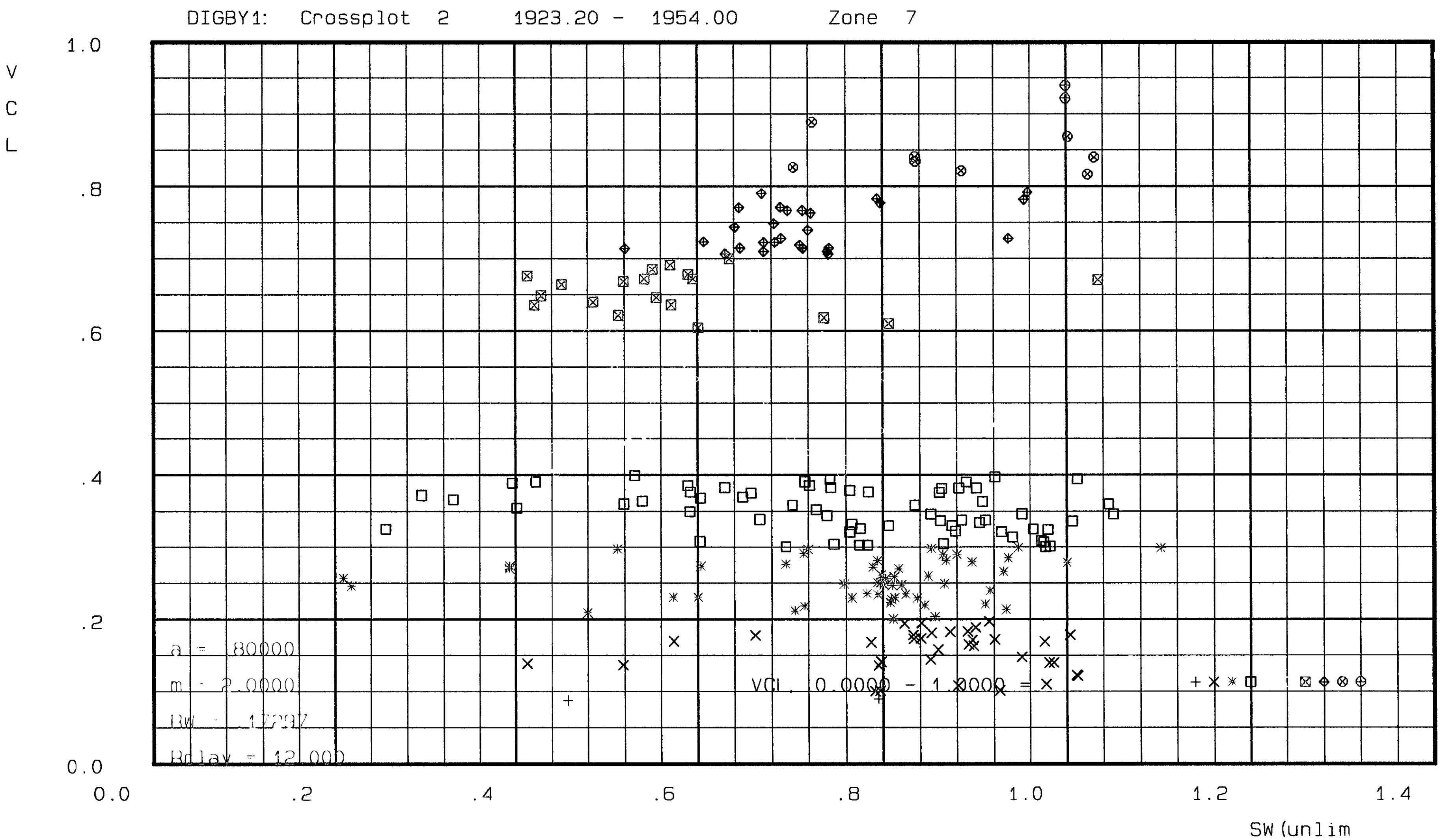
PE905922

This is an enclosure indicator page.
The enclosure PE905922 is enclosed within the container PE903969 at this location in this document.

The enclosure PE905922 has the following characteristics:

ITEM_BARCODE = PE905922
CONTAINER_BARCODE = PE903969
NAME = Crossplot
BASIN = OTWAY BASIN
PERMIT = PEP/134
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Cross Plot 2, 1923.2-1954, Zone 7 (from appendix 12 of WCR--Log Analysis Data) for Digby-1
REMARKS =
DATE_CREATED = 30/11/95
DATE_RECEIVED =
W_NO = W1130
WELL_NAME = DIGBY-1
CONTRACTOR = GFE
CLIENT_OP_CO = GFE

(Inserted by DNRE - Vic Govt Mines Dept)



DEPT. NAT. RES & ENV

PE905922