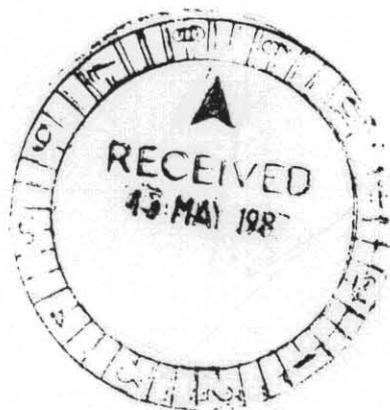


PETROLEUM GEOCHEMISTRY

HYDROCARBON SOURCE ROCK EVALUATION

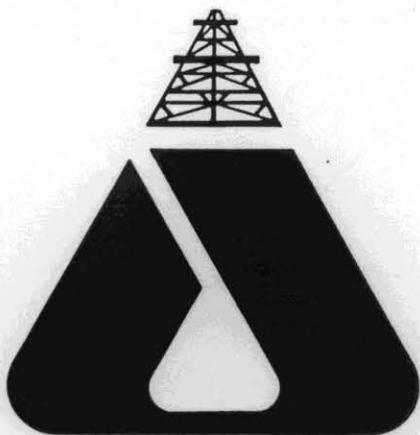
BASS BASIN



Prepared for

AMOCO AUSTRALIA PETROLEUM COMPANY

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SUMMARY

Coaly and shaly sediments from various wells in the Bass Basin have been analysed regarding their source potential. The following results were obtained:

- Samples above approximately 6000ft are usually immature to marginally mature, samples below this depth are moderately mature to mature.
- The source potential is in general good to excellent for coals, moderate to good for coaly shales and marginal to moderate for shales.
- The organic source matter is predominantly derived from higher plants and characteristic of resinous-rich coals. Shaly sequences intercalated with the coals contain various proportions of marine and mixed organic matter.
- Out-of-place hydrocarbons believed to be present in some of the coaly sediments are probably generated from similar coaly source rocks at slightly higher maturity levels.

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Aromatic Fragmentogram

3-1a to 3-1c	Bass 1 6405'
3-2a to 3-2c	Bass 1 6930'
3-3a to 3-3c	Bass 2 4135'
3-4a to 3-4c	Bass 2 4740'
3-5a to 3-5c	Bass 2 5068'
3-6a to 3-6c	Bass 2 5509'
3-7a to 3-7c	Bass 3 5023'
3-8a to 3-8c	Bass 3 7434'
3-9a to 3-9c	Dondu 1 7679' 10"
3-10a to 3-10c	Durroon 1 5551'
3-11a to 3-11c	Durroon 1 8424'
3-12a to 3-12c	Durroon 1 9915'
3-13a to 3-13c	Konkon 1 4413'
3-14a to 3-14c	Pelican 1 5851'
3-15a to 3-15c	Pelican 1 7122'
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2-2a & b	Bass 2
2-3a & b	Bass 3
2-4a & b	Dondu 1
2-5a & b	Durroon 1
2-6a & b	Konkon 1
2-7a & b	Pelican 1
2-8a & b	Pelican 3
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3-4	Bass 2 4740'
3-5	Bass 2 5068'
3-6	Bass 2 5509'
3-7	Bass 3 5023'
3-8	Bass 3 7434'
3-9	Dondu 1 7679'10"
3-10	Durroon 1 5551'
3-11	Durroon 1 8424'
3-12	Durroon 1 9915'
3-13	Konkon 1 4413'
3-14	Pelican 1 5851'
3-15	Pelican 1 7122'
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4-3	Bass 2 4135', Core 5
4-4	Bass 2 4740'
4-5	Bass 2 5068'
4-6	Bass 2 5509'
4-7	Bass 3 5023'
4-8	Bass 3 7434'
4-9	Dondu 1 7679'10"
4-10	Durroon 1 5551'
4-11	Durroon 1 8424'
4-12	Durroon 1 9915'

4-13	Konkon 1 4413'
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PETROLEUM GEOCHEMISTRYHYDROCARBON SOURCE ROCK EVALUATIONBASS BASINIntroduction

Samples from various wells in the Bass Basin, located between Victoria and Tasmania in Southeast Australia, were analysed for Amoco Australia Petroleum Company. Geochemical analyses have been performed to evaluate thermal maturity and hydrocarbon source character of the sediments and to differentiate between in-situ generated and migrated hydrocarbons in these rocks.

As no stratigraphic information (formation tops, age) was available, the geochemical results could not be put into a geological context. The study therefore had to be restricted to a descriptive interpretation of each single sample.

Analytical Techniques

Forty three samples derived from thirteen wells in the Bass Basin were forwarded to Analabs - Oil & Gas for a first screening analysis. All samples were crushed, air dried and their amount of total organic carbon was determined. Eighteen samples from nine wells were then selected by Amoco staff for more detailed analyses. These analyses included Rock Eval pyrolysis, solvent extraction, whole extract gas chromatography, liquid chromatography and gas chromatography-mass spectrometry of branched and cyclic saturates as well as aromatic fractions.

The results of the analysis performed are presented in the following figures and tables:

<u>Type of Analysis</u>	<u>Figure</u>	<u>Table</u>
TOC determination		1
Rock Eval pyrolysis		1
Solvent Extraction		2
Liquid Chromatography		2
Whole extract GC	1	
GC-MS saturate fractions	2	
GC-MS aromatic fractions	3	

The analytical procedures applied in this study are described in the "Theory and Methods" chapter at the end of this report.

General Information

Copies of this report have been sent to Mr C W Waring of Amoco Australia Petroleum Company in Sydney NSW.

Any questions related to this study may be directed to Dr Birgitta Hartung-Kagi of Analabs in Perth, WA.

All data and interpretations given herein are proprietary to Amoco Australia Petroleum Company, and are treated as highly confidential material by all Analabs personnel.

Discussion of Wells

Samples from the following wells have been analysed:

Aroo 1	(TOC only)
Bass 1	
Bass 2	
Bass 3	
Cormorant 1	(TOC only)
Dondu 1	
Durroon 1	
Konkon 1	
Narimba 1	(TOC only)
Pelican 1	
Pelican 3	
Ponboon 1	(TOC only)
Tilana 1	

Results from the different wells are discussed below and are followed by a comparison of the wells.

AROO 1

The shale sample 9566ft contains 1.76% TOC which classifies it as a good source rock, based on the TOC value alone (Tab 1-1).

BASS 1

Total organic carbon contents have been determined for four samples between 6405ft and 7694ft (Cores 12 to 15). For the two deepest samples, a dark shaly/silty sediment at 7694ft and a coal at 7412ft, TOC values of 13% and 61.65%, respectively, have been determined (Tab 1-2). The dark grey shale at 6930ft (Core 13) yielded 1.86% TOC, for the laminated shale at 6405ft a TOC value of 3.79% was obtained. This characterises them as good to very good source rocks.

Rock Eval pyrolysis results indicate that both samples are immature to date (Tmax of 422° and 427°C). For the shallowest sample (6405ft) a very good genetic potential is indicated by a S₁+S₂ value of 12.57mg/g rock, while sample 6930ft is characterised as having only marginal potential. A hydrogen index of 309, as obtained for Core 12, indicates the generation of oil, together with some gas, on maturation. The relatively high S₁ value of 0.83 in Core 12, together with a total extract of 2133.3ppm (Tab 2-1a) might suggest that this presently immature sample contains some out of place hydrocarbon (s. Bass 2).

Maturity parameters other than Tmax, i.e. EOM(mg)/TOC(g) (Tab 2-1a), gas chromatography results (Tab 2-16, Figs 1-1, 1-2) and GC-MS data (Tabs 3-1, 3-2, Figs 2-2) also indicate immaturity for oil generation. Hopane and sterane biomarker ratios which are useful maturity indicators (parameters 1 to 5 in Tab 3-1 and 3-2) are very similar to identical for samples 6930ft and 6405ft. The C₂₉ 20S/20R sterane ratio, 0.18 for both samples, is believed to be equivalent to about 0.42-0.45% Ro.

Both samples contain eudesmane, a bicyclic sesquiterpenoid hydrocarbon which is a marker for higher plants, and various plant derived diterpanes, like isopimarane, labdane, kaurane, phyllocladane, 17-nortetracyclane (Figs 2-2). These compounds, together with the overall pictures of the whole extract GC traces (Figs 1-1, 1-2) and low C₂₇/C₂₉ sterane and diasterane ratios (Tab 3-1), characterise a terrestrially derived organic matter. Odd-even-predominances in the C₂₃₊ range of the traces, carbon preference indices (Tab 2-1b) and (C₂₁+C₂₂)/(C₂₈+C₂₉) ratio support this conclusion. The presence of bisnorhopane in sample 6405ft (Fig 2-2c) might characterise an anoxic to mixed depositional environment, which is also indicated by pristane/phytane values for both samples (Tab 2-1b).

BASS 2

Four shale samples from this well (4135ft-5509ft) were fully analysed, starting with TOC determination and Rock Eval pyrolysis. These screening analyses (Tab 1-3) indicate moderate to very good source potentials and immaturity for oil generation for all four samples. The best results were obtained for sample 4135ft (S₁+S₂ of 12.03mg/g) and sample 5509ft (S₁+S₂ of 8.85mg/g), both of which contain good to very good amounts of S₁ as well. Like in Bass 1 sample 6405ft, such high S₁ values in an immature source rock, together with high amounts of total extract (1666.7ppm for sample 5509ft, 2740.6ppm for Core 5), could be caused by reservoired hydrocarbons. In both cases the GC traces, however, do not indicate the presence of out-of-place hydrocarbons and it is therefore believed to be more likely that these hydrocarbons are indigenous and derived from a coaly source. Hydrogen indices between approximately 200 and 380 for three of the four samples indicate the generation of a considerable amount of oil, together with gas, on maturation.

Liquid chromatography and gas chromatography results (2-2a, 2-2b) reveal low to moderate maturity levels, terrestrial organic matter, which was probably deposited in a reducing environment, and a particularly high aromaticity for sample 4135ft, Core 5. The high pristane peak in sample 5509ft (Fig 1-6) and the resulting high prist./phyt. and prist/n -C₁₇ ratios are probably due to the immaturity of the sample as the presence of bisnorhopane in this as well as in the other three Bass 2 samples suggests a reducing depositional environment (Fig 2-5c).

GC-MS data support the interpretation of a mainly terrestrially derived organic matter in all four samples as they all contain eudesmane and various diterpanes (isopimarane, phyllocladane, kaurane and beyerane) and C_{29} steranes and diasteranes dominate over the C_{27} compounds (Tabs 3-3 to 3-6).

BASS 3

TOC contents were determined for seven sediments between 5023ft and 7434ft and ranged from 1.25% to 31.55% (Tab 1-4). Two shales were further analysed by Rock Eval pyrolysis, indicating a marginal genetic potential and a low hydrogen index of 27 for sample 5023ft. Sample 7434ft reveals a very good genetic potential, a fairly high hydrogen index of nearly 300 and a very good level of hydrocarbons already present in this sample (S_1). This sample is characterised as mature for oil generation (T_{max} of 437°C) whereas sample 5023ft is still immature.

Both samples yield good to excellent amounts of total extract which is regarded as representing indigenous hydrocarbons. Maturity parameters obtained by liquid chromatography (Tab 2-3a) and GC-MS (Tabs 3-7, 3-8) confirm the low maturity level for the shallower sample (equivalent to approximately 0.35 to 0.4% R_o) and the high maturity of the deeper shales.

The source material in both sediments is terrestrial, as indicated by carbon preference indices and $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratios, the overall picture of the GC traces and biomarker distributions. Both samples contain diterpanes (isopimarane, phyllocladane, beyerane, Figs 2-7 h, i and 2-8 h, i), the deeper sample also contains eudesmane, a bicyclic sesquiterpenoid marker for higher plants. Bisnorhopane present in sample 5023ft (Fig 2-7e), together with low pristane/phytane values, might suggest a mixed to reducing depositional environment for these younger sediment sequence.

COMORANT 1

TOC determinations were carried out for three coaly and shaly samples, yielding 35.1% and 60.2% for the coals and 1.18% for the shale.

DONDU 1

The full suite of geochemical analyses has been carried out on one shaly sample from this well (7679ft 10"). Screening analyses characterise the sediments as a marginally mature source rock with moderate potential to generate gas and some oil (Tab 1-6). A S_1 value of 0.51mg/g rock and 1680ppm total extract (Tab 2-4a) indicate the presence of a moderate to good amount of hydrocarbons already present in the sample.

Further maturity parameters (EOM/TOC, Tab 2-4a and biomarker ratios, Tab 3-9) confirm the marginal to moderate maturity level of this sediment. The C_{29} 20S/20R sterane ratio characterises a maturity equivalent to about 0.58% Ro.

High pristane/phytane ratio, low value for $(C_{21}+C_{22})/(C_{28}+C_{29})$, characteristic GC trace and a wide range of diterpenoids indicate terrestrial organic source matter and an oxidizing depositional environment. Diterpenoids are particularly abundant in resinous materials, and the presence of a wide variety of these compounds (isopimarane, phyllocladane, kaurane, beyerane, labdane, 17-nortetracyclane, Figs 2-9 h, i) in the Dordu 1 sample makes a coaly source likely

DURROON 1

Three shaly samples from 5551ft to 9915ft depth were analysed. Rock Eval results indicate moderate maturity for samples 5551ft and 8424ft and high maturity for the deepest sample. Sample 8424ft has a moderate source potential, but hydrogen indices of all three samples are low. A value of 56 (43 and 36 for sample 5551ft and 9915ft, respectively) indicates that sample 8424ft generates gas only. The yield of total extract for sample 8424ft is good, whereas the other two shales are characterised as fair source rocks only, based on the amount of total extract yielded.

The nature of the organic source matter for the Durroon 1 samples is evidenced by $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratios (Tab 2-5b), the overall pictures of GC traces (Figs 1-10 to 1-12) and biomarker distributions (Figs 2-10 to 2-12). Sample 5551ft is characterised by high carbon preference indices, prominent odd-even predominances in the C_{23+} range, low C_{27}/C_{29} sterane and diasterane ratios and the presence of diterpenoids (isopimarane, phyllocladane, kaurane, beyerane). The presence of bisnophane might indicate an anoxic depositional environment.

Sample 8424ft contains a particularly high proportion of aromatics (Tab 2-5a) which reflects the coaly nature of its organic matter. It yields high values for $(C_{21}+C_{22})/(C_{28}+C_{29})$ diasterane and sterane ratios, indicating the contributions of some marine organic source matter. The only diterpane present is isopimarane.

Sample 9915ft is characterised by the lack of diterpanes and a high $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratio which might suggest a generally more marine organic source matter.

Sterane maturity parameters from GC-MS analyses are consistent with Rock Eval results for the two lower samples in so far as they indicate moderate to full maturity for sample 8424ft and 9915ft, respectively. The very low value of 0.02 for the C_{29} 20S/20R ratio obtained for sample 5551ft, however, is not believed to be reliable. It is rather interpreted as being caused by rapid heating and a resulting delay in sterane epimerisation, and/or by coaly fragments in the samples which carry most of the organic matter and which tend to retard epimerisation.

KONKON 1

Two samples were analysed for TOC, yielding 54.00% (4413ft) and 1.18% (4437ft). Further analyses were carried out on the coal, 4413ft.

This sample is regarded as an excellent source rock for gas and oil, as indicated by genetic potential (S_1+S_2 of 111.86mg/g rock), S_1 yield (5.6mg/g) and hydrogen index(196). A T max of 425°C characterises the sample as immature to date (Tab 1-8).

The sample appears to contain out-of-place hydrocarbons, as it is evidence by an extremely high amount of total extract of 21357ppm (Tab 2-6a). It is unlikely that a sediment of such a low maturity level as indicated here (Tmax, EOM/TOC, biomarkers) would have generated this amount of extract. Based on the GC trace it is believed that the hydrocarbons have been generated by a more mature but otherwise very similar coaly source rock.

The presence of biomarkers like eudesmane and resin-derived diterpanes (Figs 2-13g to i) explain the high aromaticity of the extract (Tab 2-6a). These compounds, together with a low $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratios, a pronounced odd-even-preference in the higher plant range of the GC trace and low C_{27}/C_{29} diasterane and sterane ratios, indicate terrestrially derived organic material.

Maturity related biomarker ratios (T_s/T_m , C_{30} hopane/ C_{30} moretane, C_{31} 22S/22R hopane, C_{32} 22S/22R hopane, C_{29} 20S/20R steranes) confirm the immaturity of the Konkon 1 sample.

NARIMBA 1

Three samples, one coal and two dark shales between 9297ft and 9750ft, were analysed for TOC. The coal yielded 70.25%, the shales around 2.5%. No further analyses were carried out.

PELICAN 1

A sequence between 5851ft and 10086ft comprising eight sediment samples, was submitted to TOC determination. The values obtained vary between 0.63% for a light brown silty clay and 58.40% for a coal. More detailed source rock analyses were carried out on the silty clay, 5851ft, a very dark coaly shale or shaly coal, 7122ft, and a dark laminated shale, 9269ft.

Sample 5851ft is characterised by a poor genetic potential (0.8mg/g), a low hydrogen index of 73 and a Tmax of 405 which indicates immaturity (Tab 1-10). The coaly sample at 7122ft yielded an excellent amount of S₁ and S₁+S₂, a hydrogen index of 225 indicative for the generation of oil and gas, and a marginal to moderate maturity level. Sample 9269ft is moderately mature, has a moderate source rock potential and a hydrogen index which suggest the generation of gas with some oil

Total extracts yielded are fair for sample 5851ft, very high for 7122ft and good for 9269 (Tab 2-7a). The coaly sample at 7122ft is believed to contain out-of-place hydrocarbons, as indicated by the extremely high amount of total extract at a relatively moderate level of maturity. Like in the Konkon 1 sample these hydrocarbons are believed to be generated from coaly source rocks which are very similar to the sediments in which they are reservoired to date, but which are at a higher level of maturity.

Extracts from samples 5851ft and 7122ft are very rich in aromatics which reflects the coaly source. Well developed odd-even predominance in the C₂₃₊ range, apparent in the GC traces (Figs 1-14 and 1-15), the presence of eudesmane in 7122ft (Fig 2-15g) and a variety of diterpanes in all three samples reflect the predominantly terrestrial higher plant source of the organic matter. C₂₇/C₂₉ diasterane and sterane ratios for sample 5851ft, however, indicates a mixed rather than a completely terrestrial source matter.

The presence of bisnorhopane in samples 5851ft and 7122ft might indicate reducing conditions during deposition, though this interpretation seems to be somehow contractictory to the very high pristane/phytane value obtained for both samples (Tab 2-7b).

Maturity levels as determined by GC-MS analyses (Tab 3-14 to 3-16) are low for the two younger samples (equivalent to approximately 0.45% Ro, based on C₂₉ 20S/20R steranes), but very high for sample 9269ft. This is not fully consistent with Tmax value and EOM/TOC ratio (Tab 1-10 and 2-7a), which are indicative for moderate maturity. This inconsistency might suggest the presence of migrated hydrocarbons reservoired in the sediment, which generally tend to lower Tmax values during Rock Eval pyrolysis.

PELICAN 3

Total organic carbon determination was carried out on three sediments between 9386ft and 9485ft and yielded 1.42% to 2.86%. The richest sample, a grey laminated shale at 9386.6ft, was investigated further.

Rock Eval results classify this sample as a moderate source rock with a fairly low hydrogen index of 84 and a moderate maturity level (Tab 1-11). The sediment yields a good amount of total extract which is rich in aromatic hydrocarbons (Tab 2-8a).

The organic matter is of terrestrial origin as it is evidenced by odd-even predominances of the C_{25+} n-alkanes (Fig 1-17), a low $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratio, the presence of eudesmane and diterpanes in the GC-MS mass fragmentograms (Fig 2-17g and Figs 2-17h, i) and low C_{27}/C_{29} diasterane and sterane ratios.

Some of the biomarker maturity parameters indicate a slightly higher maturity level than Rock Eval and extraction data (C_{30} hopane/ C_{30} moretane, C_{29} 20S/20R sterane), equivalent to about 0.75% to 0.8% Ro. This again could be due to some out of place hydrocarbons though no evidence for a mature oil is apparent in the GC trace (Fig 1-17).

POONBOON 1

Two coals and one shale were analysed for TOC only. The coals at 8114ft and 9974ft 11" yielded 63.1% and 27.6%, respectively, the shale sample at 8818ft contained 1.93% TOC.

TILANA 1

A dark shale, 2800.9m, was submitted to geochemical analyses to assess its source potential. A TOC content of 2.11% a genetic potential of 4.27mg/g and a hydrogen index of 181 classify the sample as a moderate source rock for oil and gas. Tmax of 436°C (Tab 1-13) and EOM/TOC ratio of nearly 80 indicate a moderate maturity level. Like in Pellican 1 and 3, some biomarker maturity parameters (Ts/Tm and sterane ratio) seem to suggest a somewhat higher maturity level than Rock Eval and extract data, i.e. a fully mature rather than a moderately mature level.

Very high pristane/phytane ratio, low $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratio, prominent odd-even predominance apparent in the GC trace (Fig 1-181), together with the presence of eudesmane and various diterpanes (isopimarane, 17-nortetracyclone, labdane, phyllocladane, kaurane and beyrane) as well as low C_{27}/C_{29} sterane and diasterane ratios evidence the higher plant origin of the organic matter.

Comparison of Source Rocks and Conclusions

With few exceptions (see below) the source rock samples analysed from the Bass Basin, including Anglesea 1 and Otway Ranges, are immature to marginally/moderately mature and dominated by an input of terrestrially derived organic matter. This organic material consists largely of the resinous materials of higher plants, as it is evidenced by the presence of diterpenoid biomarkers. These are generally abundant in sediments of Cretaceous and younger ages and appear to be derived from both conifers and angiosperms. Only phyllocladane is restricted to conifers. Common in the Bass Basin sediments are the tricyclic terpenoids labdane and isopimarane as well as the tetracyclic terpenoids beyerane, kaurane, phyllocladane and 17-nortetracyclane.

Similarly common in the Bass Basin samples is eudesmane, a bicyclic sesquiterpenoid marker for higher plants which is usually a component of essential oils or resins. The general preponderance of C_{29} steranes and diasteranes, expressed as low C_{27}/C_{29} sterane and diasterane ratios, also indicates a strong terrestrial contribution. These biomarkers, together with usually high amounts of pristane and C_{23+} n-alkanes apparent in the GC traces, characterise a very similar coaly source for the hydrocarbons present in all samples analysed.

Some source rocks, however, contain various amounts of marine organic matter. These are Anglesea 1, 2565ft and particularly 6239ft; Bass 2, 4740ft and possibly 5509ft; Pelican 1, 5851ft; Durroom 1, possibly 8424ft and certainly 9915ft. All these sediments are shales with a predominance of C_{27} steranes and diasteranes, no or only minor amounts of diterpanes and only few high molecular weight compounds apparent in the GC traces. Two Bass 2 shales (4740ft and 5509ft) contain 4-methylsteranes, a dinosterane which is attributed to dinoflagellates and which is believed to characterise a marine or lacustrine source. The non-terrestrial source rocks present in the Bass Basin do not seem to be as rich as the coals, they are generally classified as moderate source rocks only, while the coaly sediments often tend to have a good to very good potential to generate hydrocarbons.

The maturity level of sediments in the Bass Basin is usually low (immature to marginally mature) above approximately 6000ft depth. Samples analysed from depths higher than 6000ft in wells Bass 3, Dondu 1, Durroom 1, Pelican 1 and 3 are moderately mature to mature. The very high maturity level of shale 6239ft in Anglesea 1 is probably due to magmatic intrusions which occurred in the Bass Basin during Late Cretaceous to Miocene. These magmatic activities are also believed to be responsible for retarded sterane epimerisation as observed in some samples, causing a discrepancy between sterane and other maturity parameters.

Some samples analysed yielded extremely high amounts of total extract which suggests the presence of certain amounts of out-of-place hydrocarbons. This is particularly evident in sample Konkon 1, 4413ft; Pelican 1, 7122ft; Anglesea, 497ft and Otway Ranges, Sample 14. These extracts are believed to be generated from coaly source rocks similar to those in which they are reservoired to date, probably in the same sequences in a slightly more mature position in the basin.

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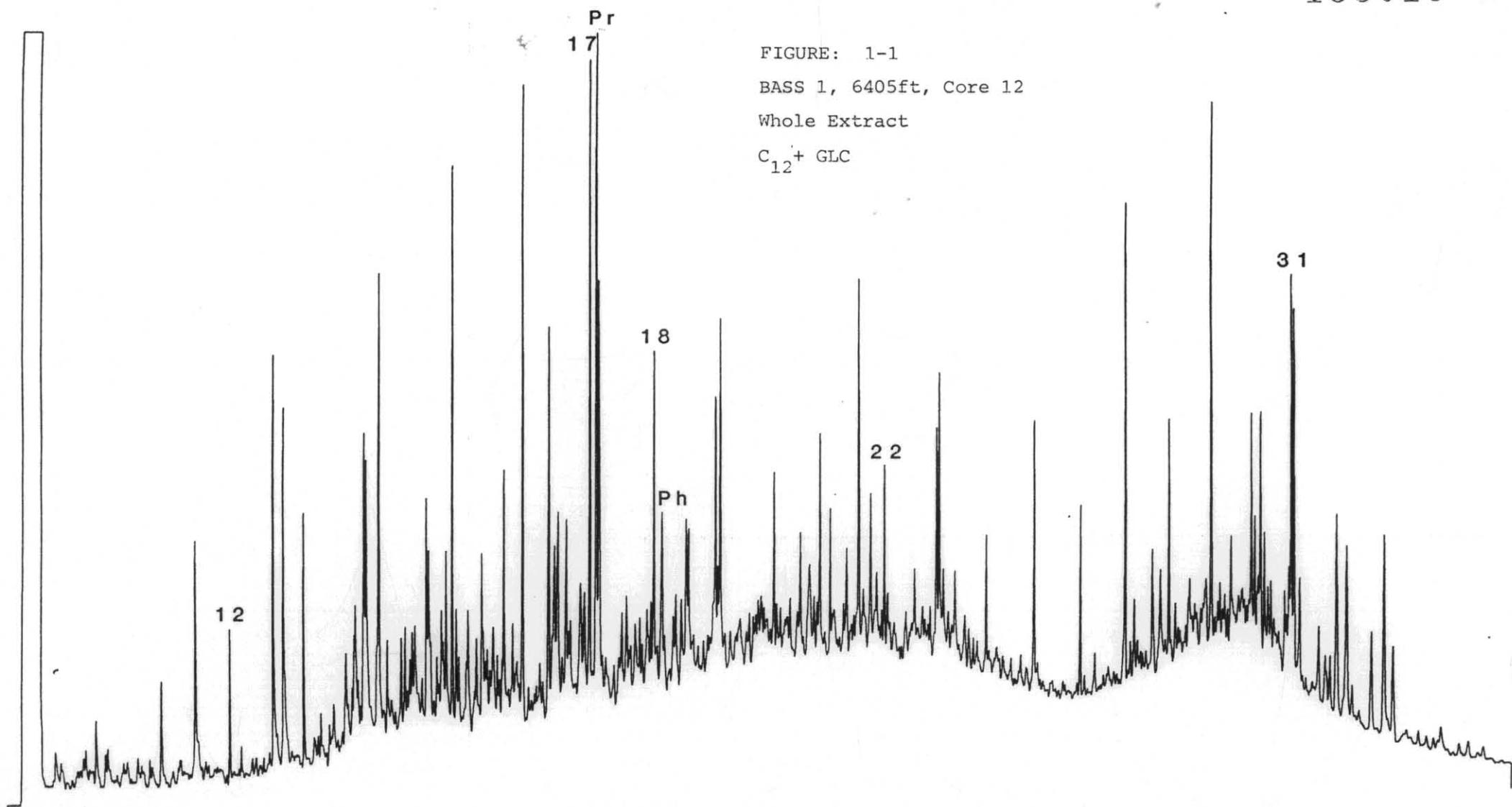


FIGURE: 1-1
BASS 1, 6405ft, Core 12
Whole Extract
C₁₂+ GLC

158019

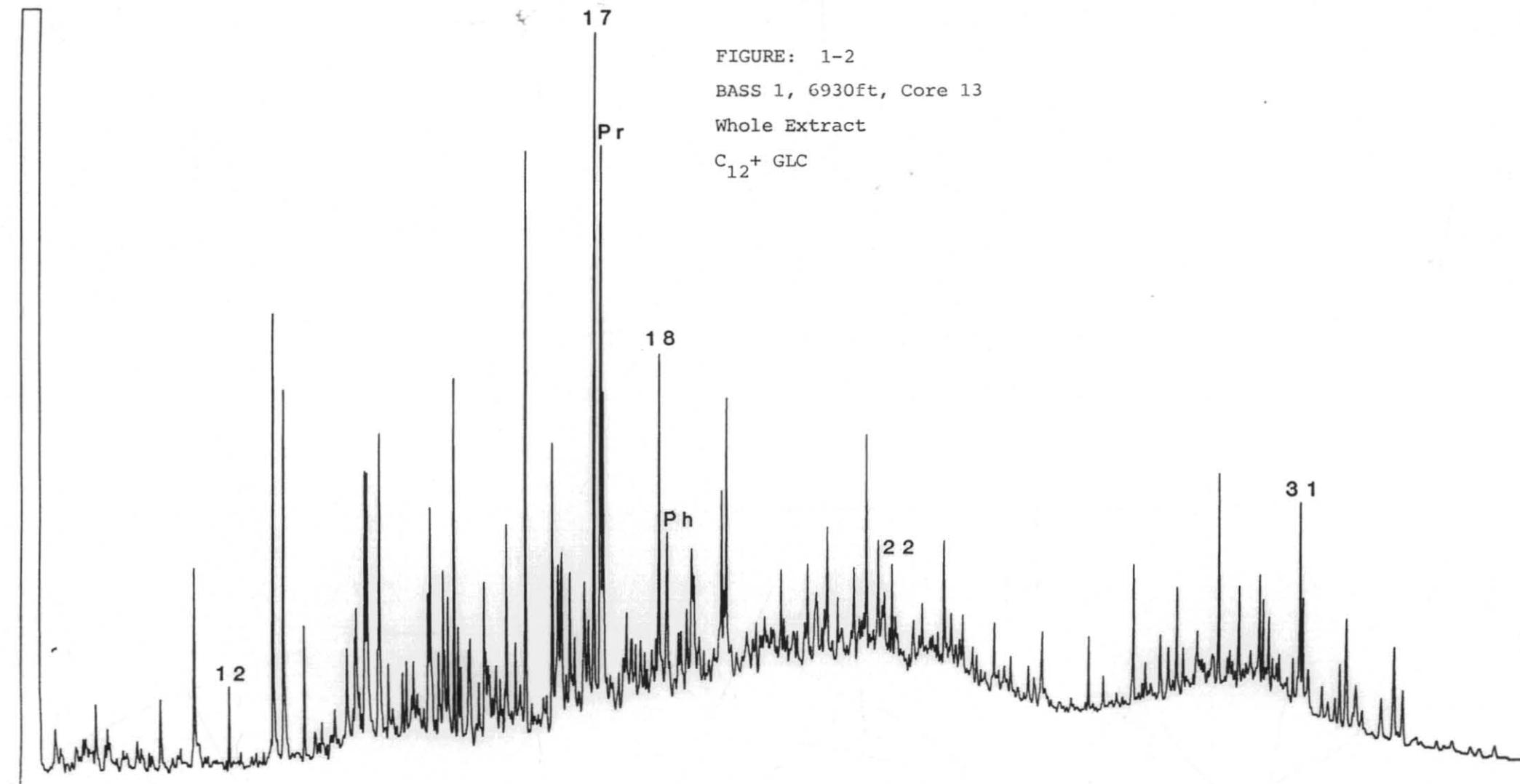


FIGURE: 1-2

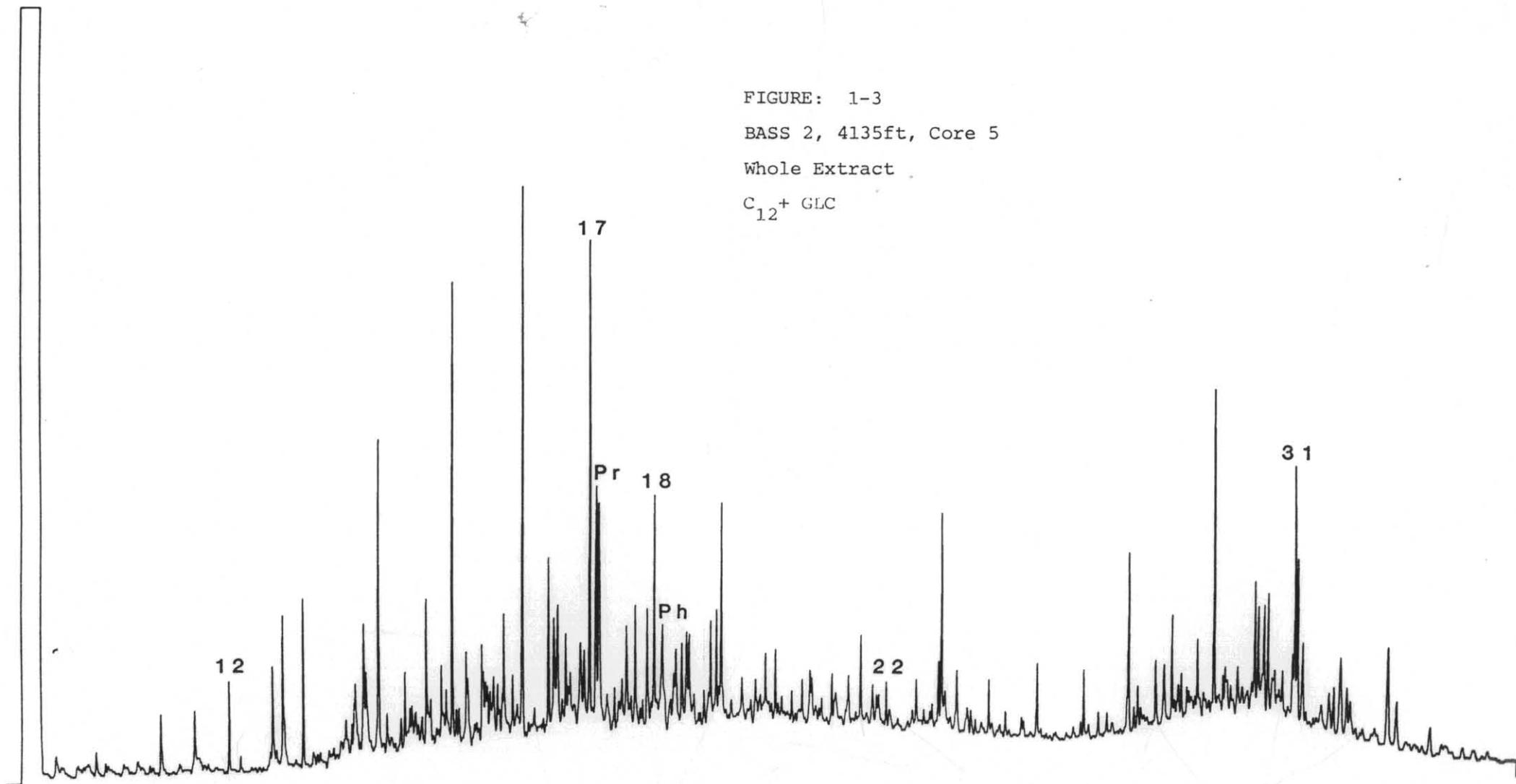
BASS 1, 6930ft, Core 13

Whole Extract

C₁₂⁺ GLC

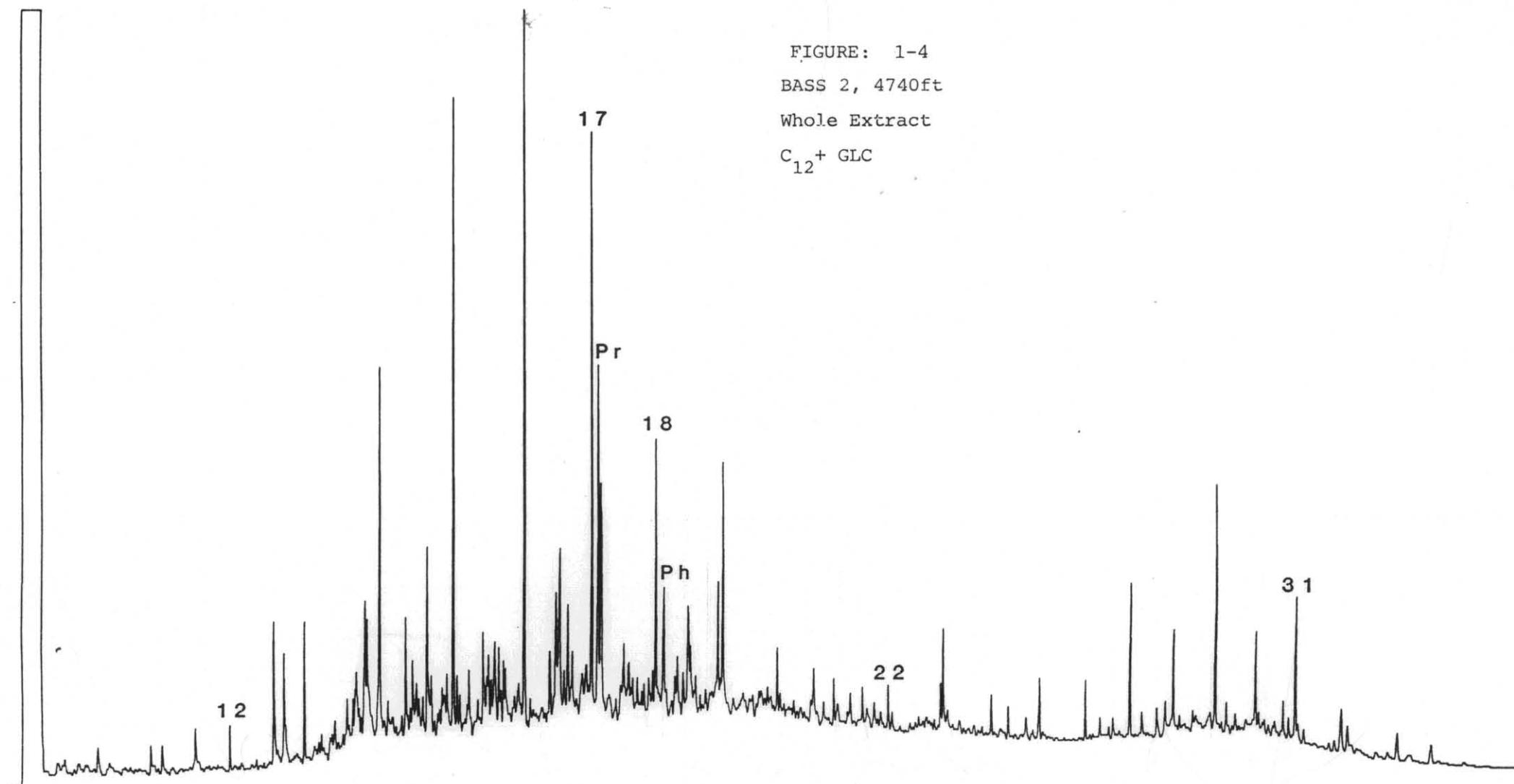
158020

FIGURE: 1-3
BASS 2, 4135ft, Core 5
Whole Extract
C₁₂⁺ GLC



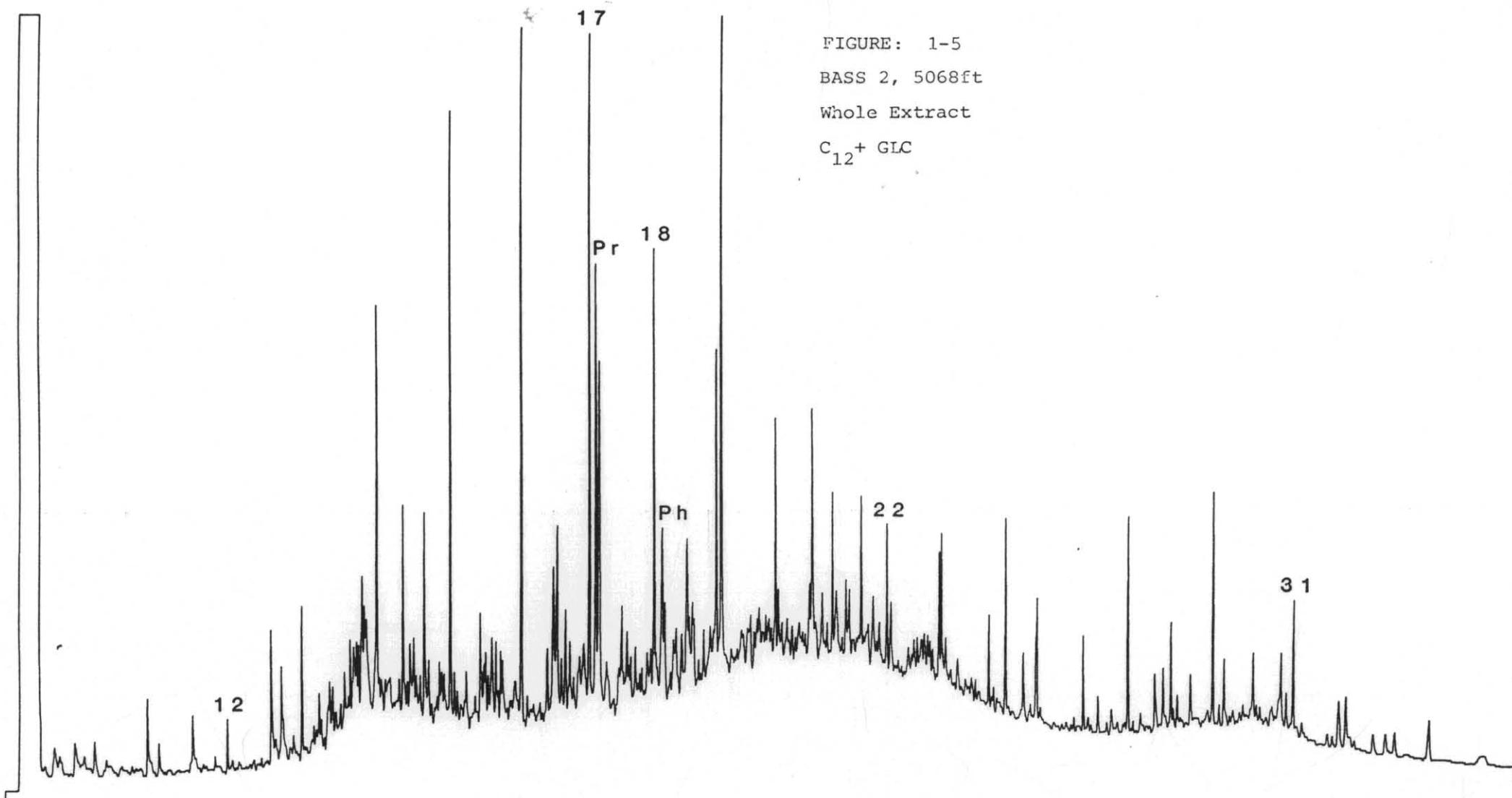
158021

FIGURE: 1-4
BASS 2, 4740ft
Whole Extract
C₁₂⁺ GLC



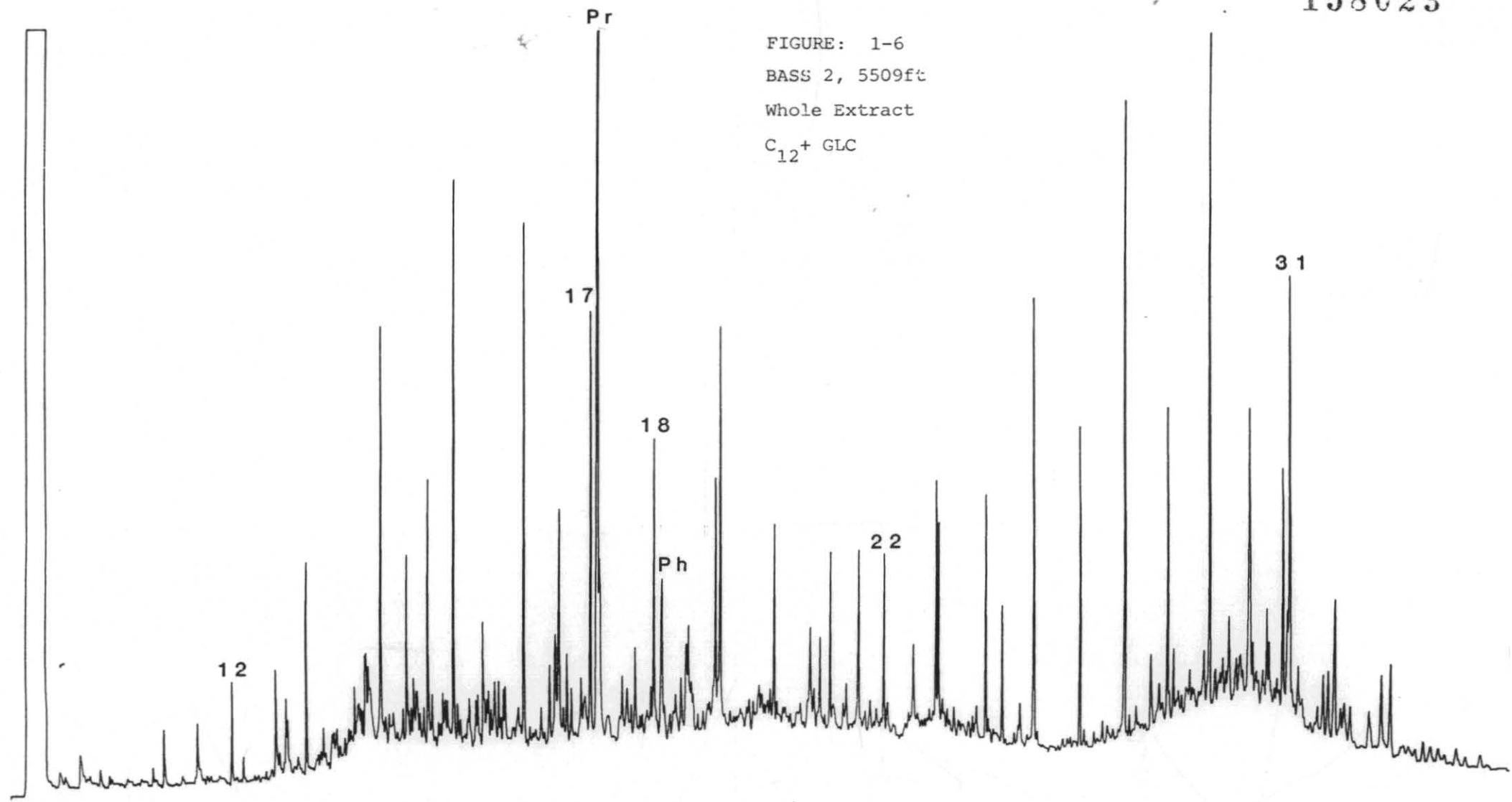
158022

FIGURE: 1-5
BASS 2, 5068ft
Whole Extract
C₁₂+GLC



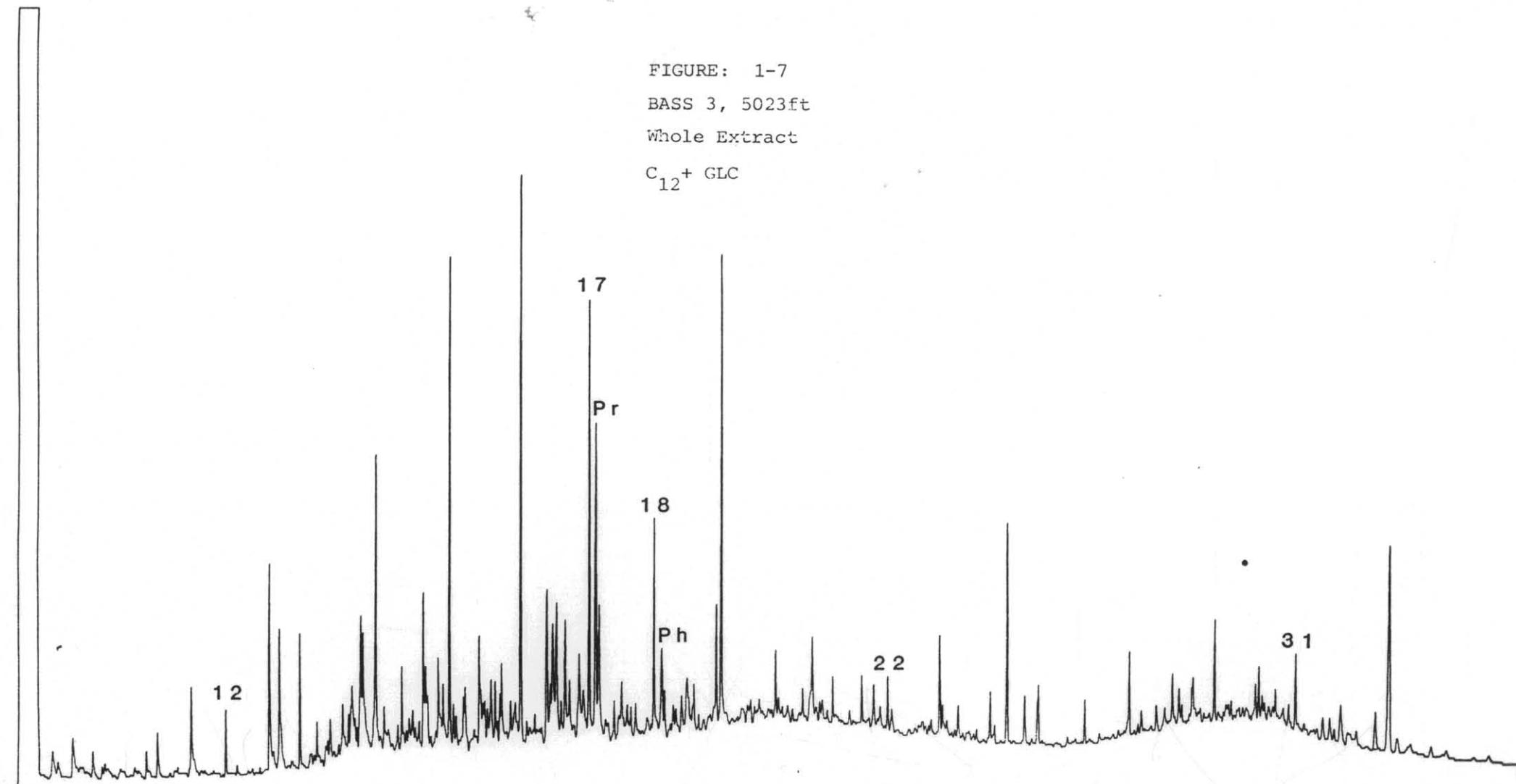
158023

FIGURE: 1-6
BASS 2, 5509ft
Whole Extract
C₁₂⁺ GLC



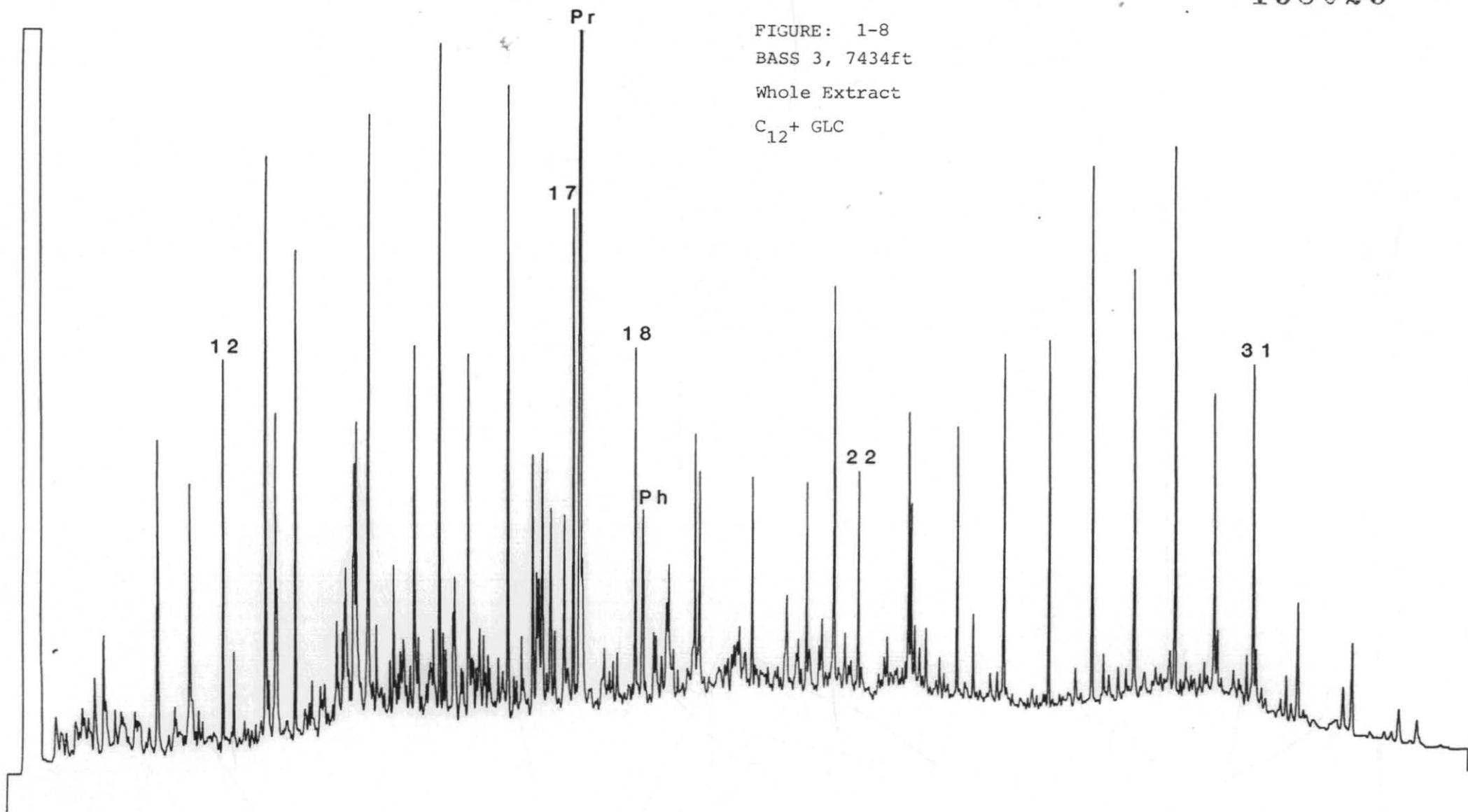
158024

FIGURE: 1-7
BASS 3, 5023ft
Whole Extract
C₁₂⁺ GLC



158025

FIGURE: 1-8
BASS 3, 7434ft
Whole Extract
C₁₂+ GLC



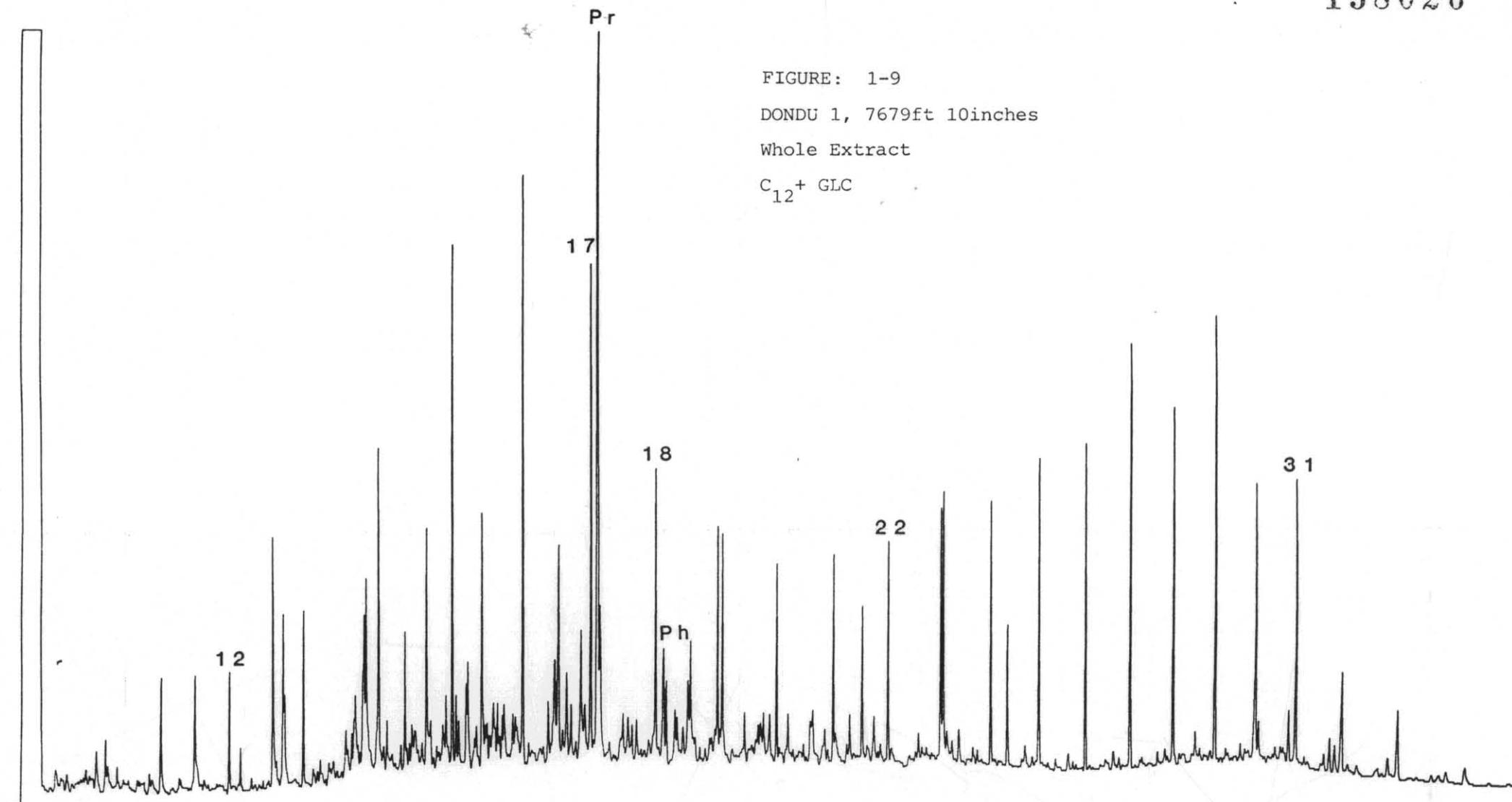
158026

FIGURE: 1-9

DONDU 1, 7679ft 10inches

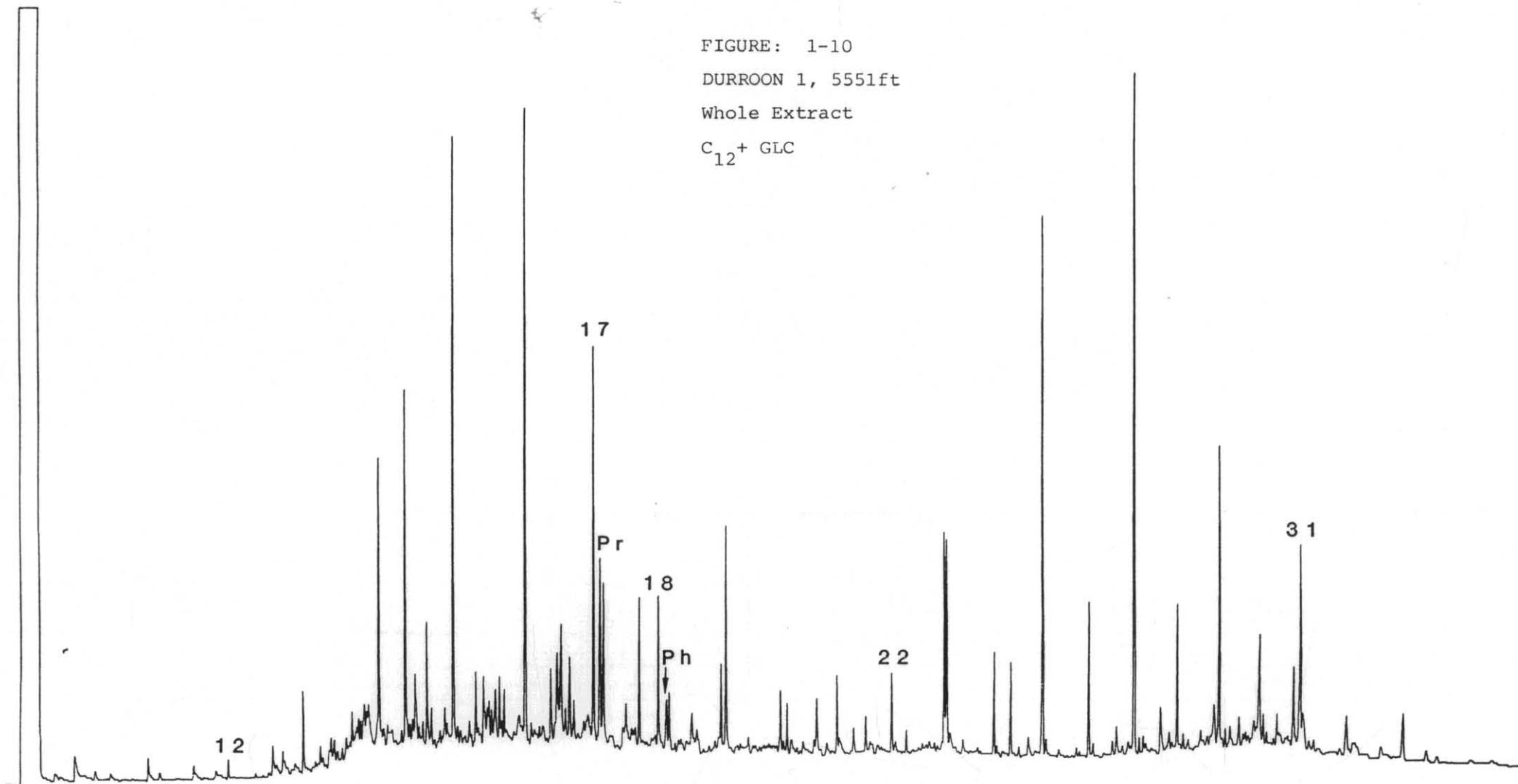
Whole Extract

C₁₂⁺ GLC



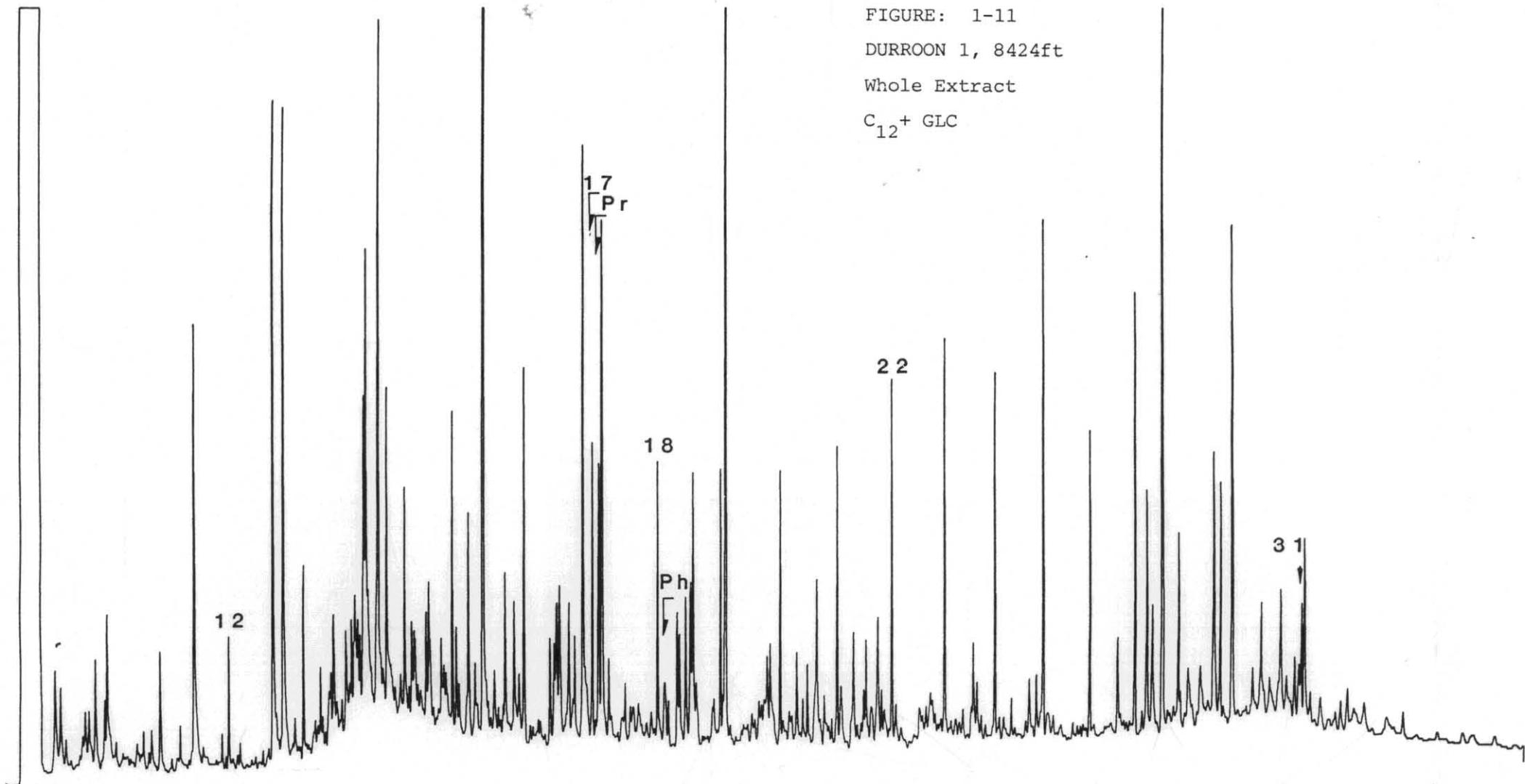
158027

FIGURE: 1-10
DURROON 1, 5551ft
Whole Extract
C₁₂⁺ GLC



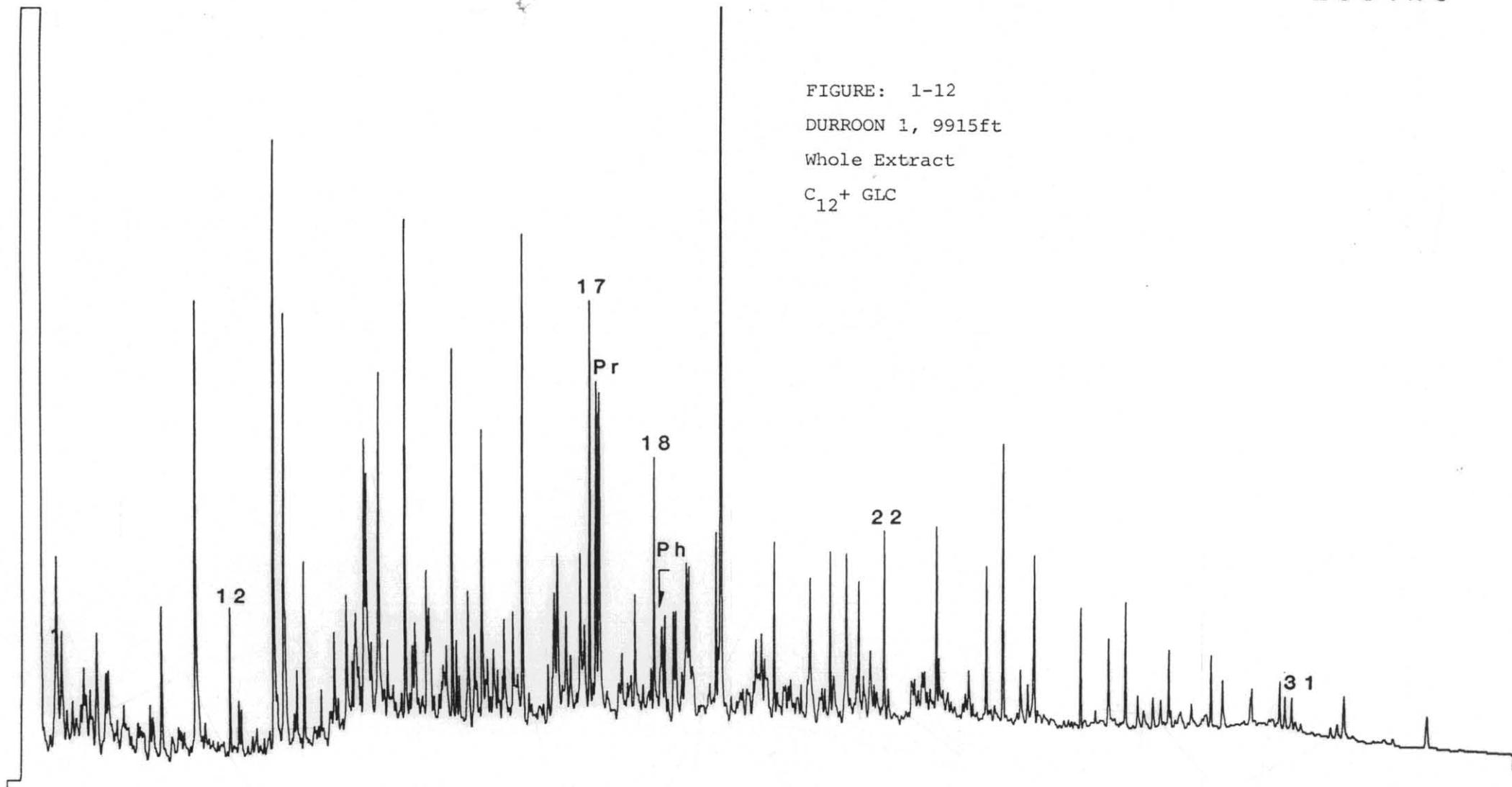
158028

FIGURE: 1-11
DURROON 1, 8424ft
Whole Extract
C₁₂+ GLC



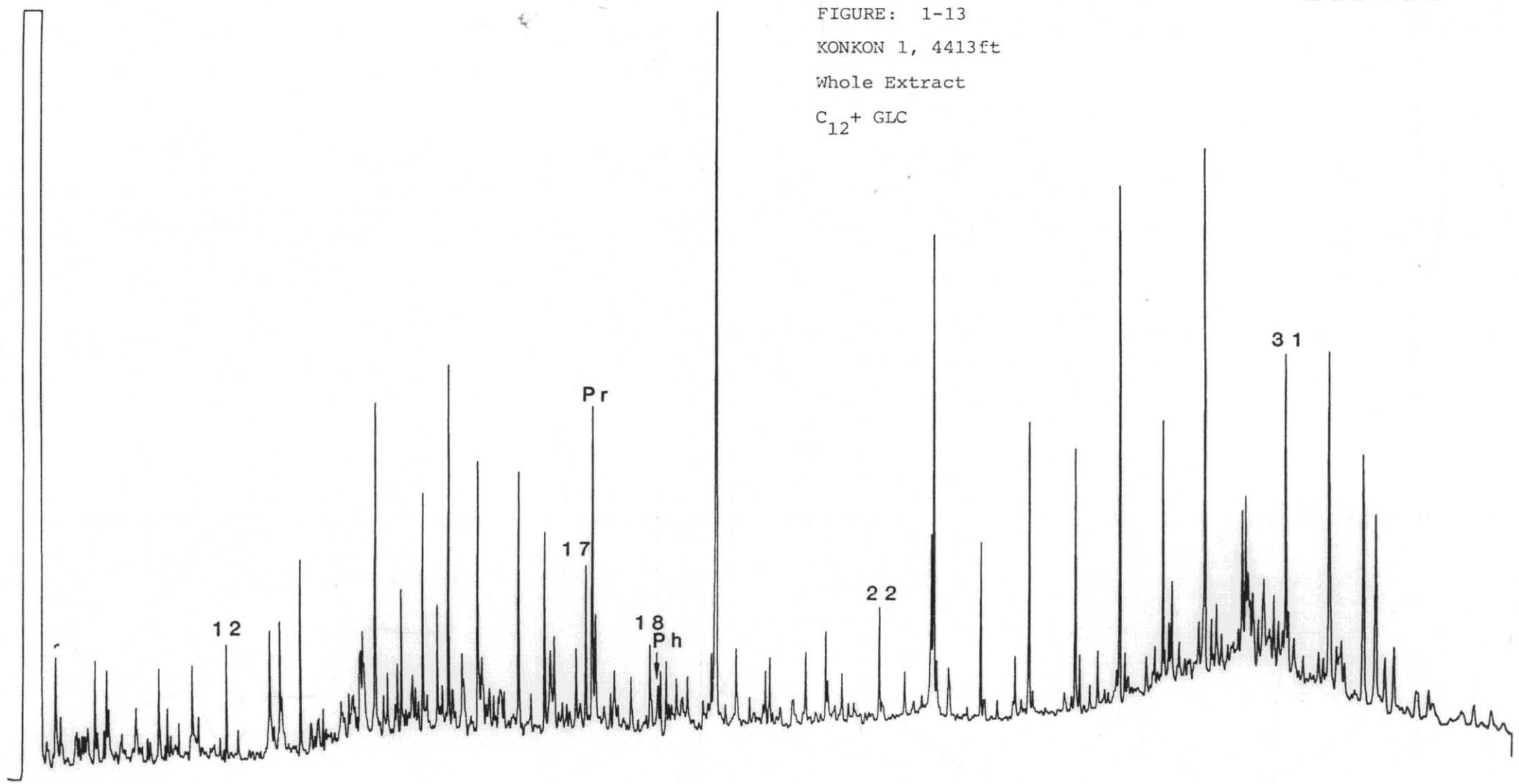
158029

FIGURE: 1-12
DURROON 1, 9915ft
Whole Extract
C₁₂⁺ GLC



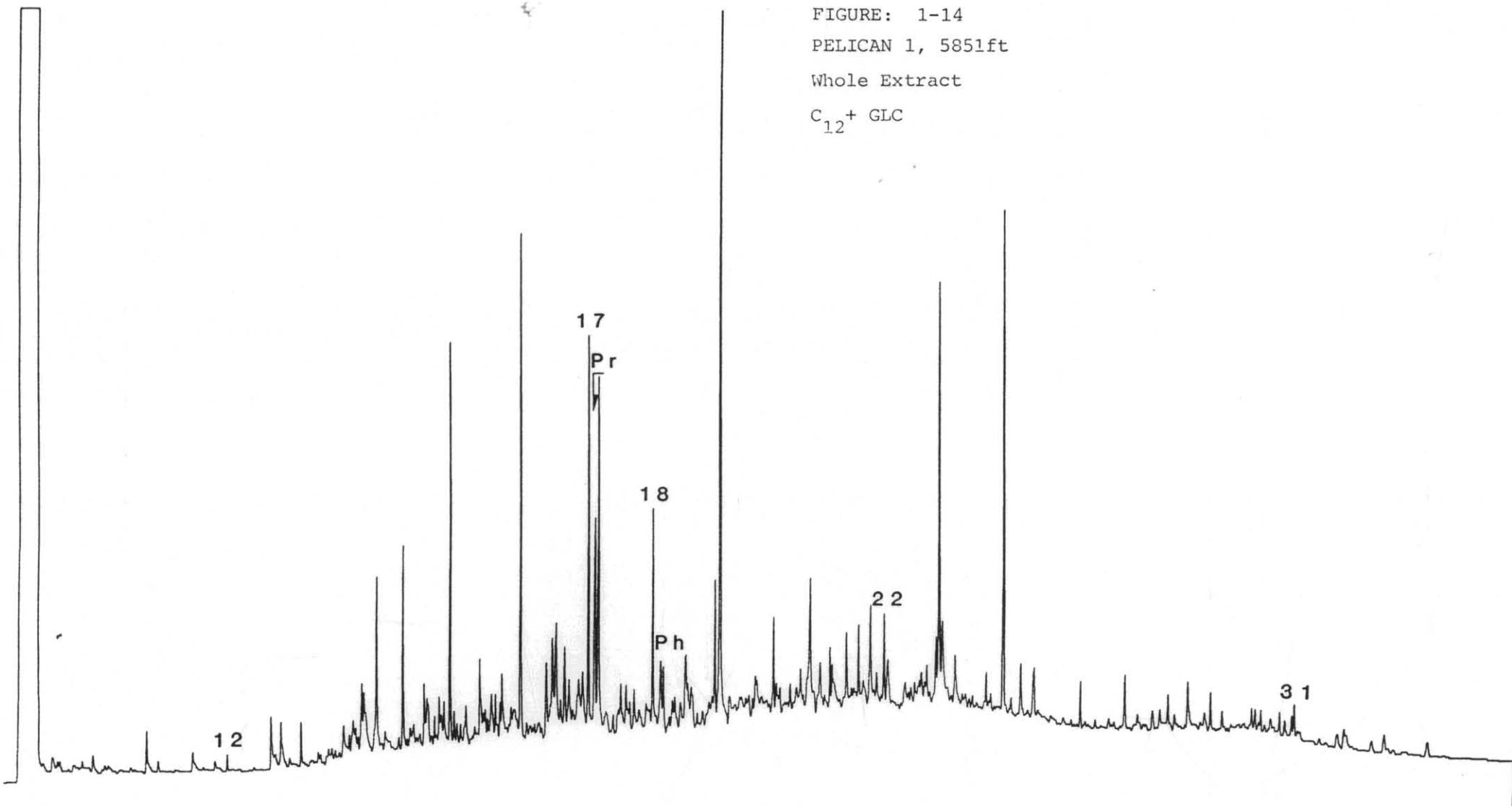
158030

FIGURE: 1-13
KONKON 1, 4413ft
Whole Extract
C₁₂⁺ GLC



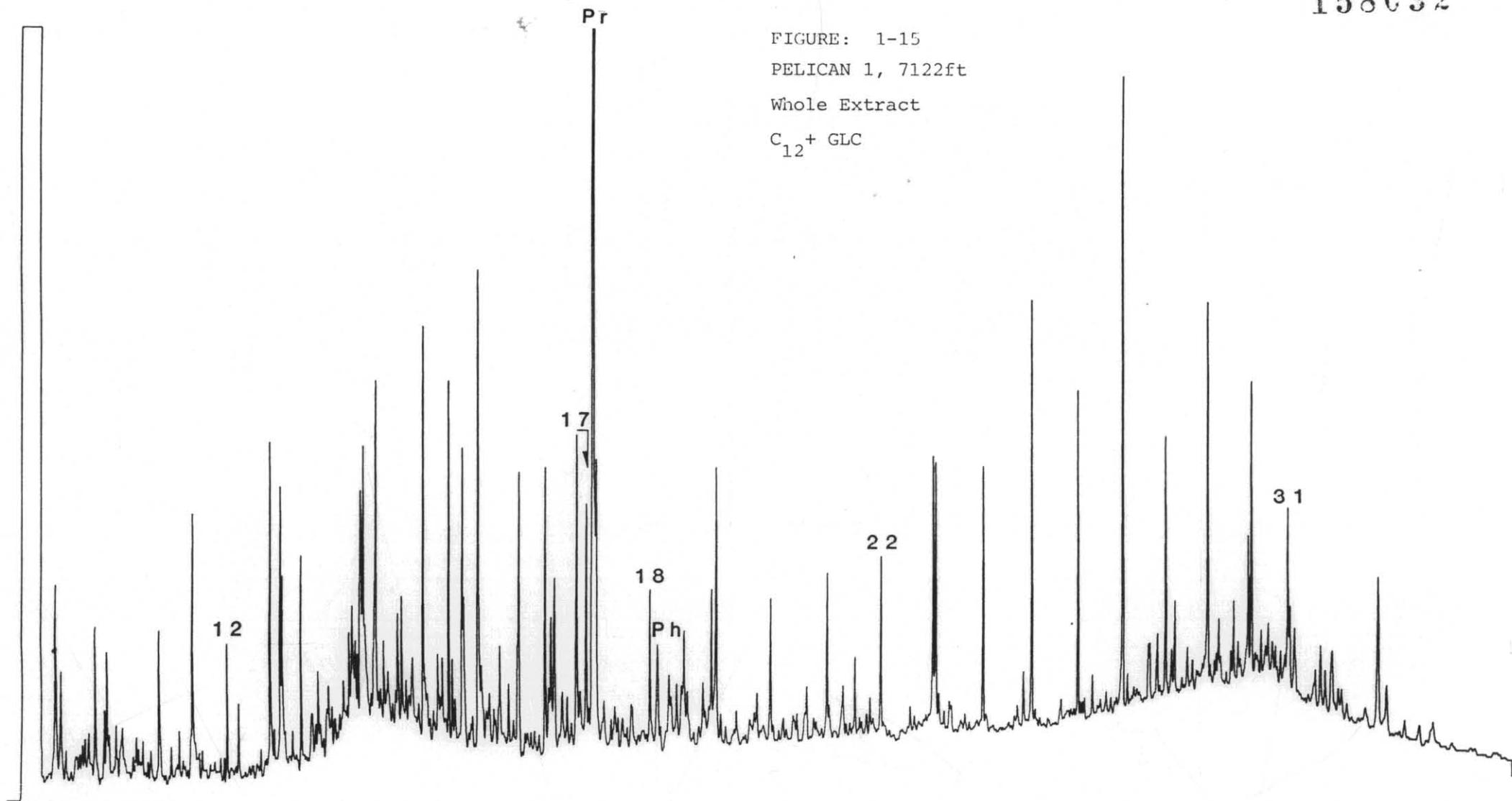
158031

FIGURE: 1-14
PELICAN 1, 5851ft
Whole Extract
C₁₂+ GLC



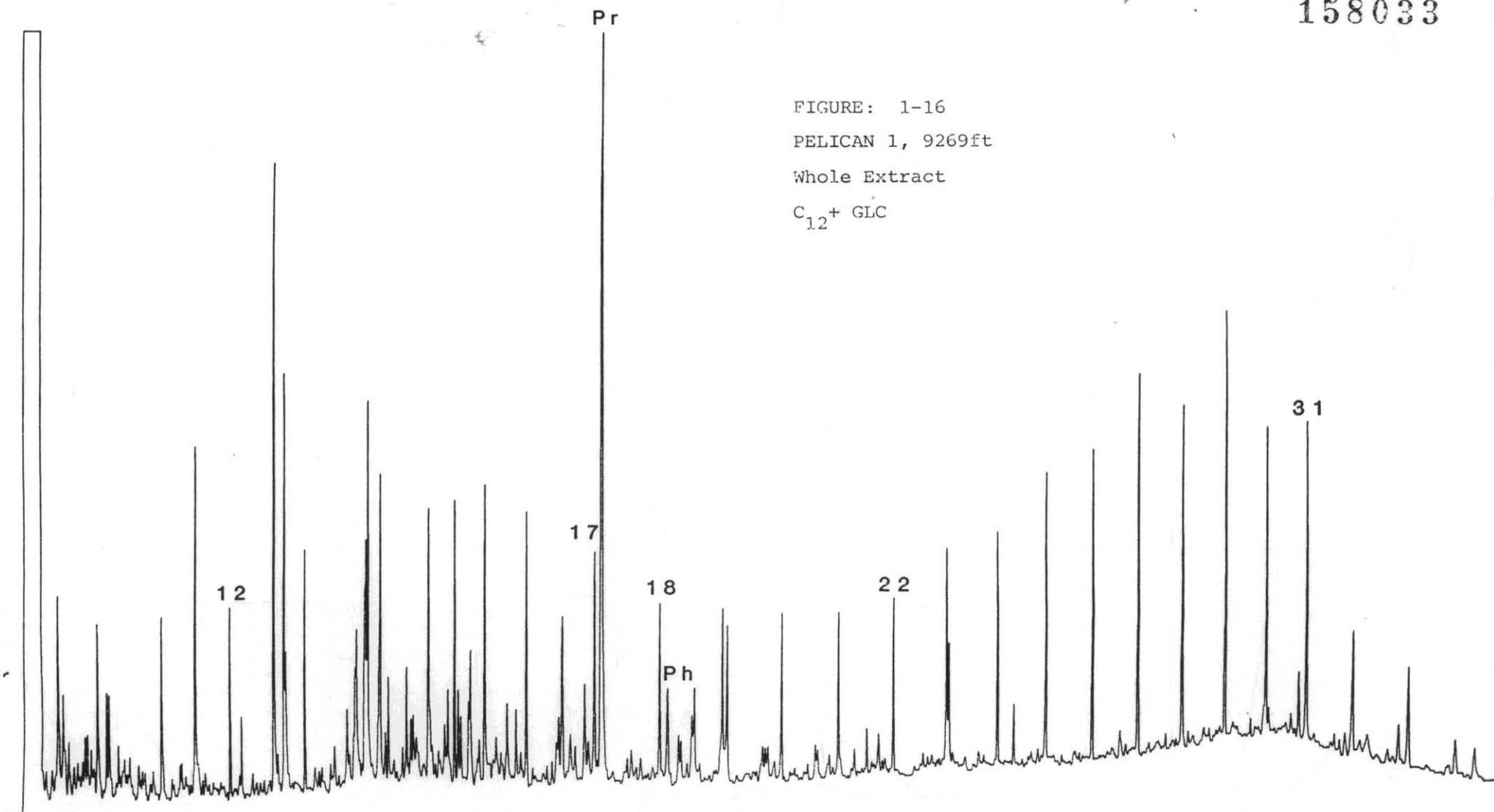
158032

FIGURE: 1-15
PELICAN 1, 7122ft
Whole Extract
C₁₂+ GLC



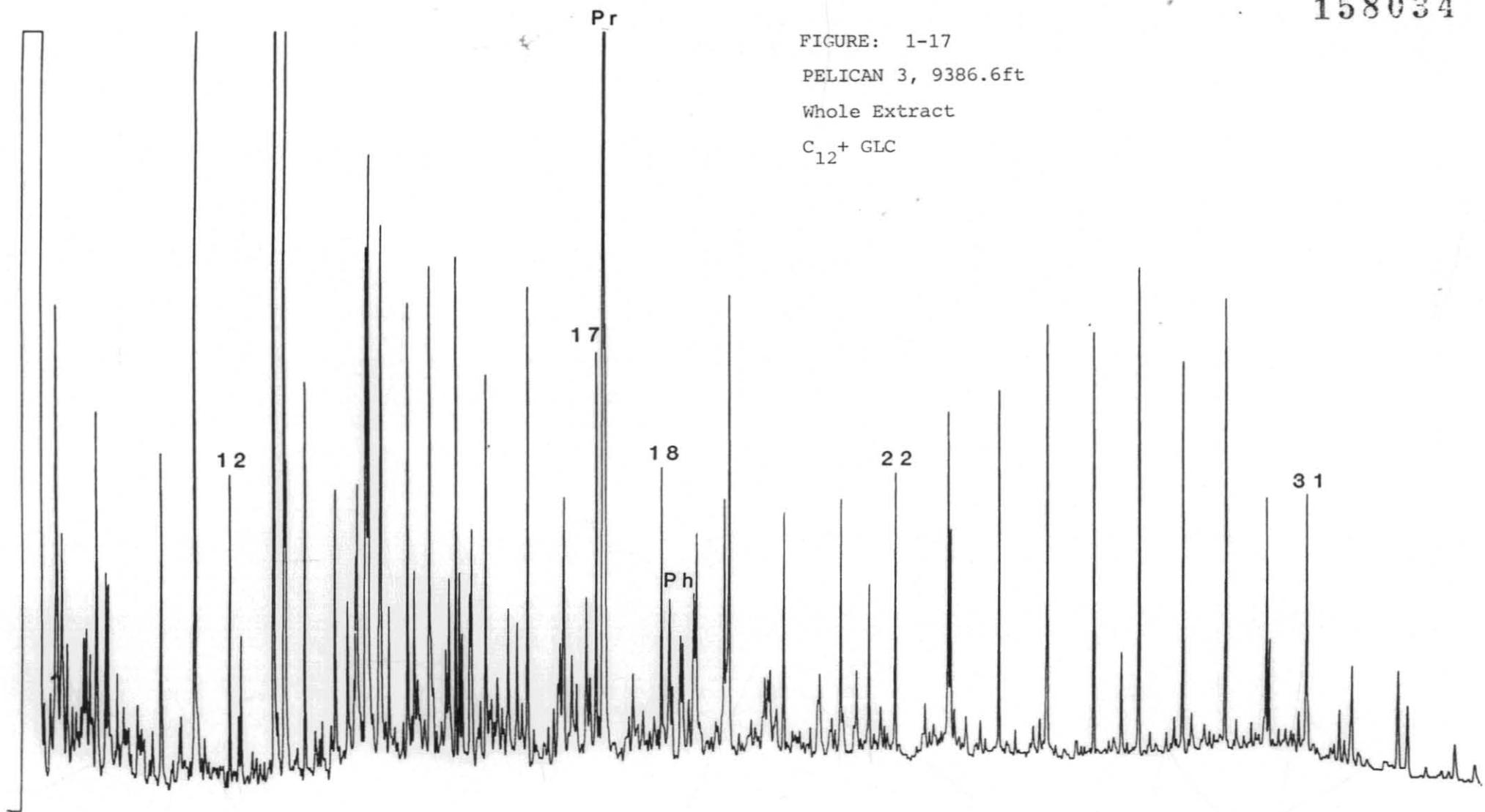
158033

FIGURE: 1-16
PELICAN 1, 9269ft
Whole Extract
C₁₂⁺ GLC



158034

FIGURE: 1-17
PELICAN 3, 9386.6ft
Whole Extract
C₁₂+ GLC



158035

FIGURE: 1-18
TILANA 1, 2800.9m
Whole Extract
C₁₂+ GLC

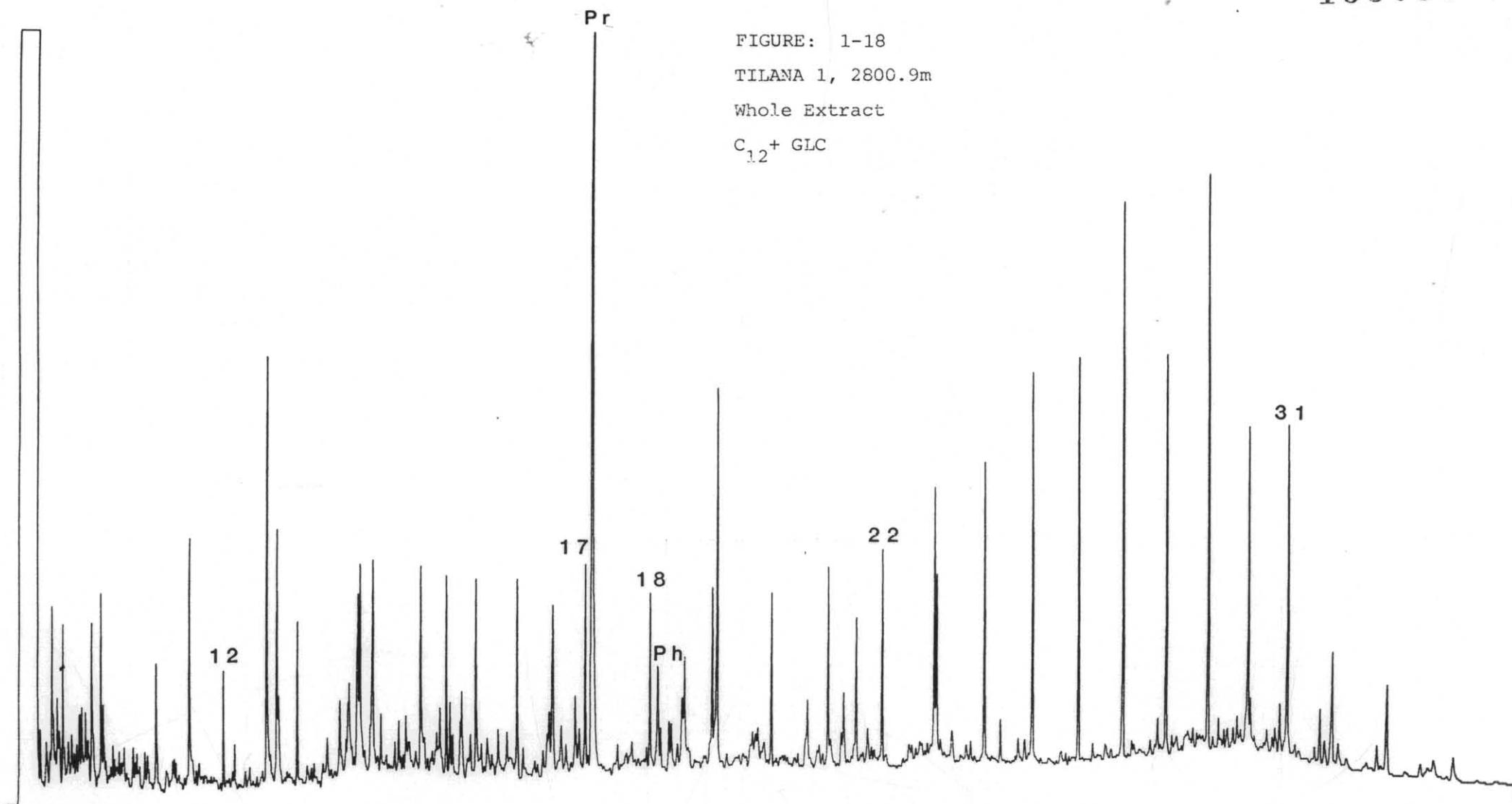
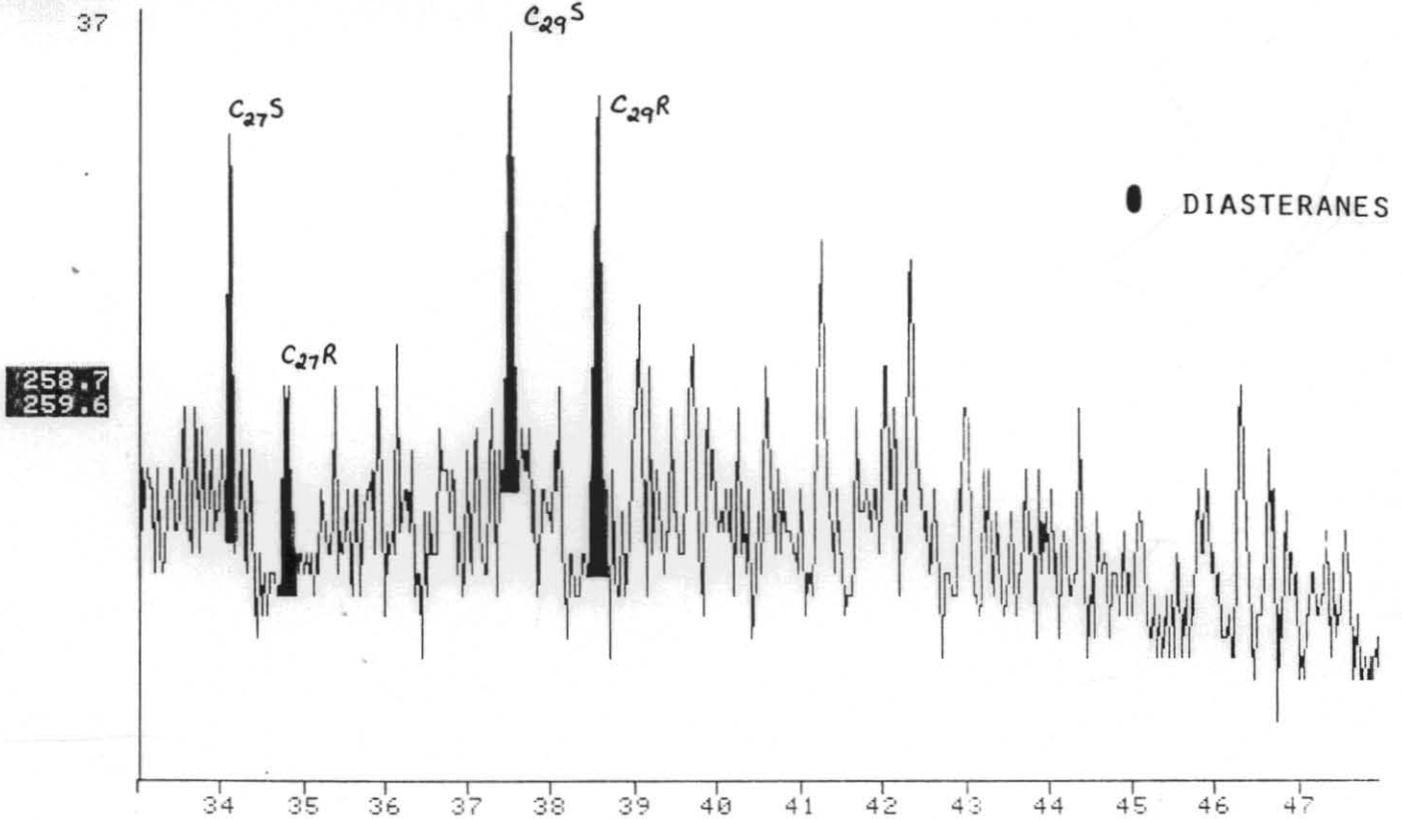


FIGURE: 2-1a

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224

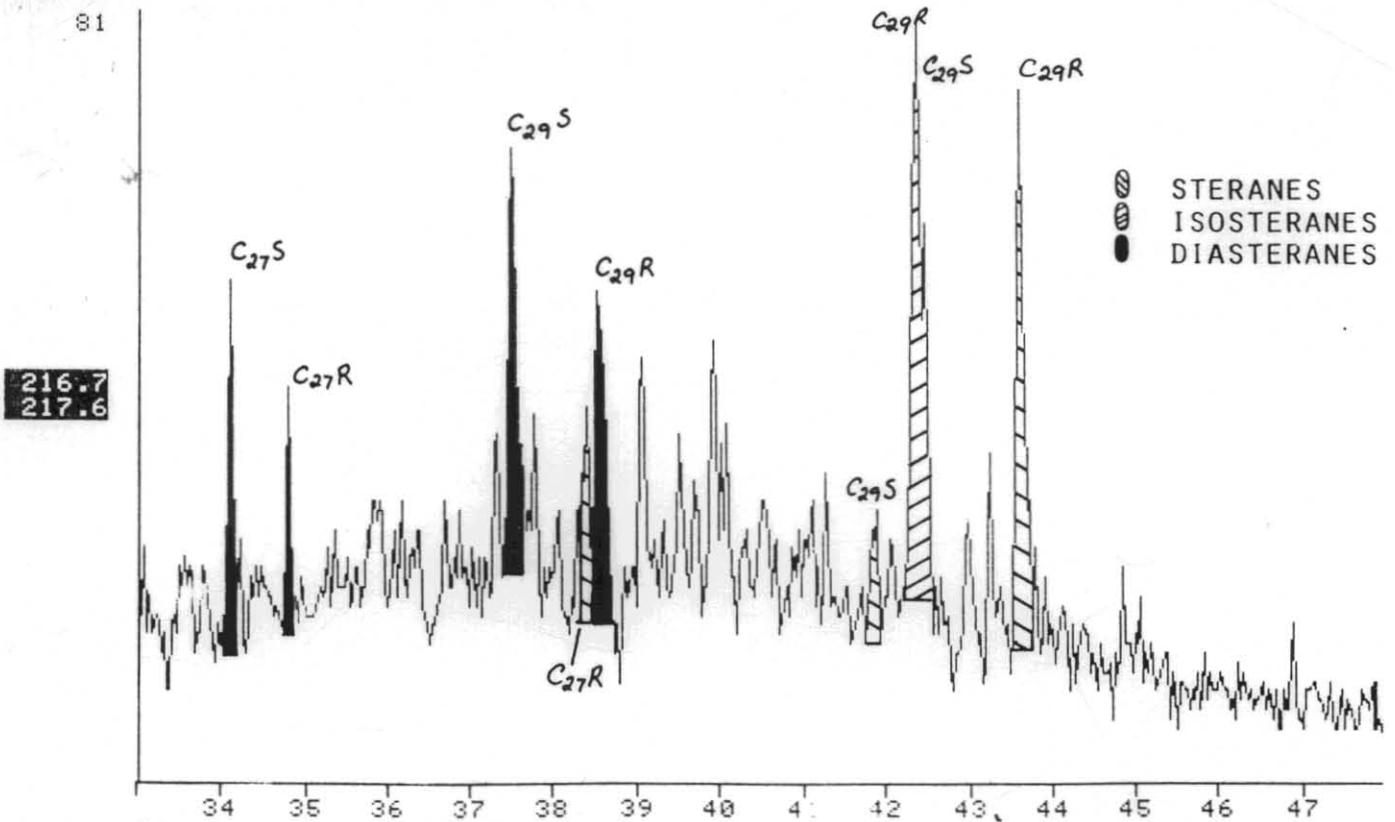
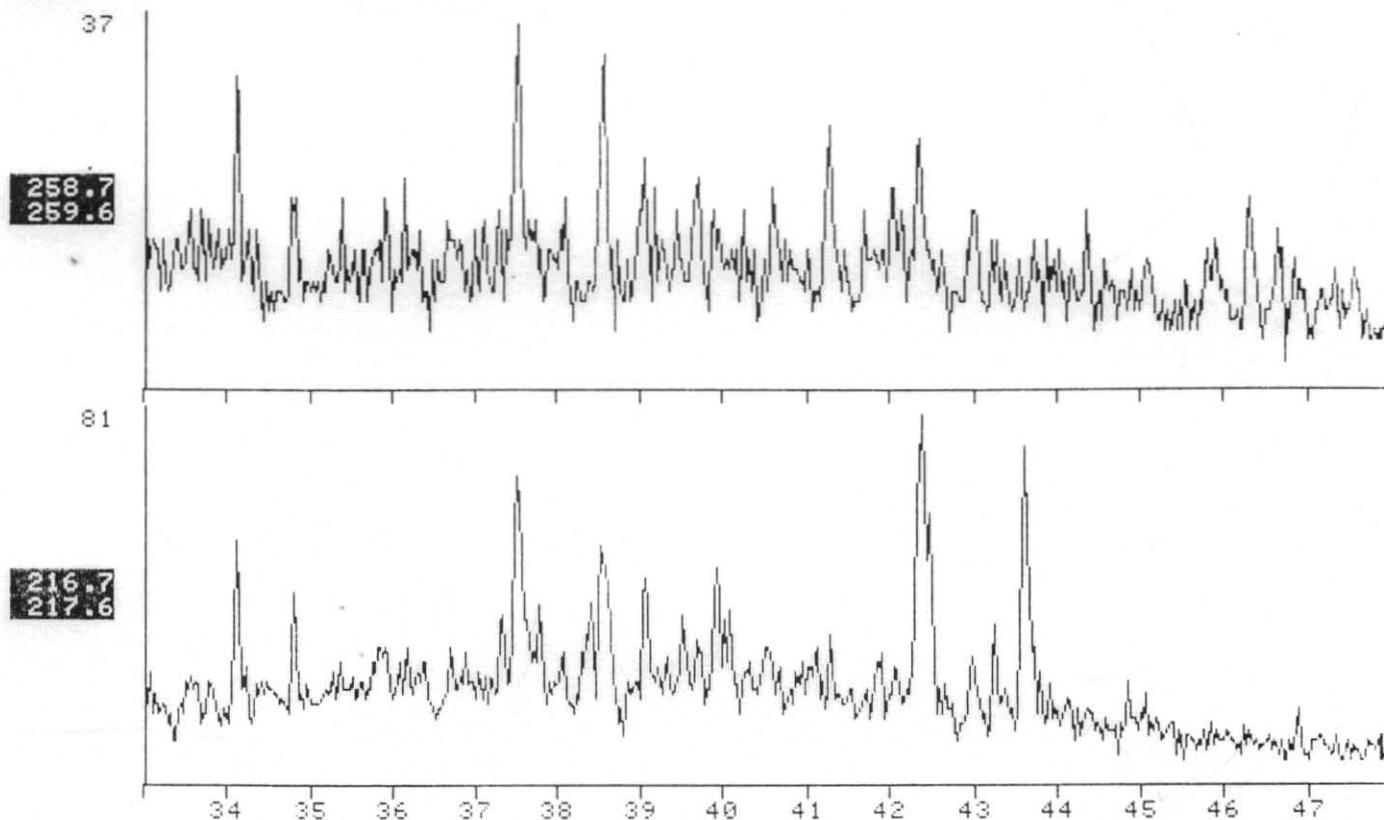


FIGURE: 2-1b

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85u1. COL#72.

FRN 6224

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85u1. COL#72.

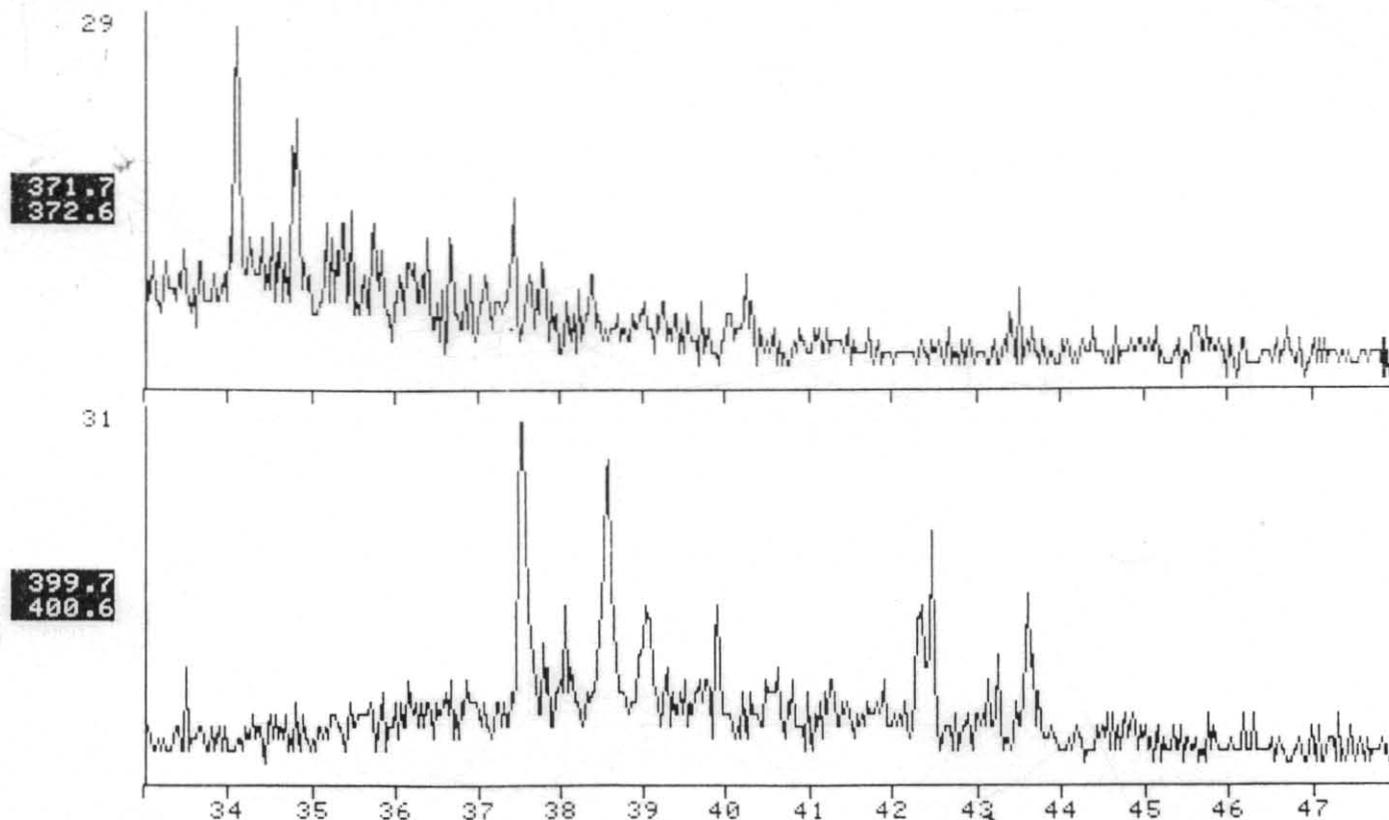
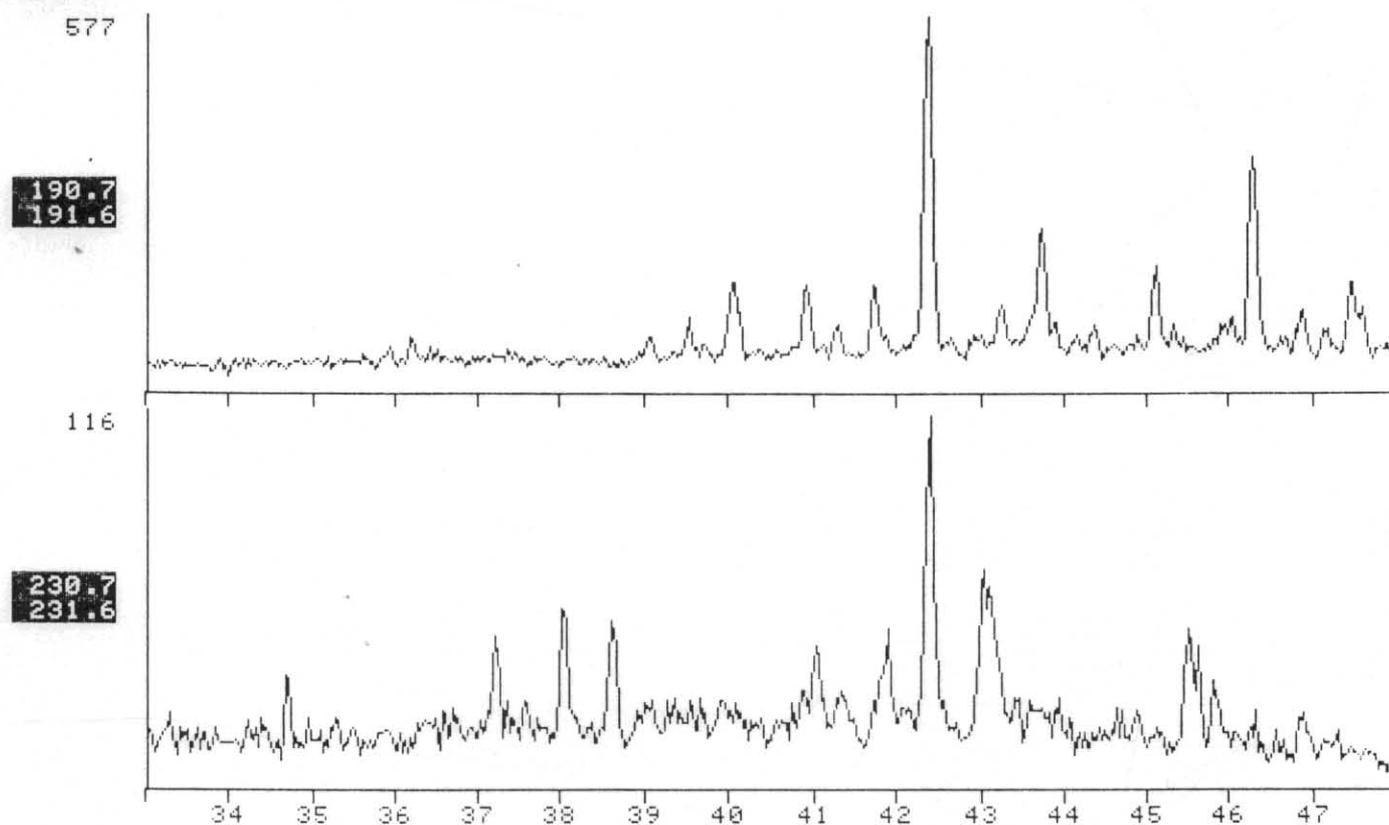
FRN 6224

FIGURE: 2-1c

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85u1. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85u1. COL#72.

FRN 6224

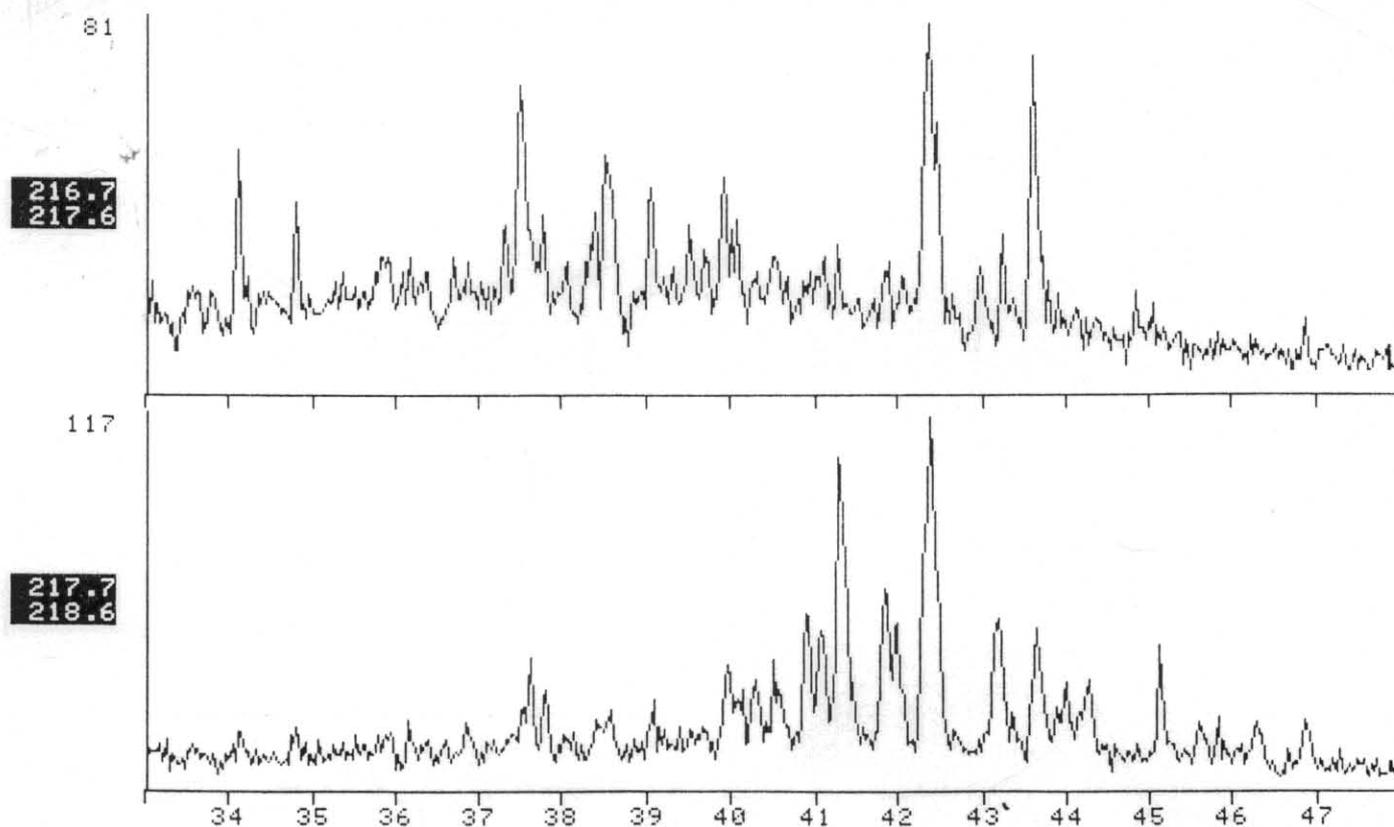
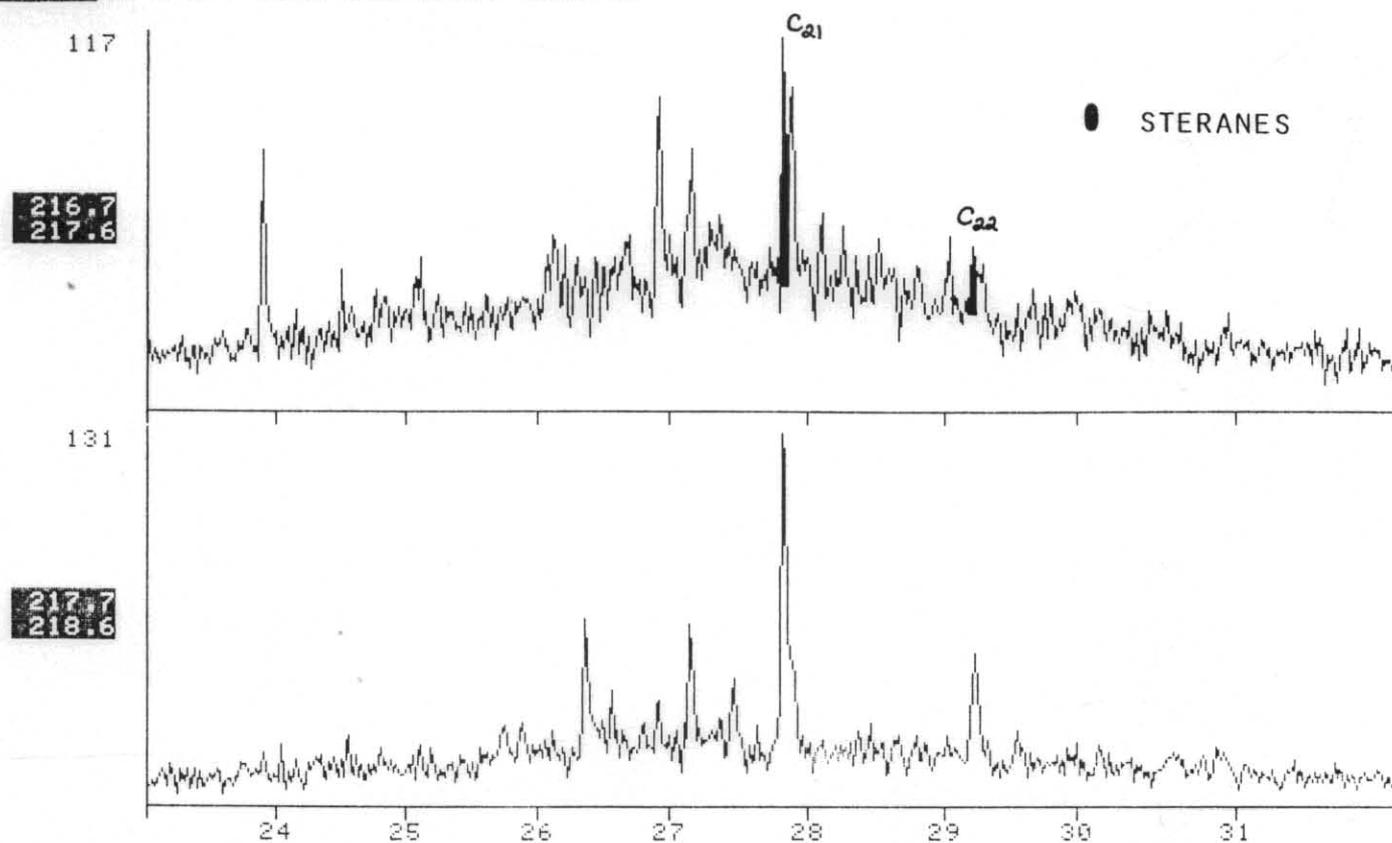


FIGURE: 2-1d

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/8501. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/8501. COL#72.

FRN 6224

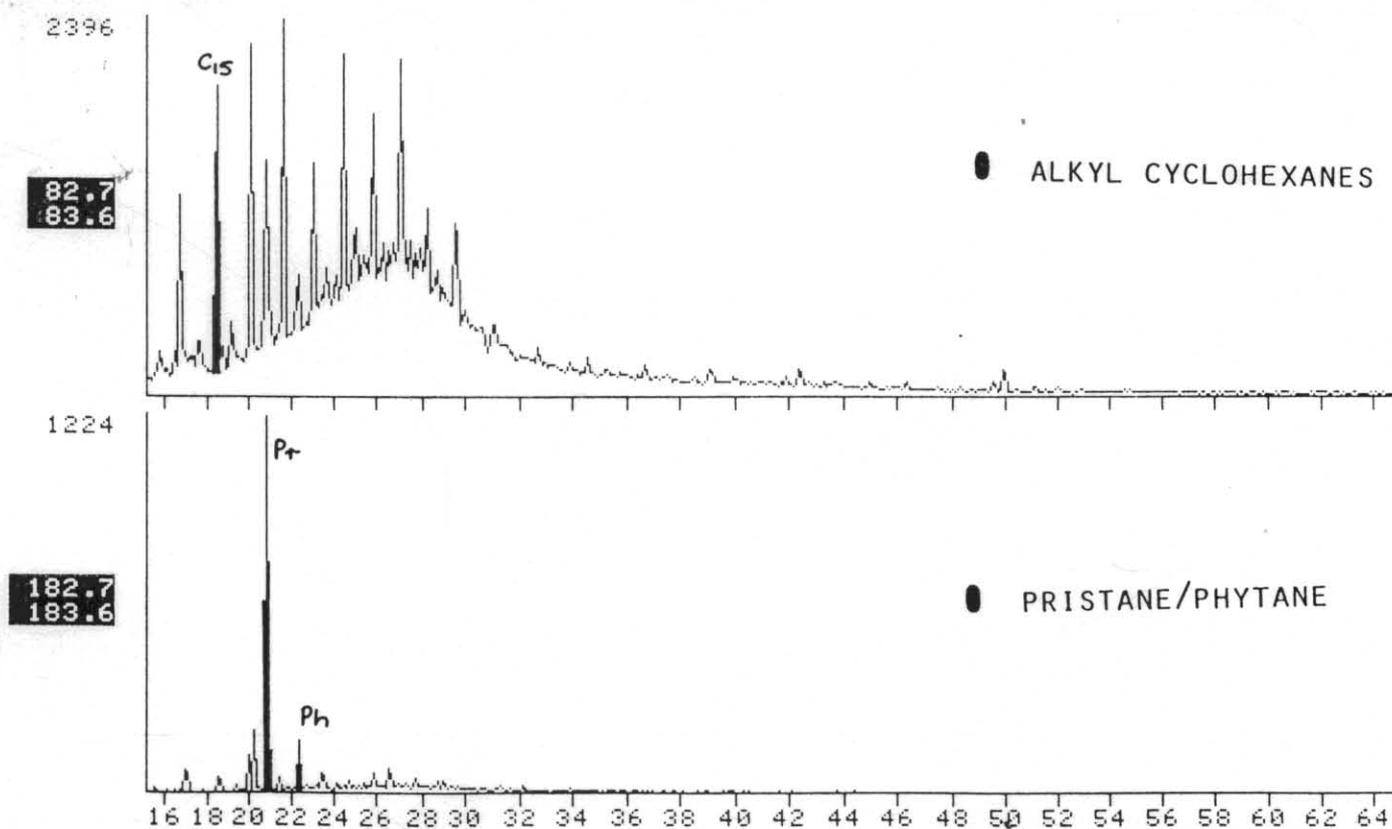
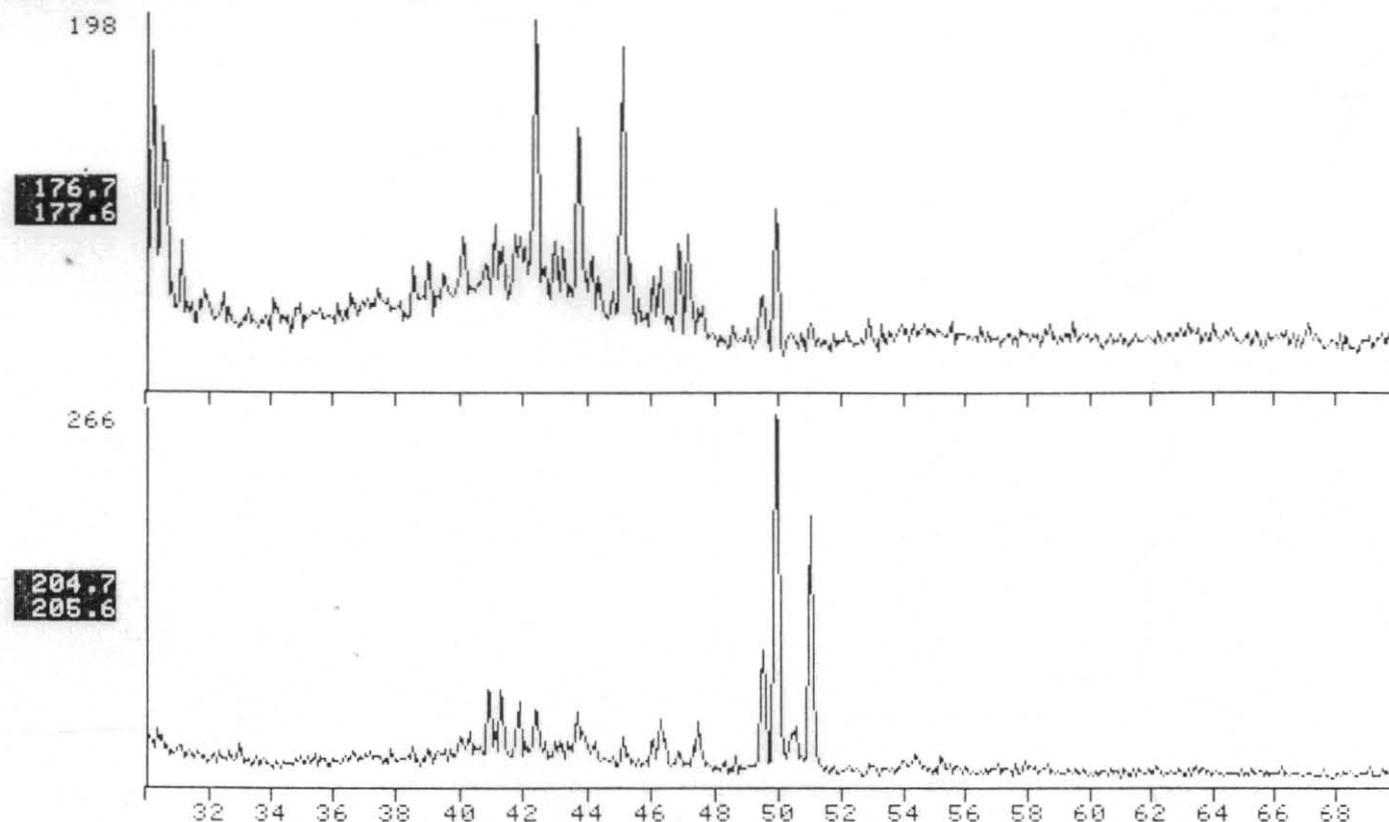


FIGURE: 2-1e

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224

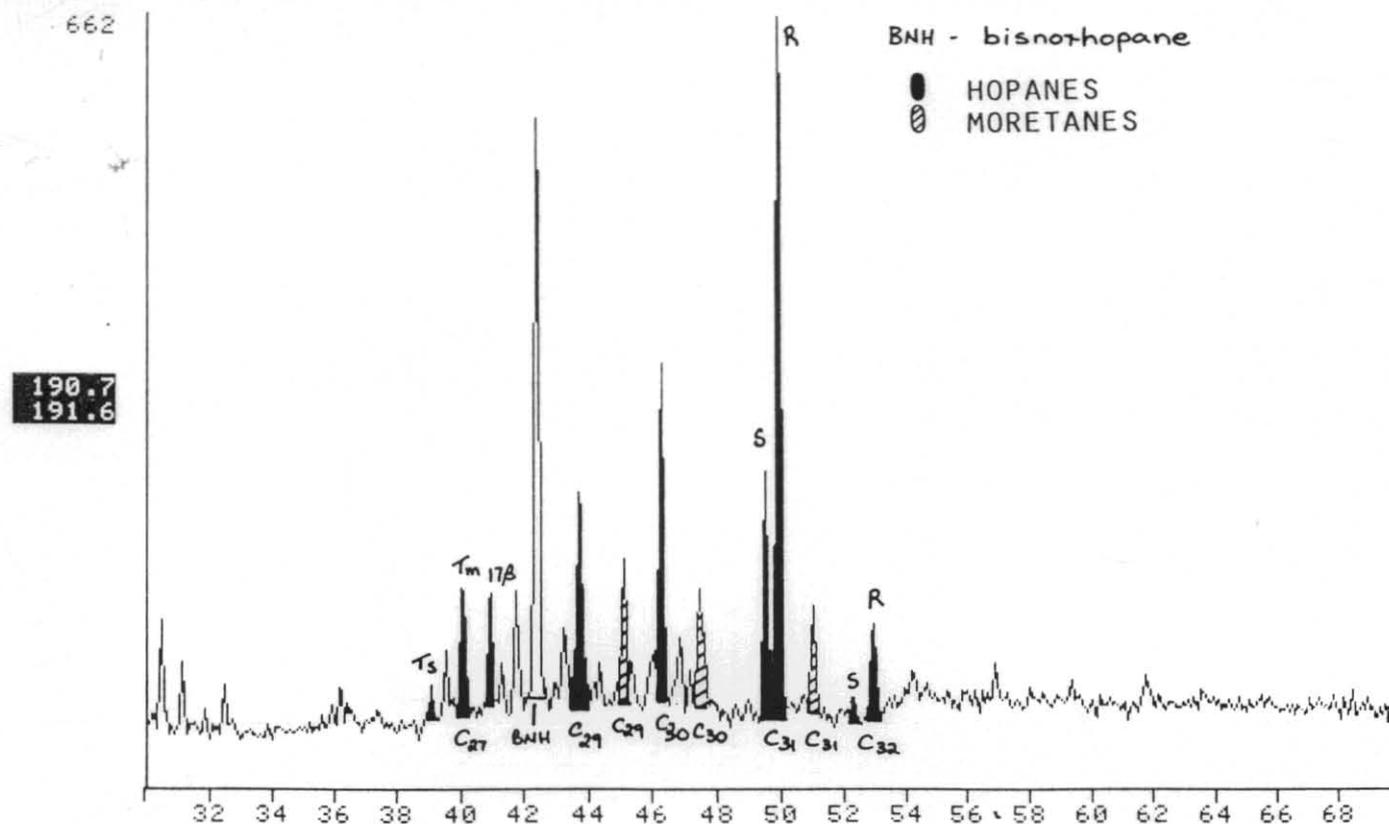
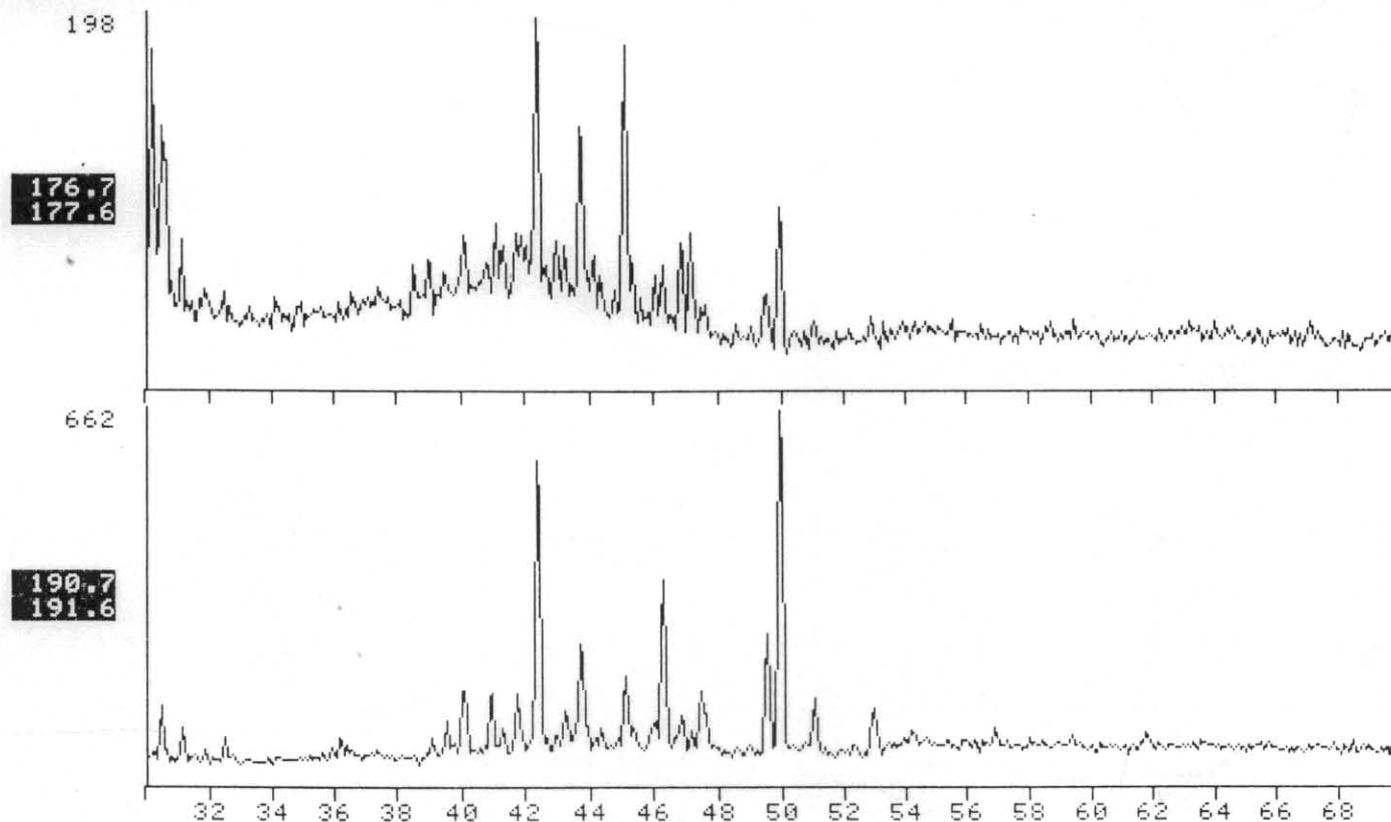


FIGURE: 2-1f

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224

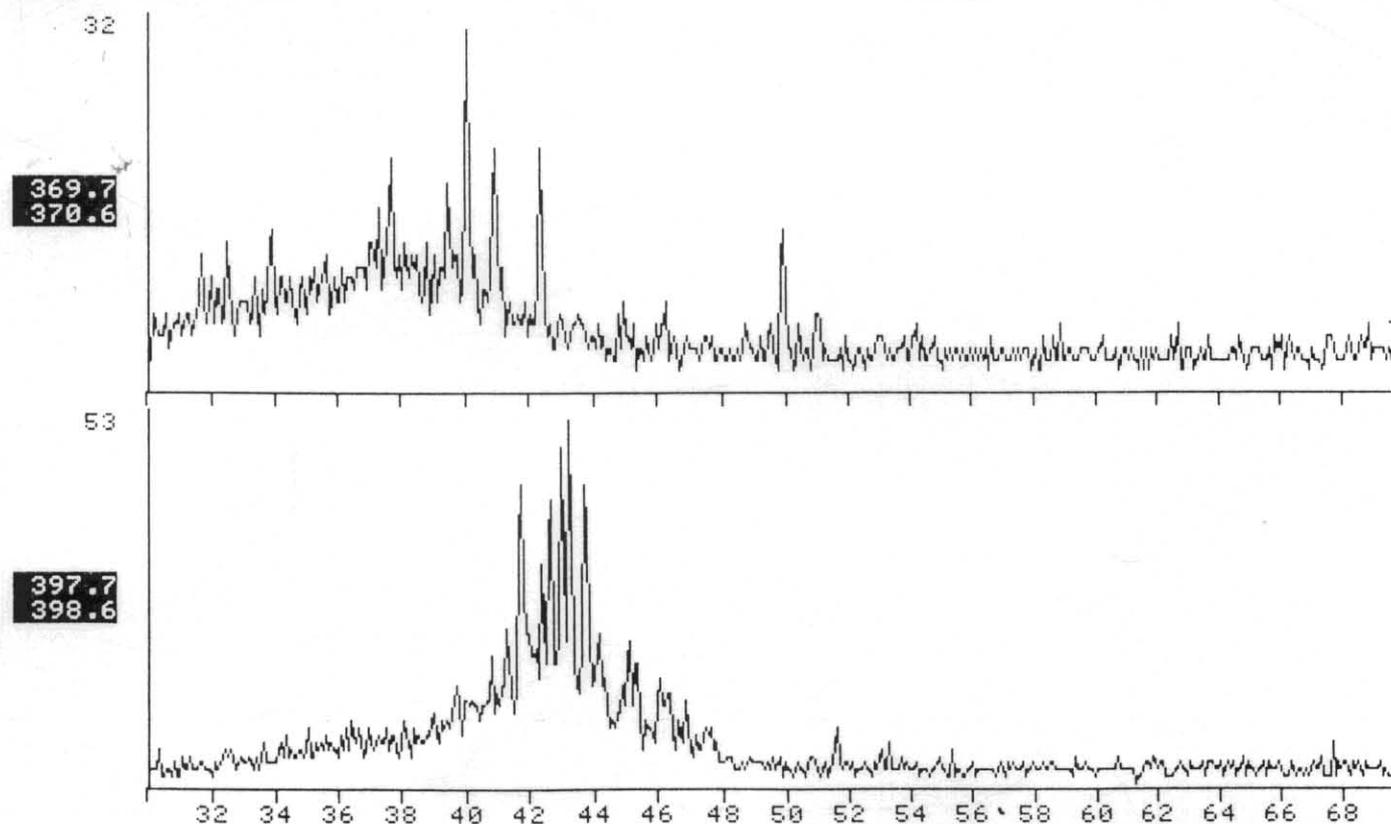
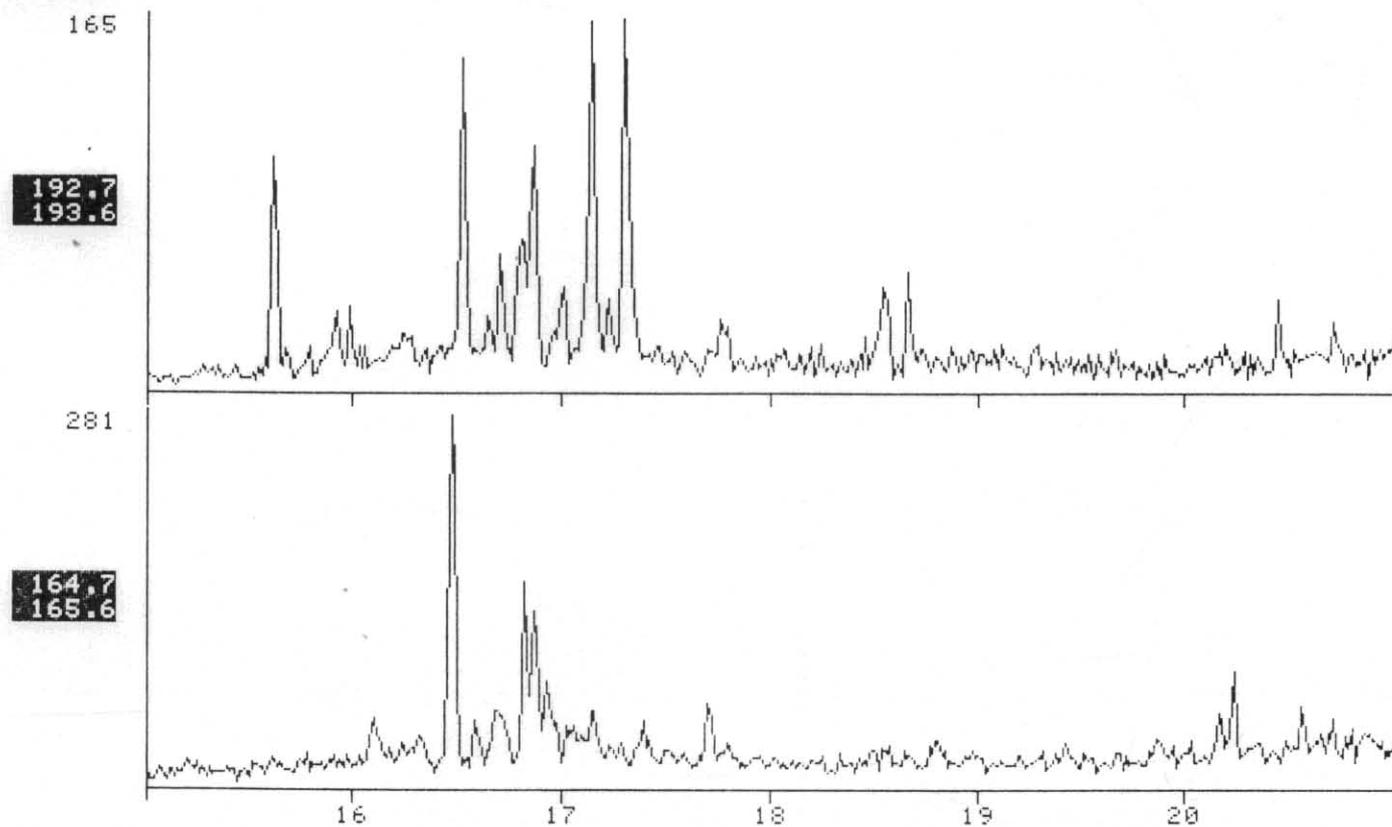


FIGURE: 2-1g

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224

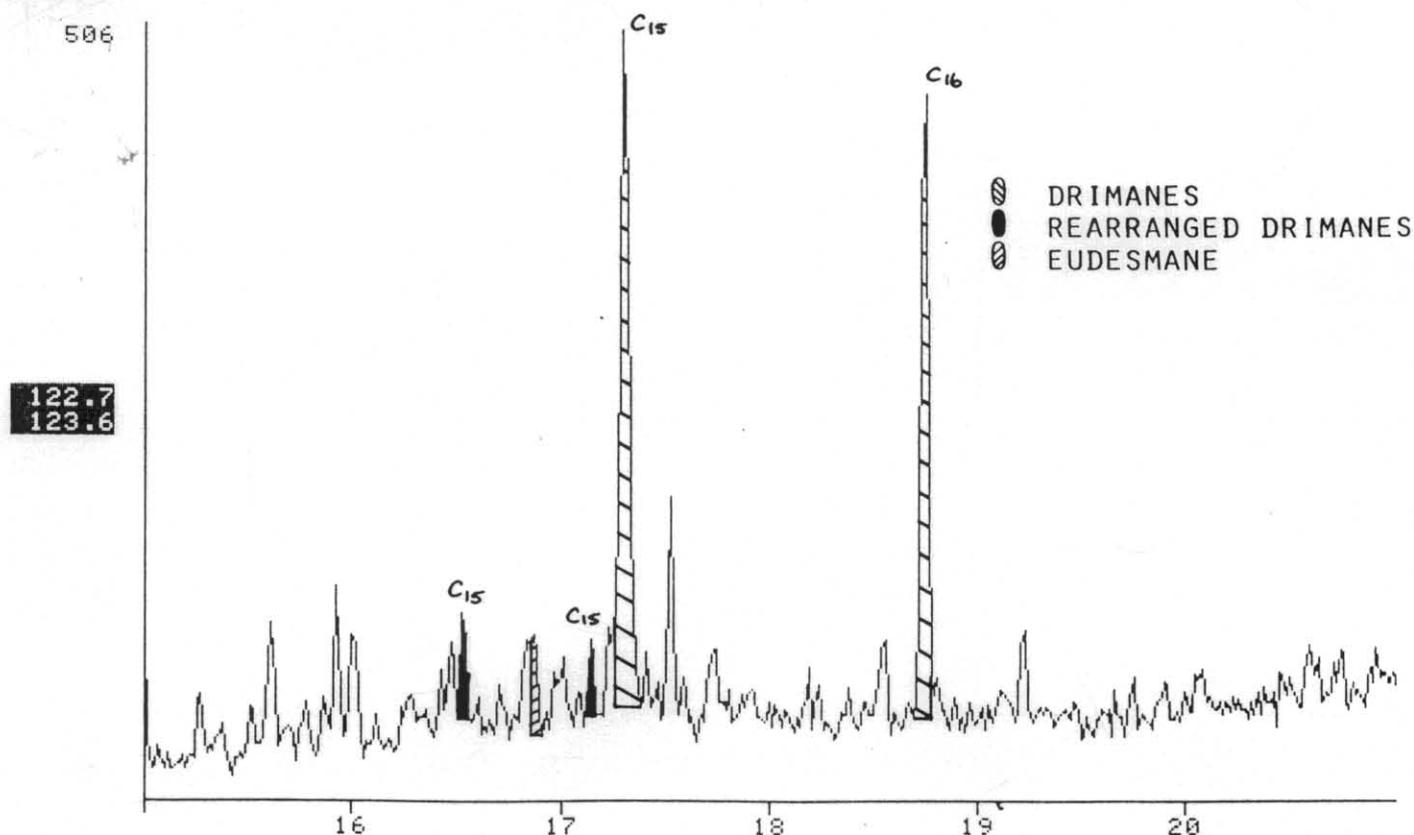
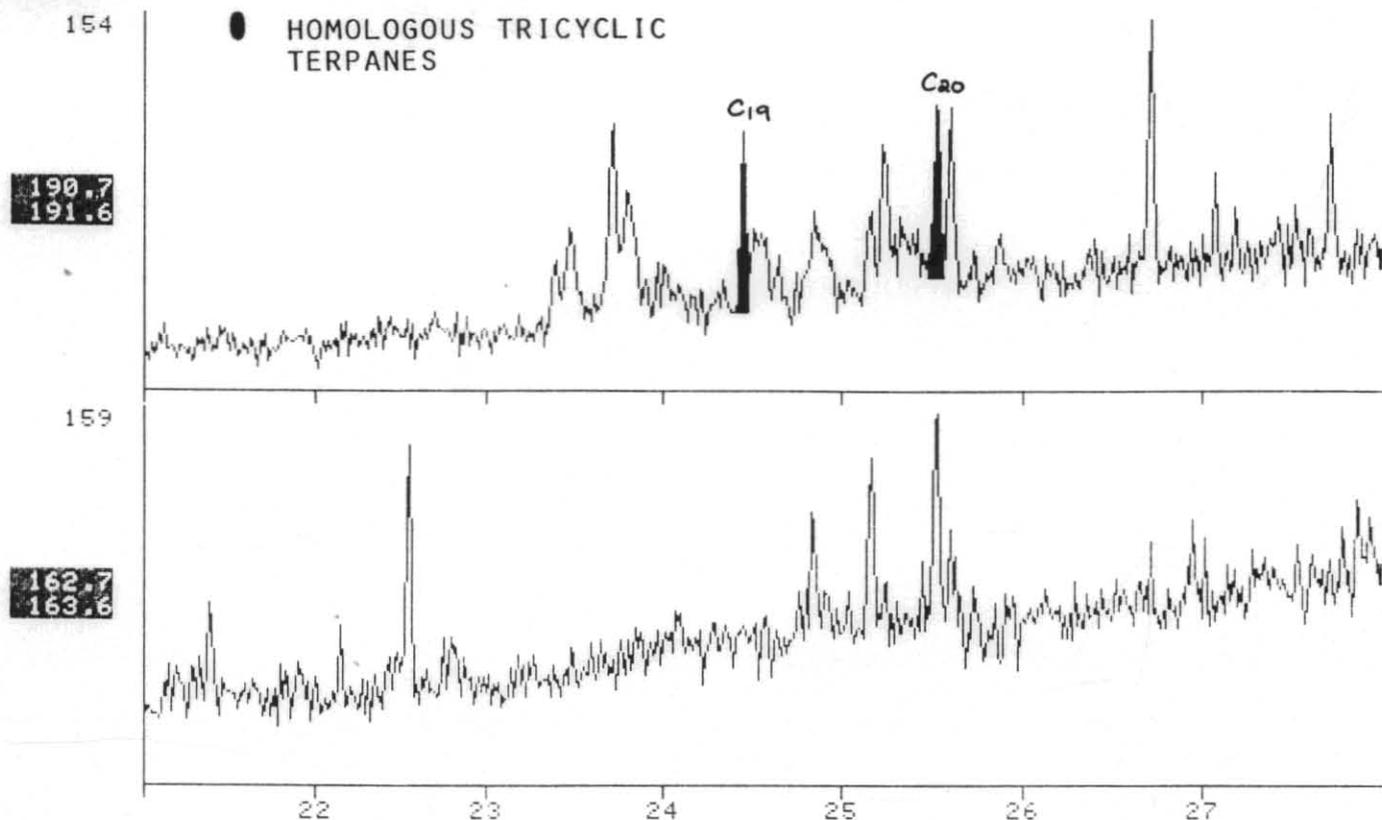


FIGURE: 2-1h

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85u1. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85u1. COL#72.

FRN 6224

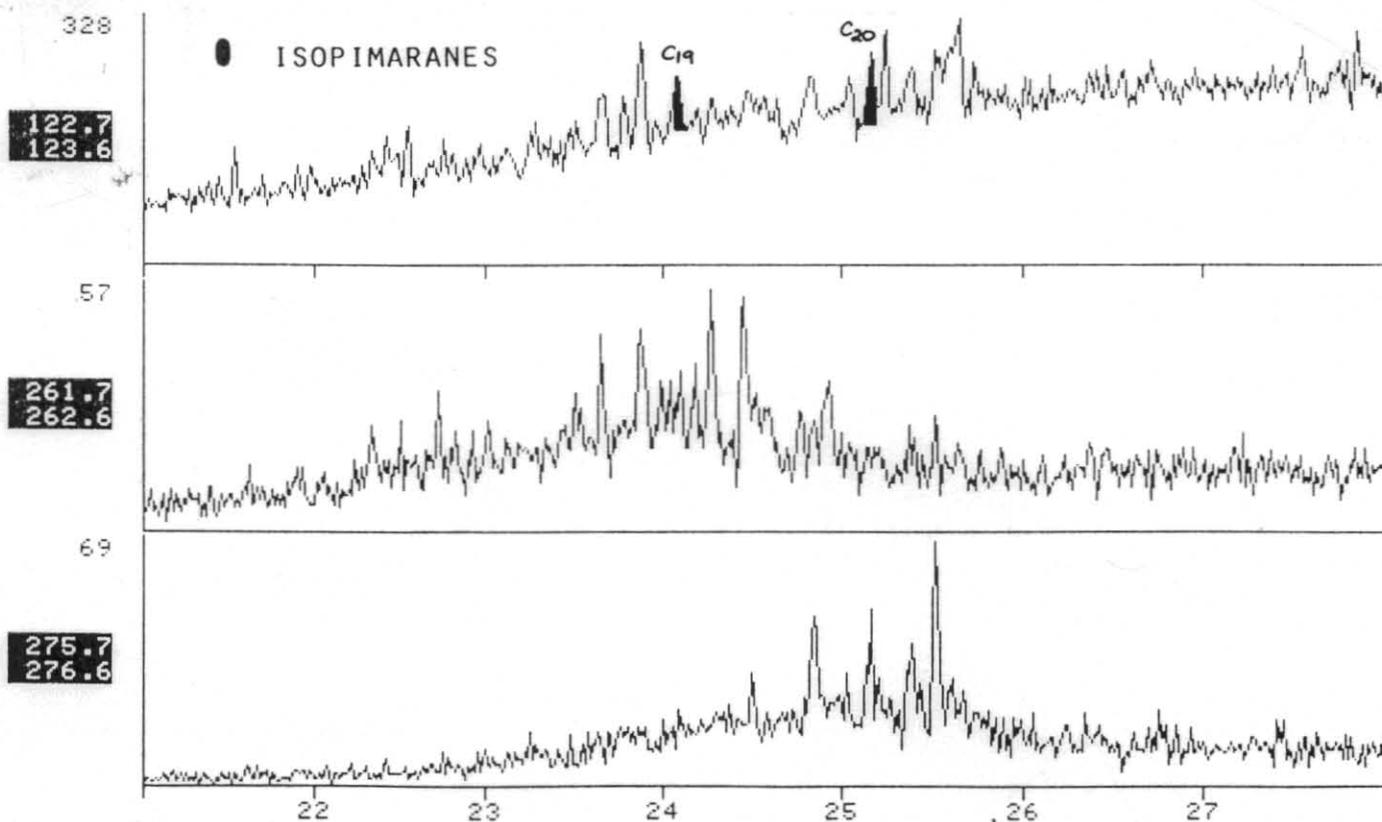
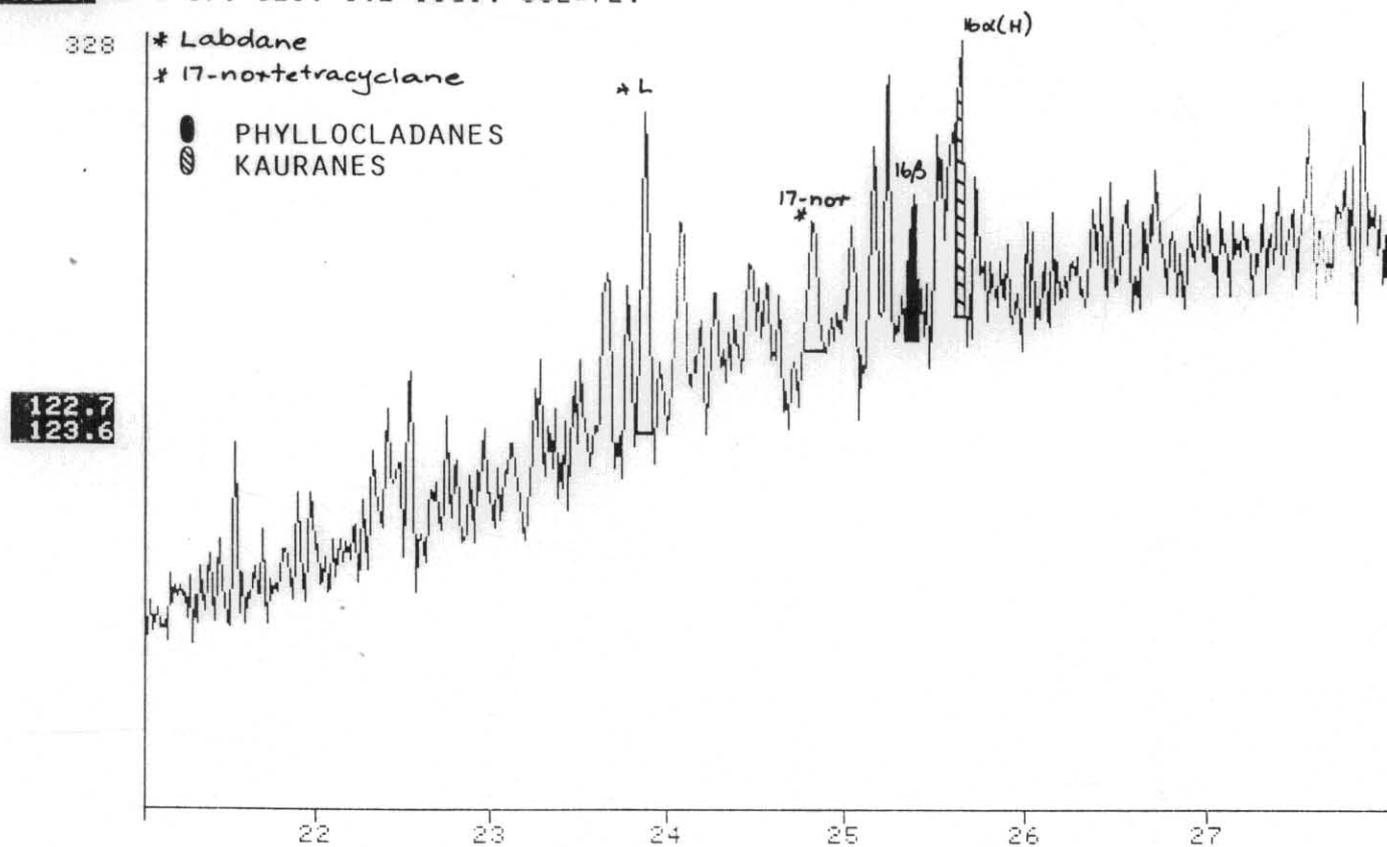


FIGURE: 2-1i

NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224



NAME BASS#1, 6405'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 16-3-87. GEC. 0.2/85ul. COL#72.

FRN 6224

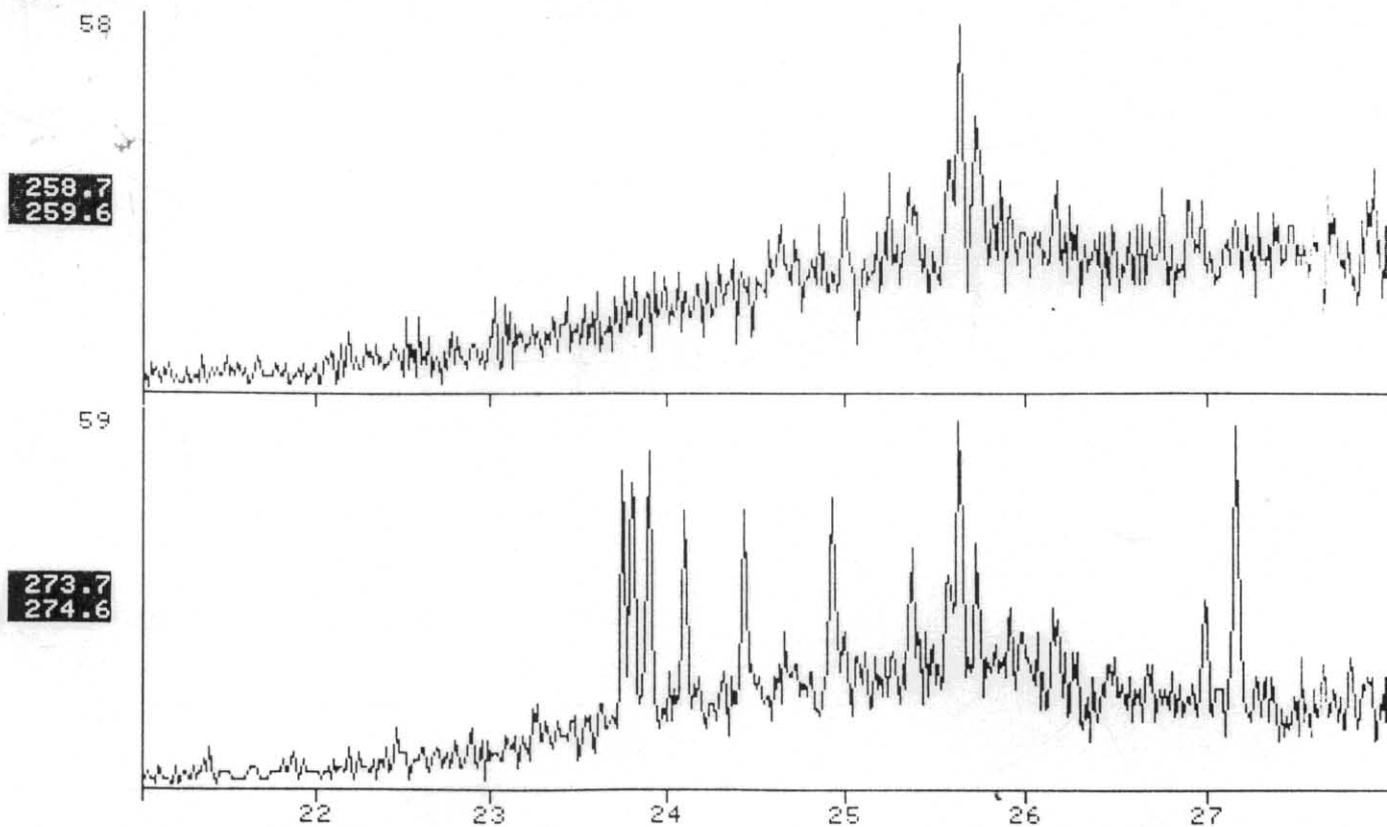
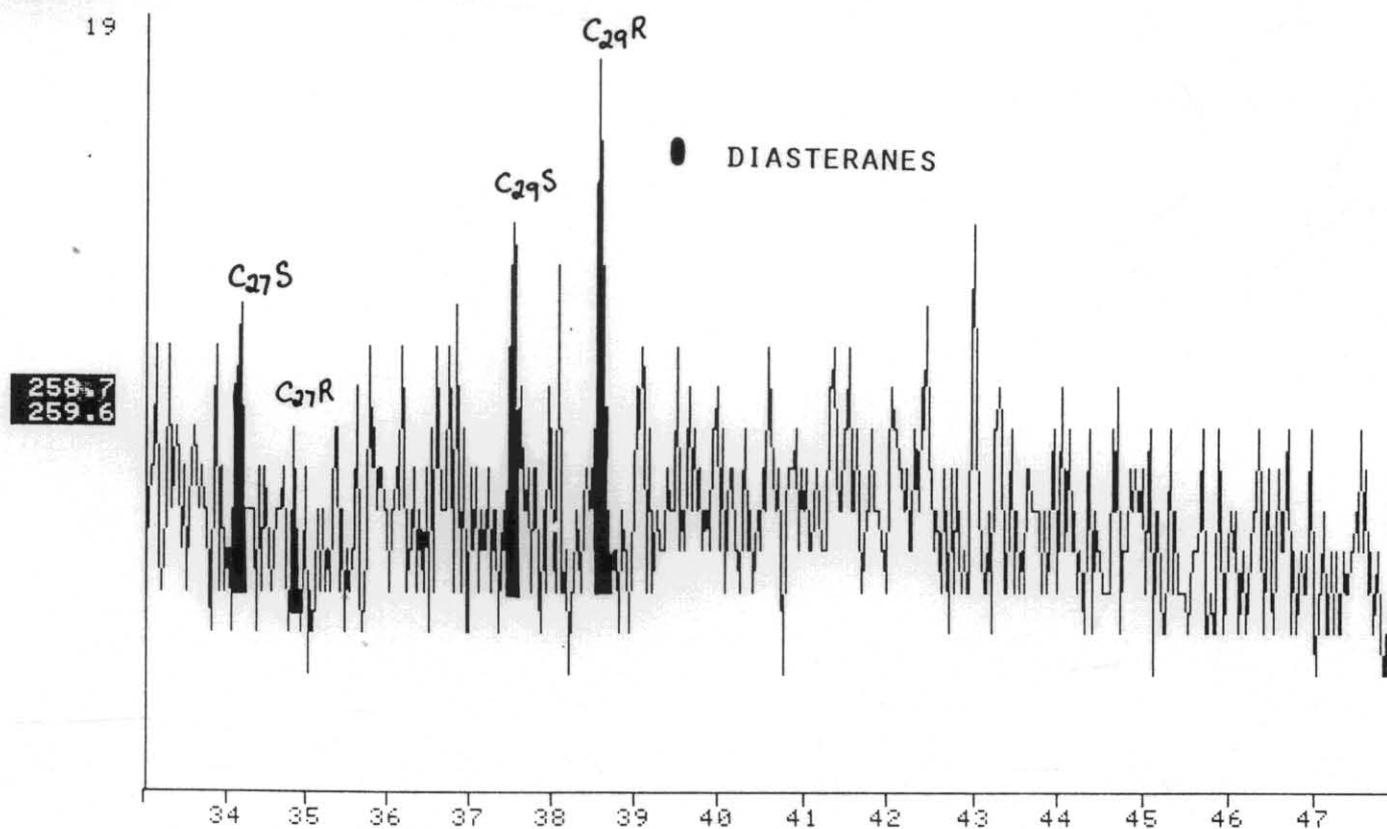


FIGURE: 2-2a

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

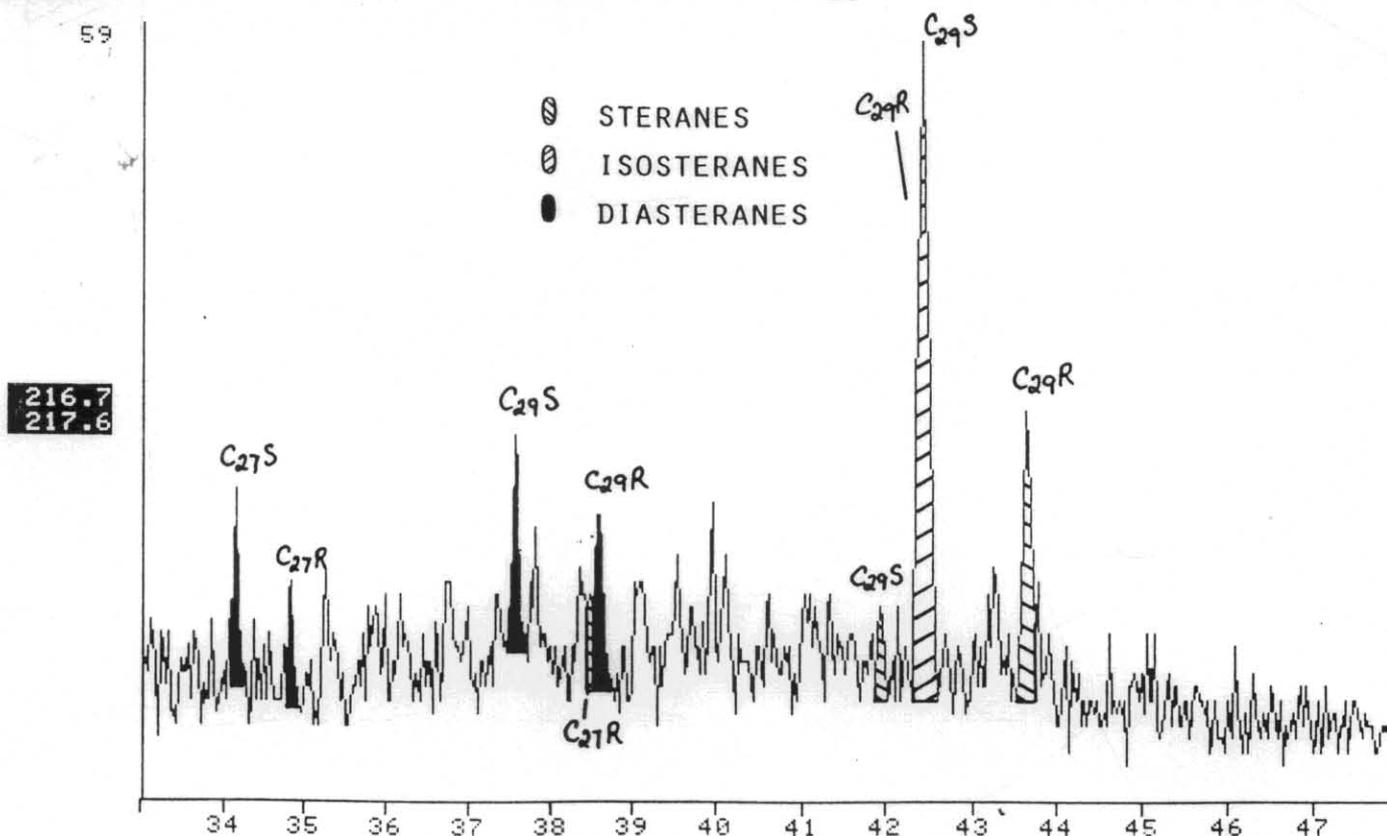
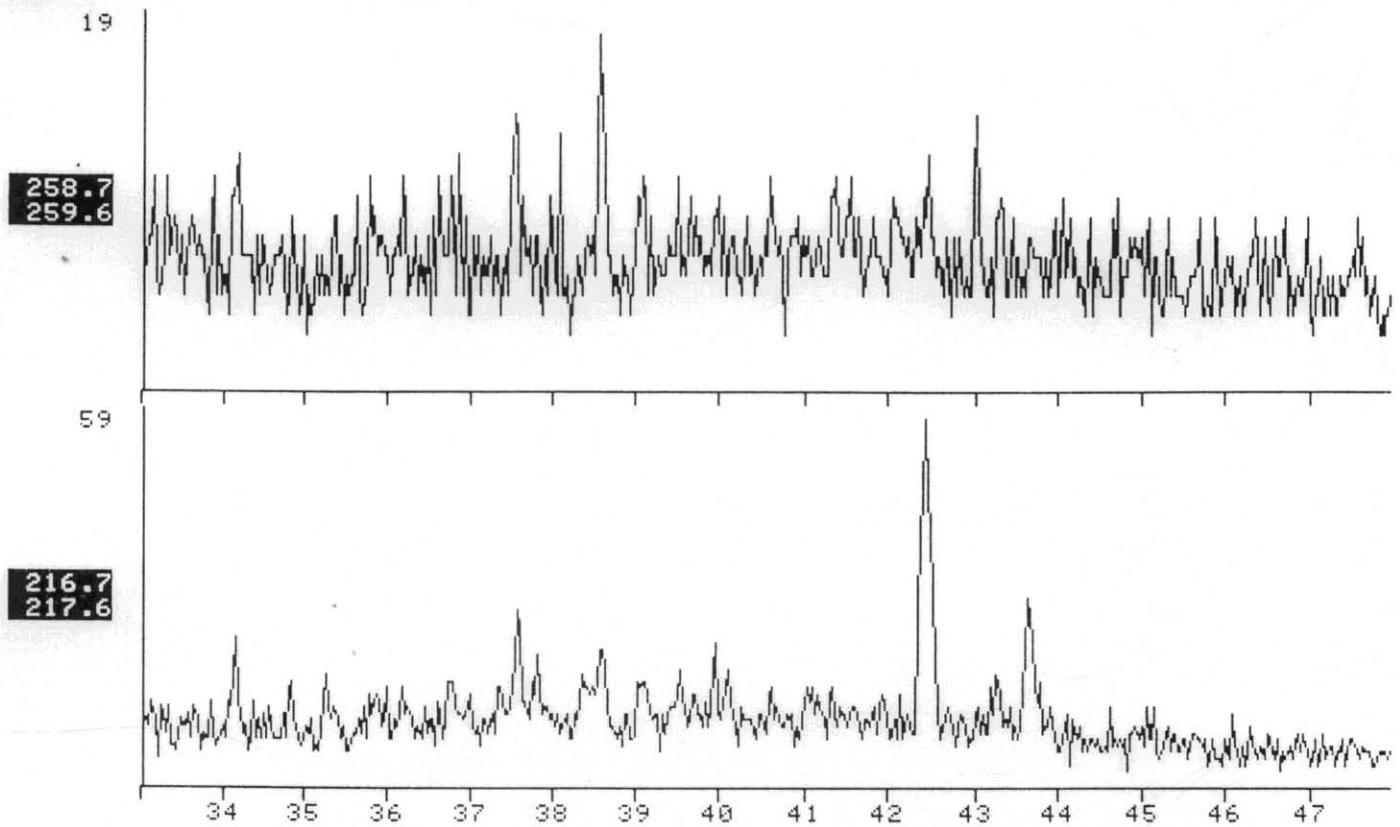


FIGURE: 2-2b

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

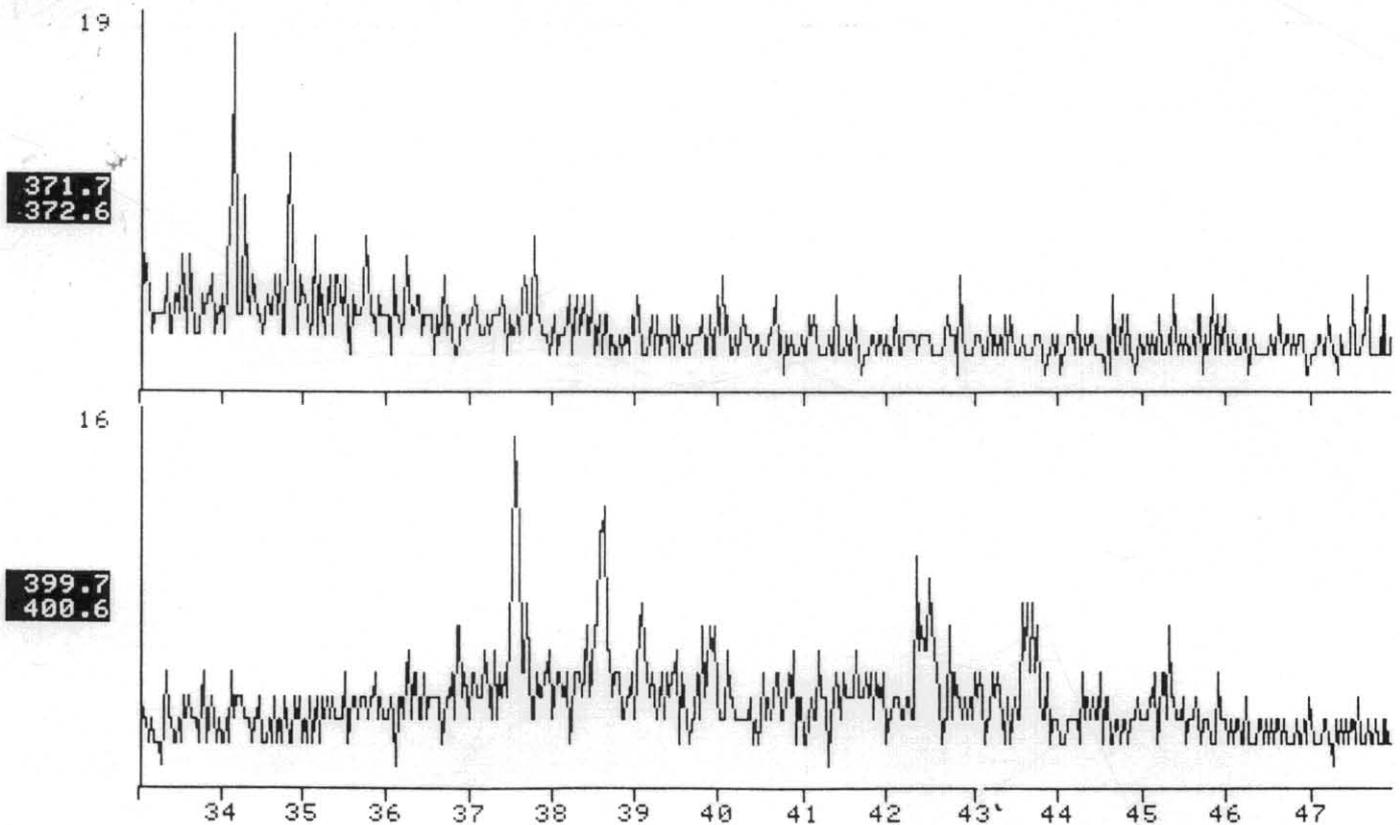
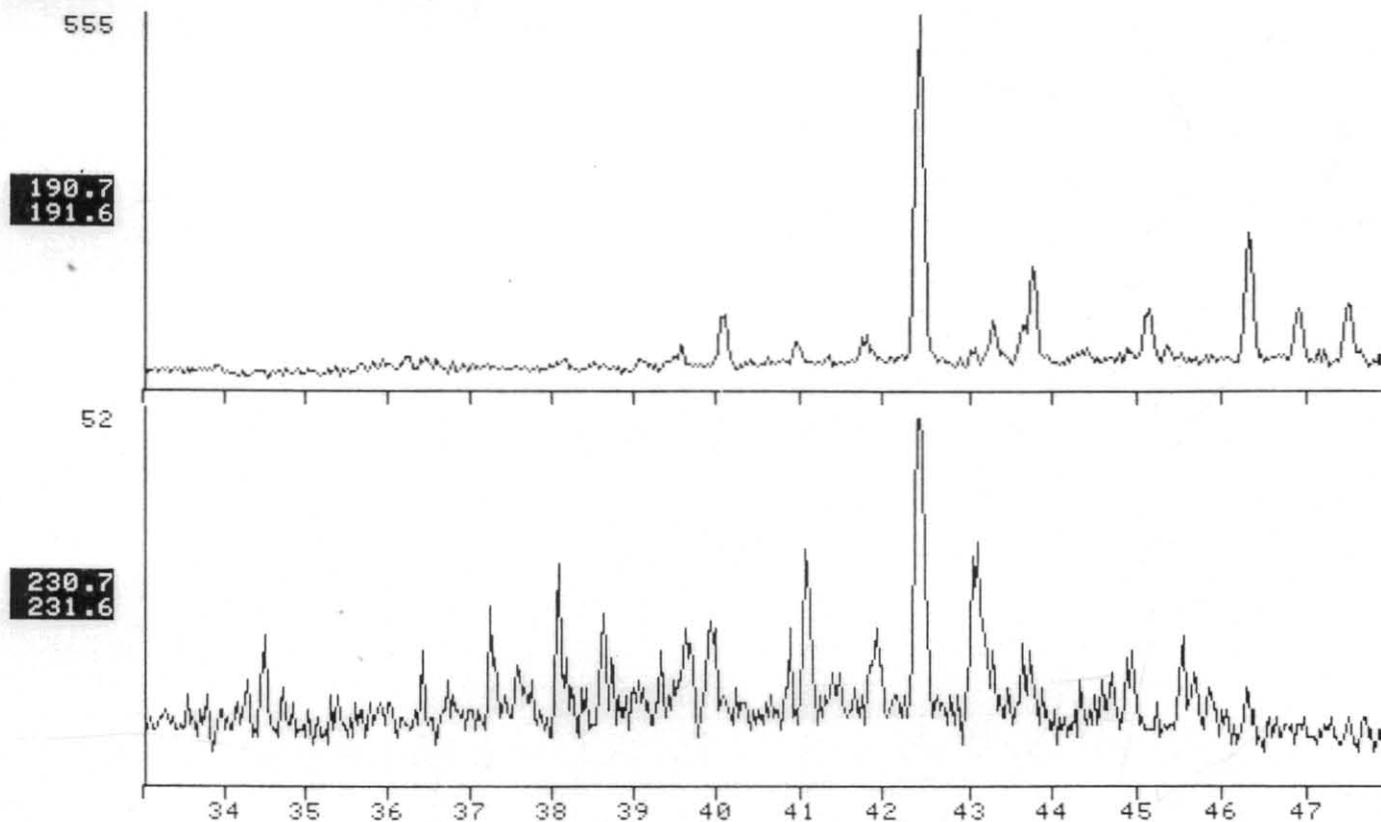


FIGURE: 2-2c

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

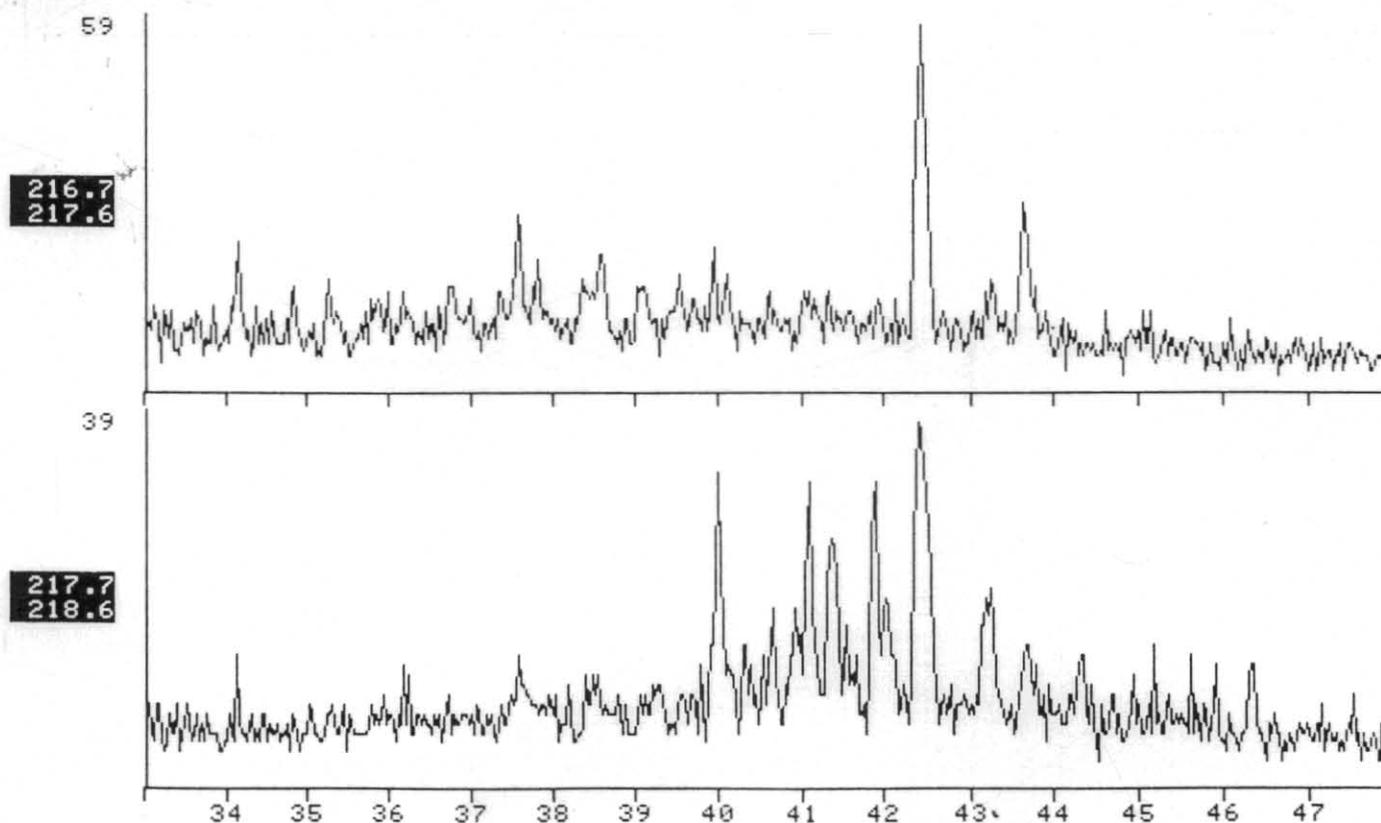
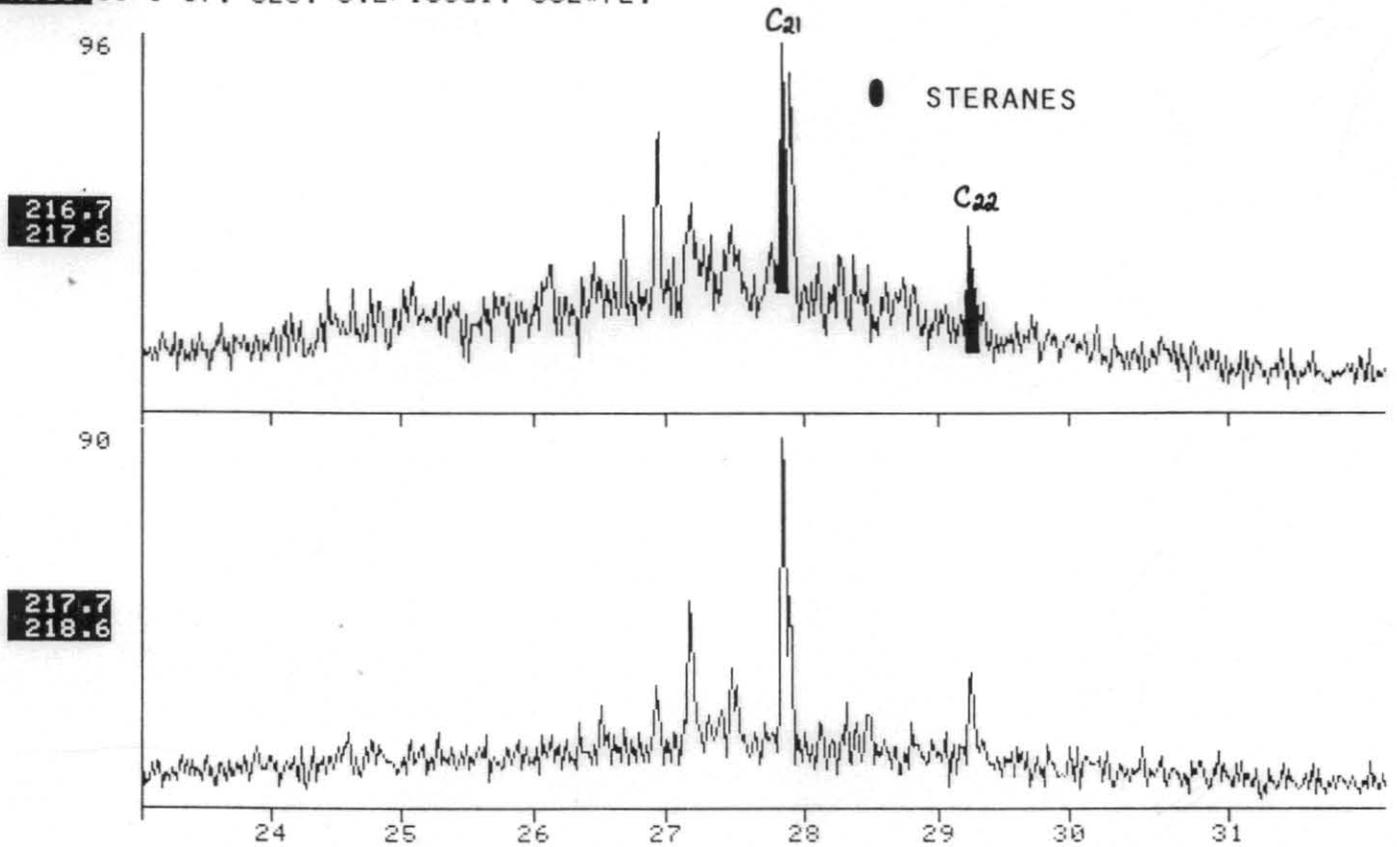


FIGURE: 2-2d

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

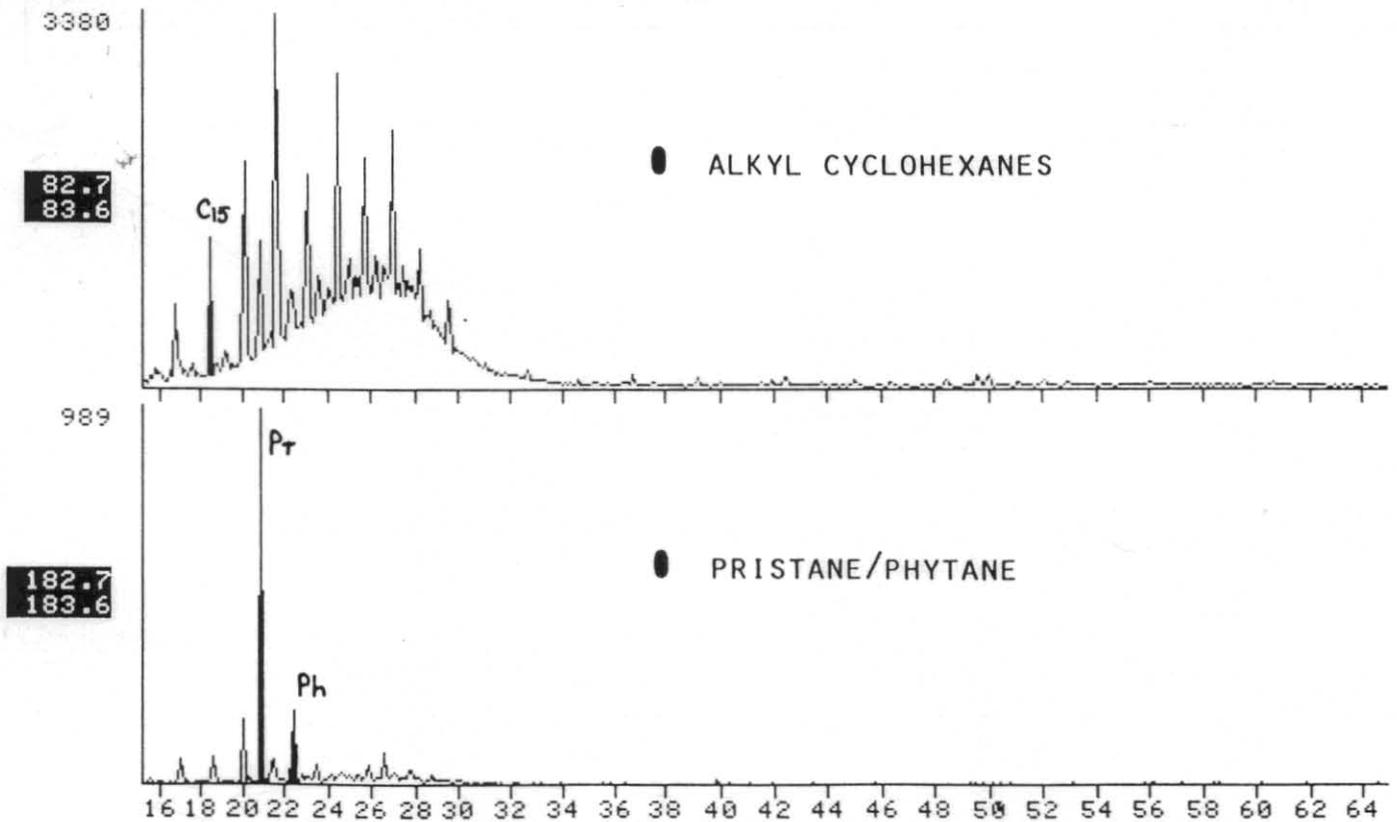
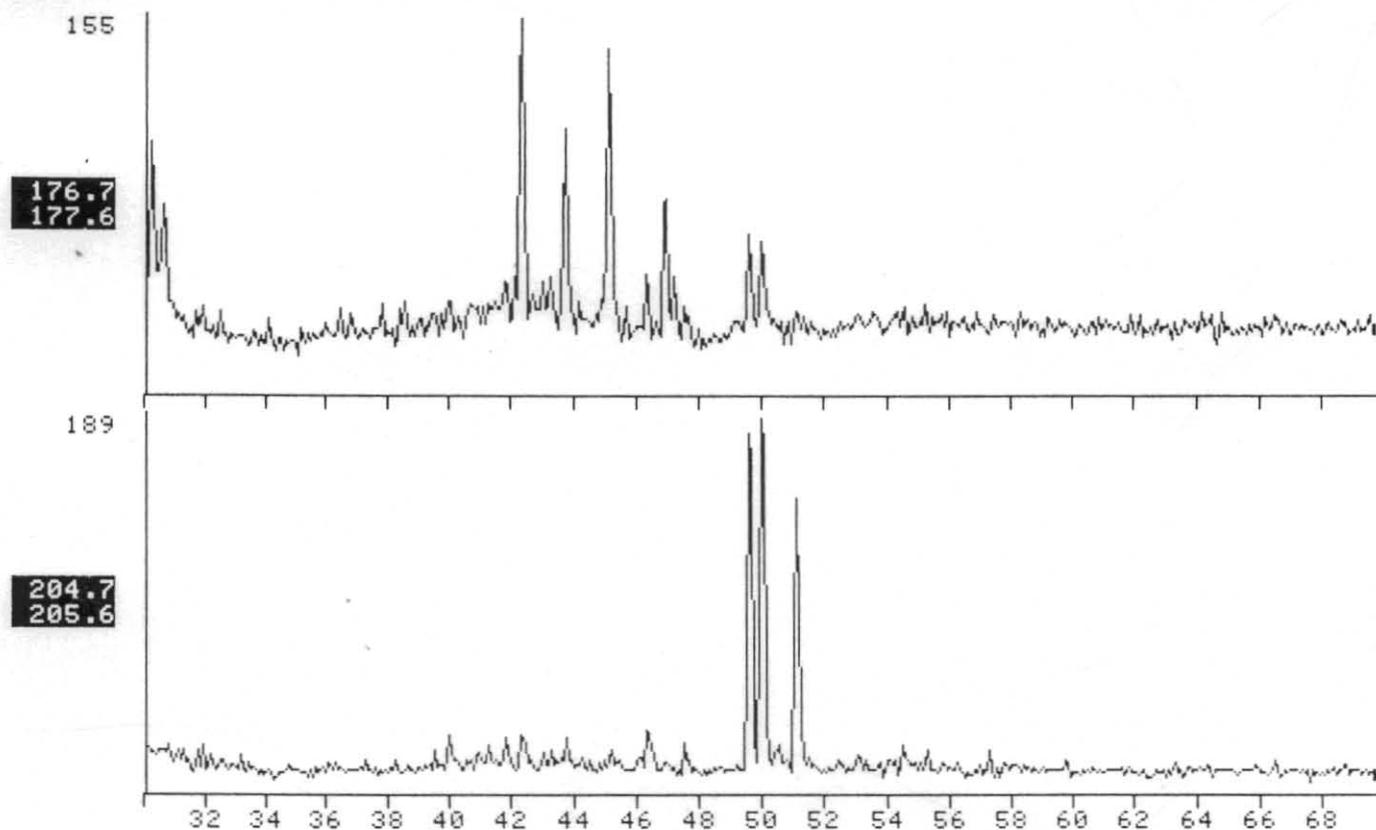


FIGURE: 2-2e

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

BNH: bisnorhopane

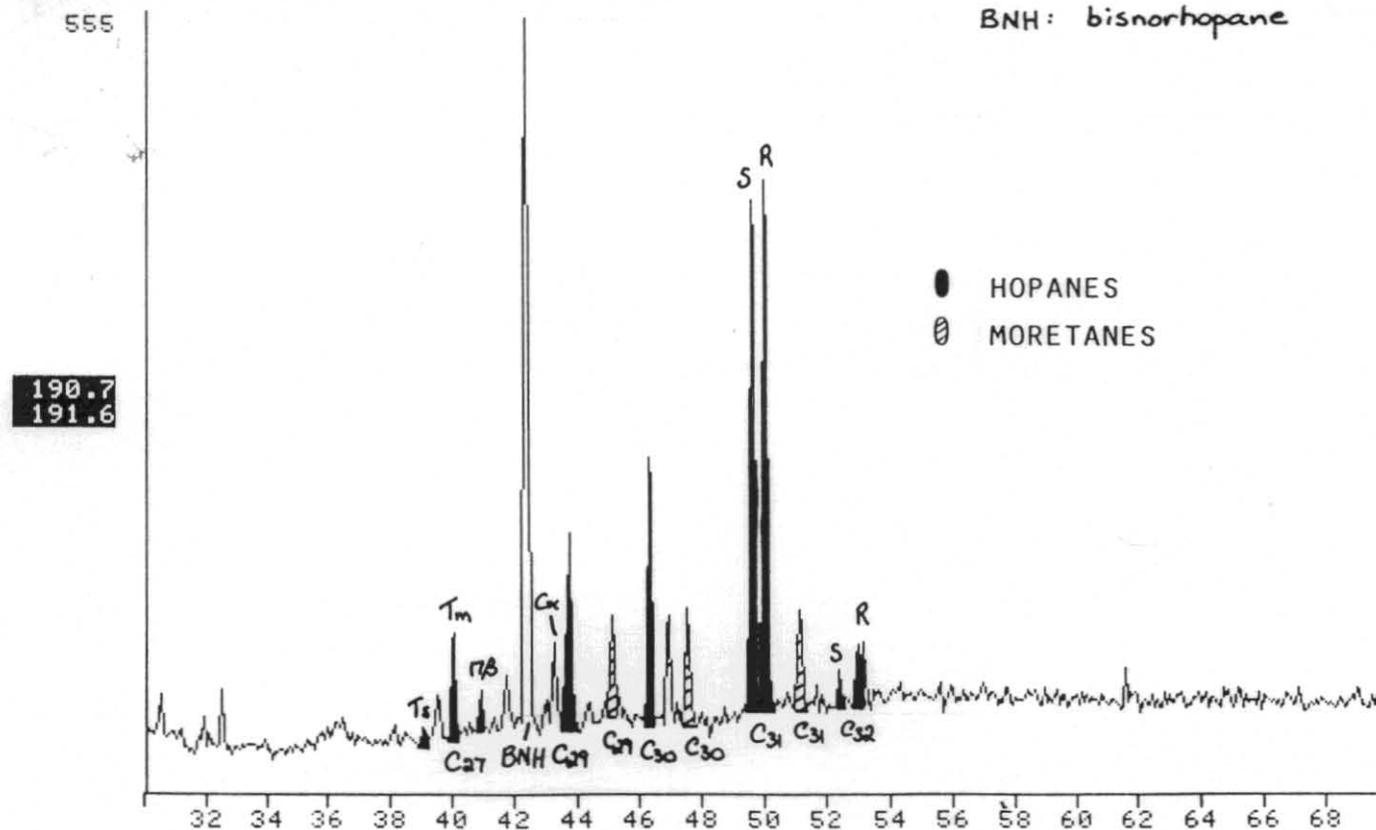
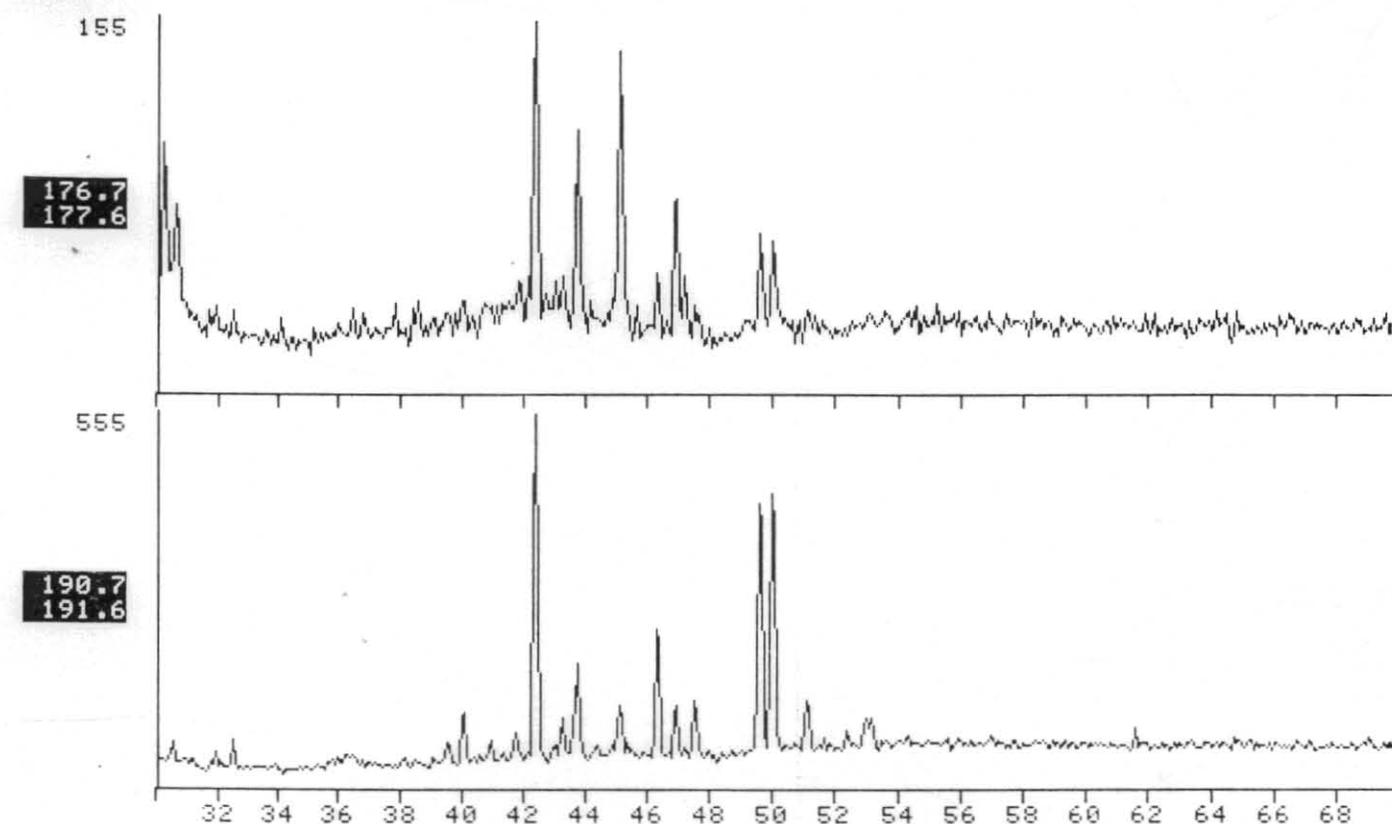


FIGURE: 2-2f

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

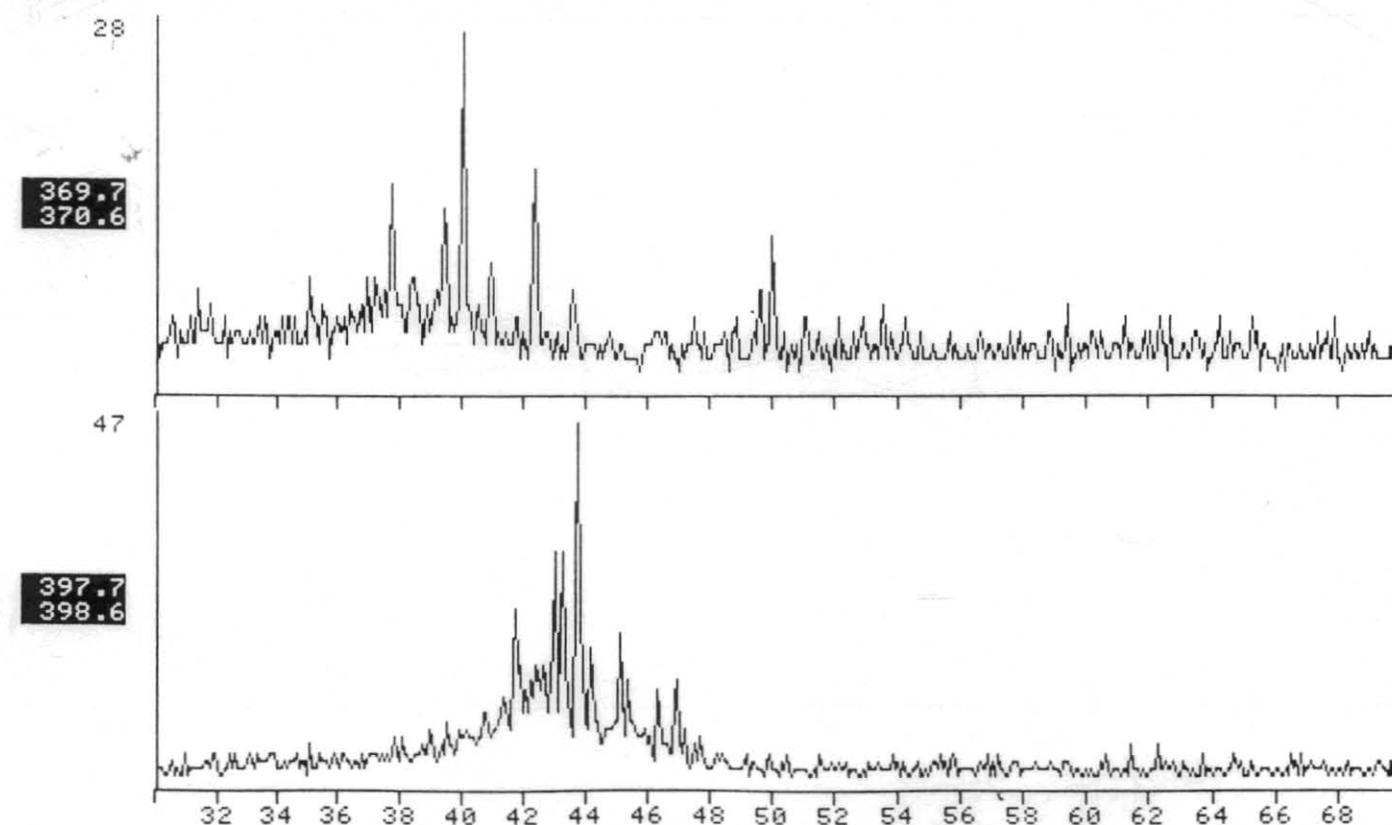
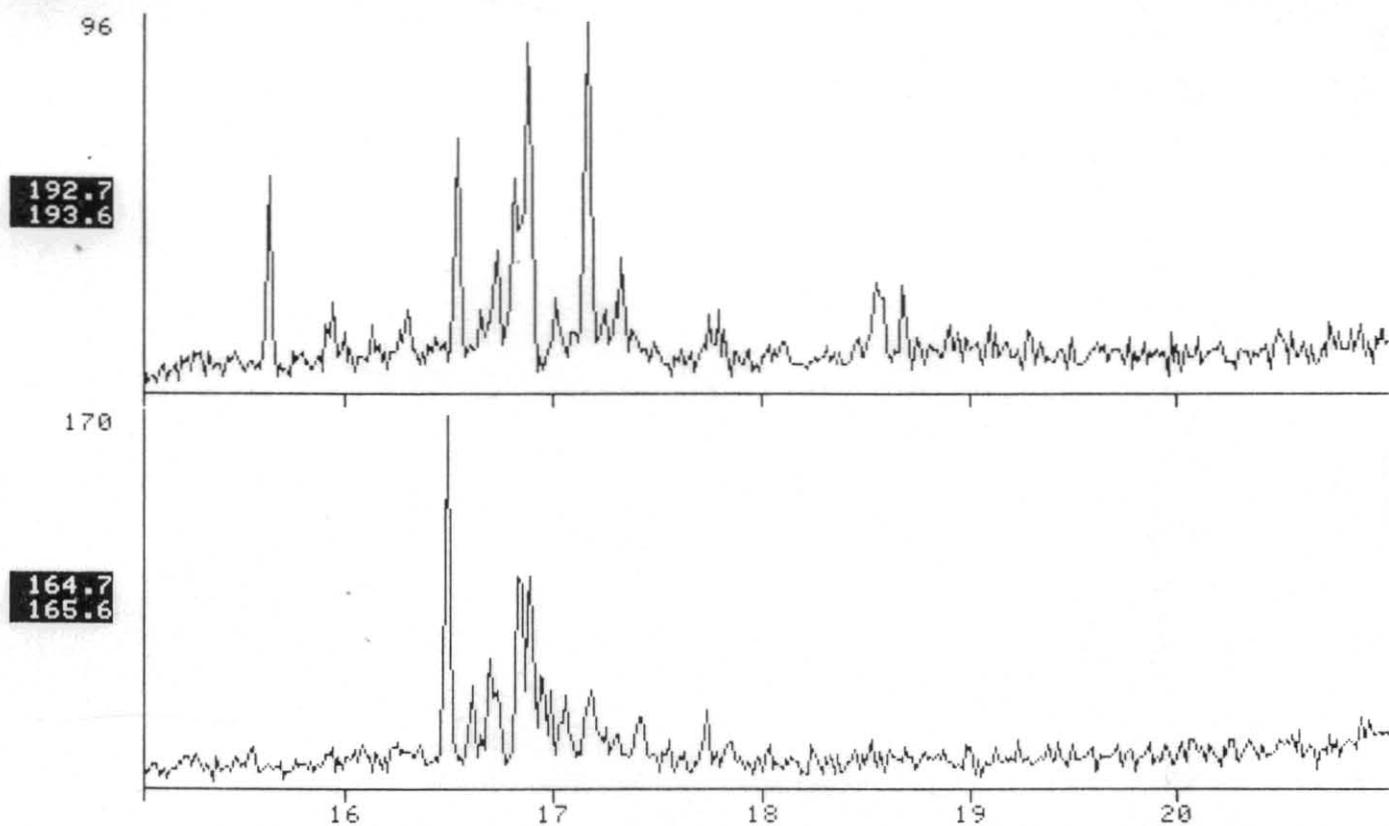


FIGURE: 2-2g

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

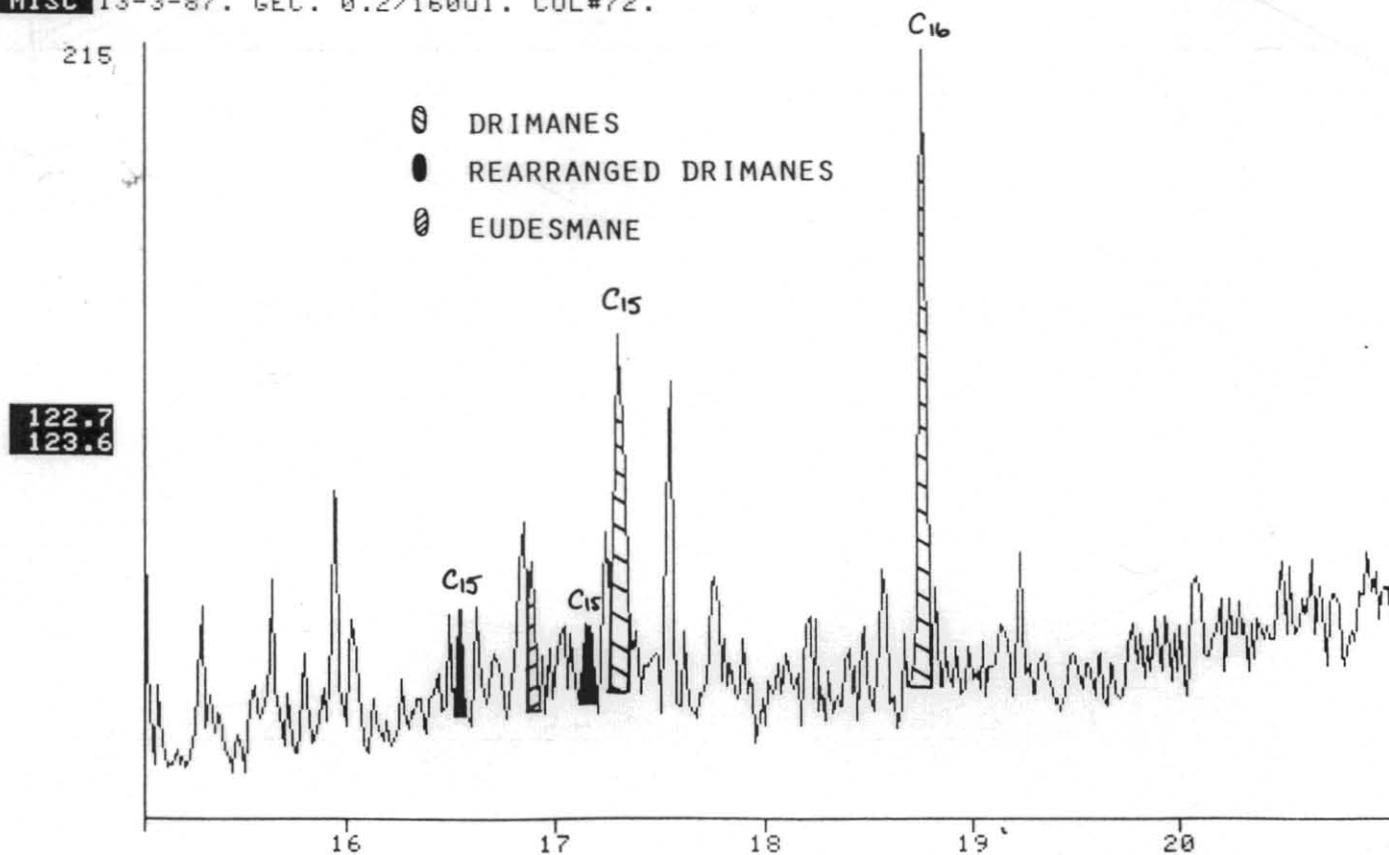
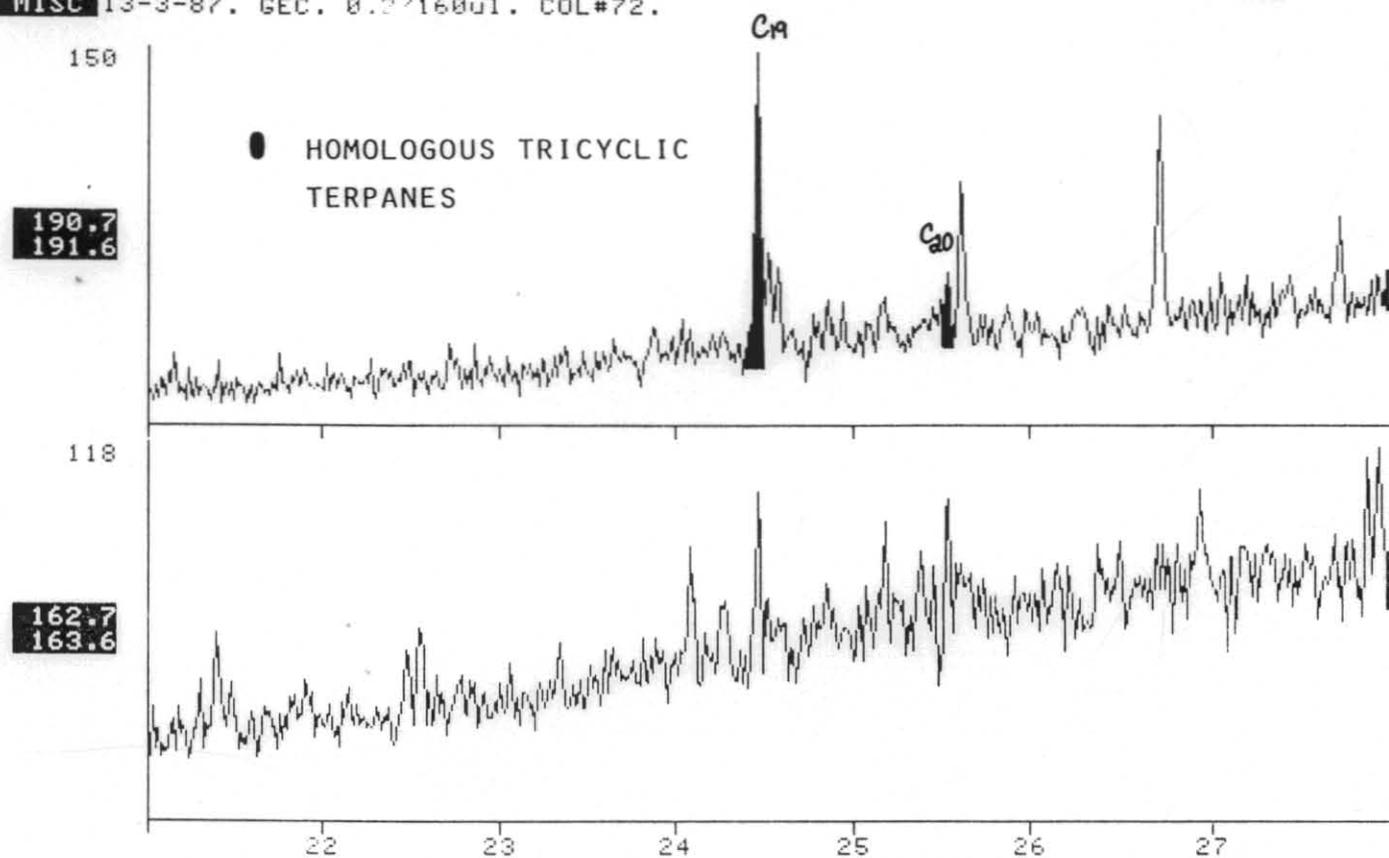


FIGURE: 2-2h

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

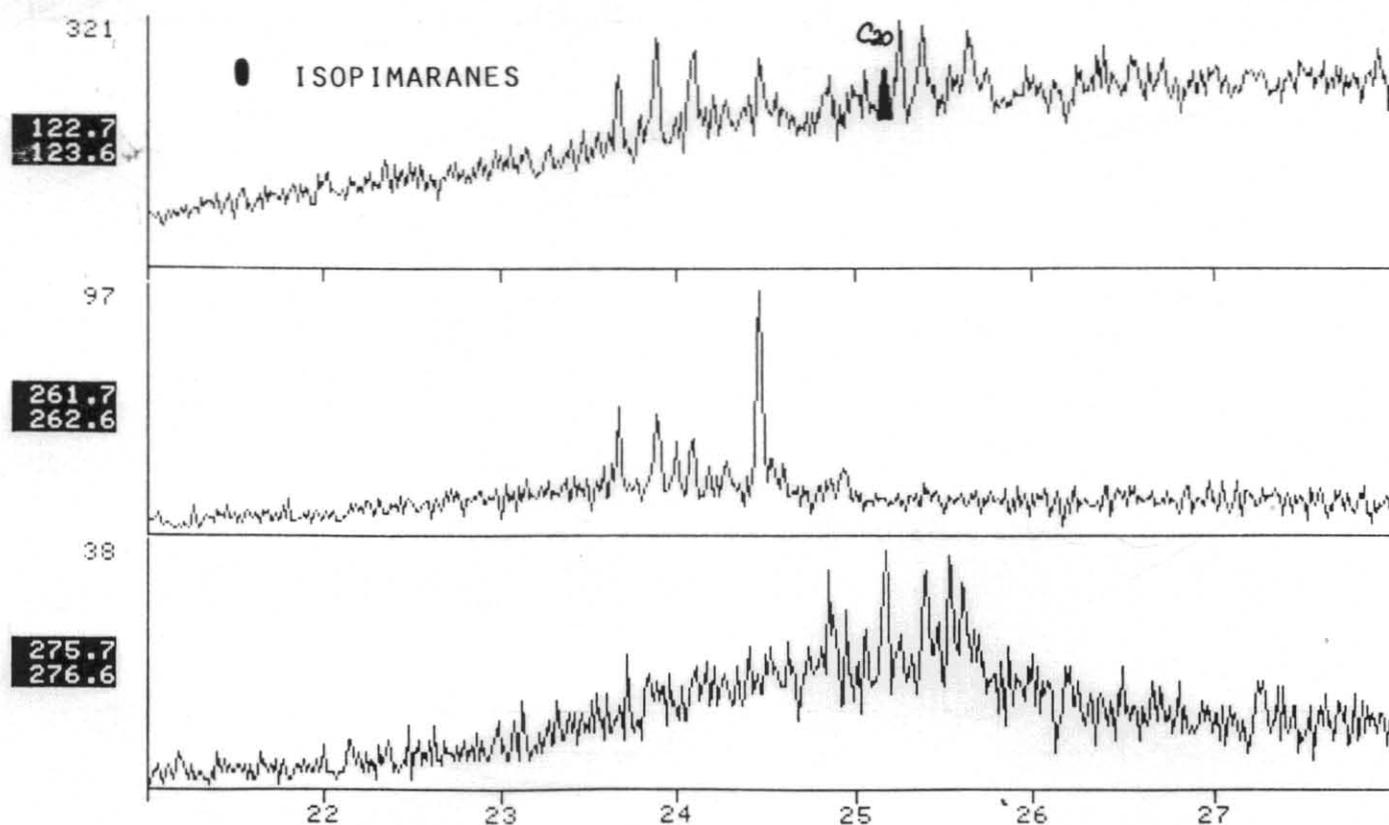
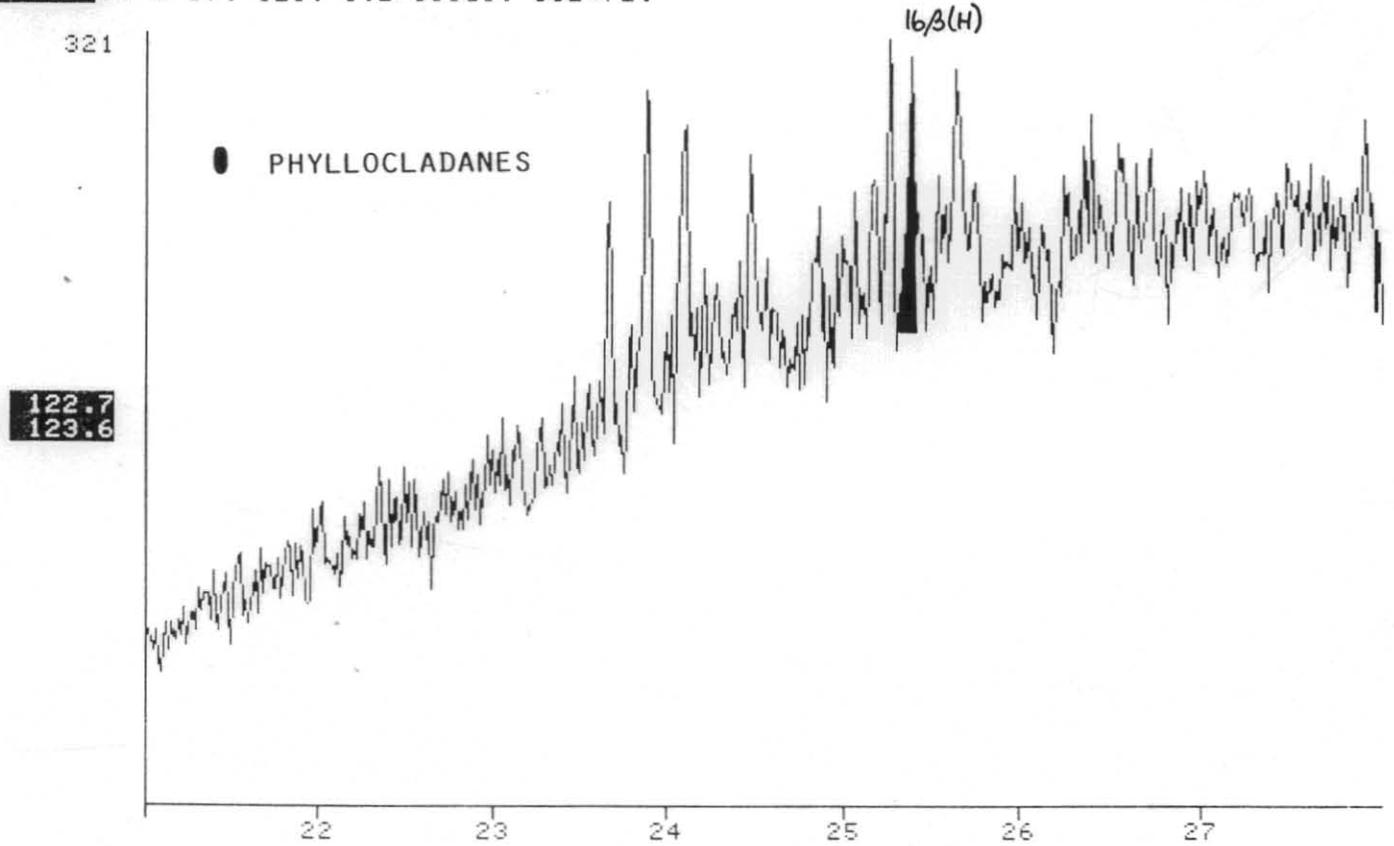


FIGURE: 2-2i

NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223



NAME BASS#1, 6930'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 13-3-87. GEC. 0.2/160ul. COL#72.

FRN 6223

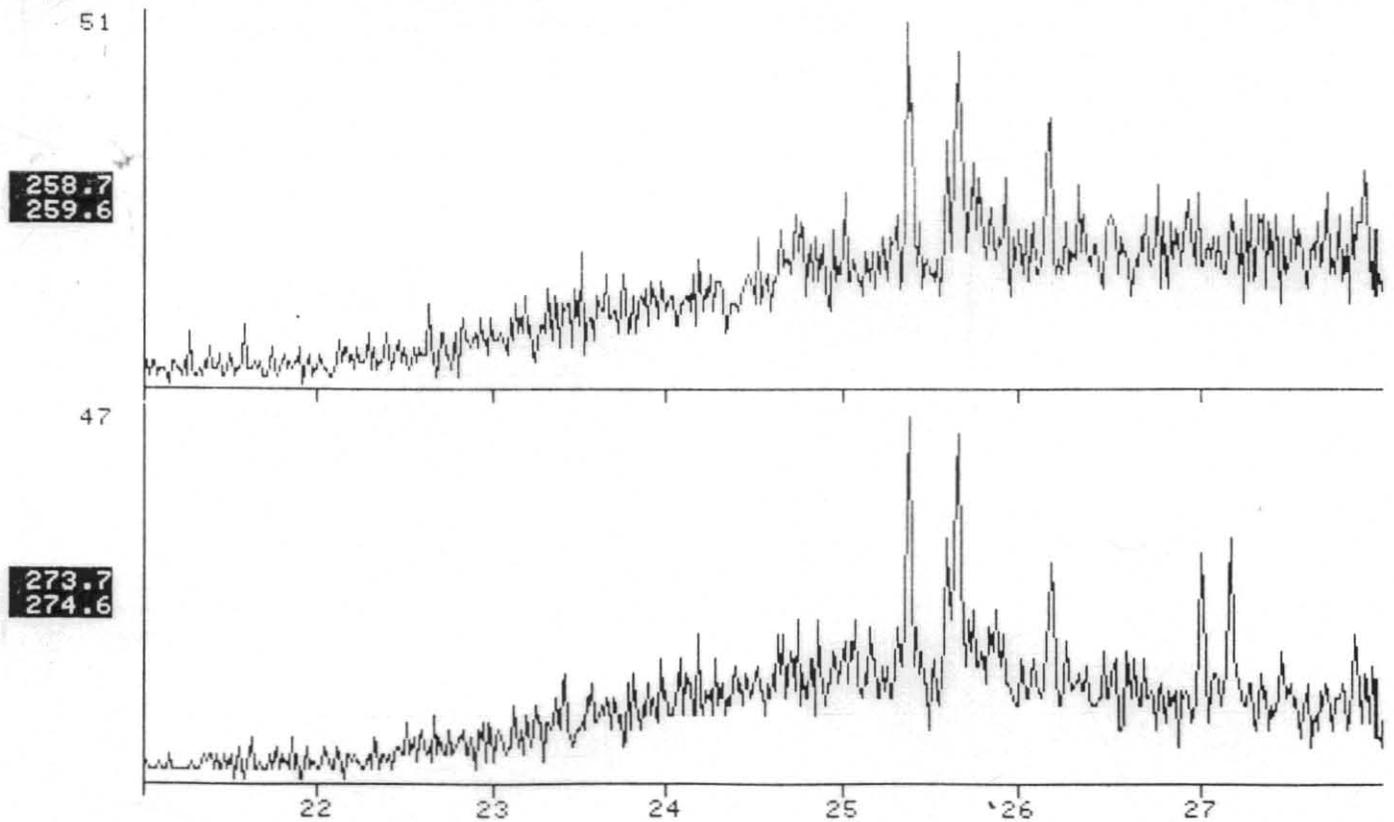
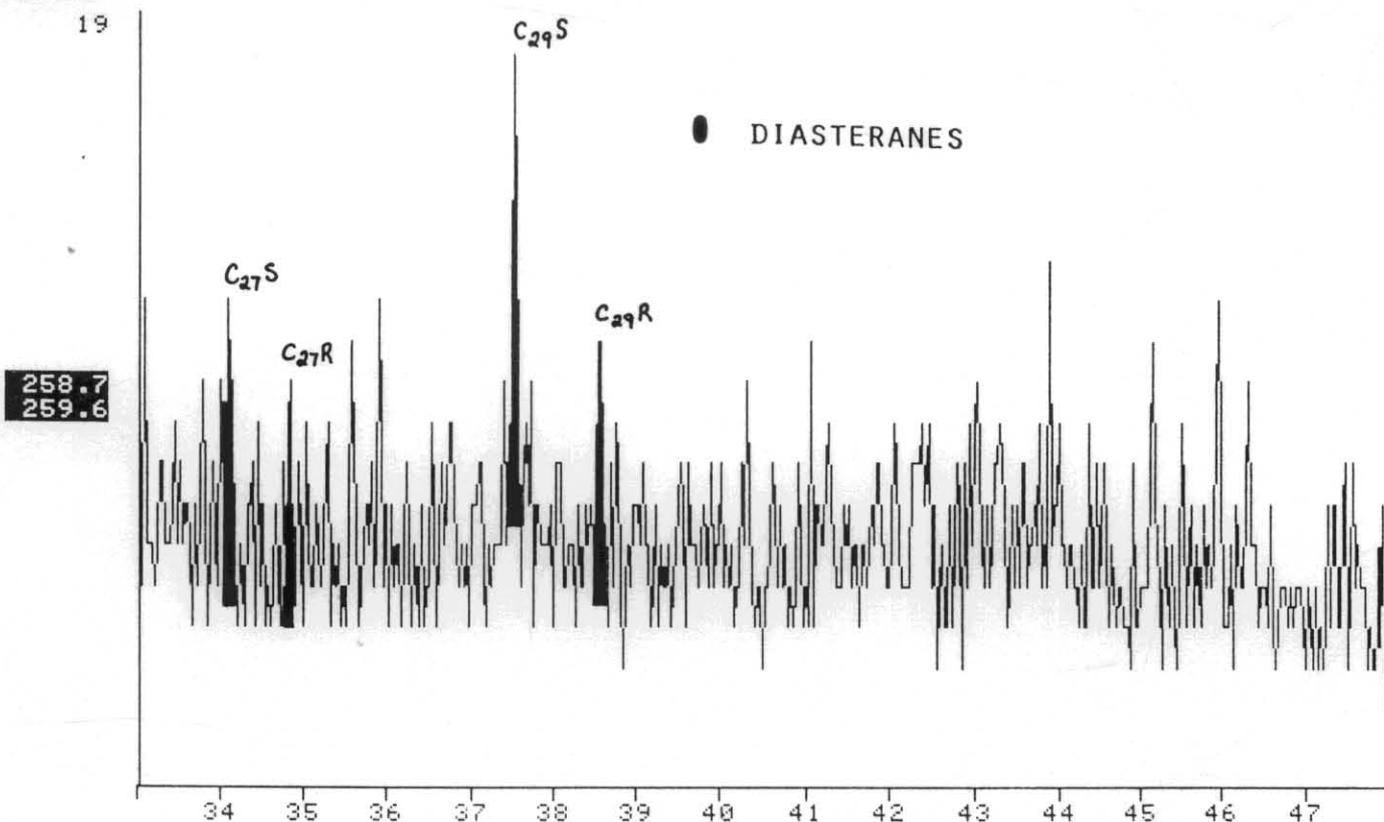


FIGURE: 2-3a

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

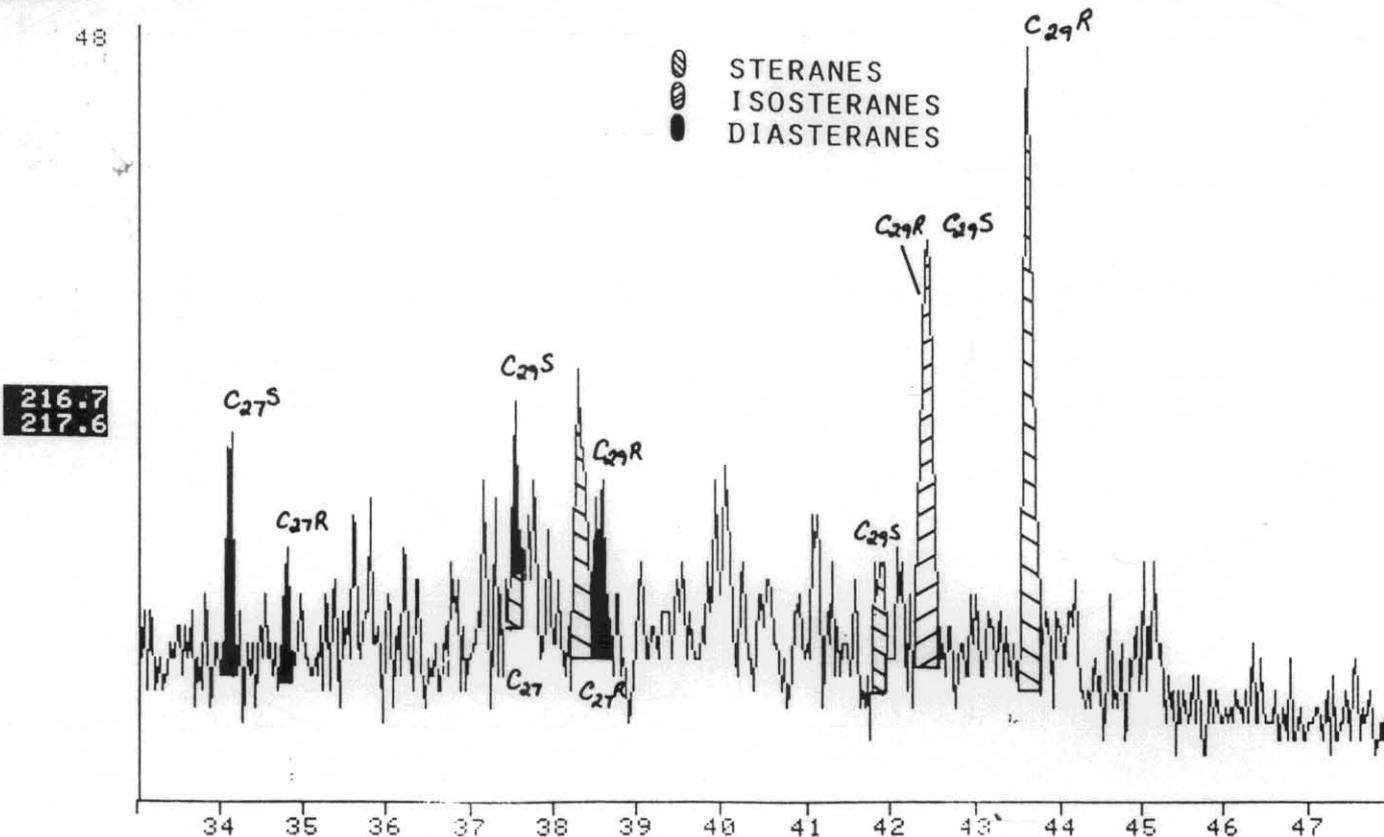
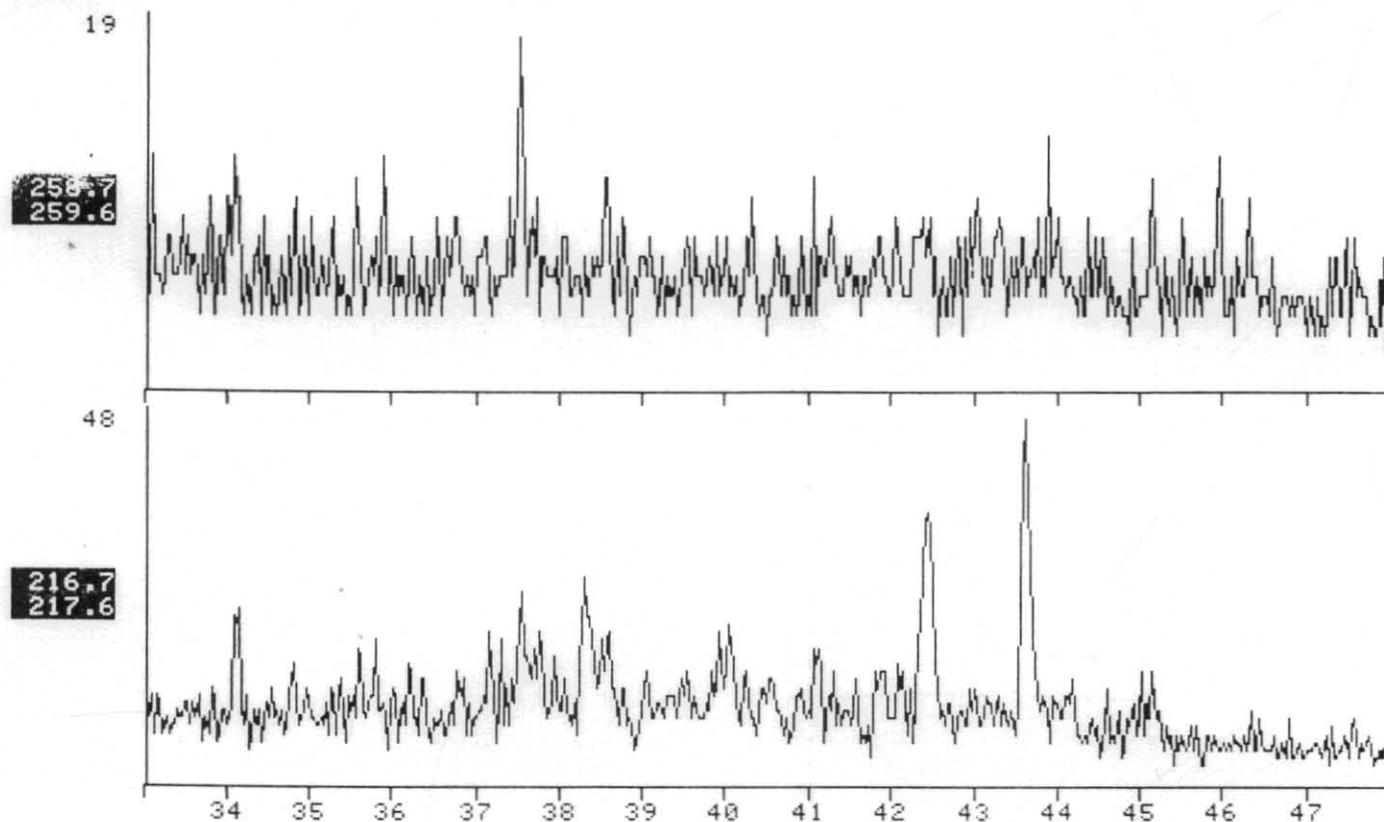


FIGURE: 2-3b

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

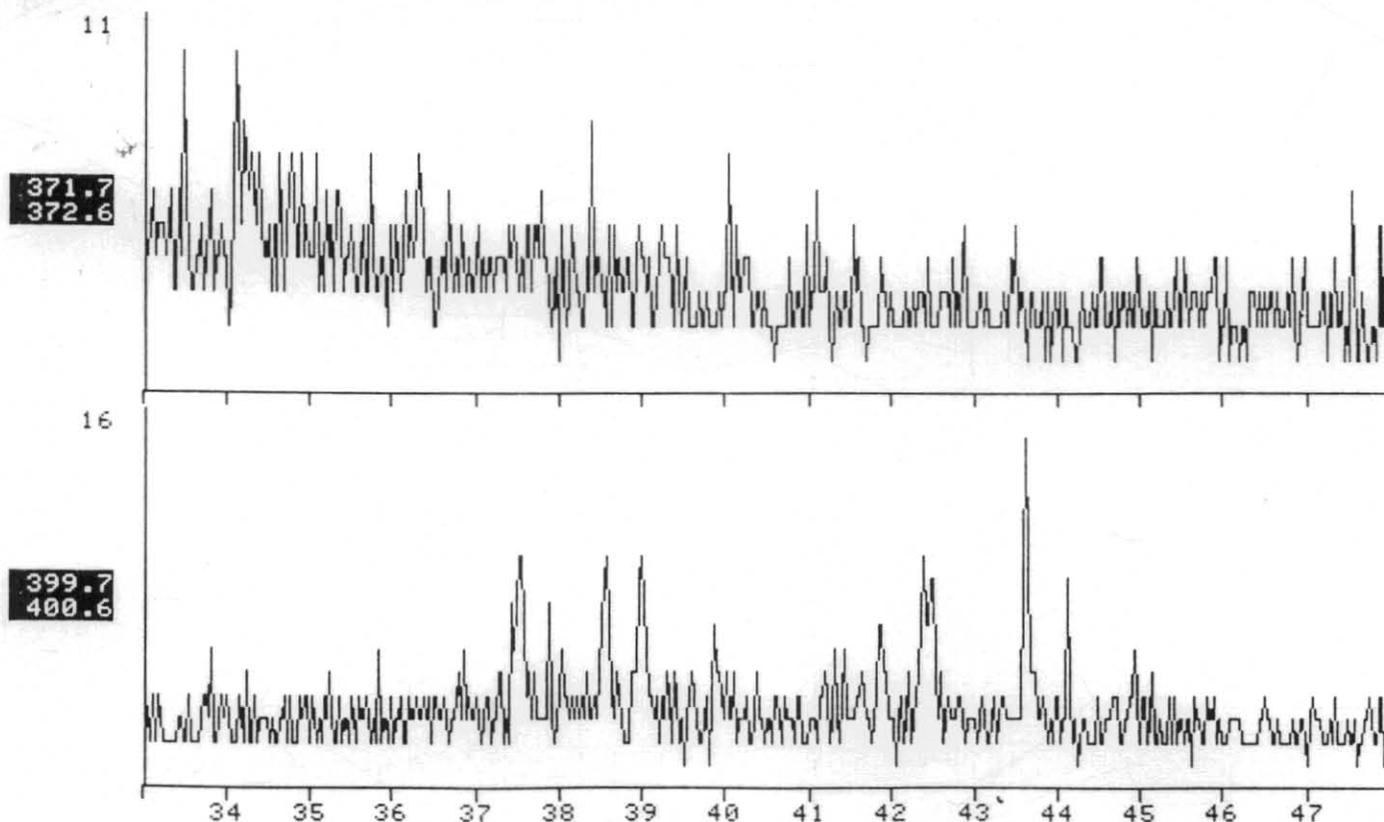
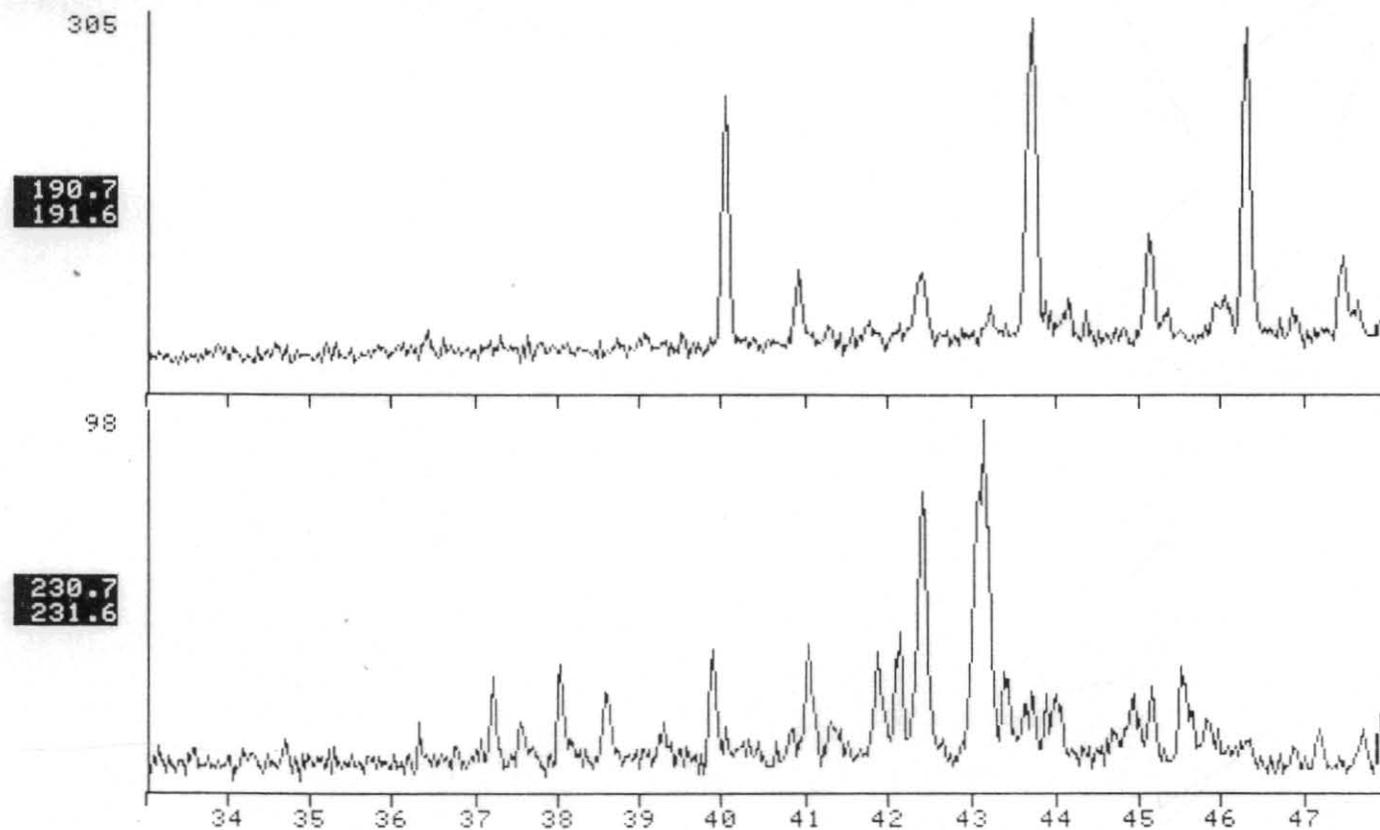


FIGURE: 2-3c

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

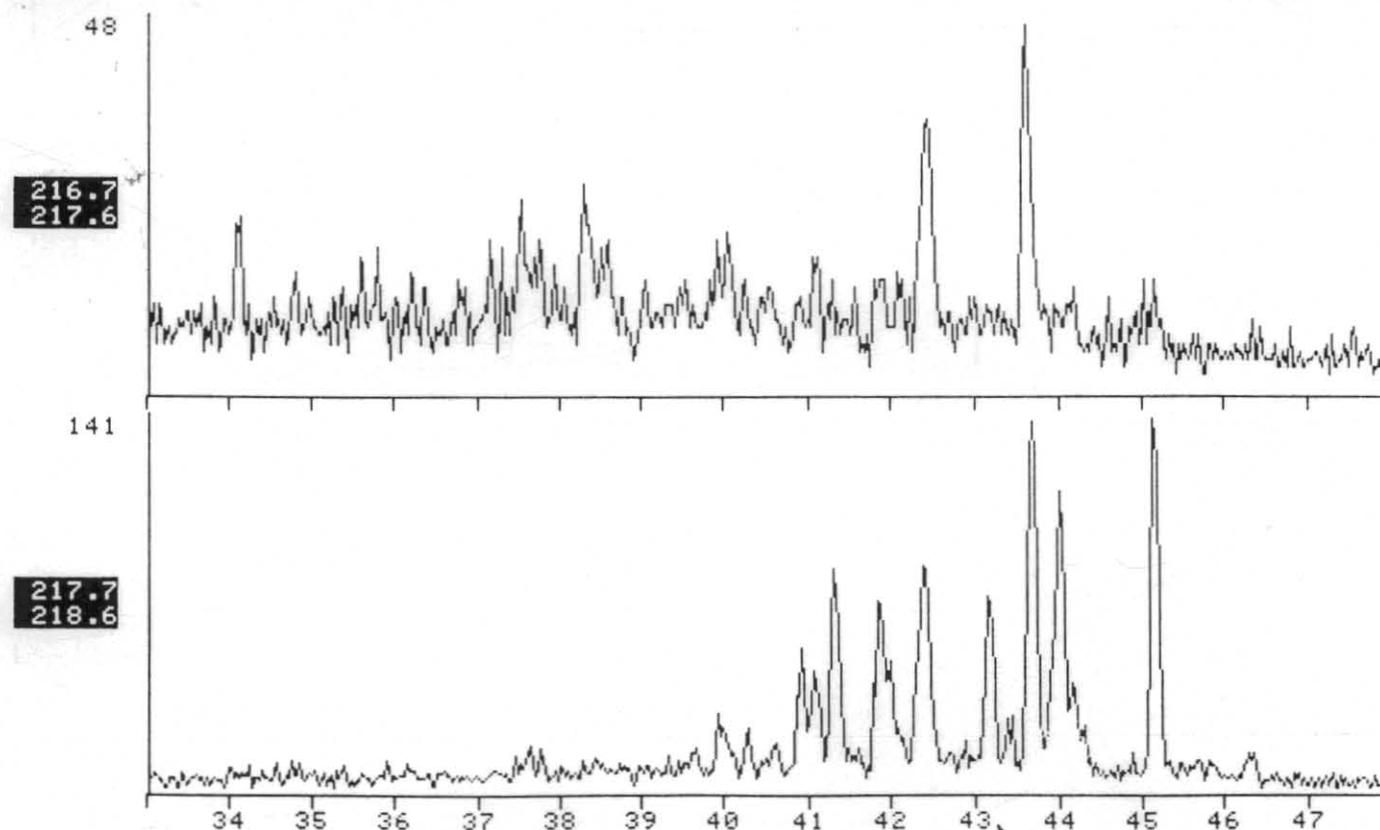
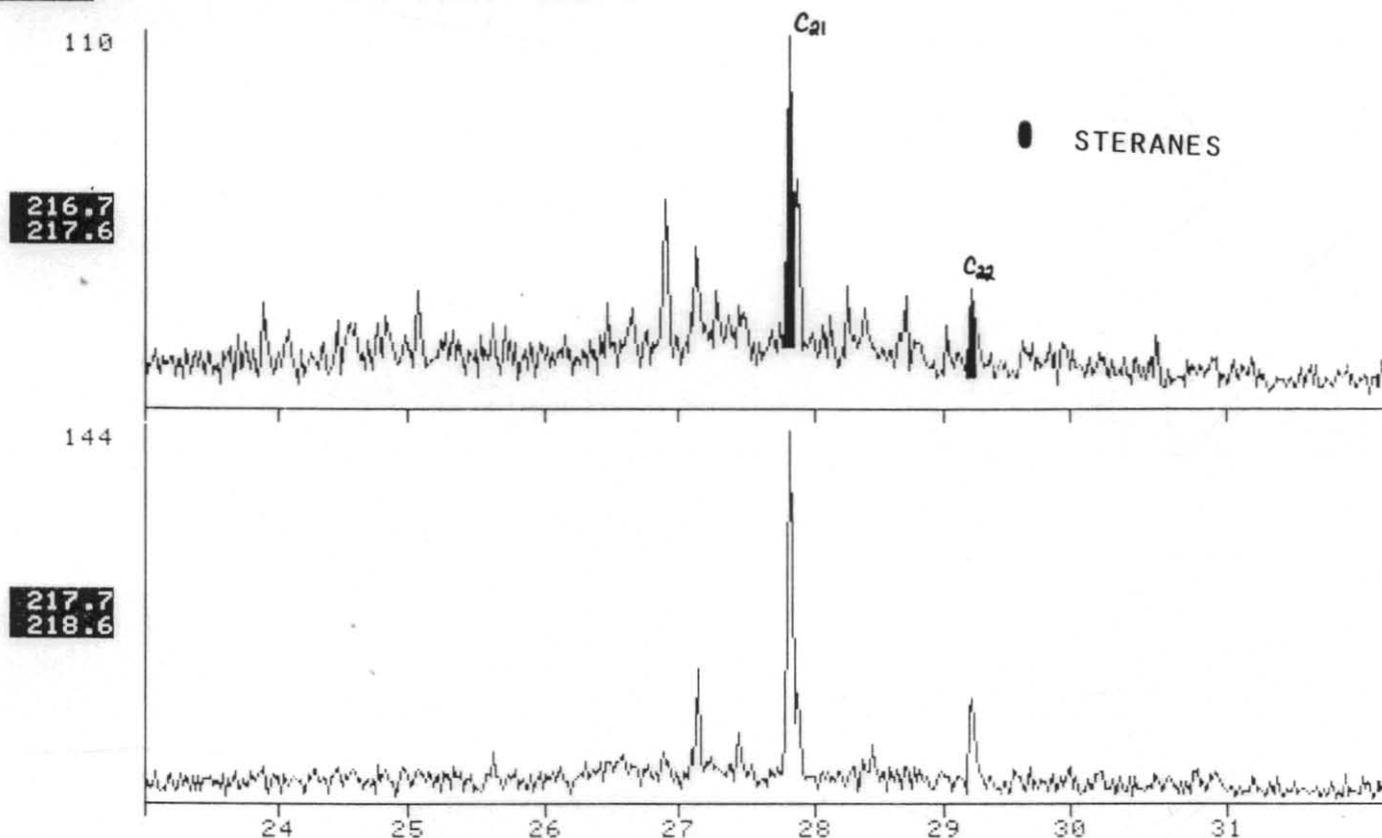


FIGURE: 2-3d

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

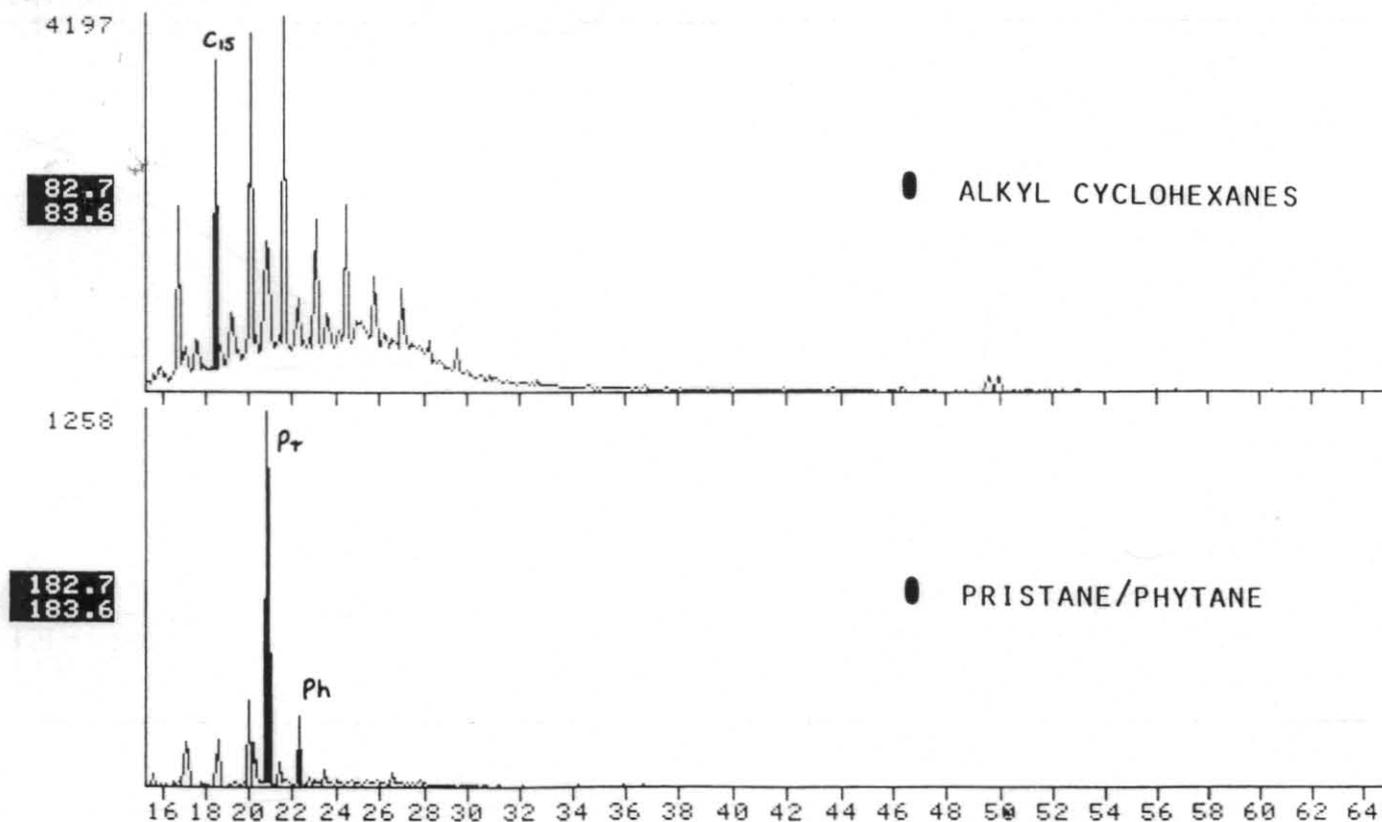
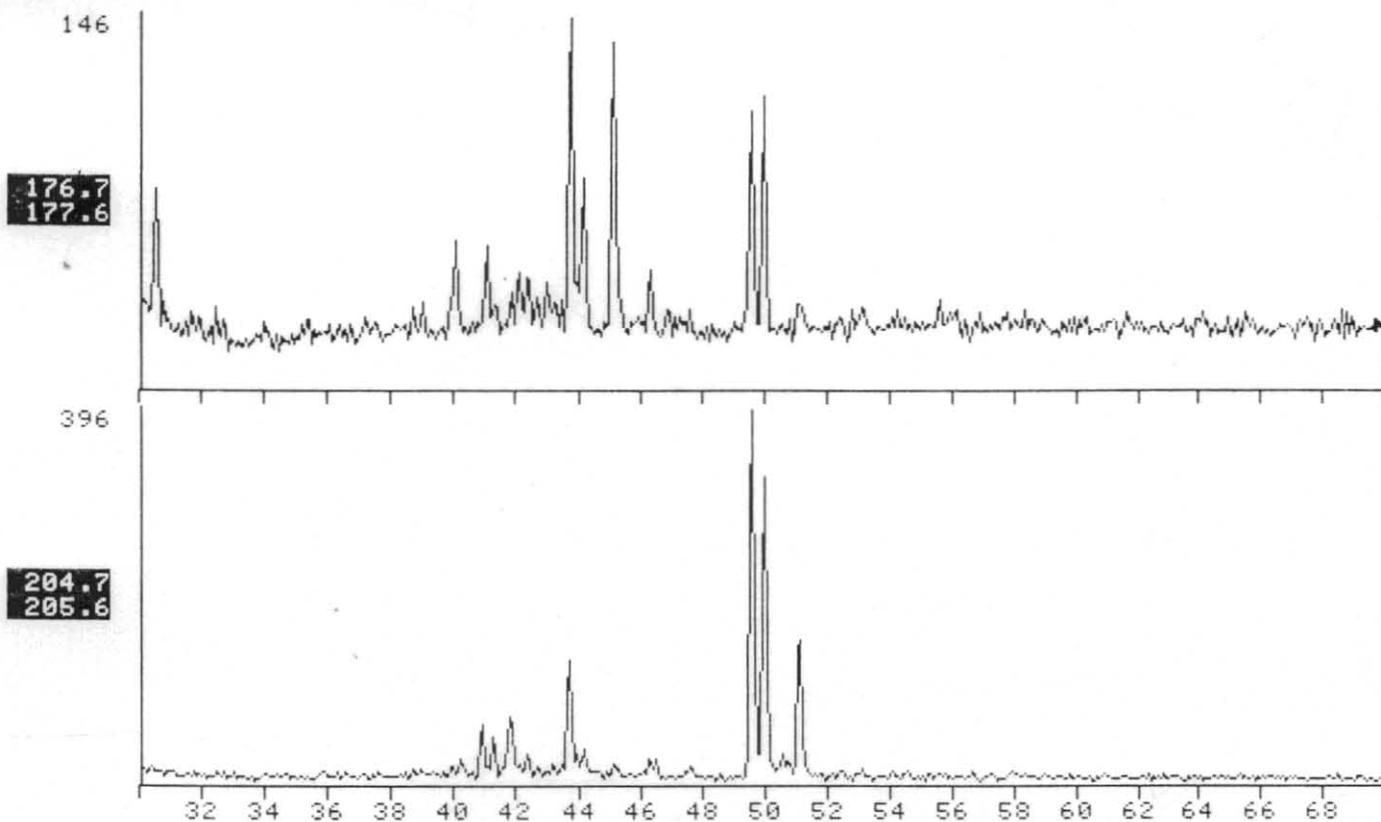


FIGURE: 2-3e

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

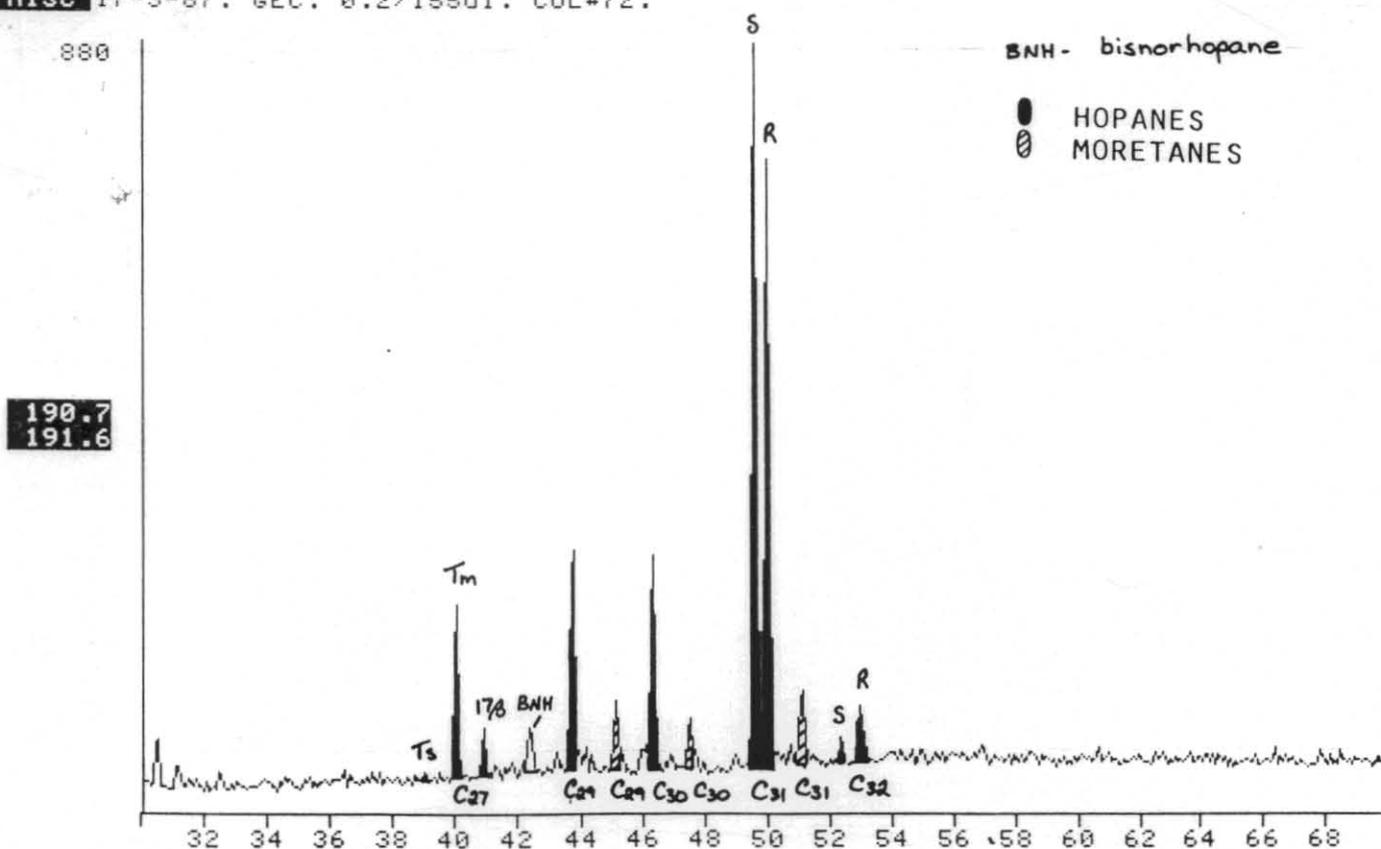
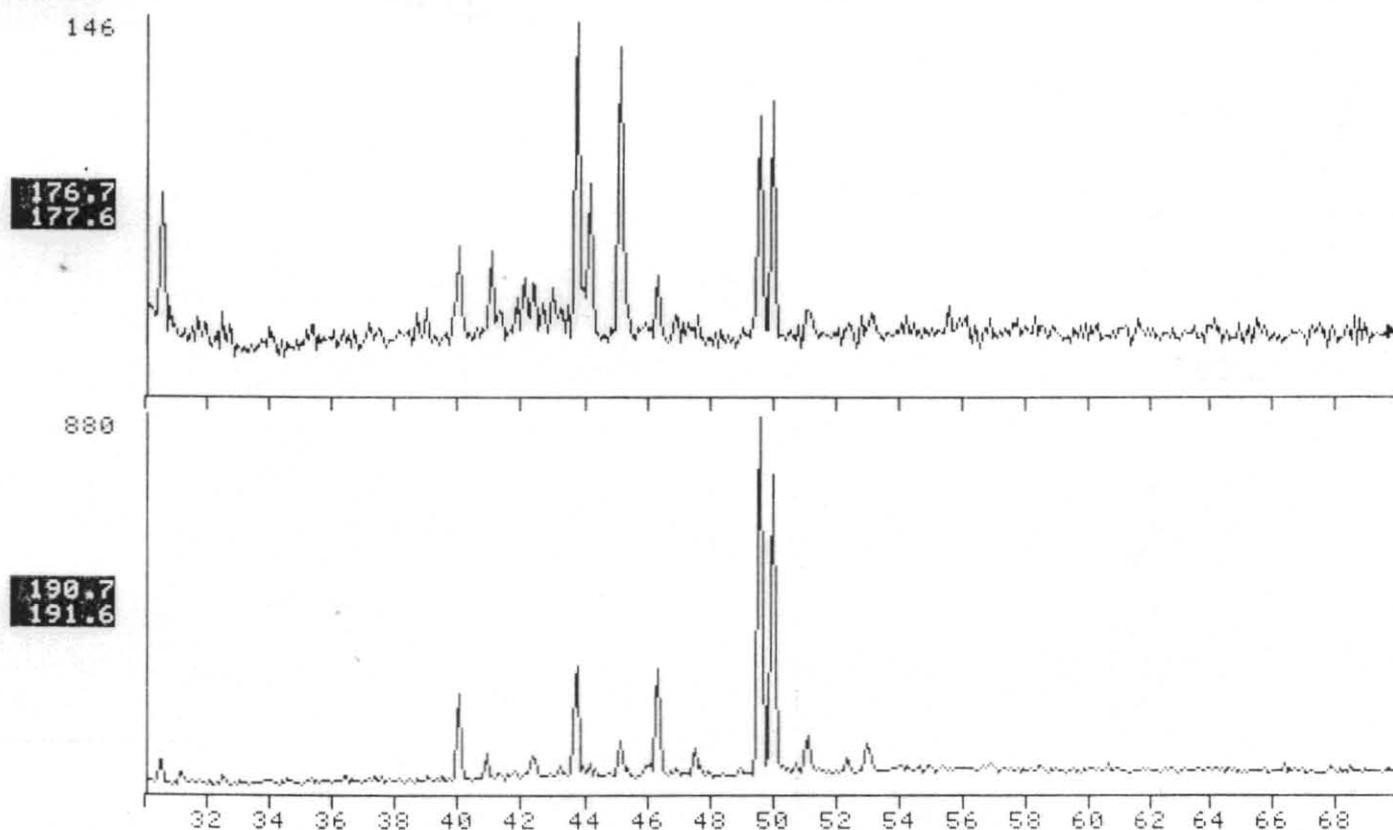


FIGURE: 2-3f

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155u1. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155u1. COL#72.

FRN 6225

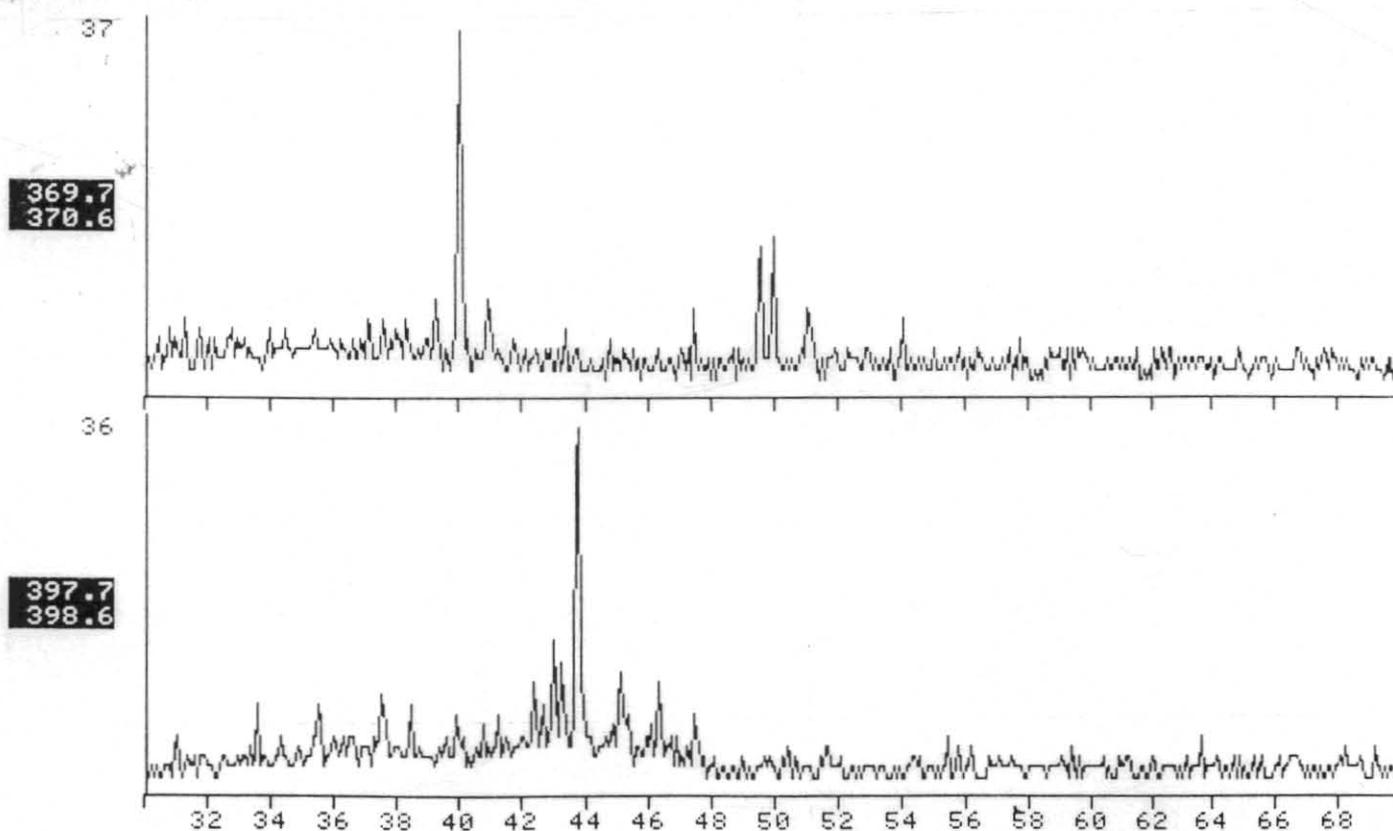
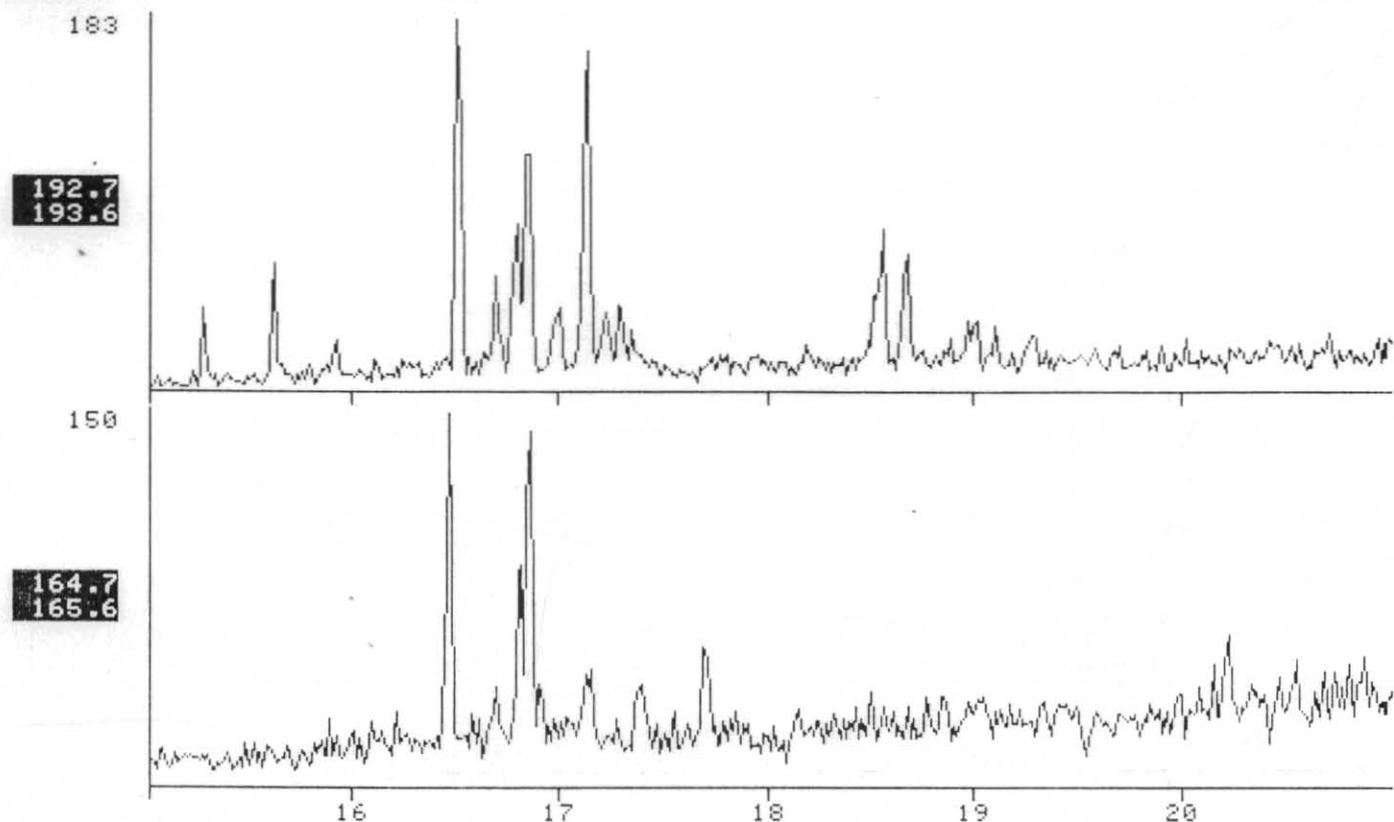


FIGURE: 2-3g

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/155u1. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/155u1. COL#72.

FRN 6225

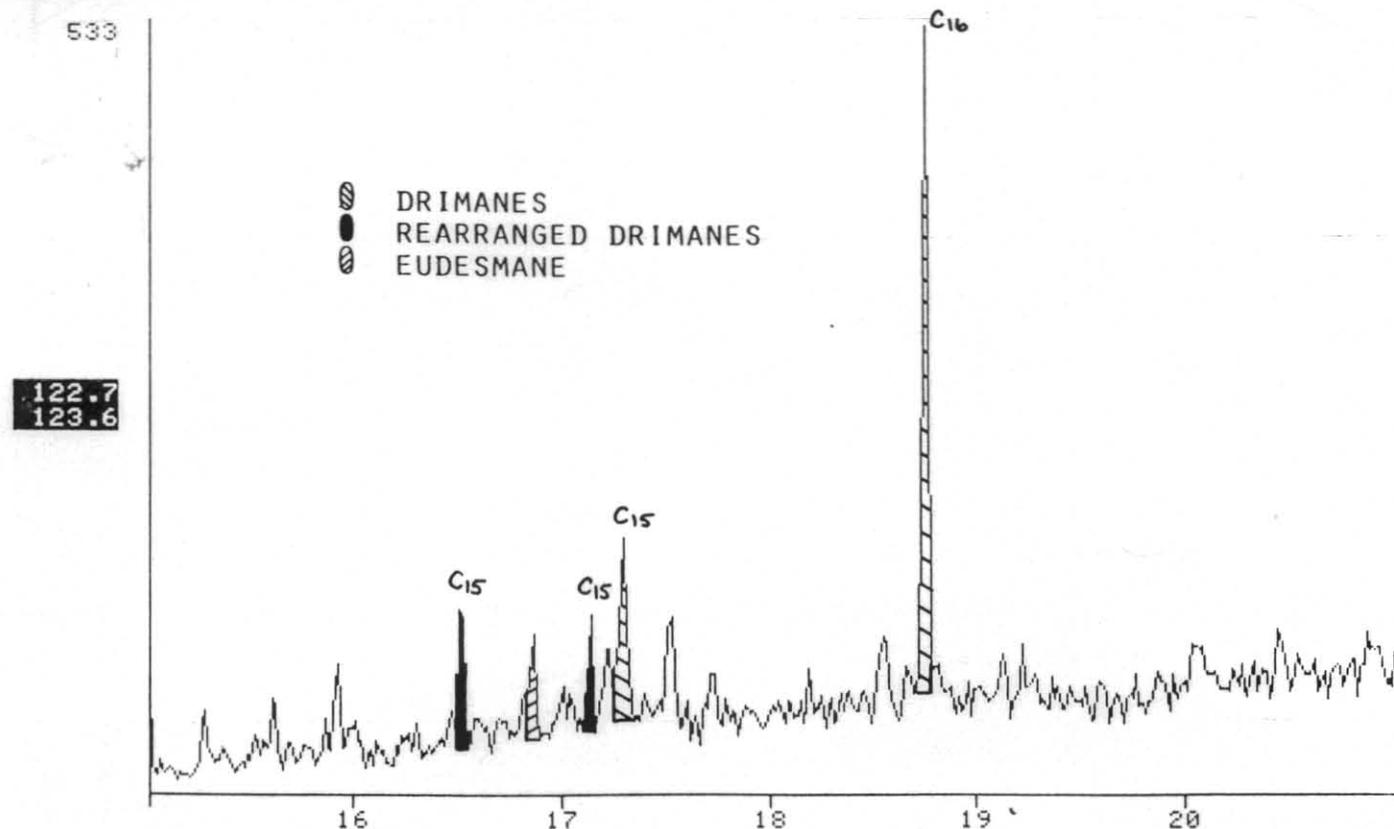
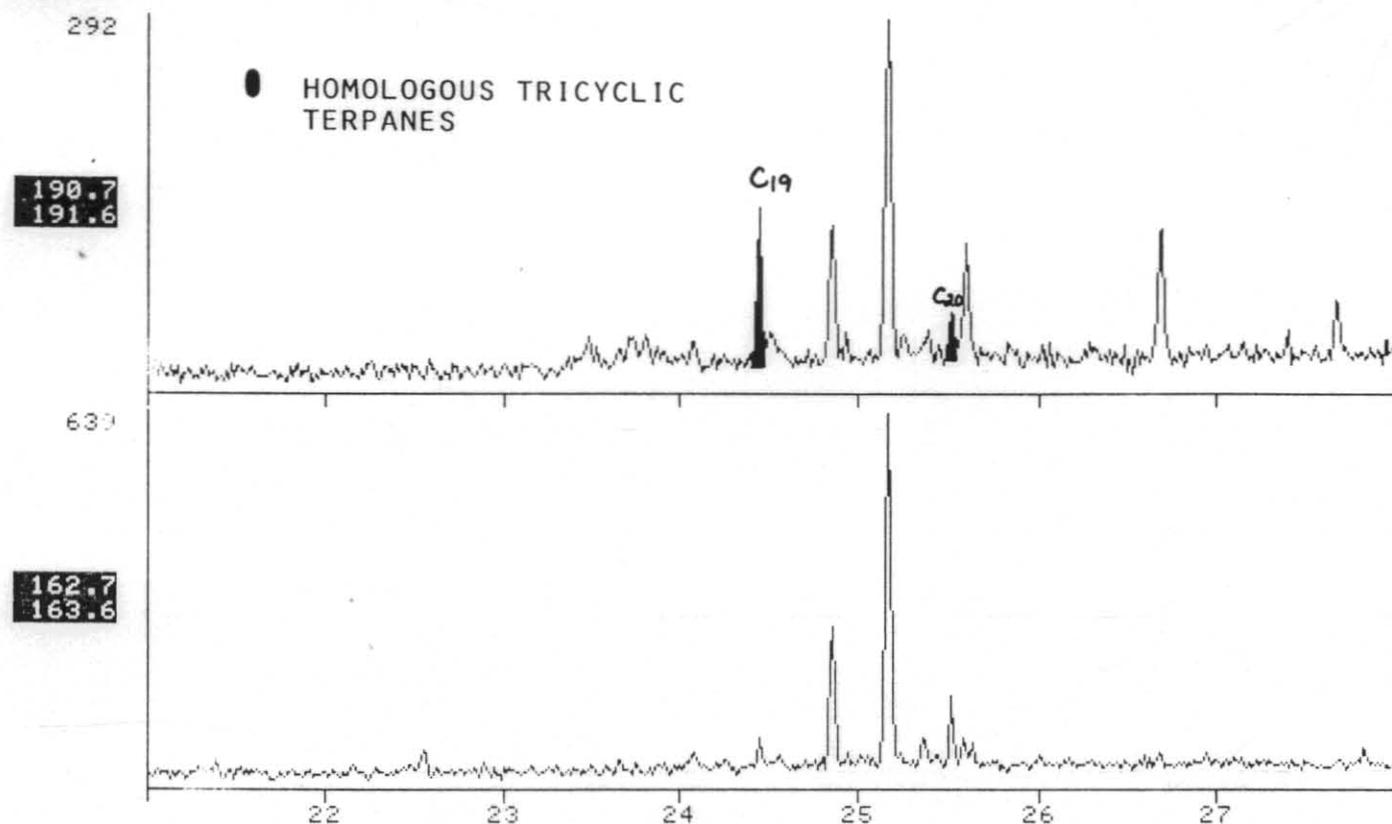


FIGURE: 2-3h

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

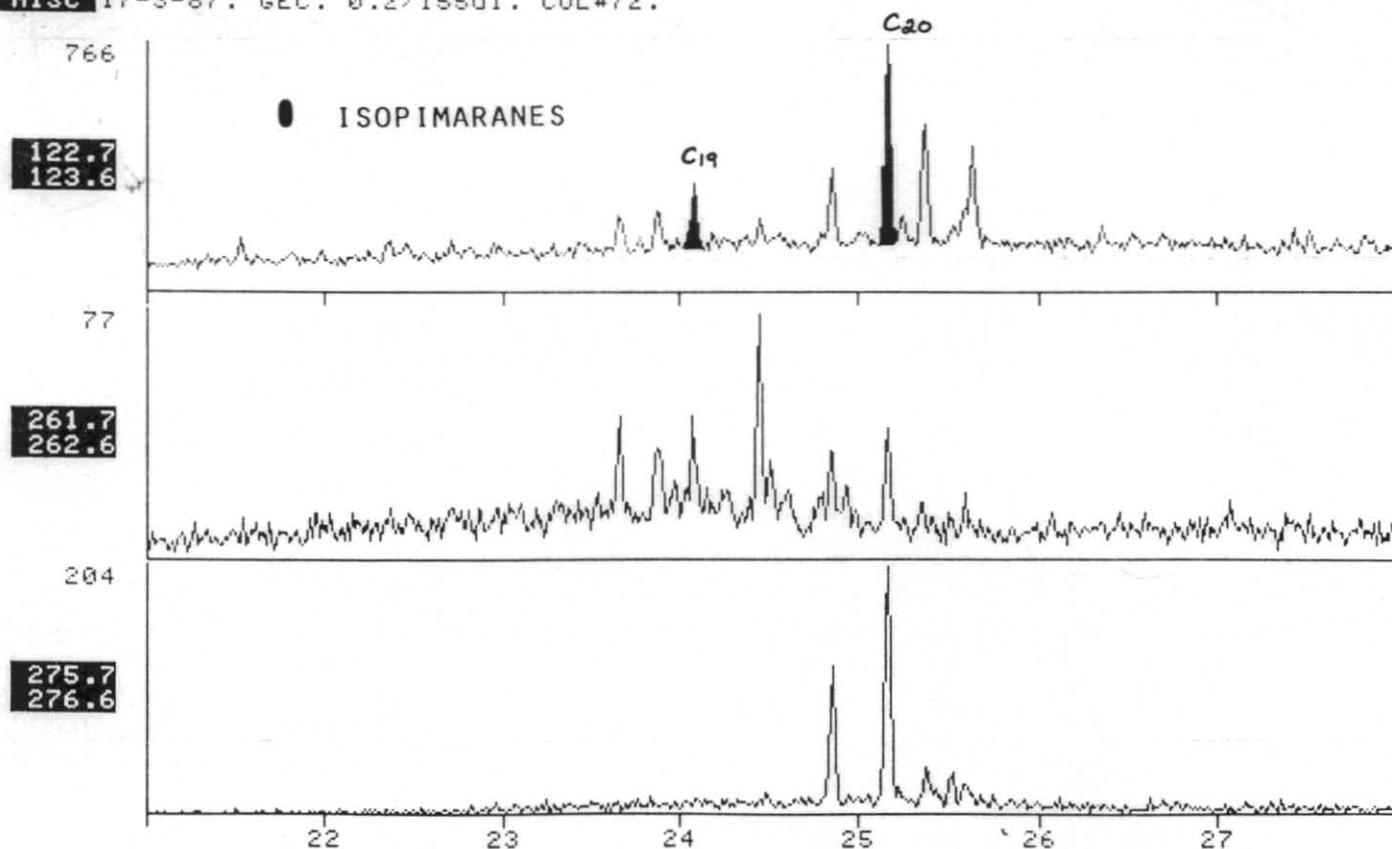
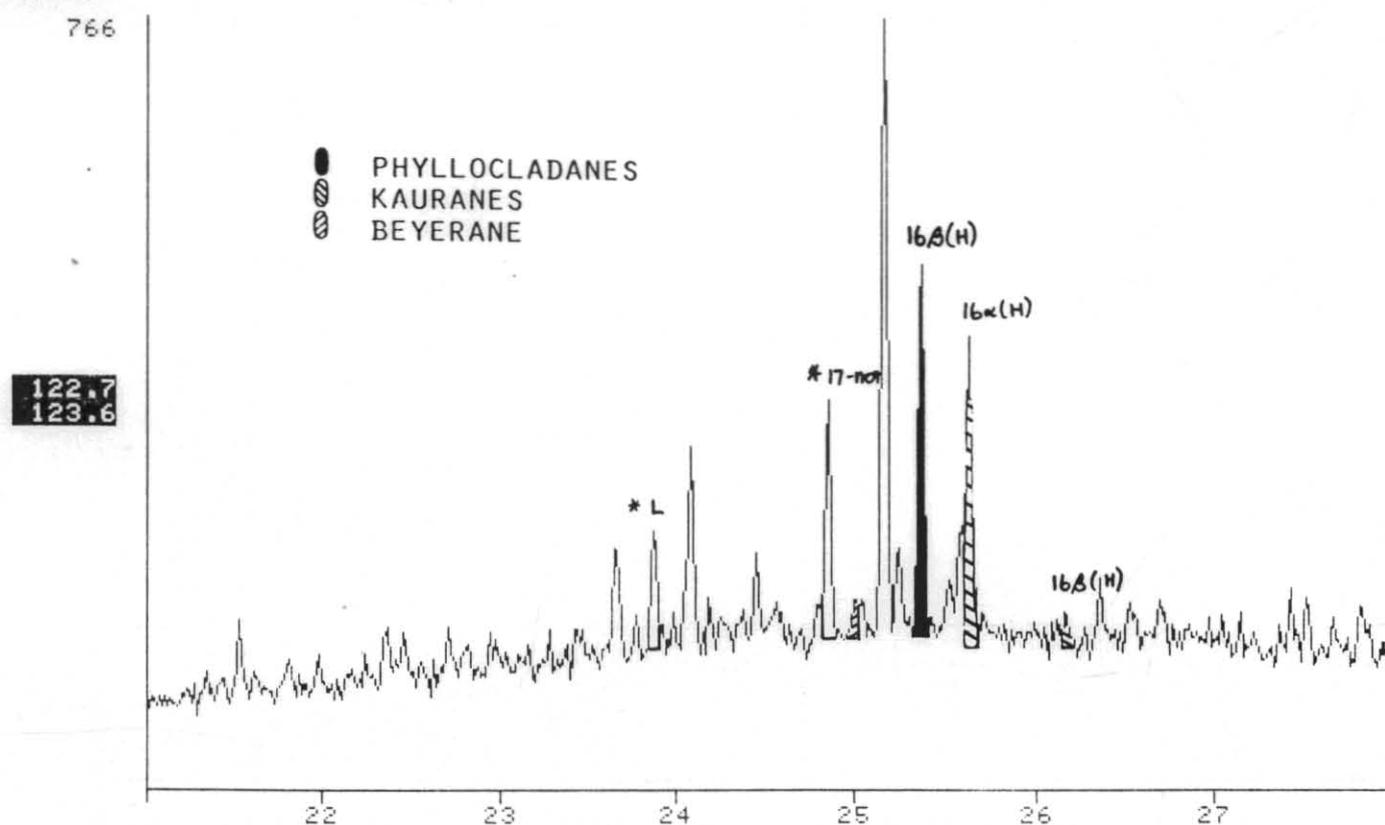


FIGURE: 2-3i

NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225



NAME BASS#2, 4135'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/155ul. COL#72.

FRN 6225

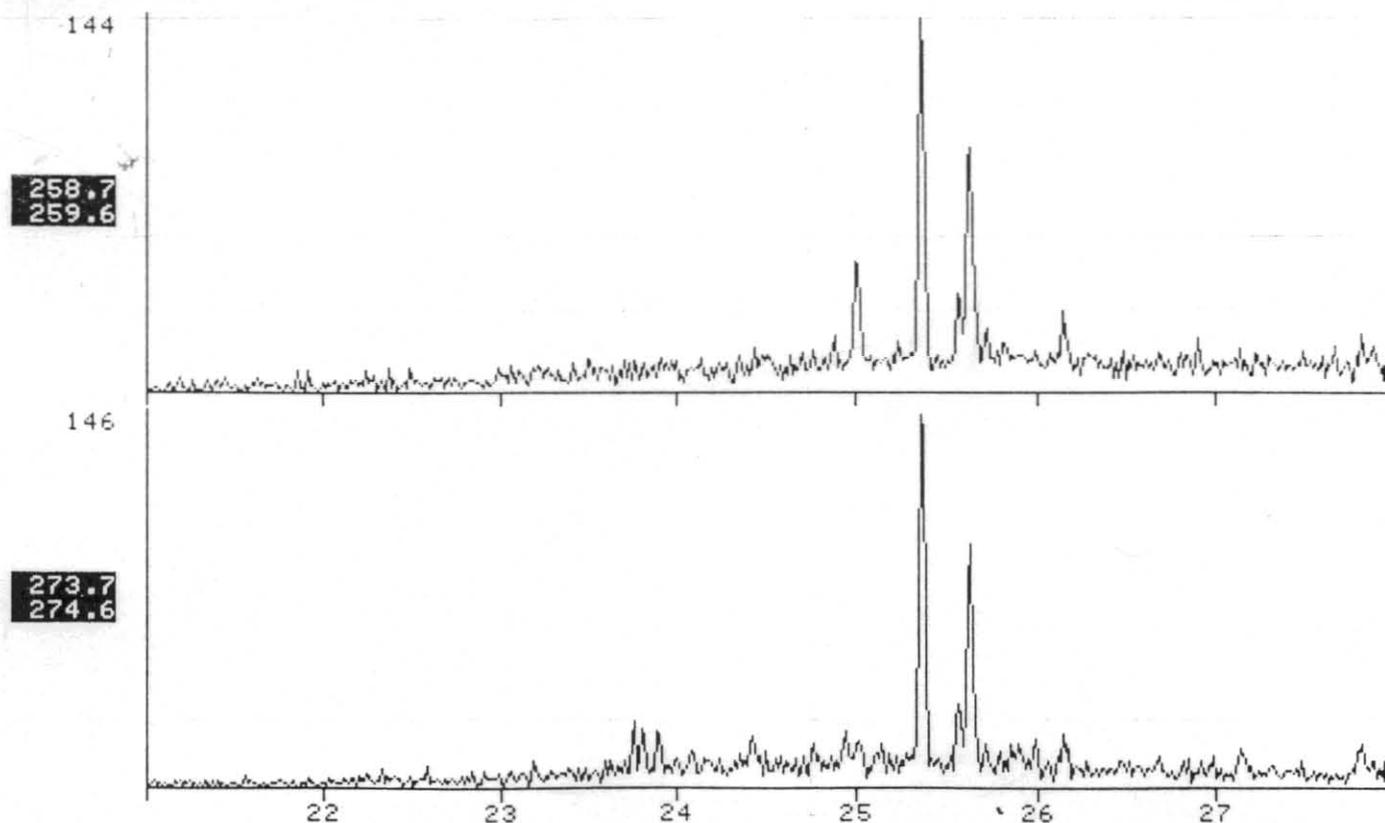
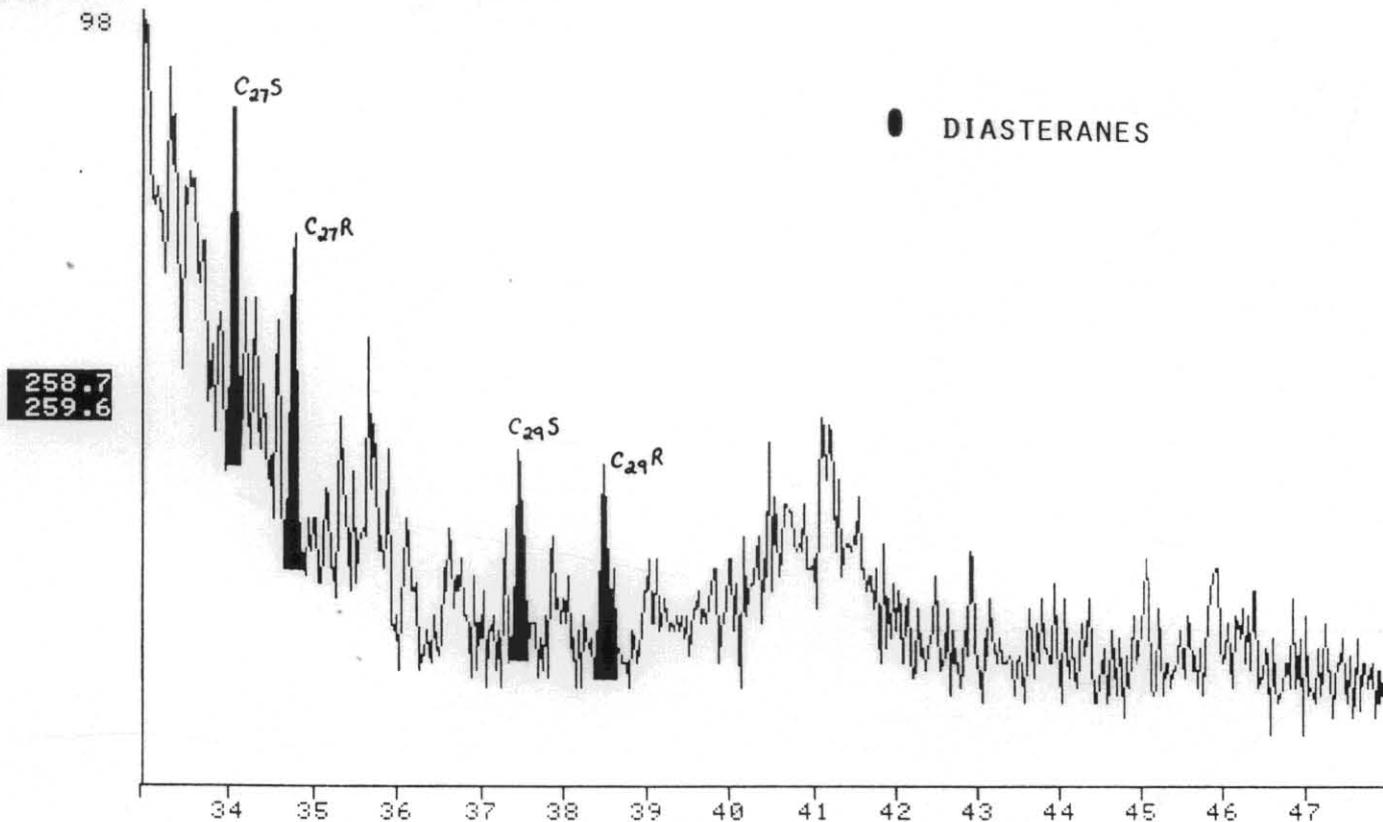


FIGURE: 2-4a

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

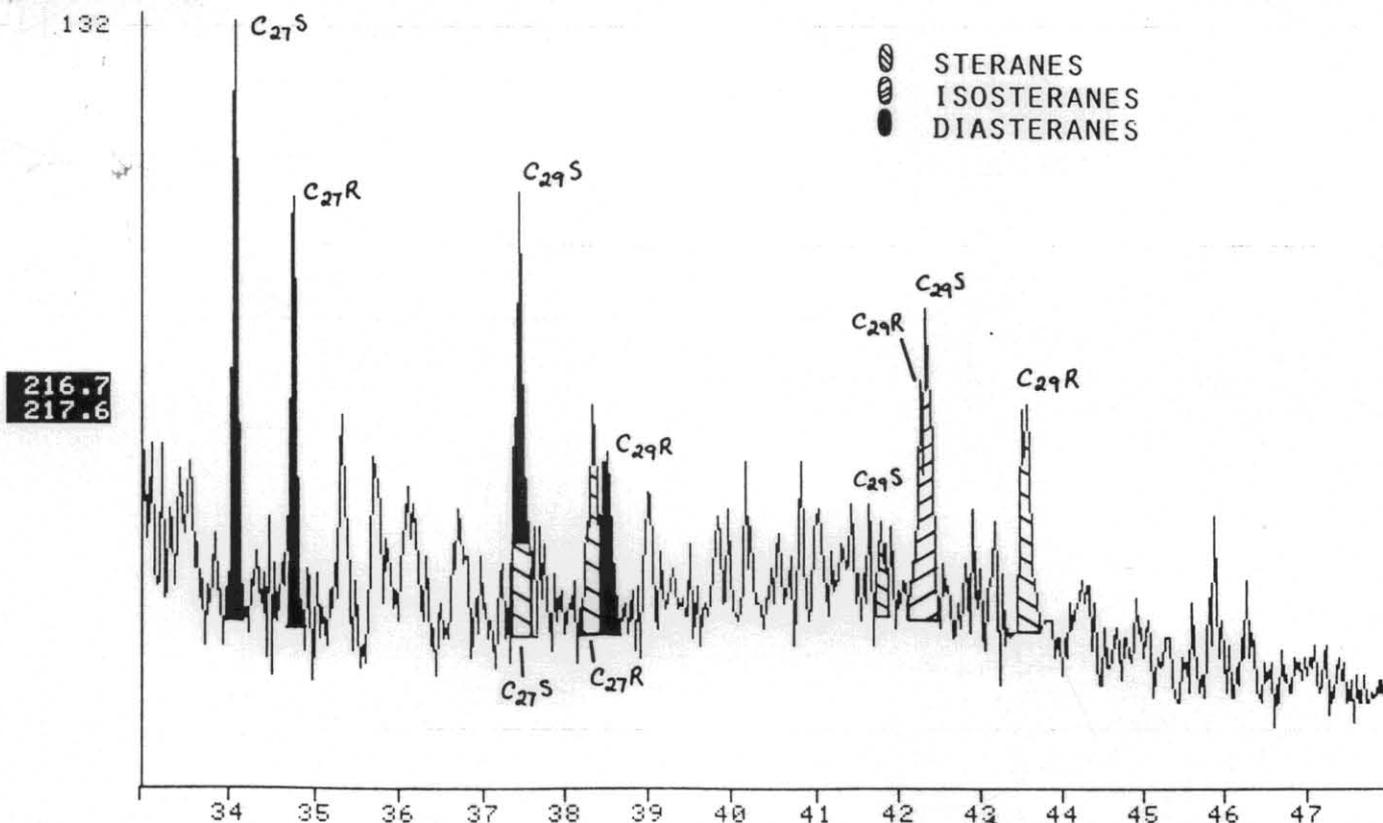
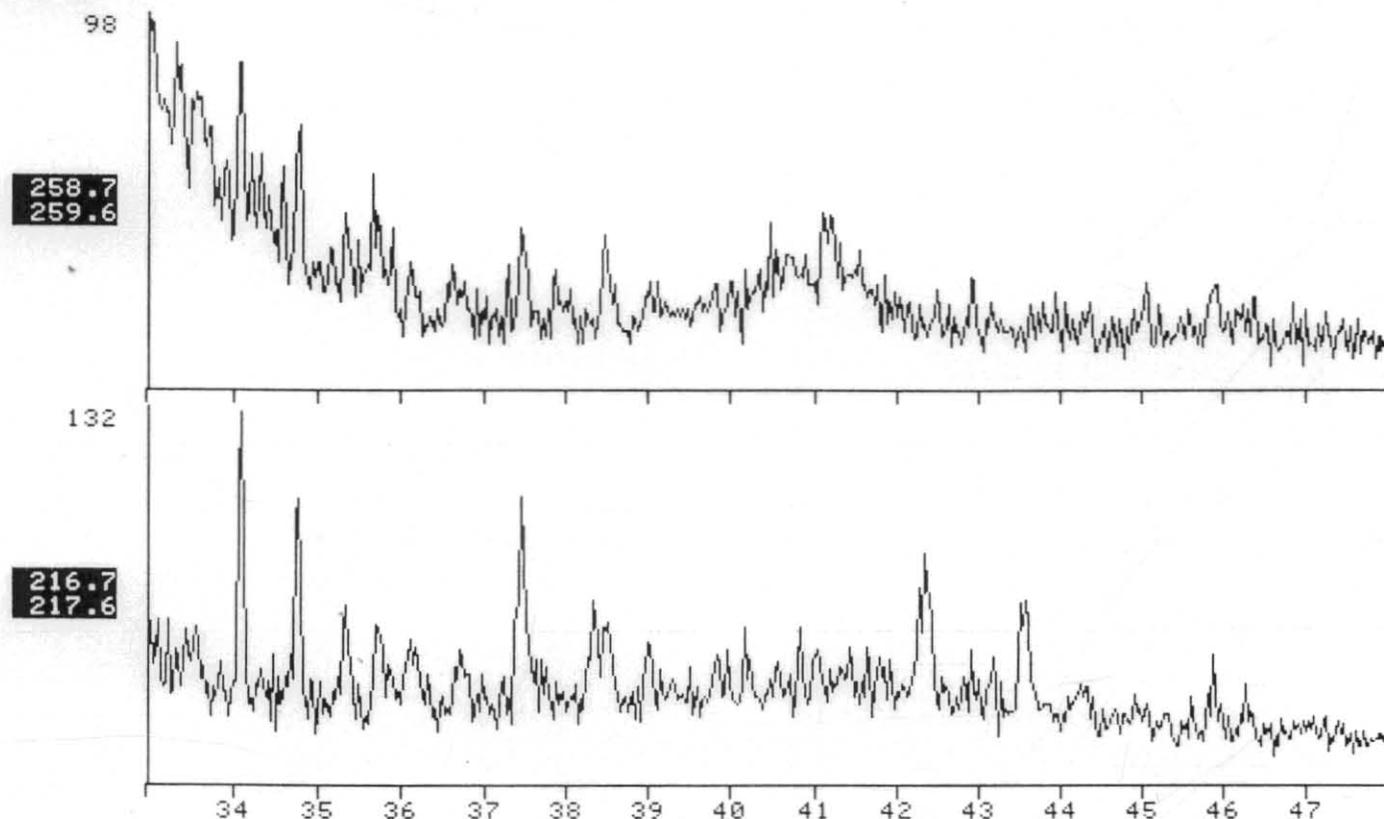


FIGURE: 2-4b

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200u1. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200u1. COL#72.

FRN 6233

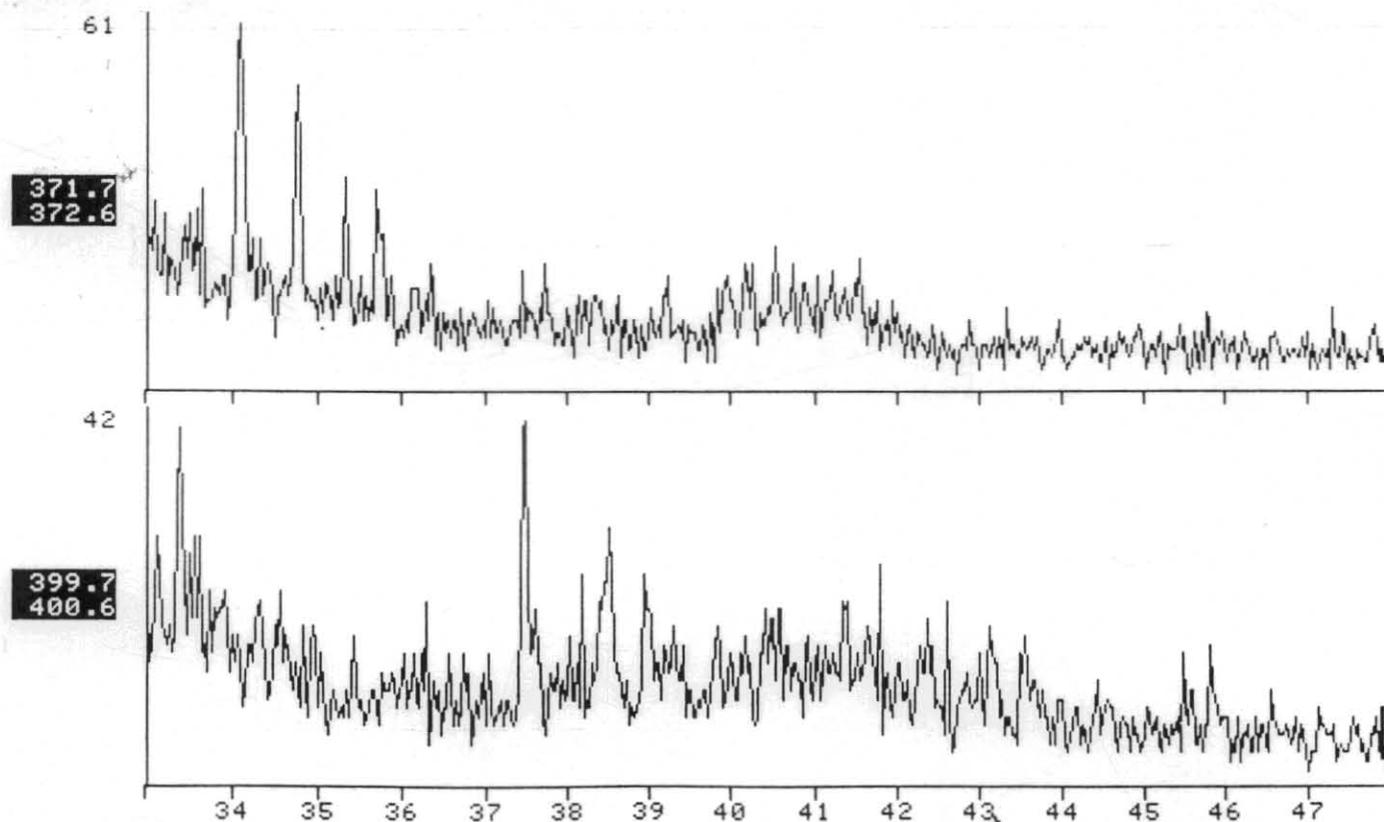
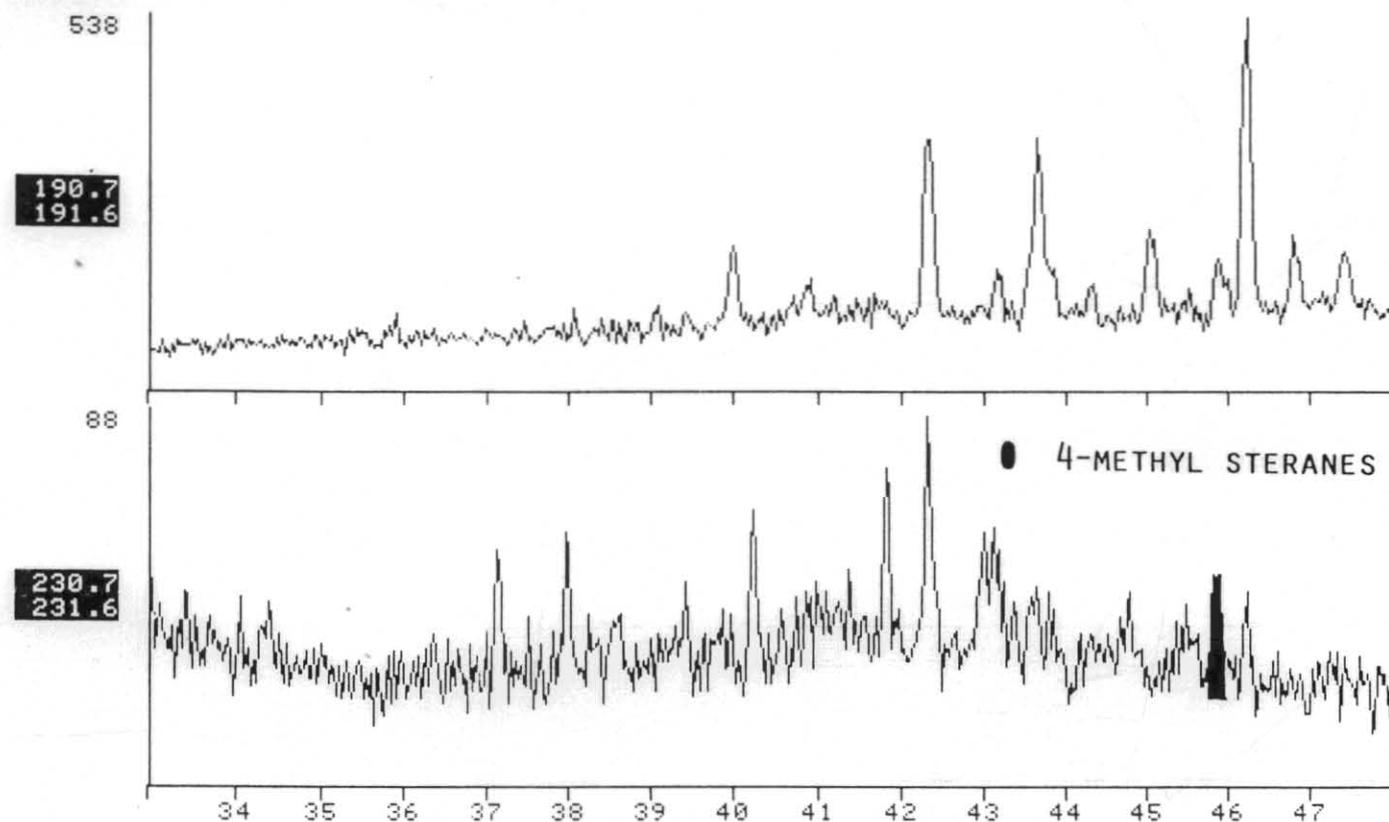


FIGURE: 2-4c

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

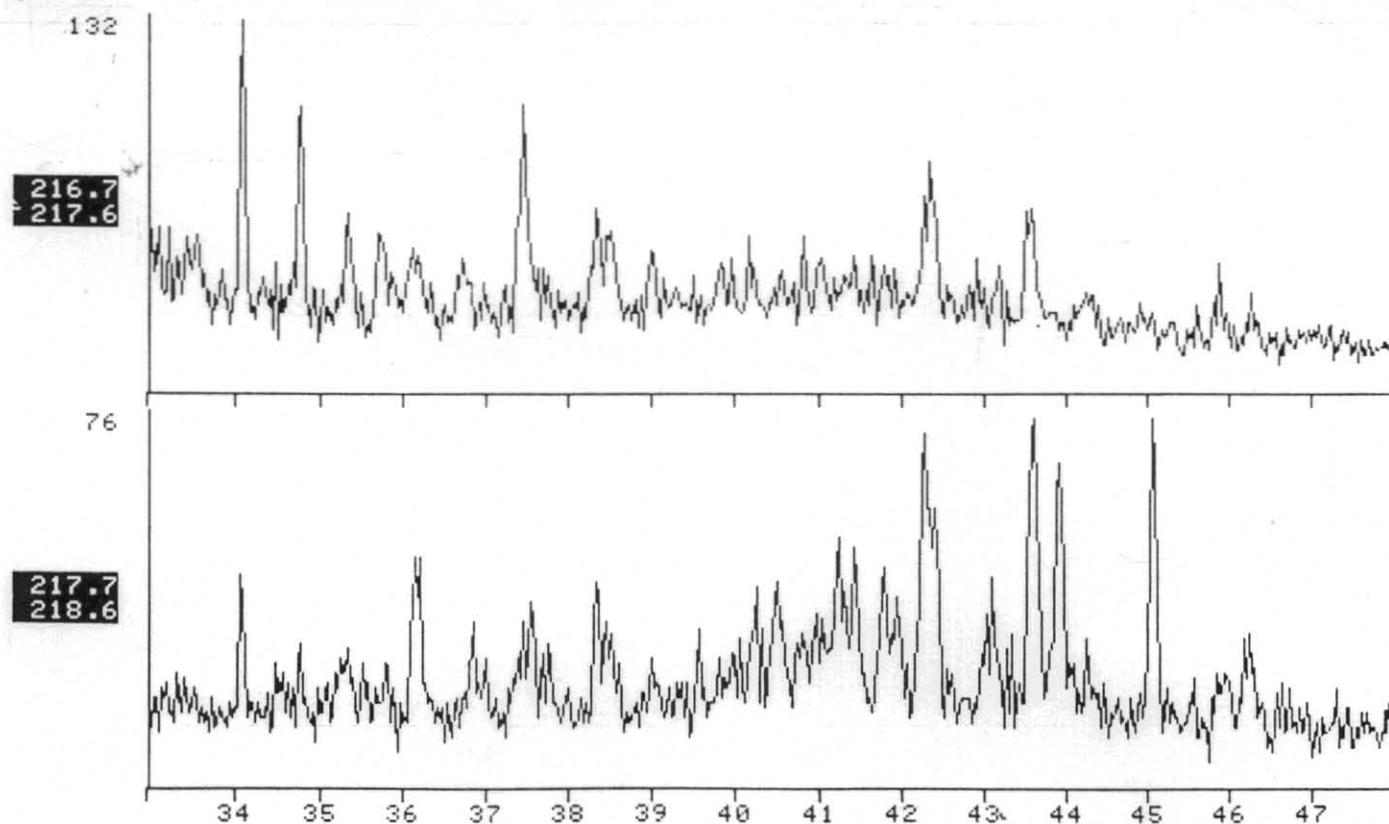
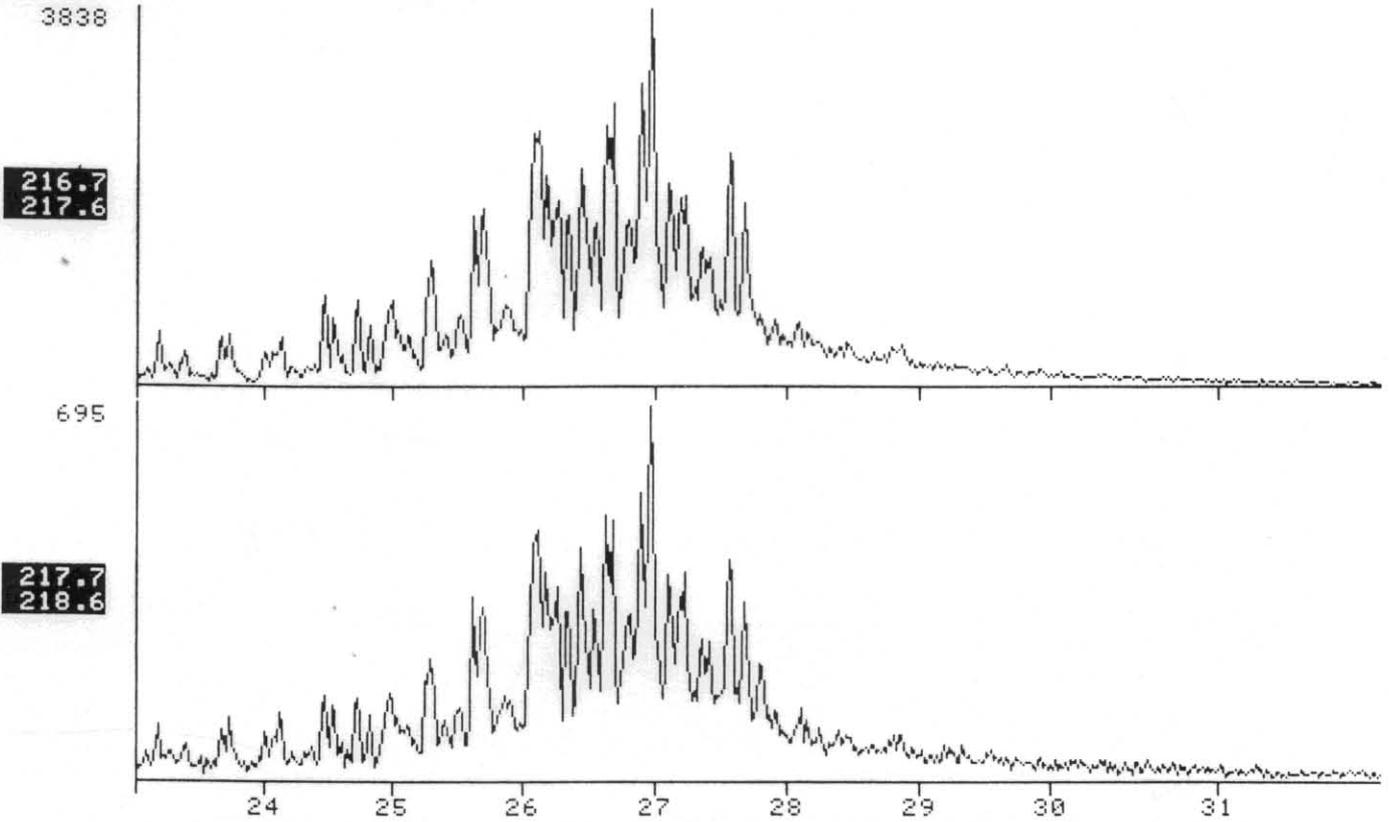


FIGURE: 2-4d

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

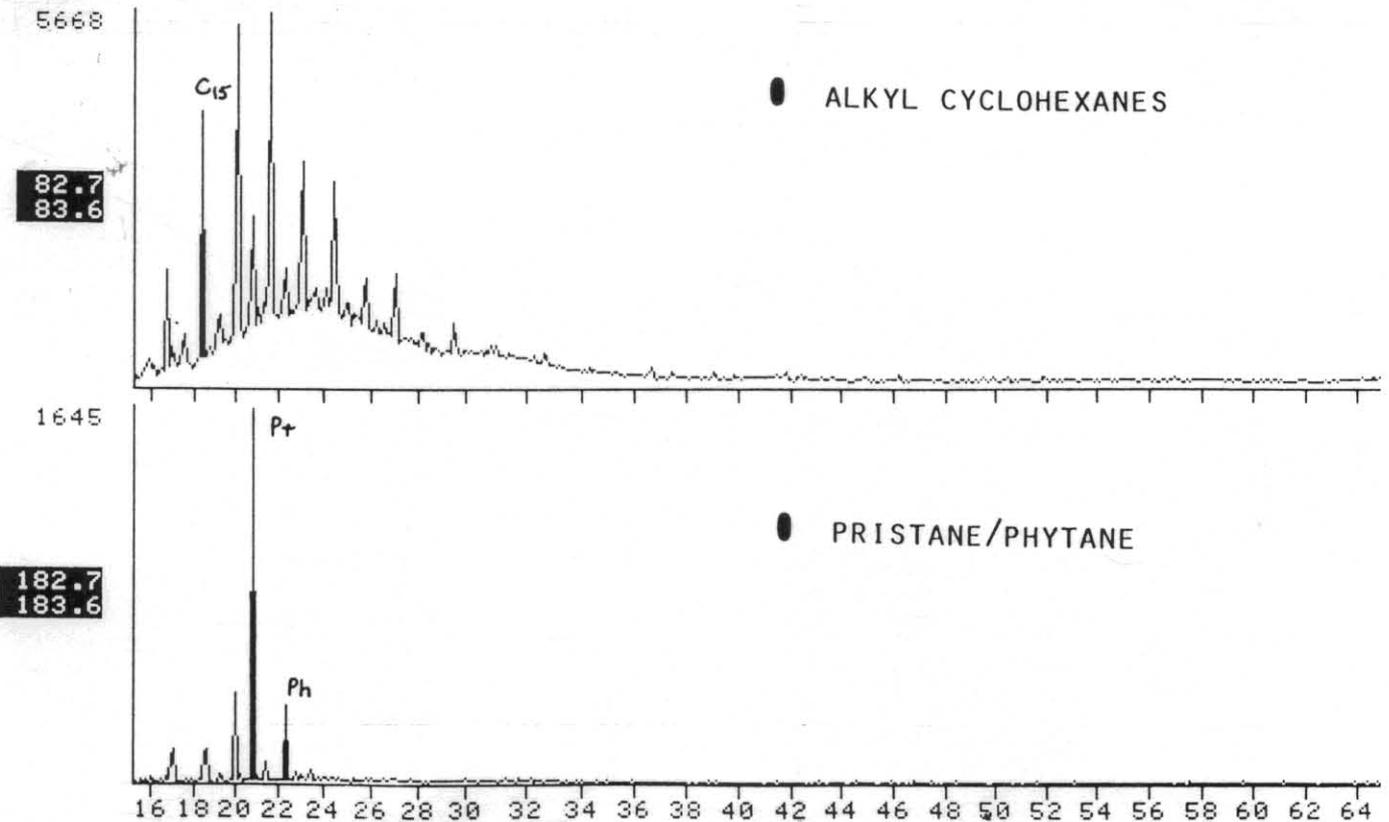
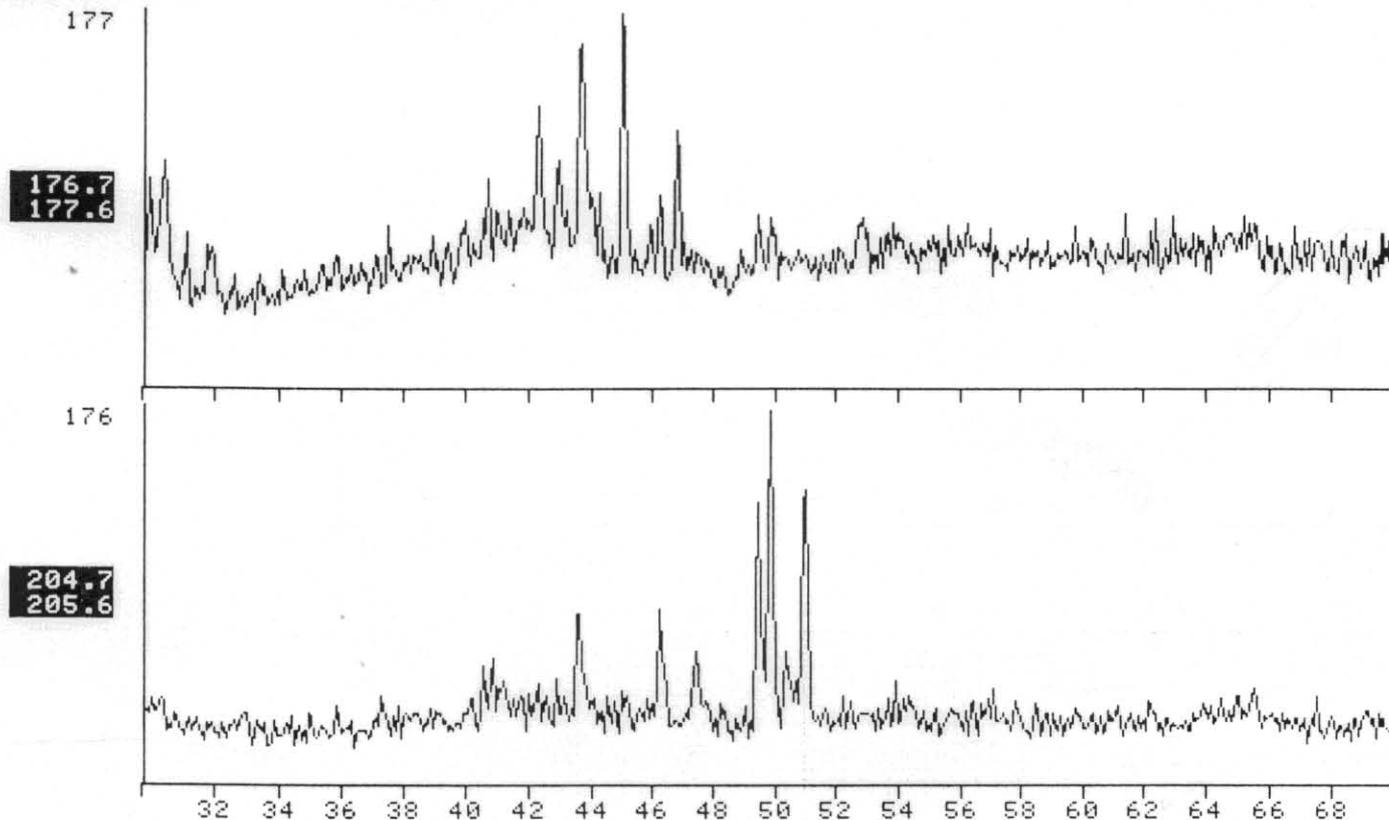


FIGURE: 2-4e

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

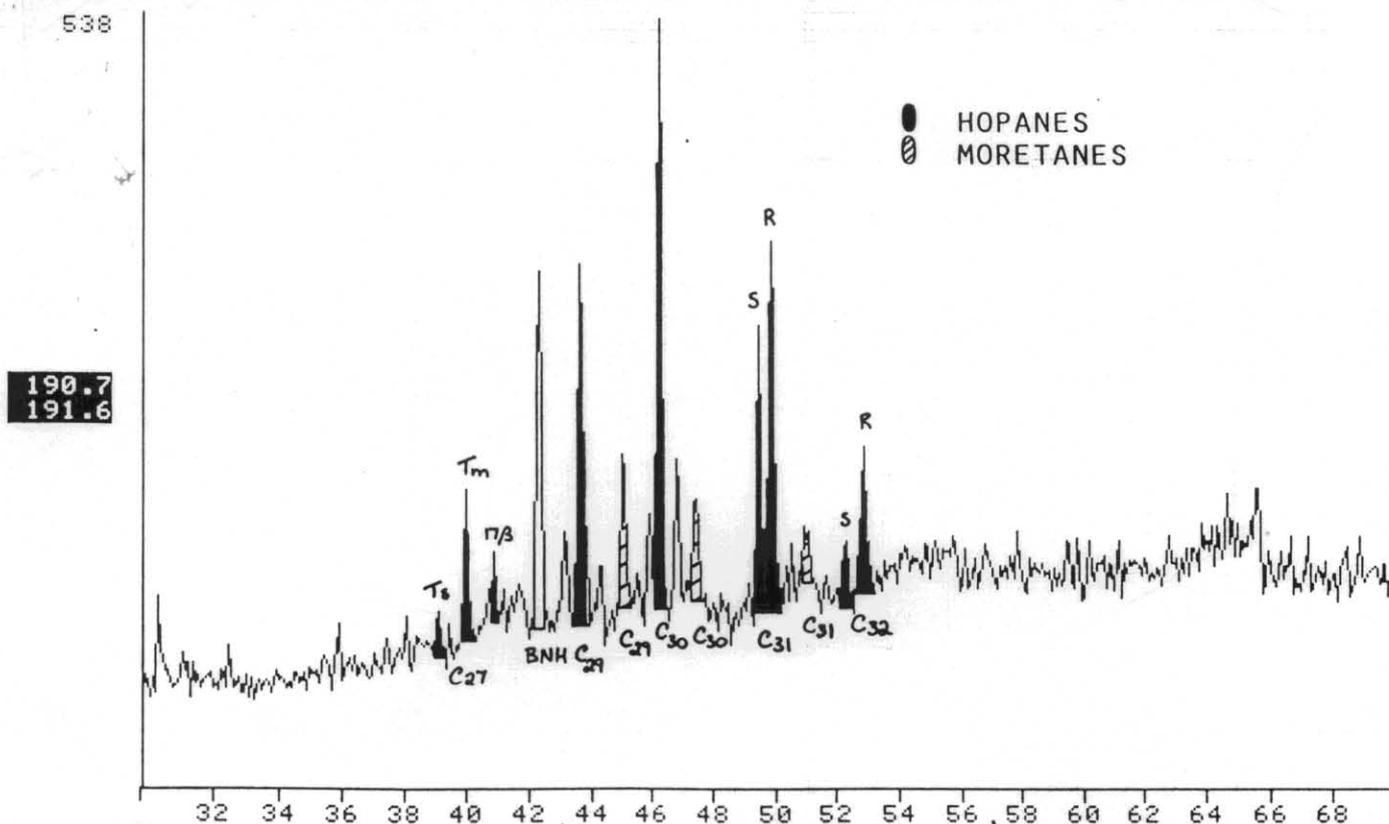
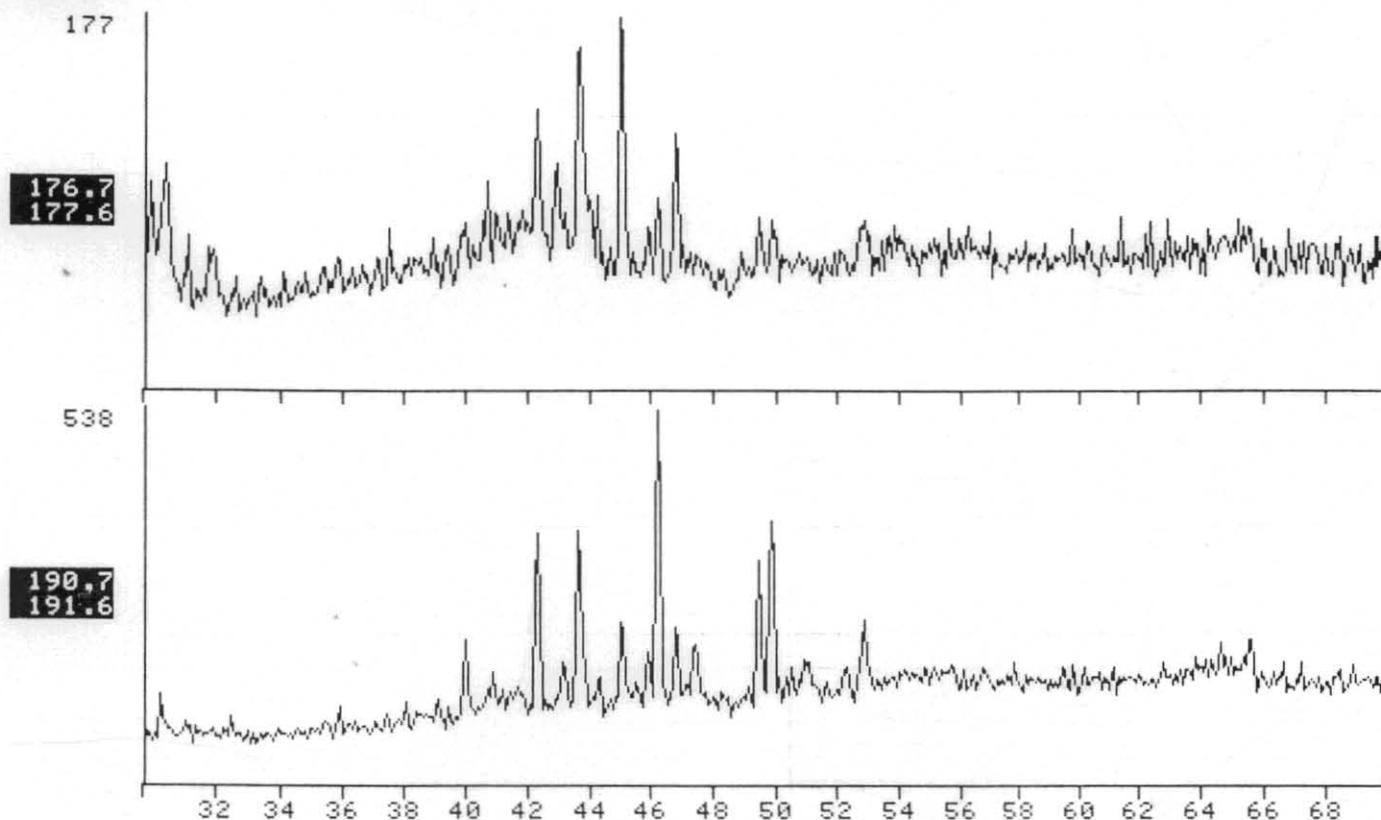


FIGURE: 2-4f

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

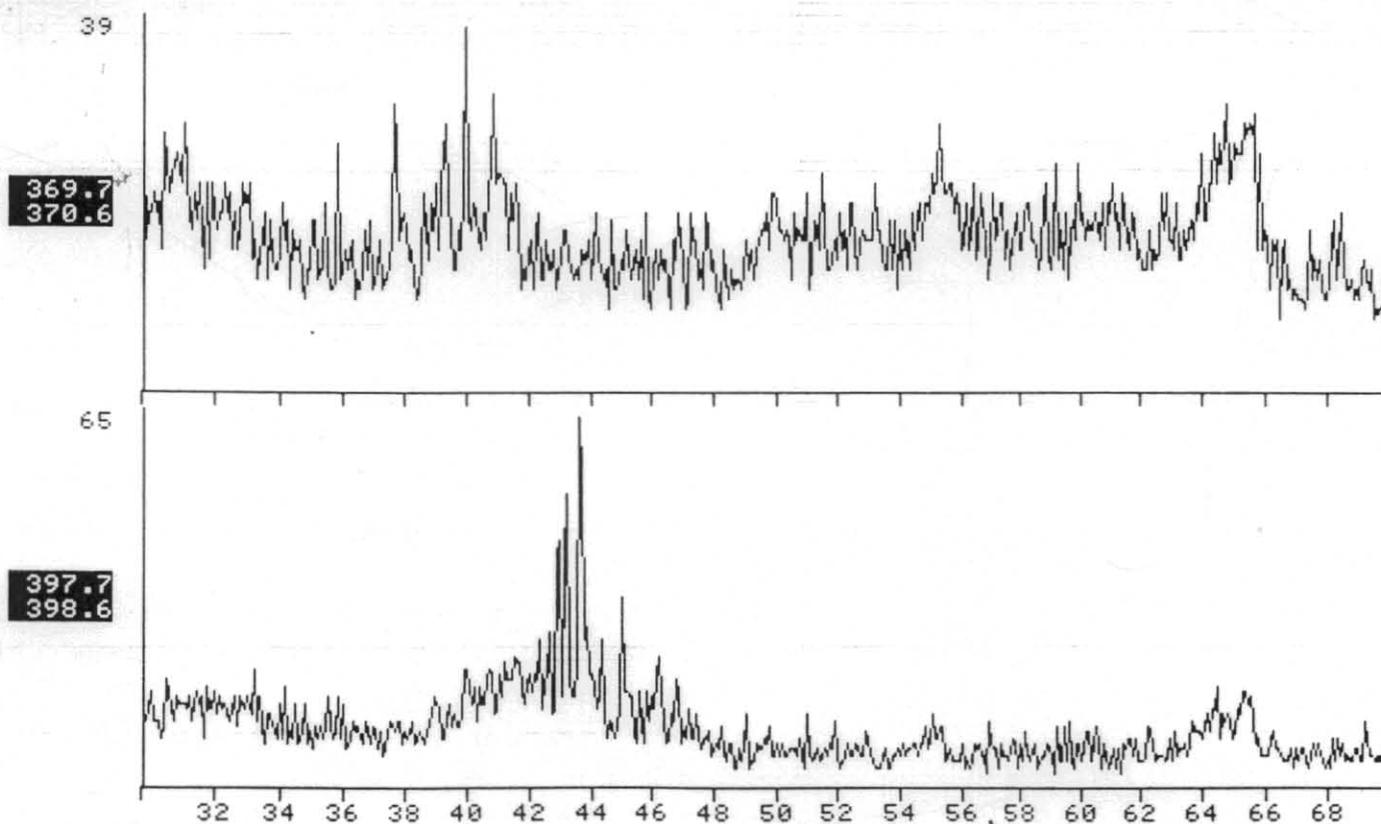
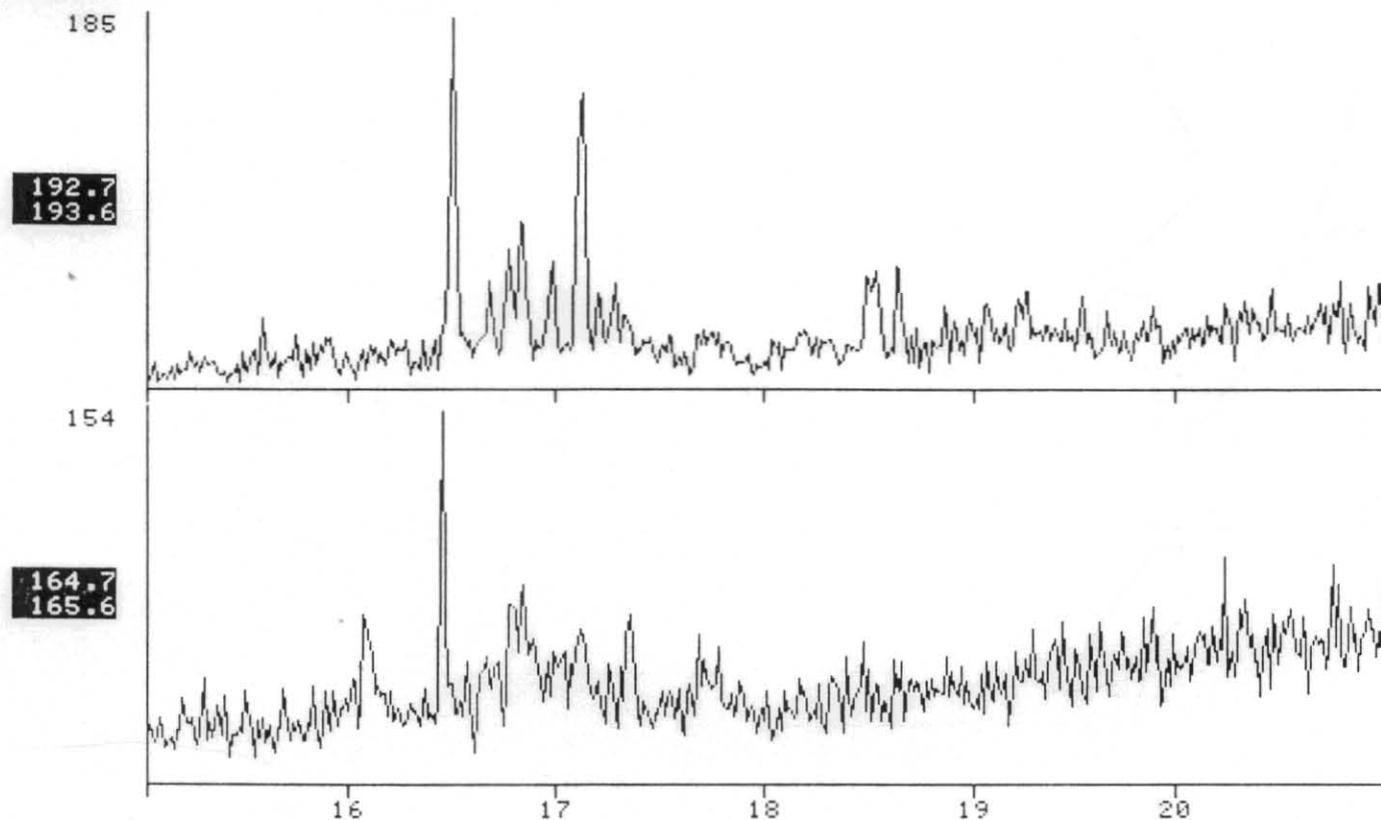


FIGURE: 2-4g

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

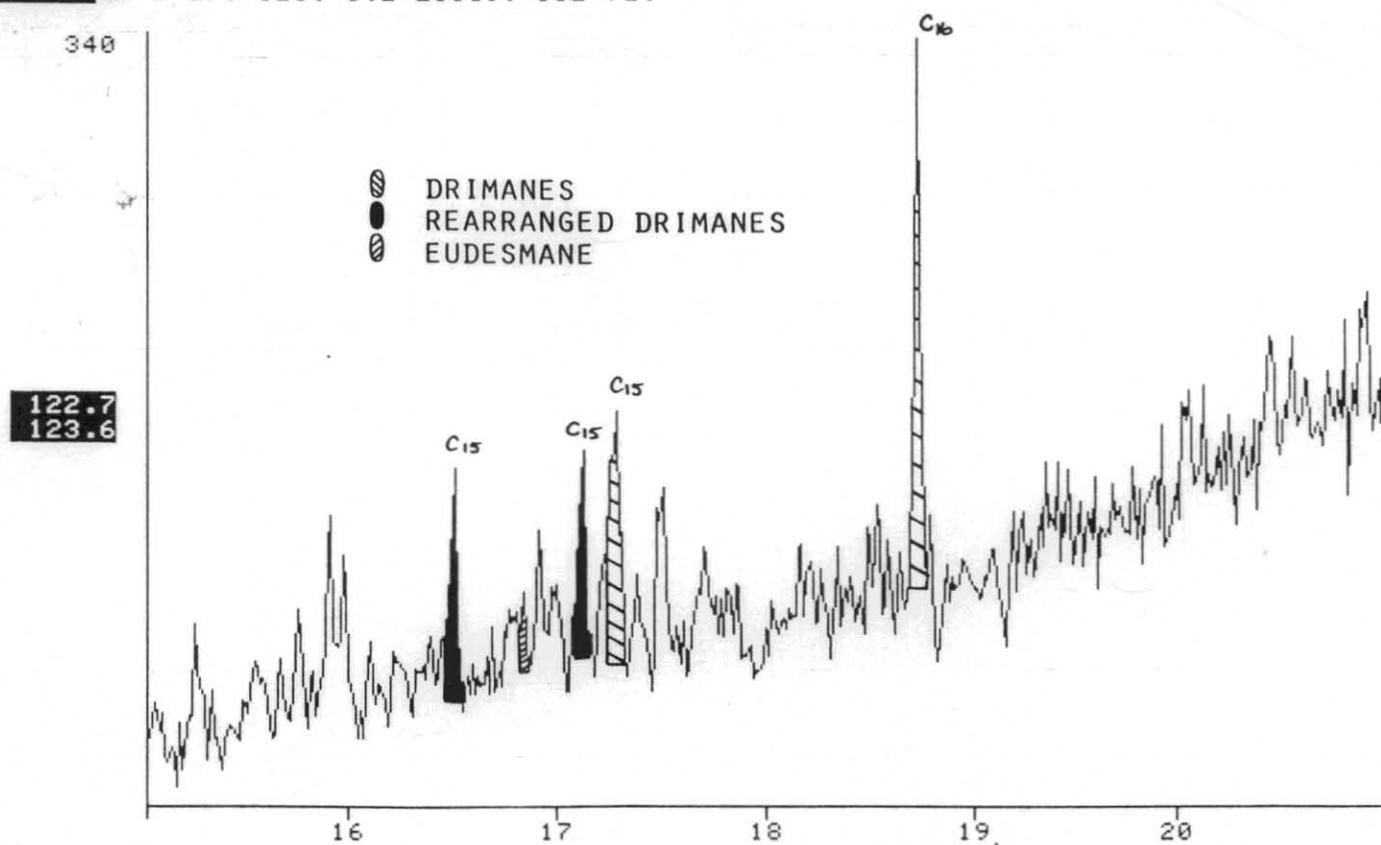
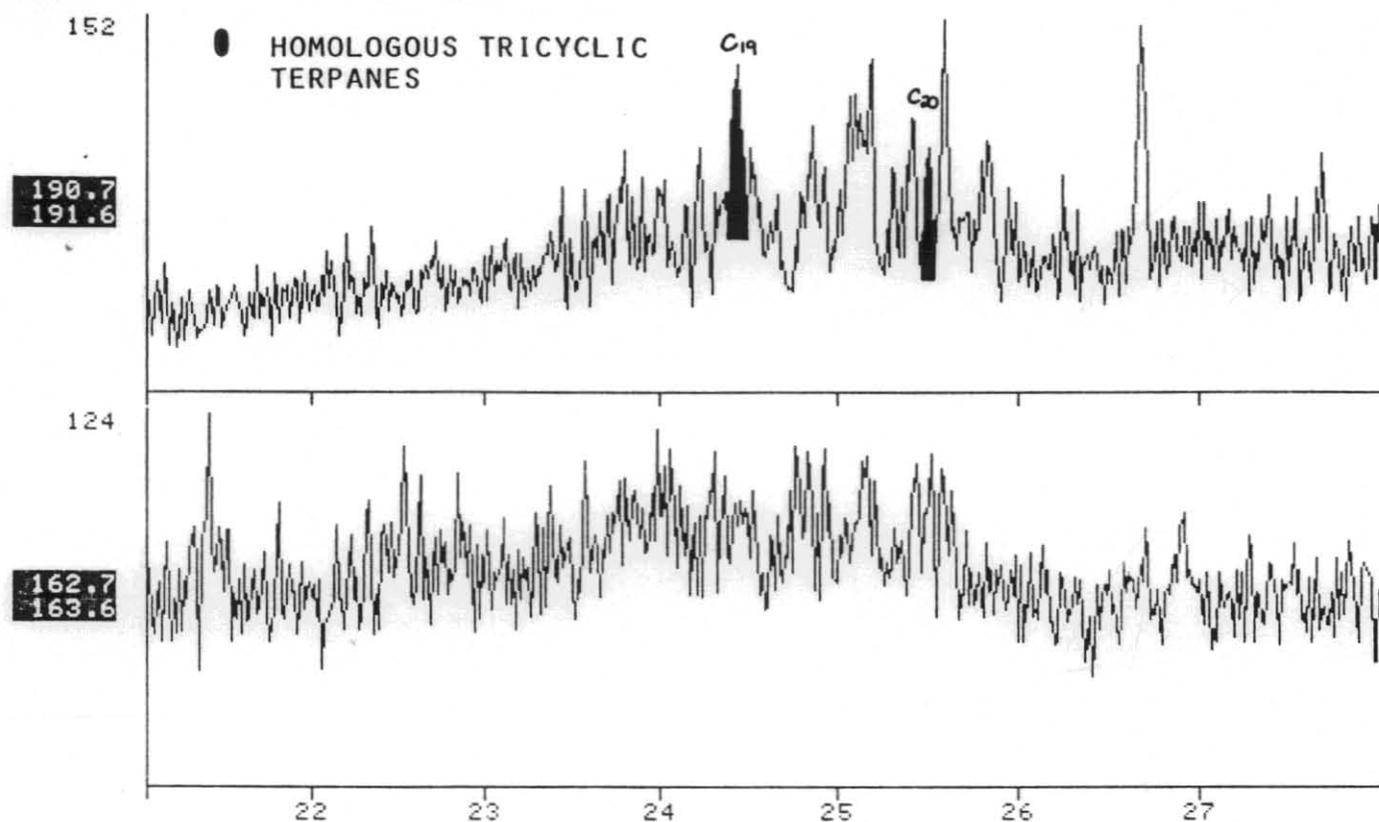


FIGURE: 2-4h

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

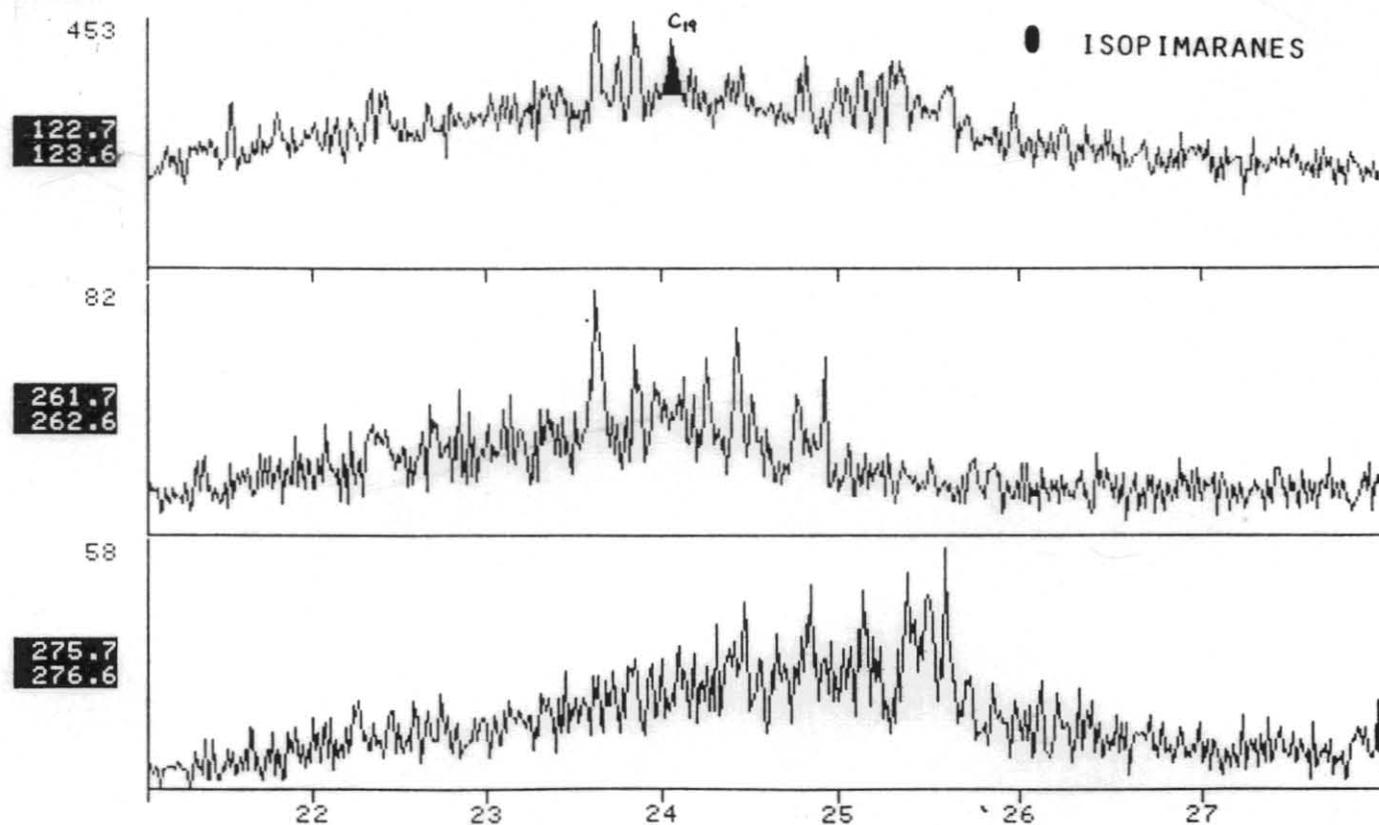
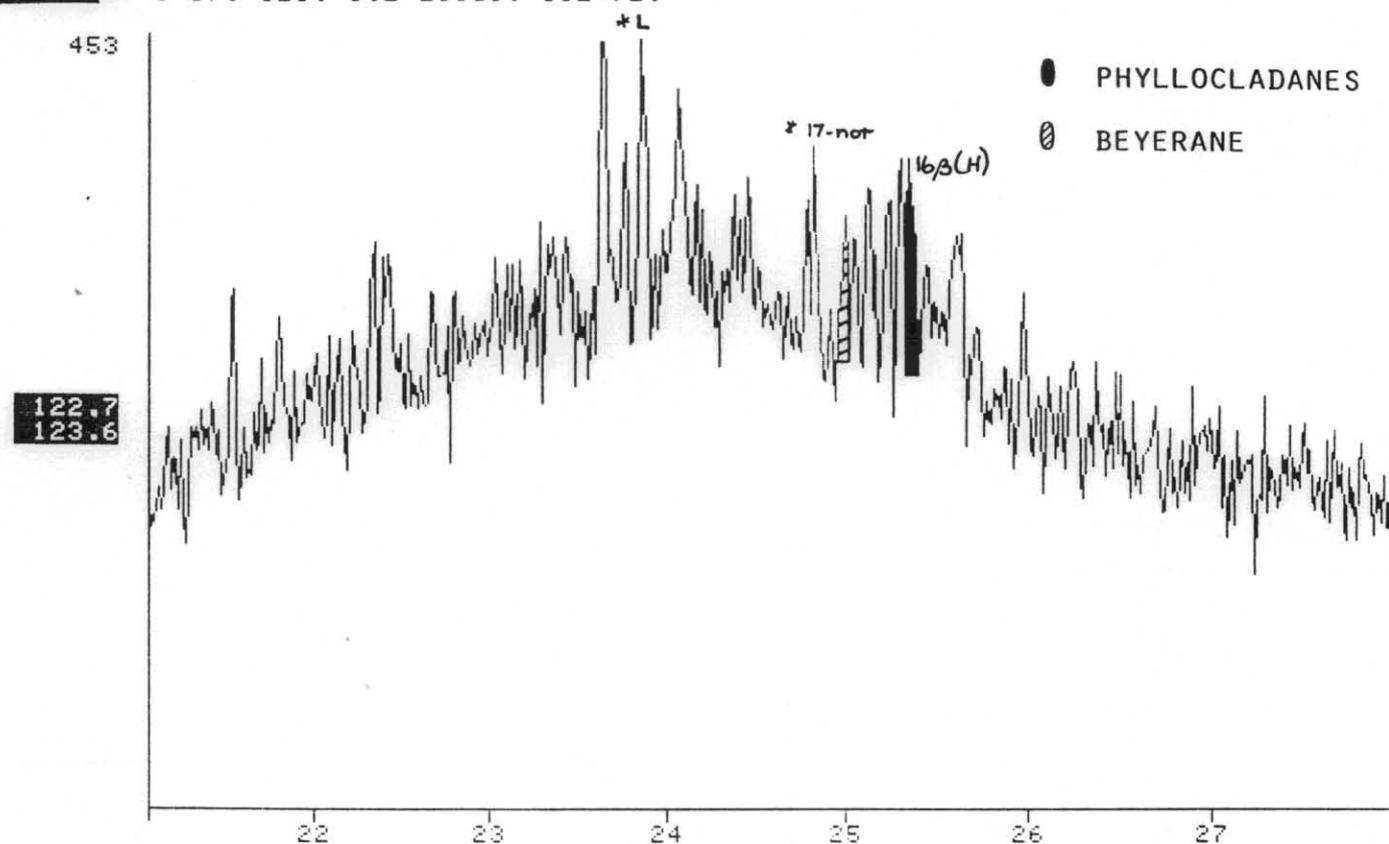


FIGURE: 2-4i

NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233



NAME BASS#2, 4740'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/200ul. COL#72.

FRN 6233

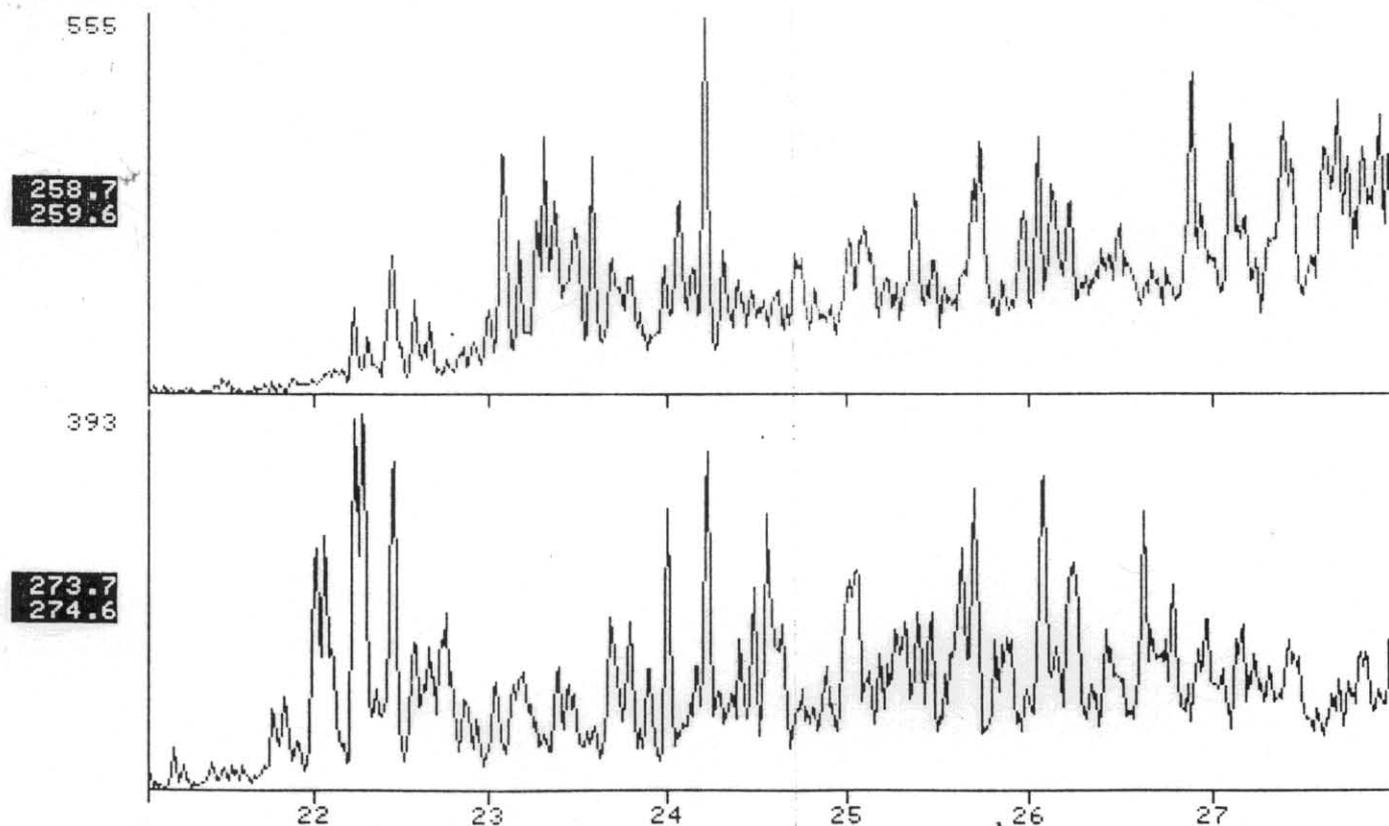
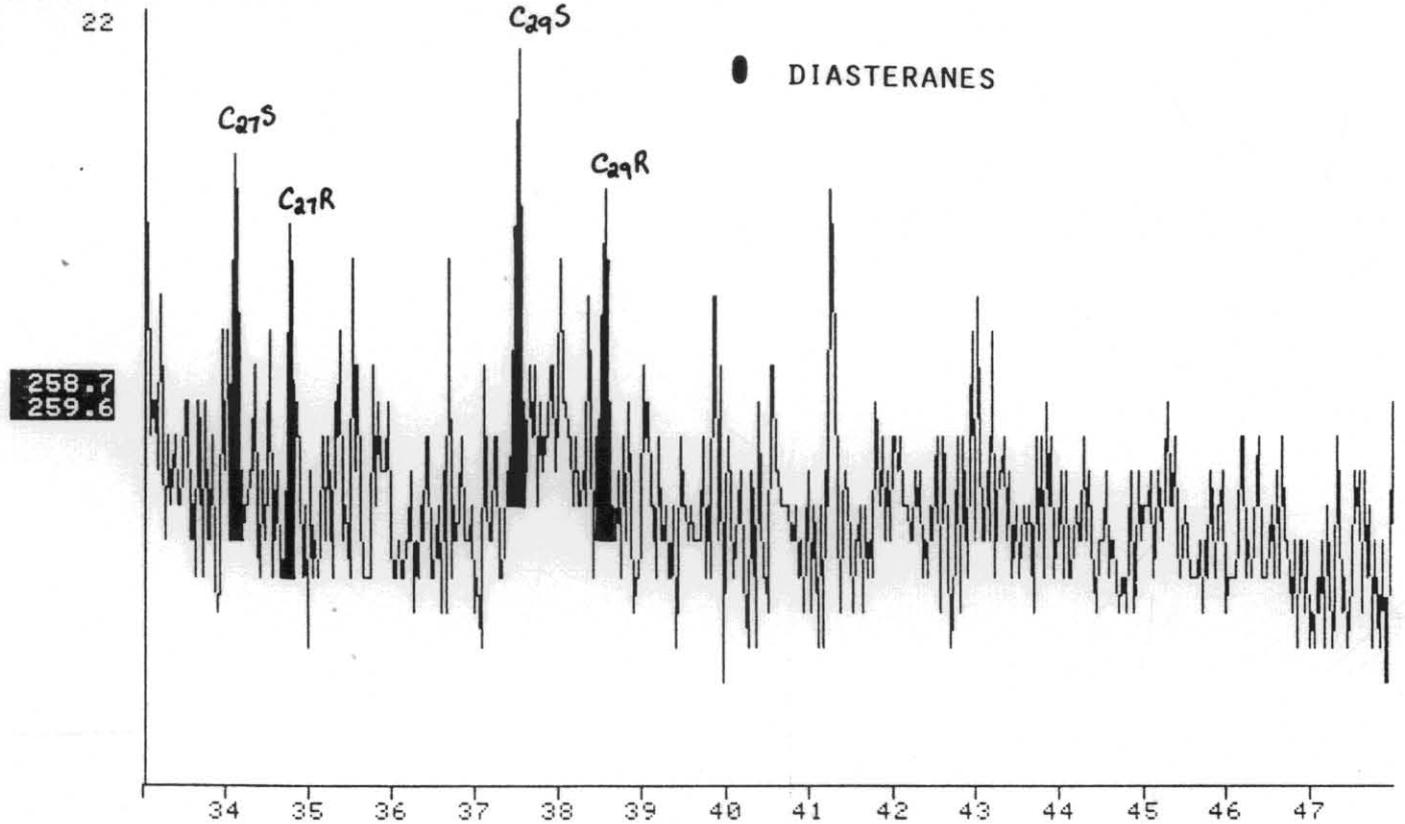


FIGURE: 2-5a

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM,
 MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM,
 MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

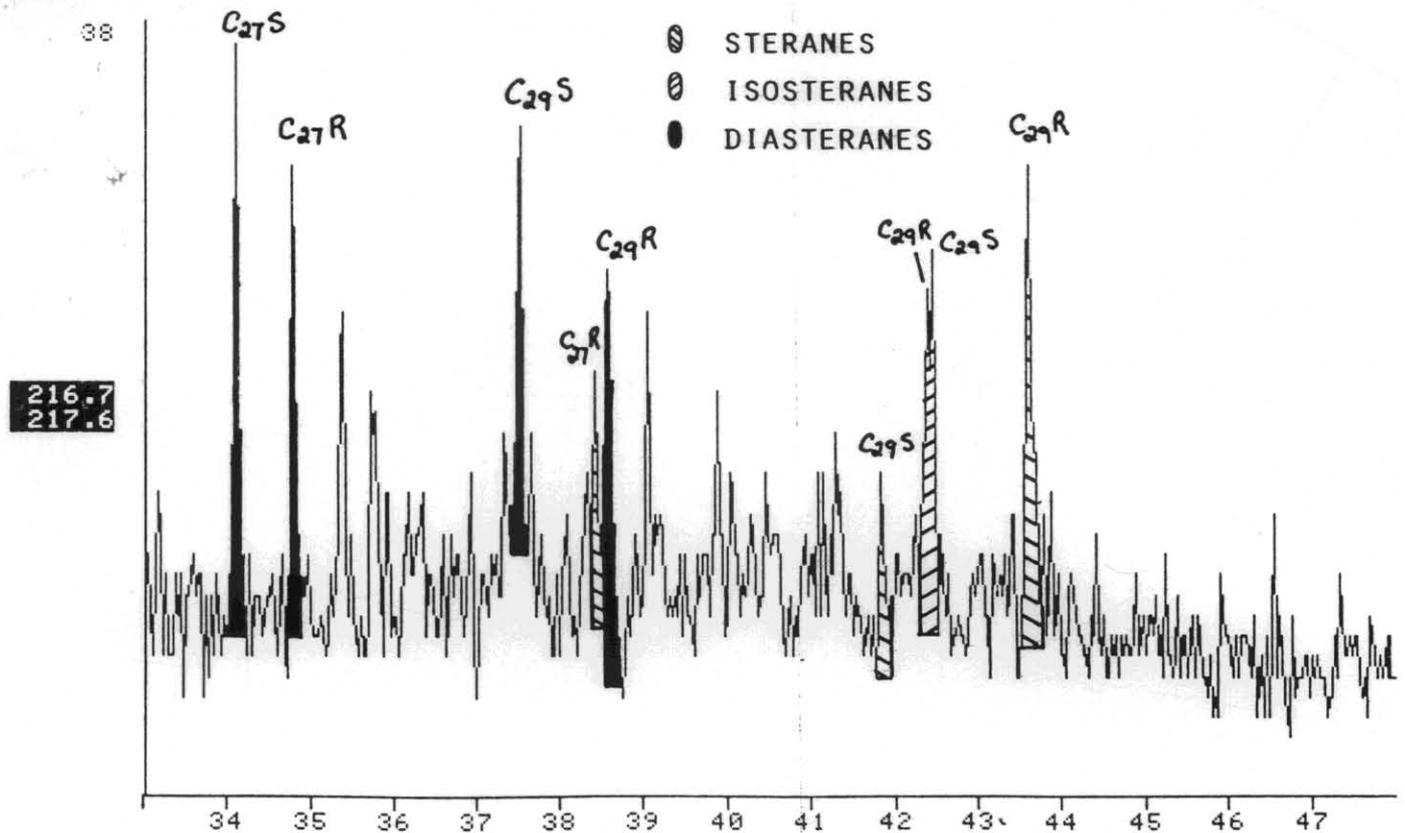
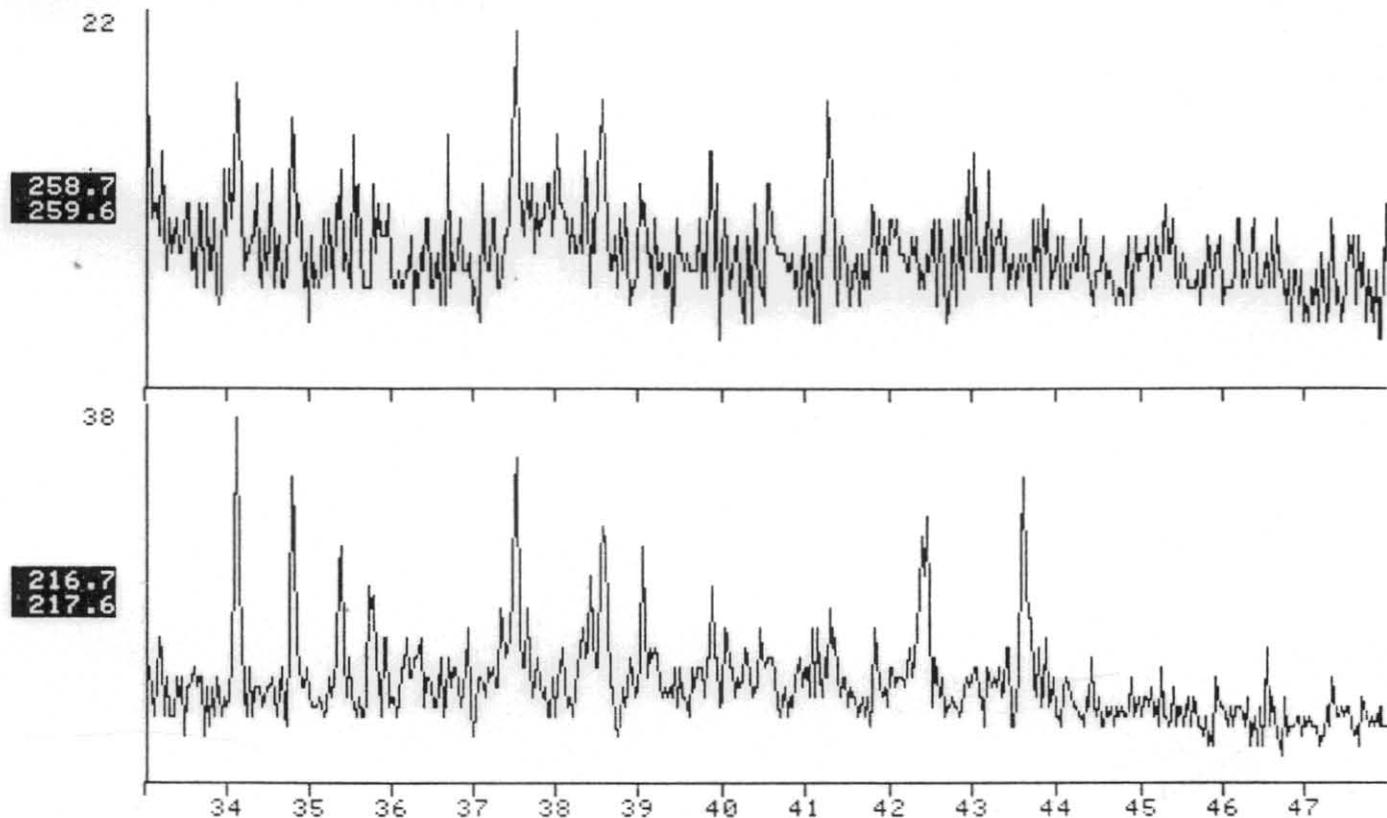


FIGURE: 2-5b

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

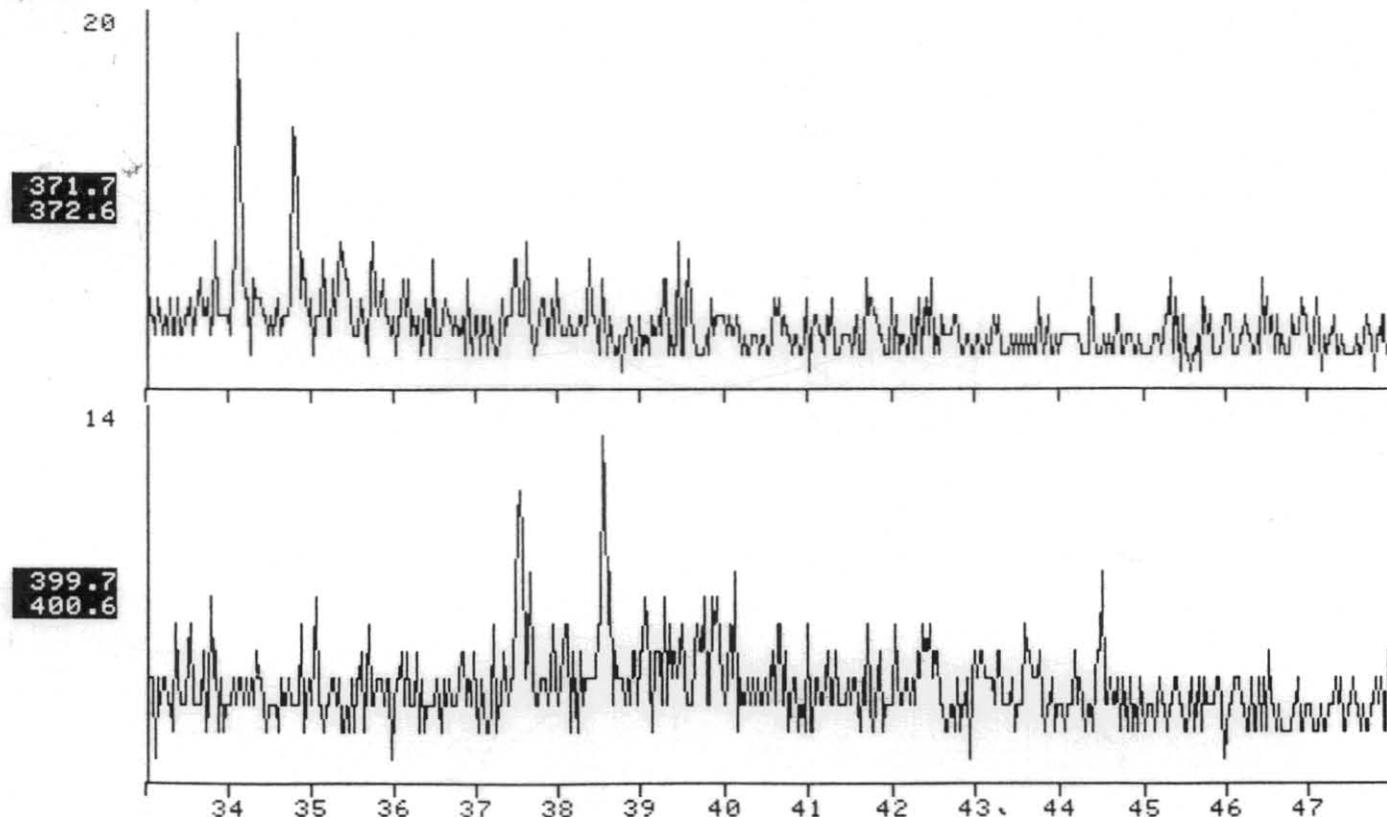
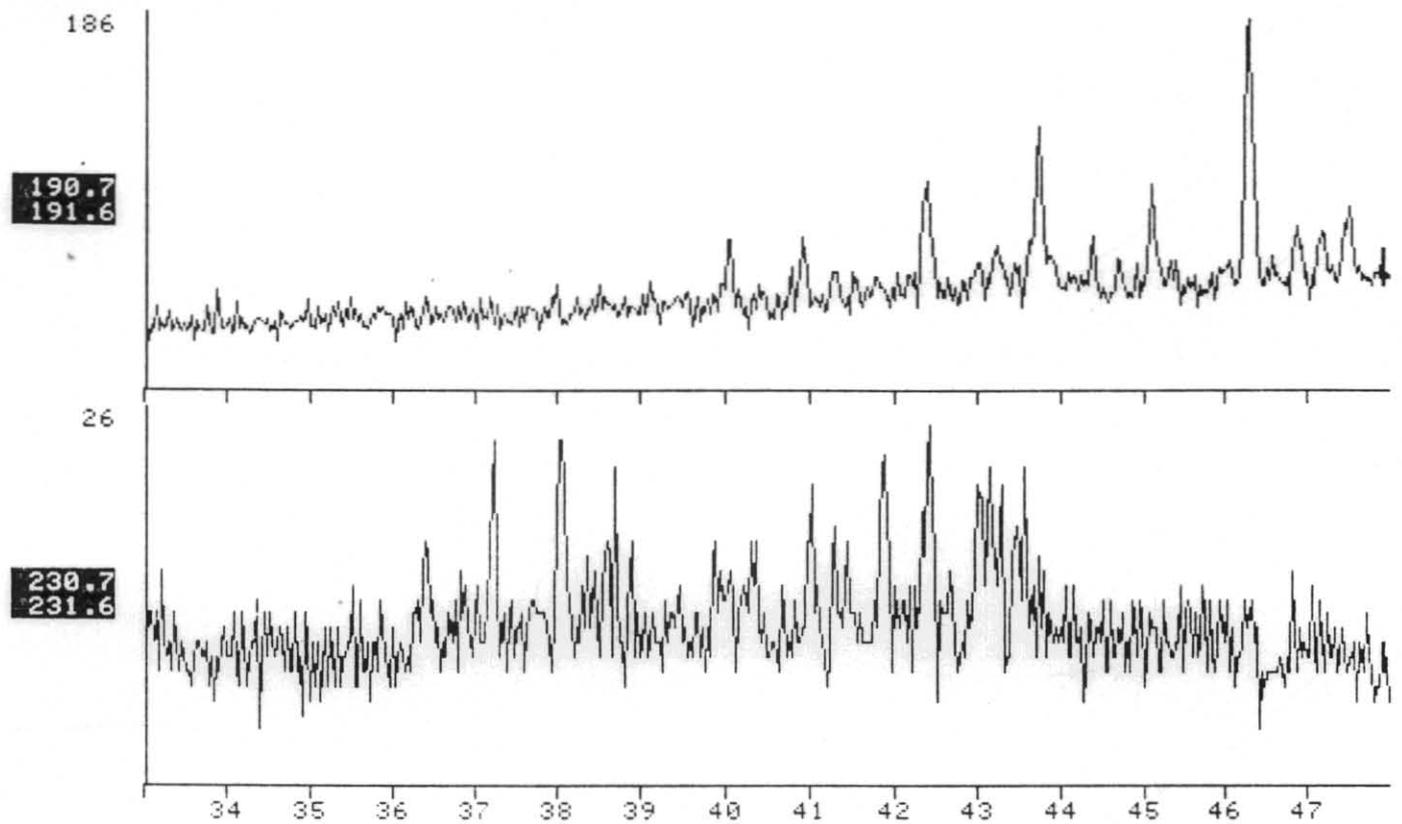


FIGURE: 2-5c

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

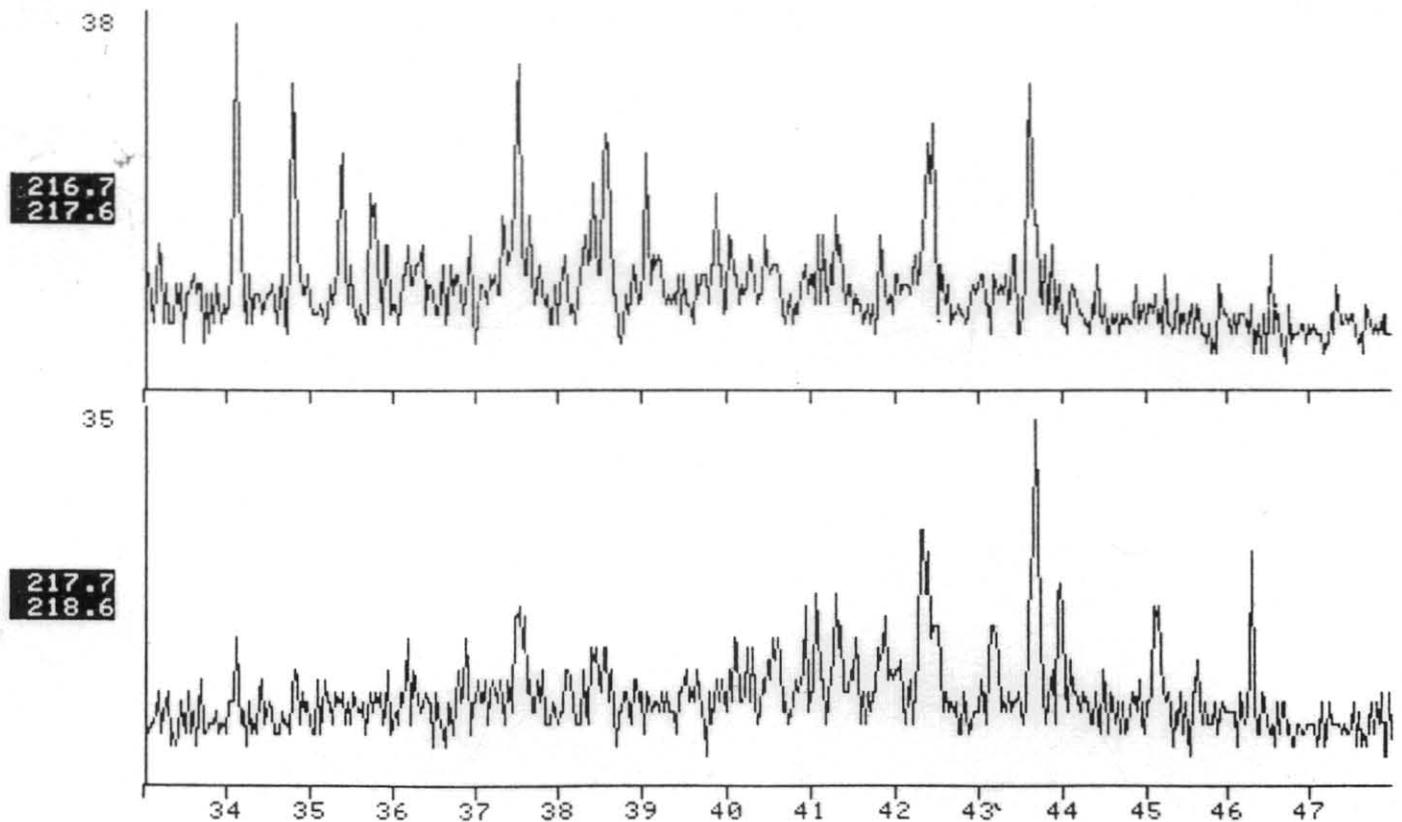
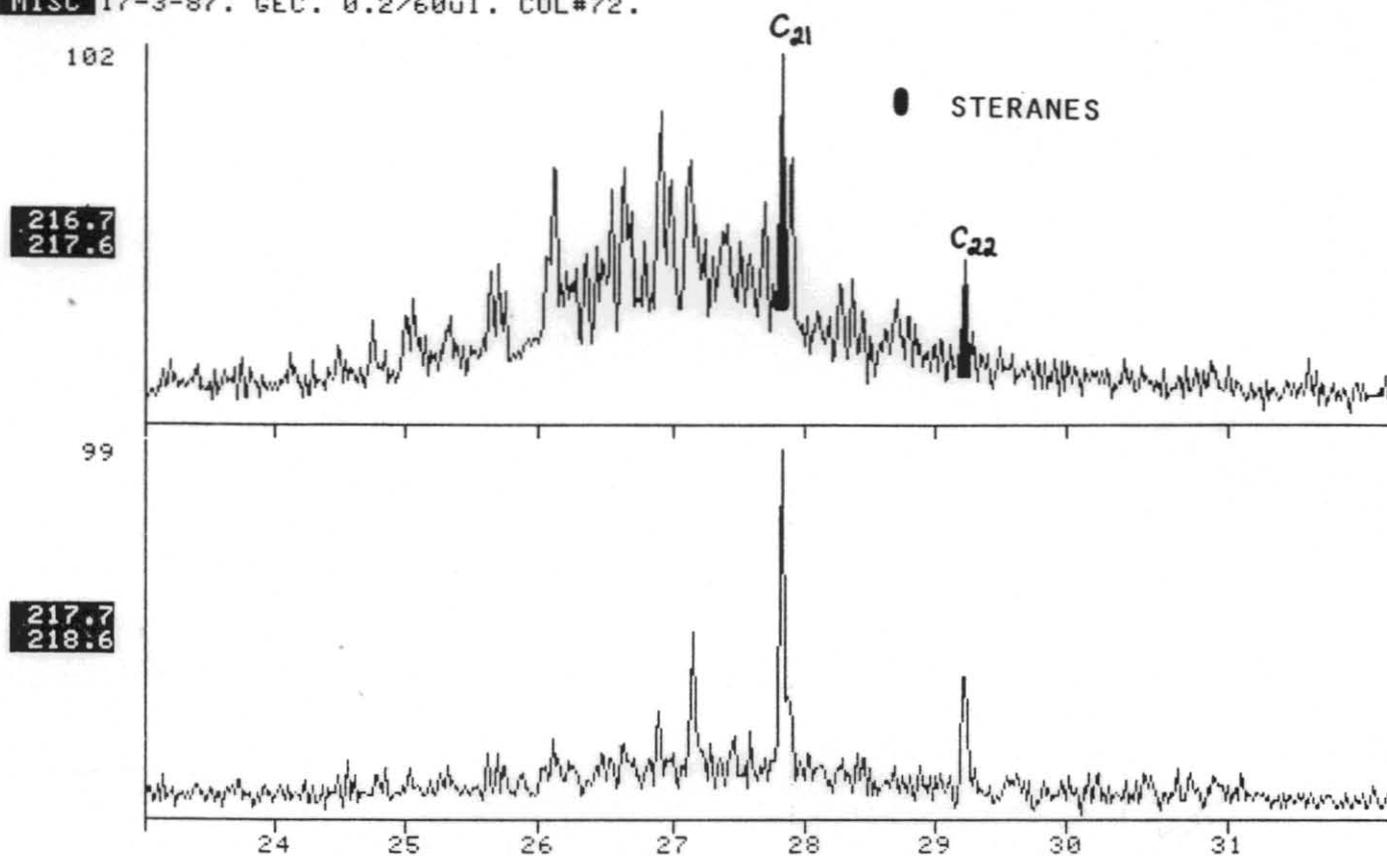


FIGURE: 2-5d

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

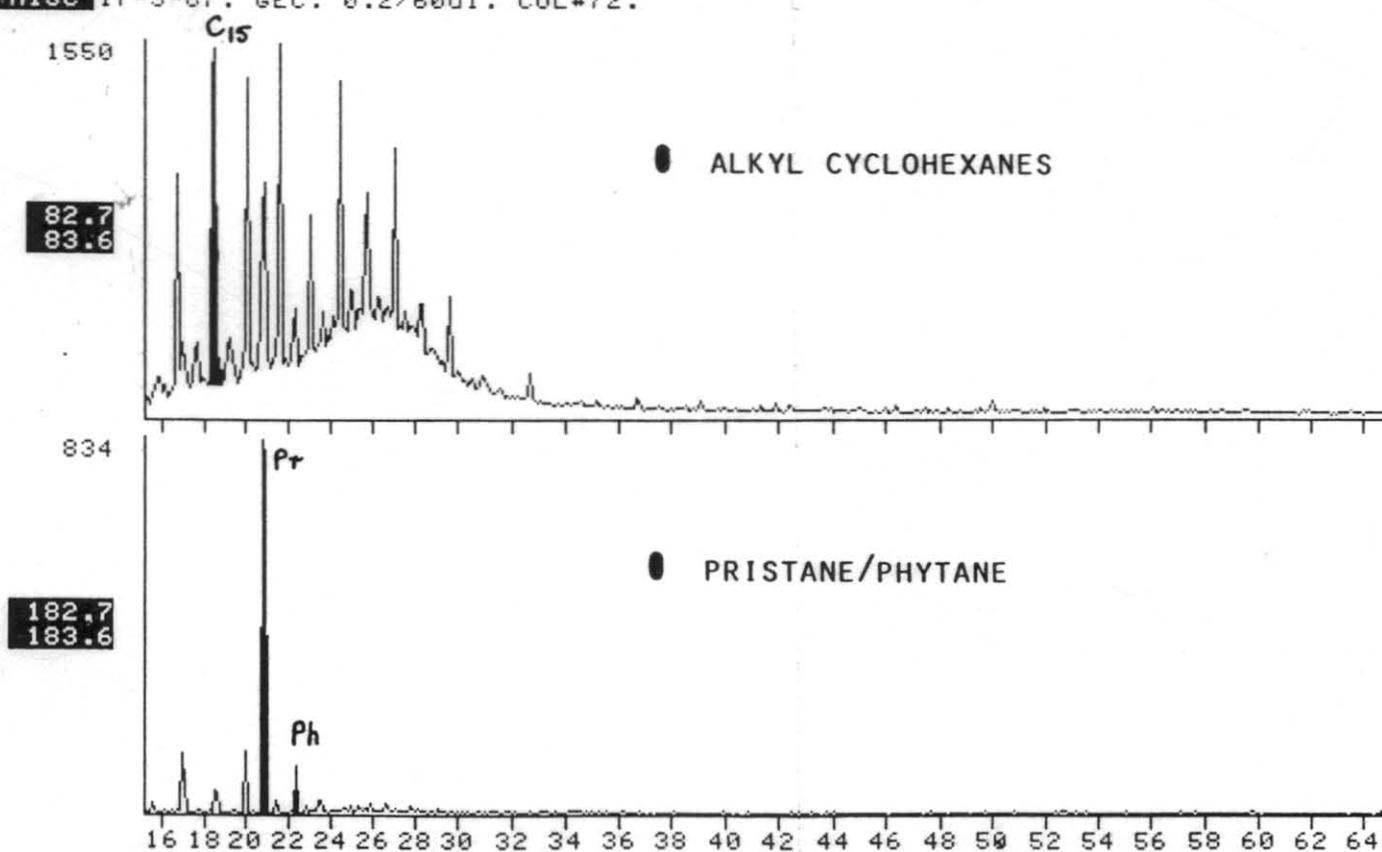
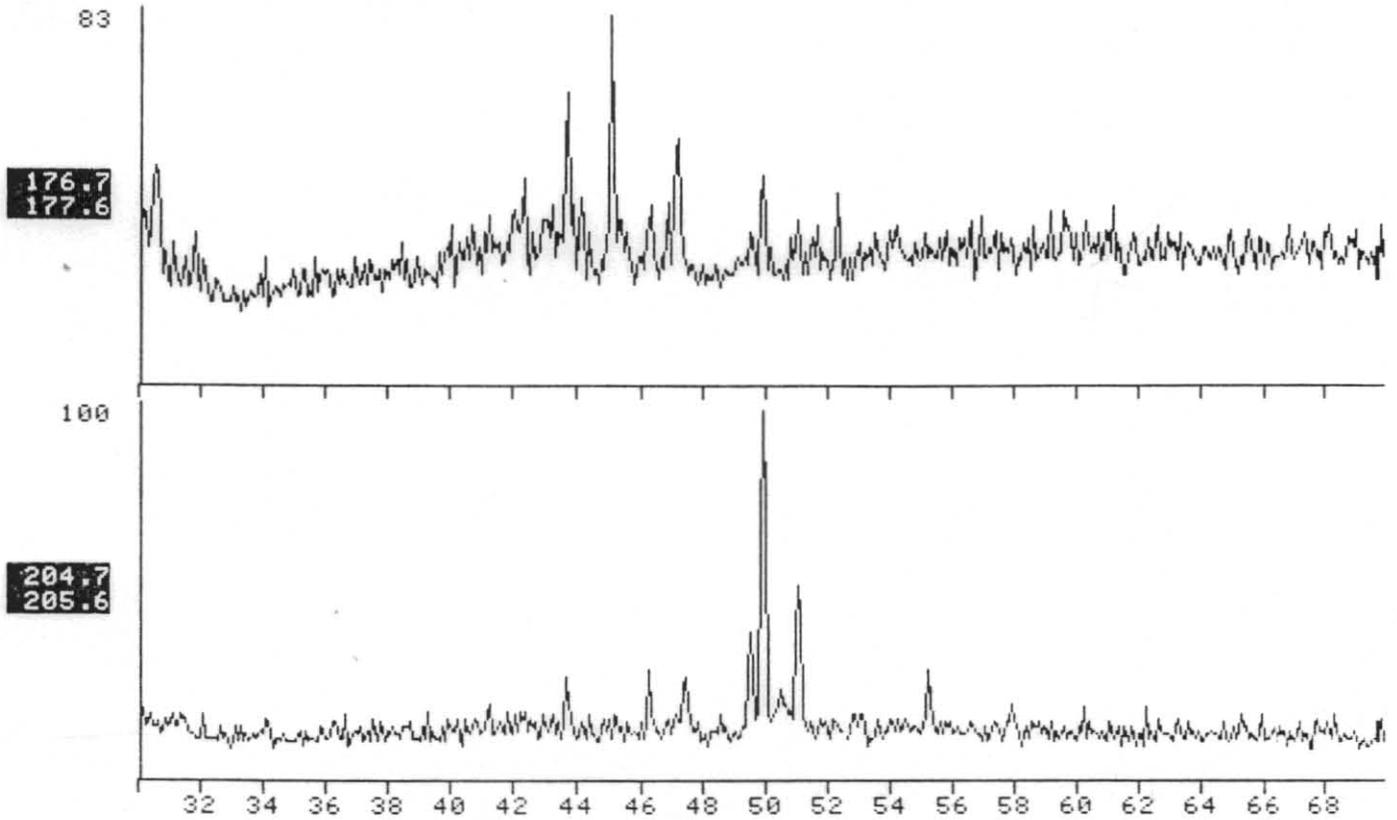


FIGURE: 2-5e

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

BNH: bisnorhopane

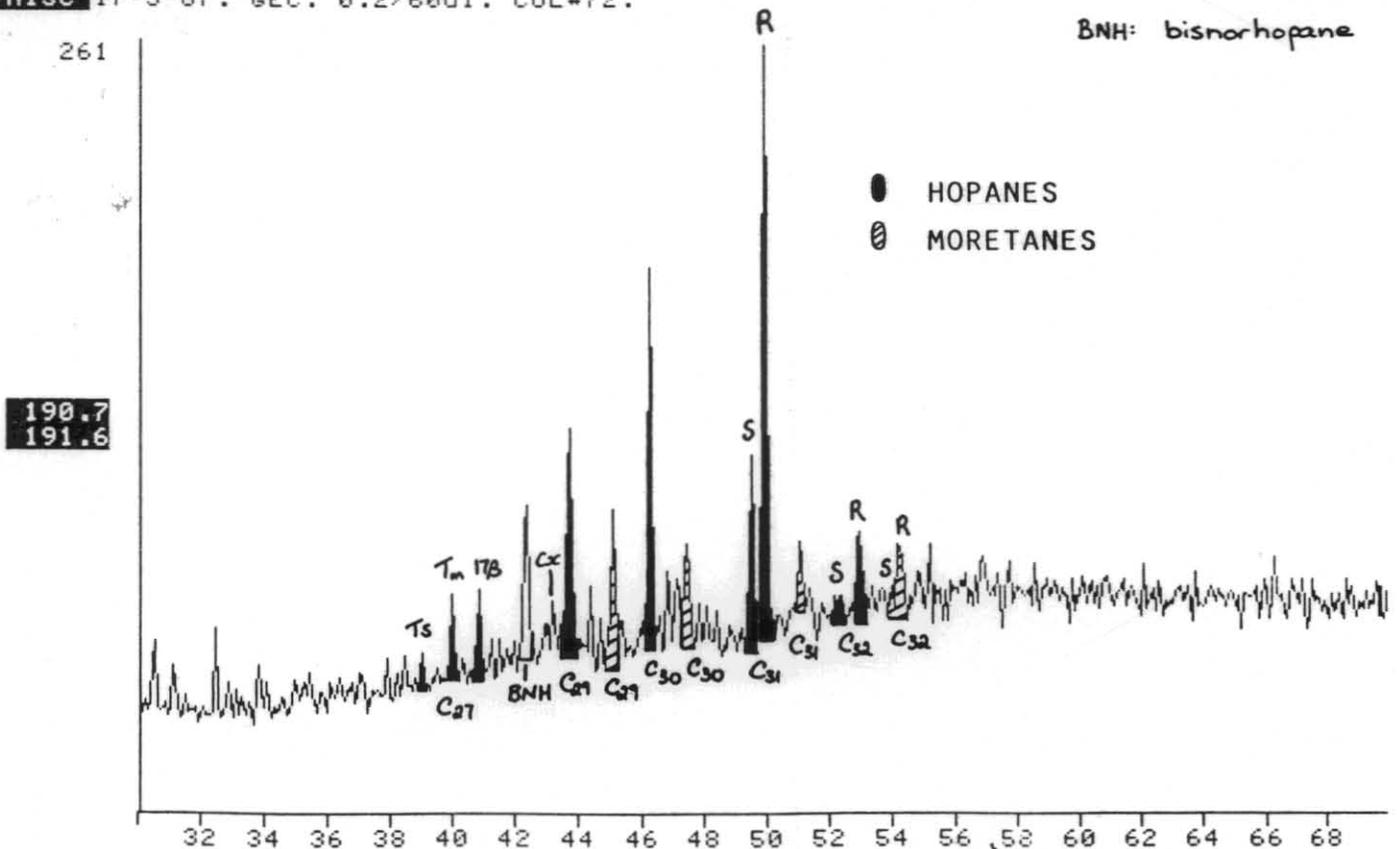
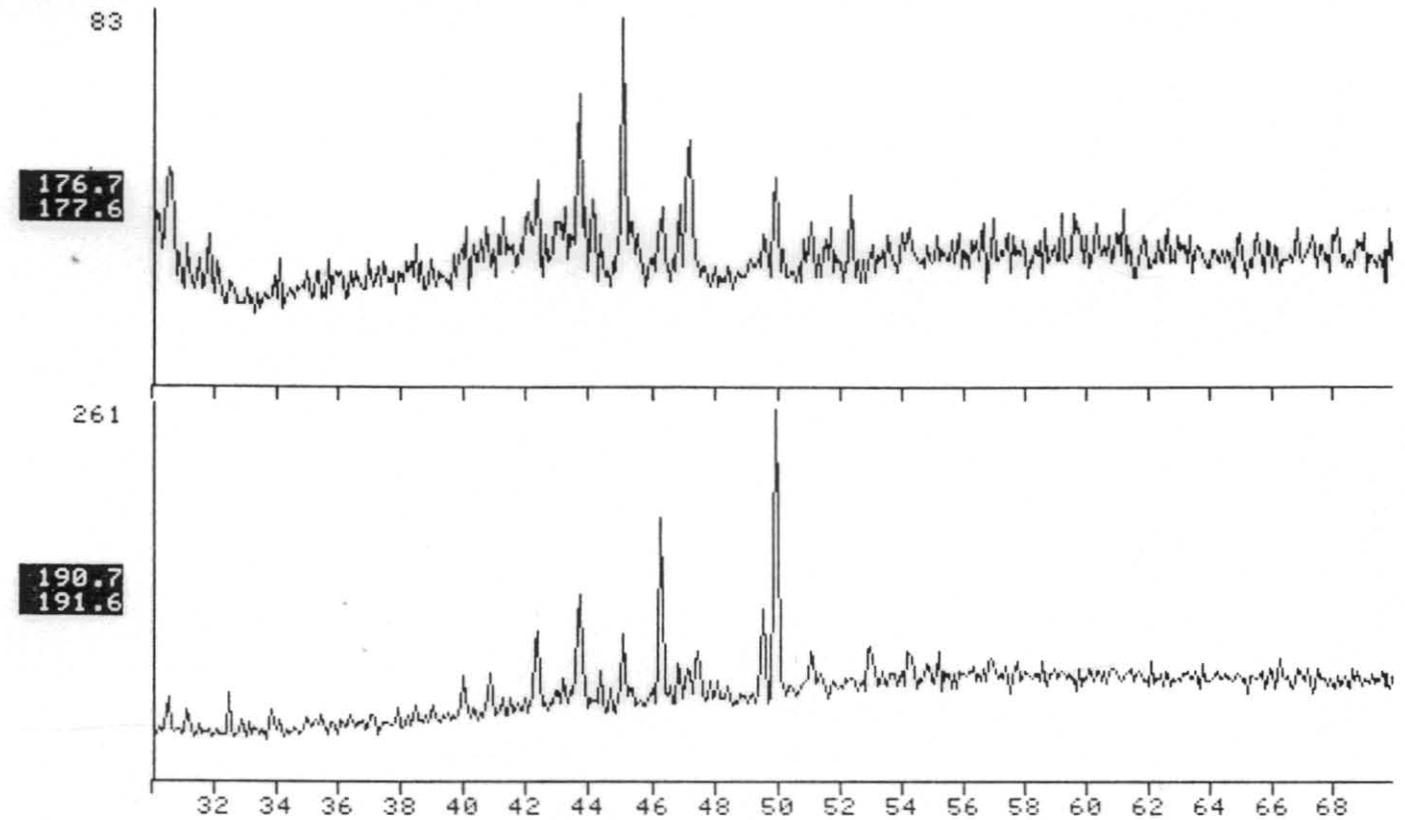


FIGURE: 2-5f

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

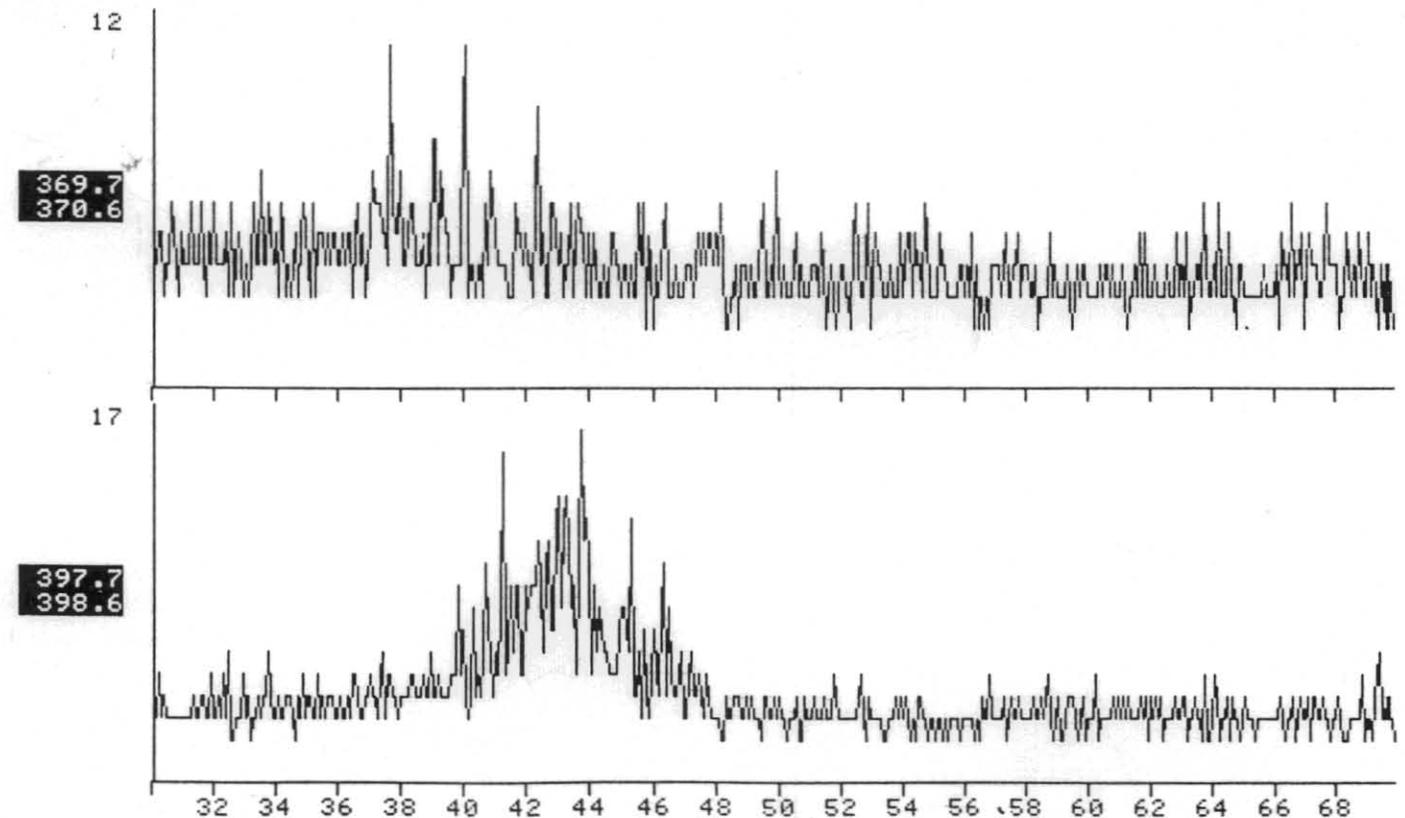
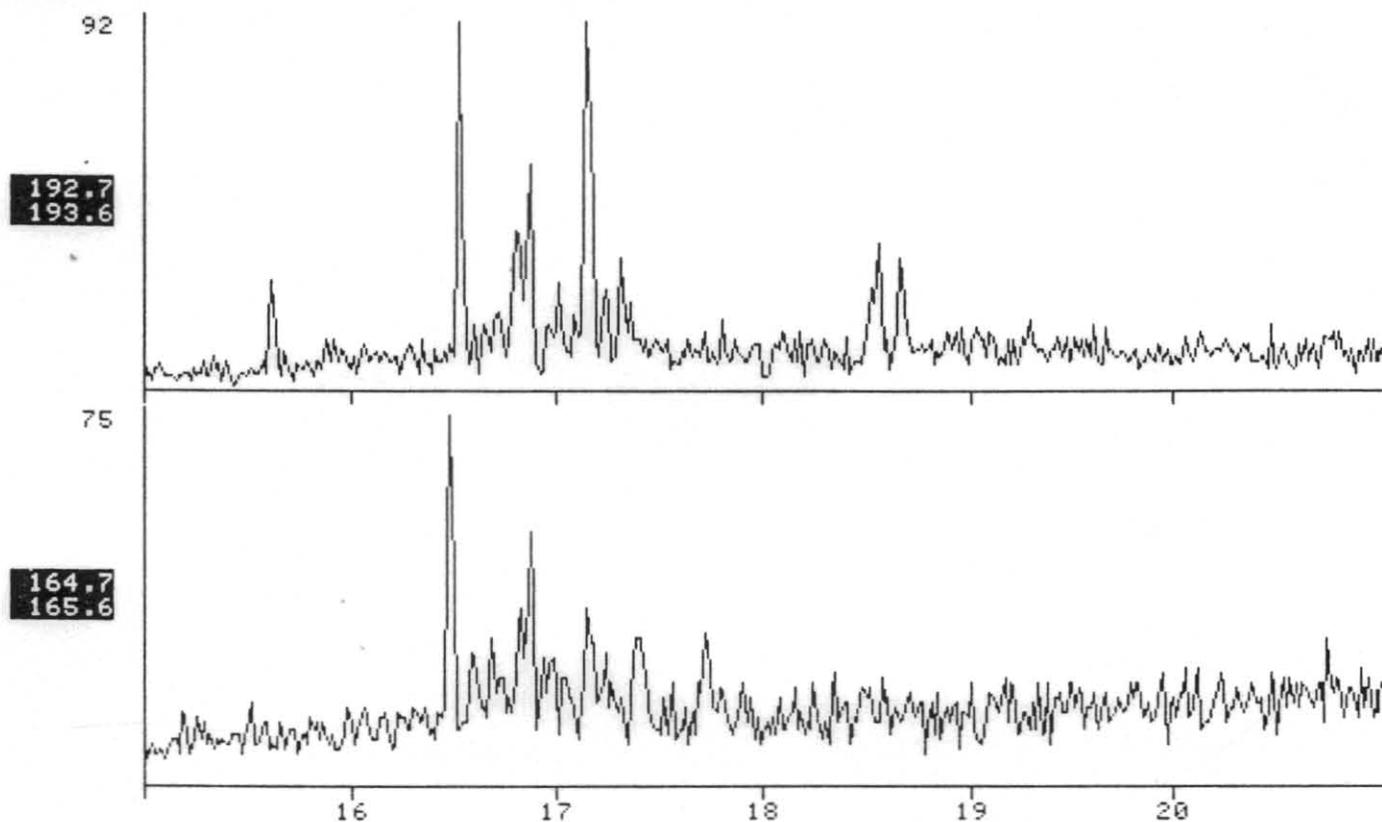


FIGURE: 2-5g

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

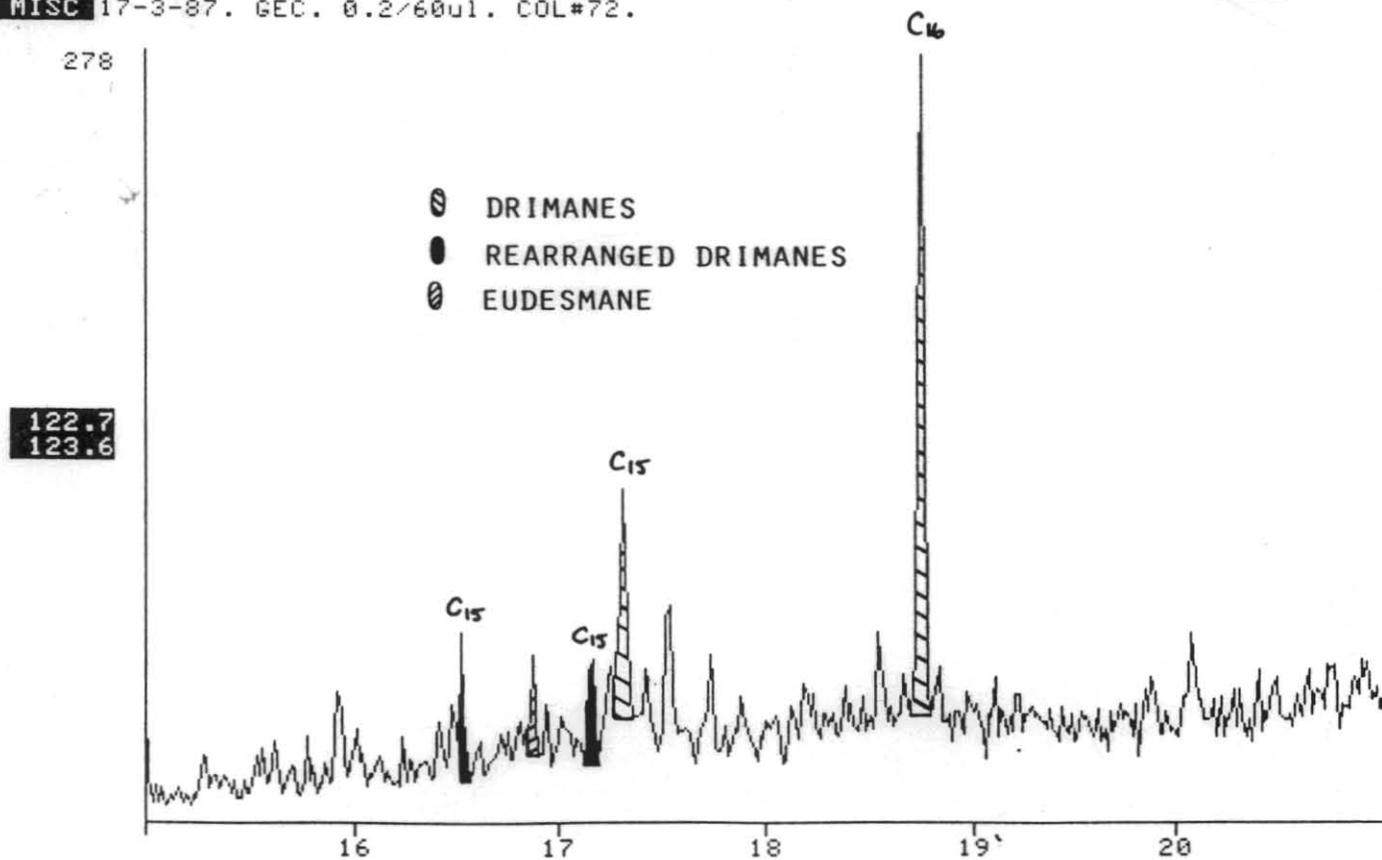
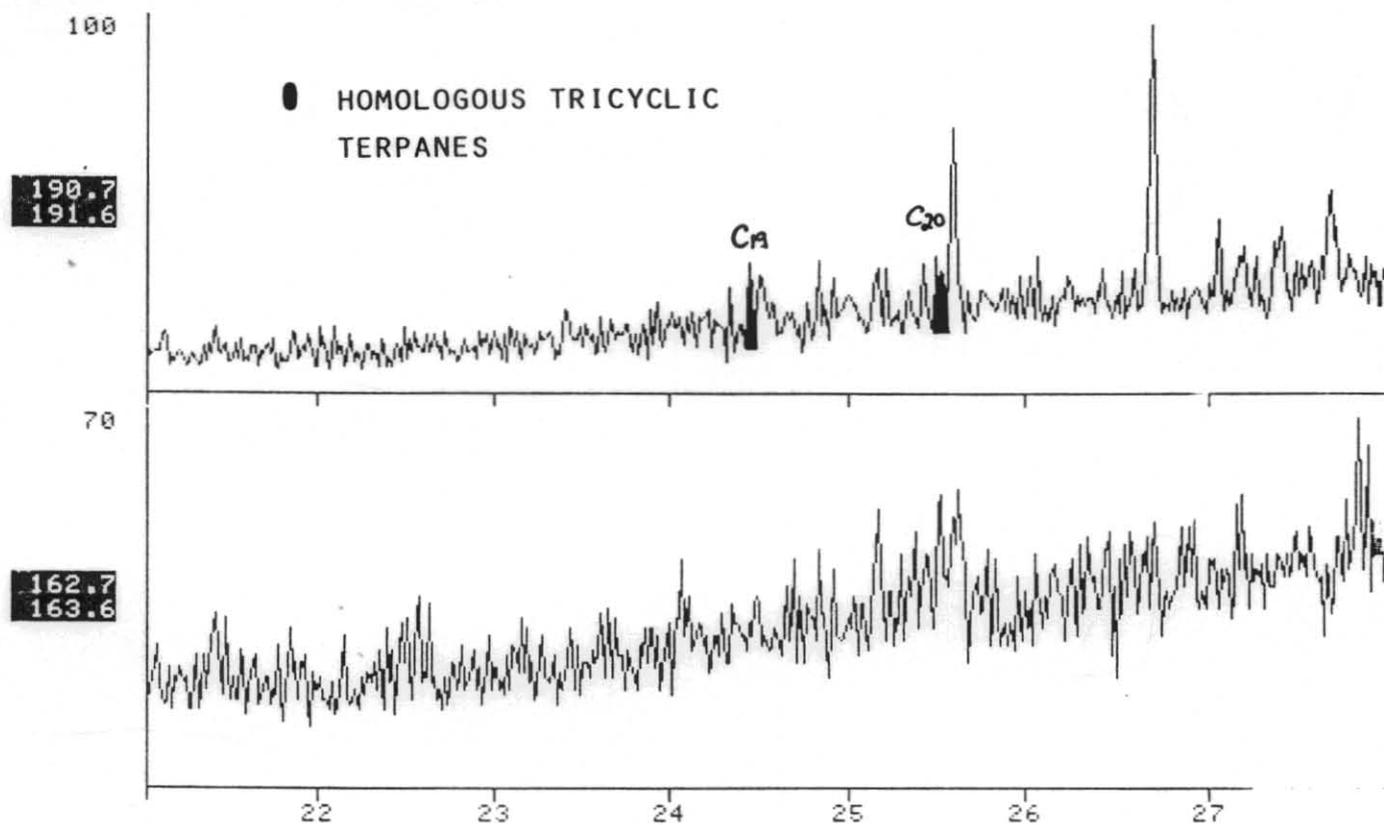


FIGURE: 2-5h

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

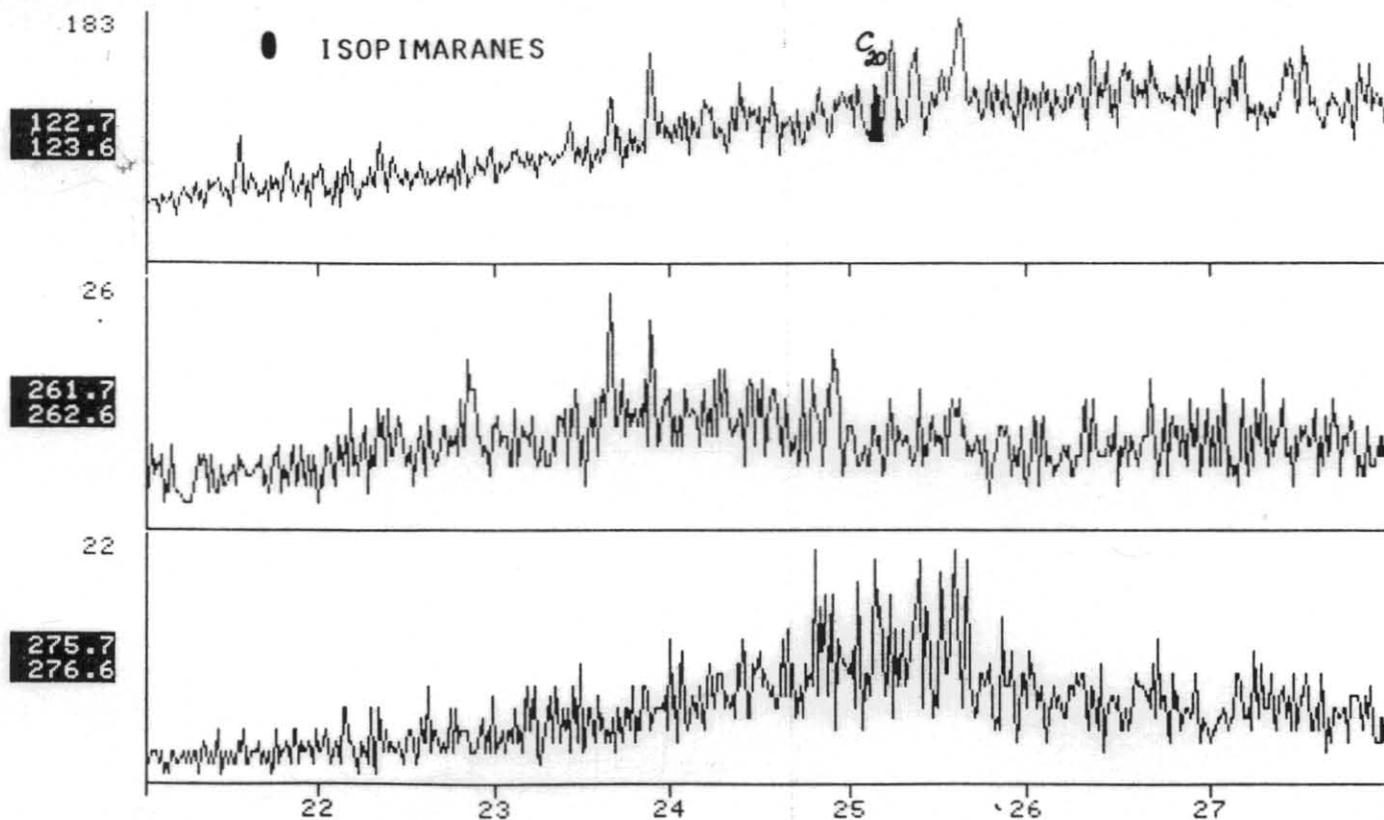
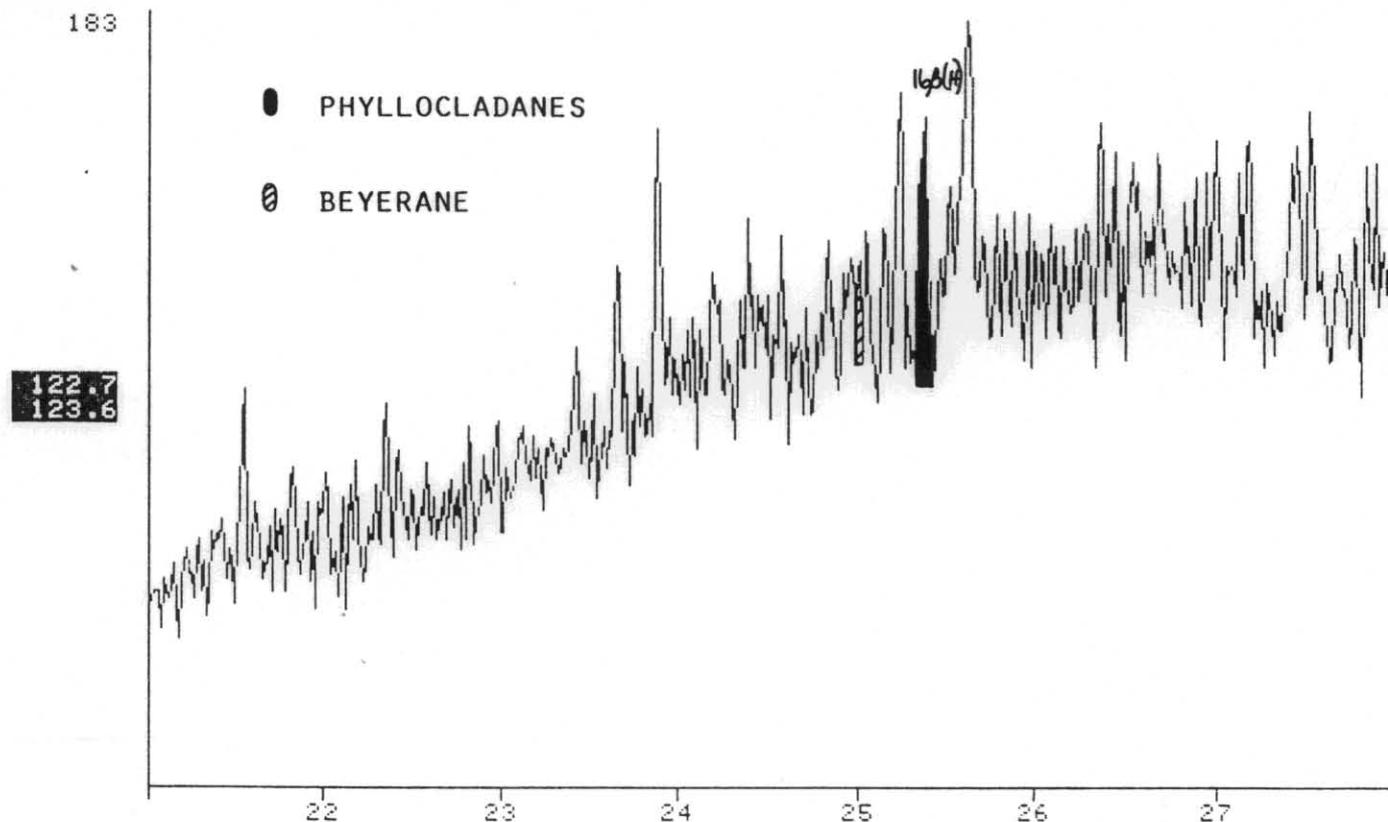


FIGURE: 2-5i

NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226



NAME BASS#2, 5068. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17-3-87. GEC. 0.2/60ul. COL#72.

FRN 6226

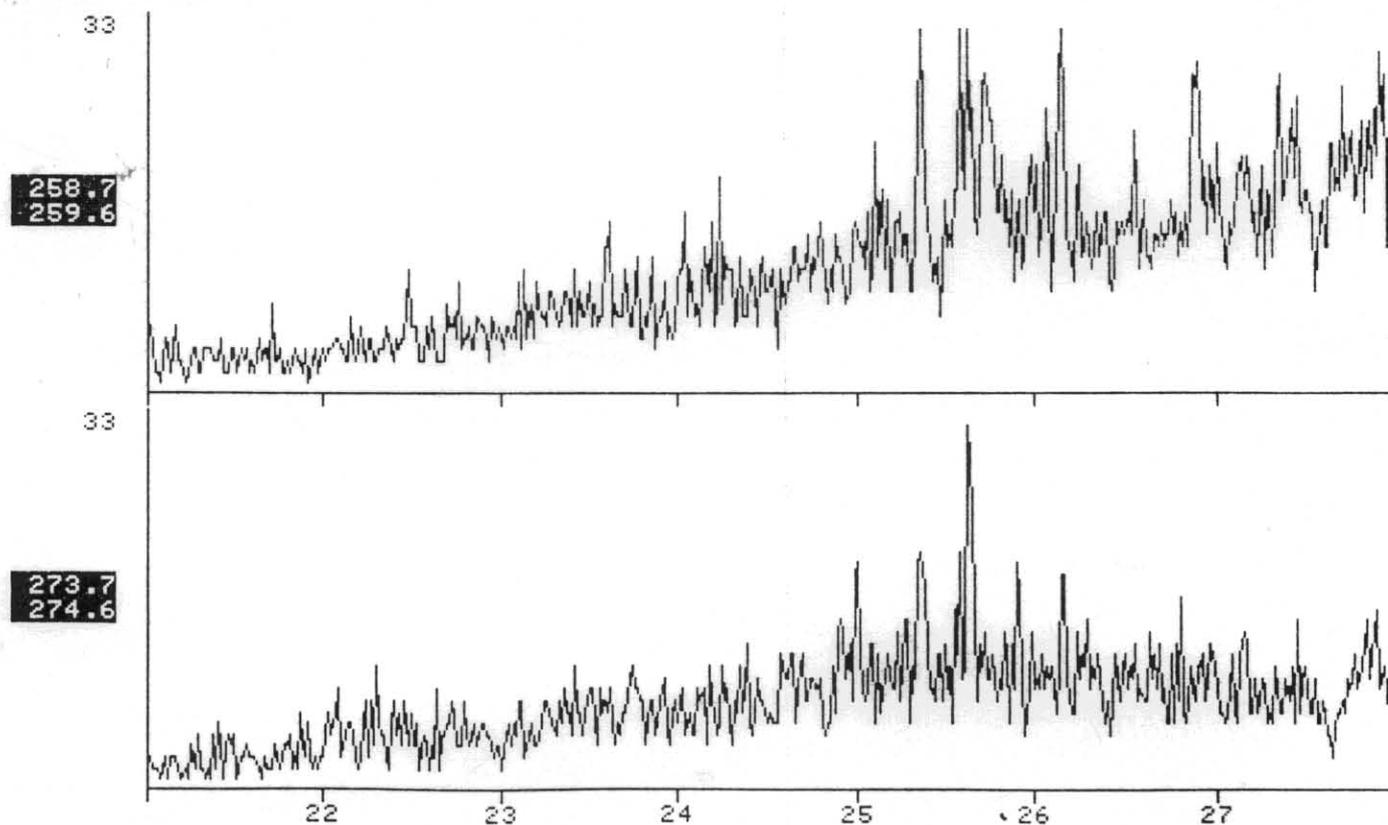
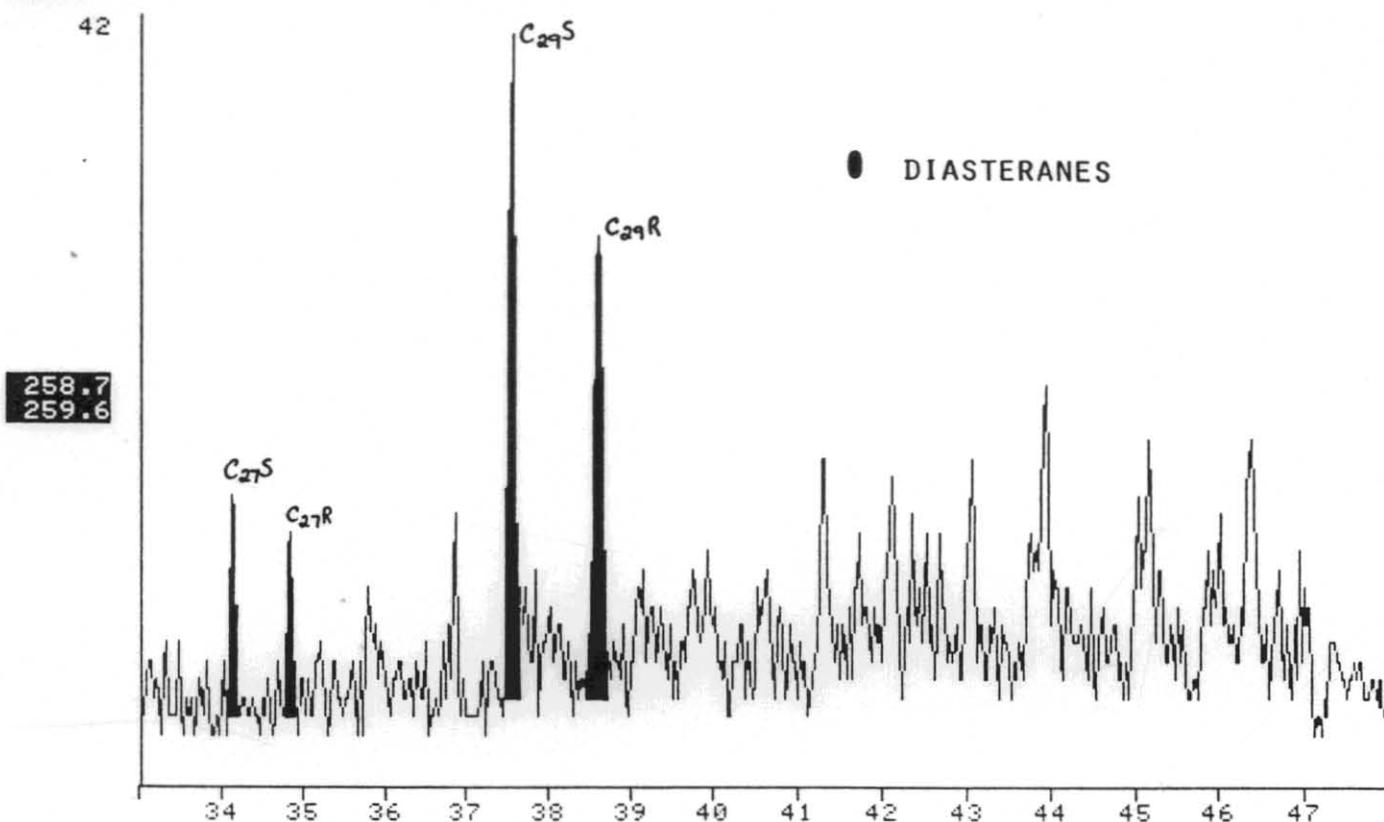


FIGURE: 2-6a

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

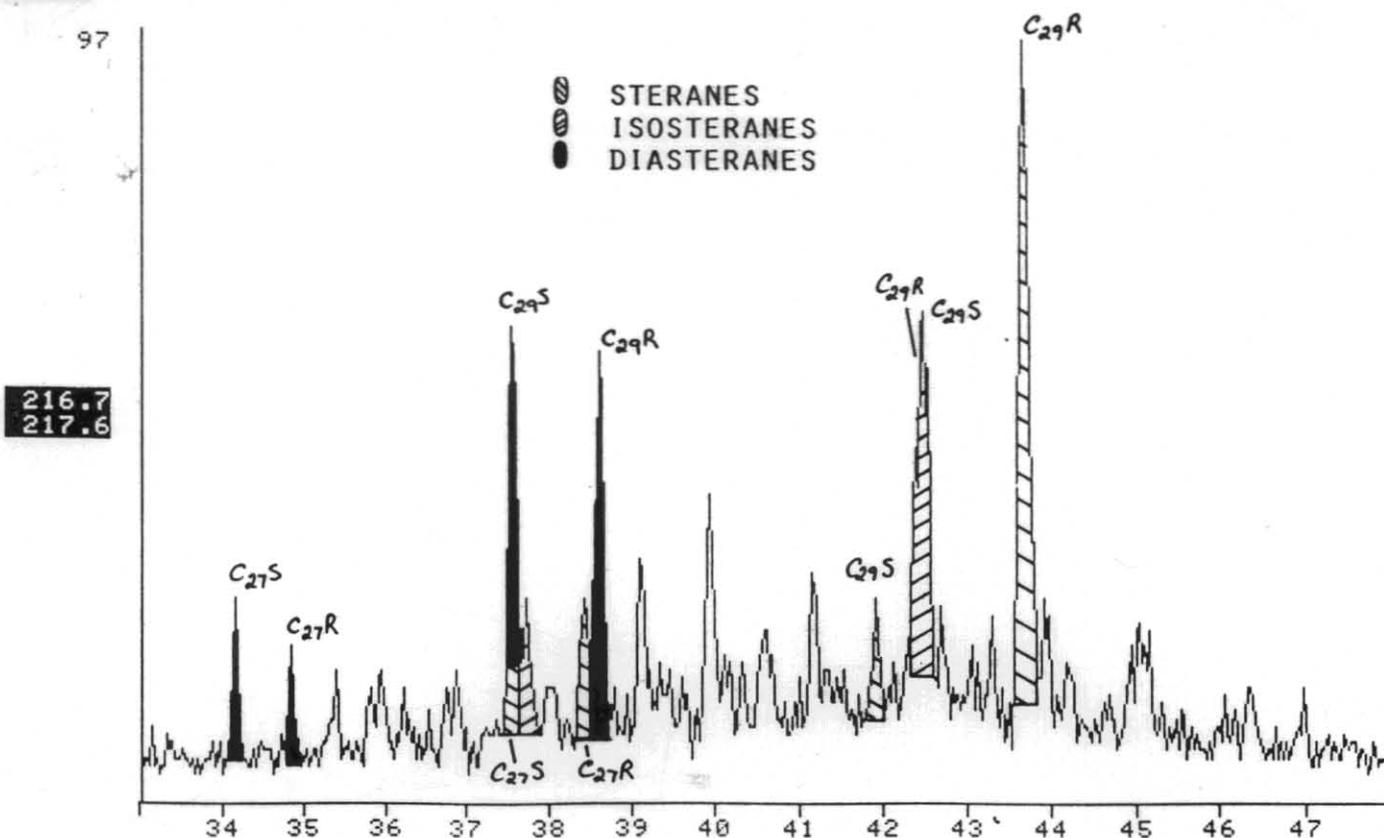
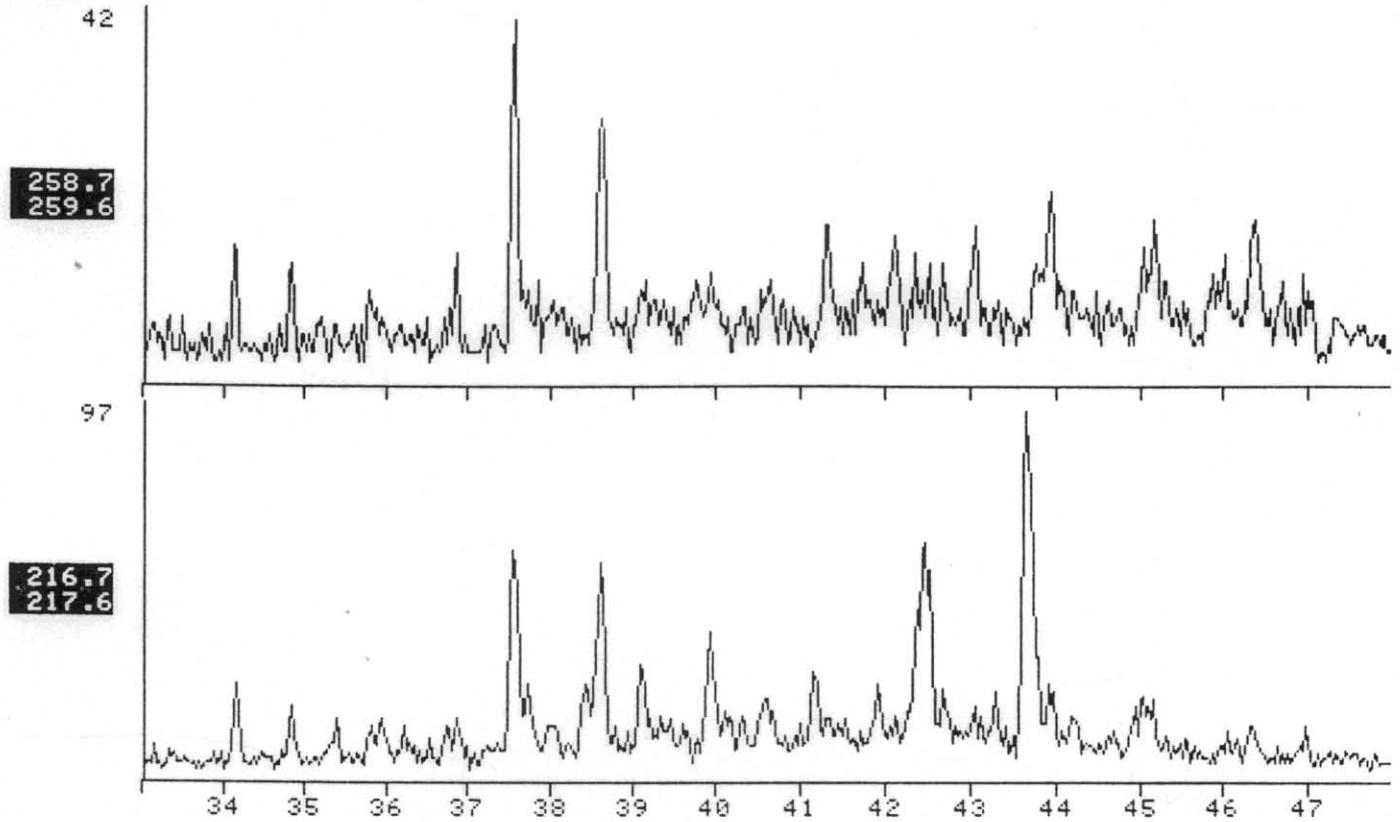


FIGURE: 2-6b

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

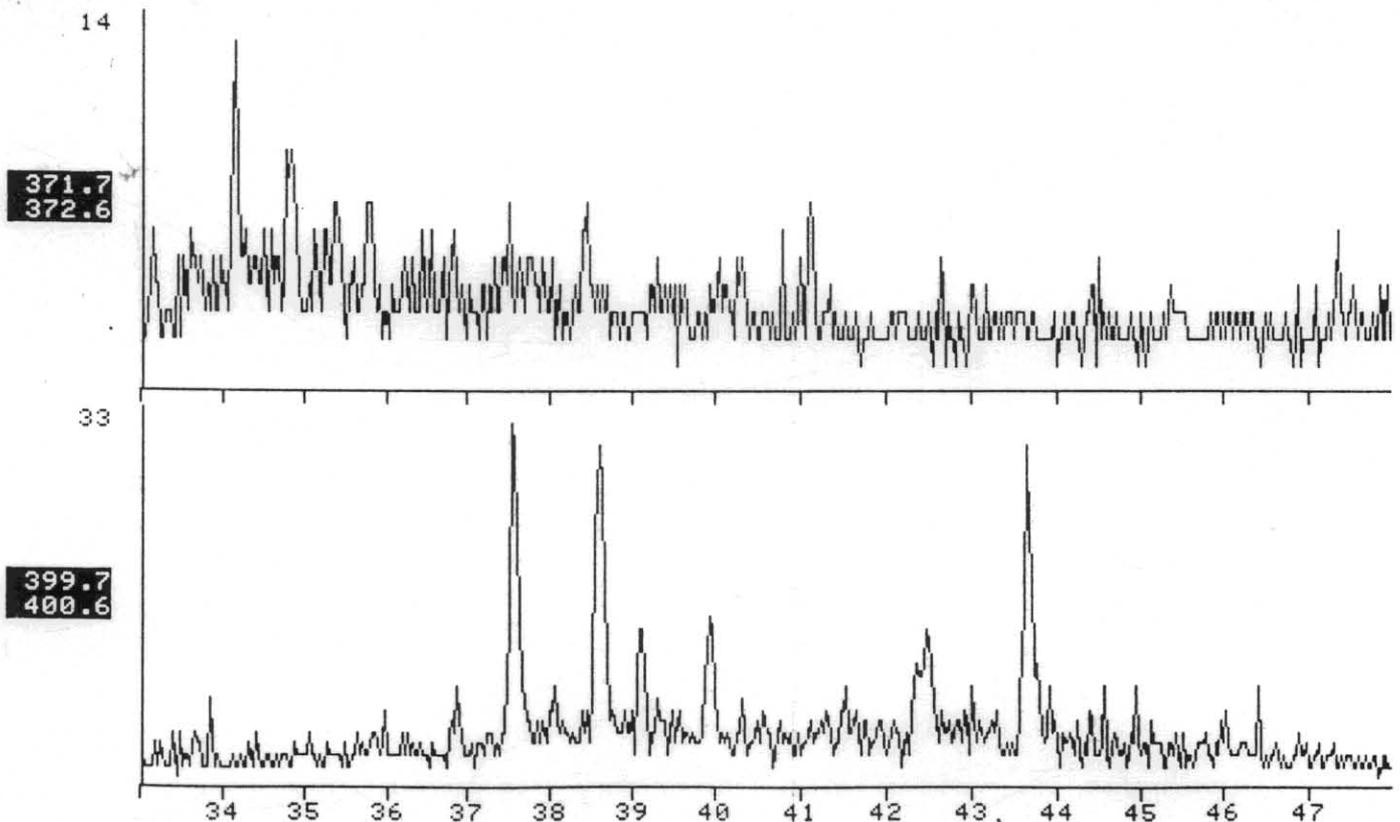
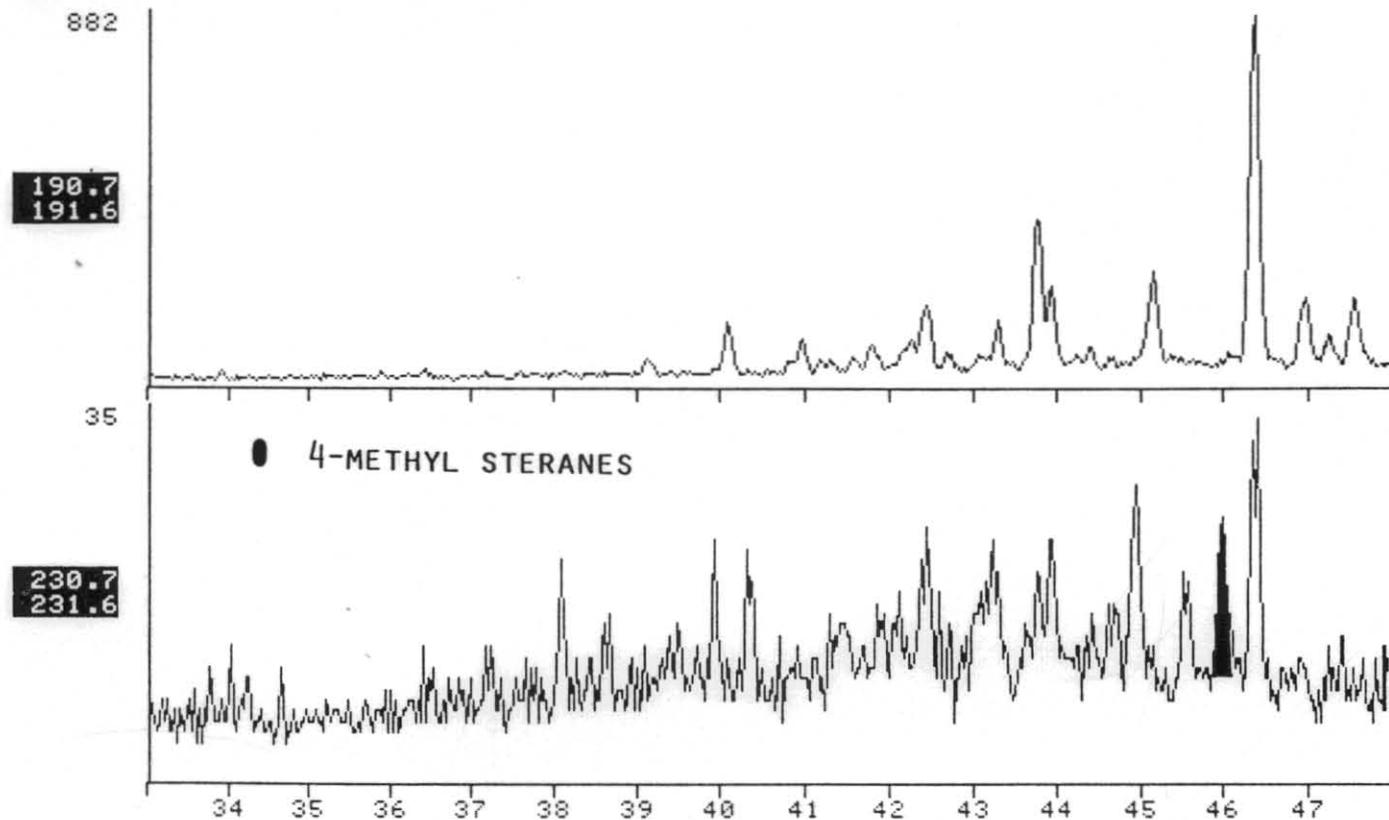


FIGURE: 2-6C

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

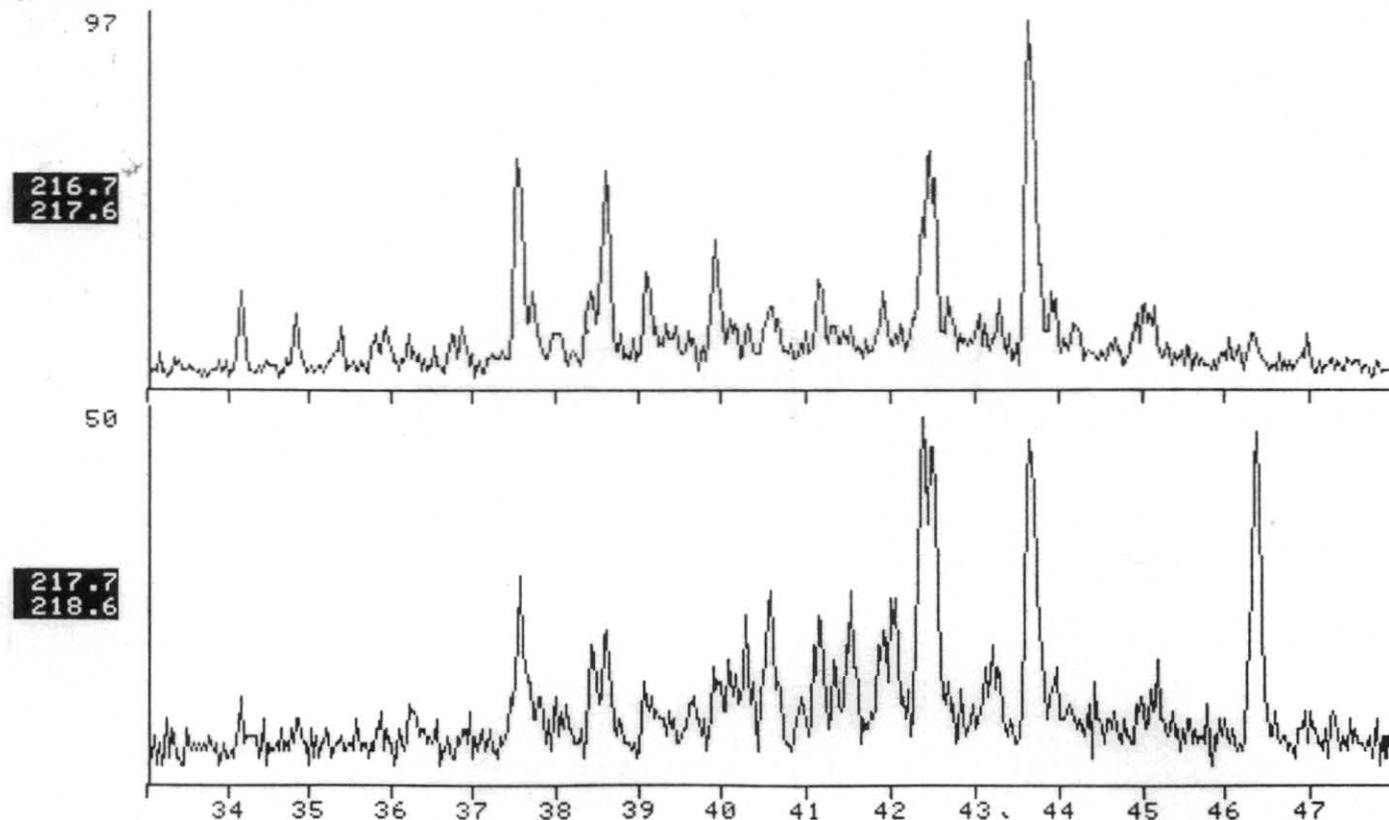
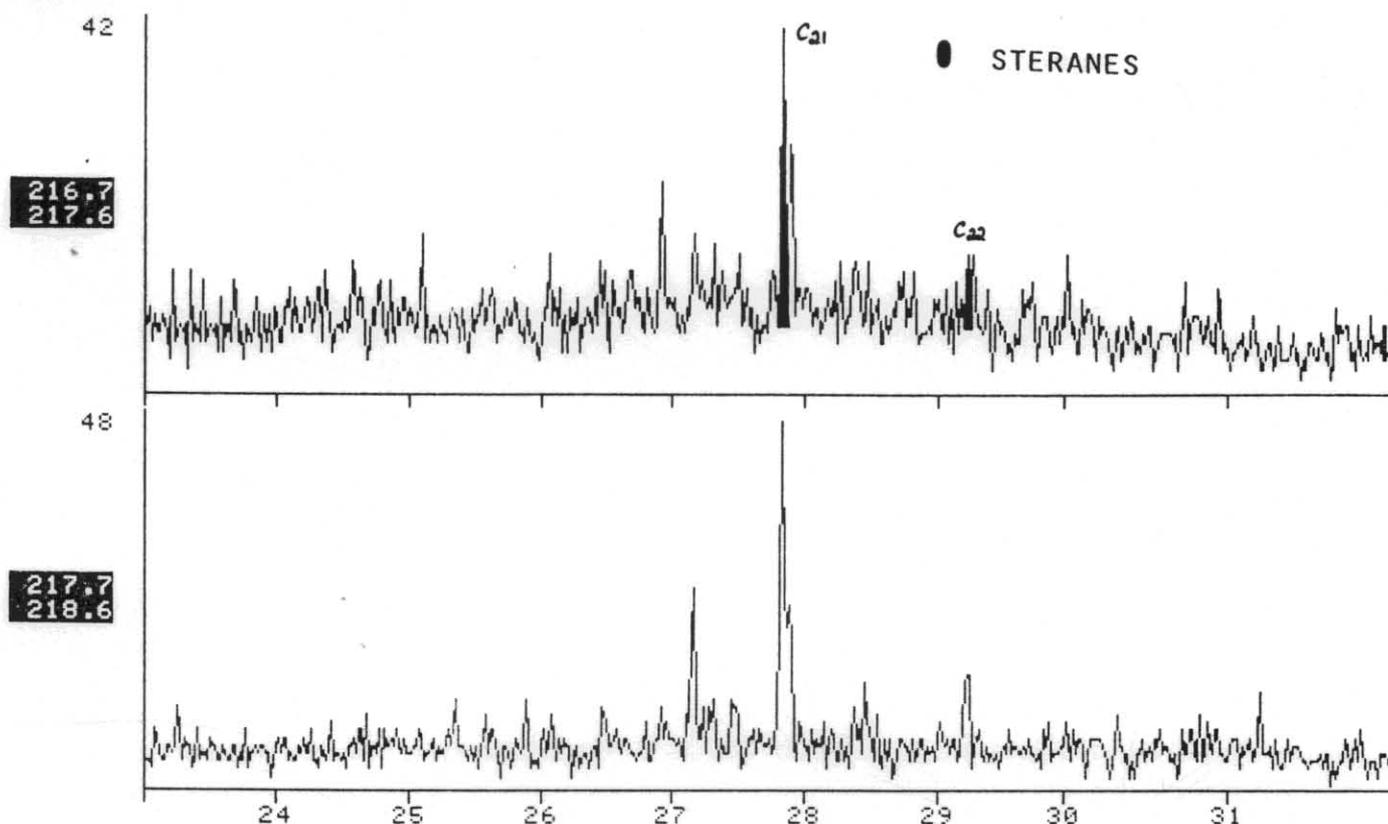


FIGURE: 2-6d

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

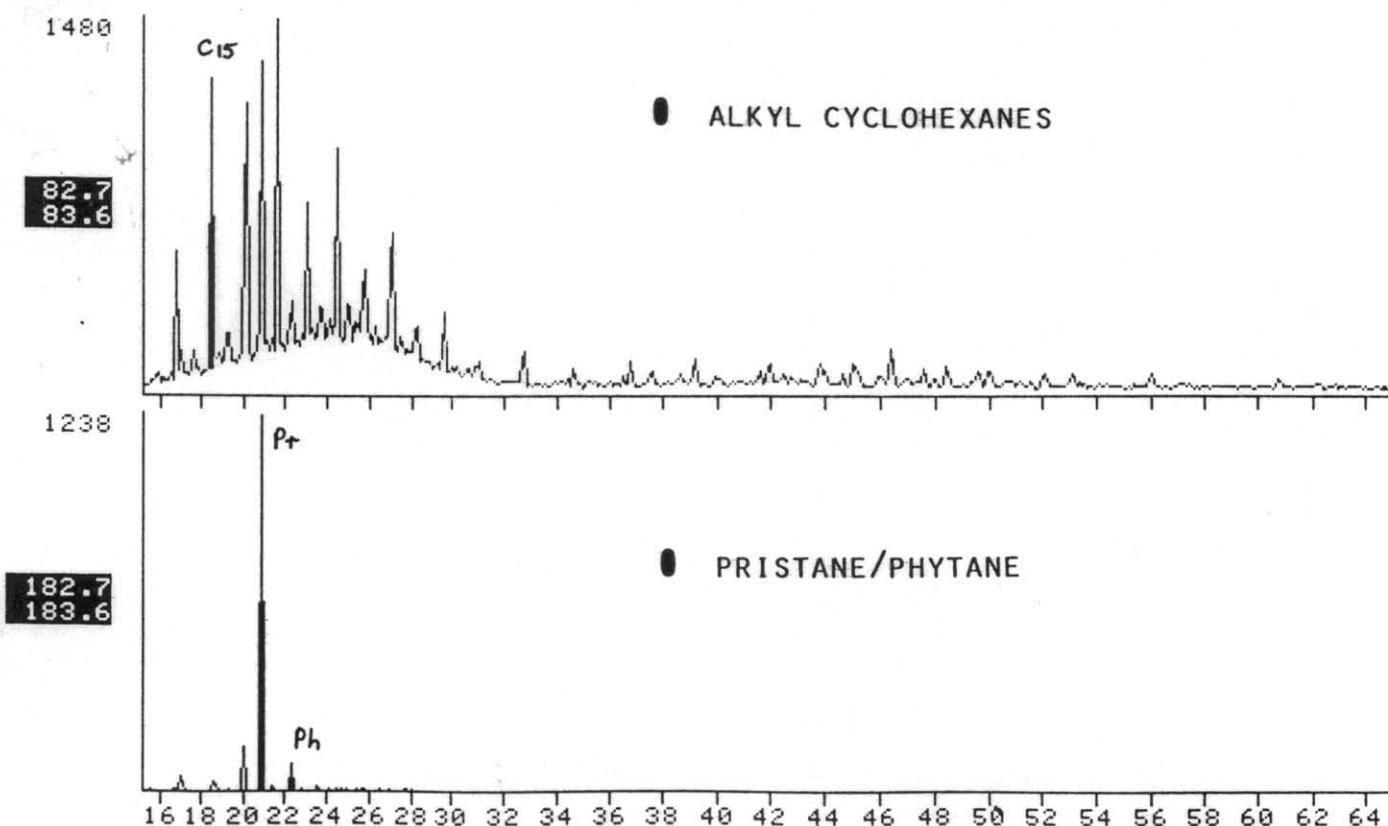
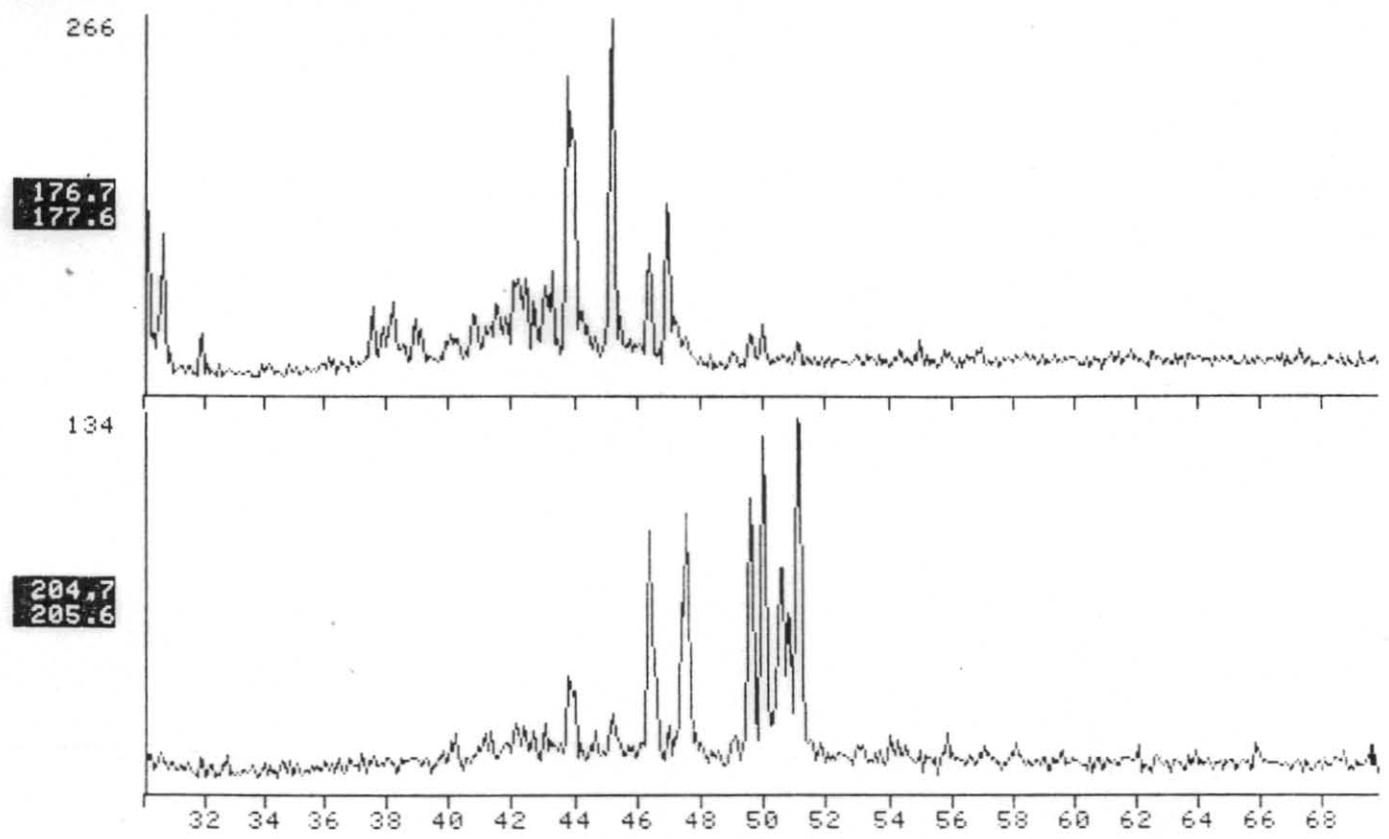


FIGURE: 2-6e

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

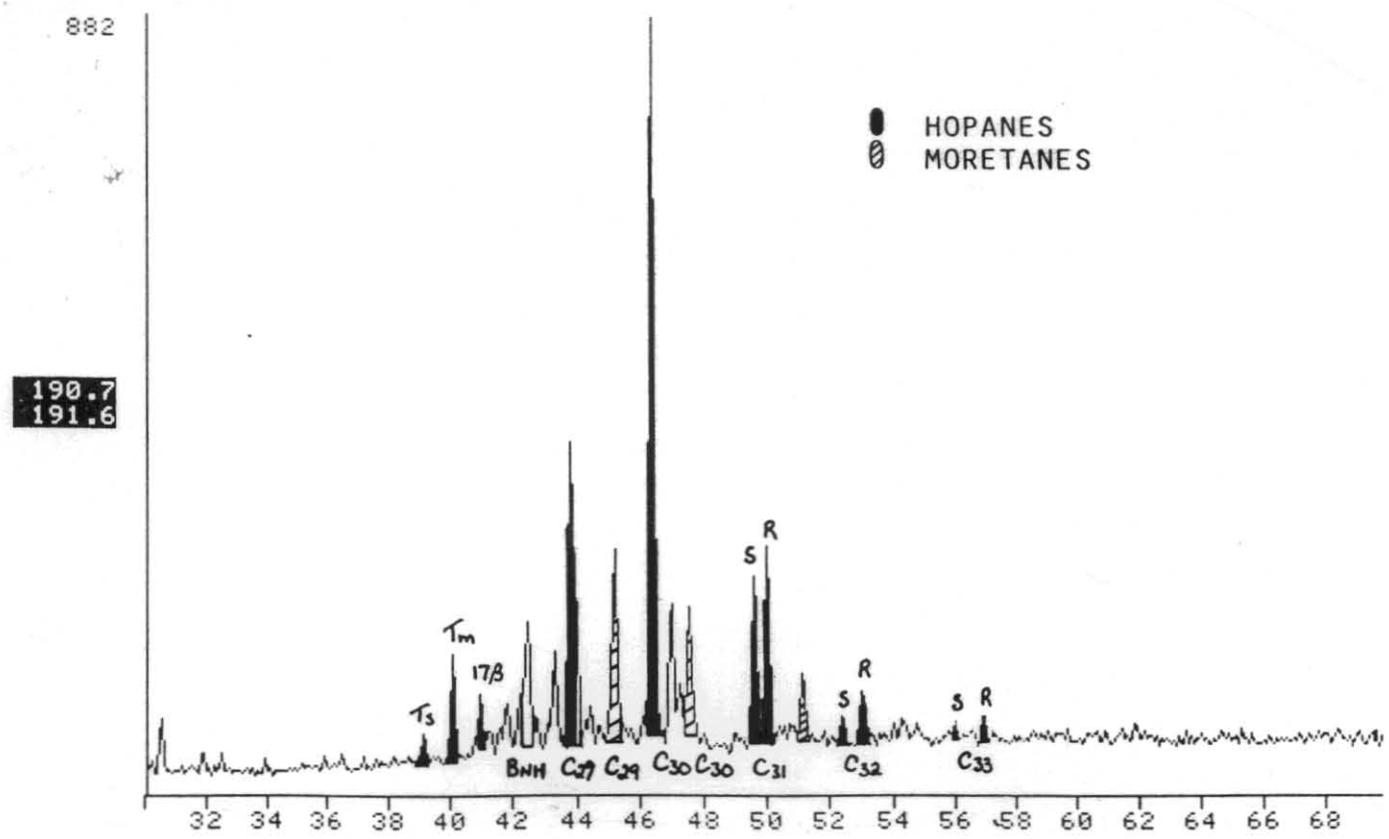
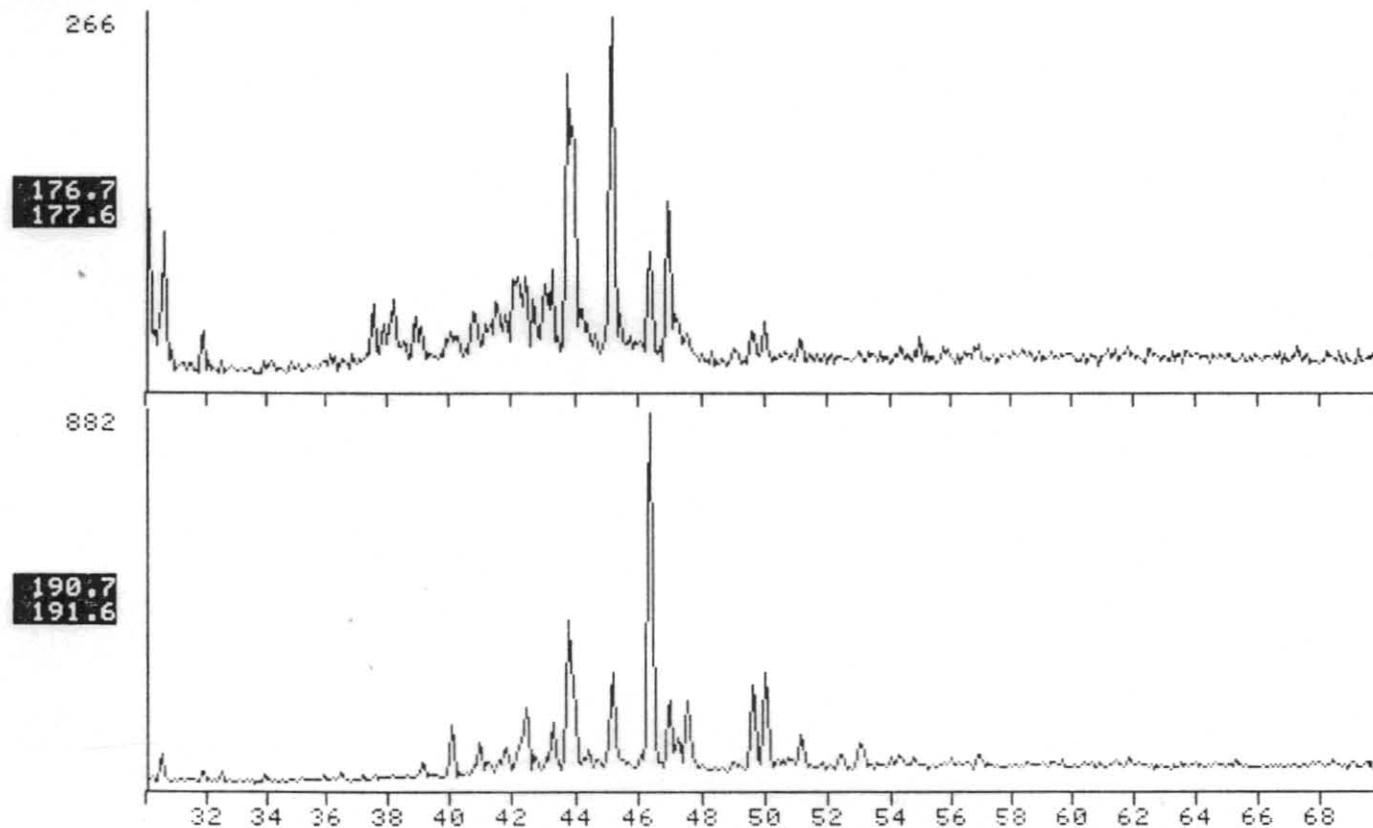


FIGURE: 2-6f

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

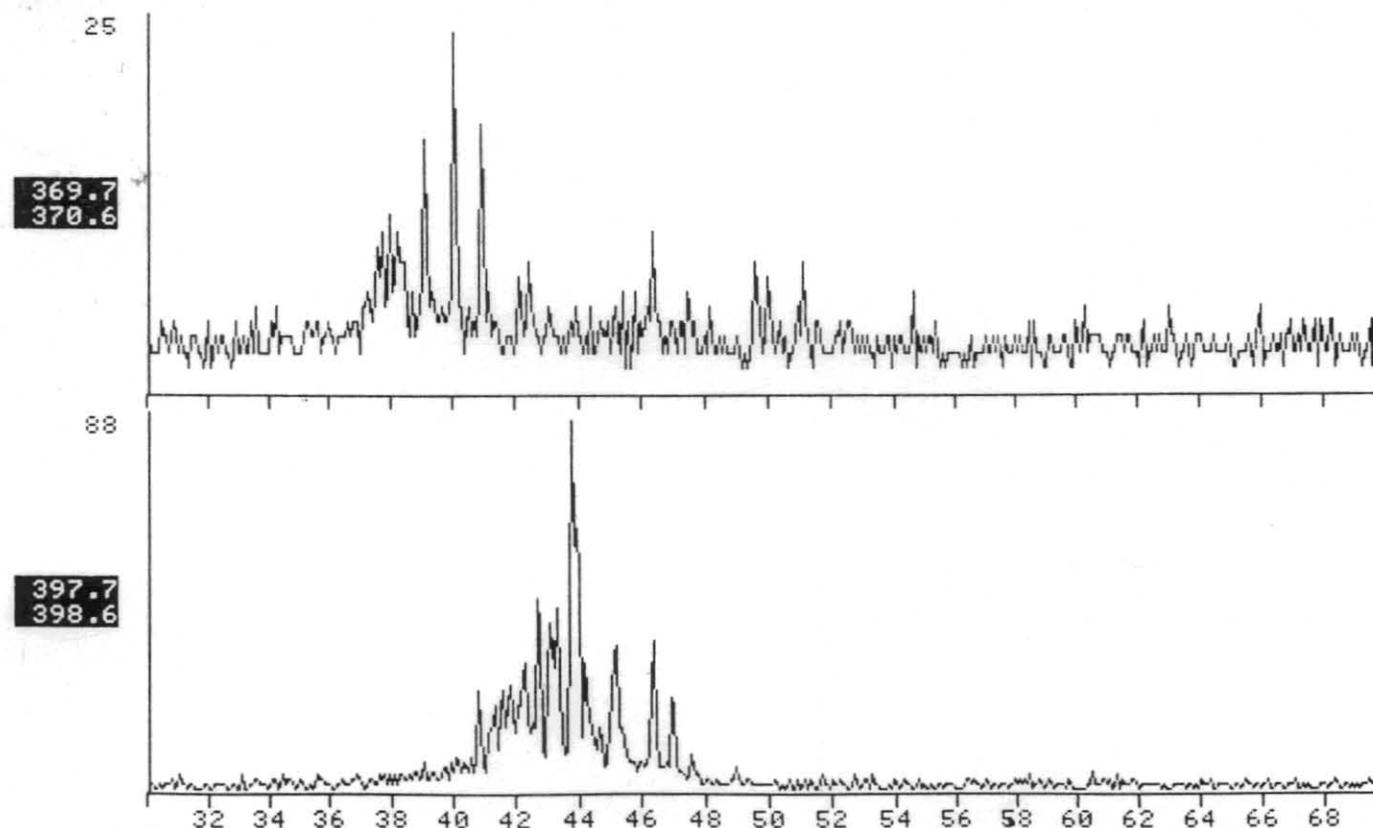
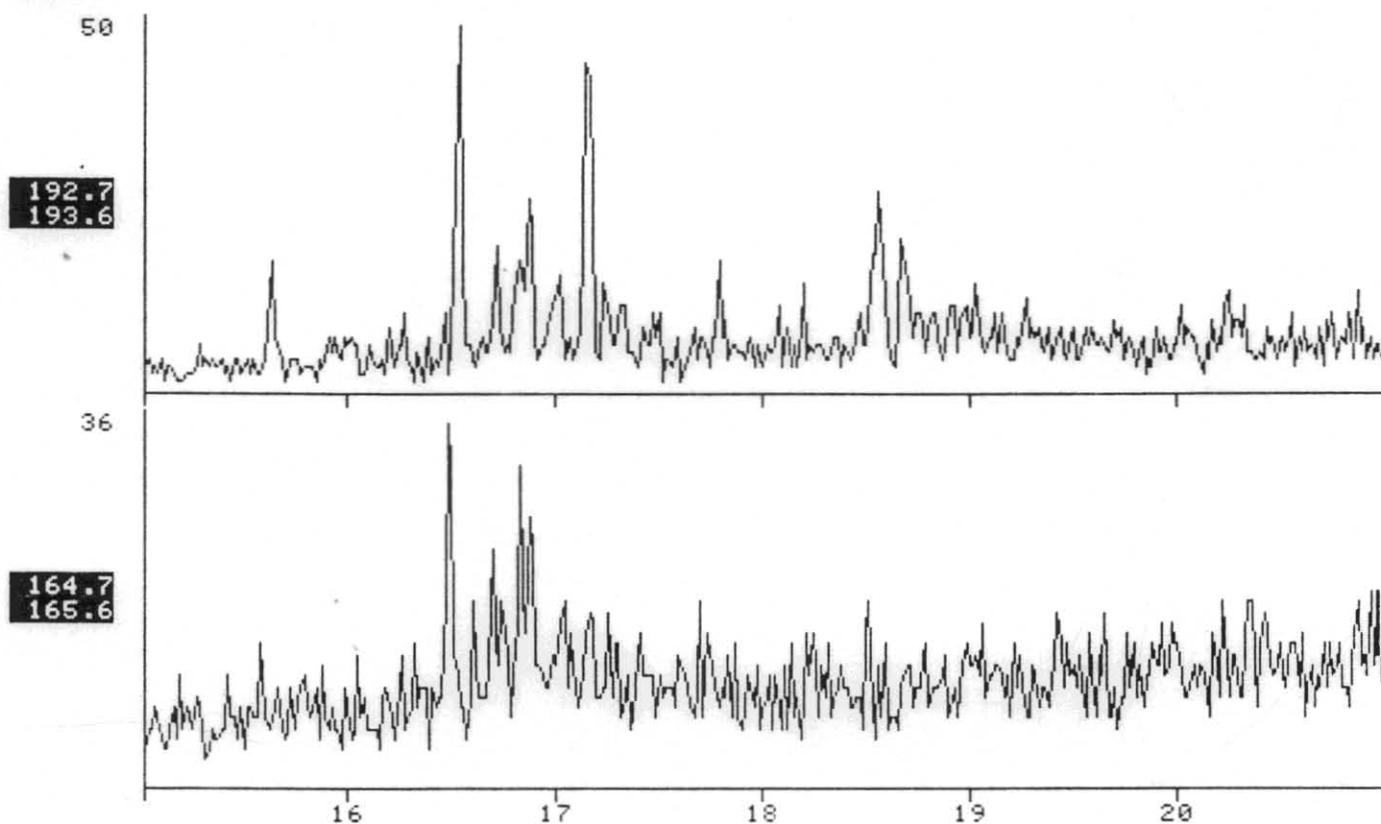


FIGURE: 2-6g

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

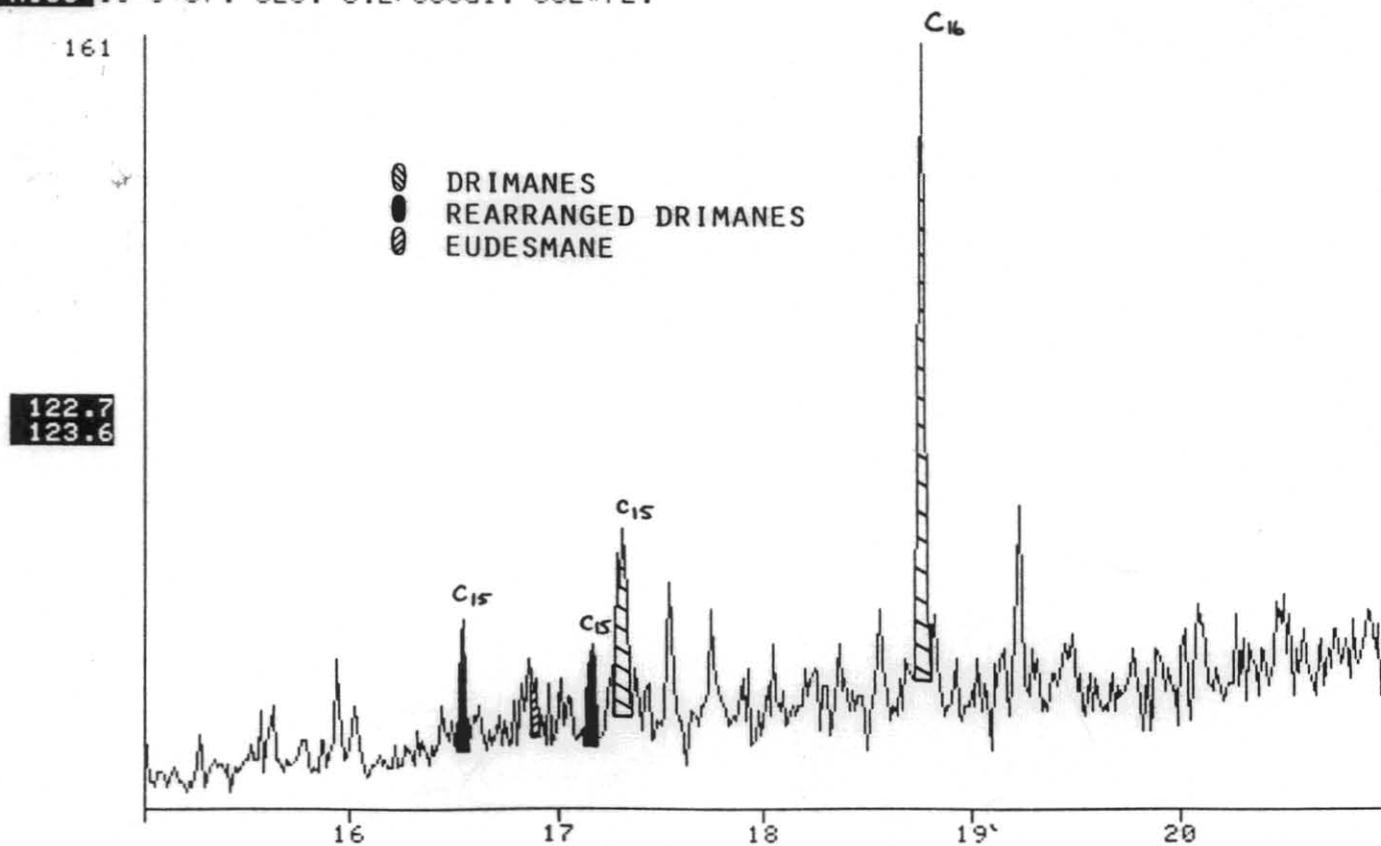
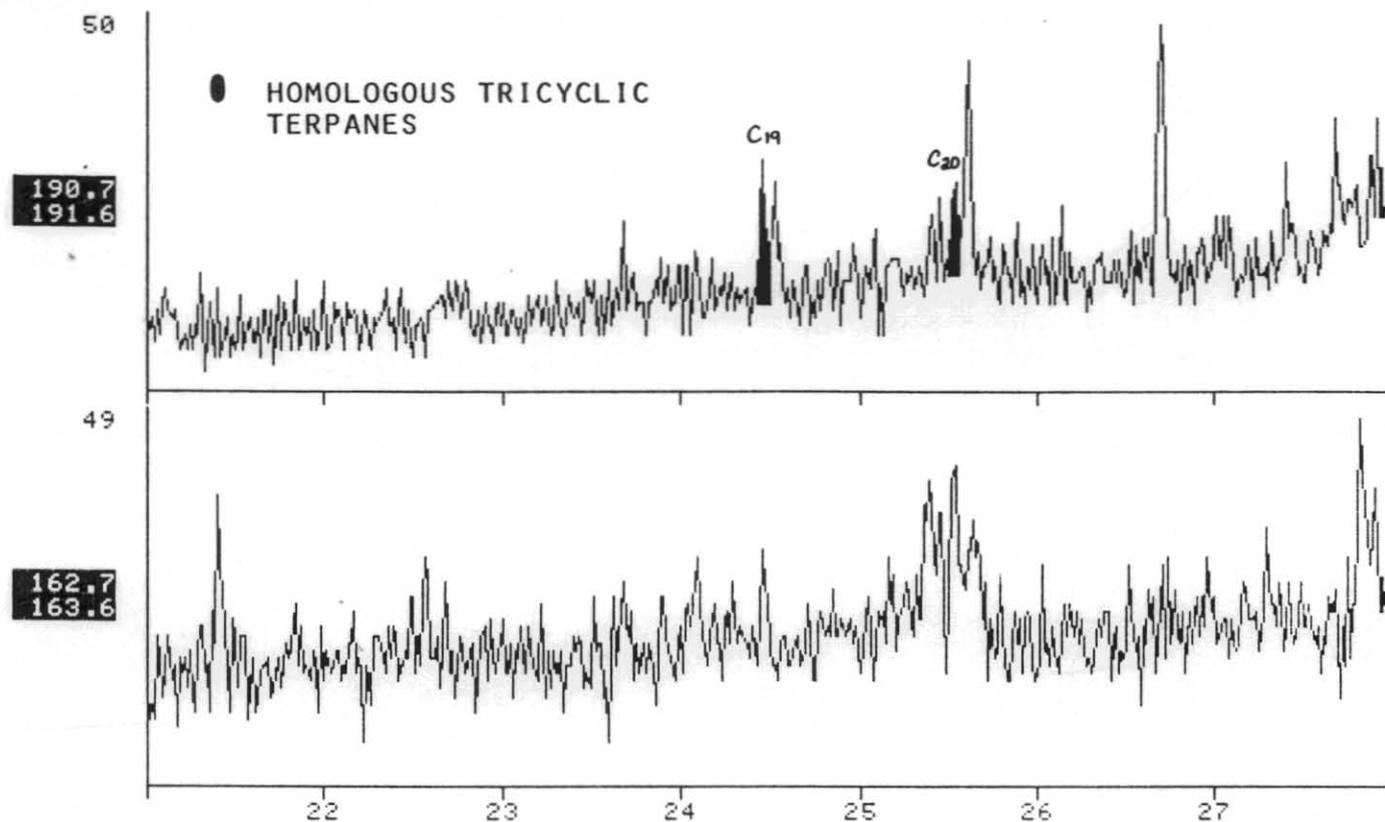


FIGURE: 2-6h

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

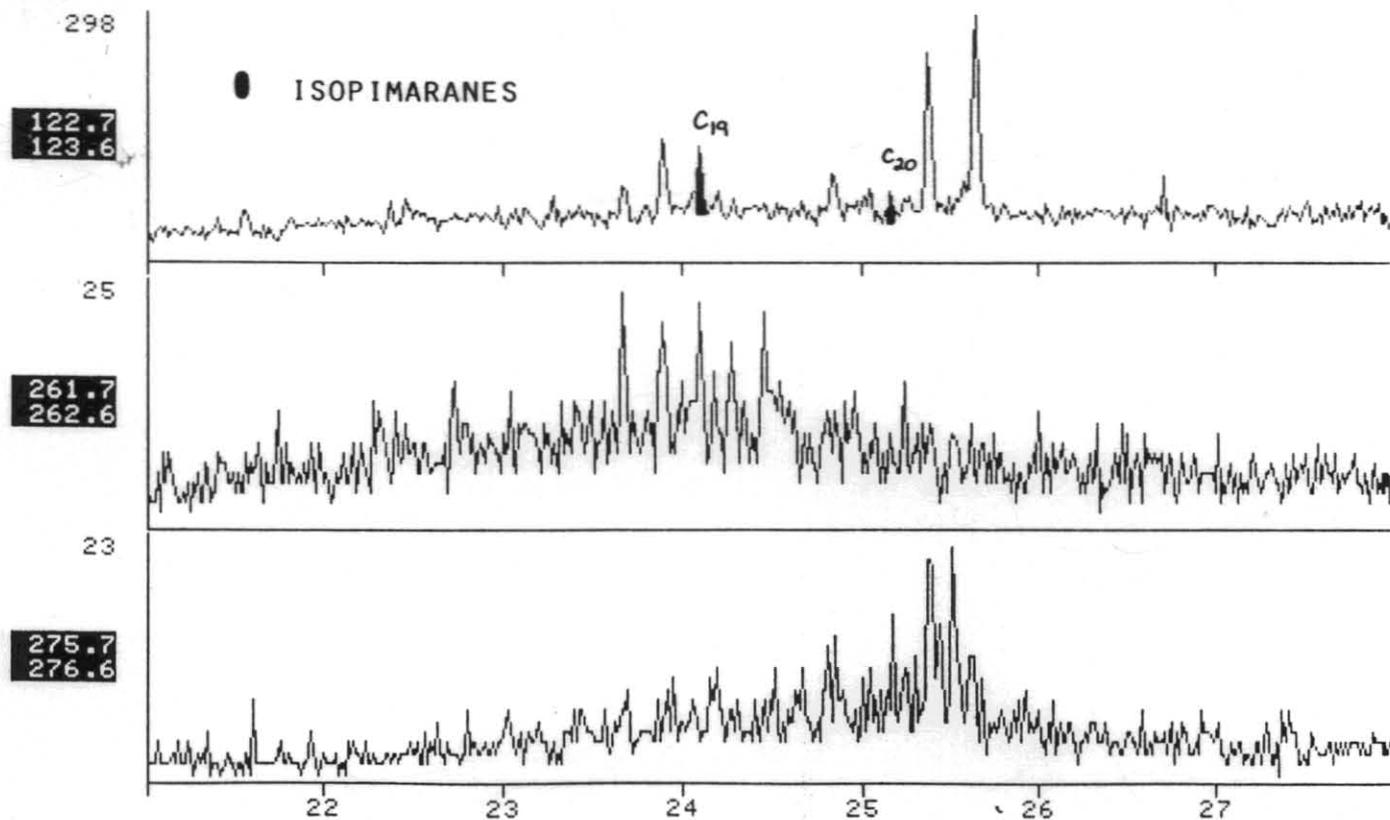
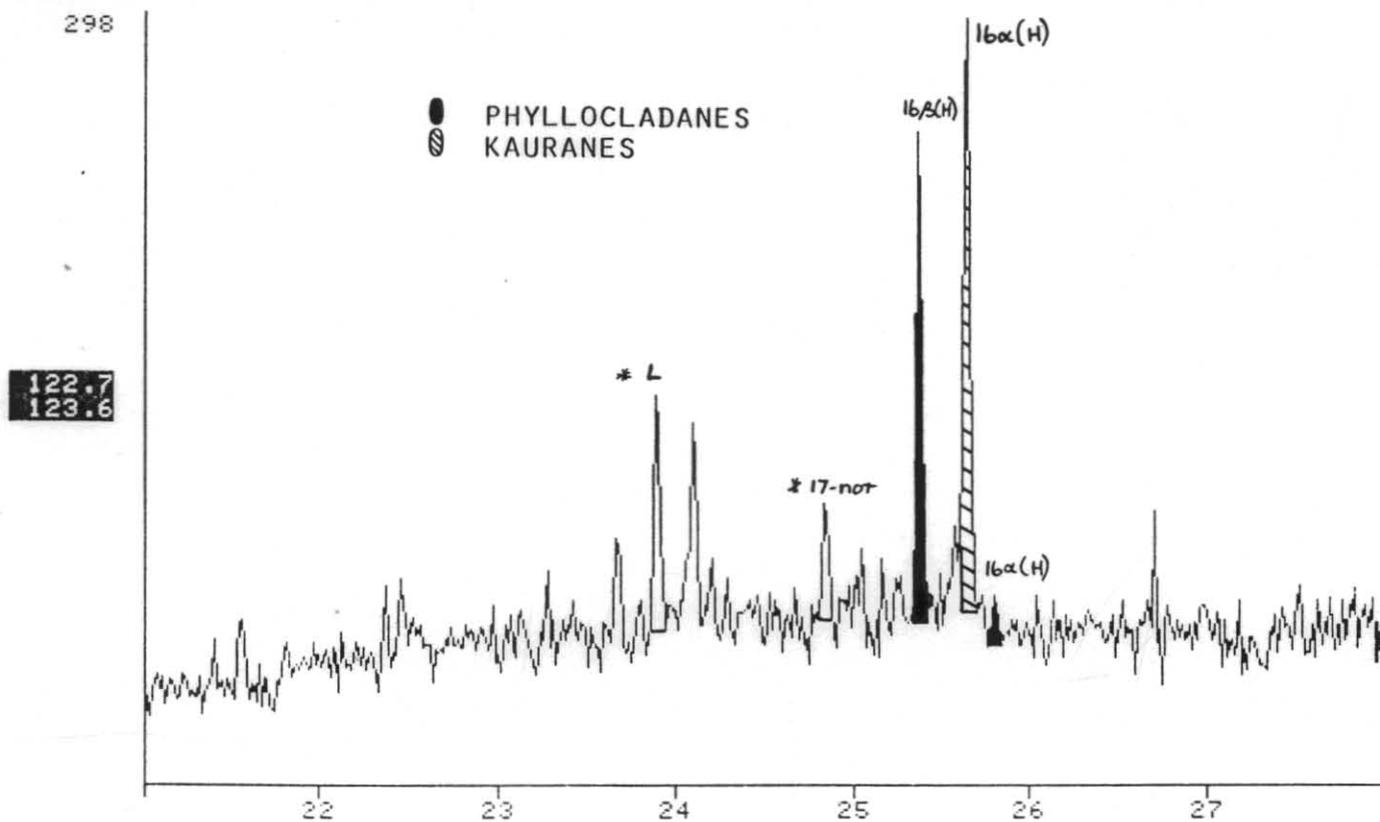


FIGURE: 2-6i

NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227



NAME BASS#2, 5509'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 18-3-87. GEC. 0.2/330ul. COL#72.

FRN 6227

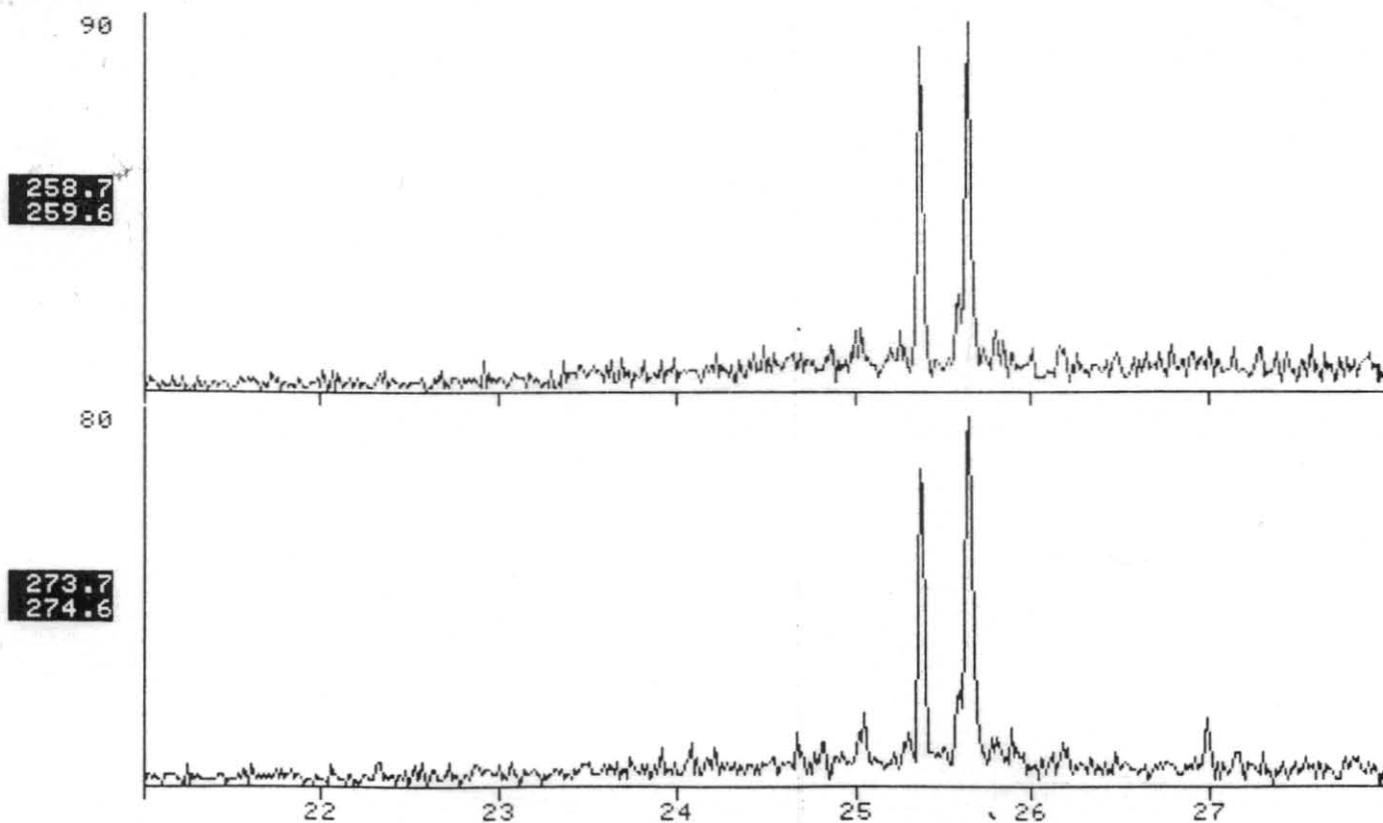
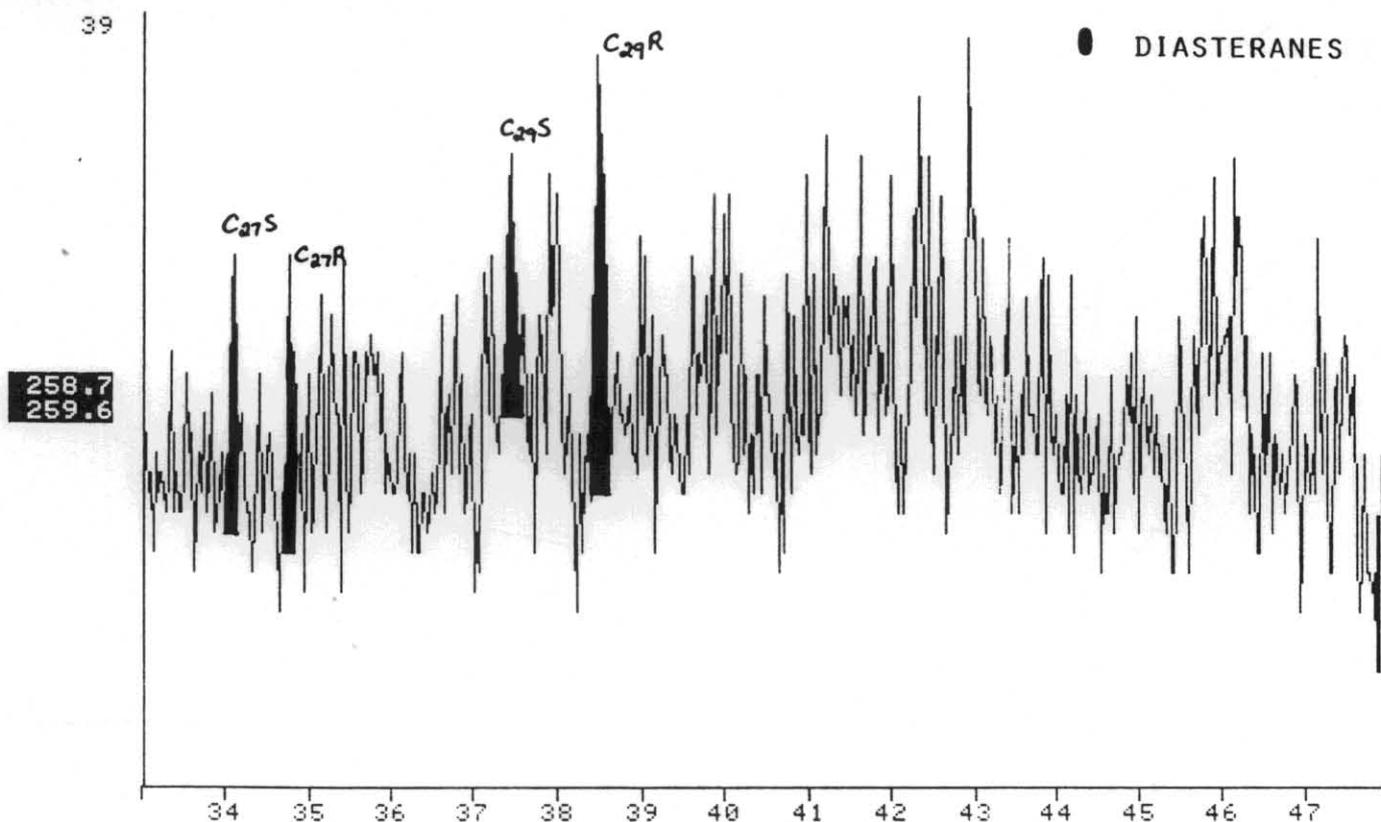


FIGURE: 2-7a

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

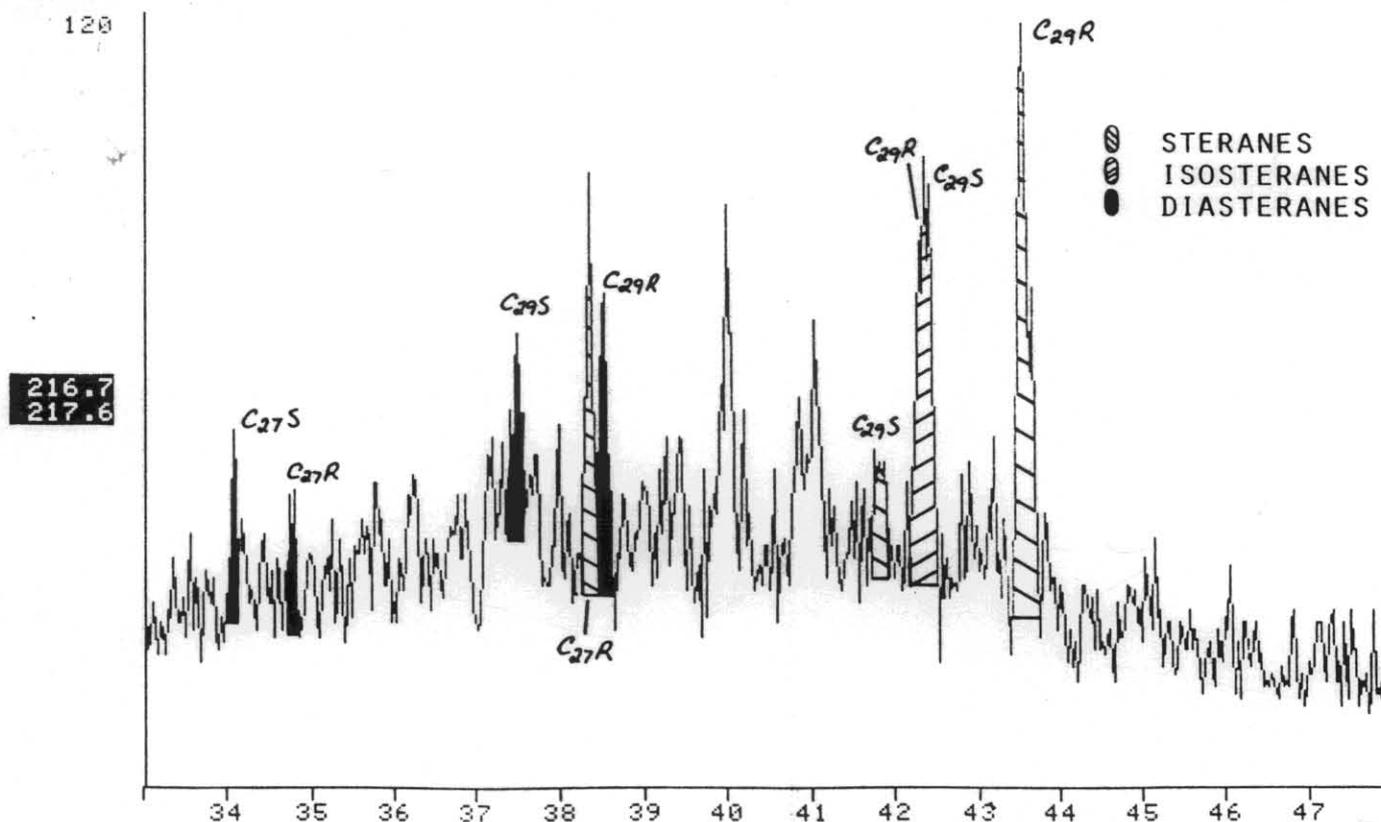
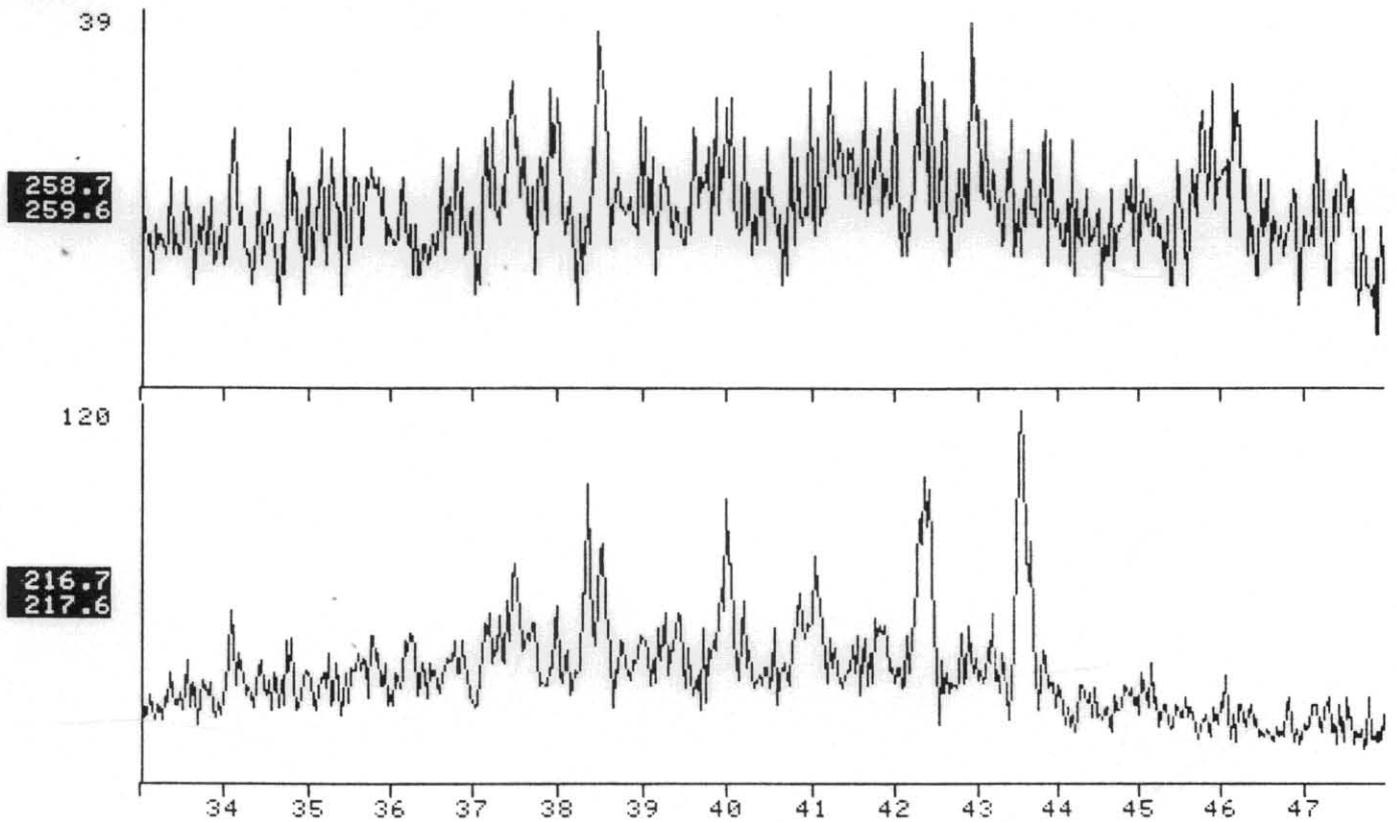


FIGURE: 2-7b

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

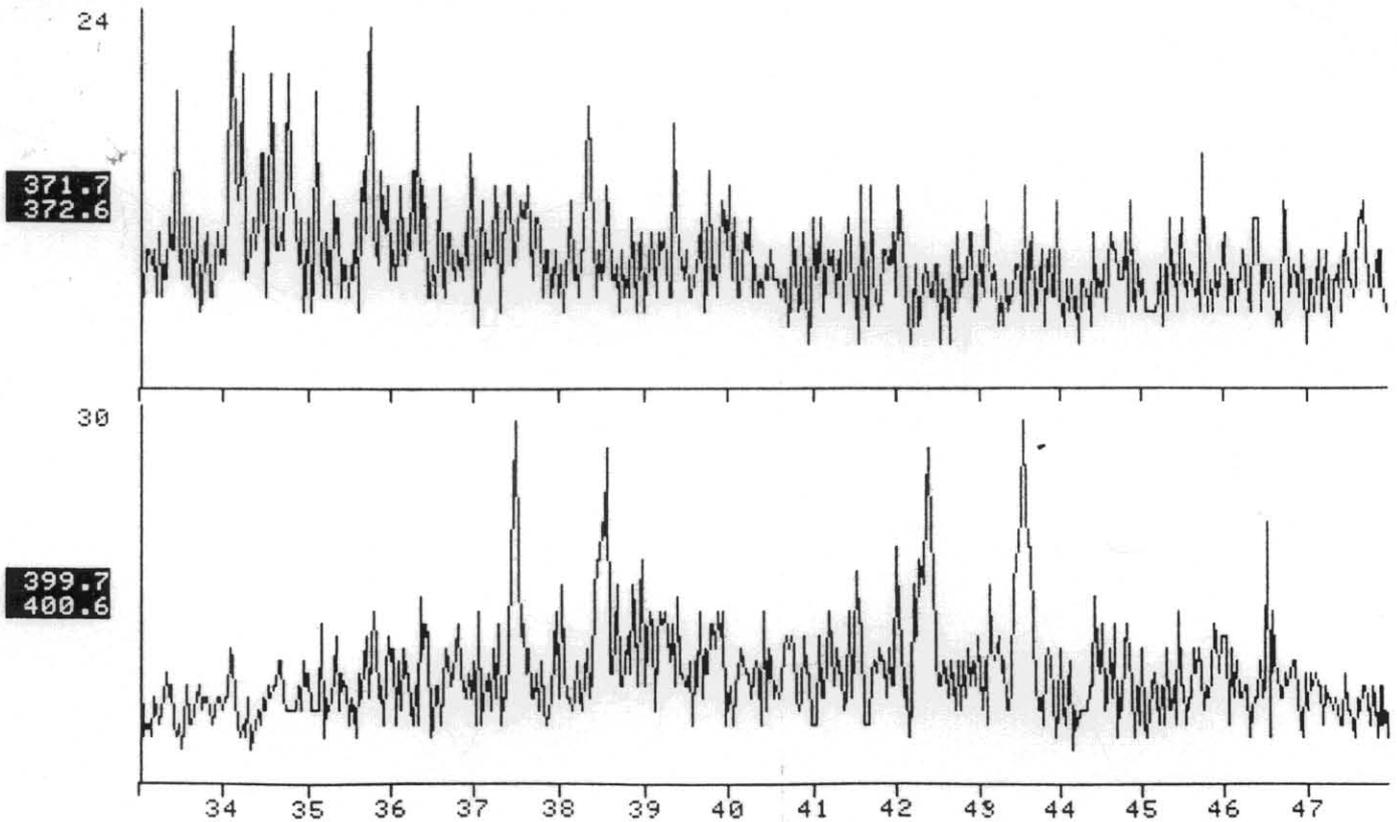
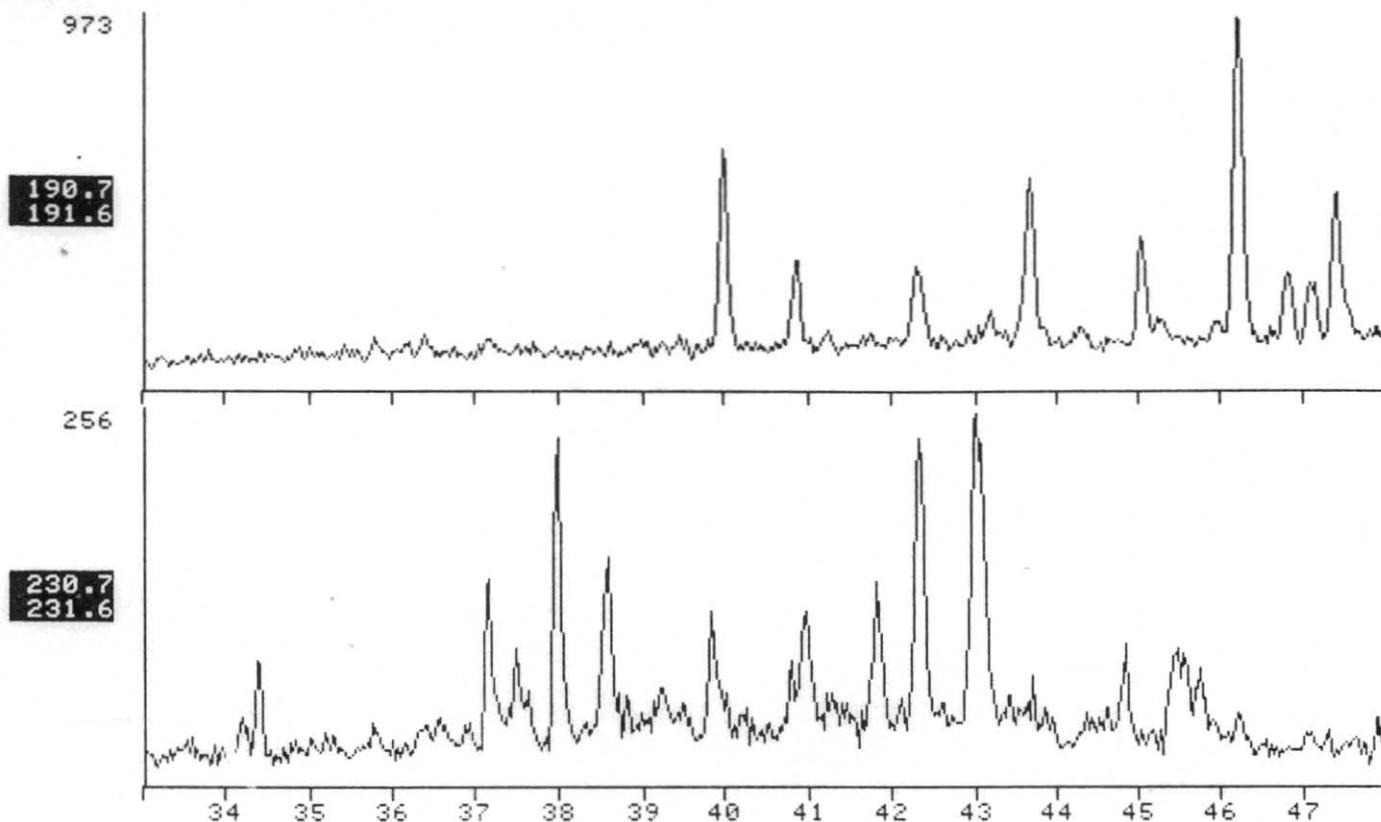


FIGURE: 2-7c

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

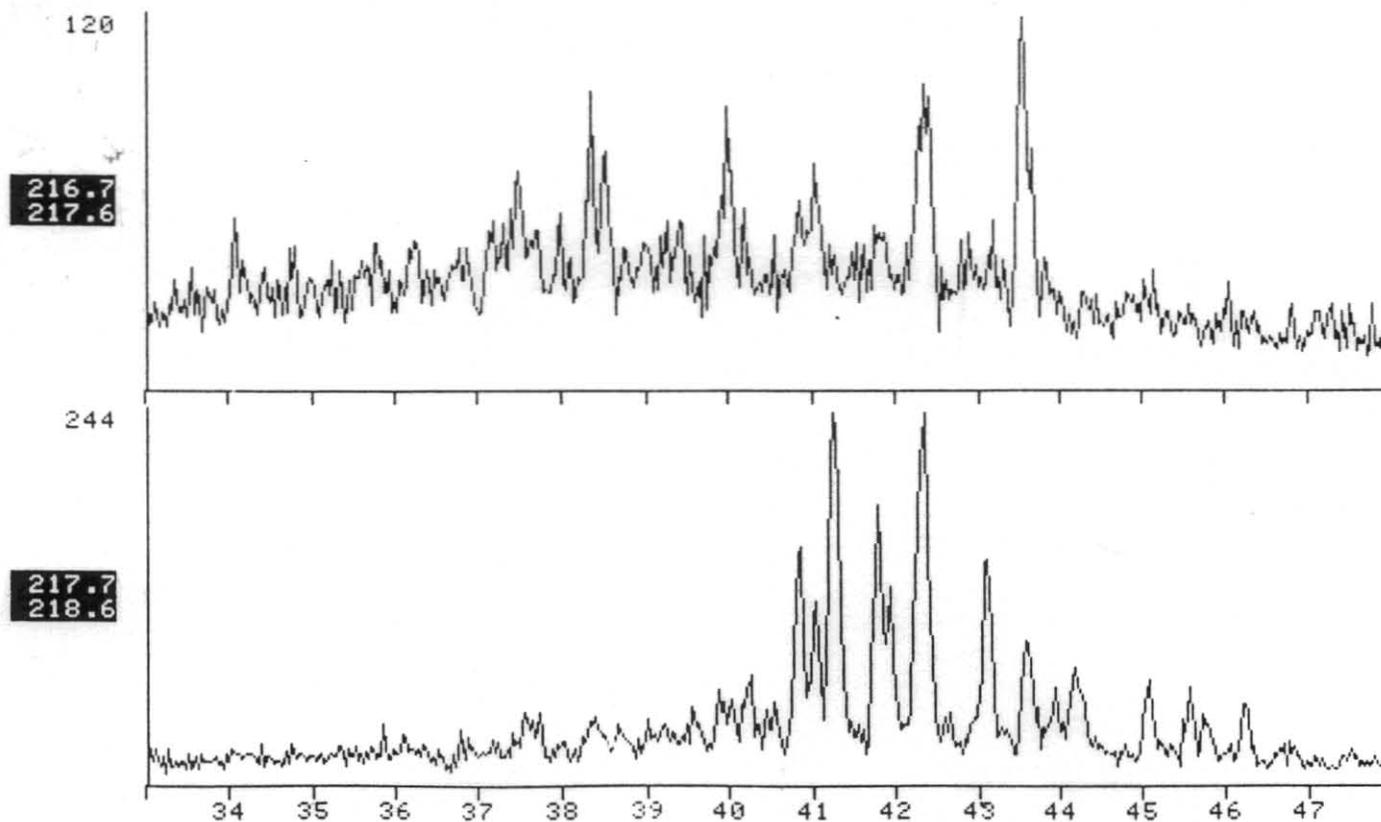
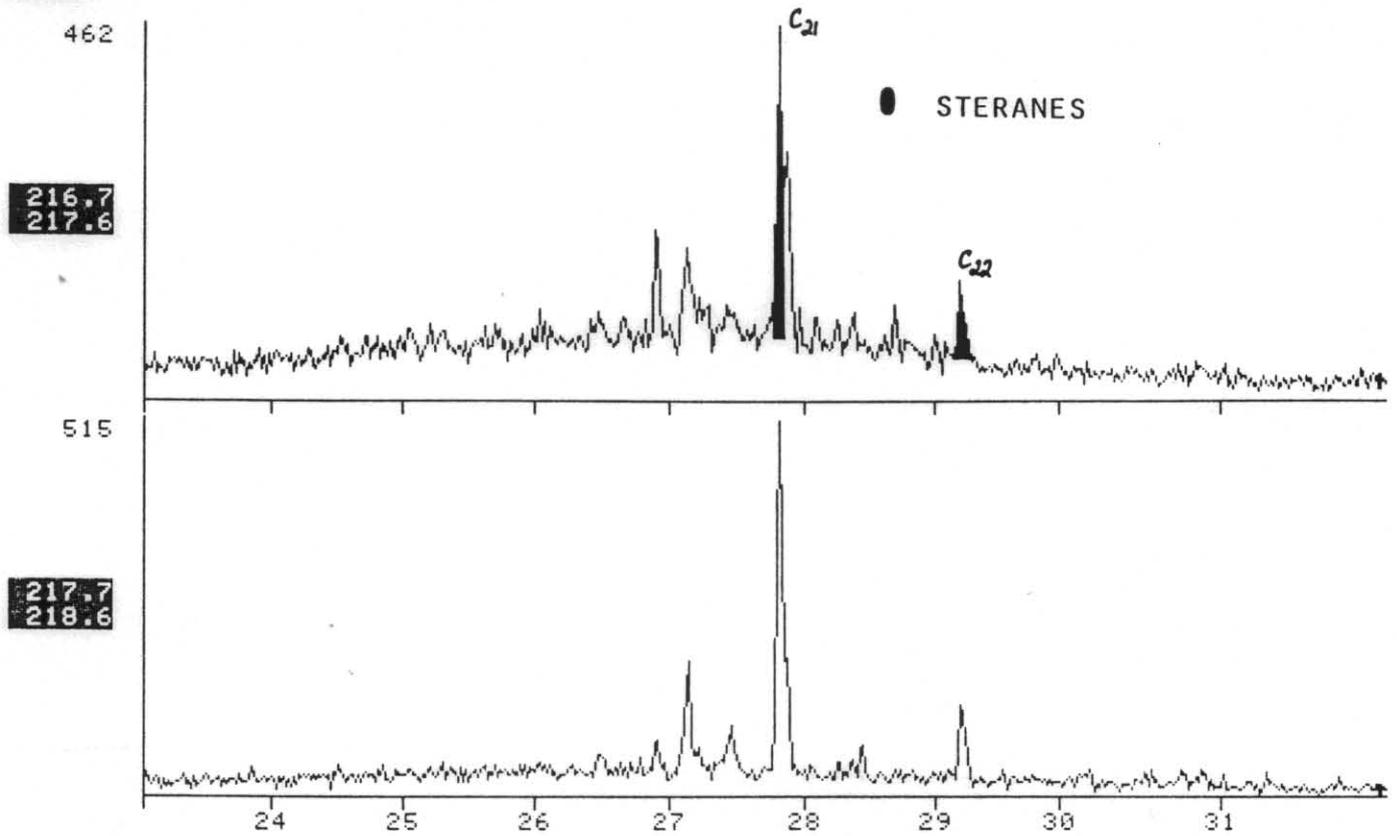


FIGURE: 2-7d

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

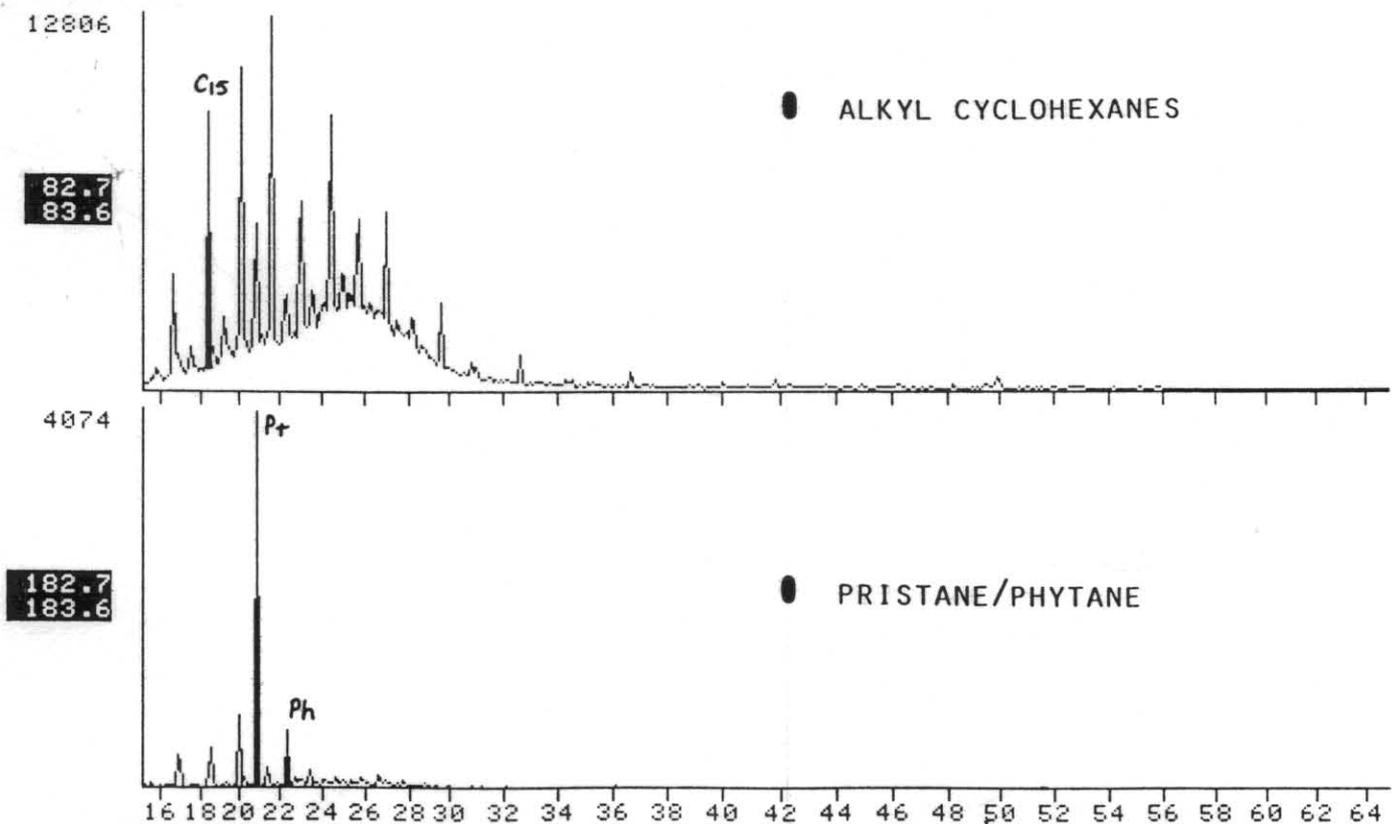
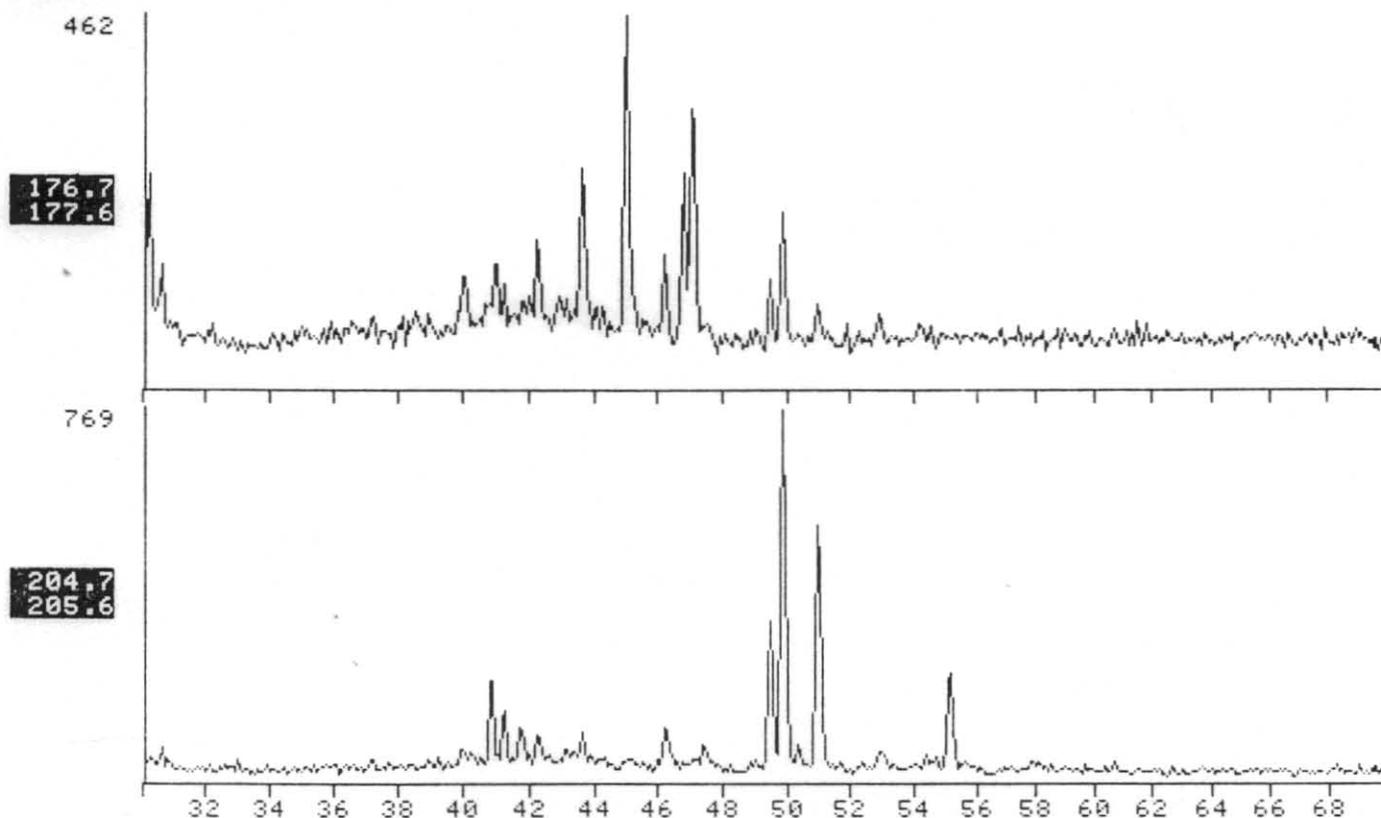


FIGURE: 2-7e

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

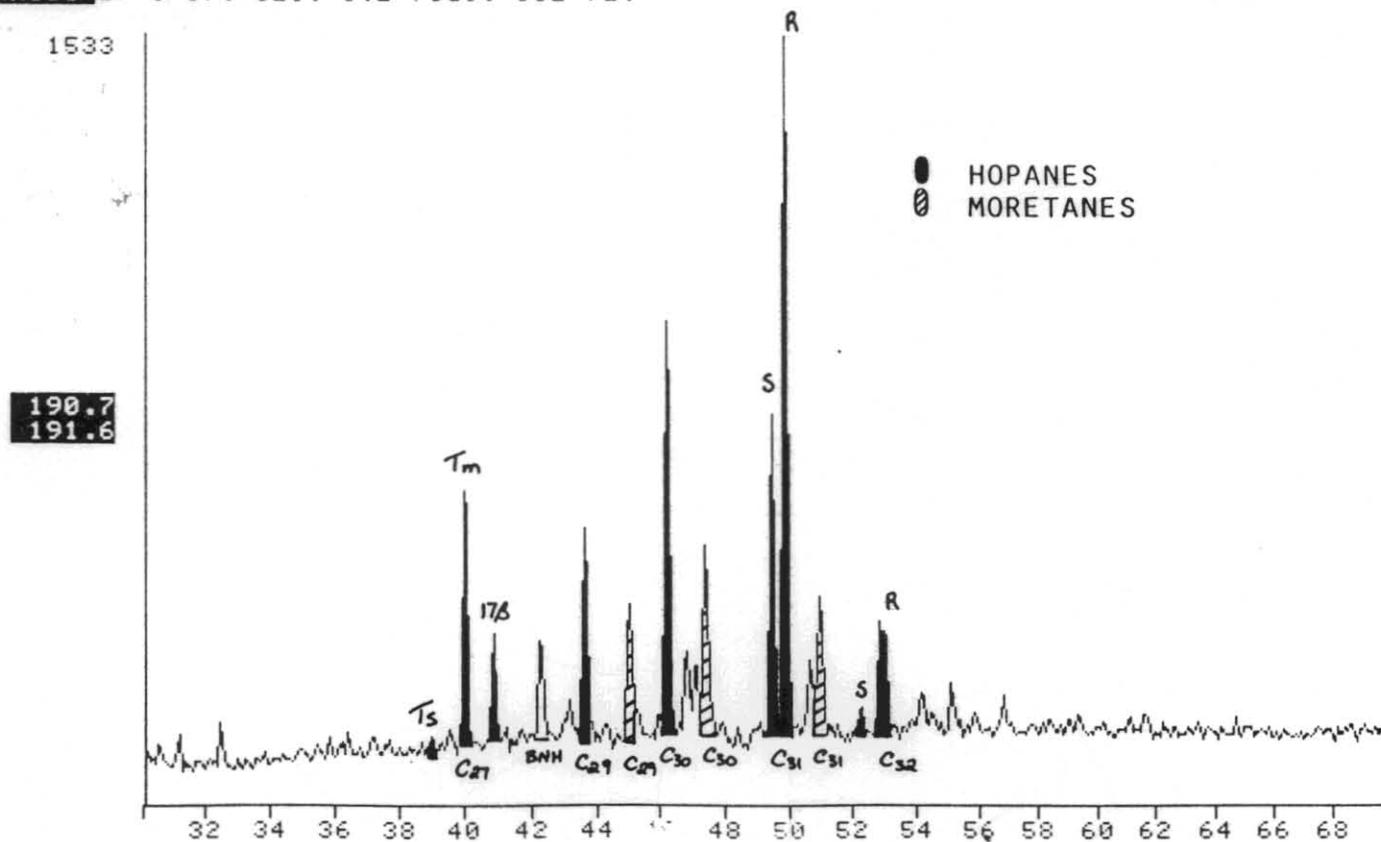
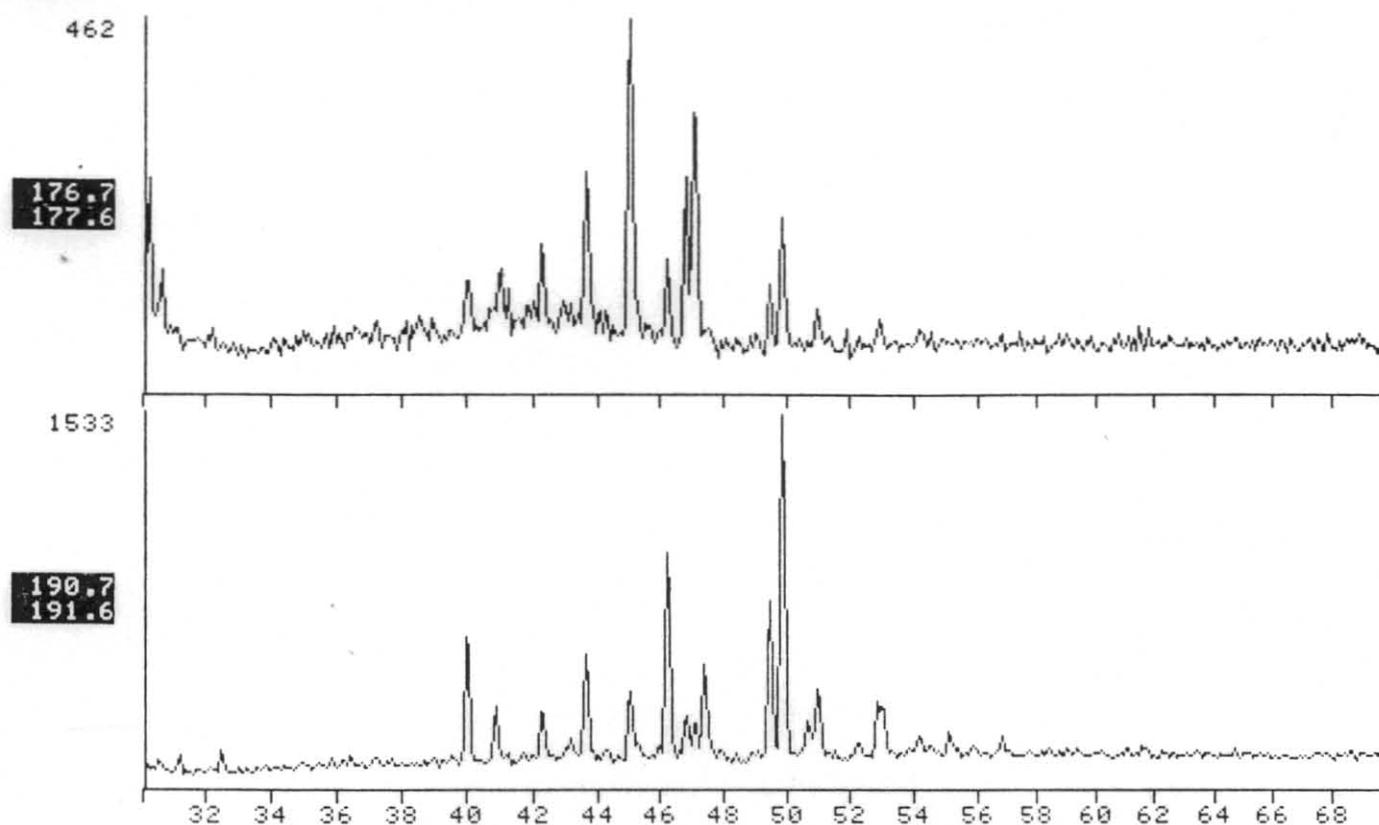


FIGURE: 2-7f

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

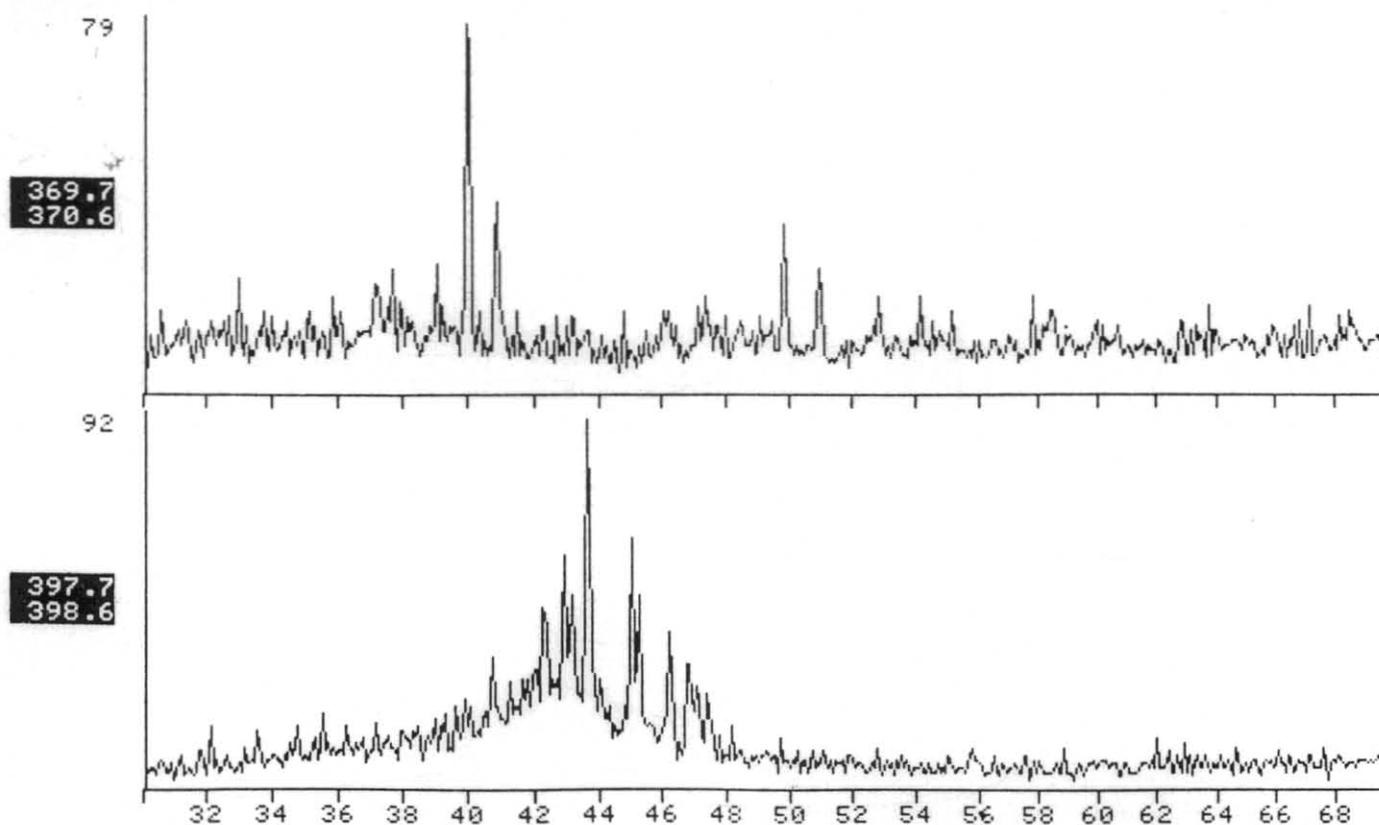
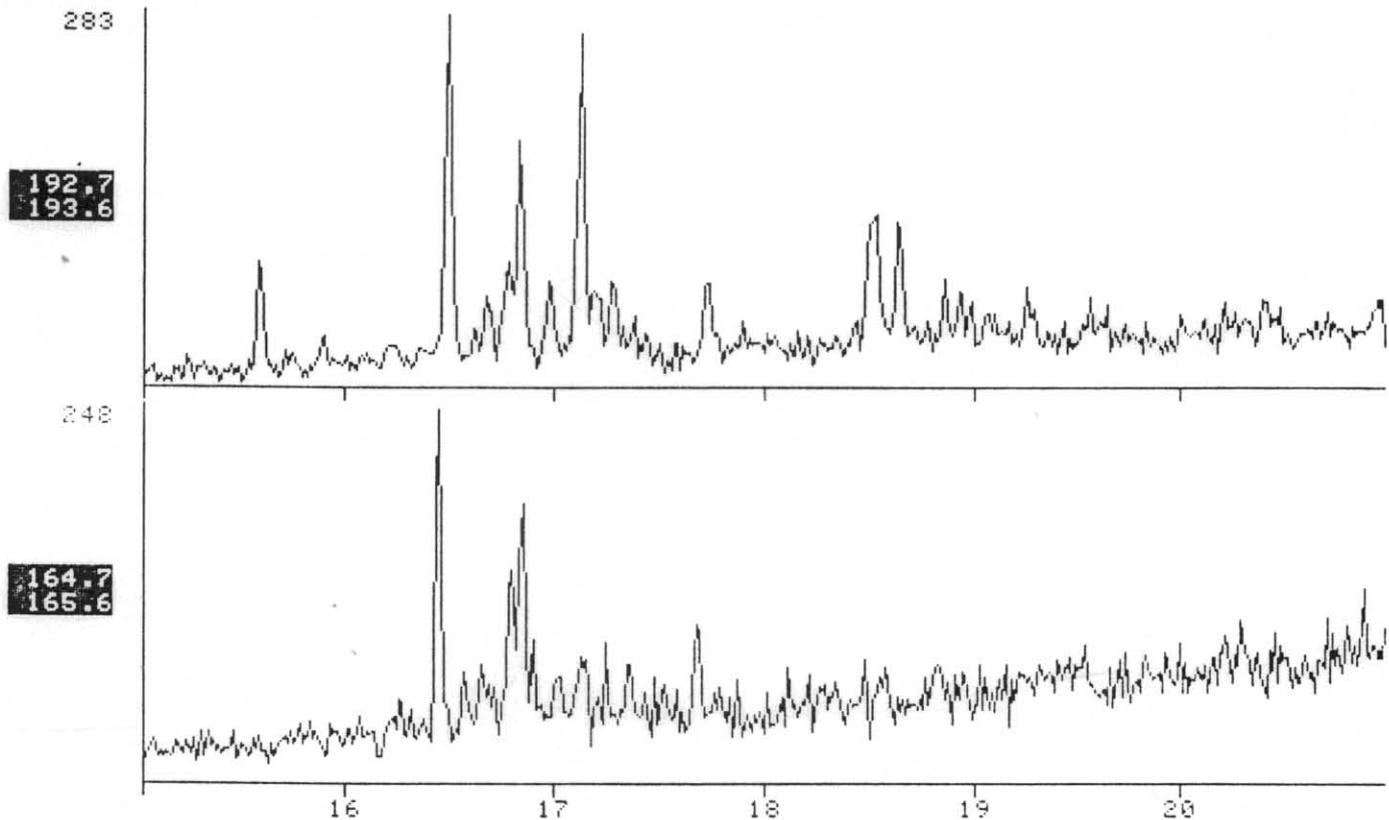


FIGURE: 2-7g

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

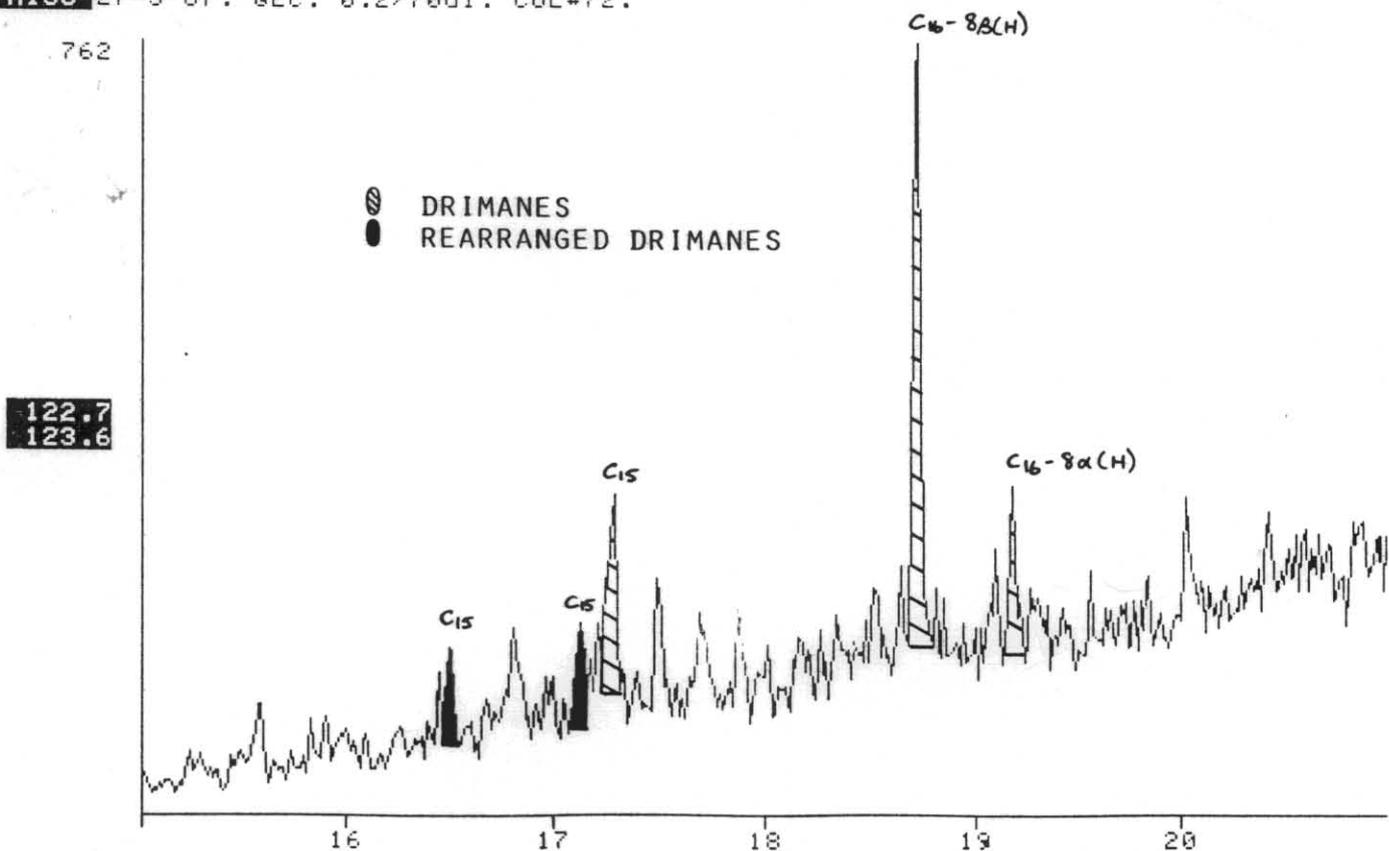
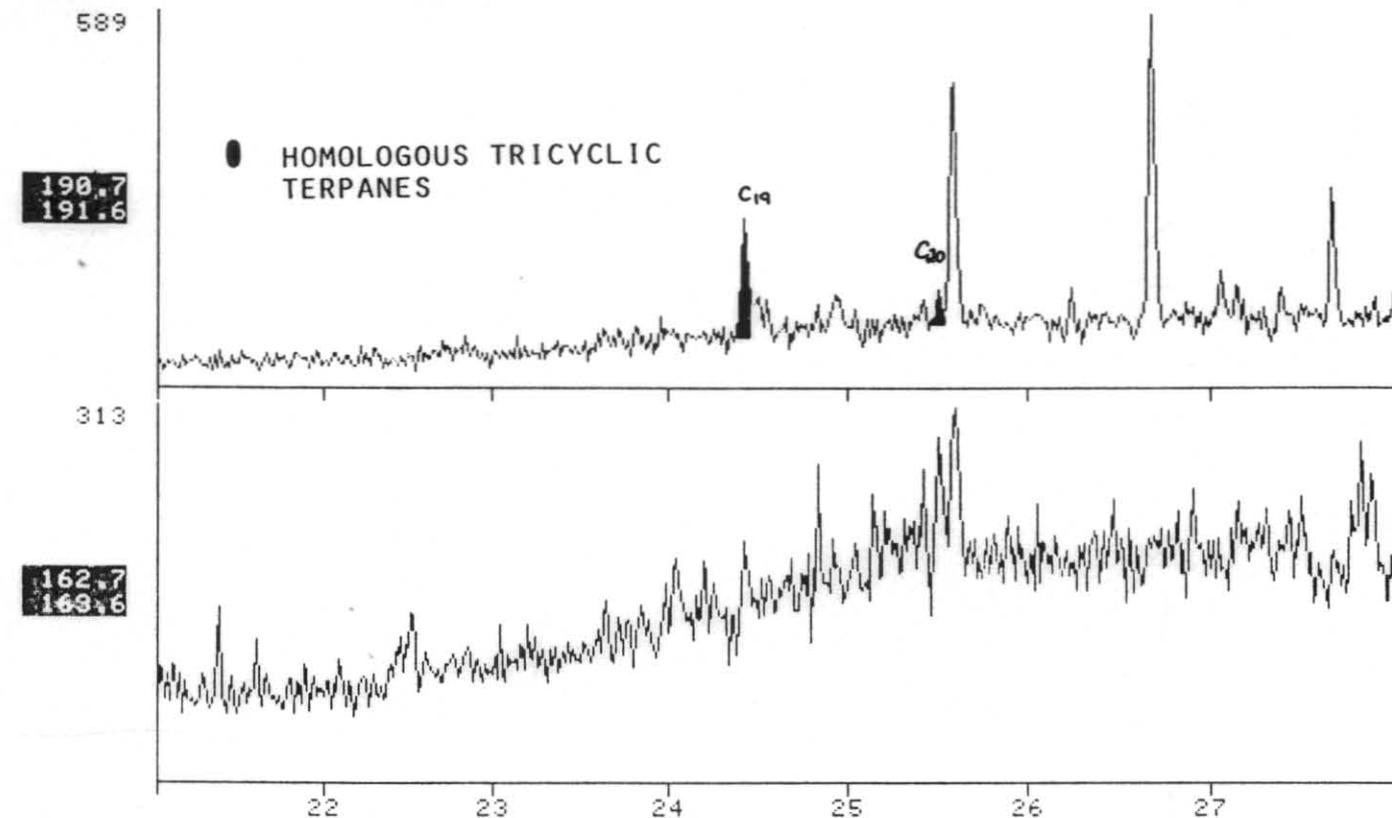


FIGURE: 2-7h

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

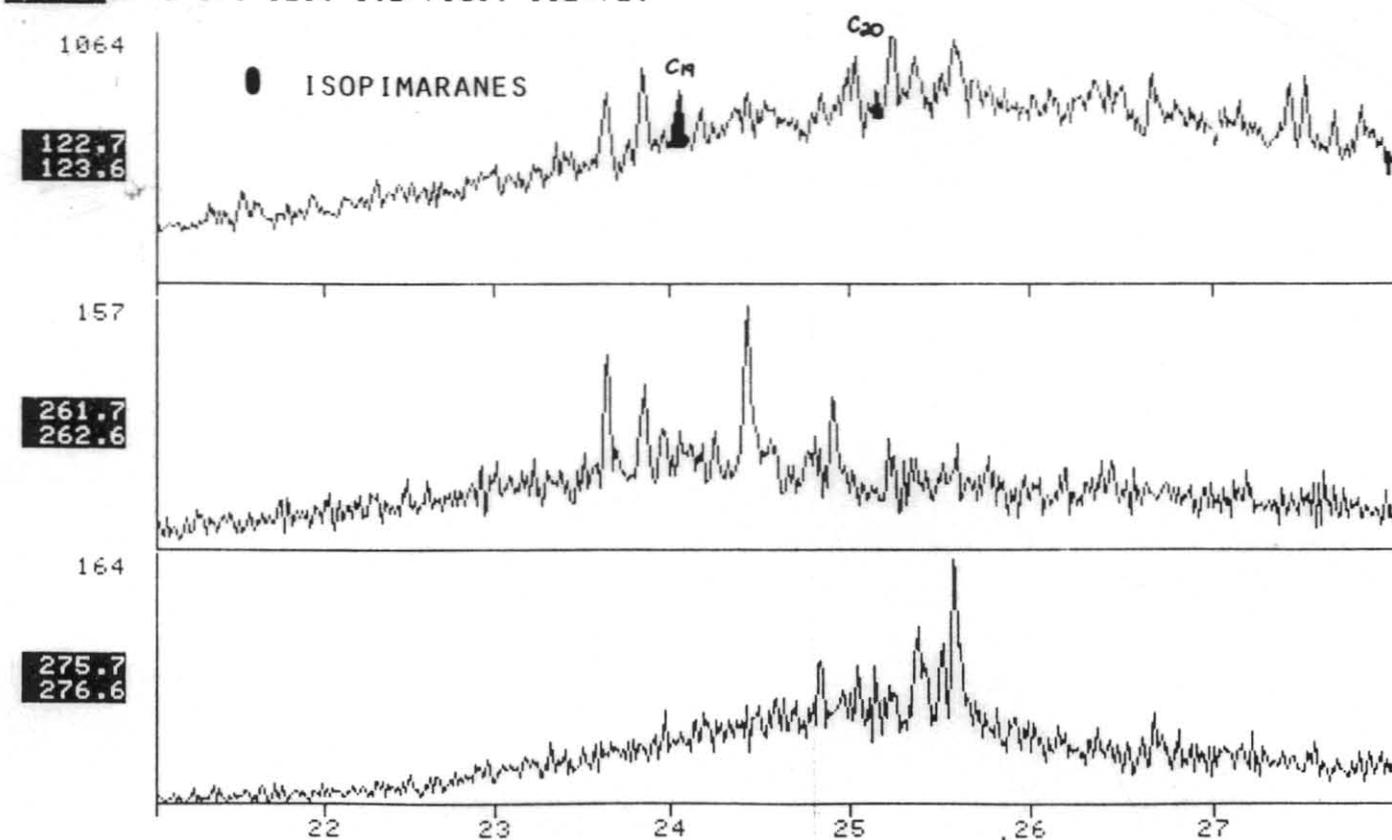
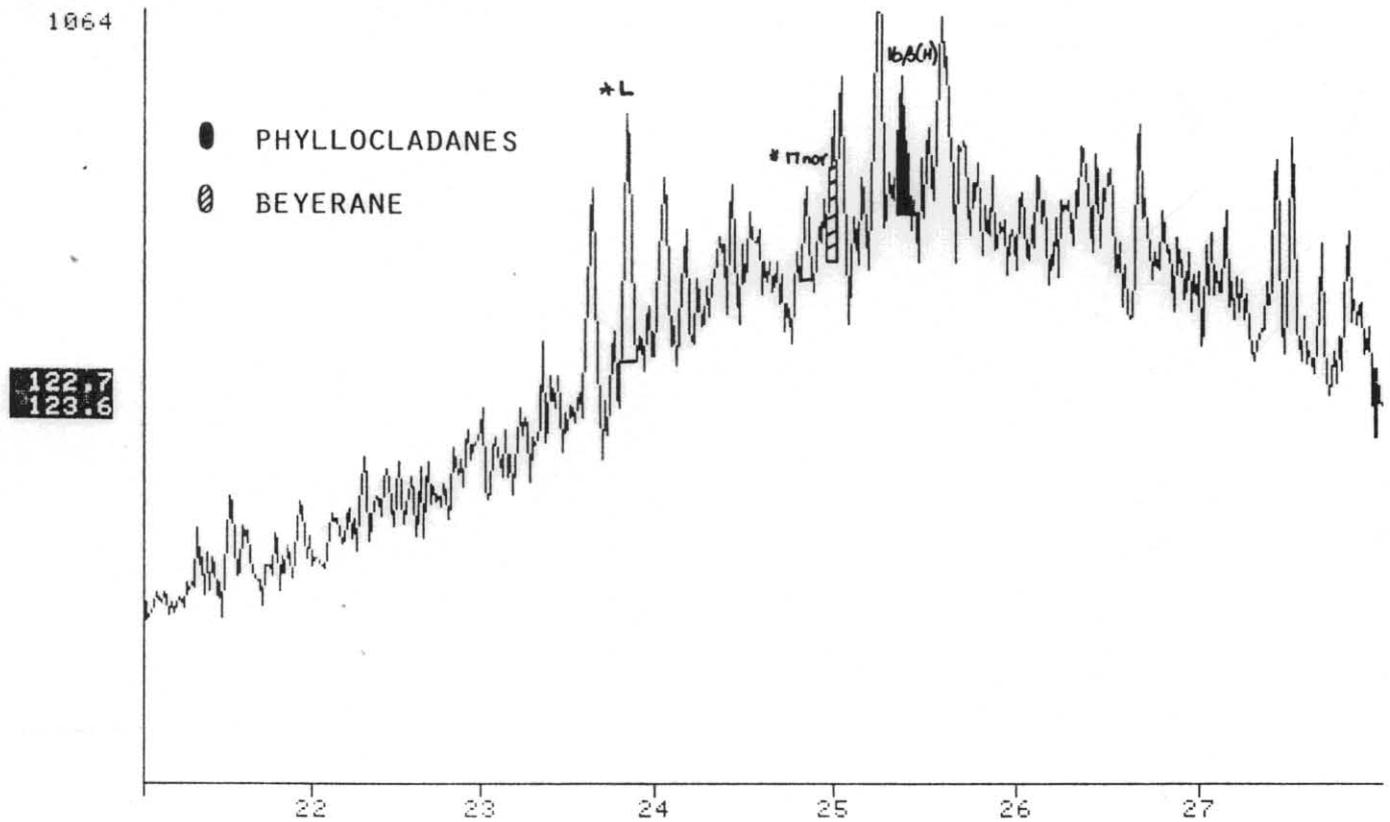


FIGURE: 2-7i

NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231



NAME BASS#3, 5023'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/70ul. COL#72.

FRN 6231

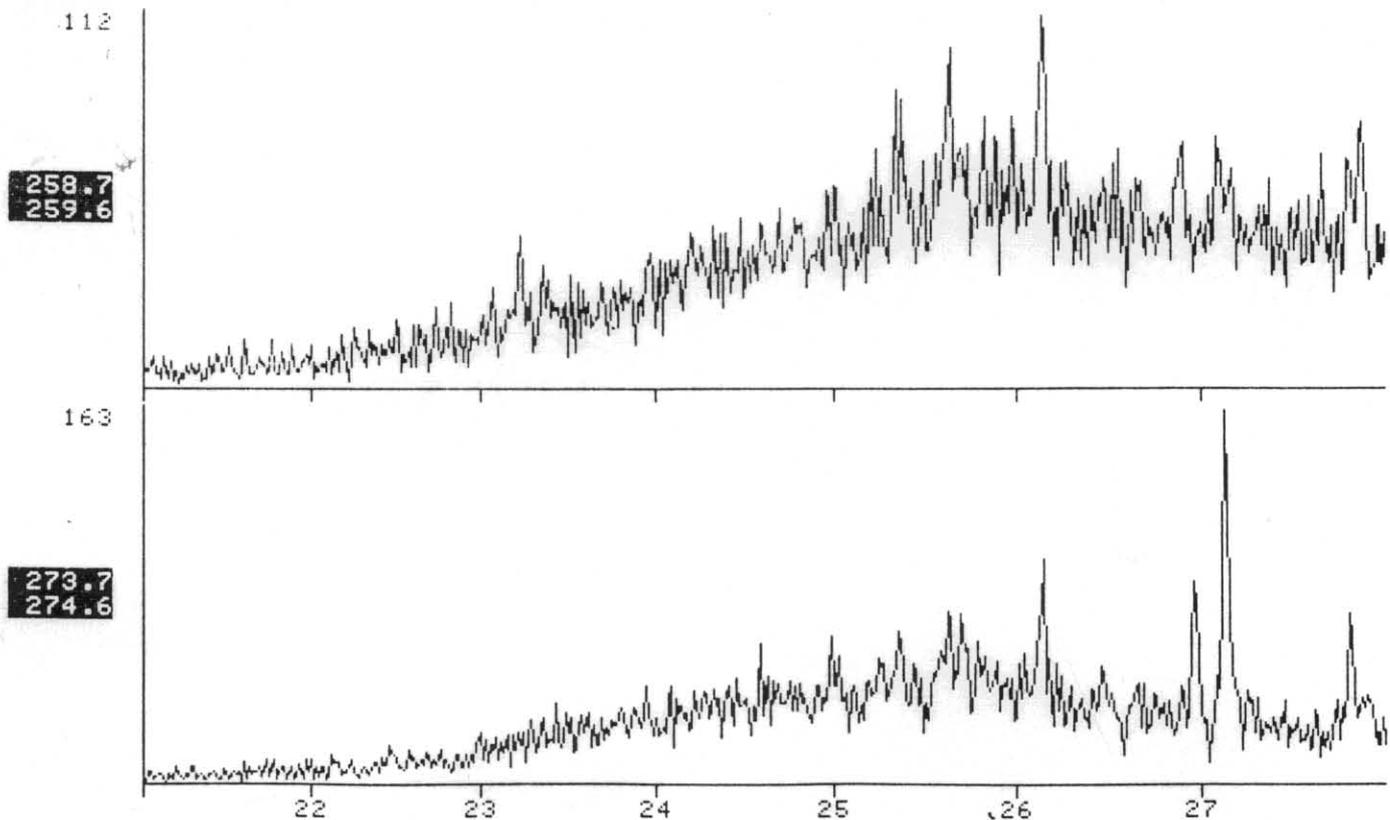
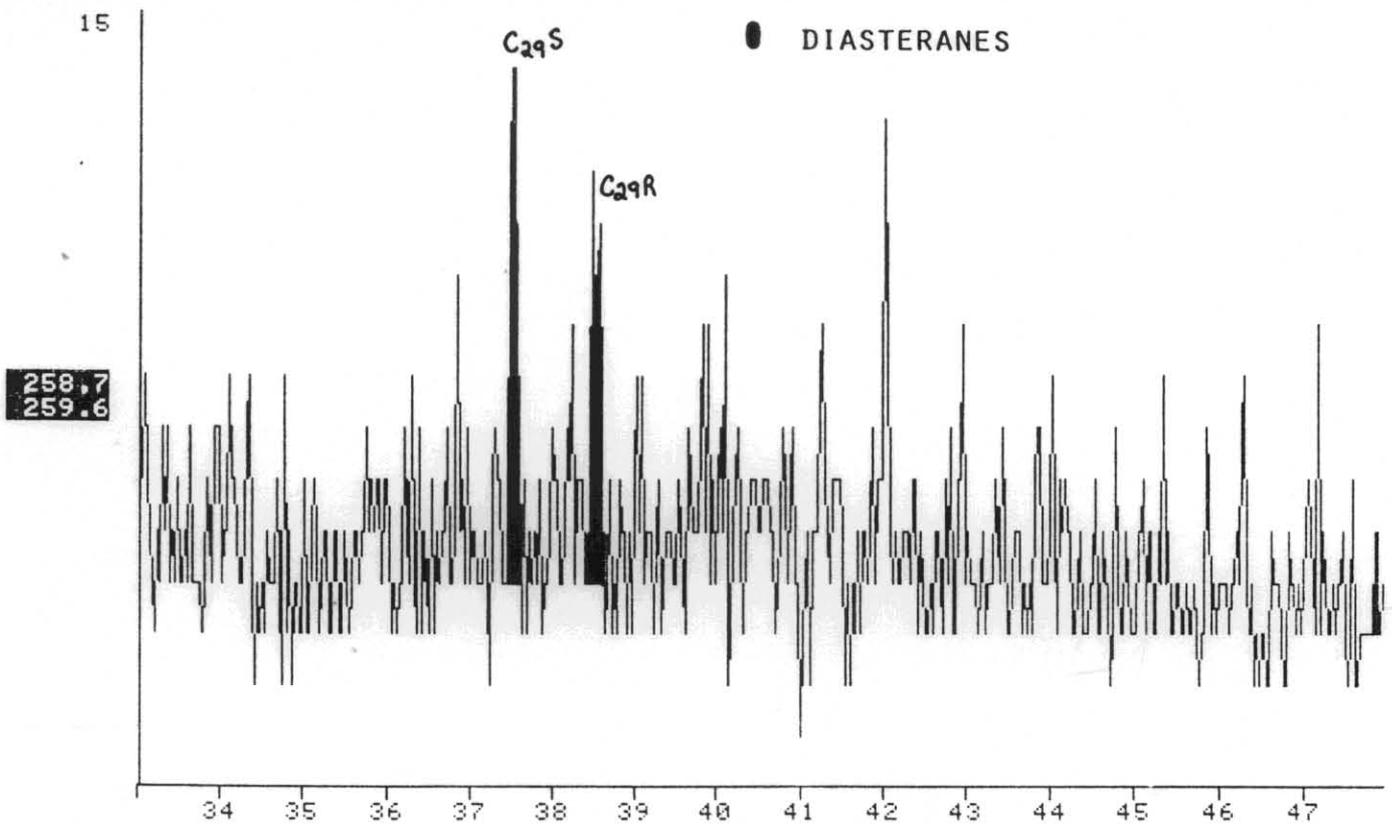


FIGURE: 2-8a

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

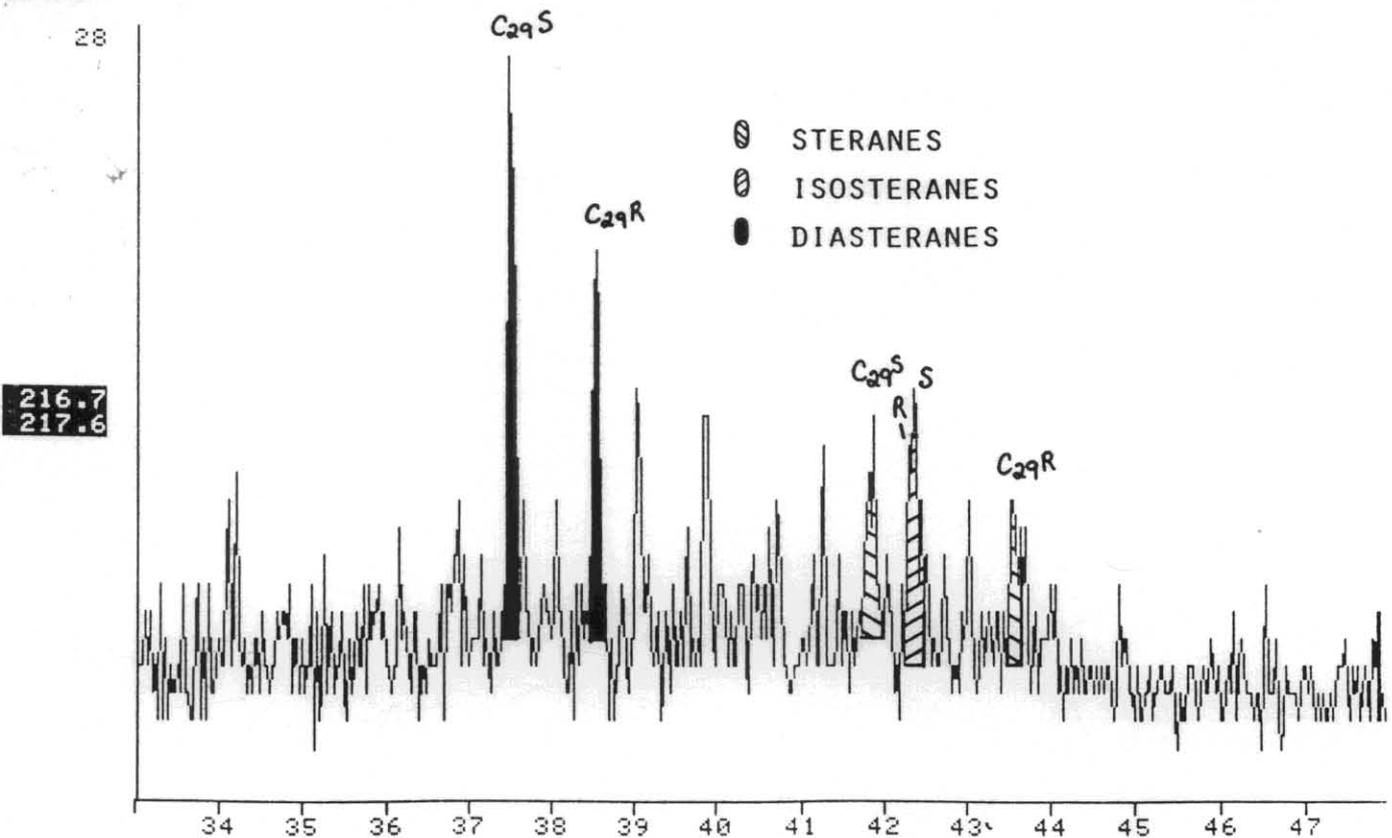
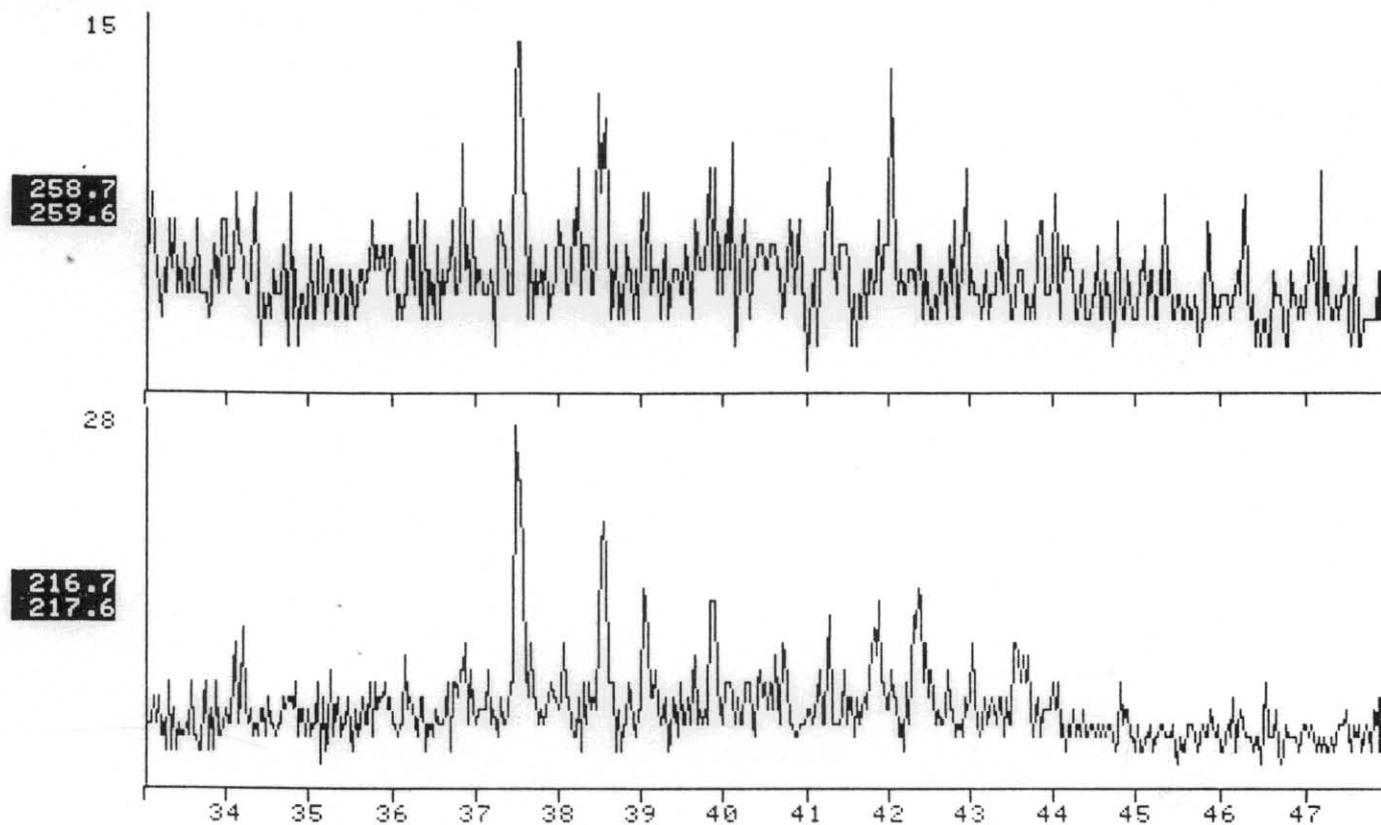


FIGURE: 2-8b

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

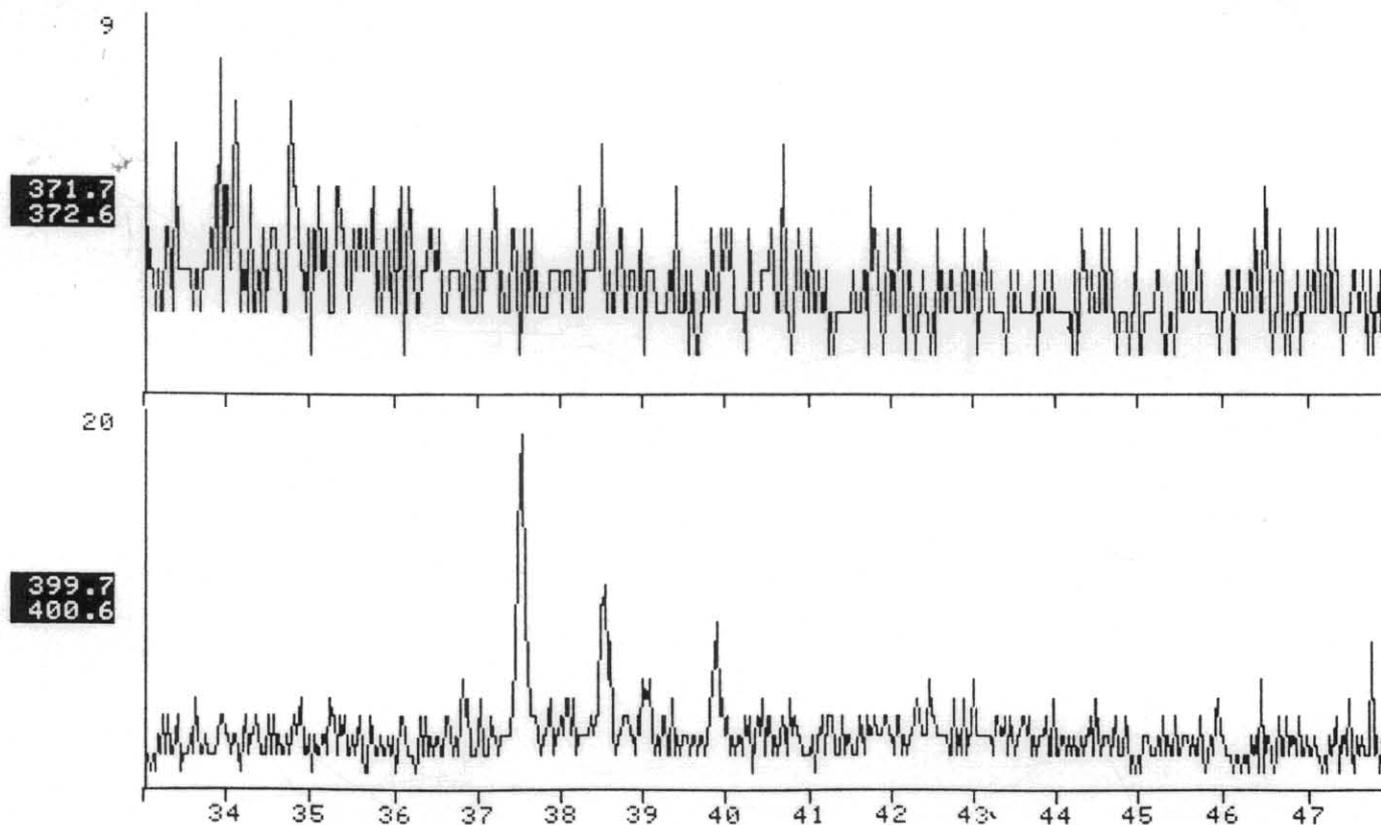
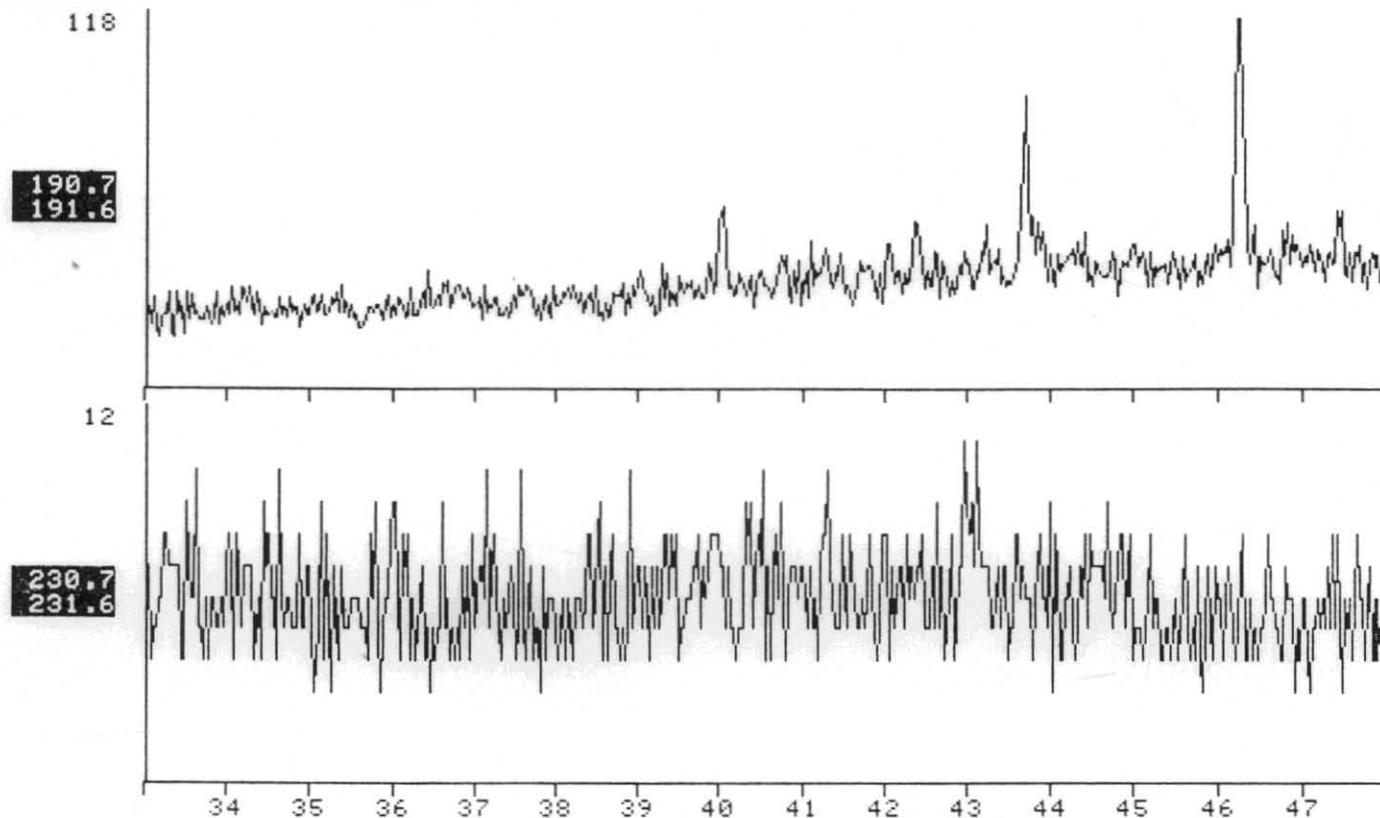


FIGURE: 2-8c

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

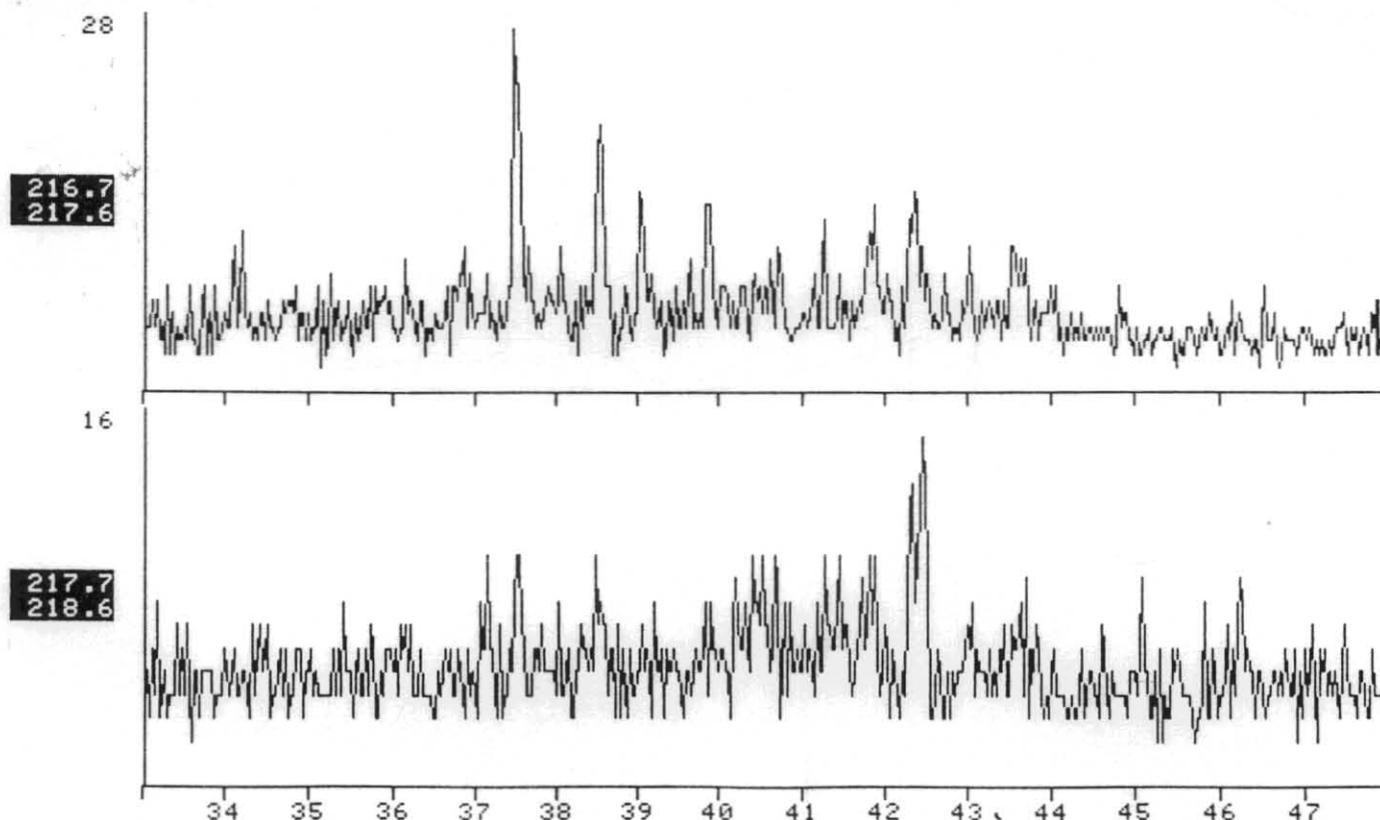
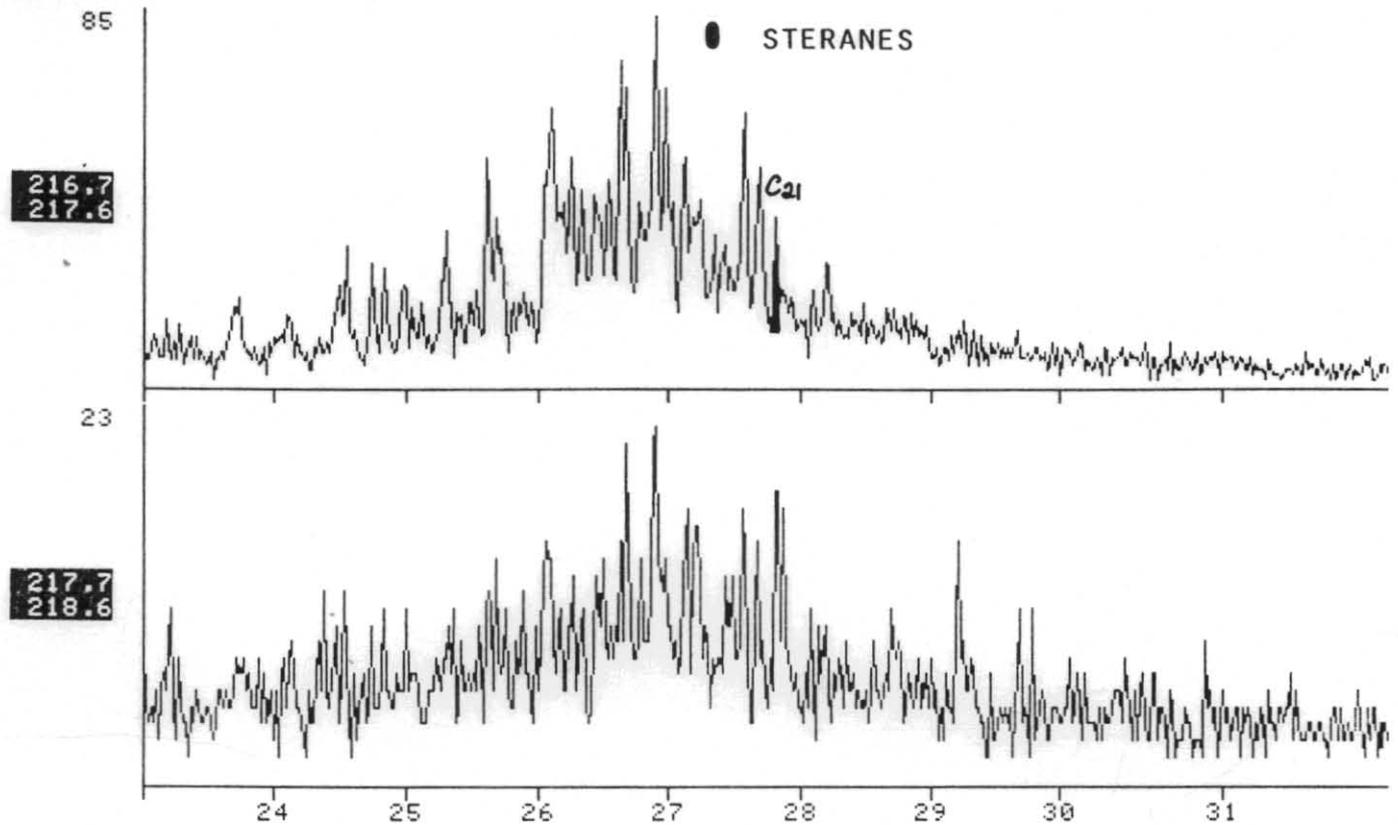


FIGURE: 2-8d

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

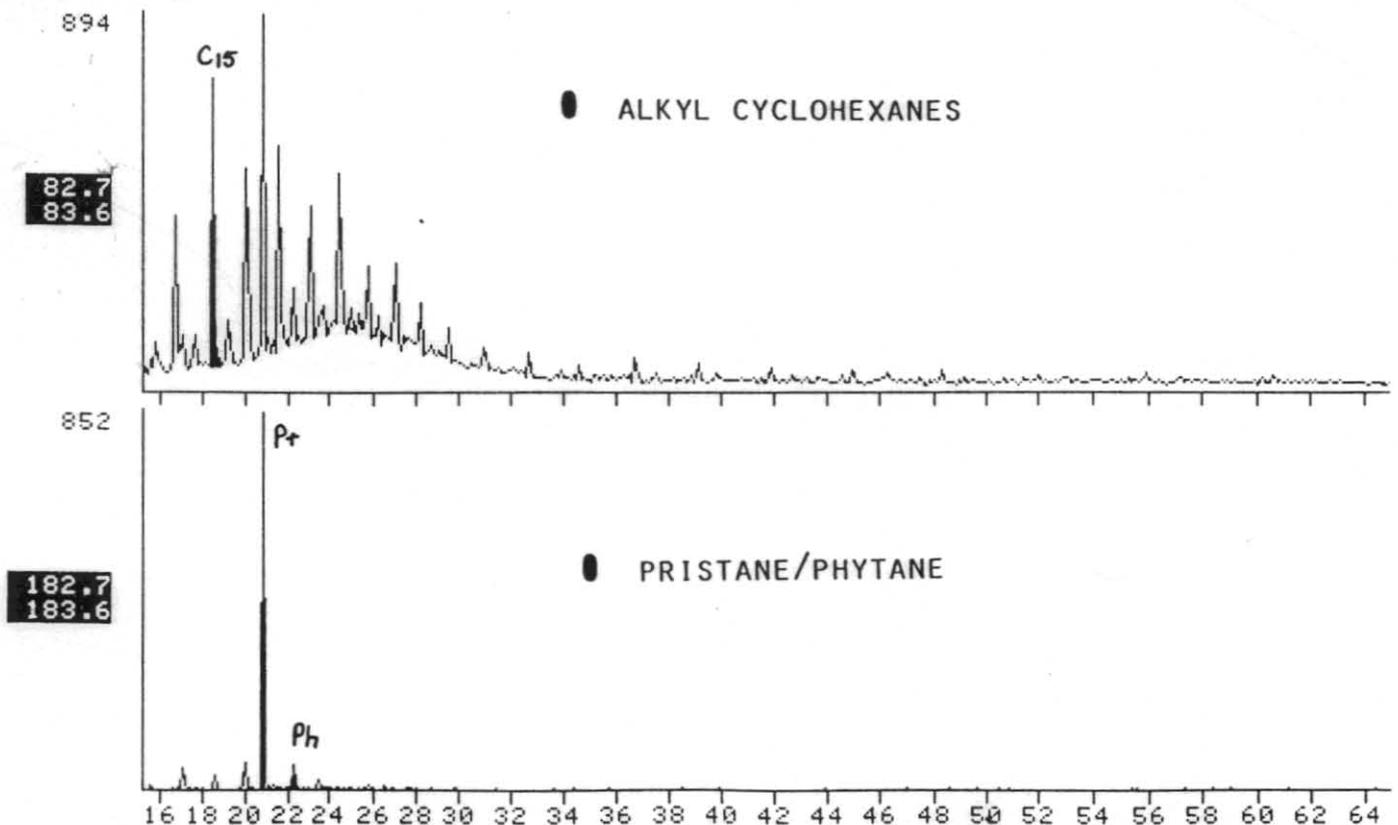
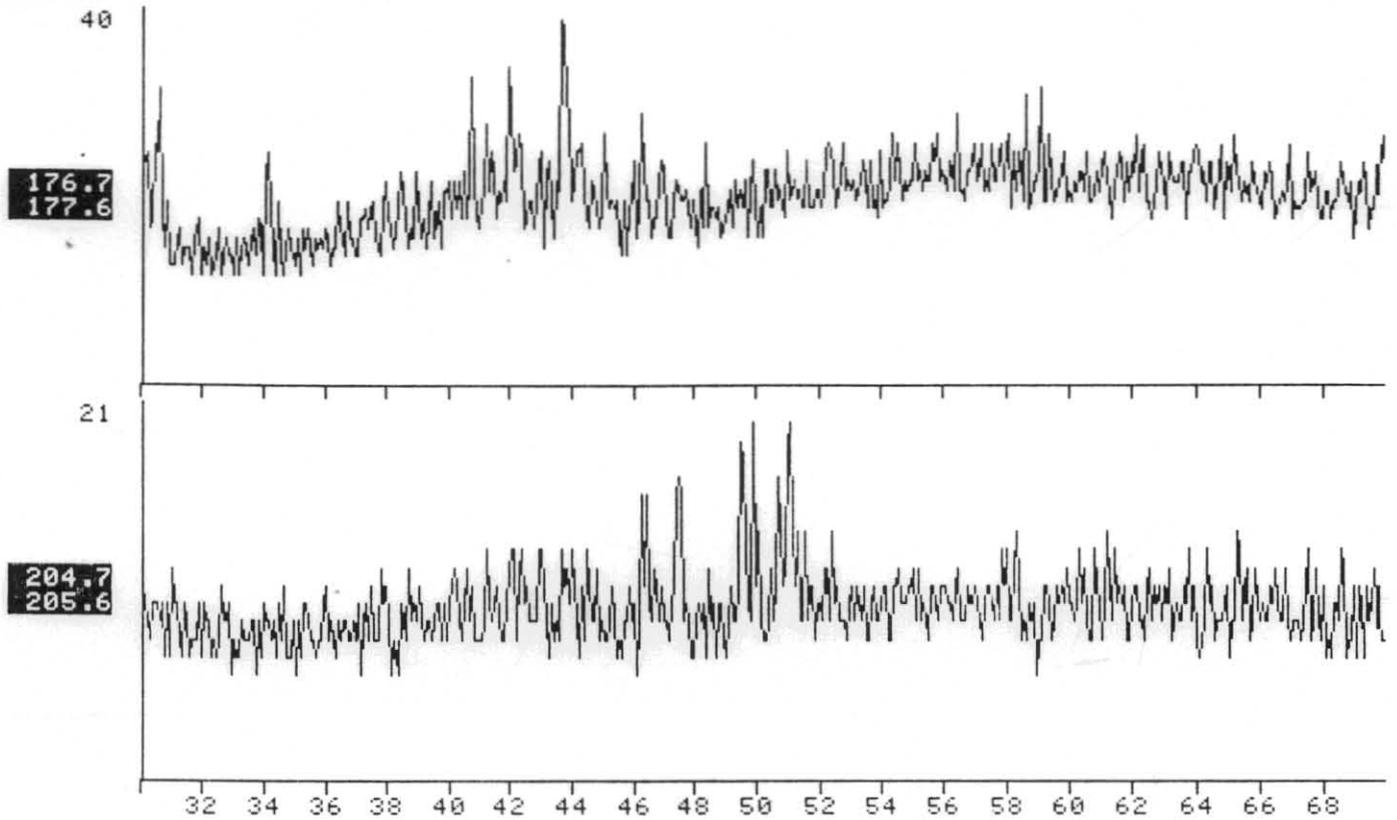


FIGURE: 2-8e

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

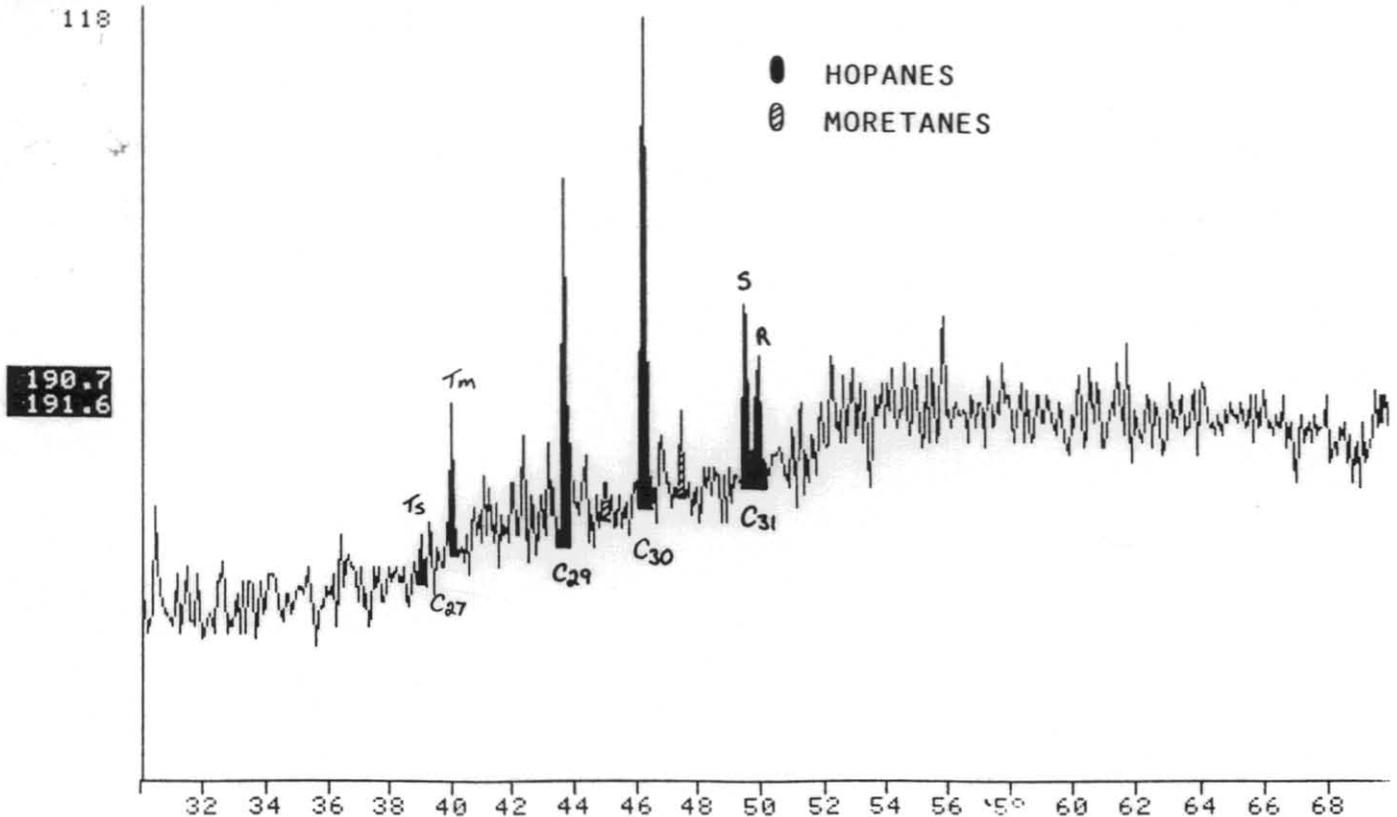
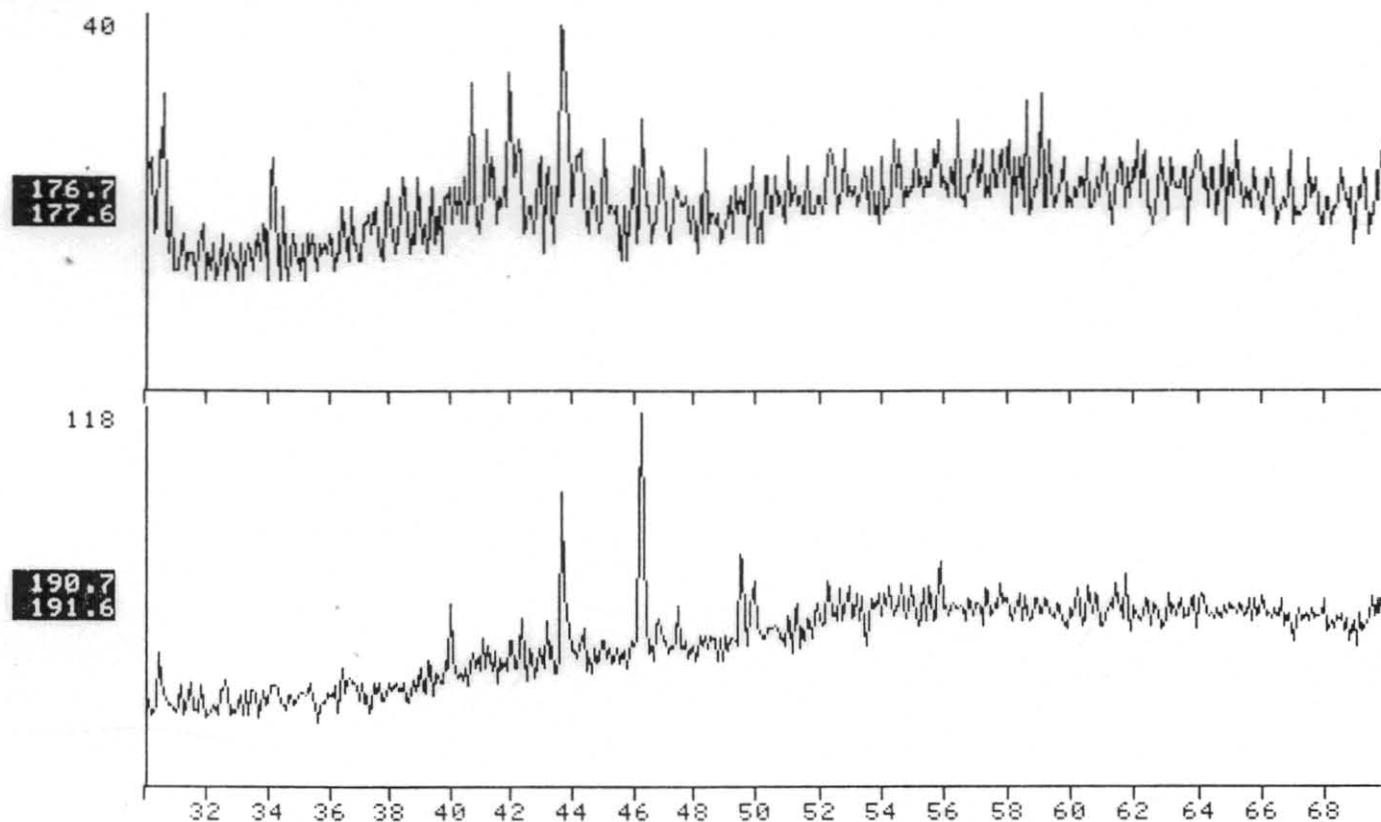


FIGURE: 2-8f

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

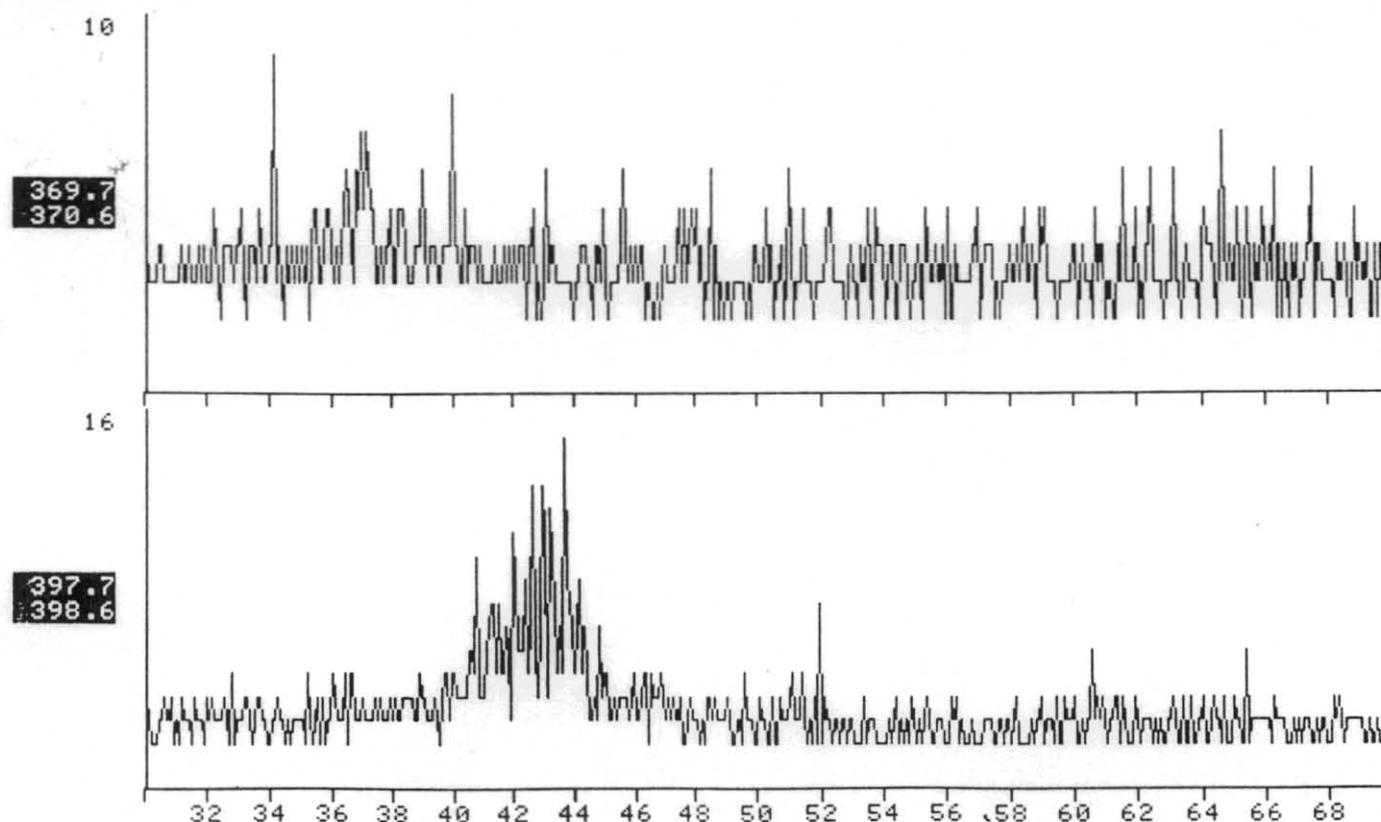
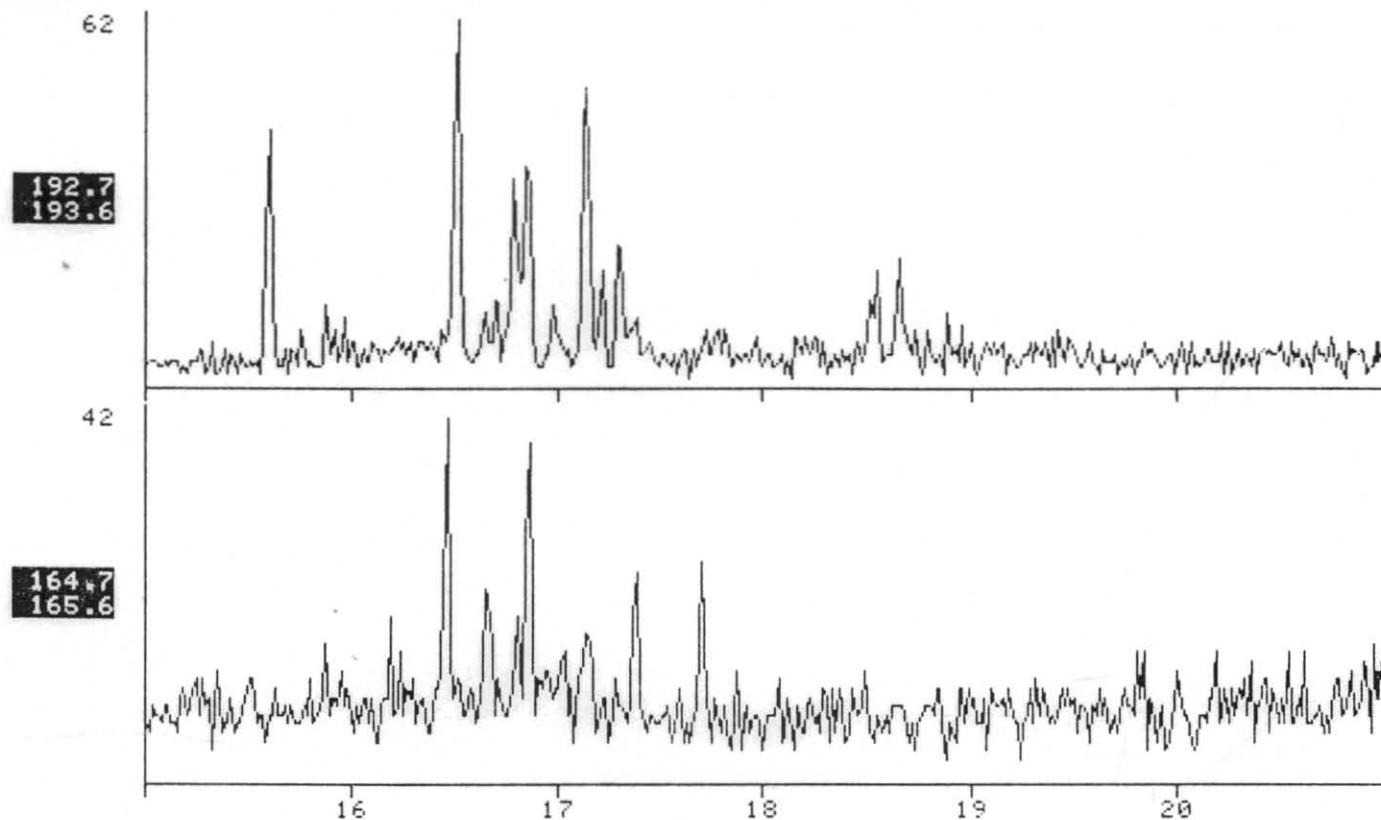


FIGURE: 2-8g

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

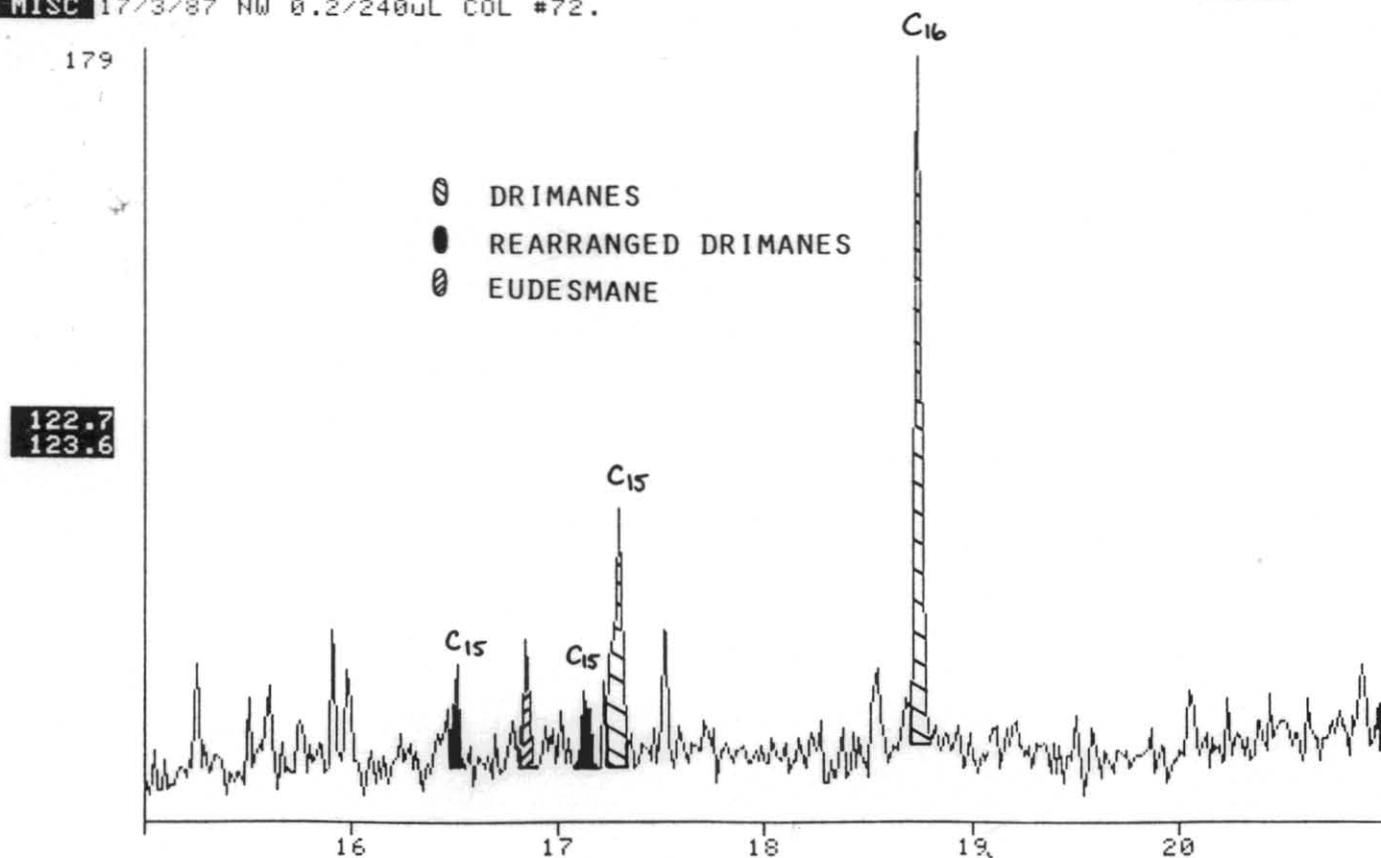
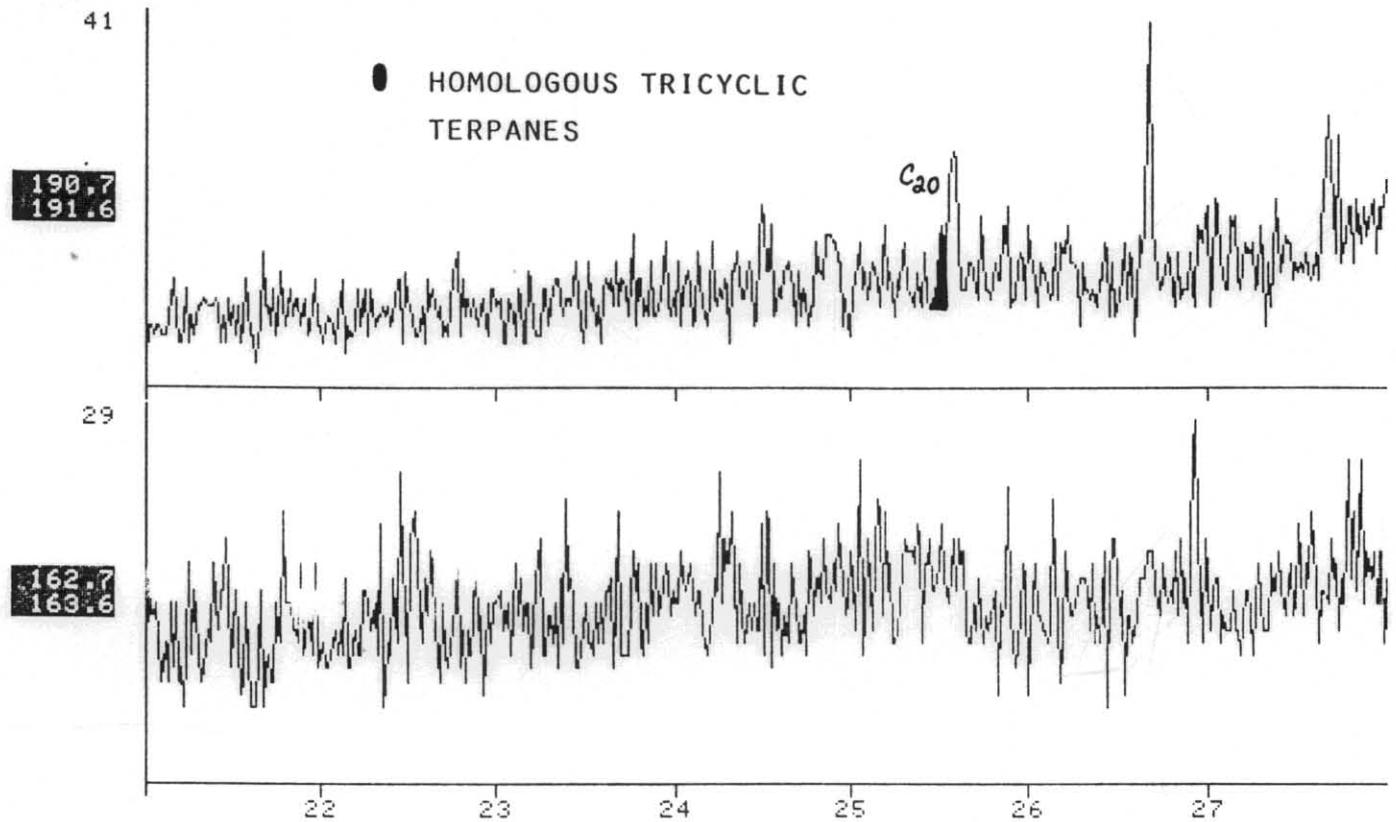


FIGURE: 2-8h

NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

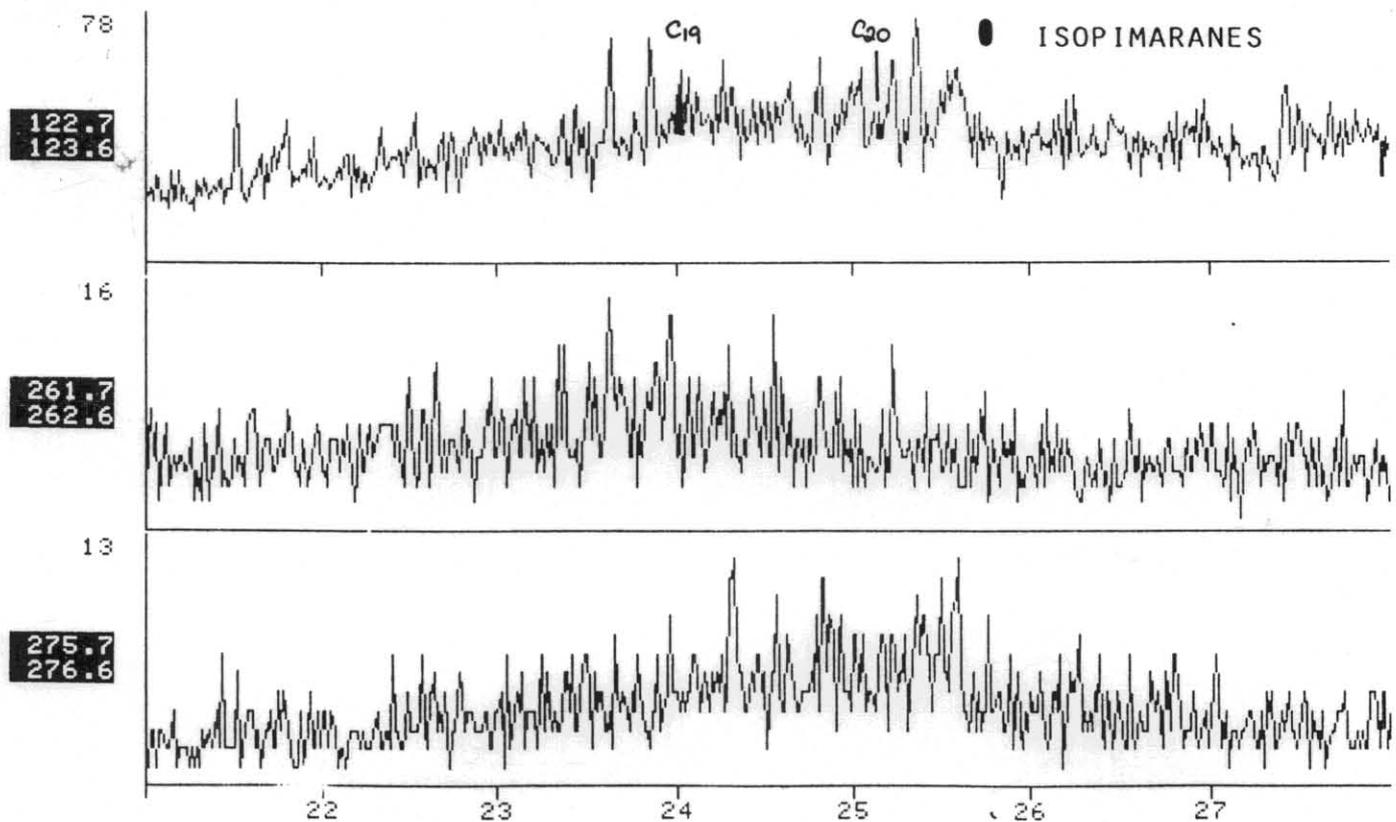
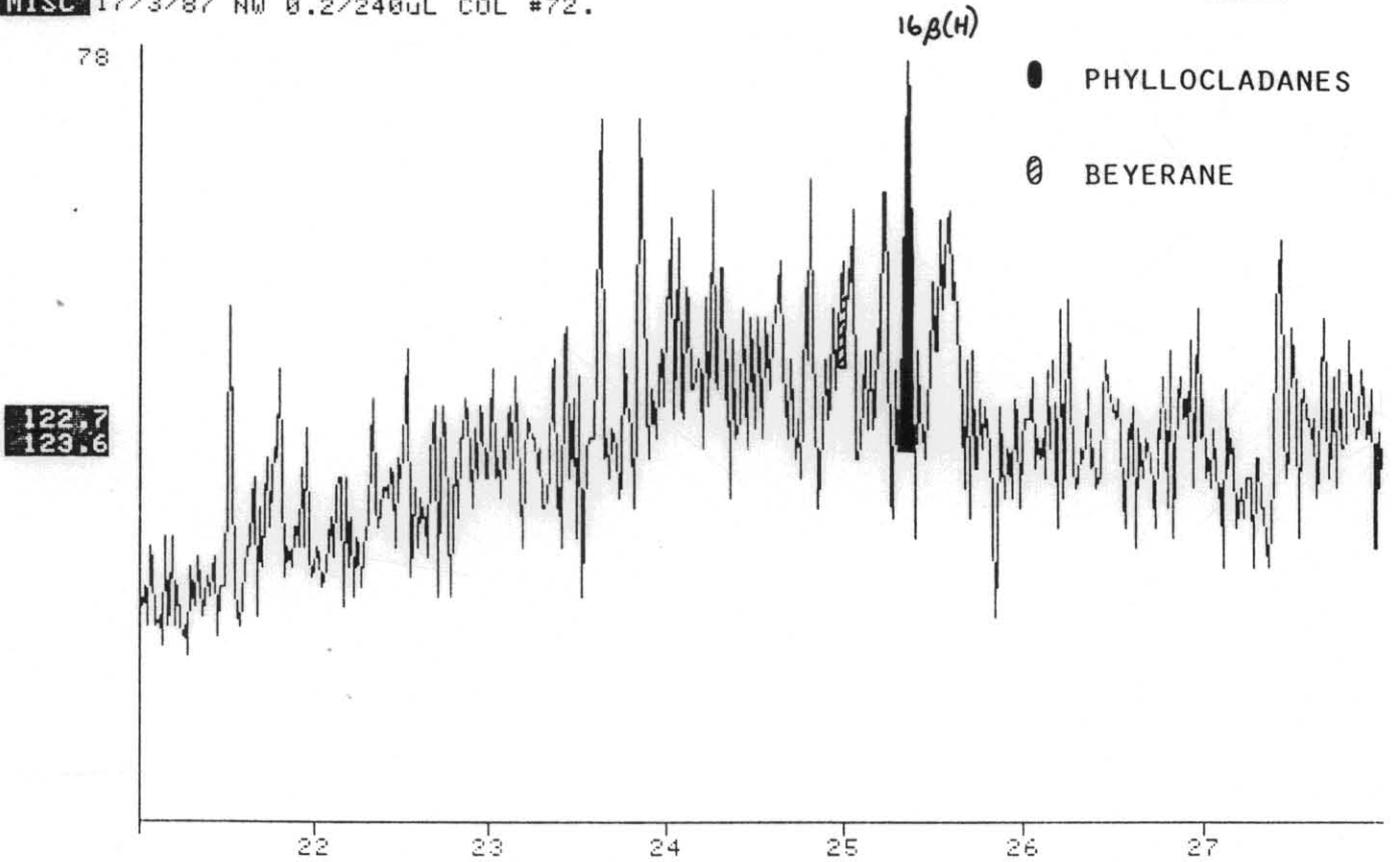


FIGURE: 2-8i

NAME: BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC: 17/3/87 NW 0.2/240uL COL #72.

FRN 6228



NAME: BASS #3 7434 BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC: 17/3/87 NW 0.2/240uL COL #72.

FRN 6228

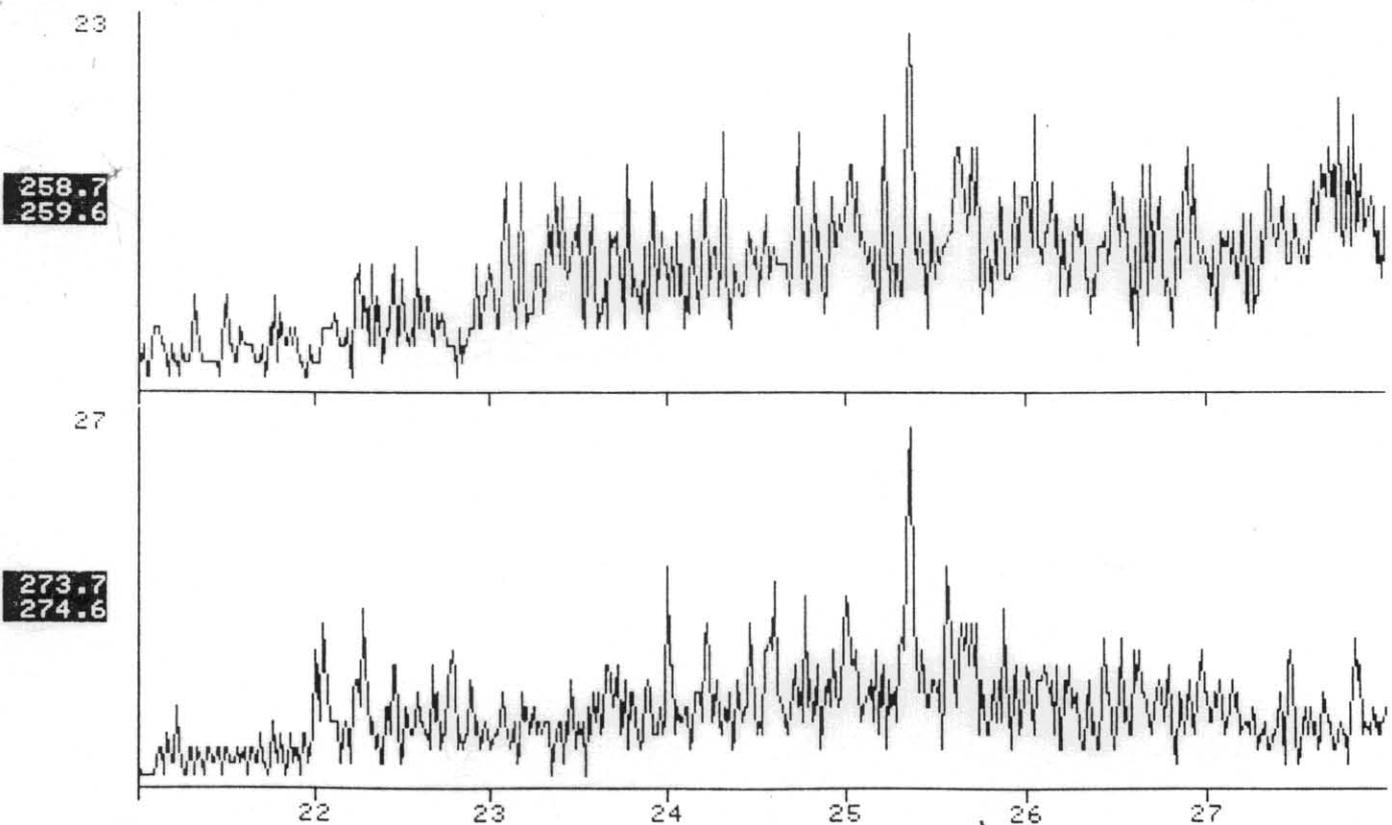
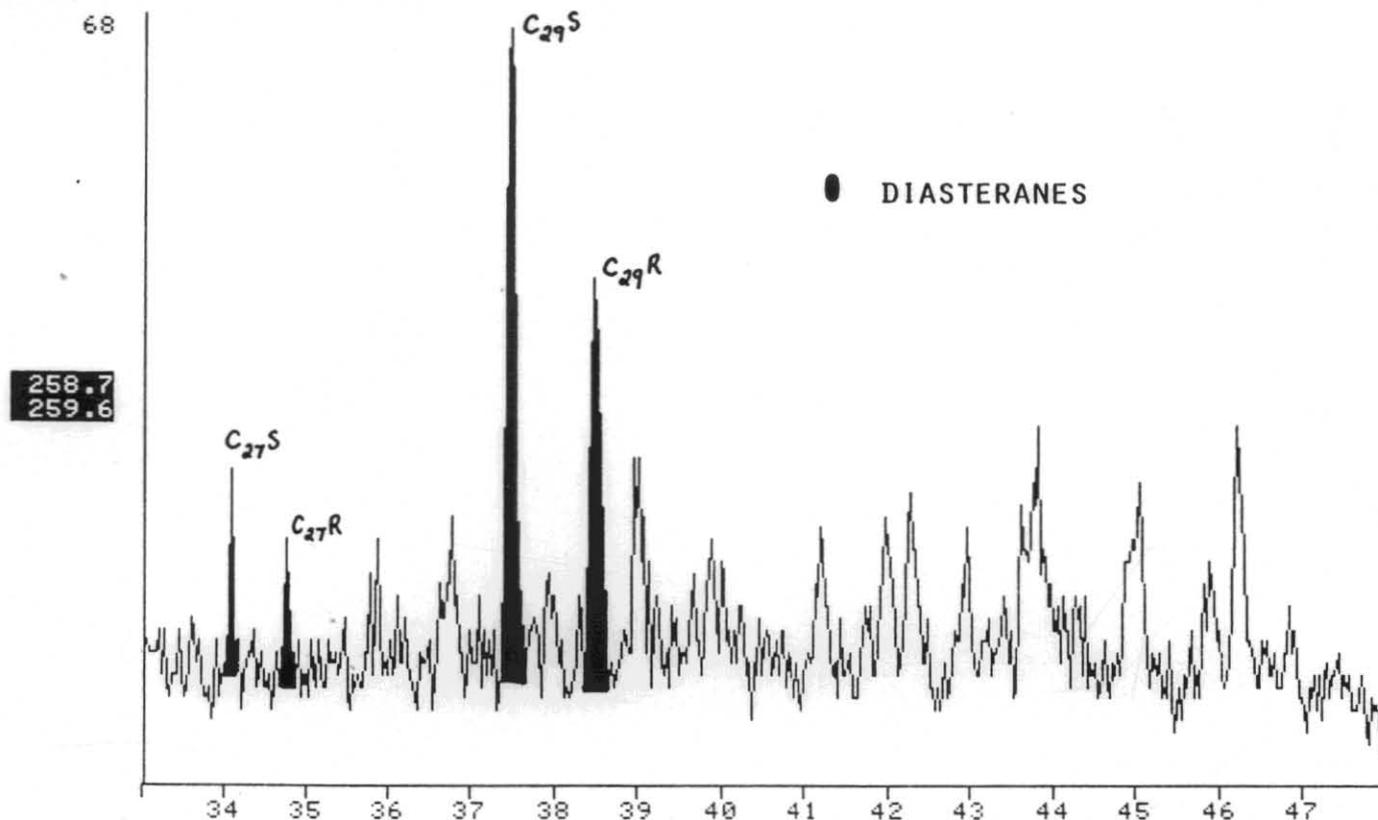


FIGURE: 2-9a

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

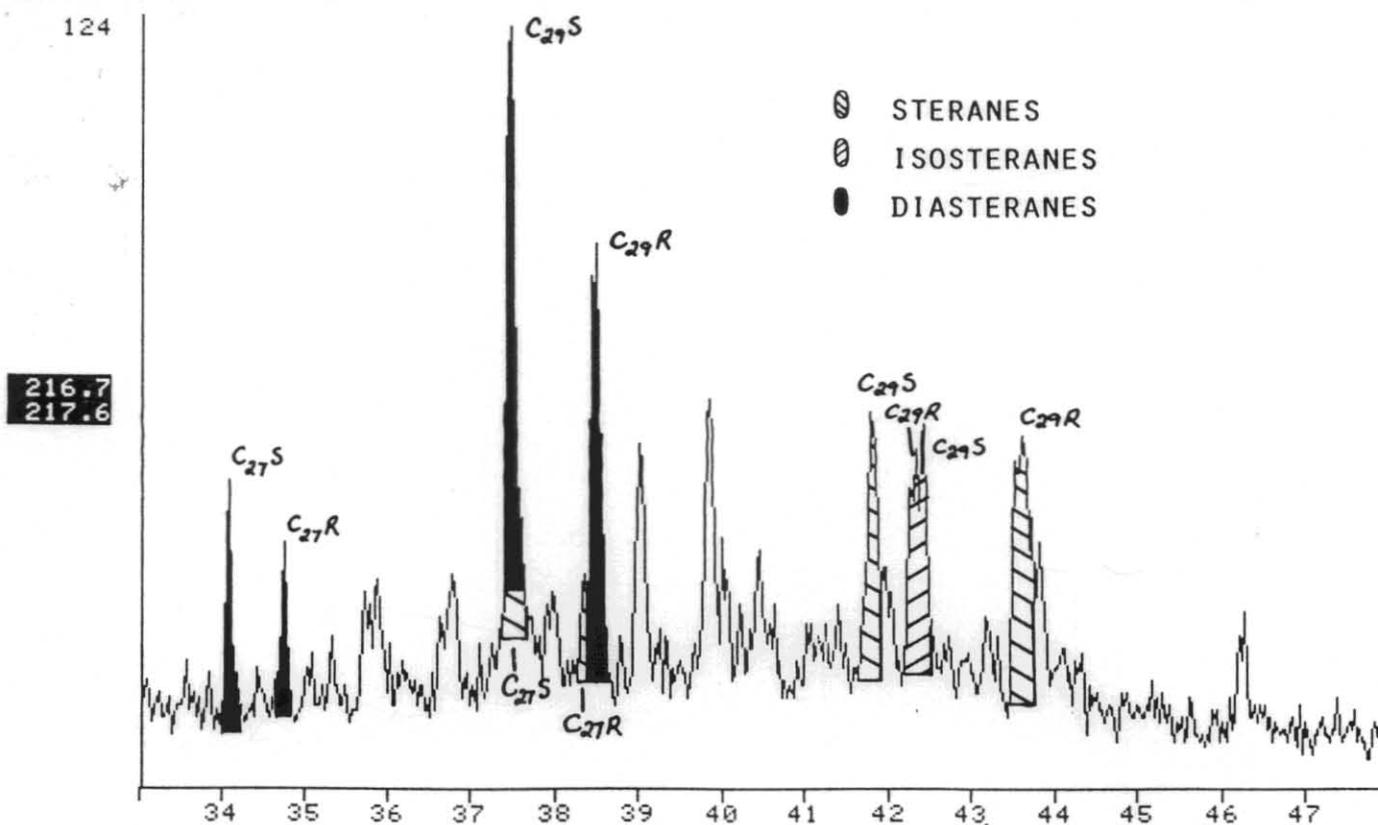
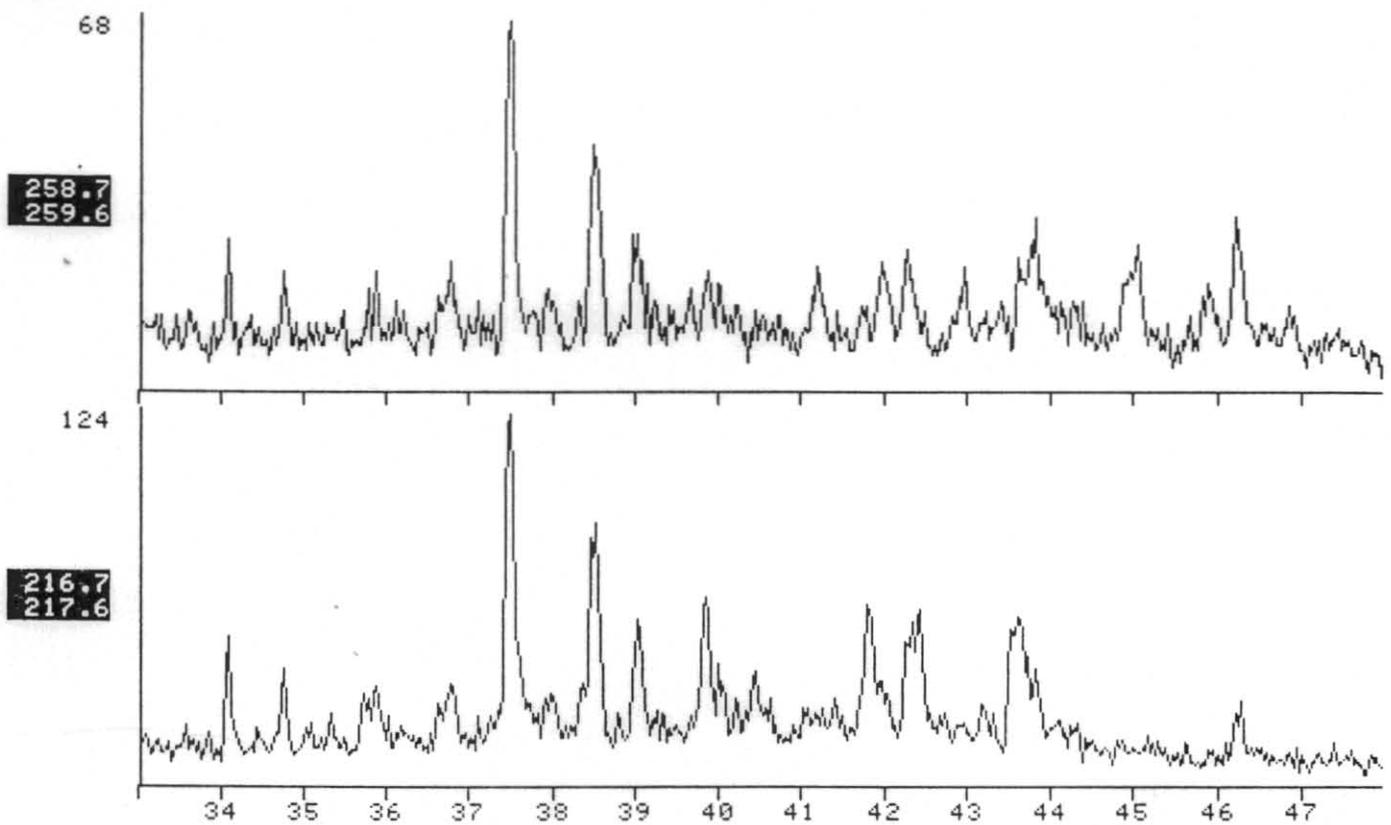


FIGURE: 2-9b

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

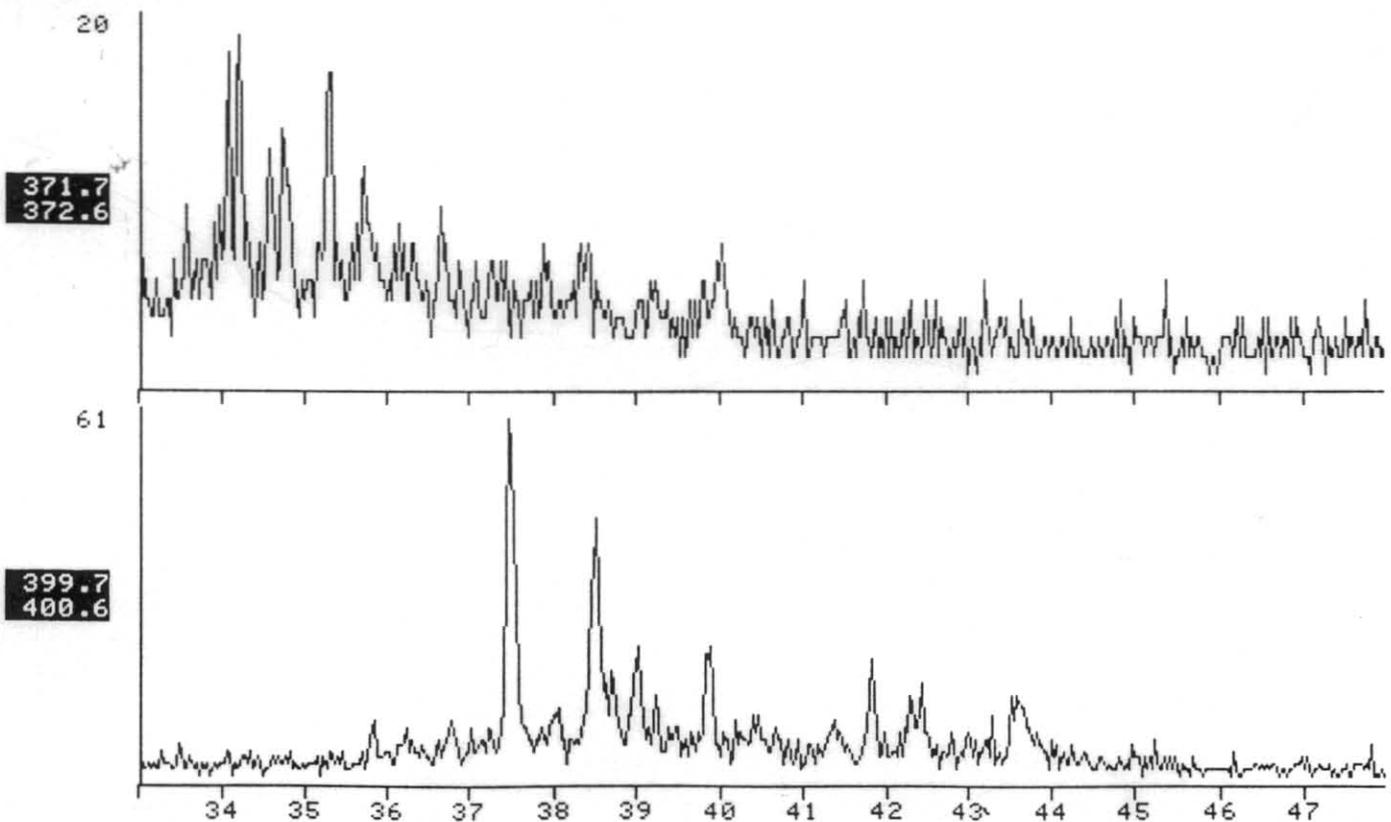
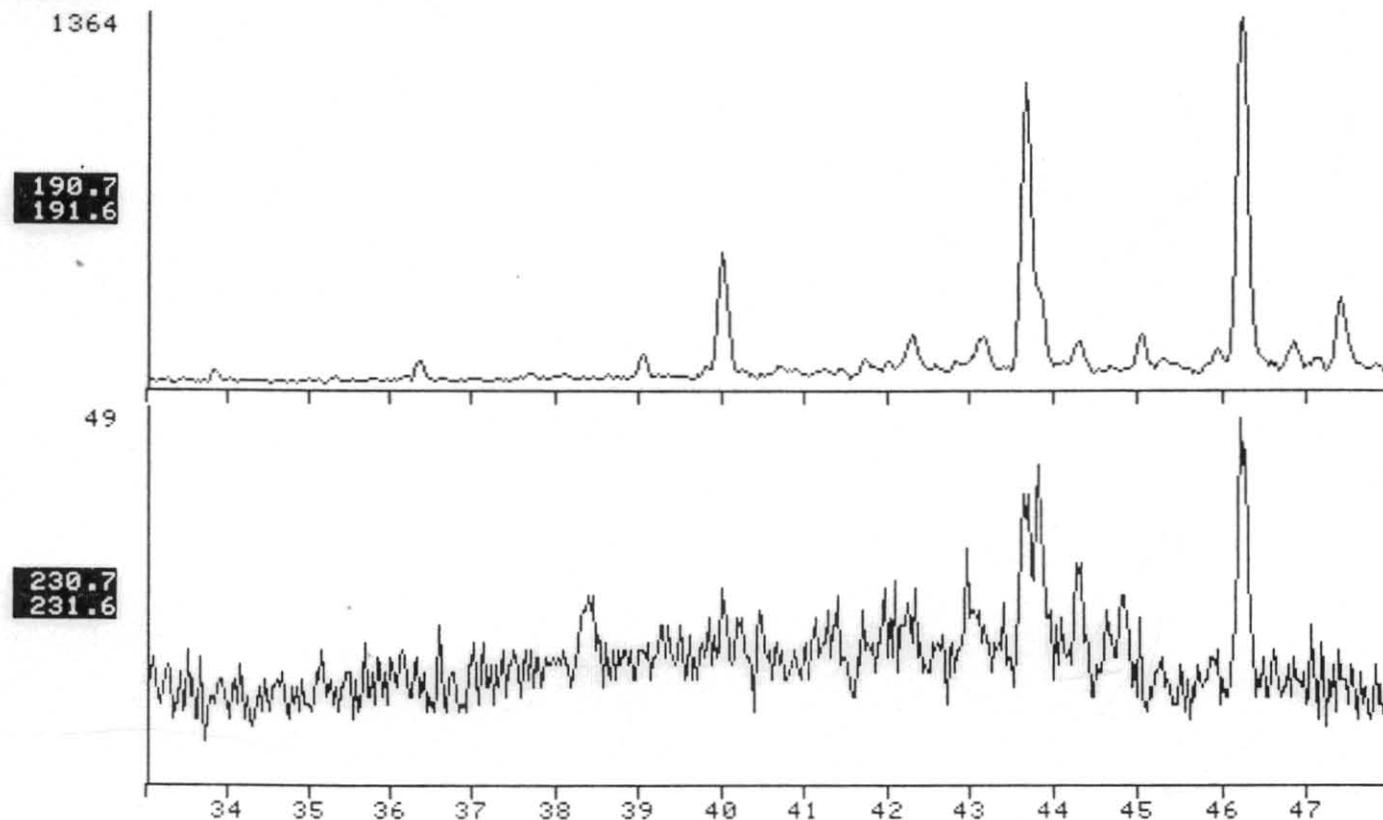


FIGURE: 2-9c

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

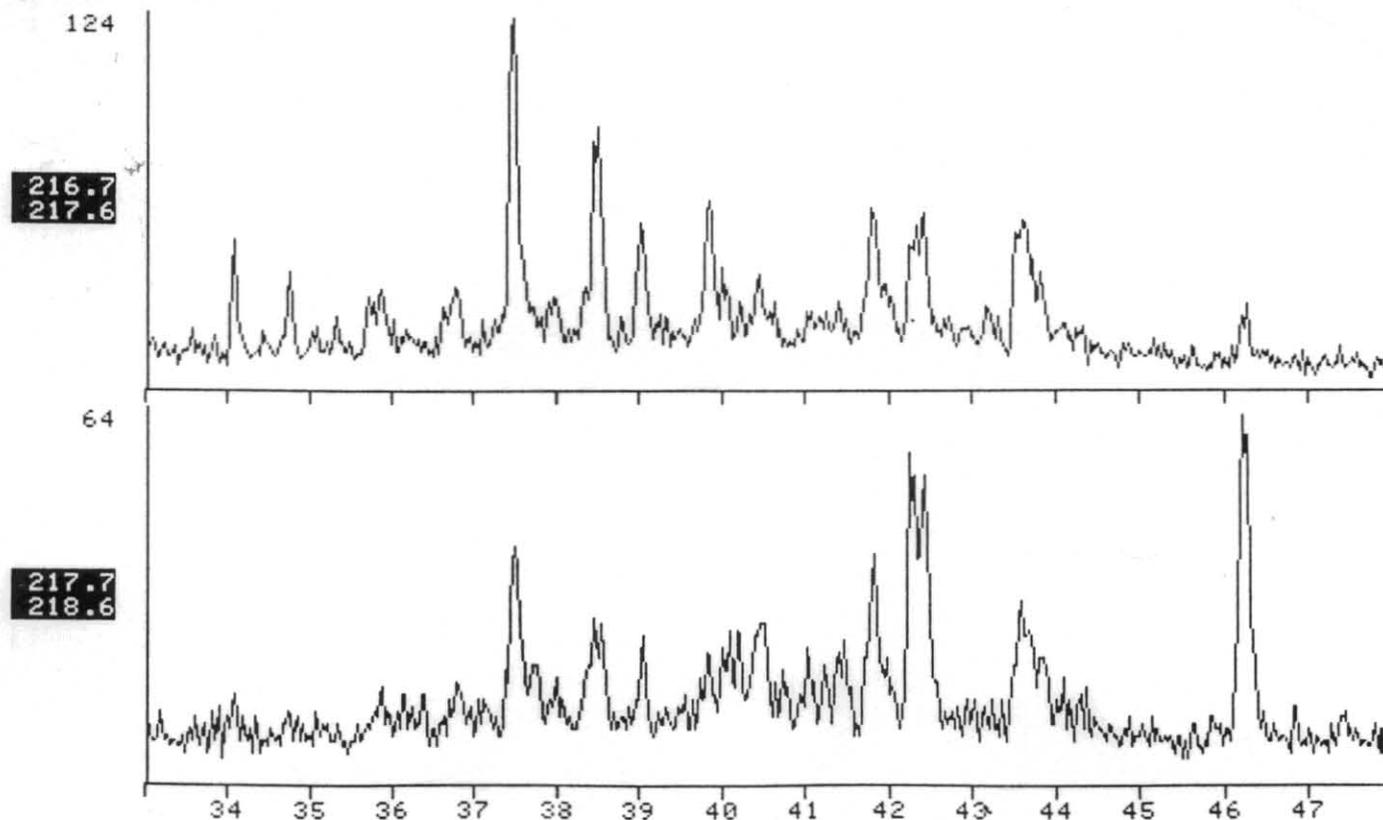
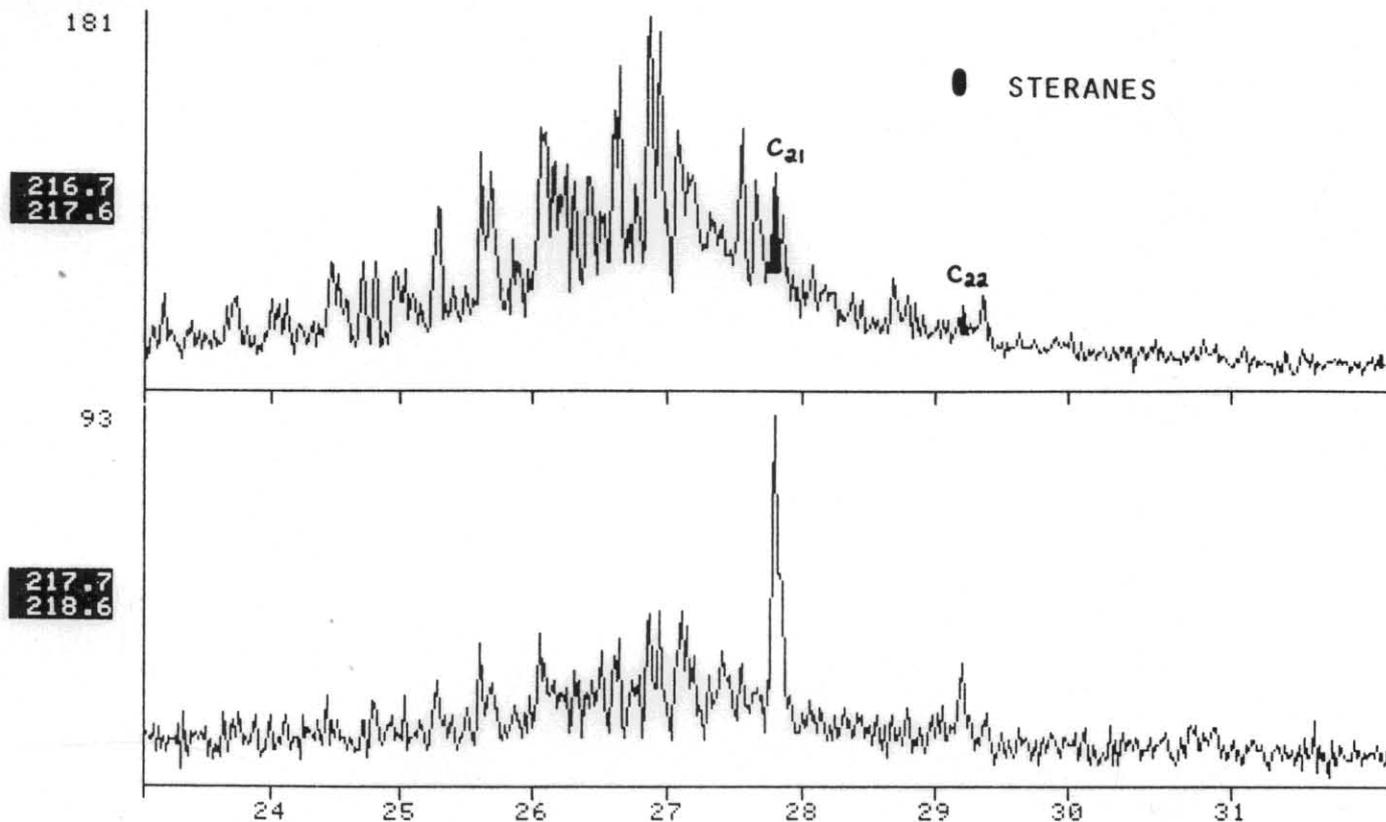


FIGURE: 2-9d

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

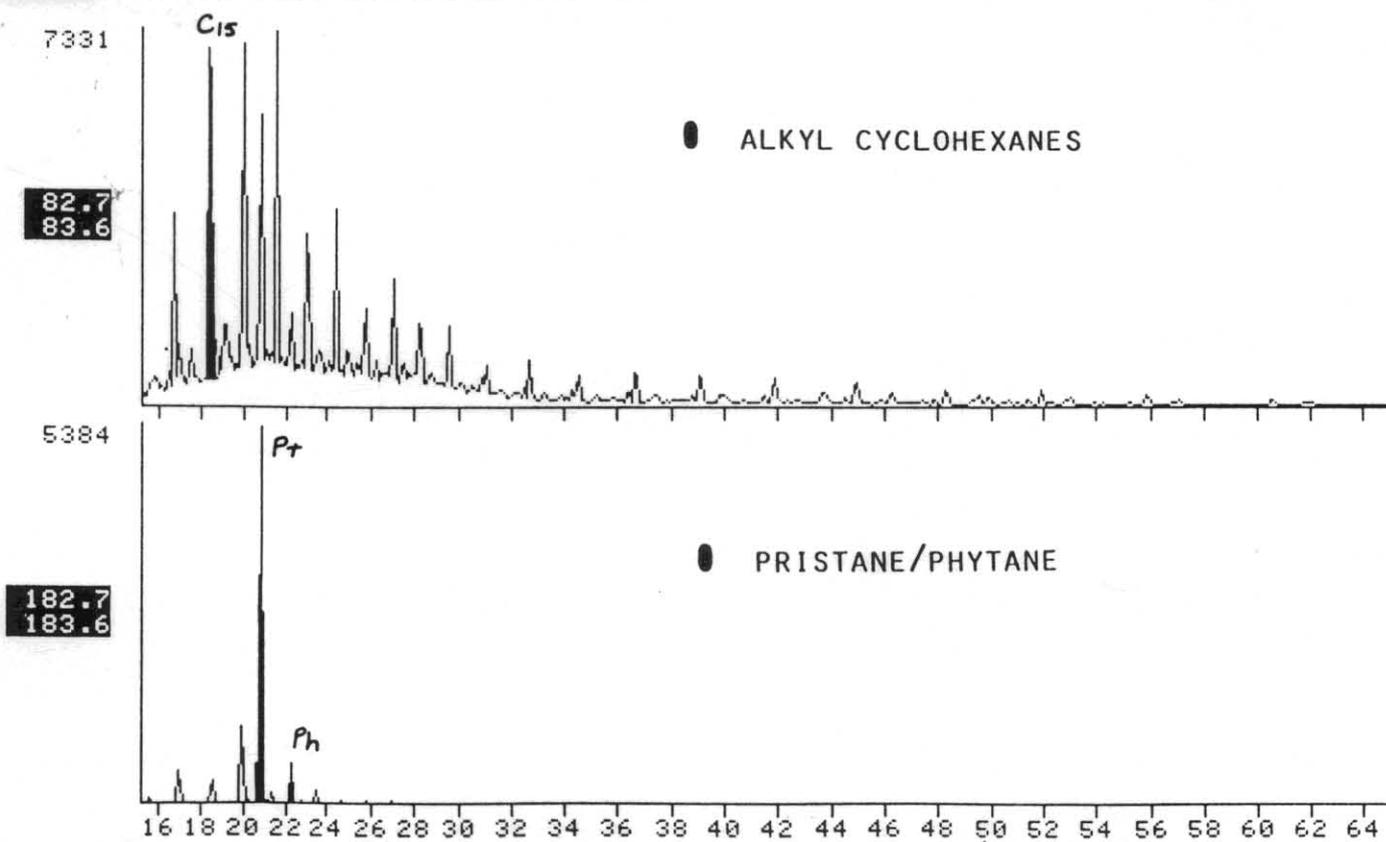
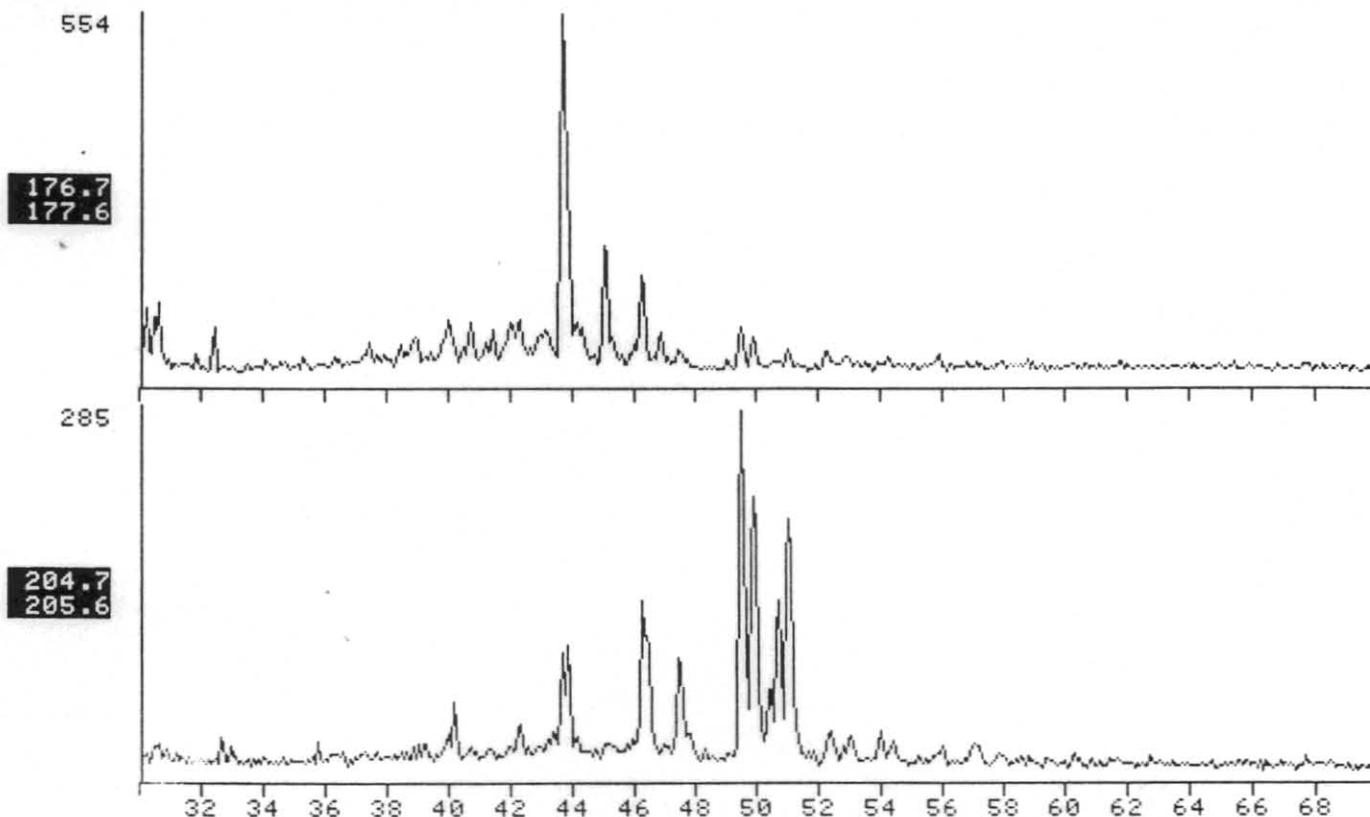


FIGURE: 2-9e

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

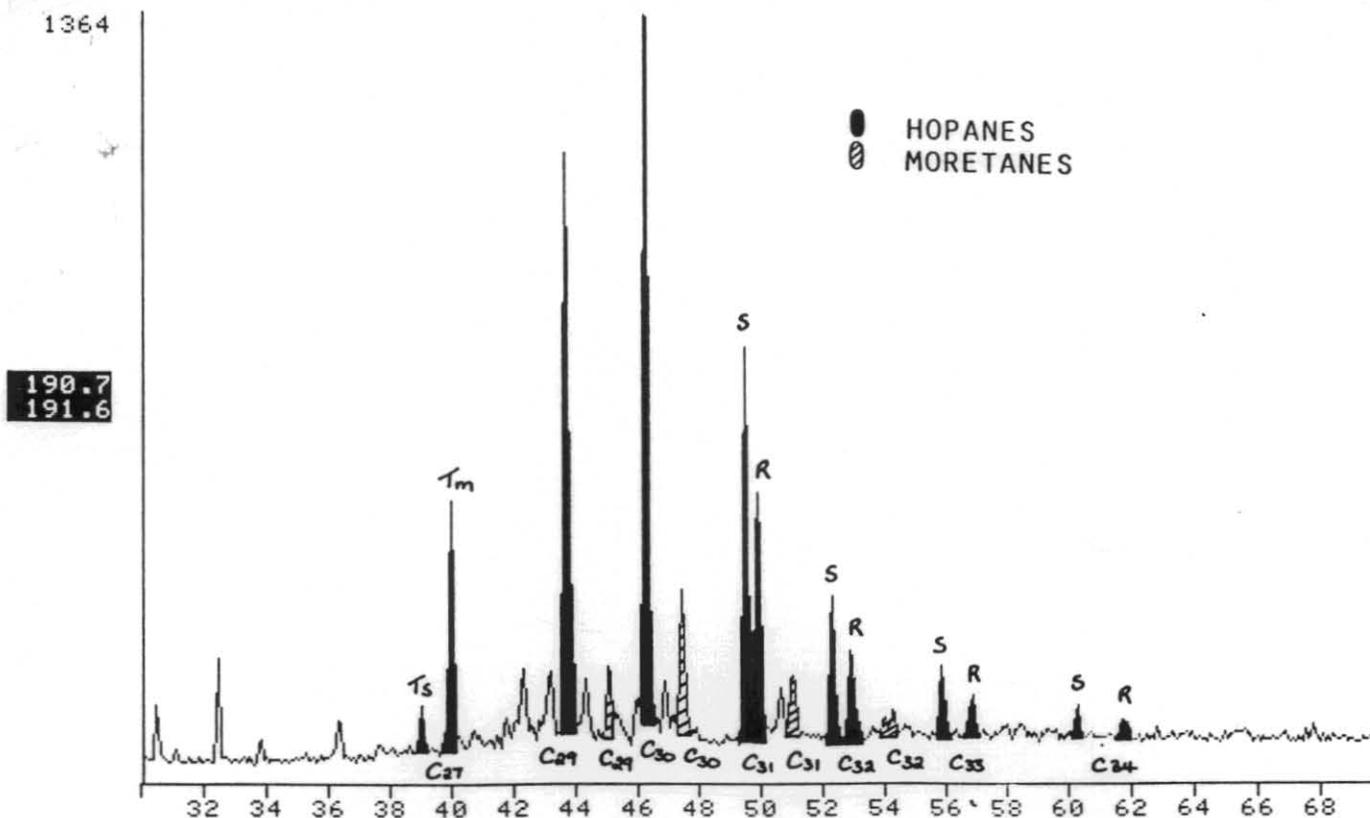
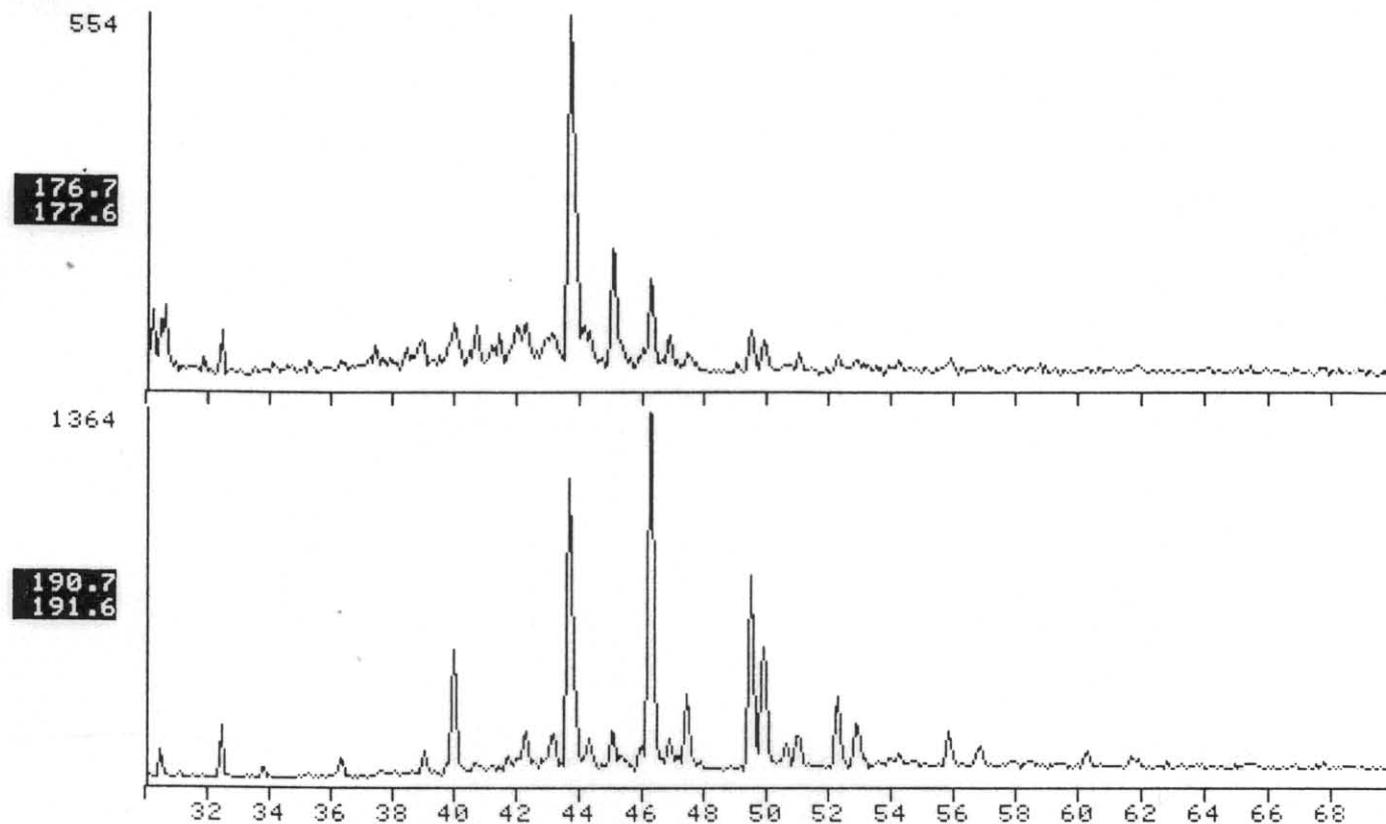


FIGURE: 2-9f

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

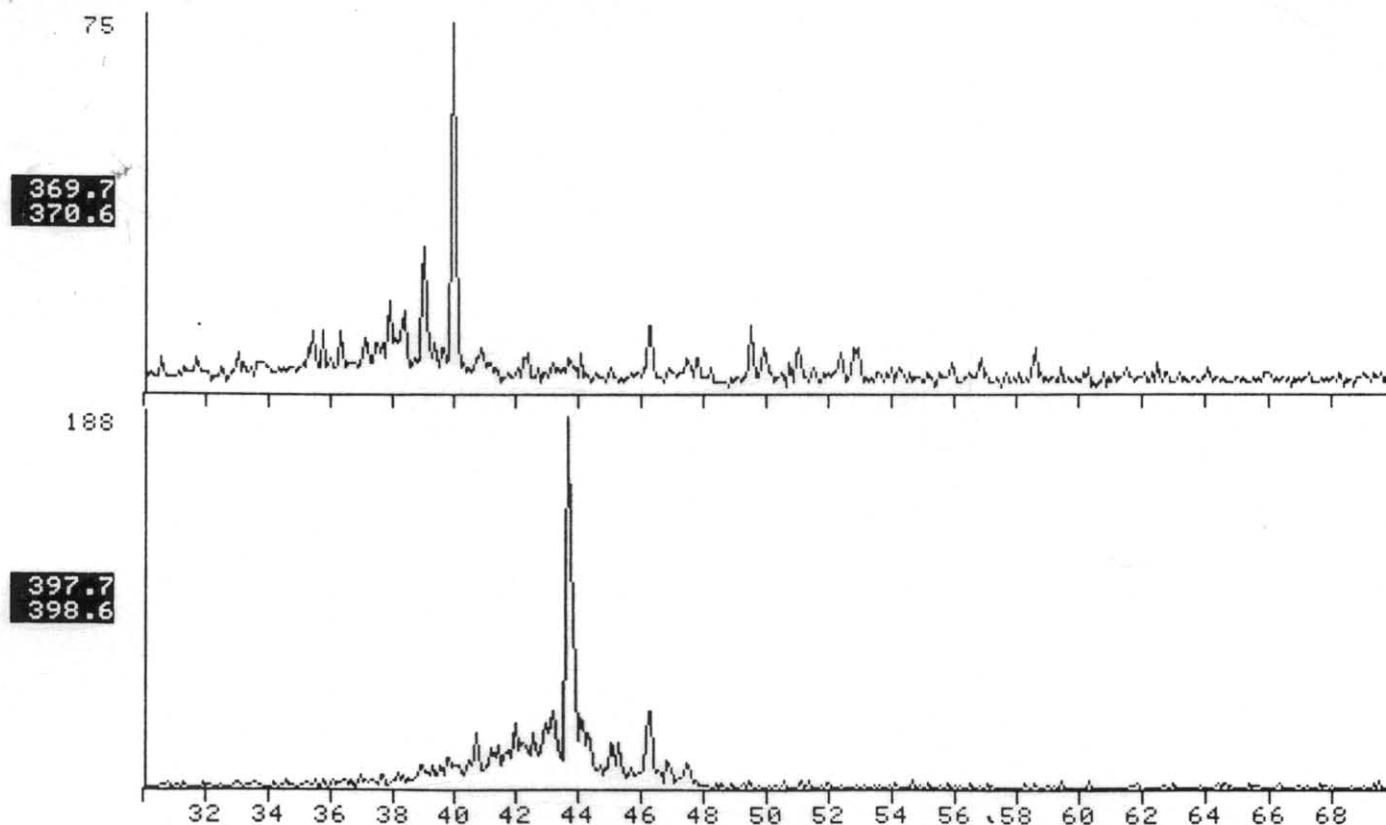
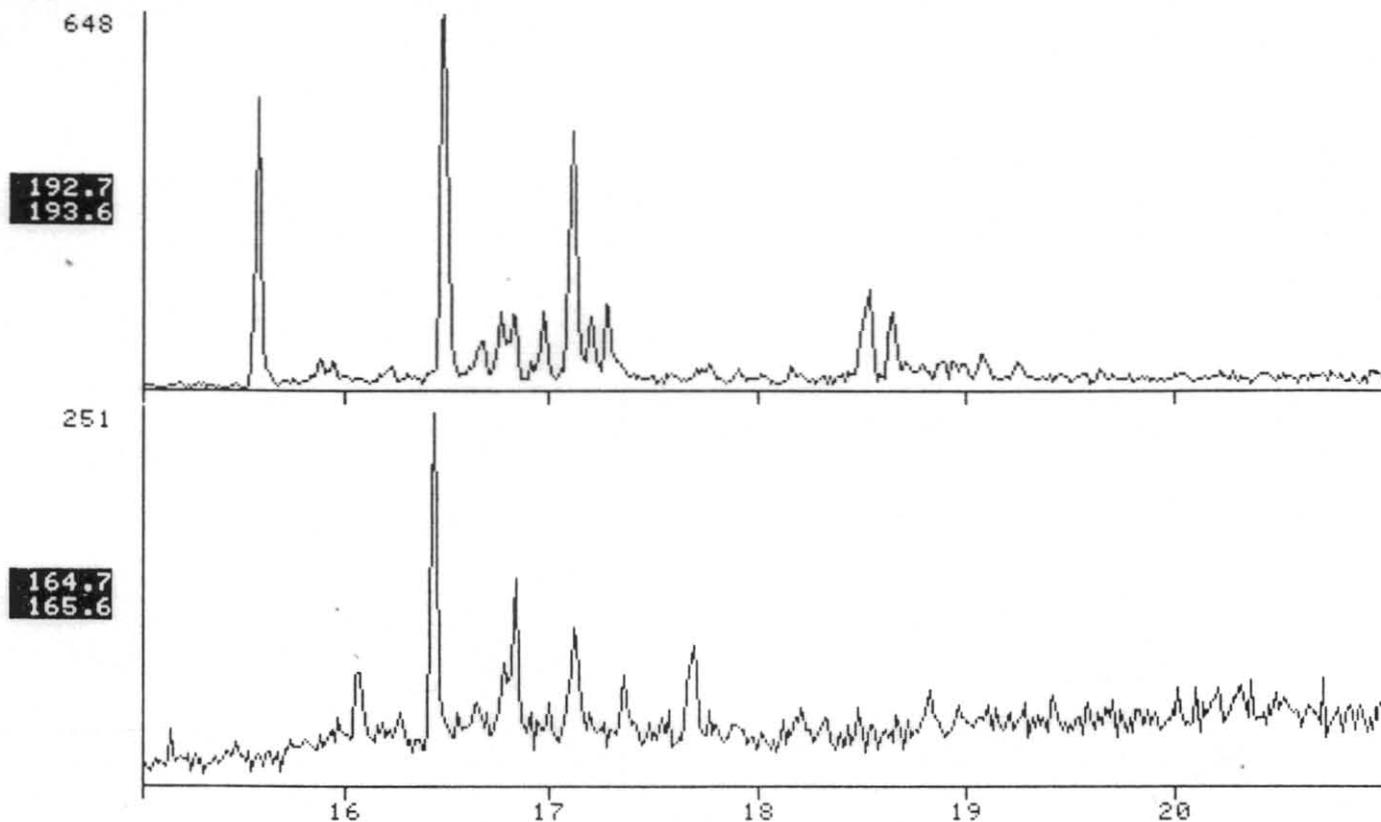


FIGURE: 2-9g

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

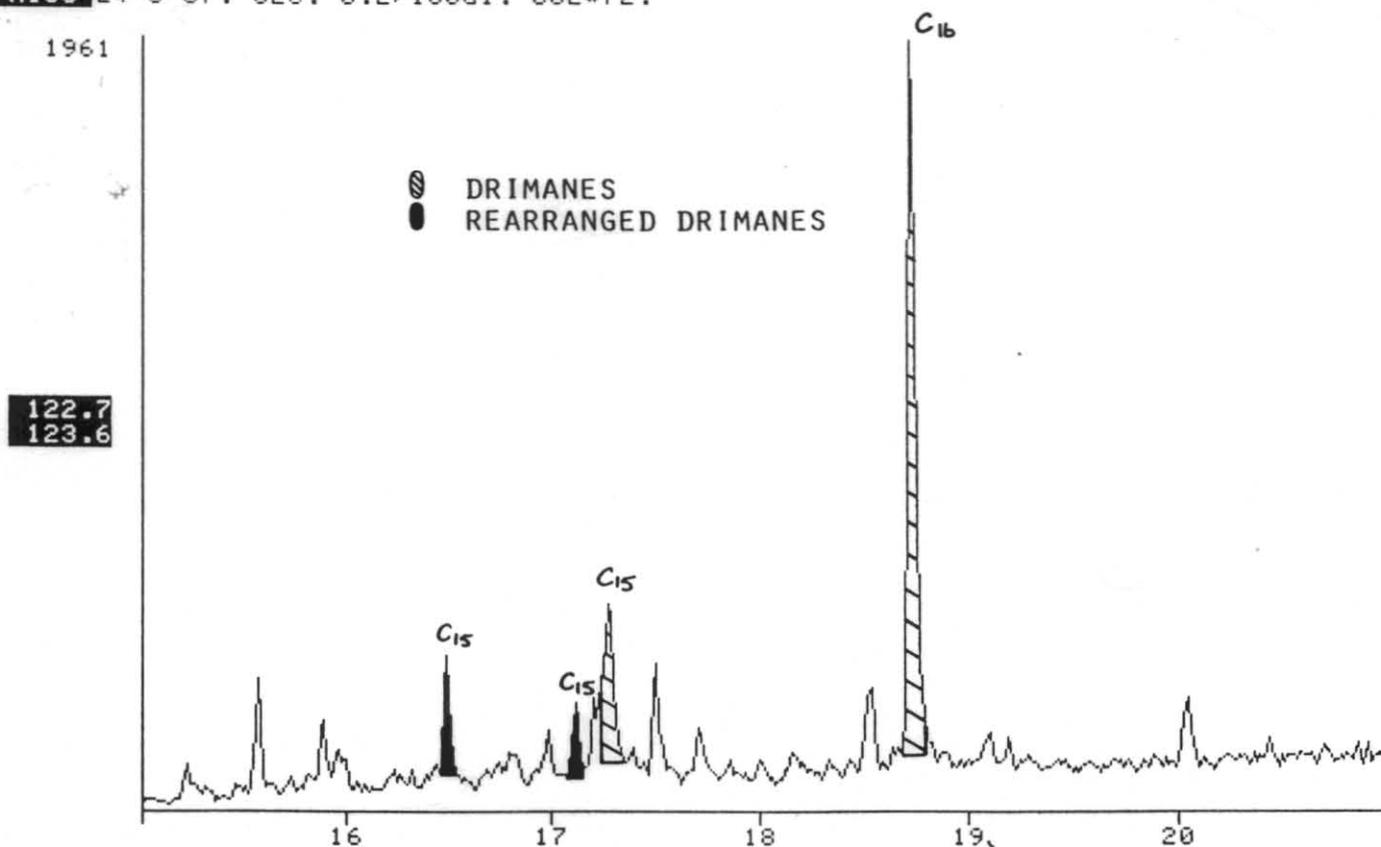
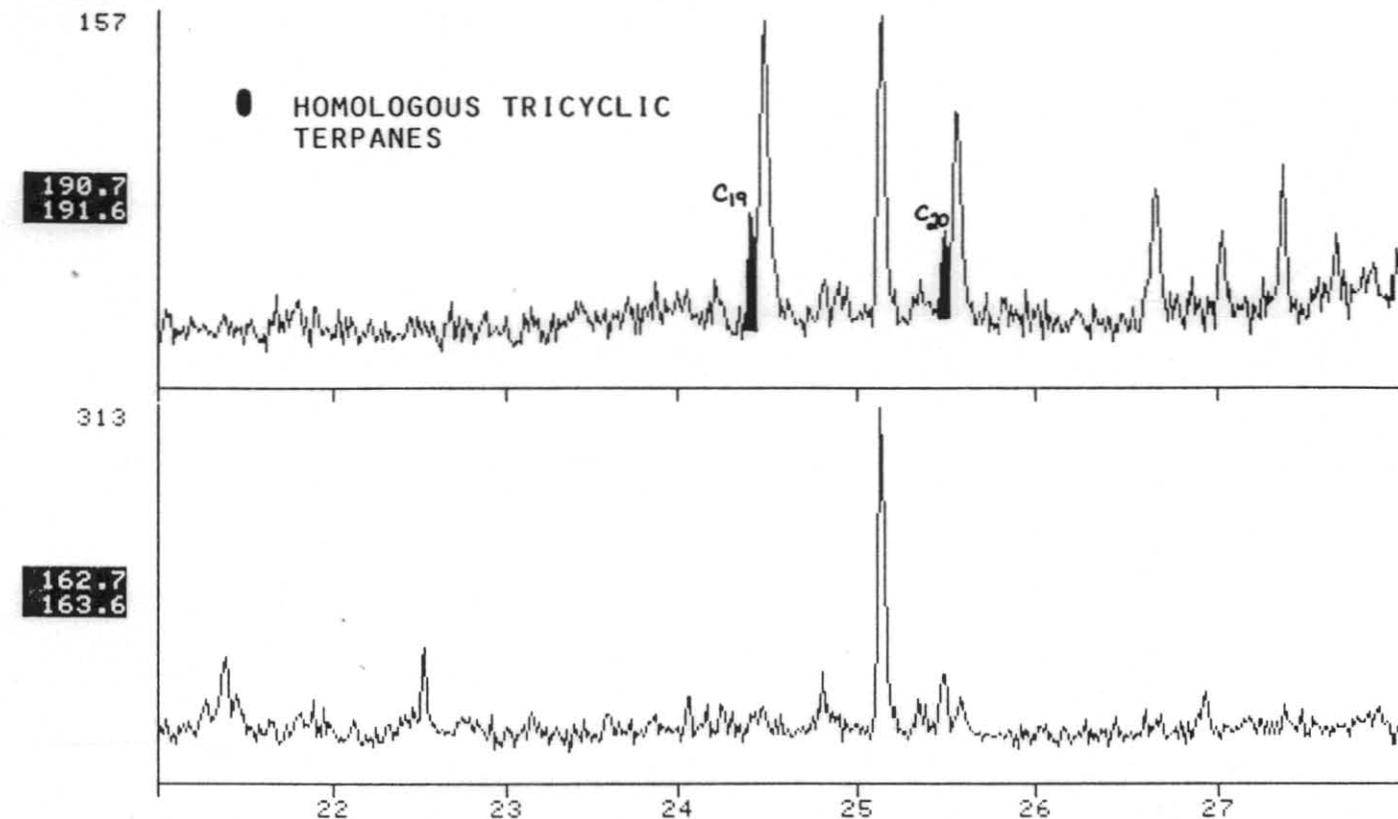


FIGURE: 2-9h

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

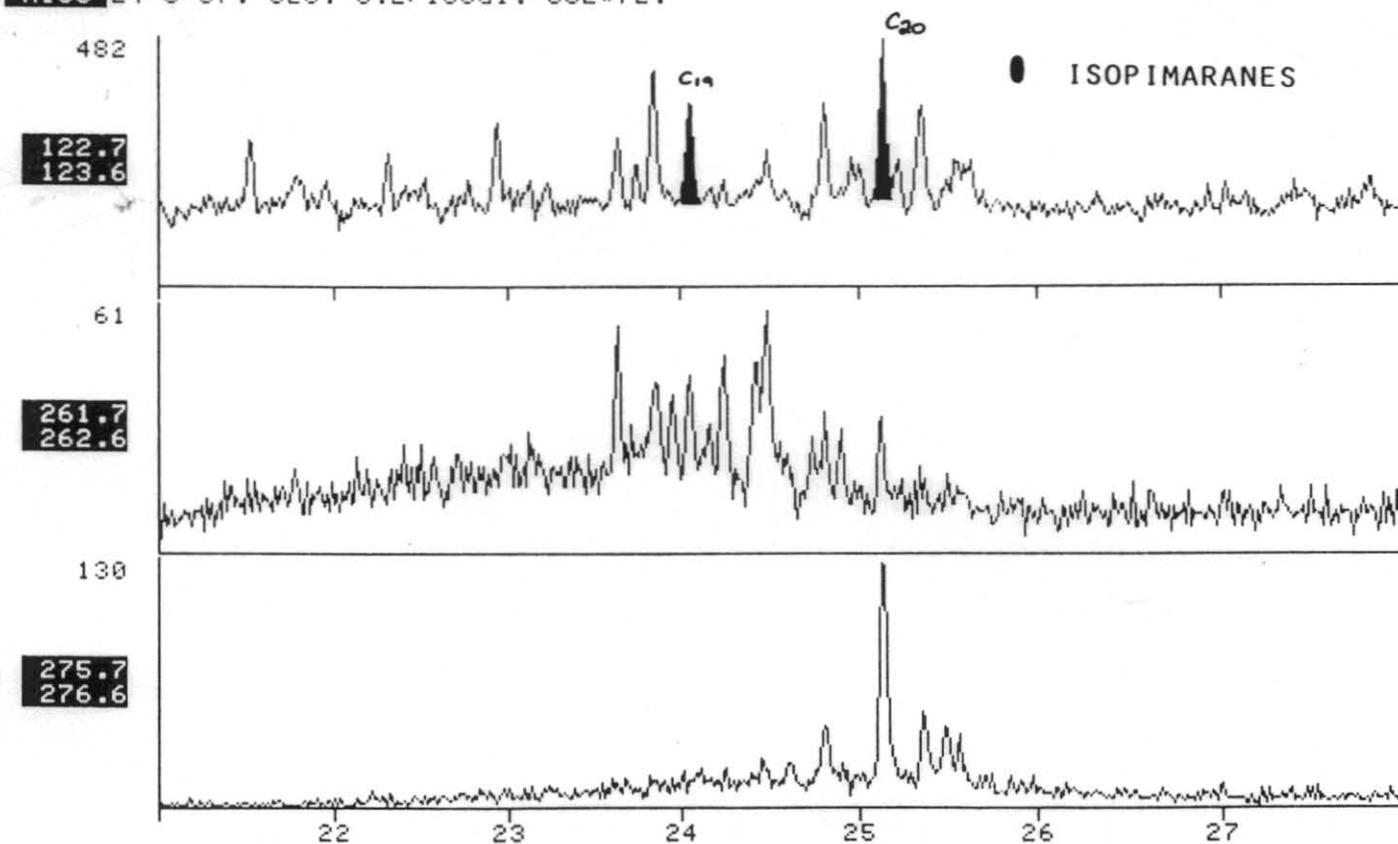
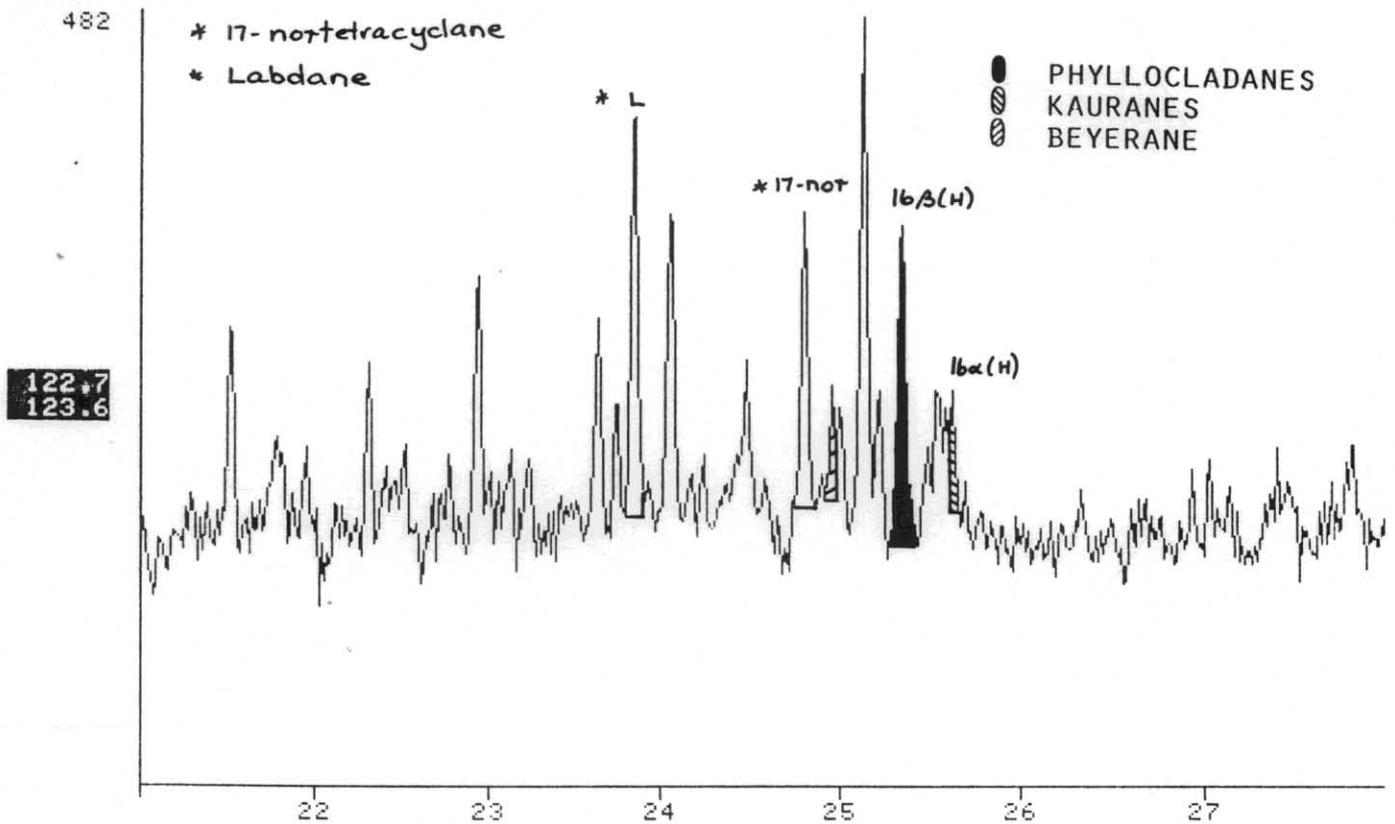


FIGURE: 2-9i

NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244



NAME DONDU#1, 7679'10". BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/100ul. COL#72.

FRN 6244

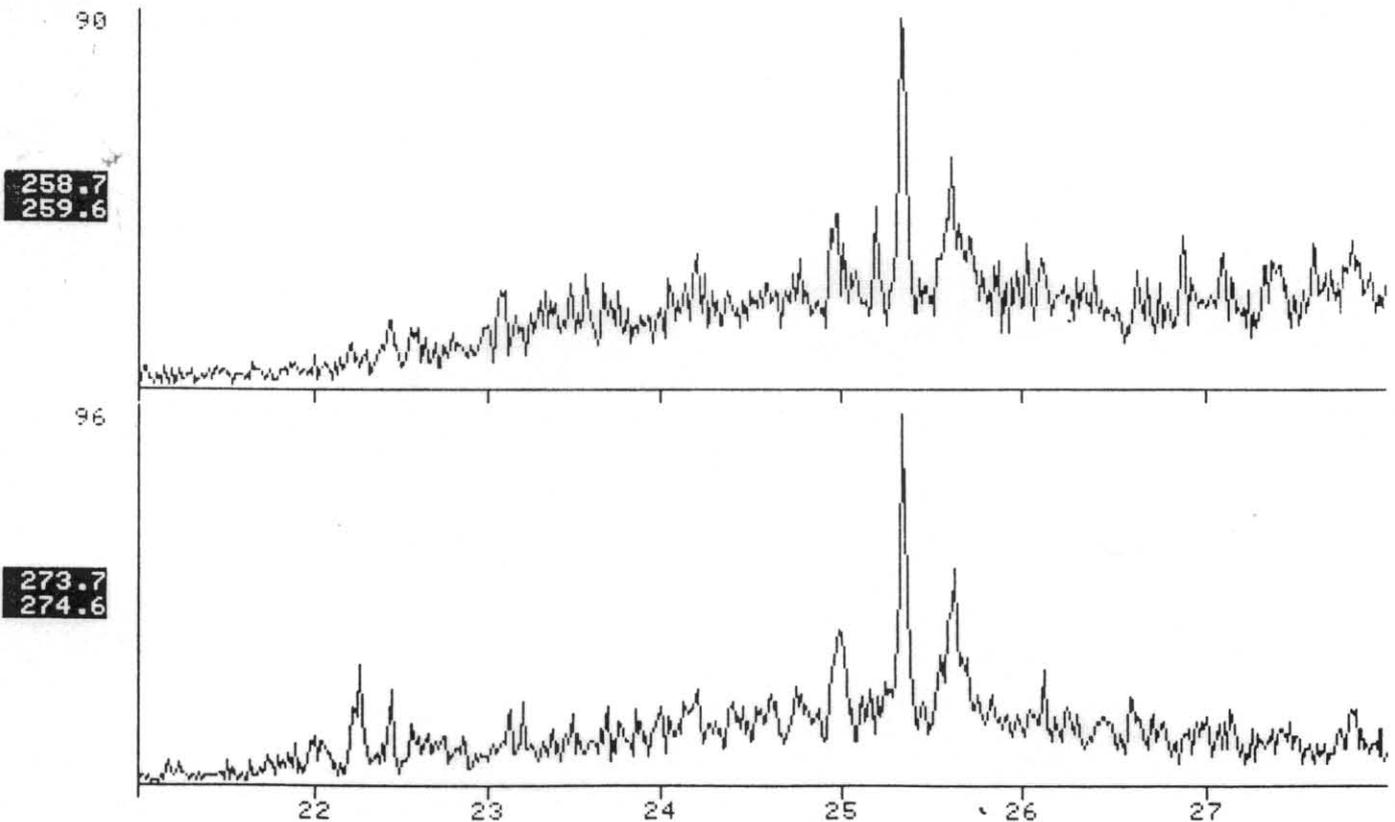
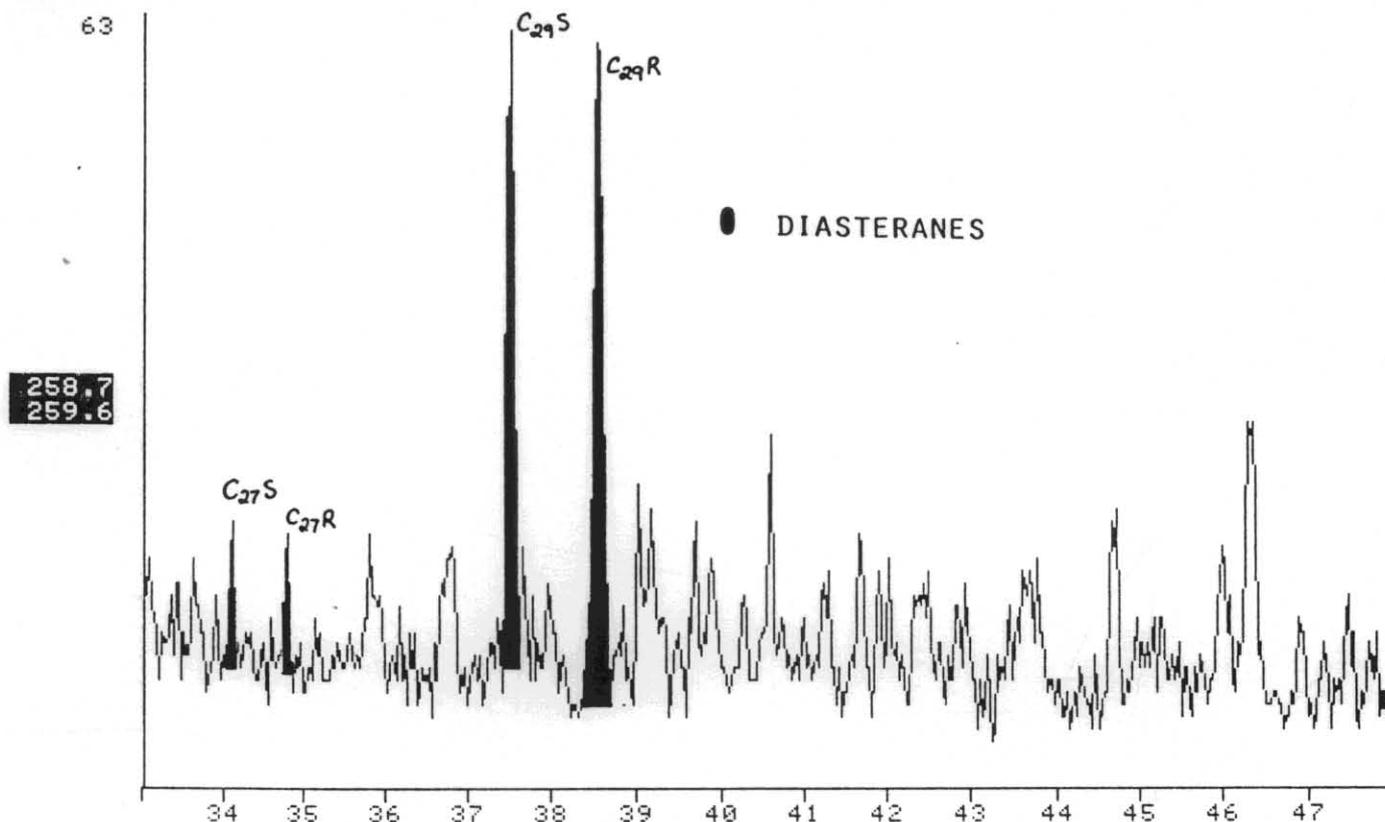


FIGURE: 2-10a

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6240



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6240

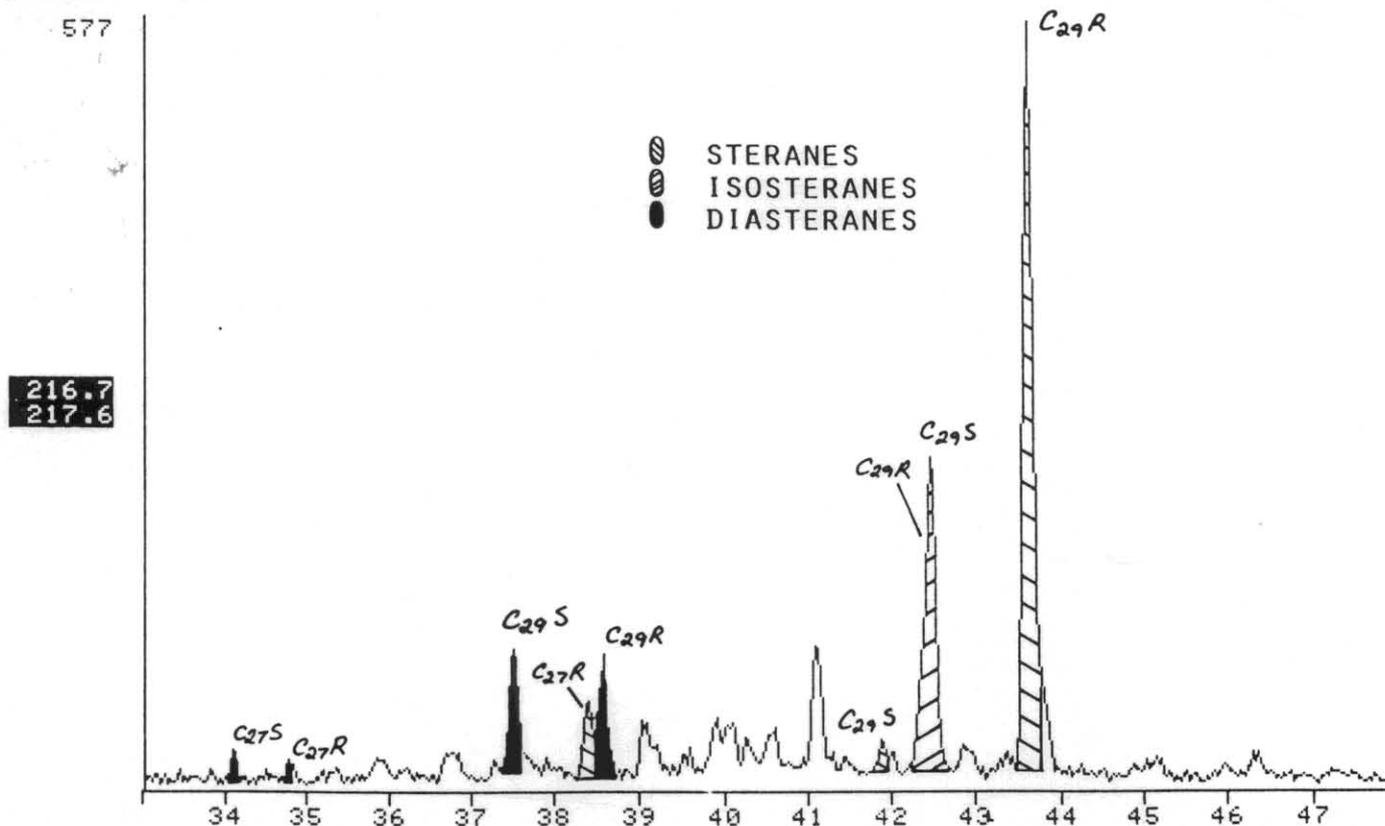
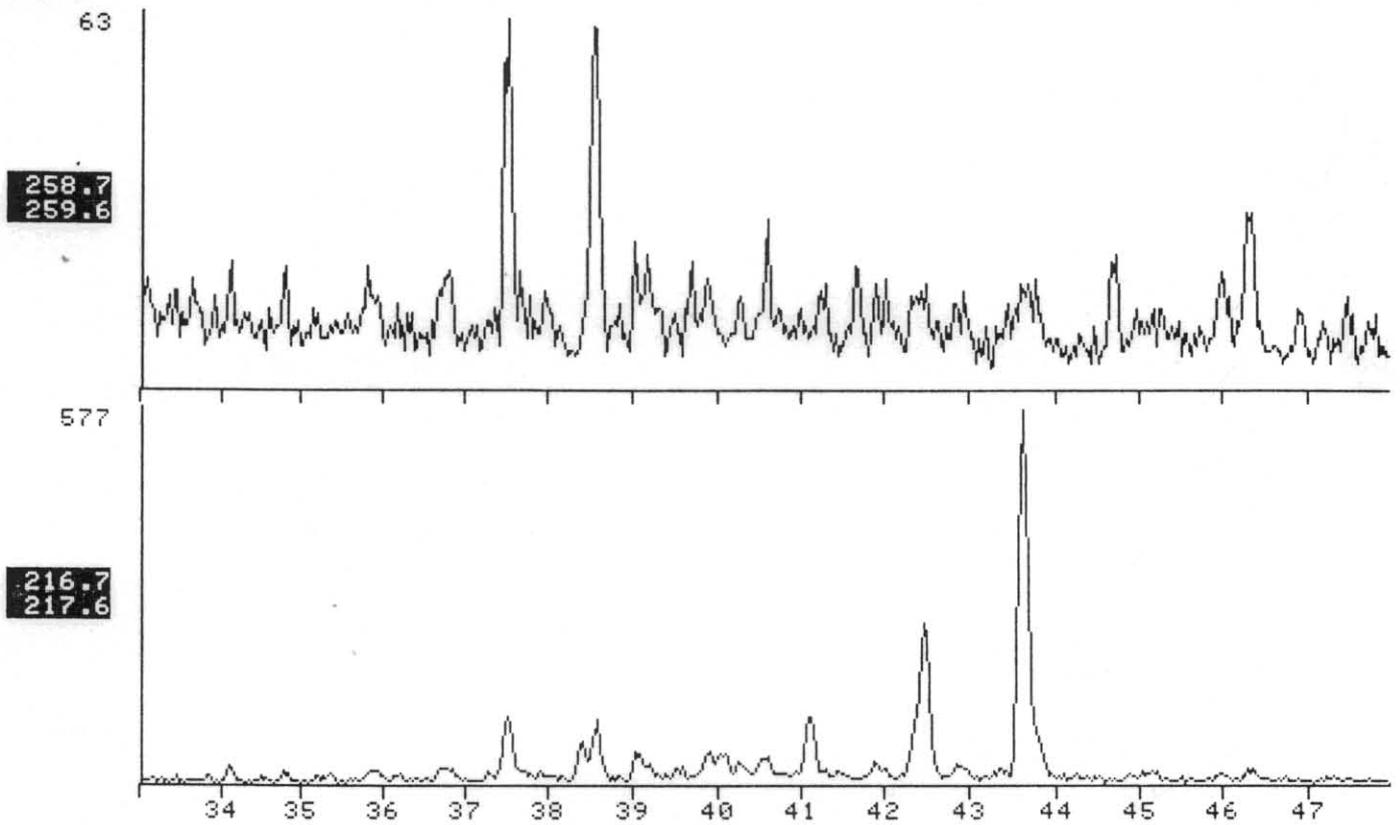


FIGURE: 2-10b

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240

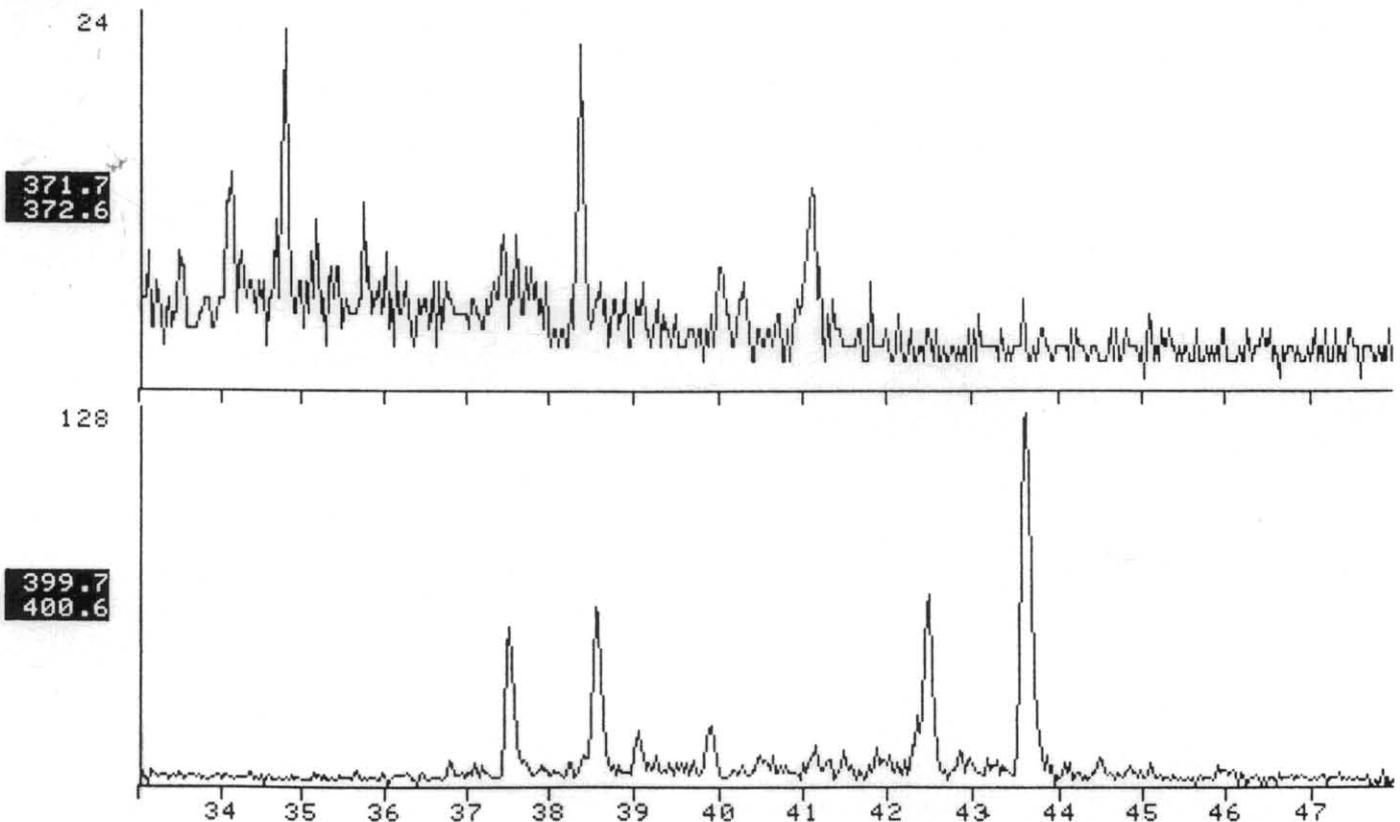
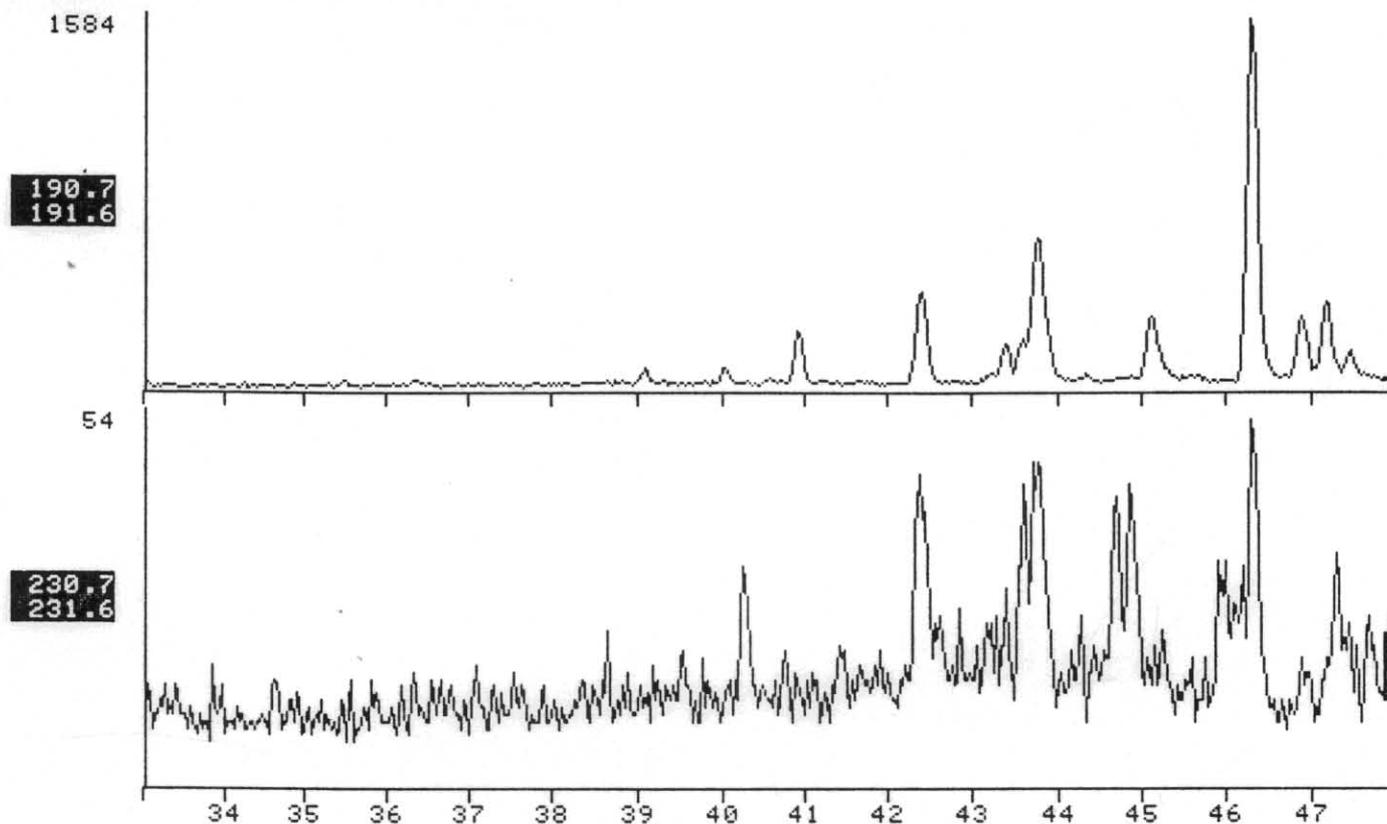


FIGURE: 2-10c

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240

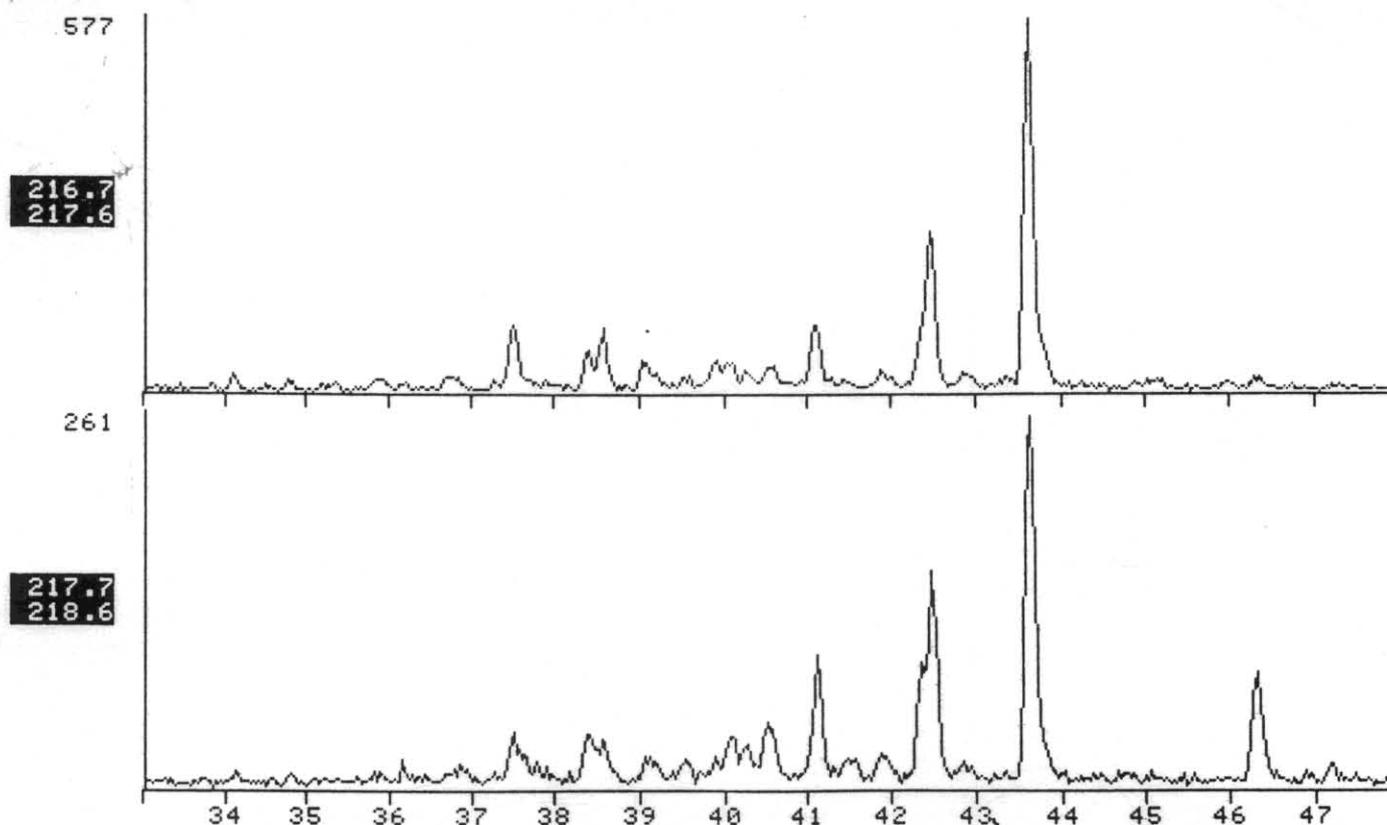
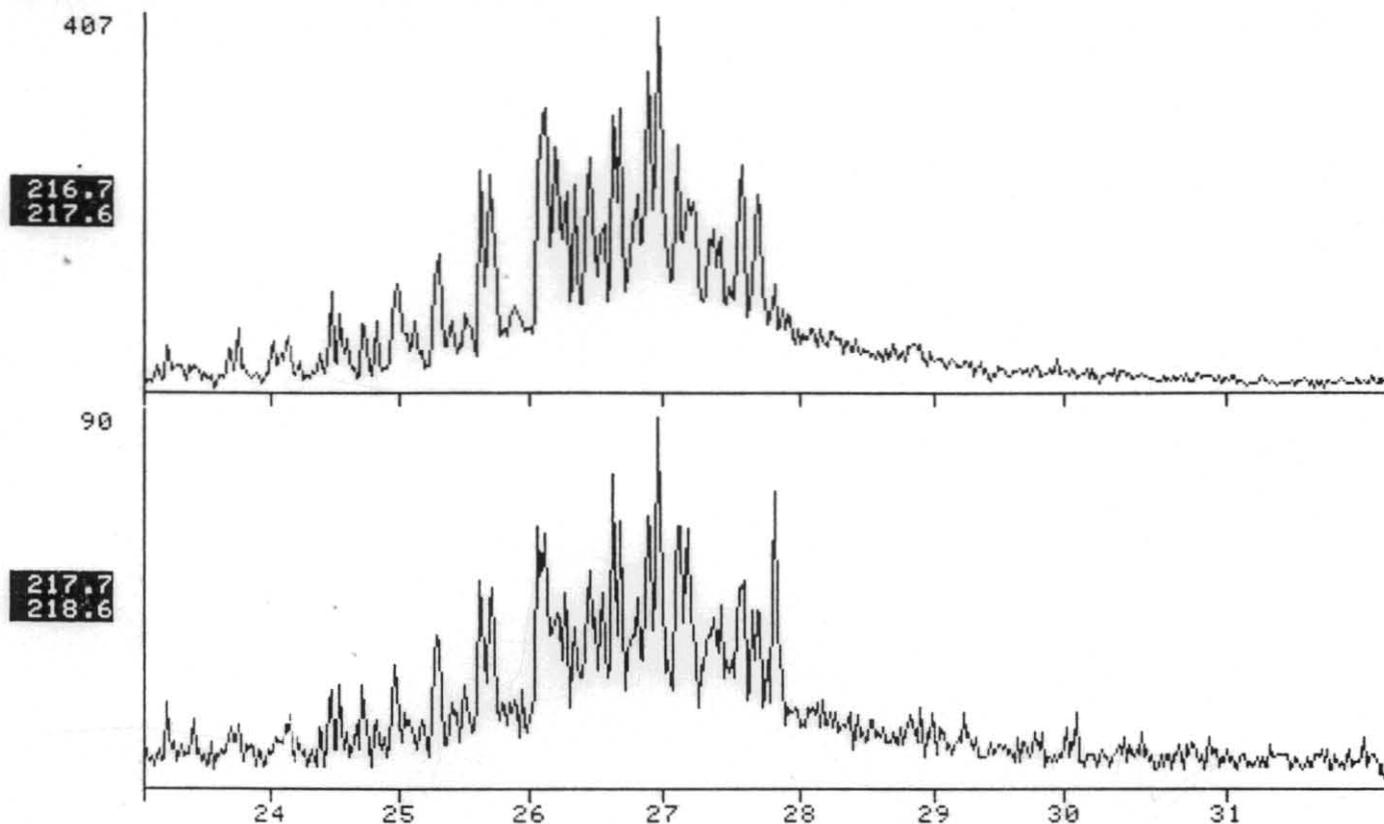


FIGURE 2-10d

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240

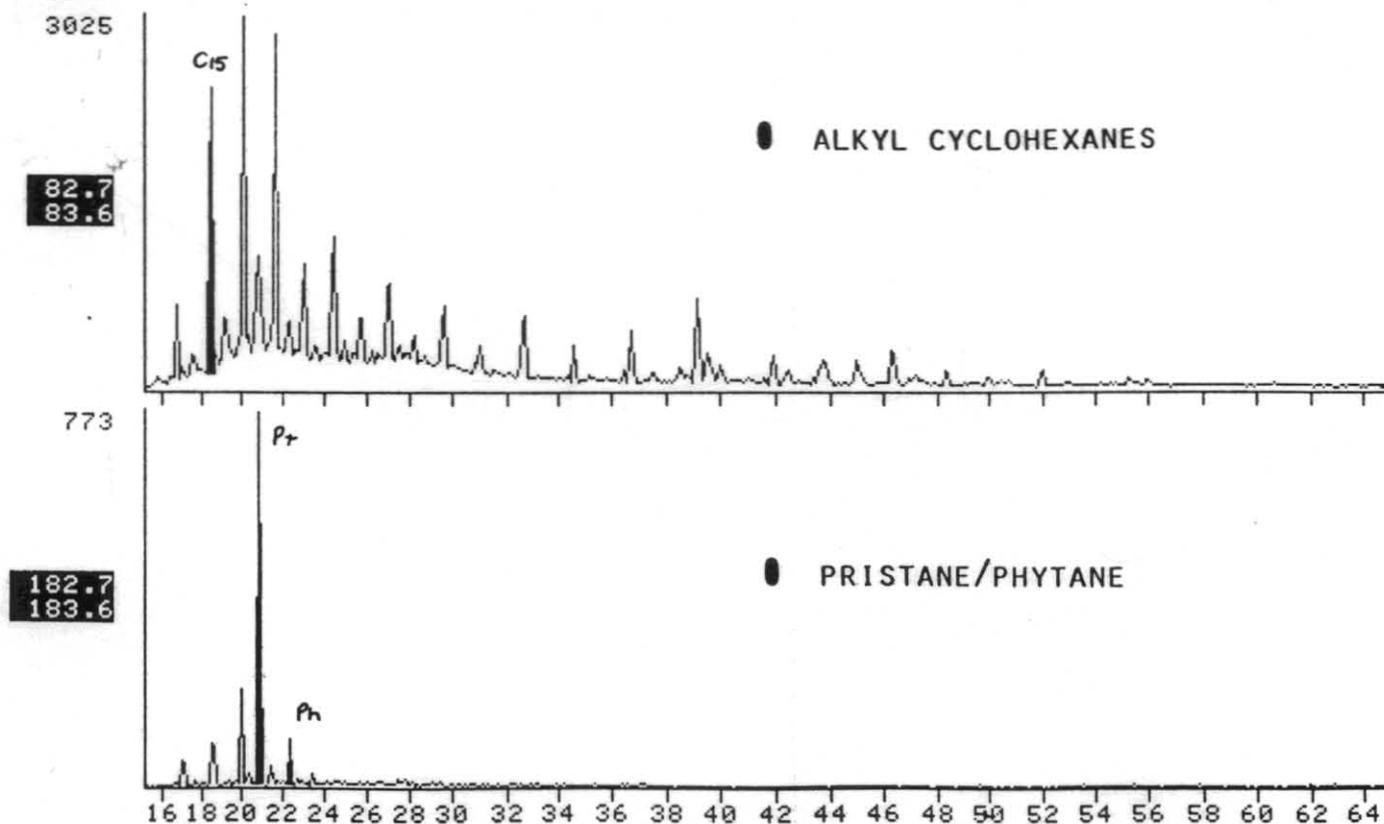
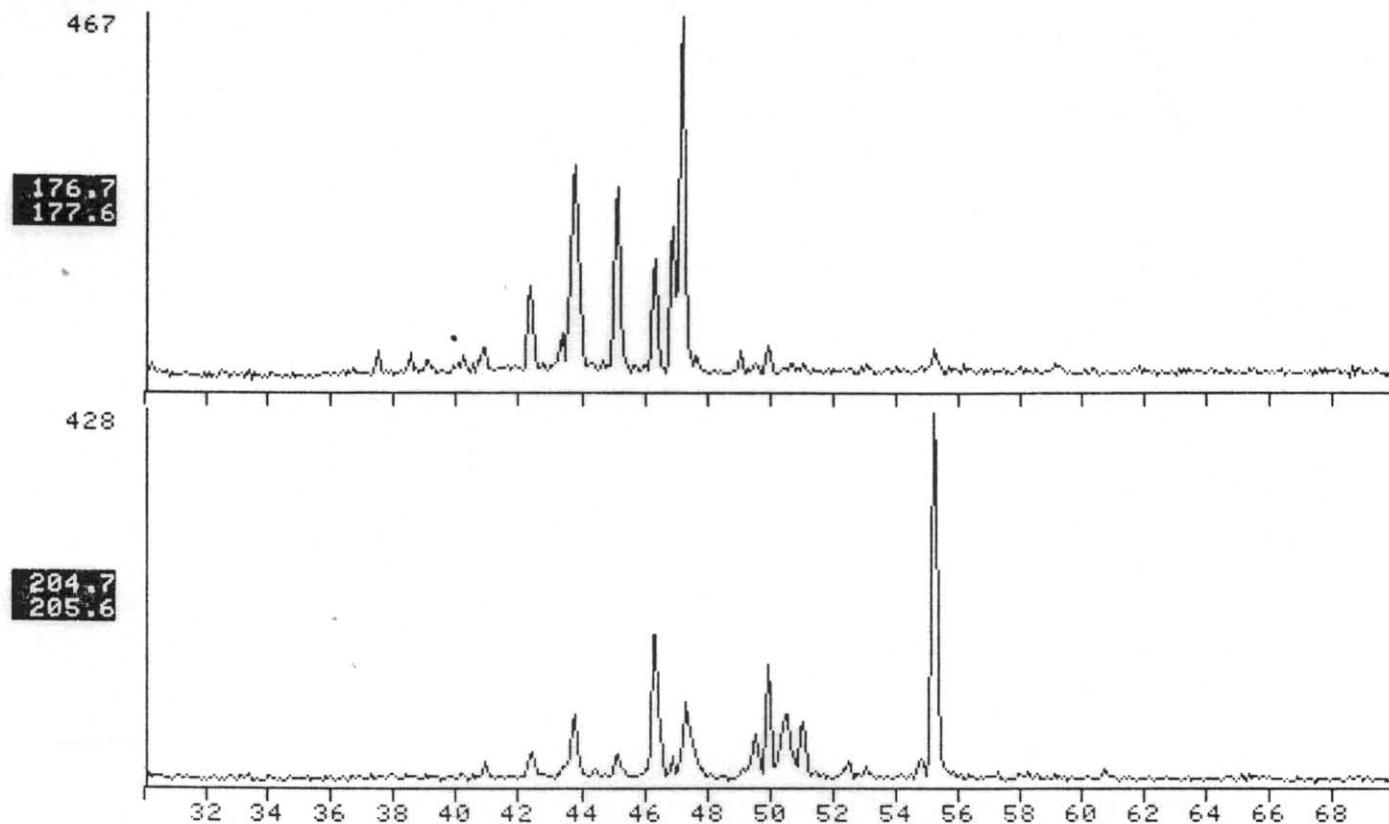


FIGURE: 2-10e

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6248



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6248

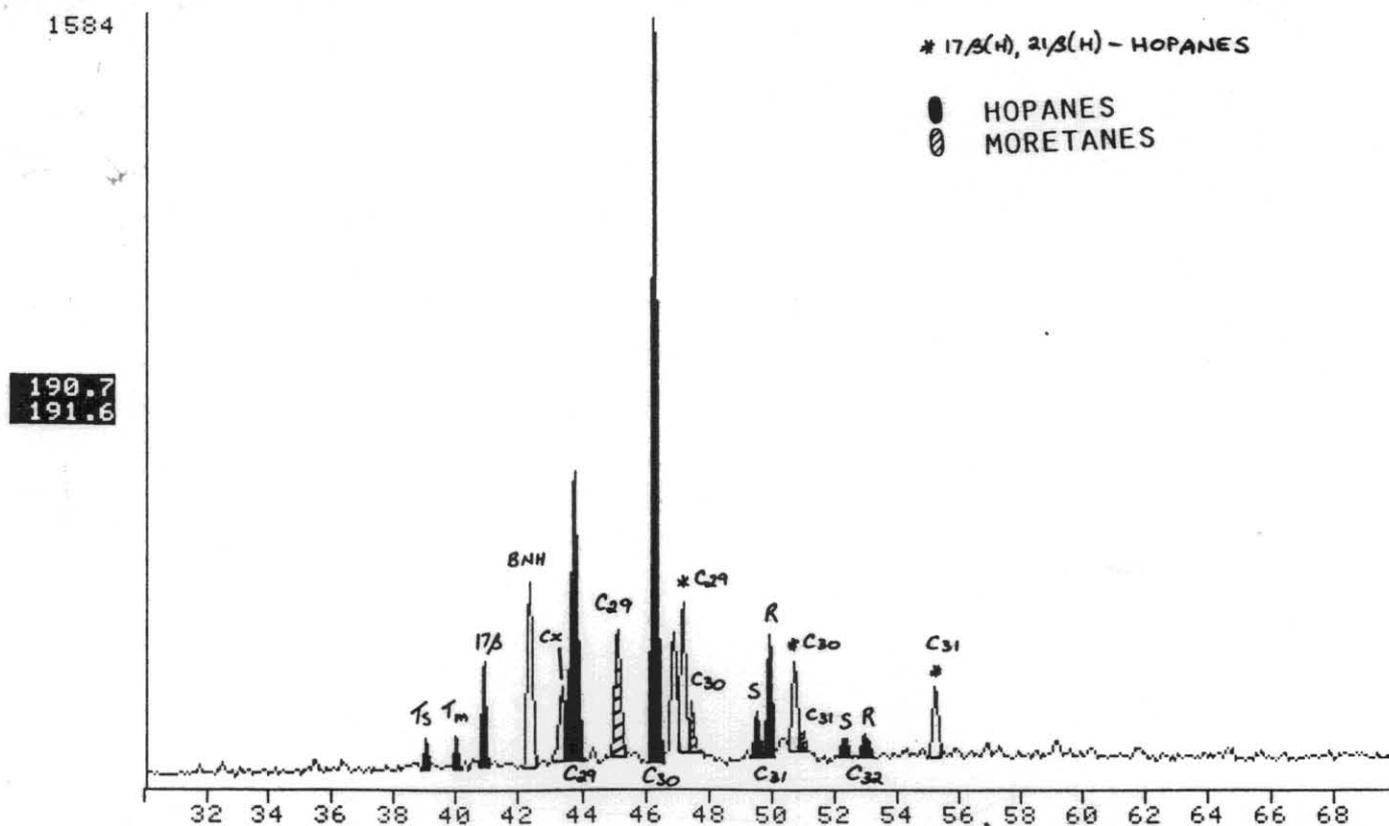
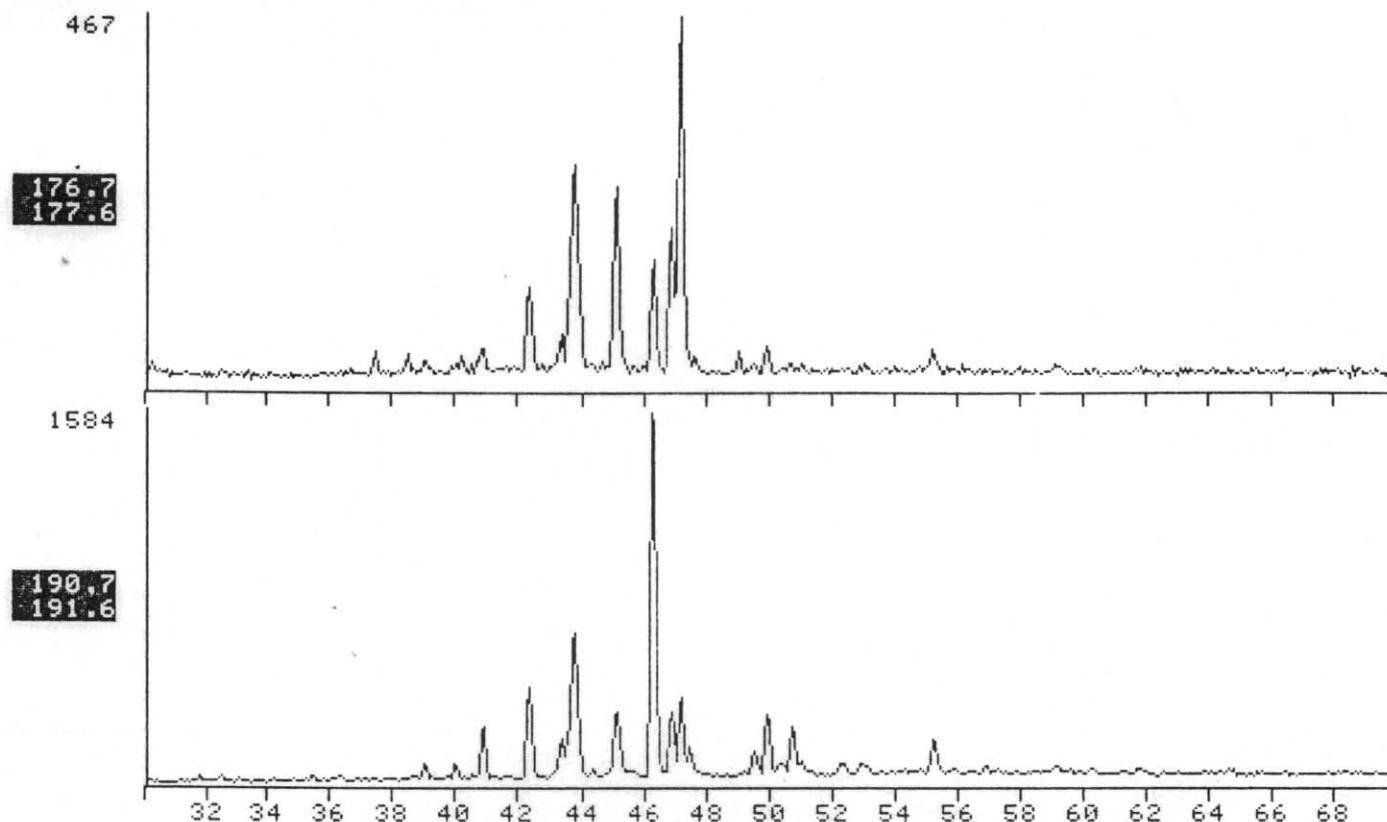


FIGURE: 2-10f

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6248



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6248

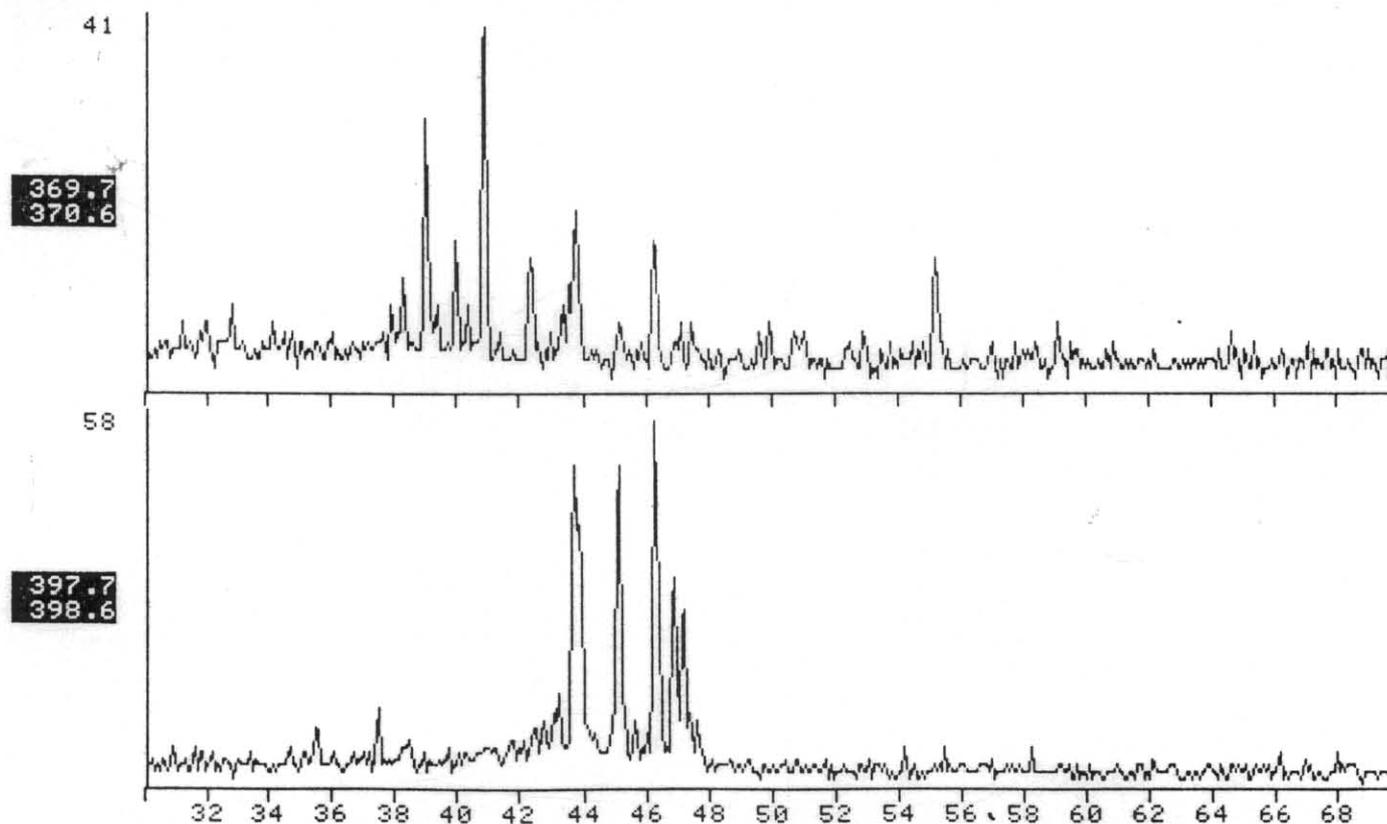
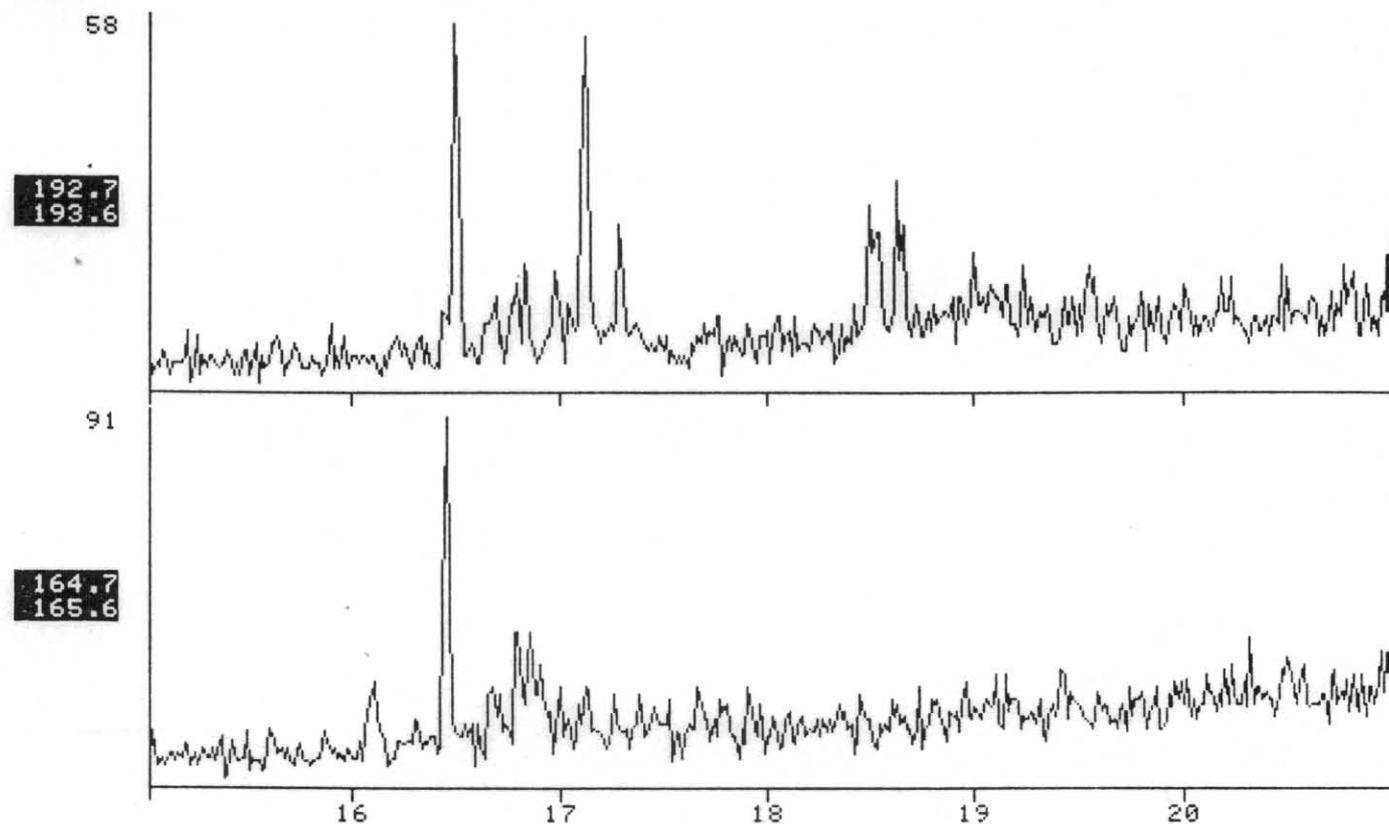


FIGURE: 2-10g

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6248



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70#

FRN 6248

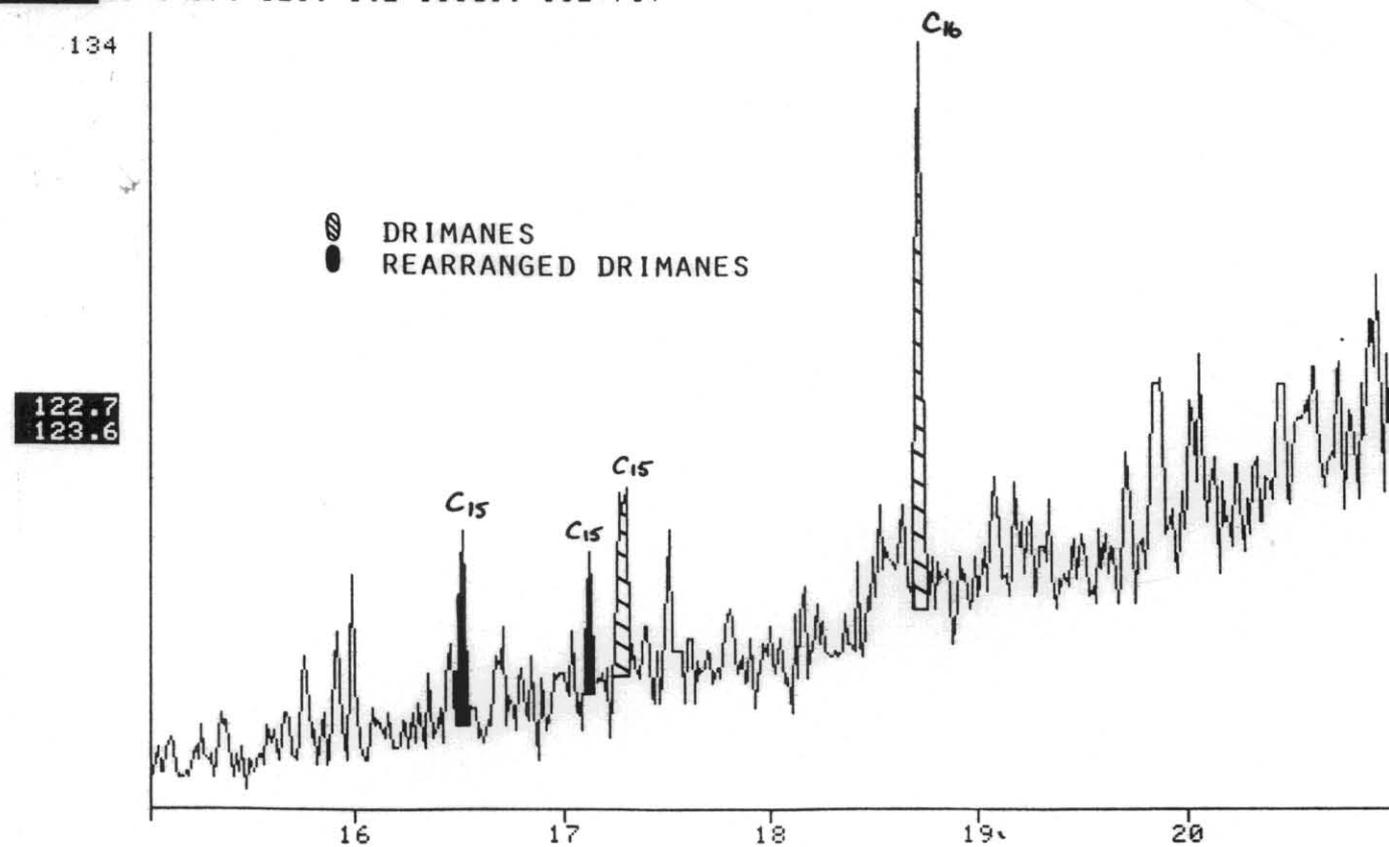
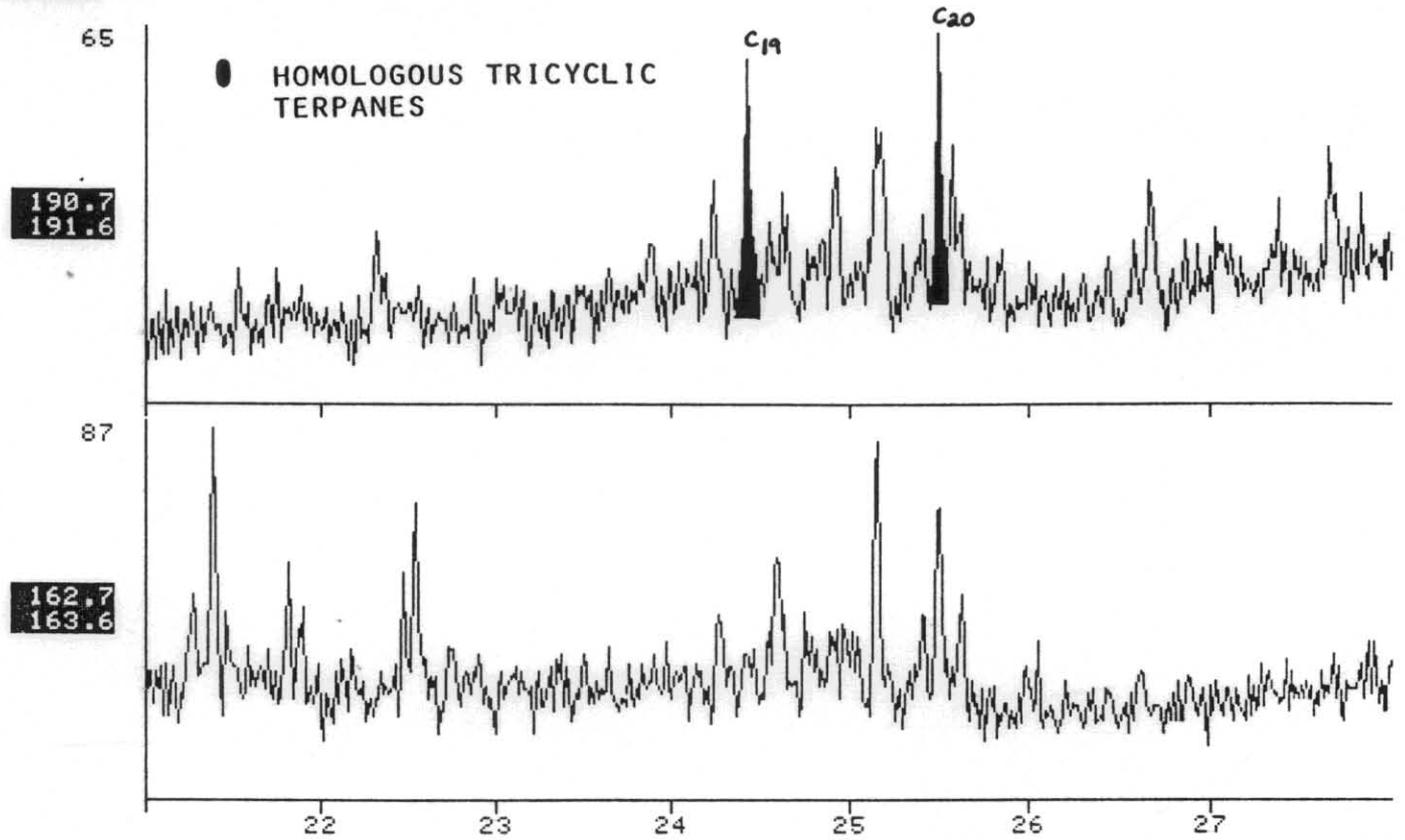


FIGURE: 2-10h

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240

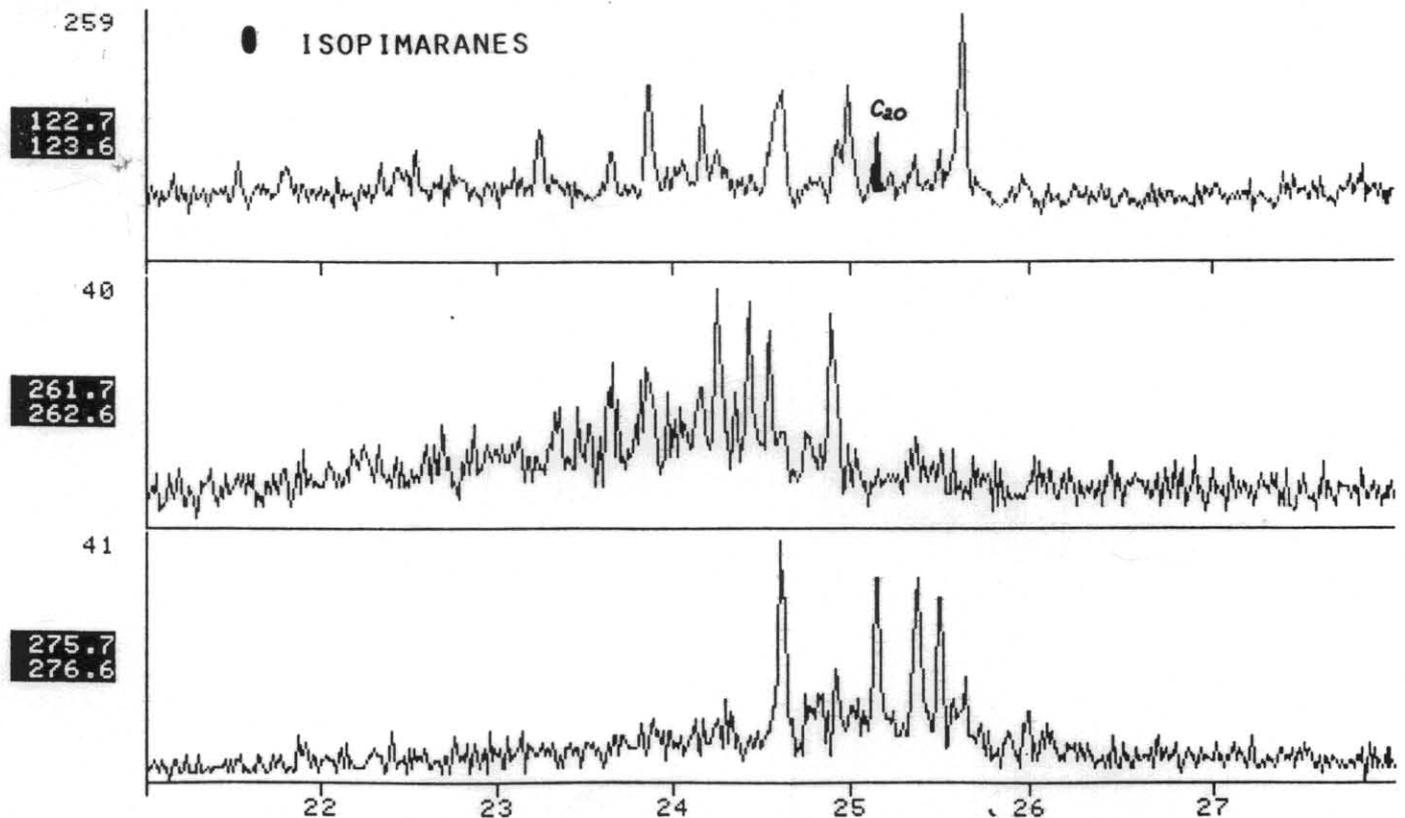
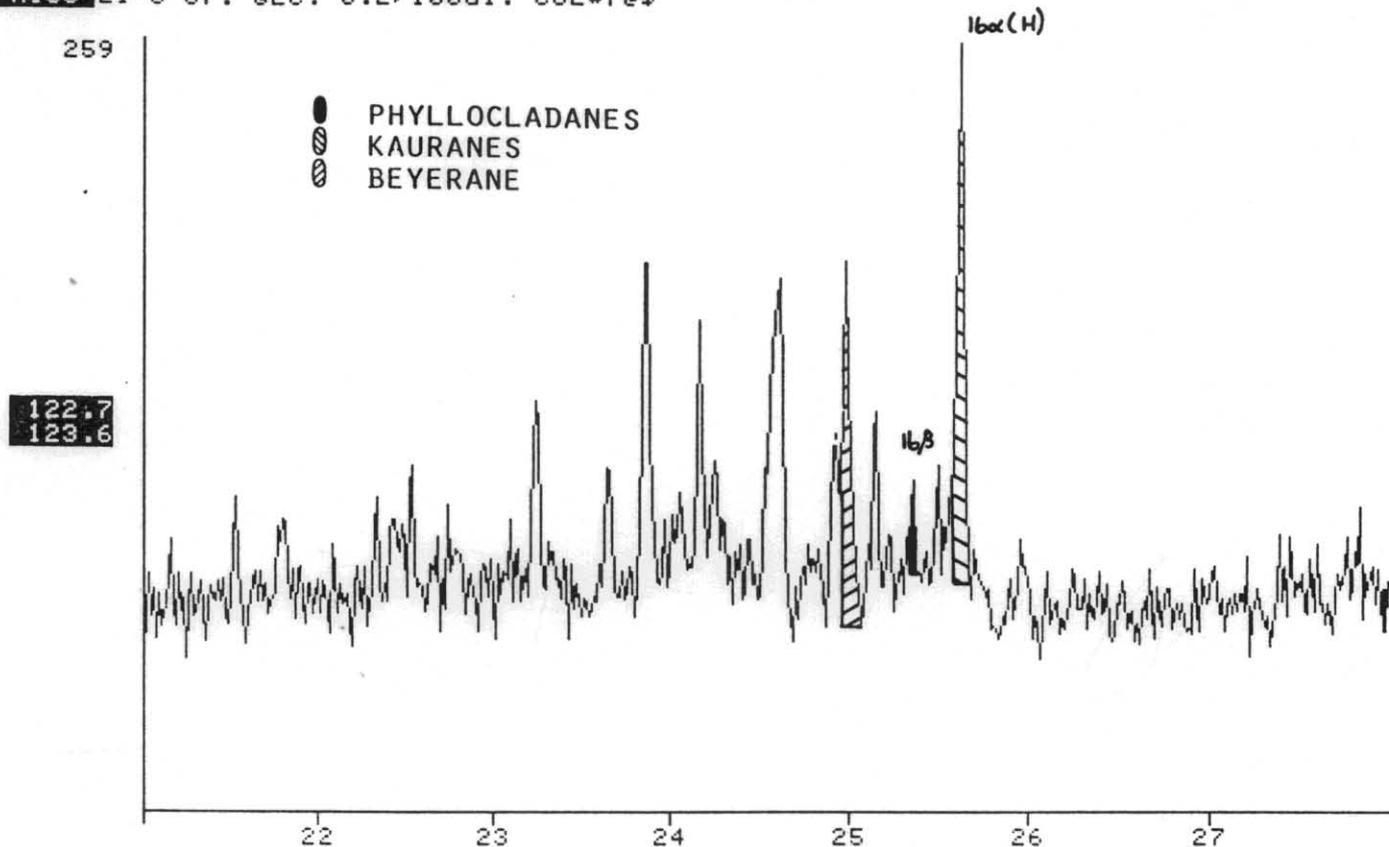


FIGURE: 2-10i

NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240



NAME DURROON#1, 5551'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/100ul. COL#70\$

FRN 6240

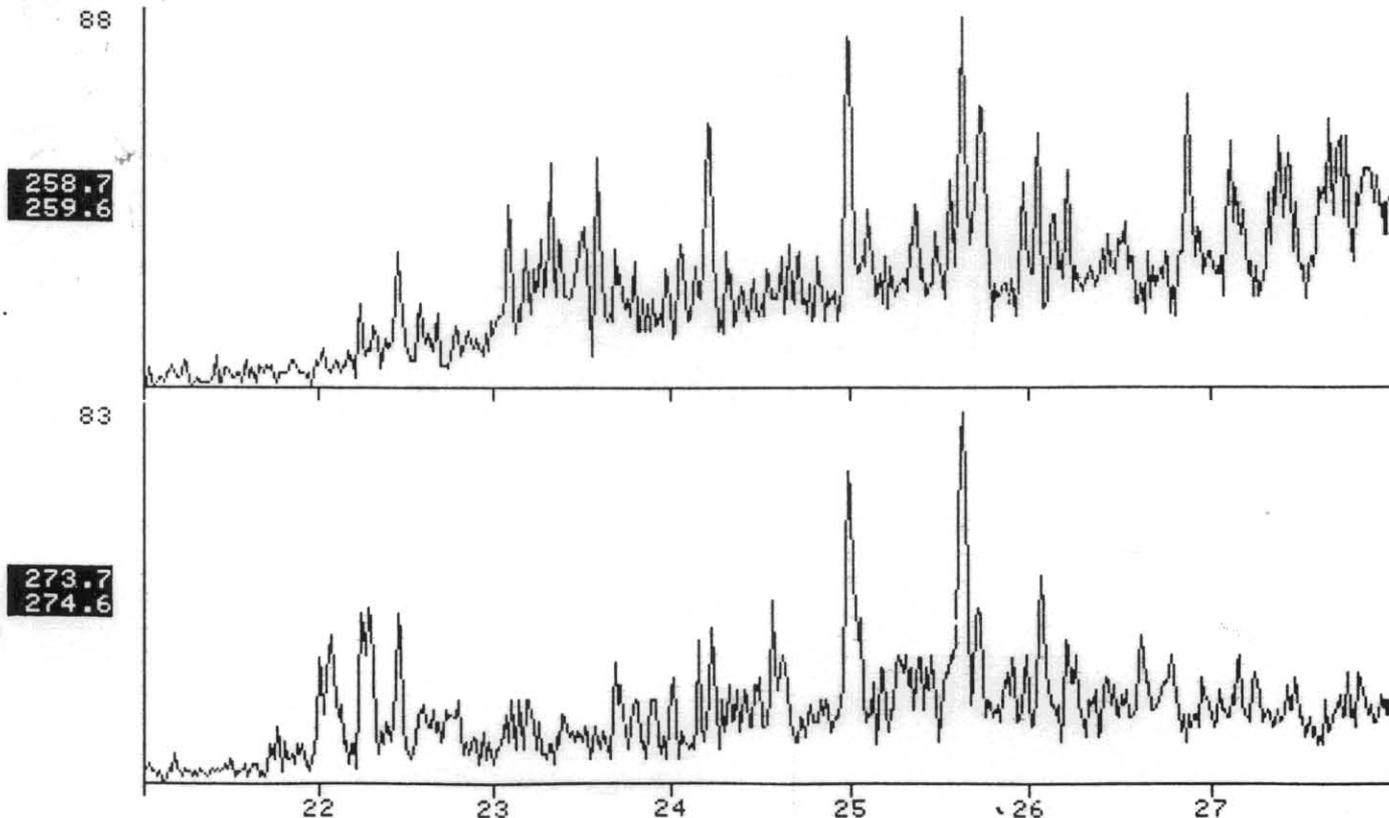
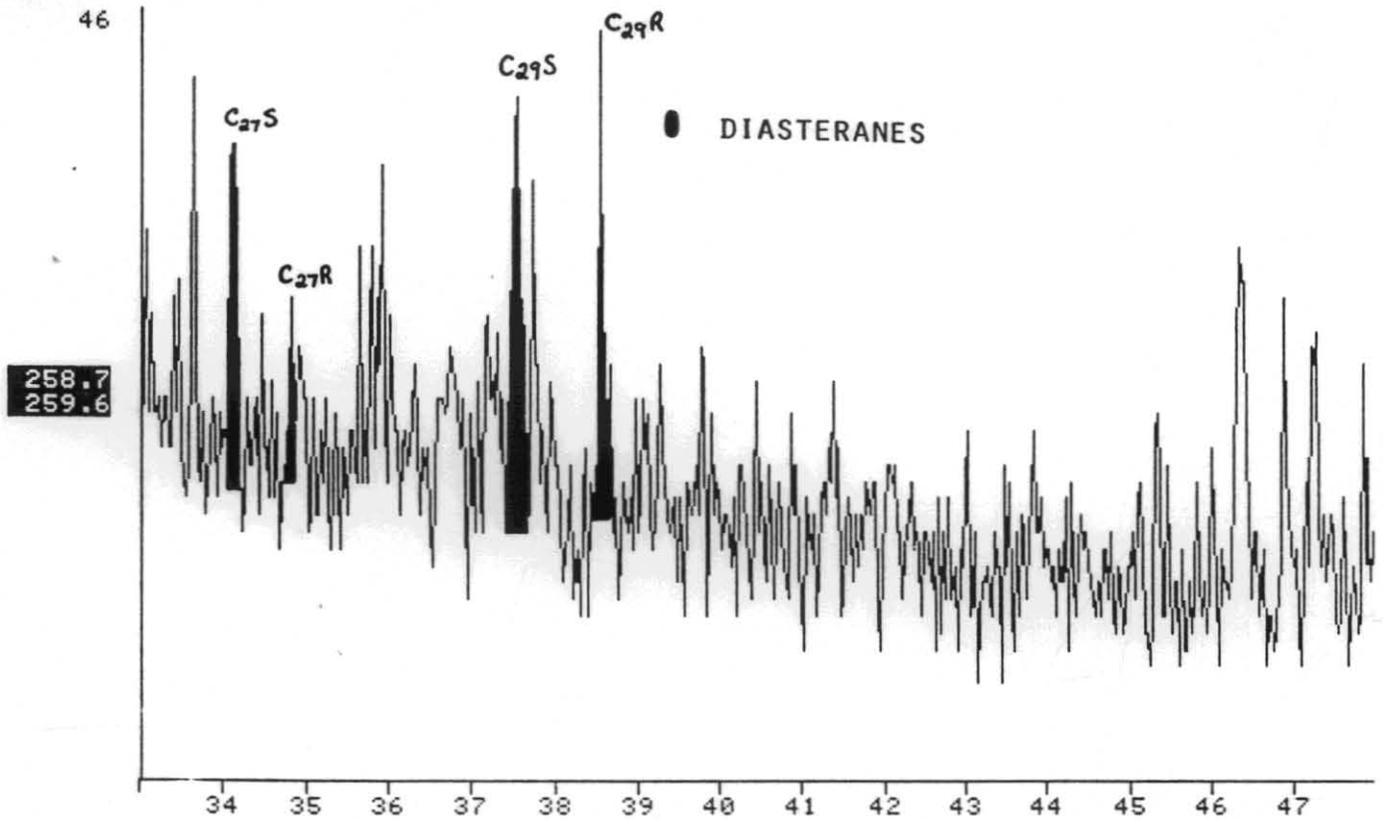


FIGURE: 2-11a

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

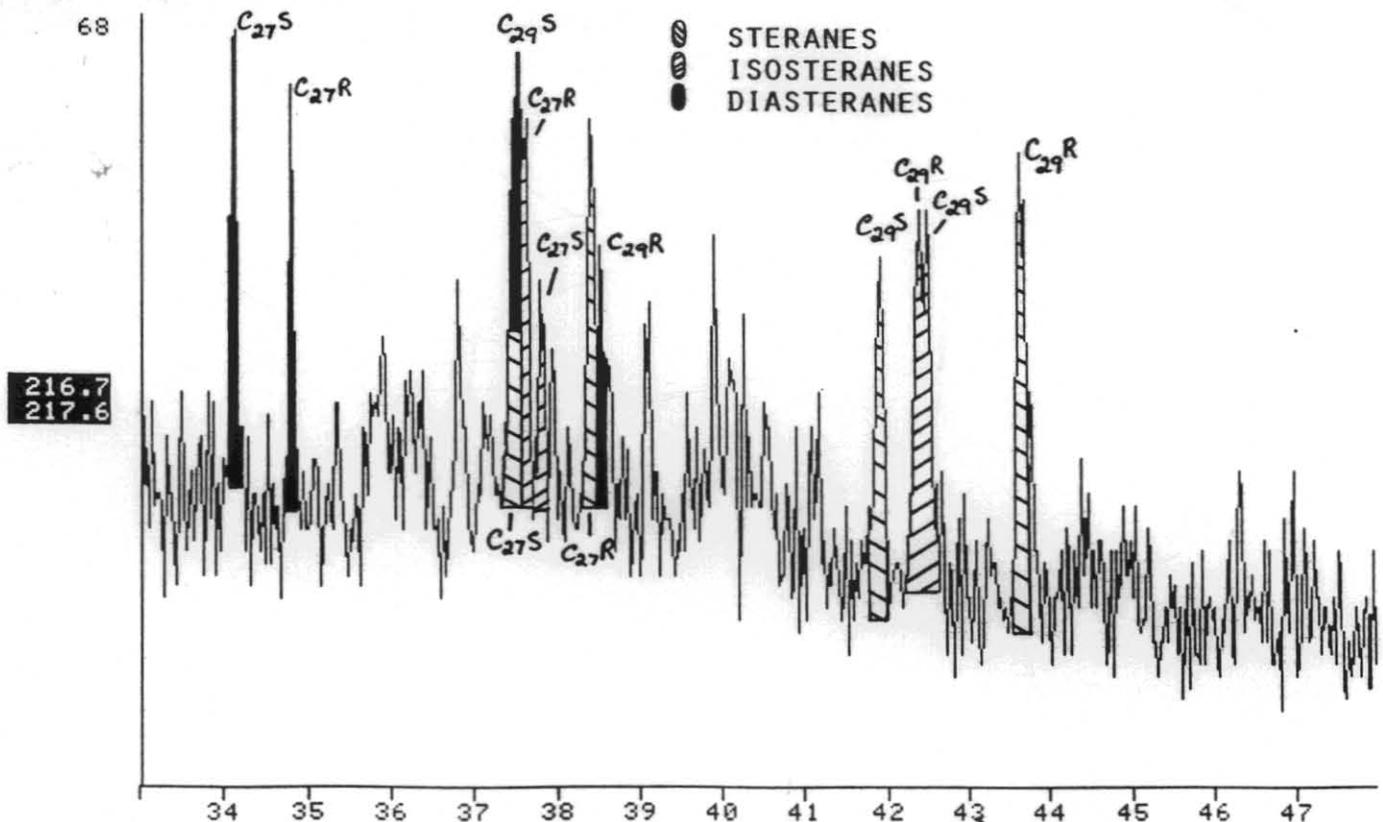
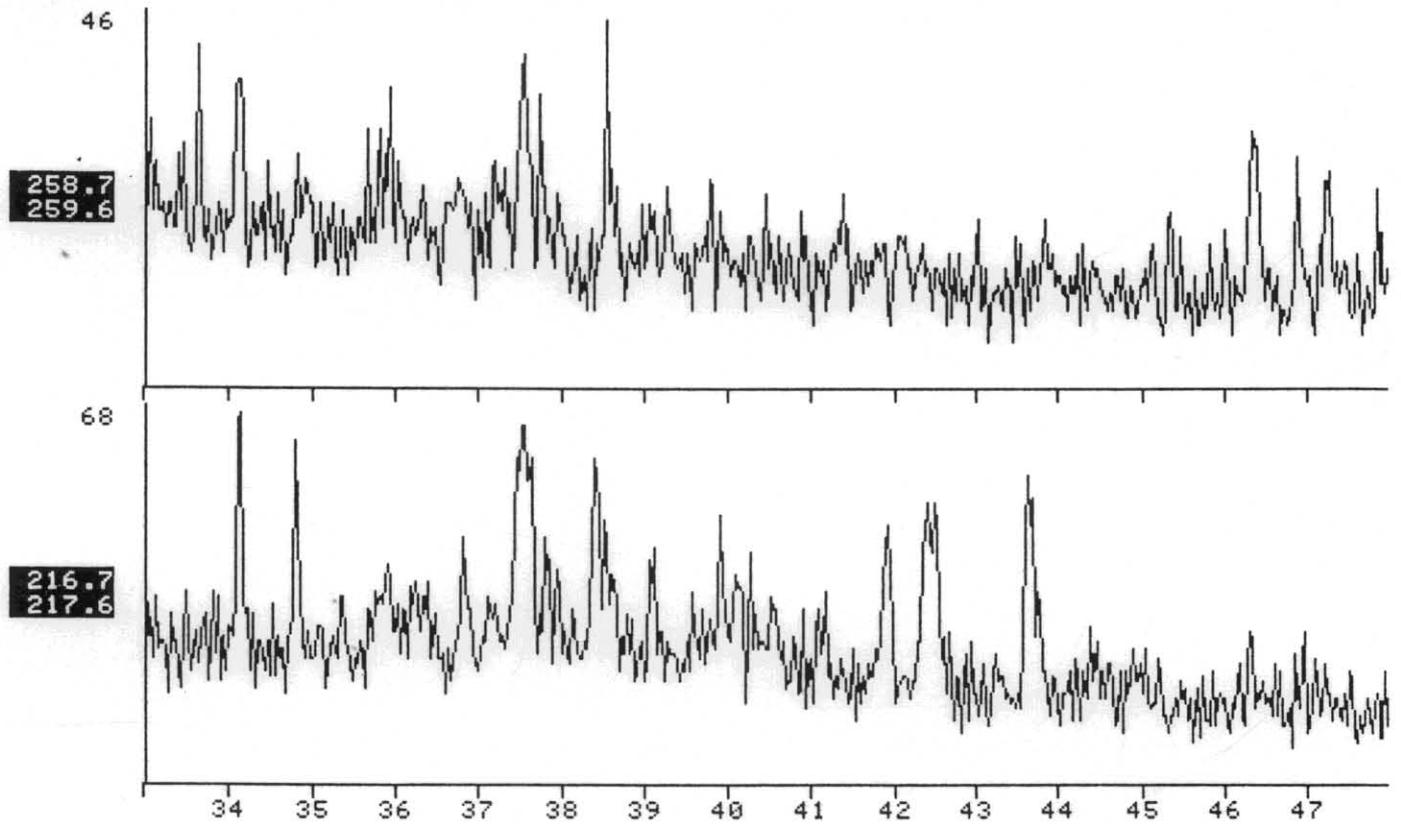


FIGURE: 2-11b

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

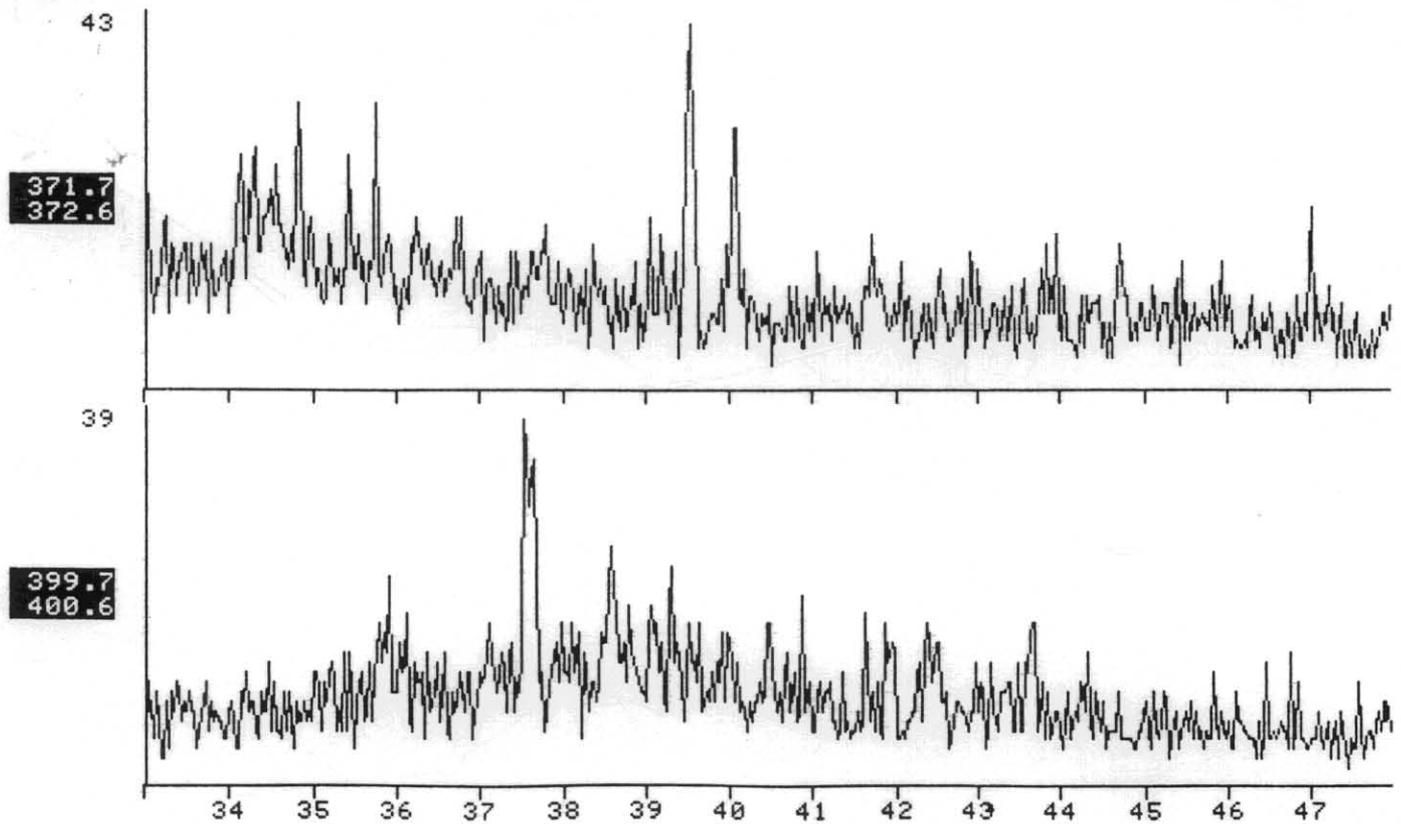
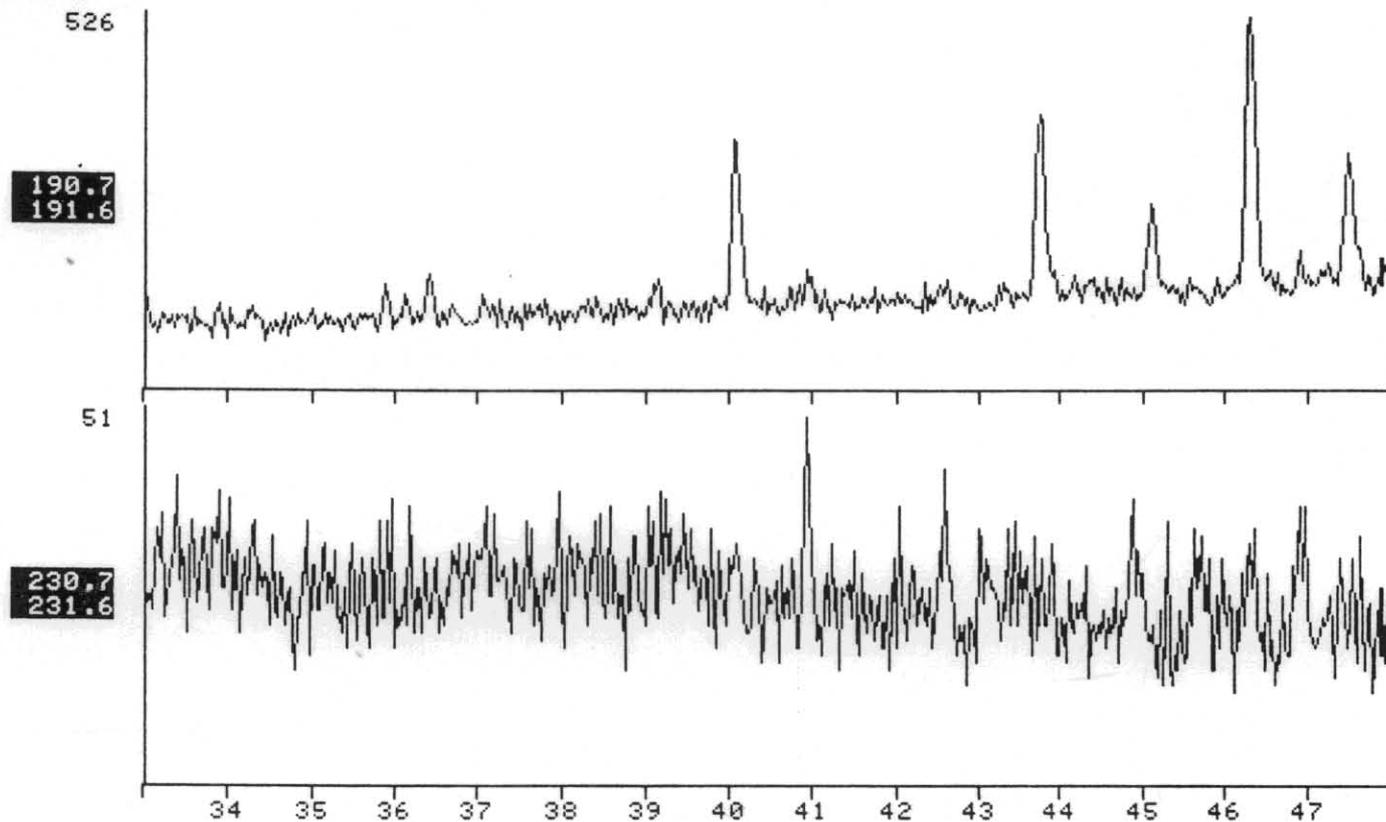


FIGURE: 2-11c

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

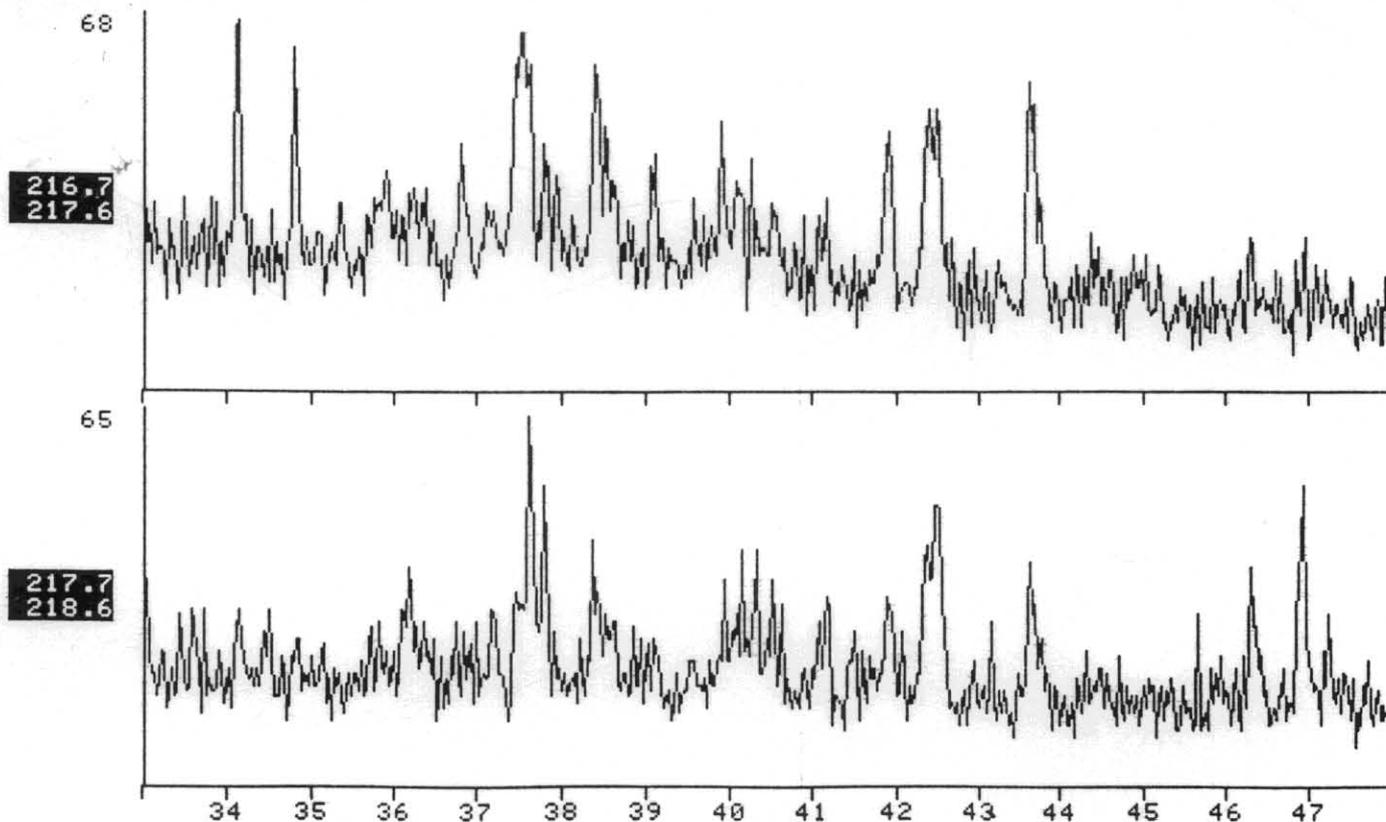
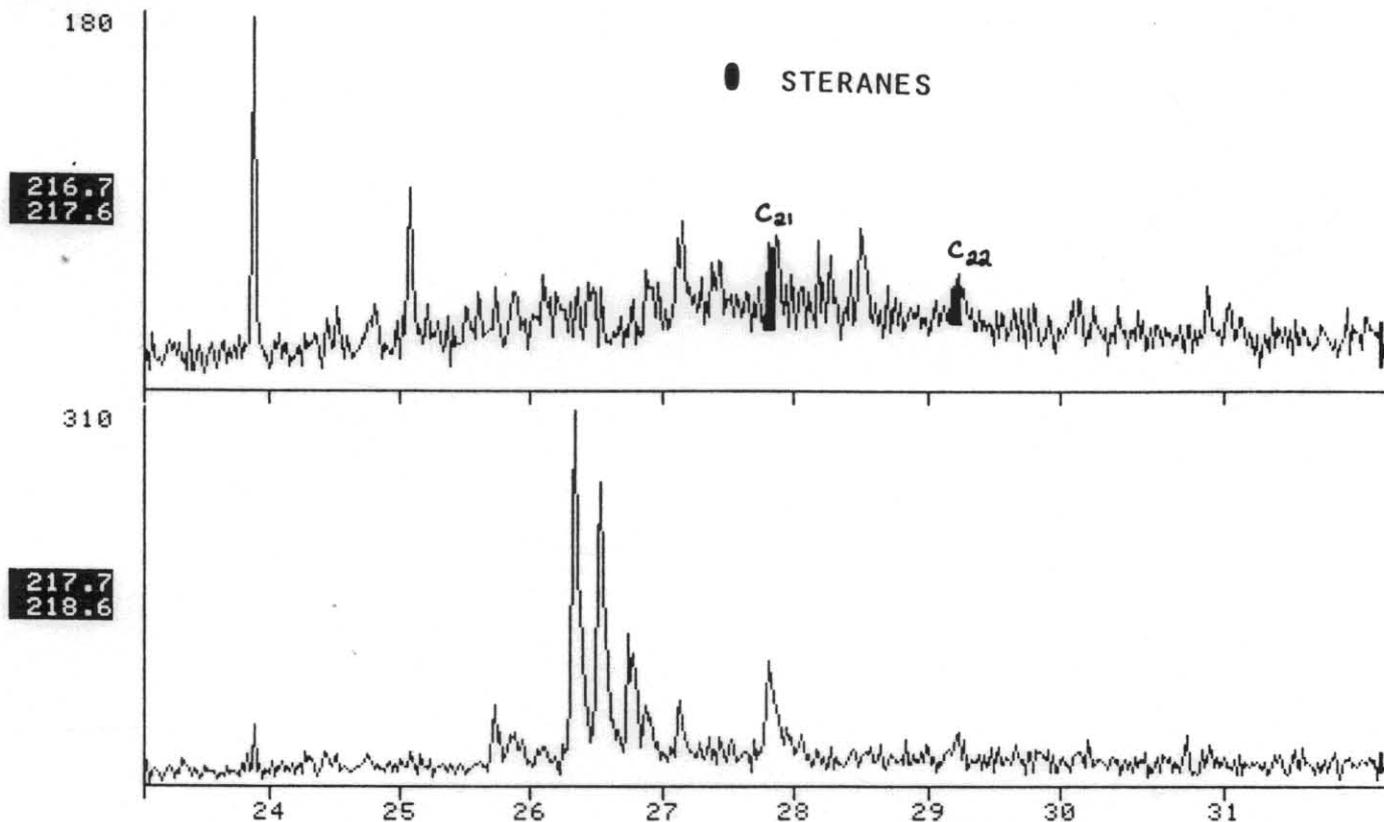


FIGURE: 2-11d

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

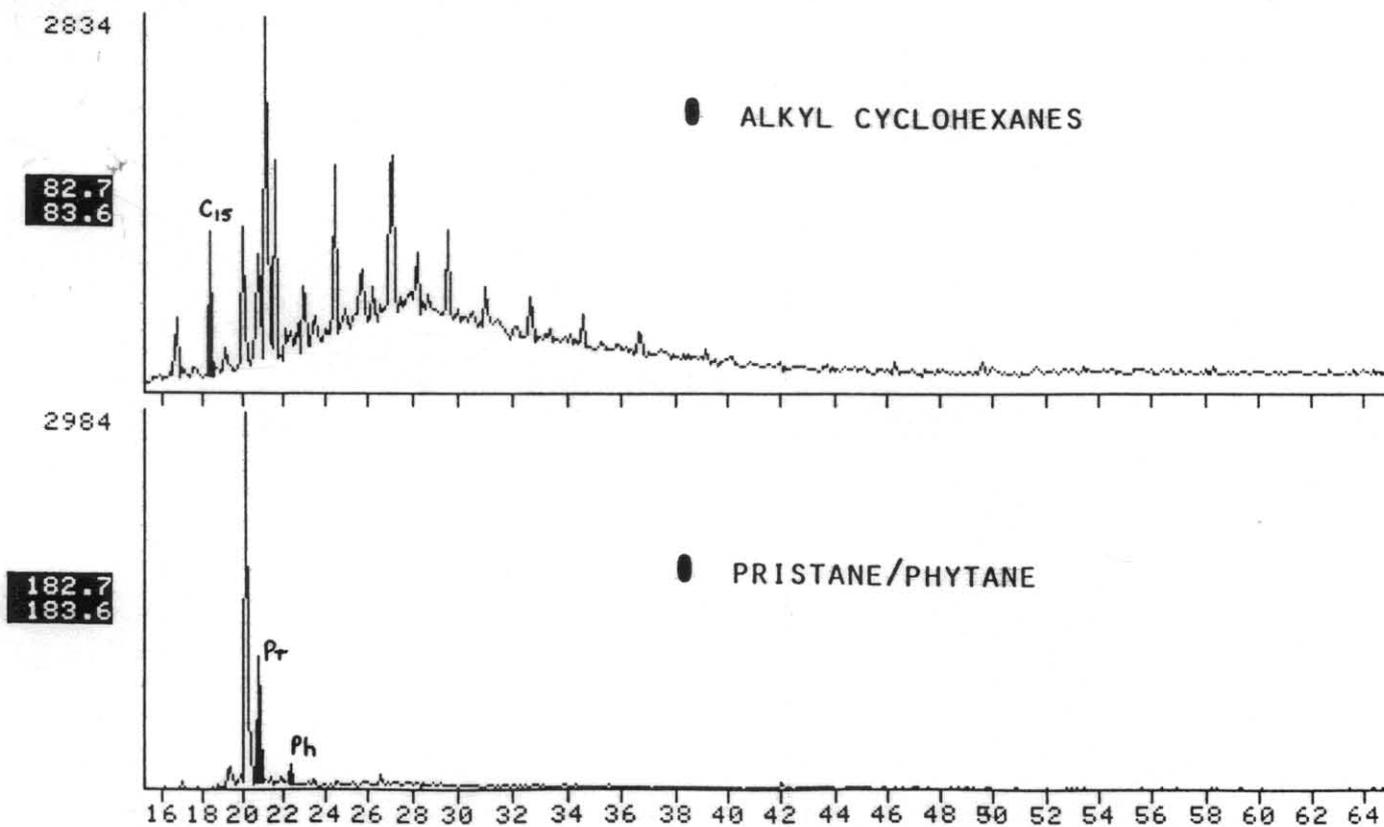
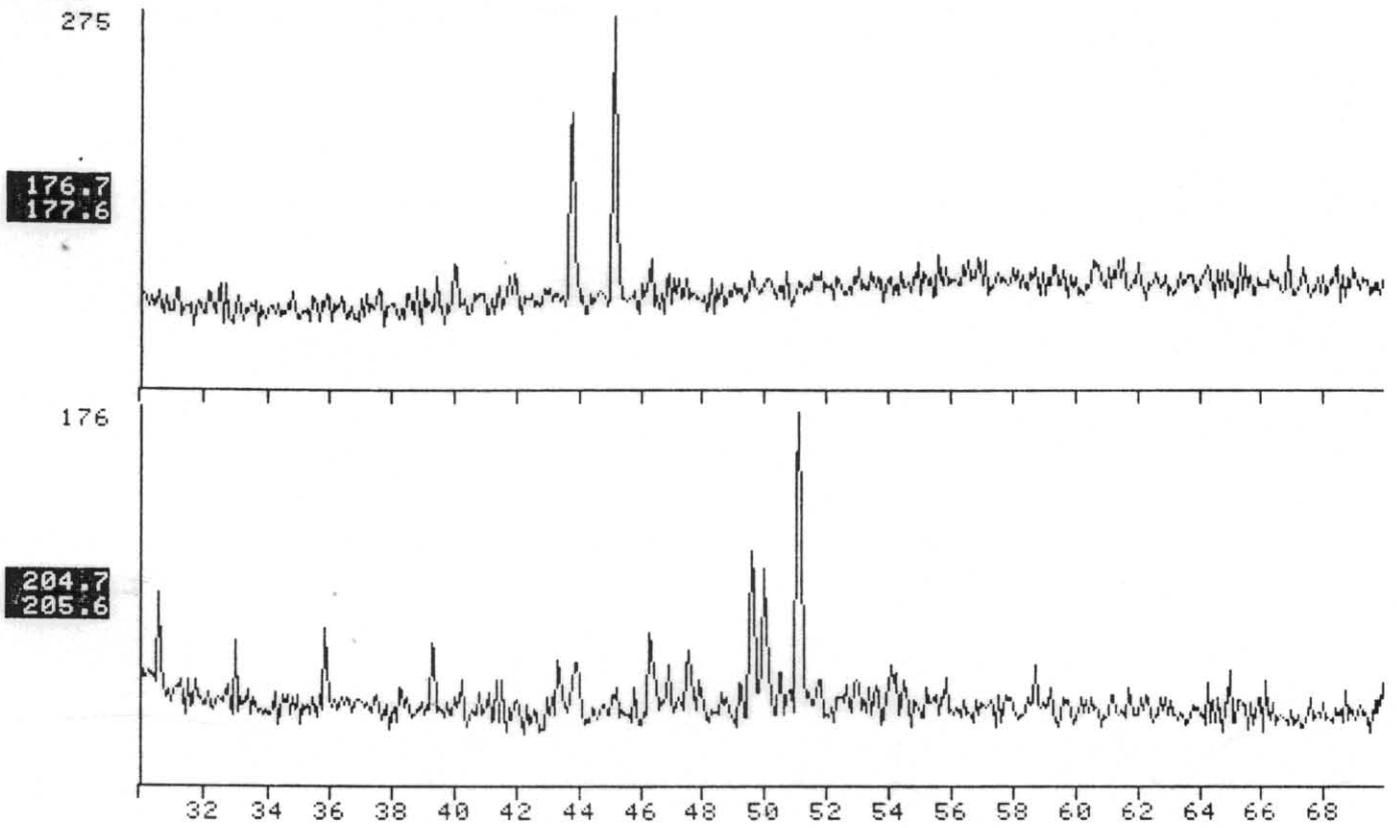


FIGURE: 2-11e

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

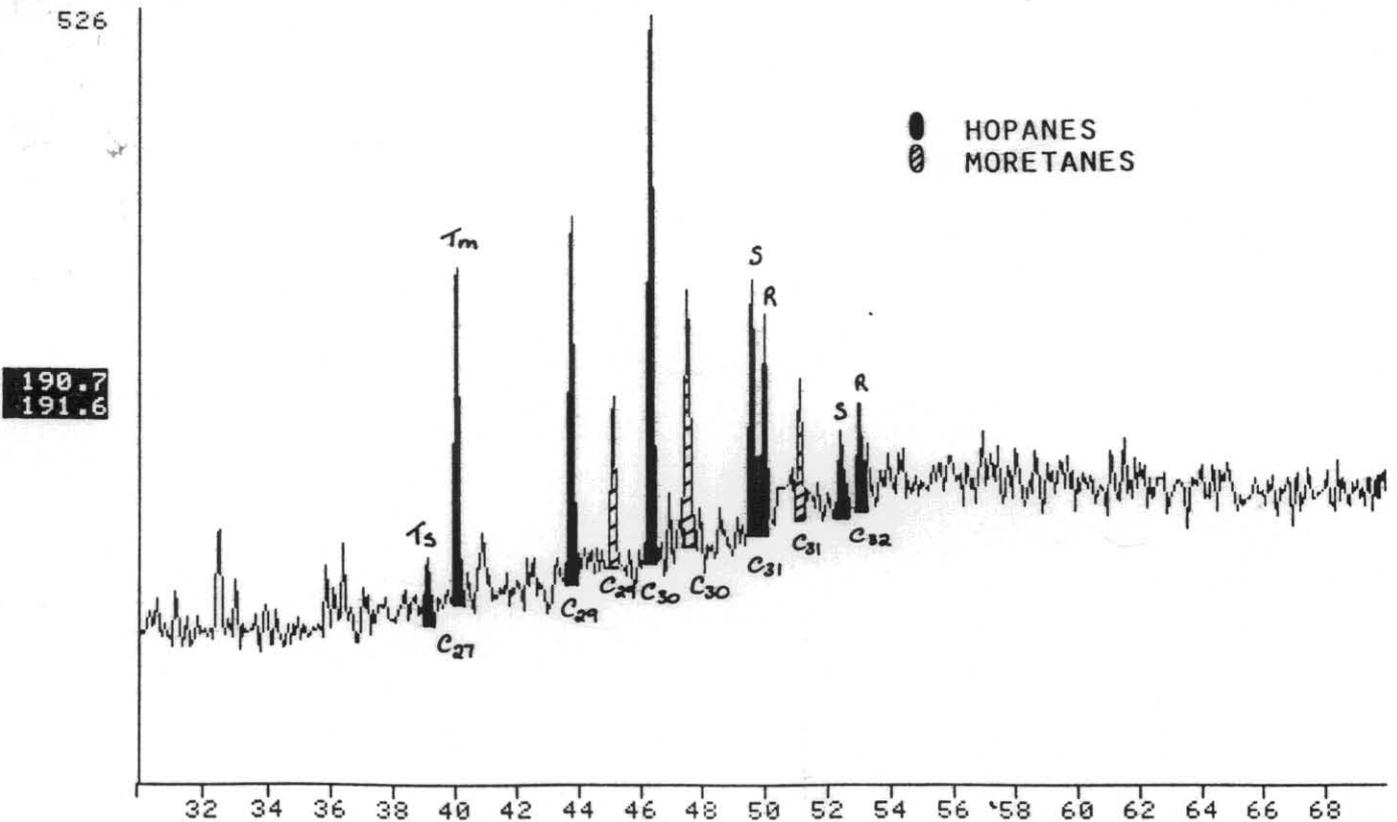
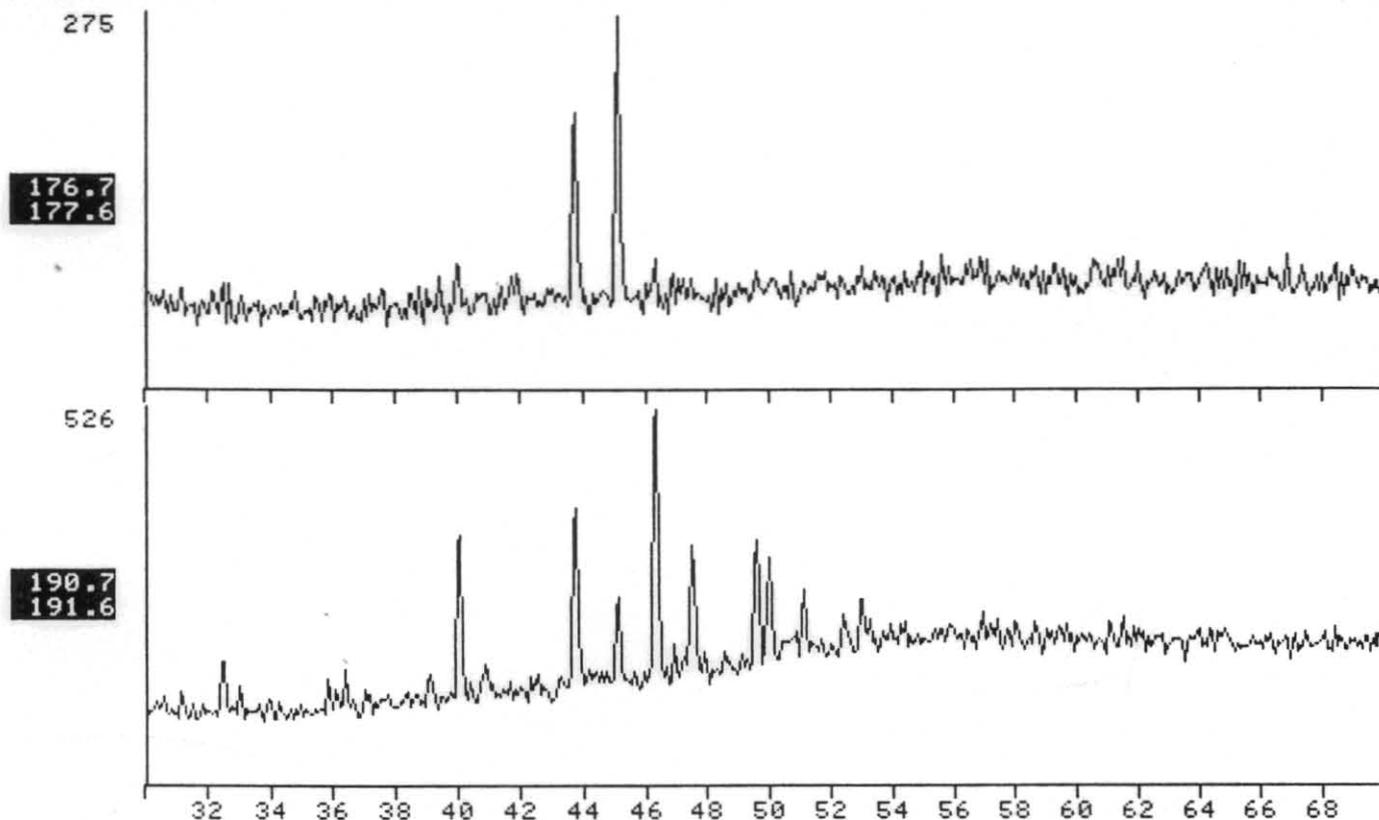


FIGURE: 2-11f

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720#

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720#

FRN 6241

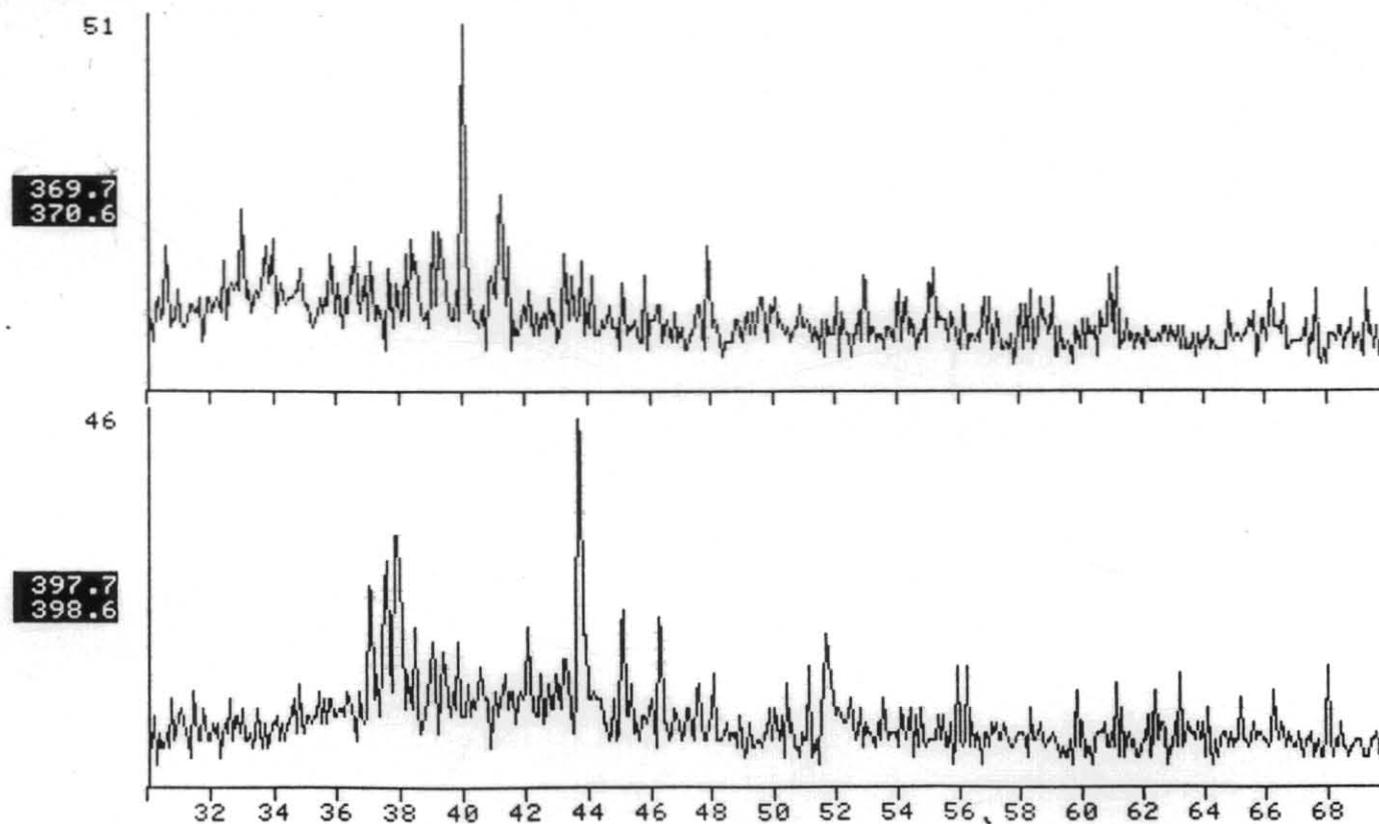
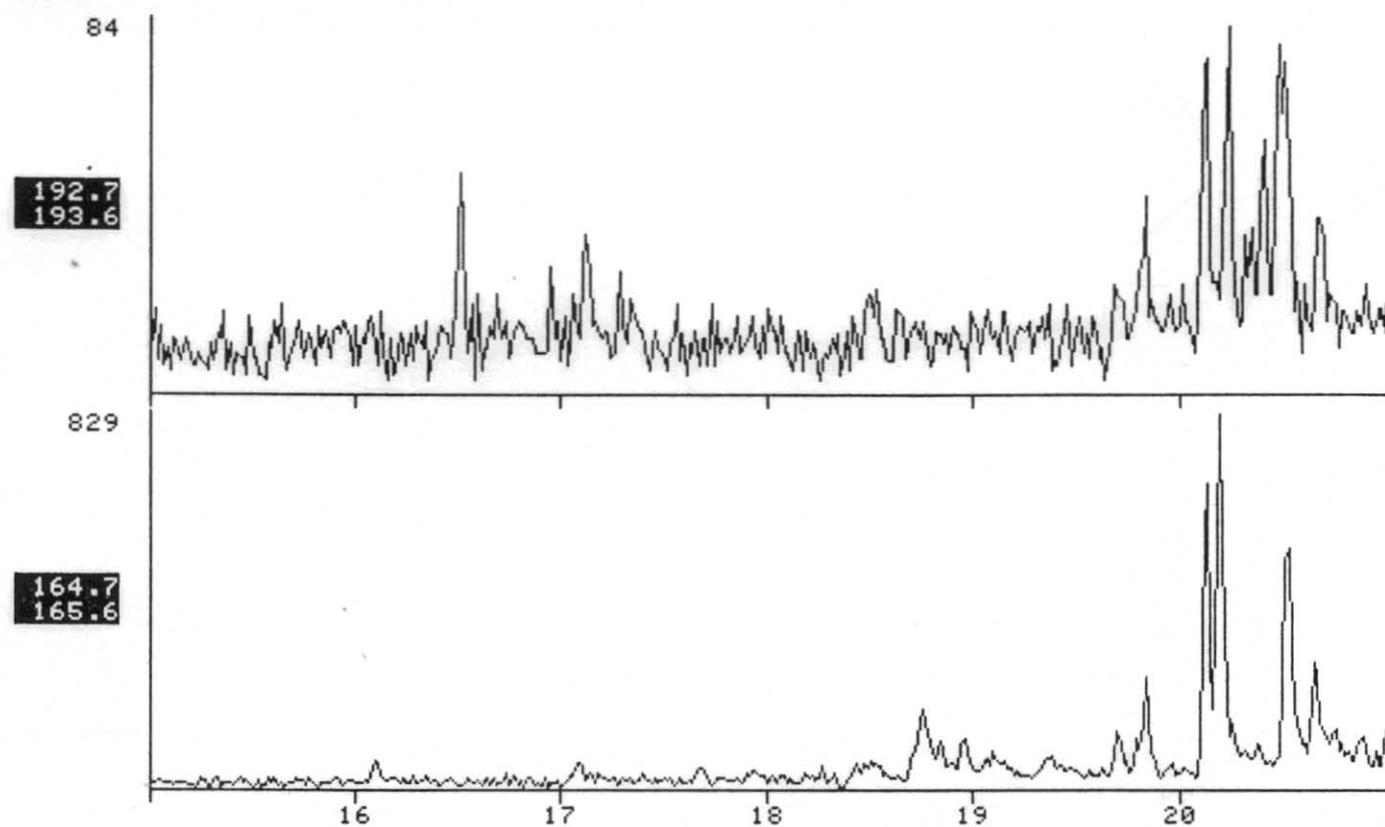


FIGURE: 2-11g

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

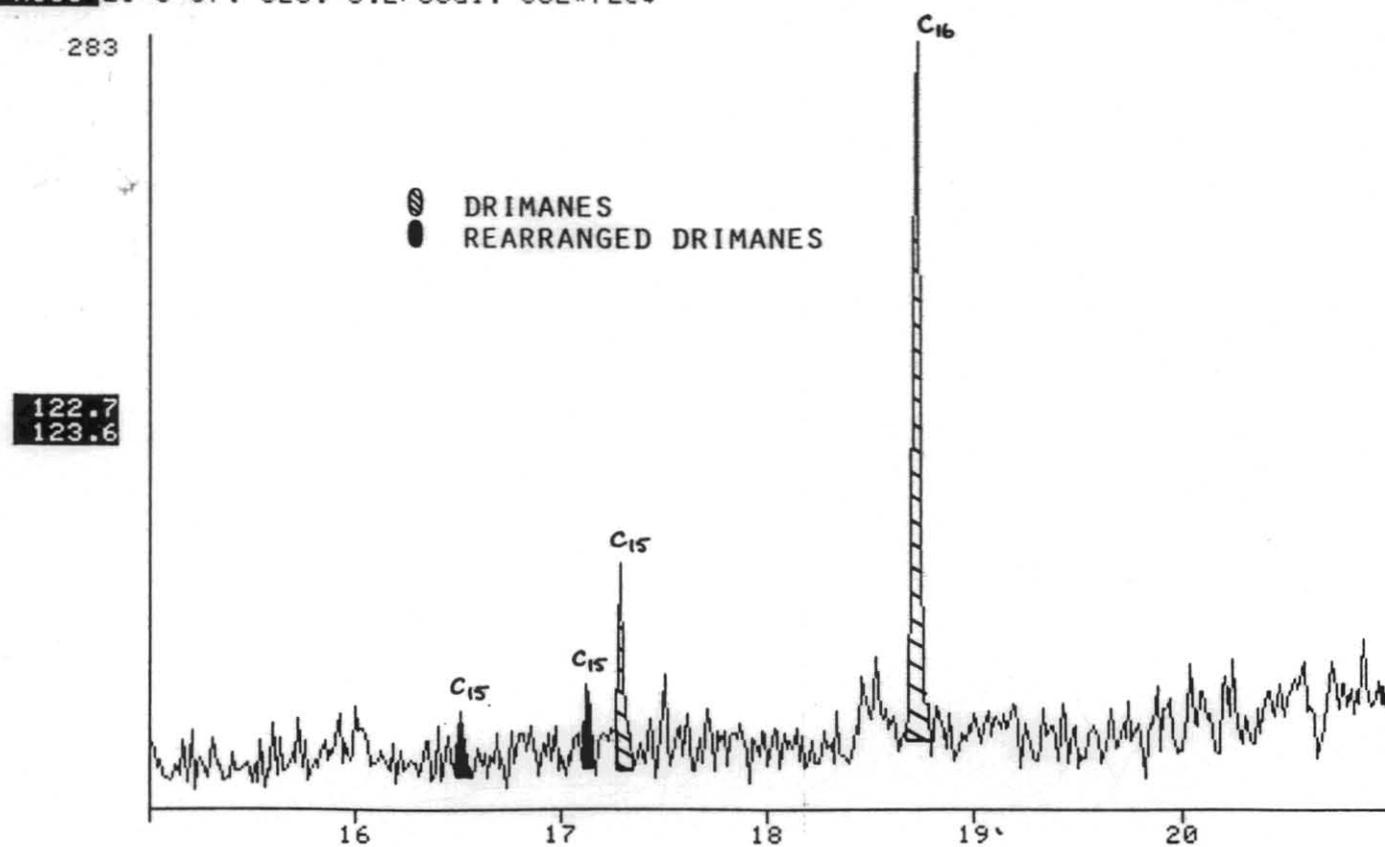
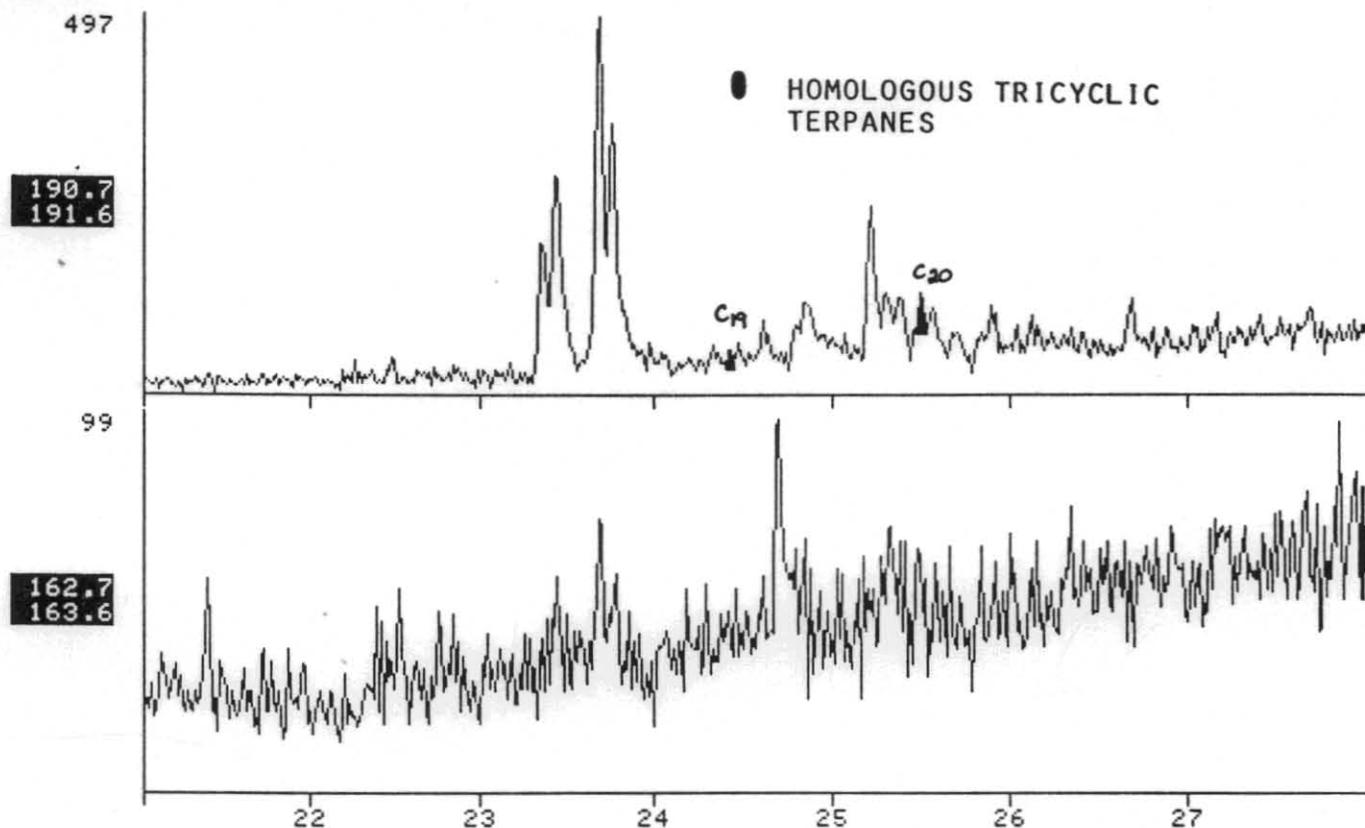


FIGURE: 2-11h

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720#

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720#

FRN 6241

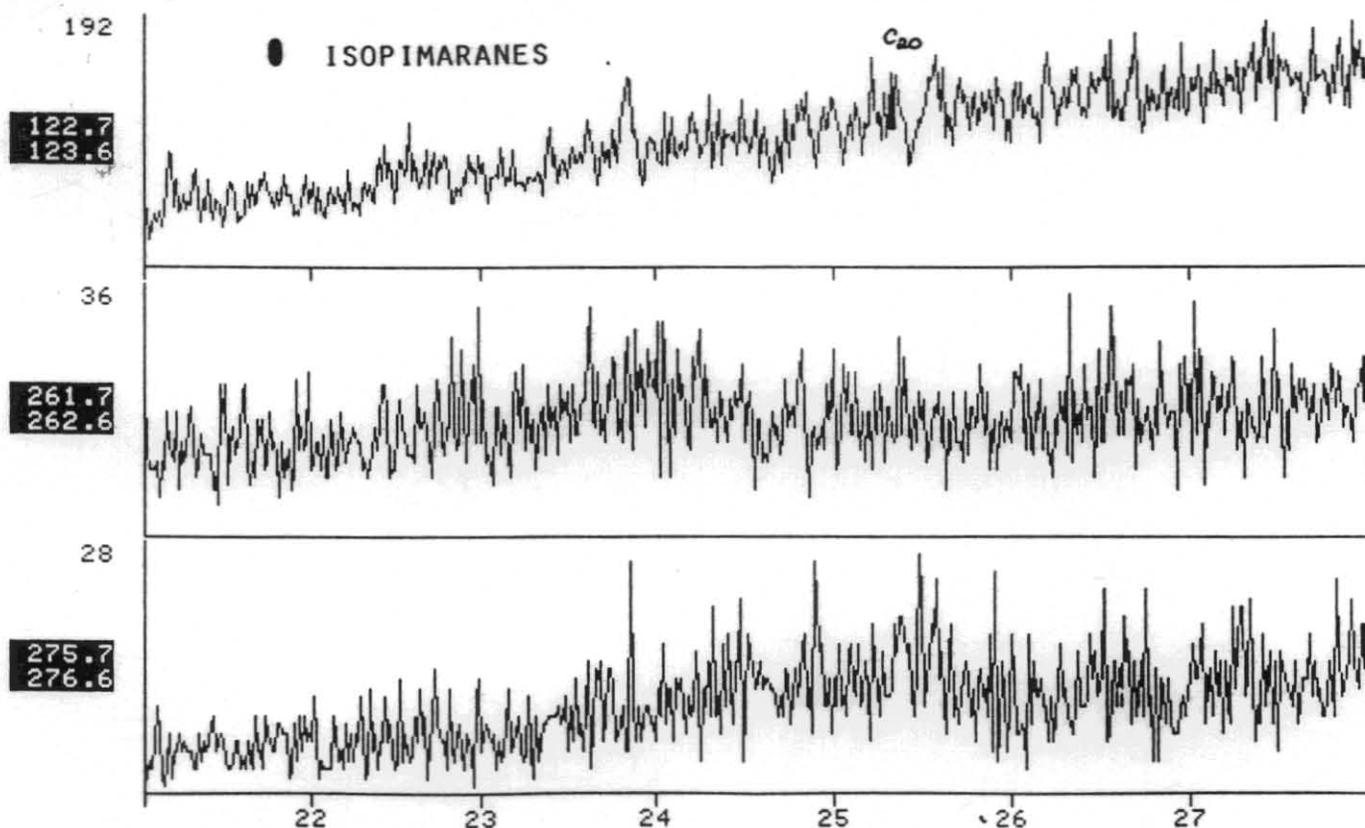
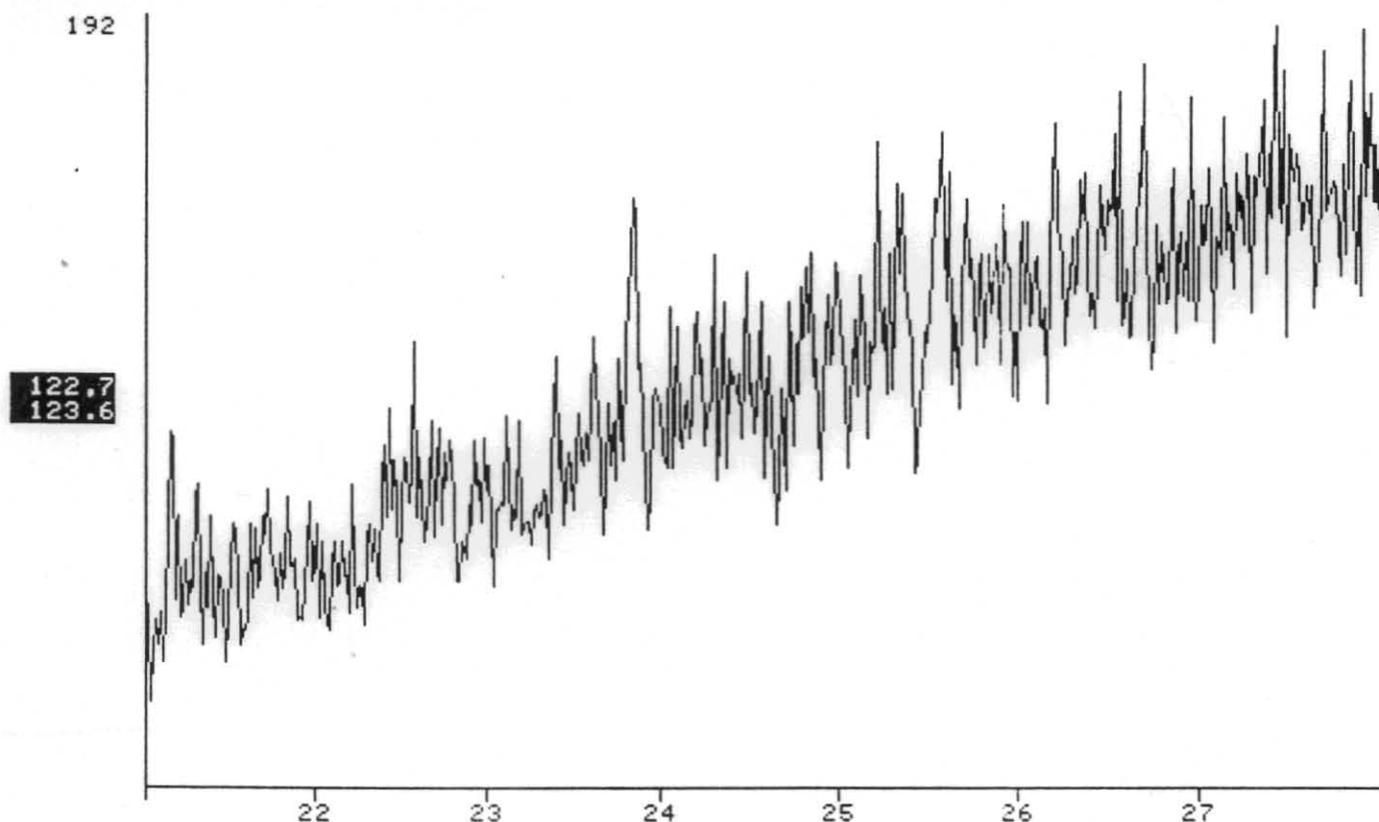


FIGURE: 2-11i

NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241



NAME DURROON#1, 8424'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 21-3-87. GEC. 0.2/60ul. COL#720\$

FRN 6241

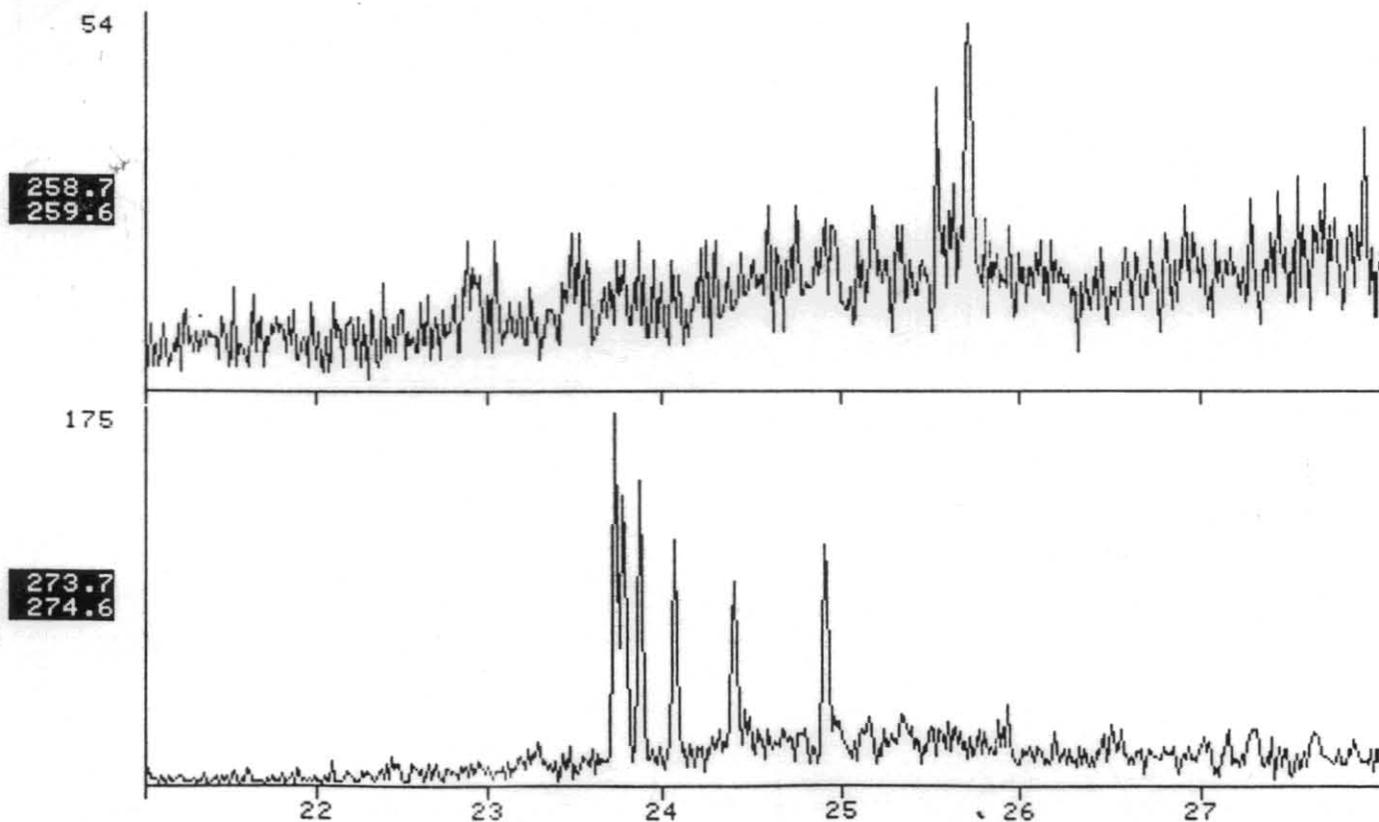
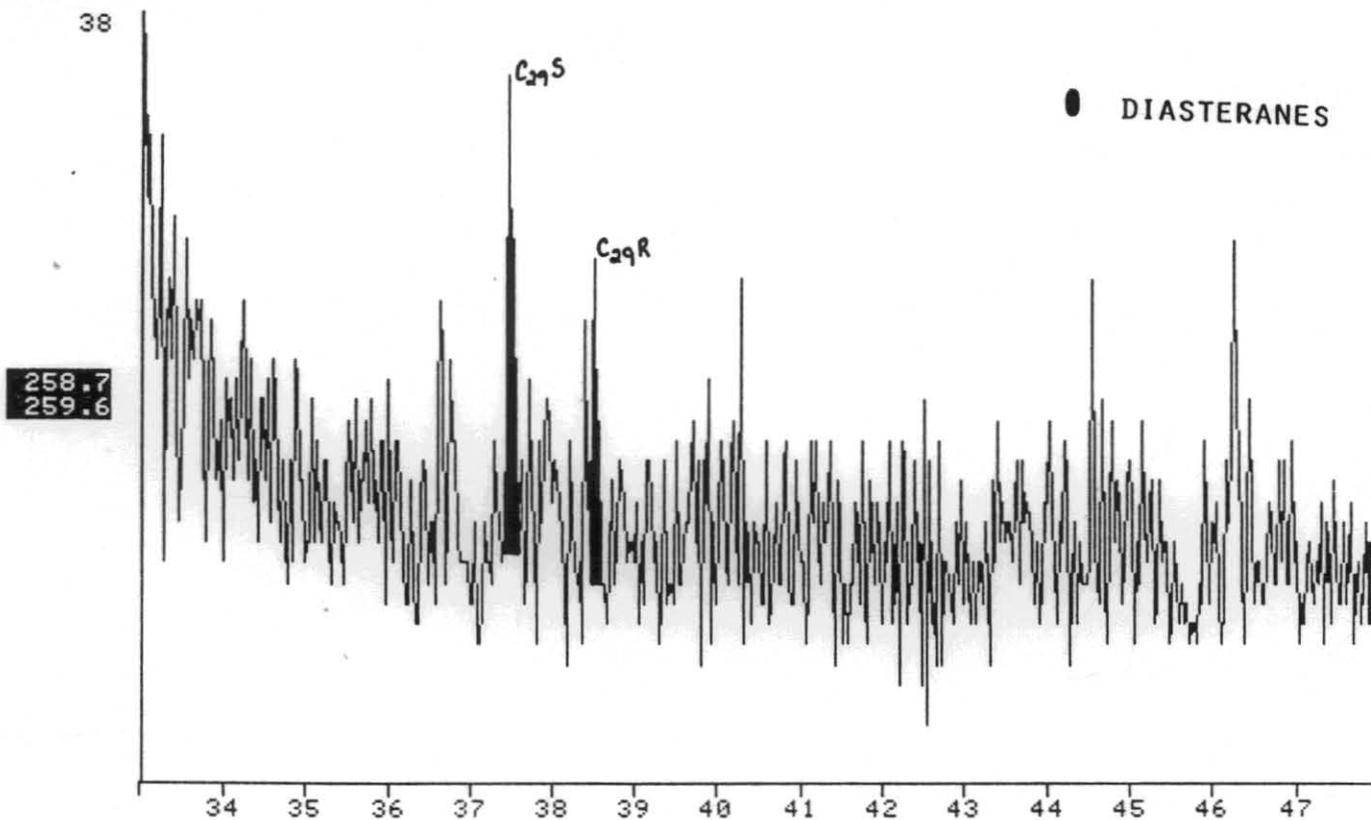


FIGURE: 2-12a

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242

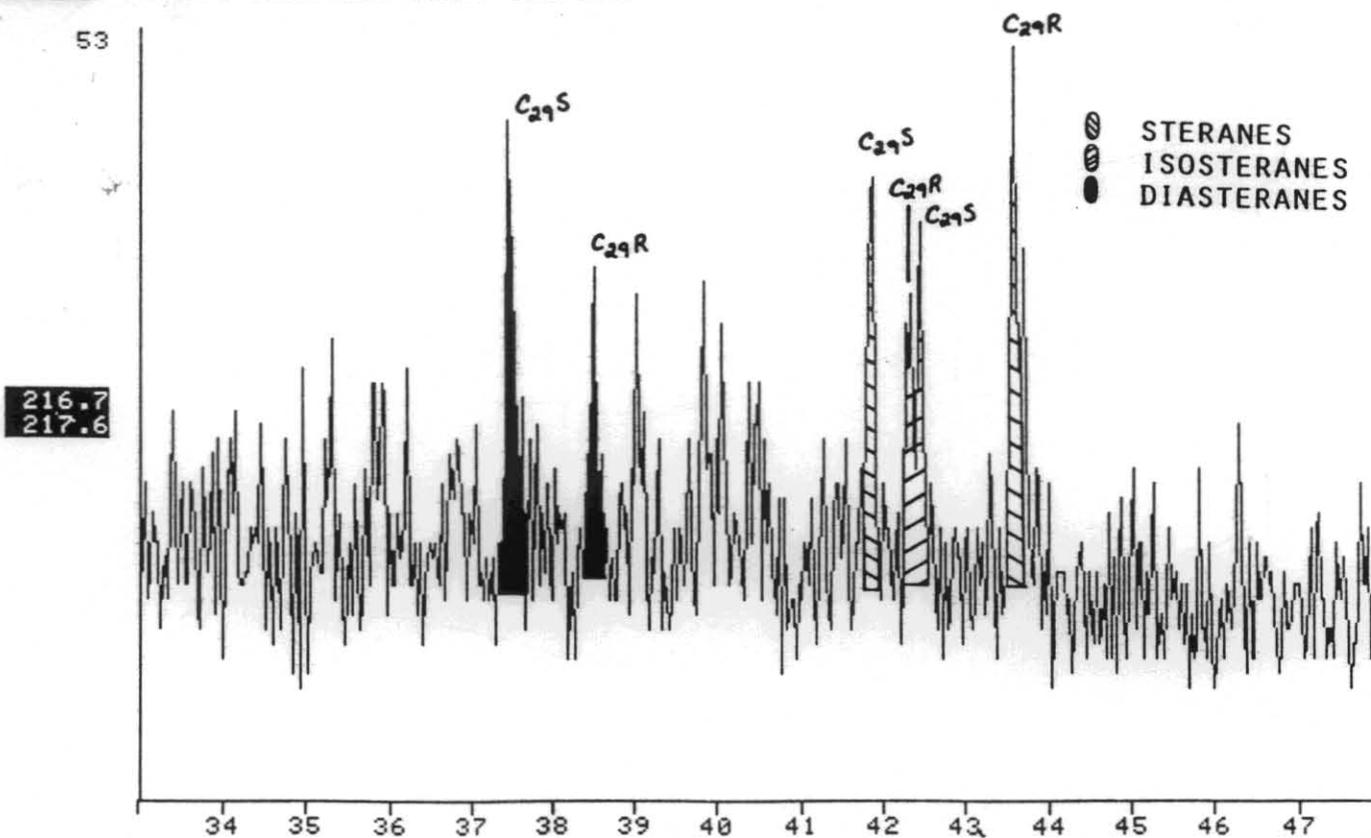
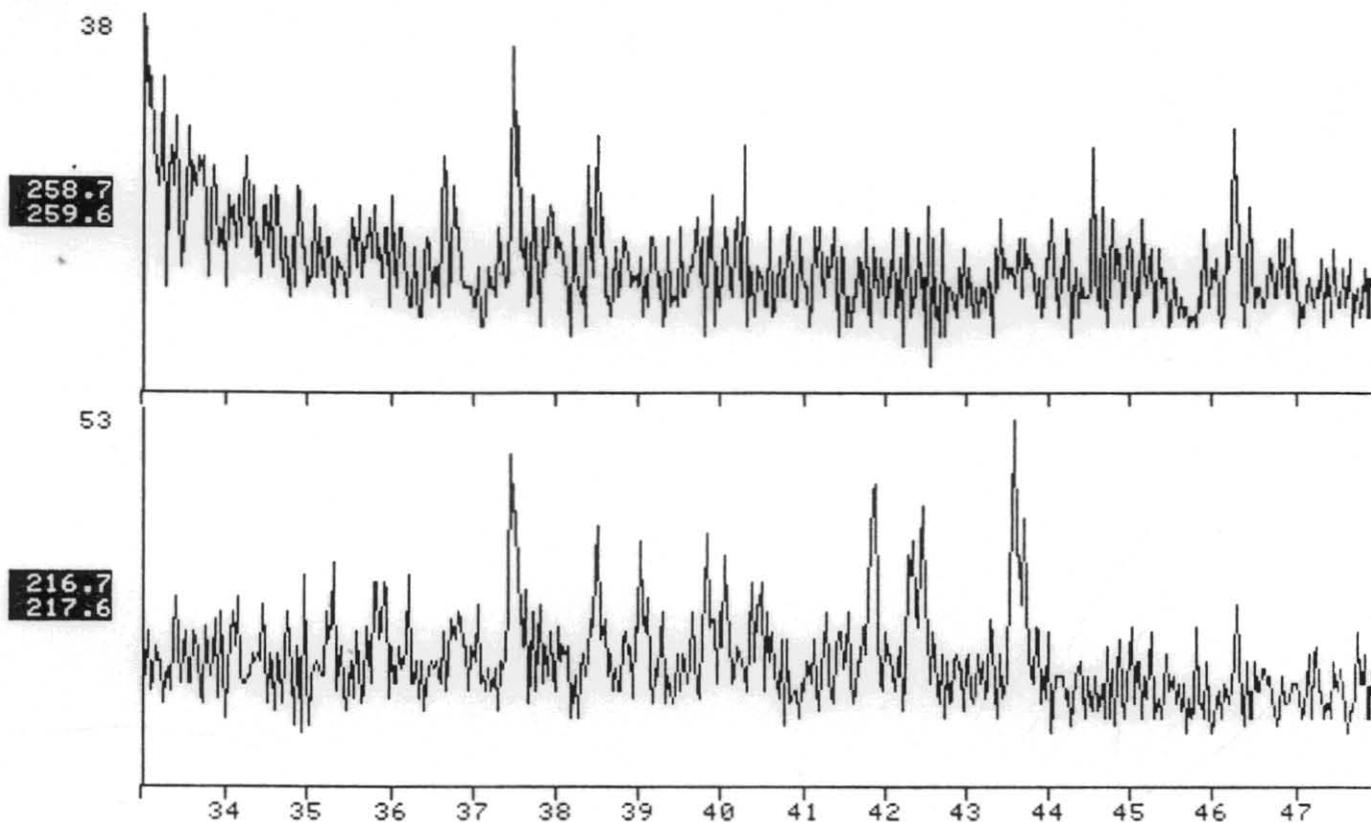


FIGURE: 2-12b

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242

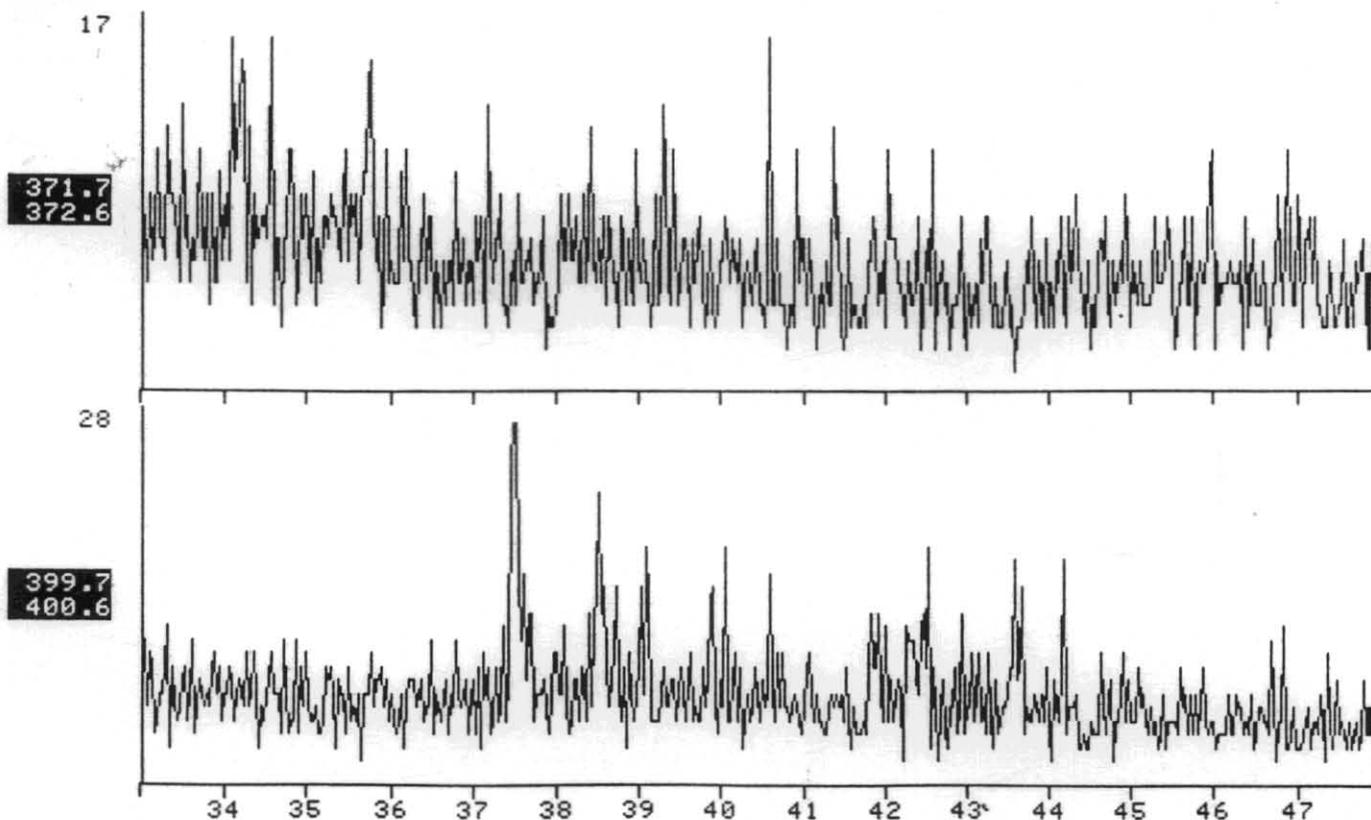
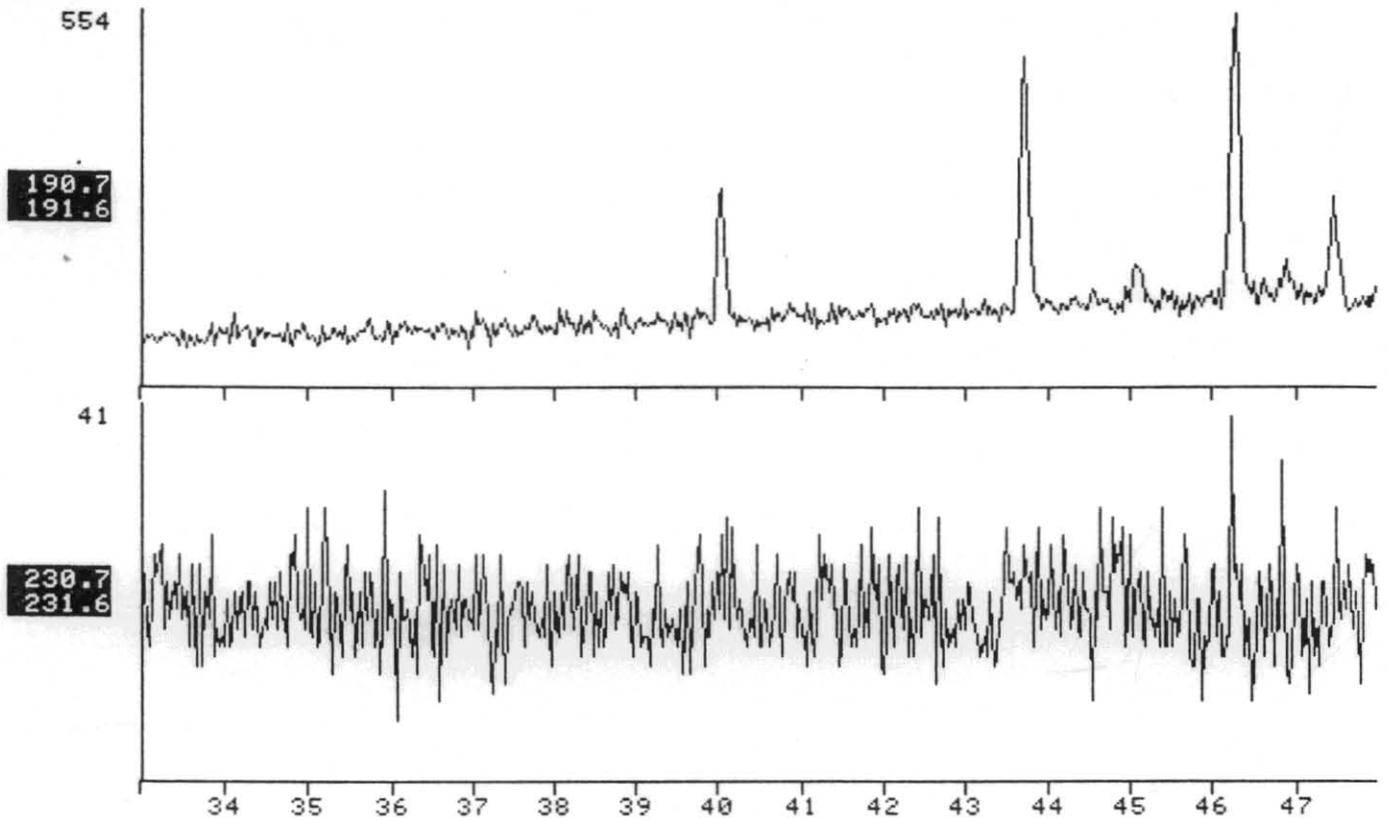


FIGURE: 2-12c

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242

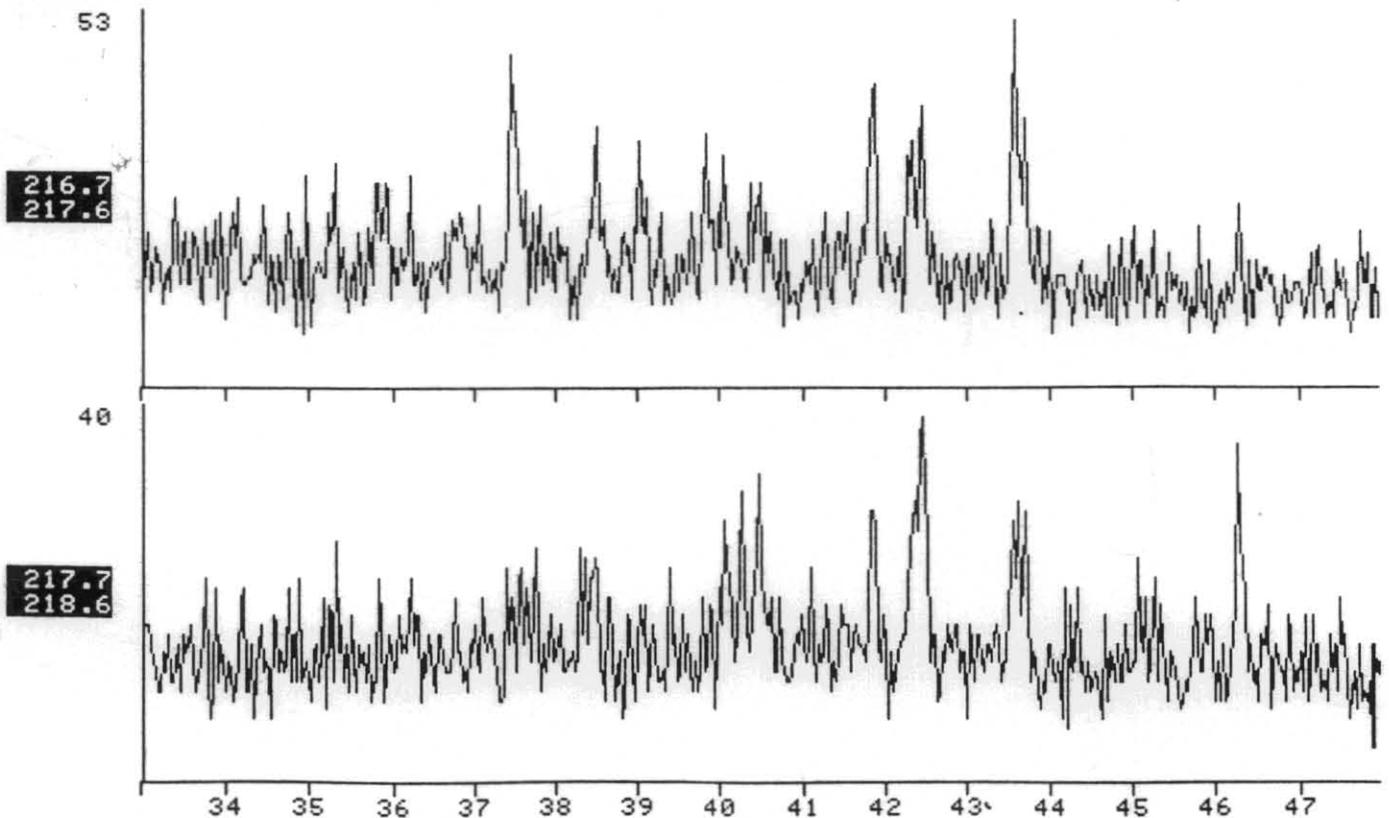
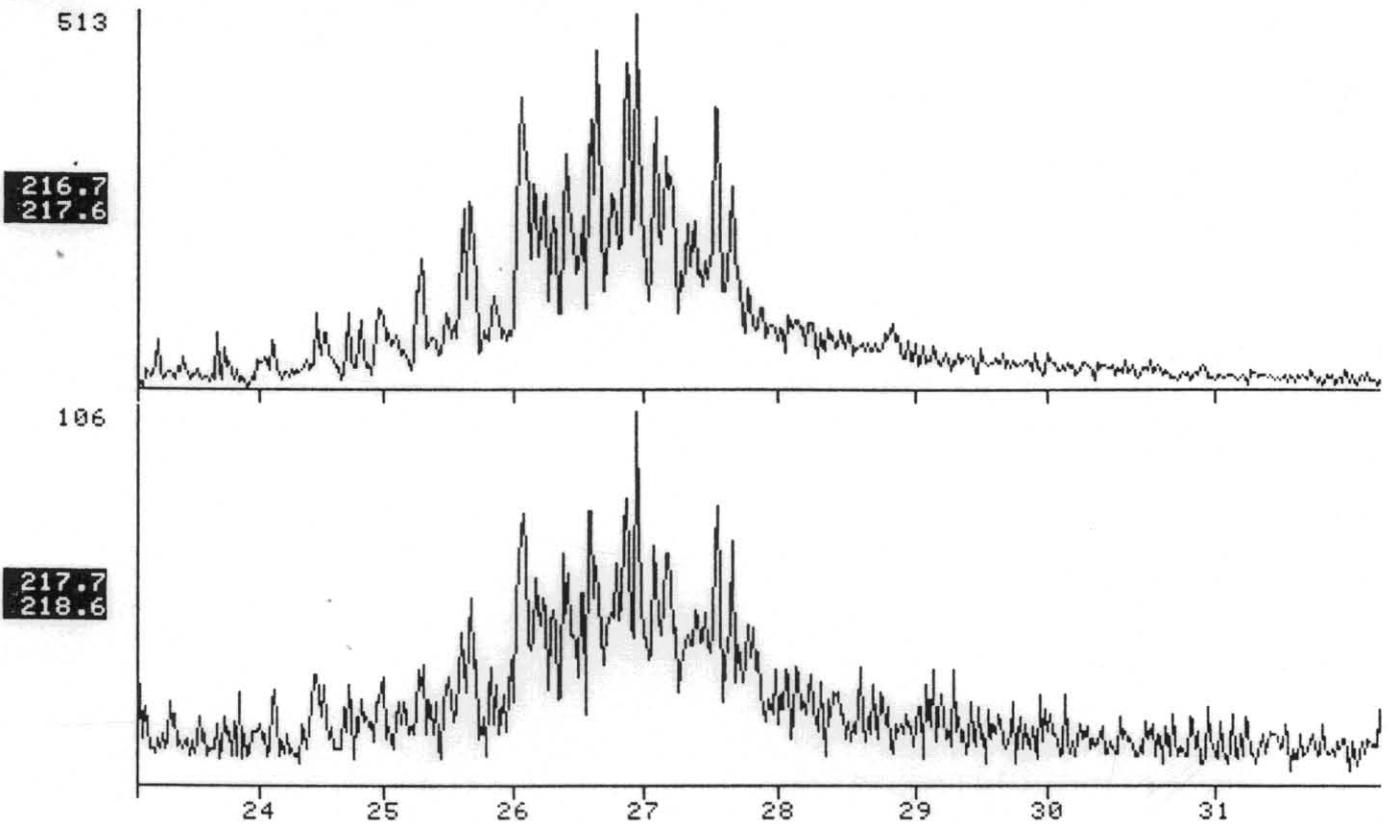


FIGURE: 2-12d

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242

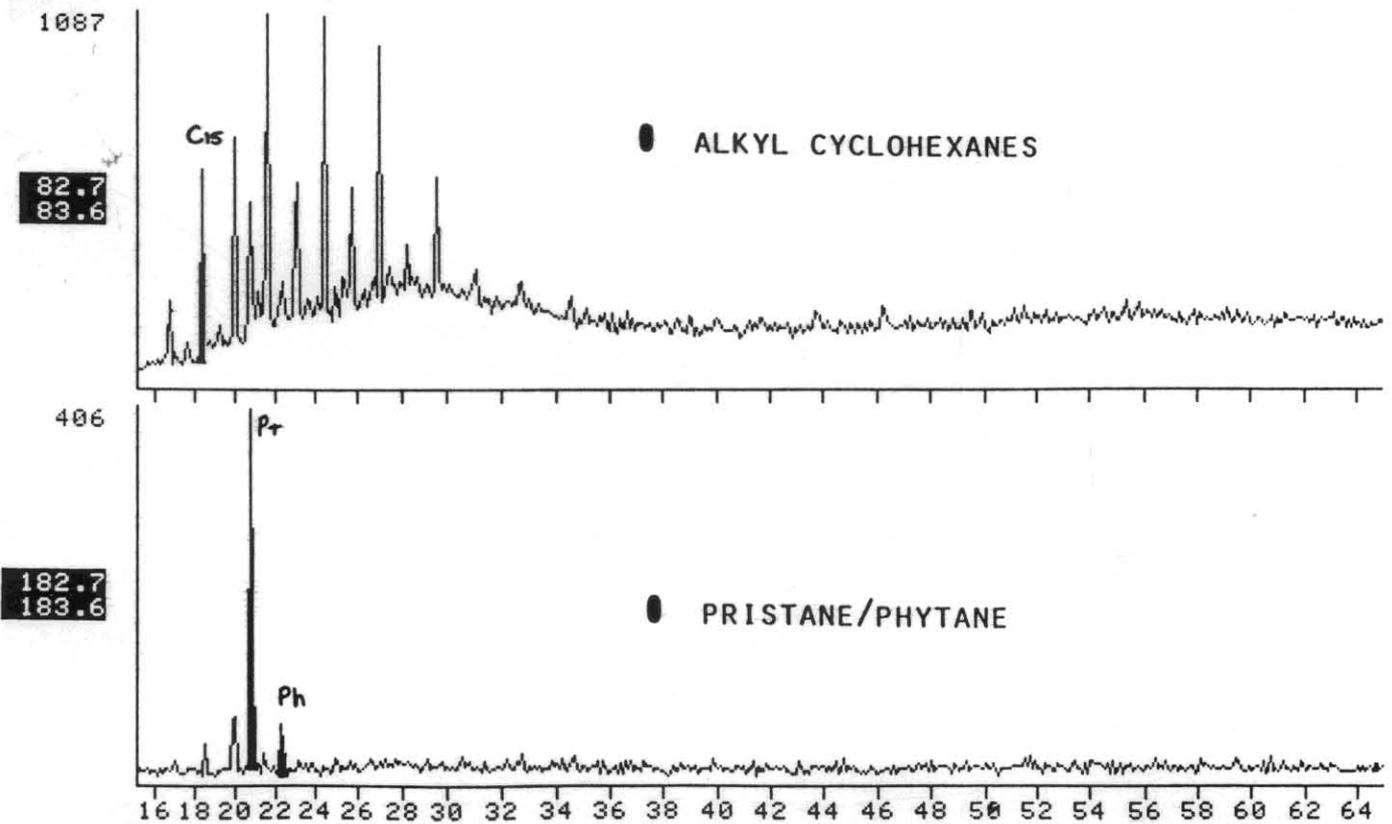
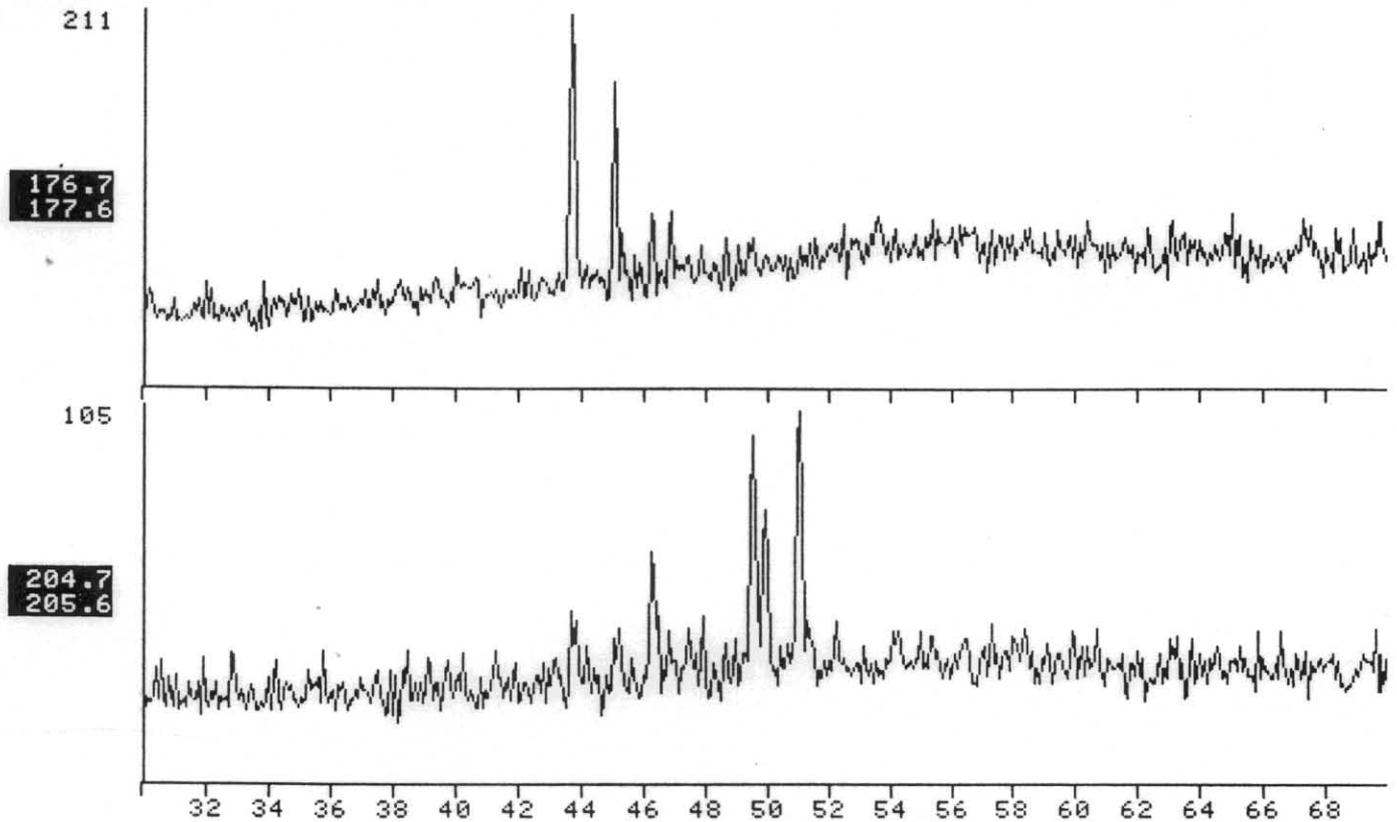


FIGURE: 2-12e

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242

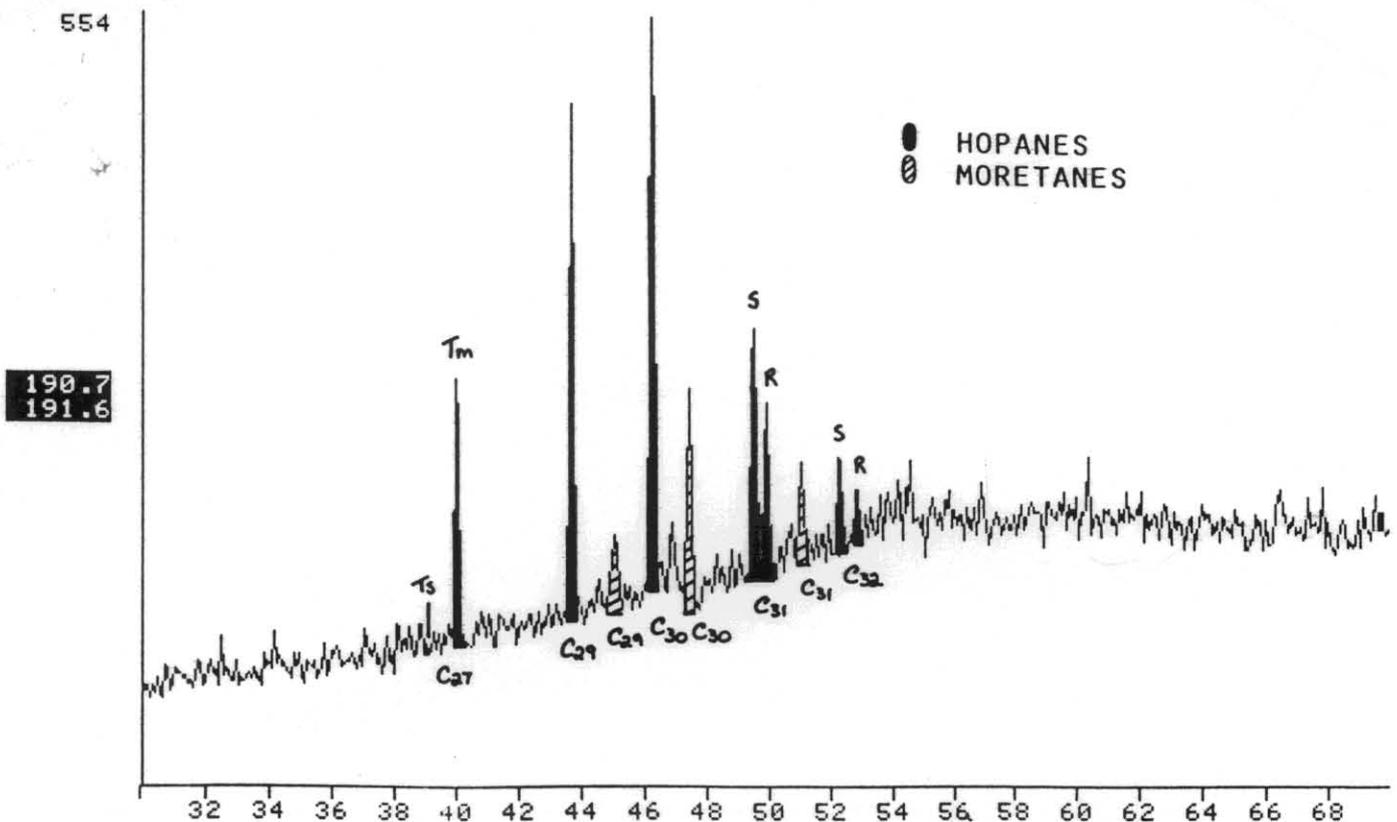
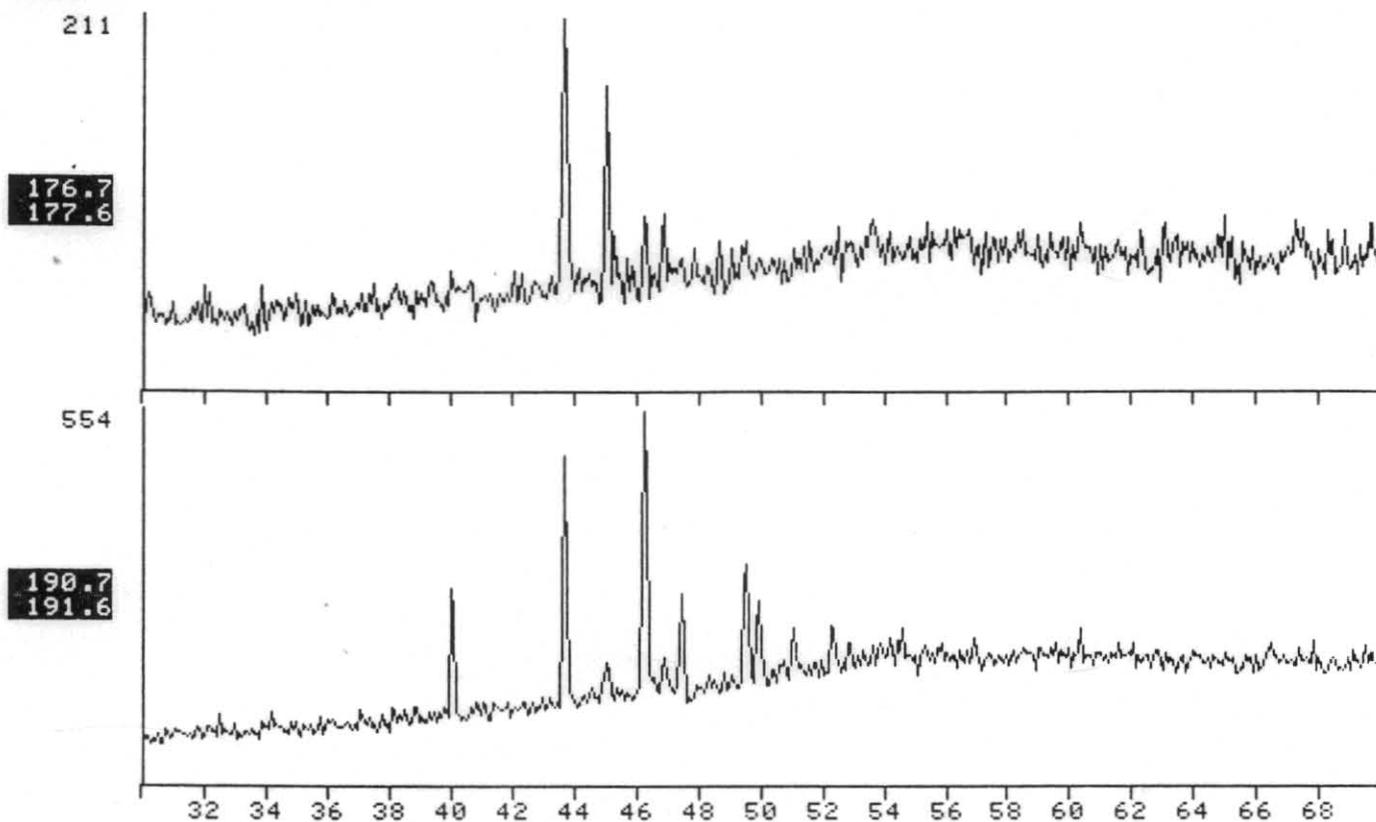


FIGURE: 2-12f

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242

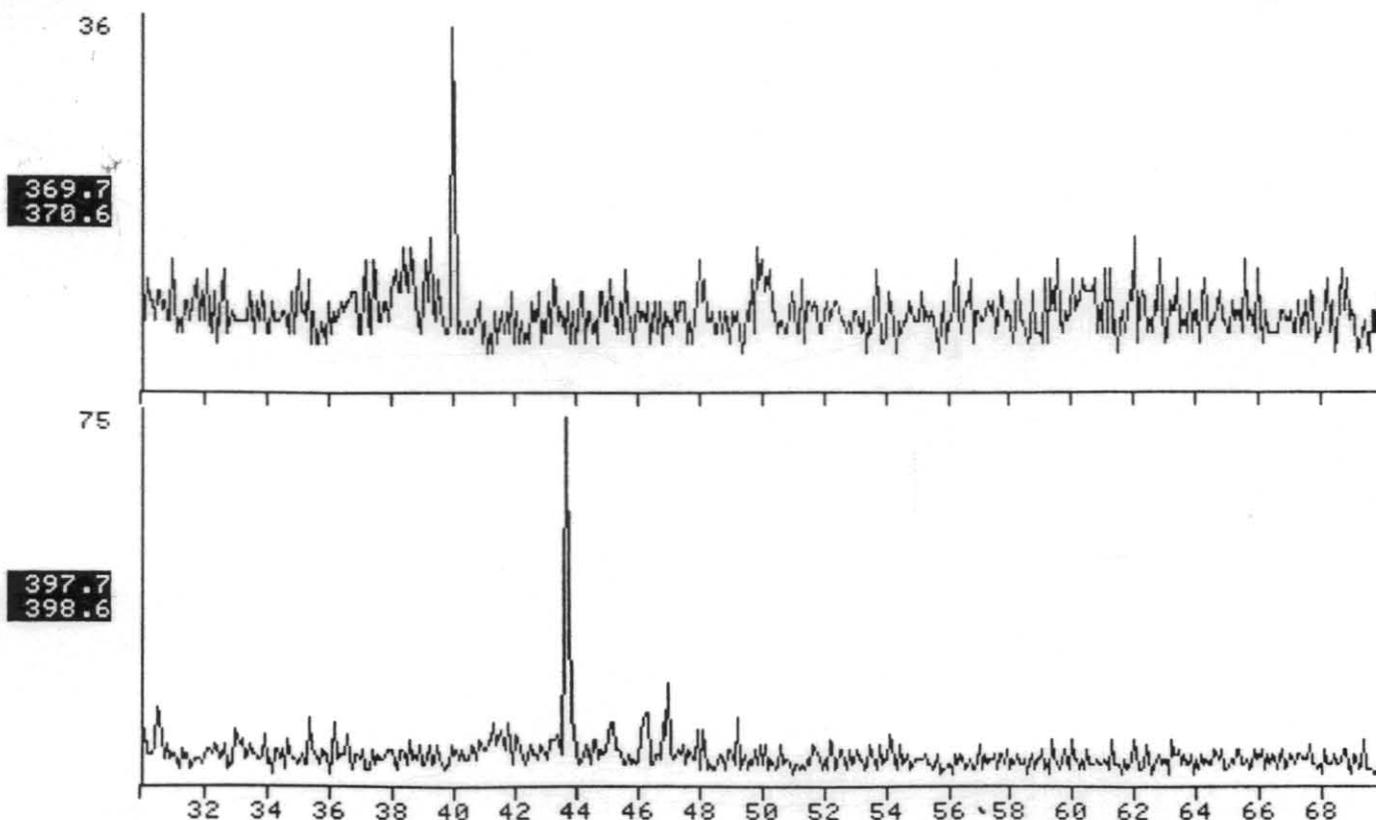
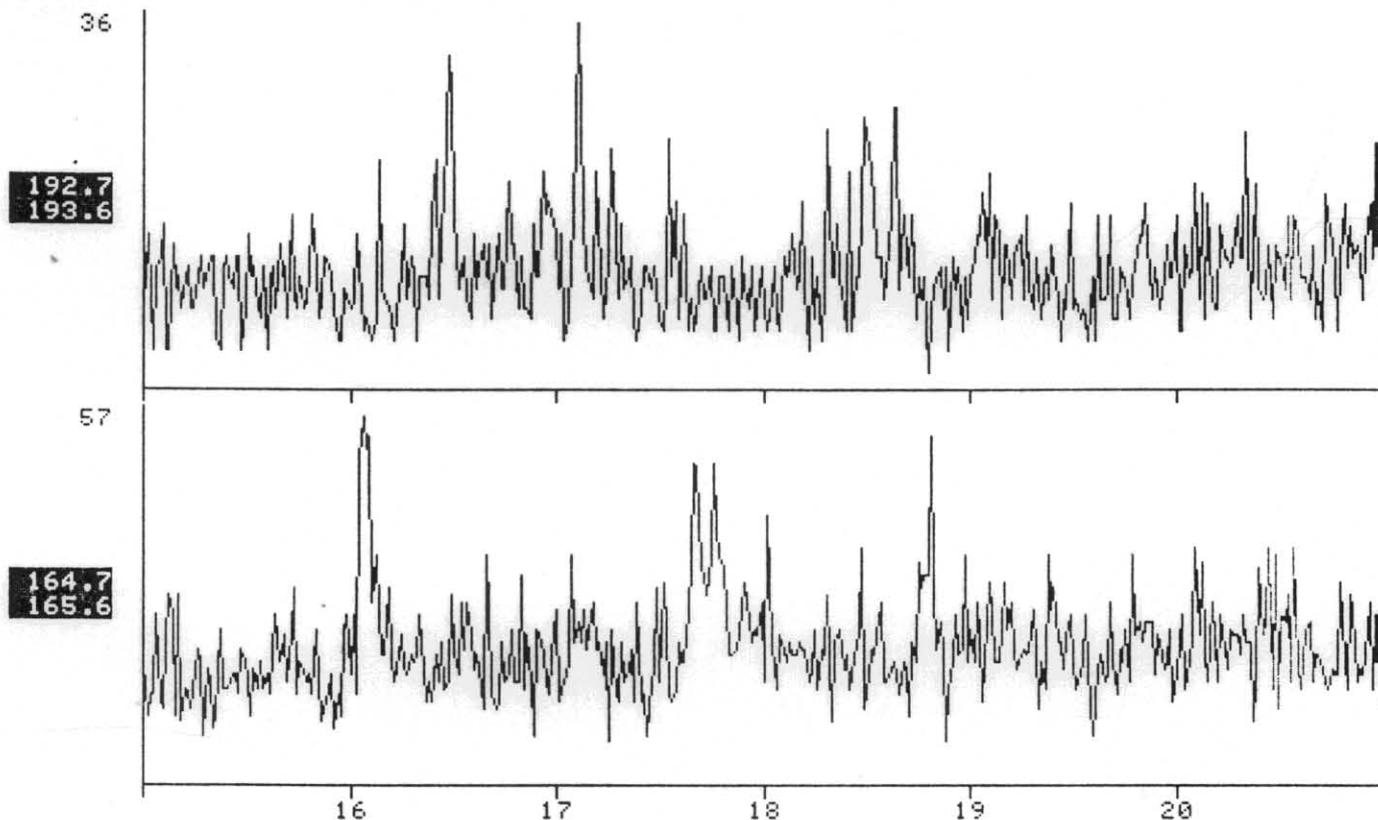


FIGURE: 2-12g

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242

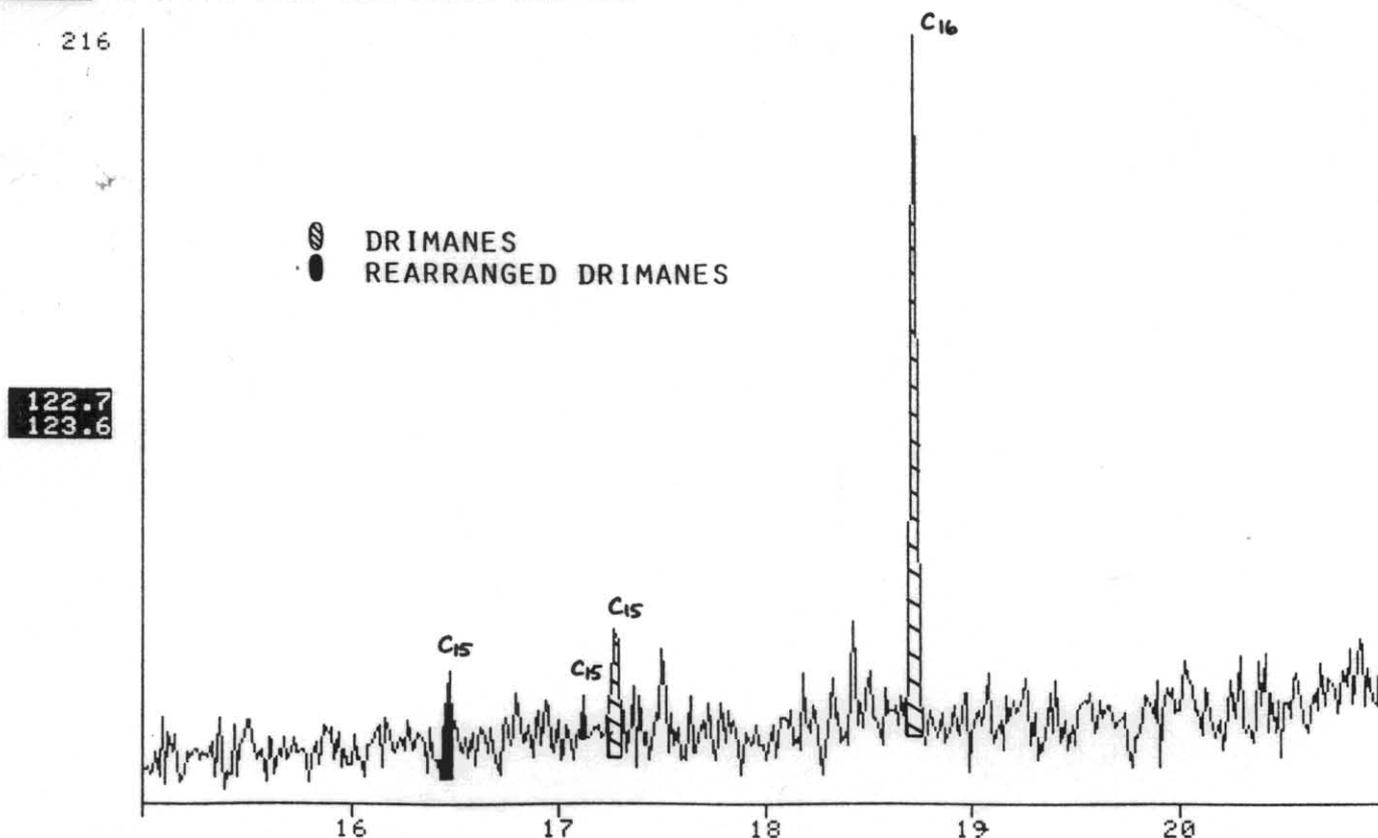
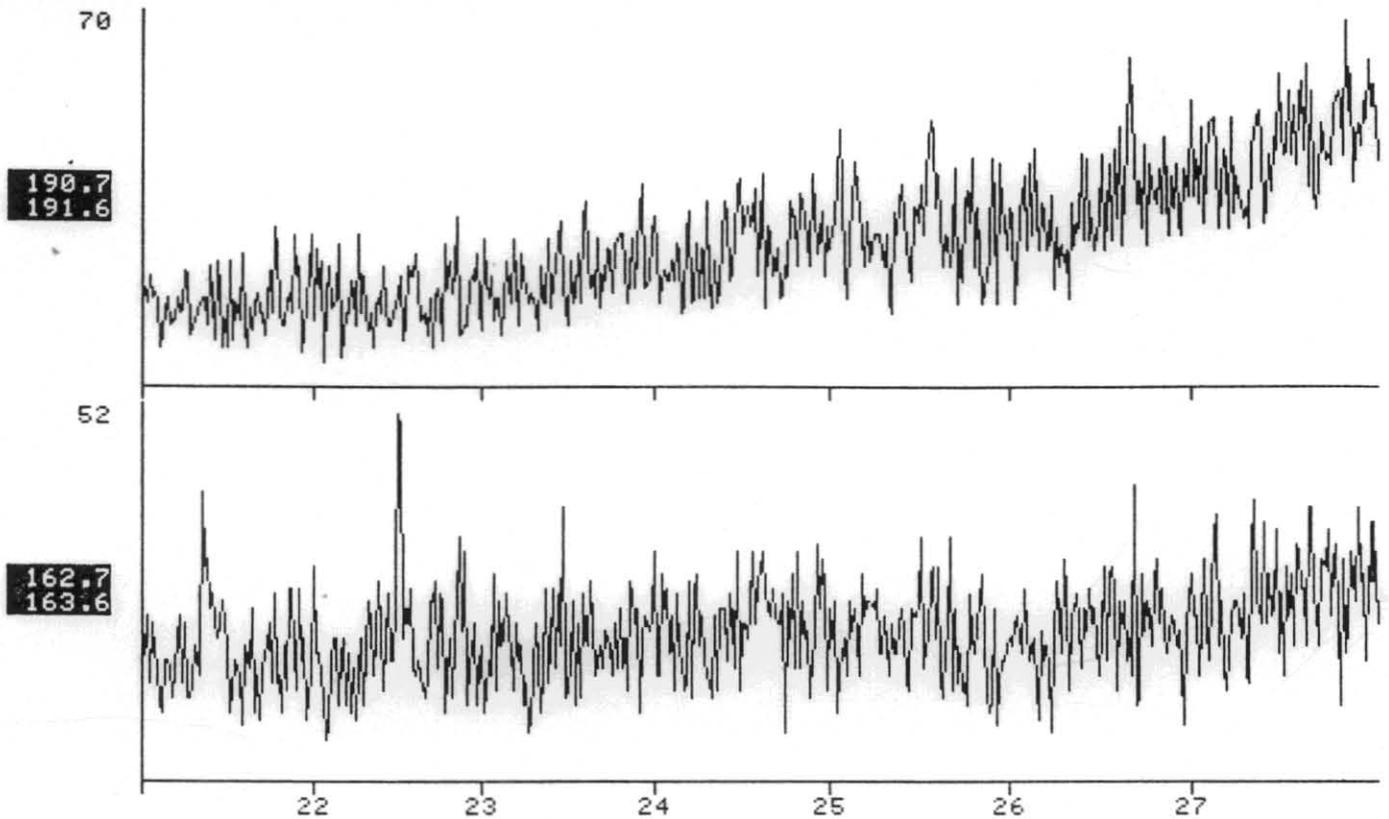


FIGURE: 2-12h

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35u1. COL#72.

FRN 6242

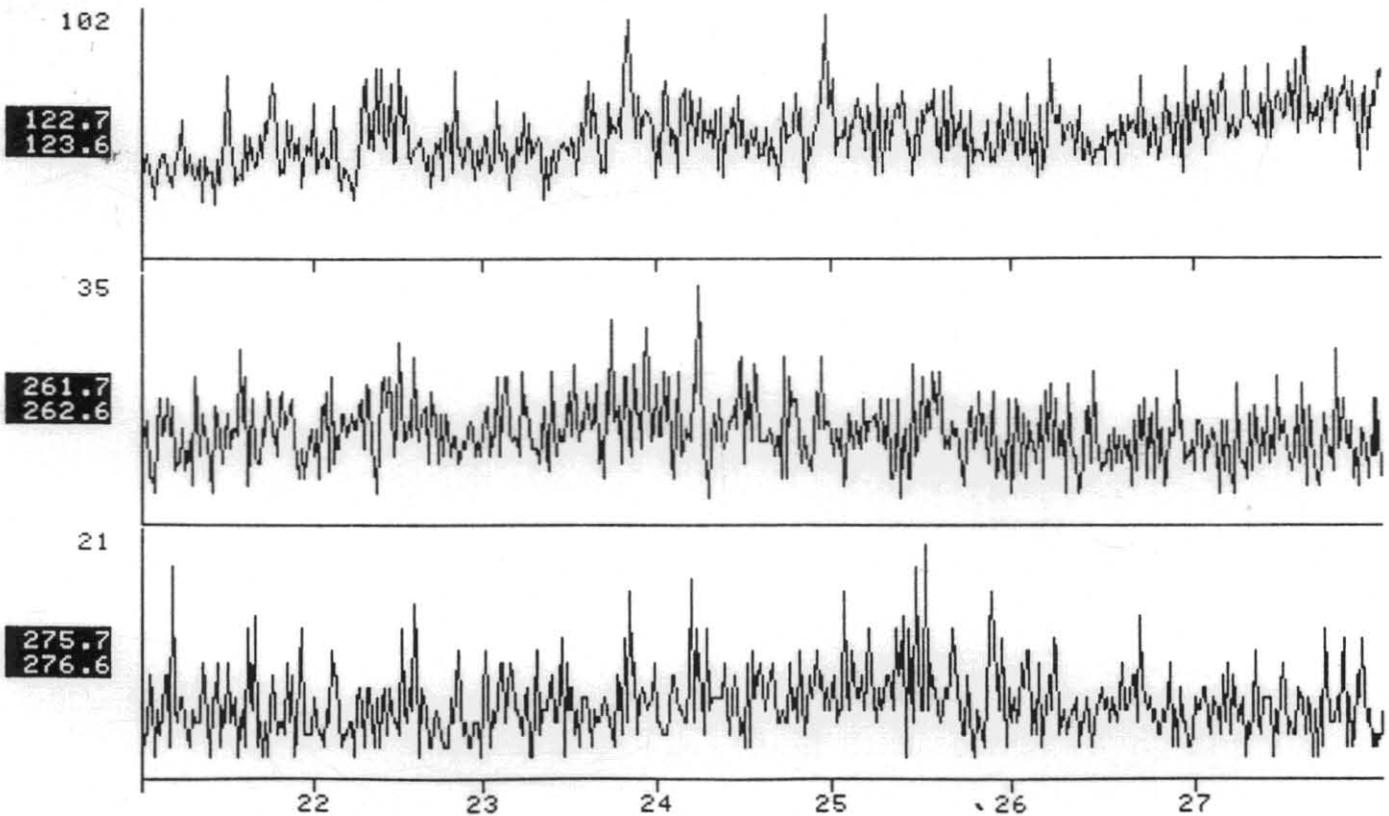
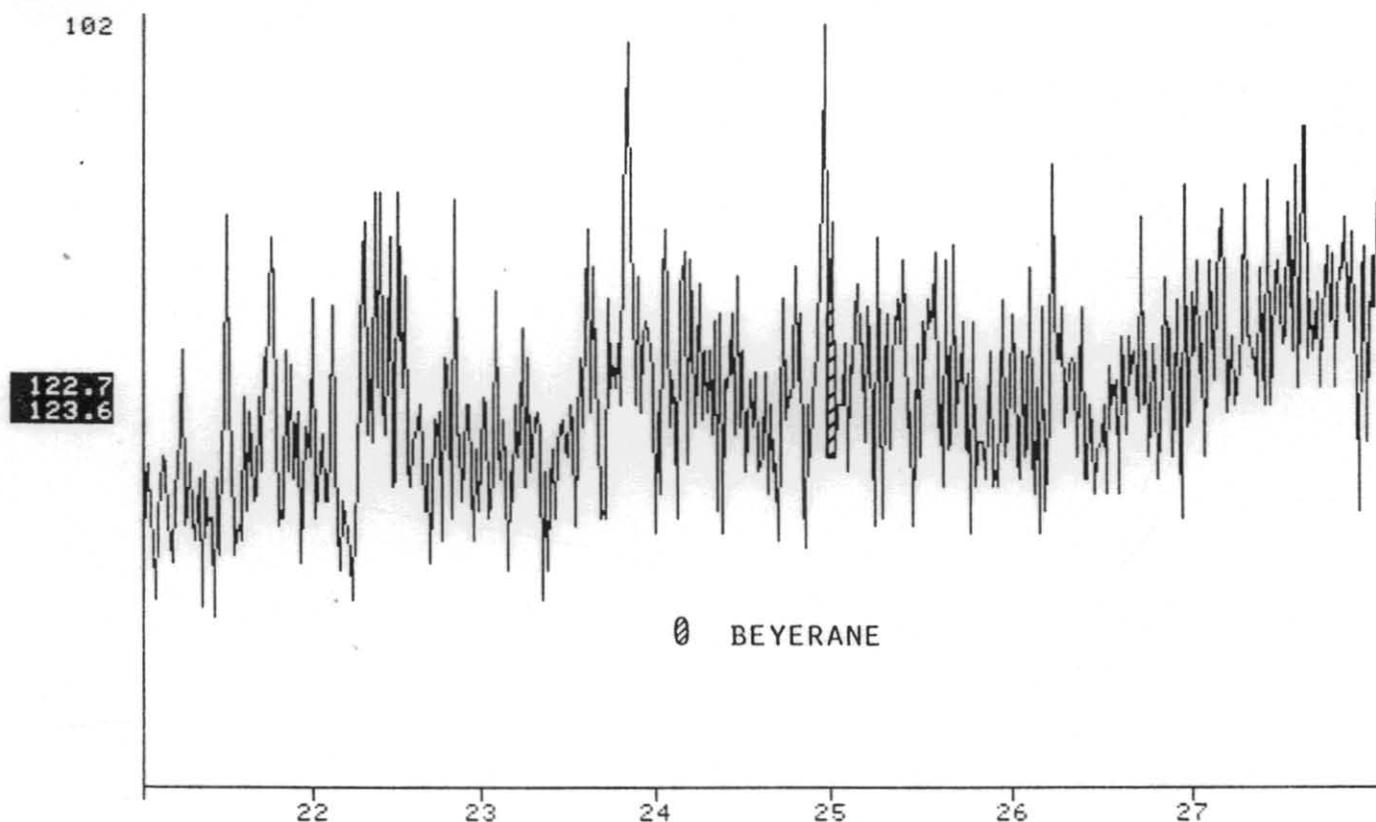


FIGURE: 2-12i

NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242



NAME DURROON#1, 9915'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/35ul. COL#72.

FRN 6242

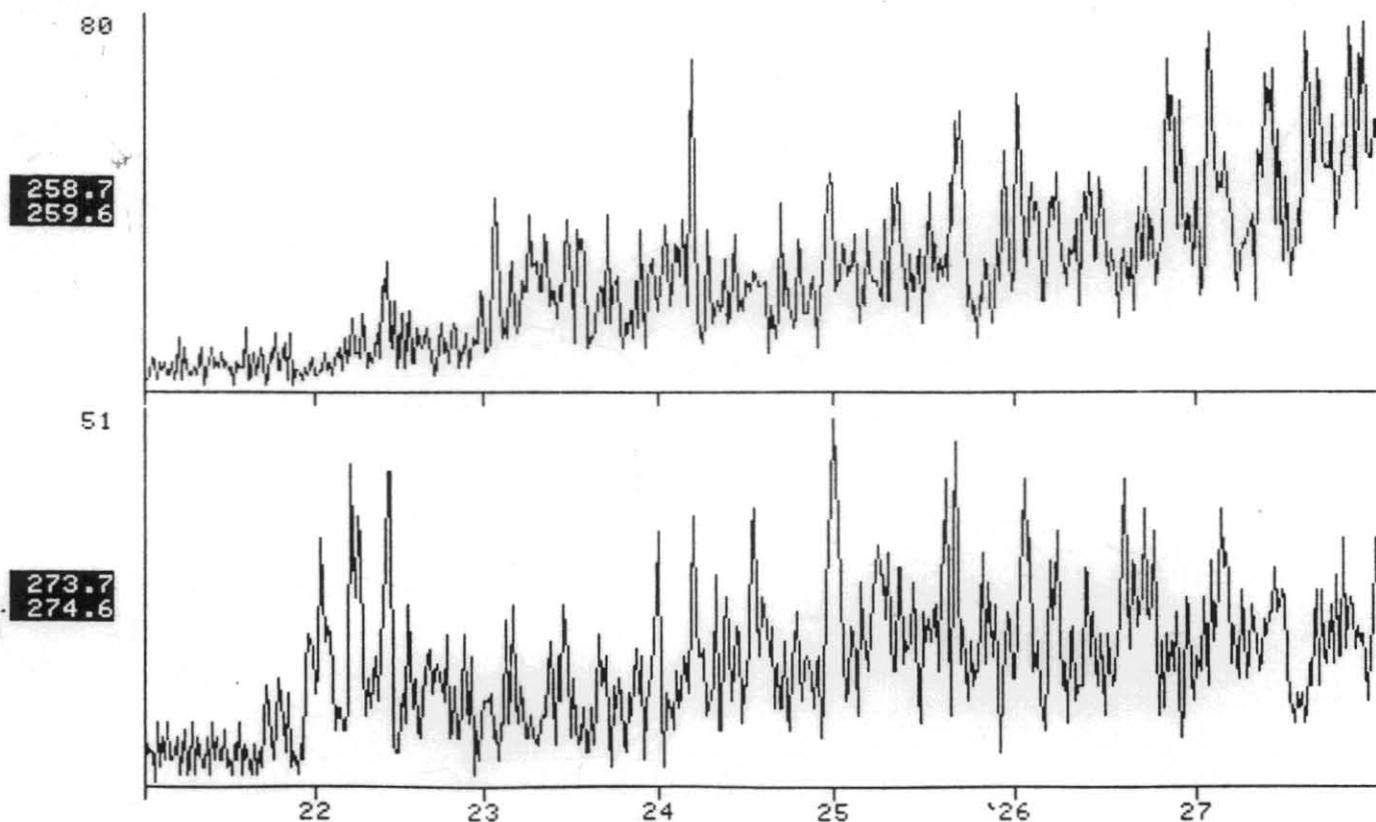
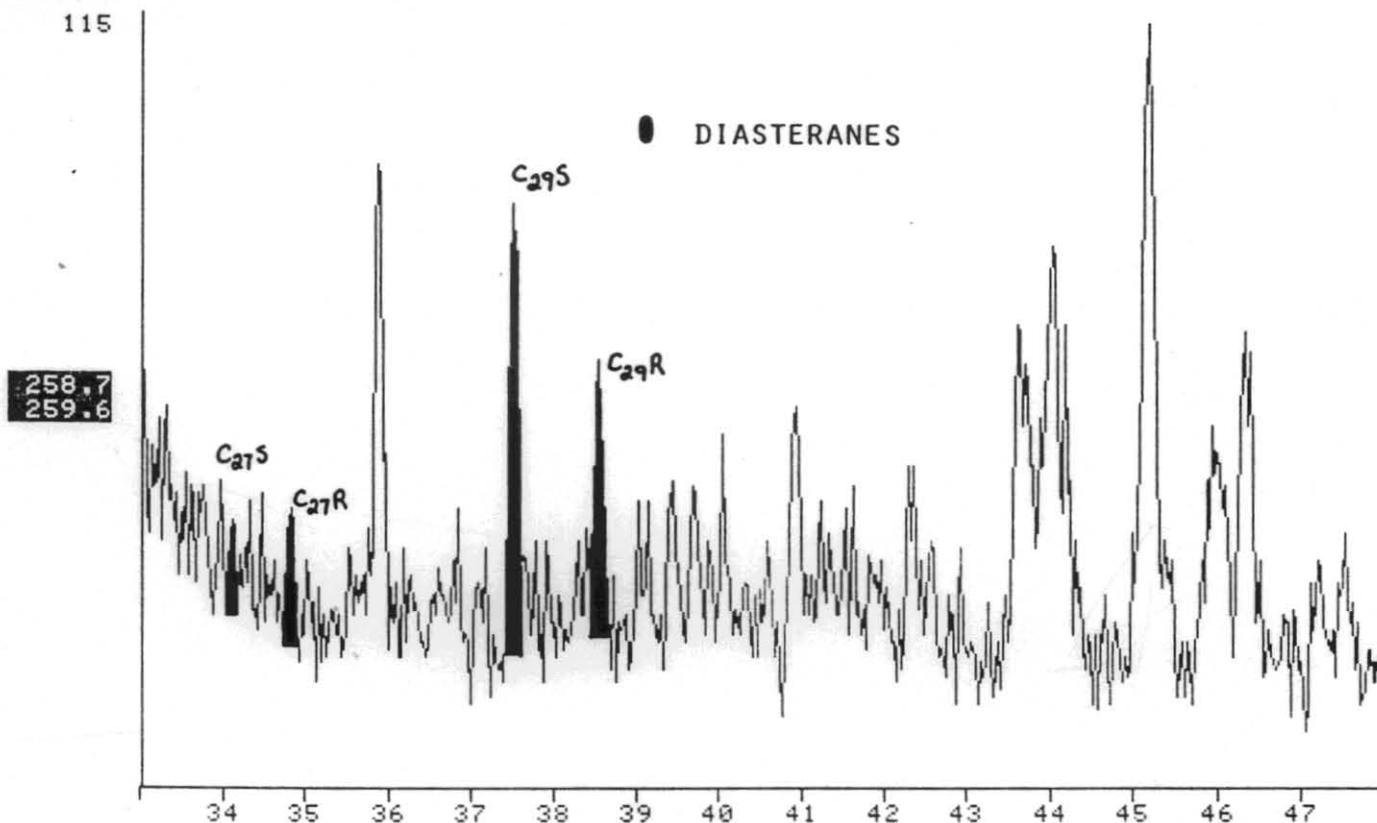


FIGURE: 2-13a

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

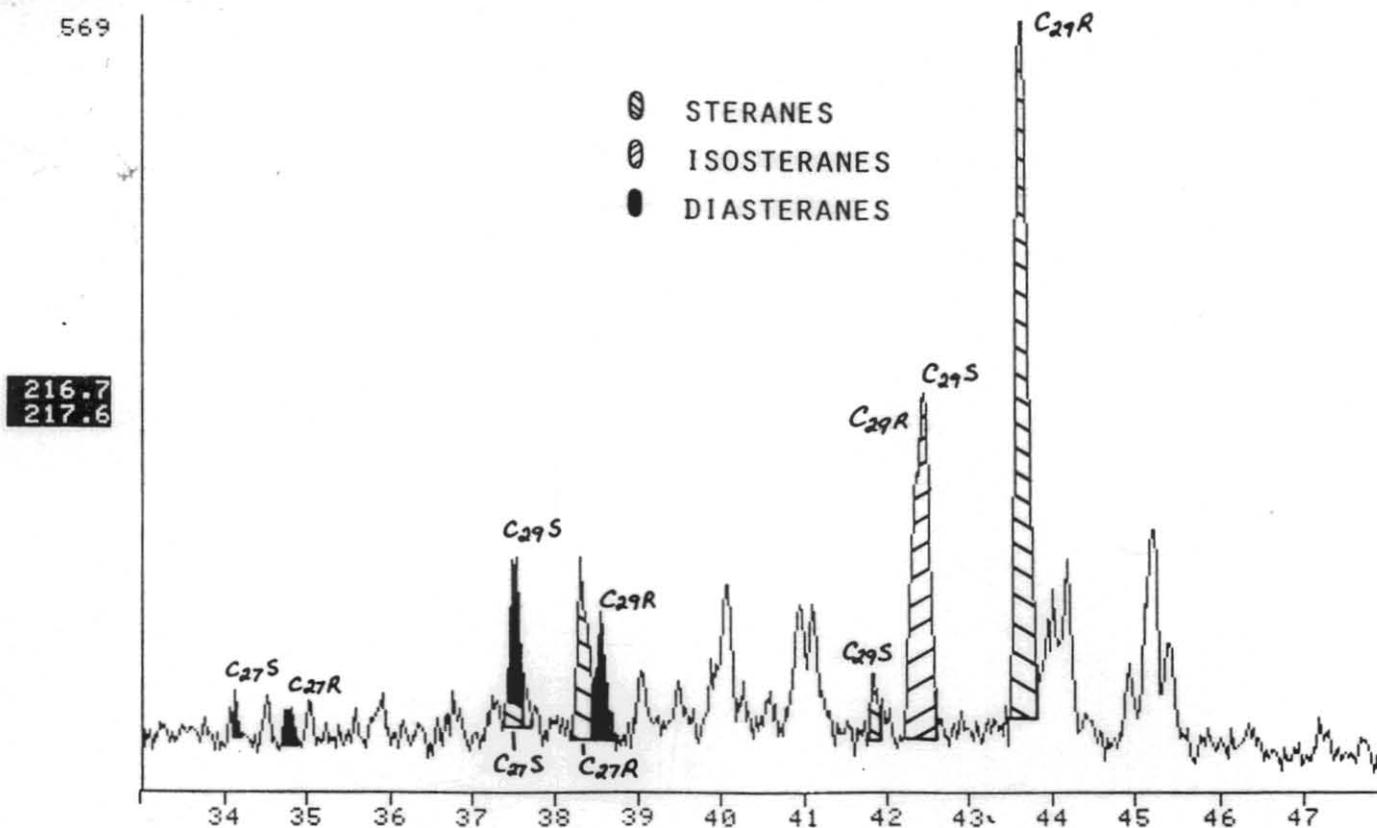
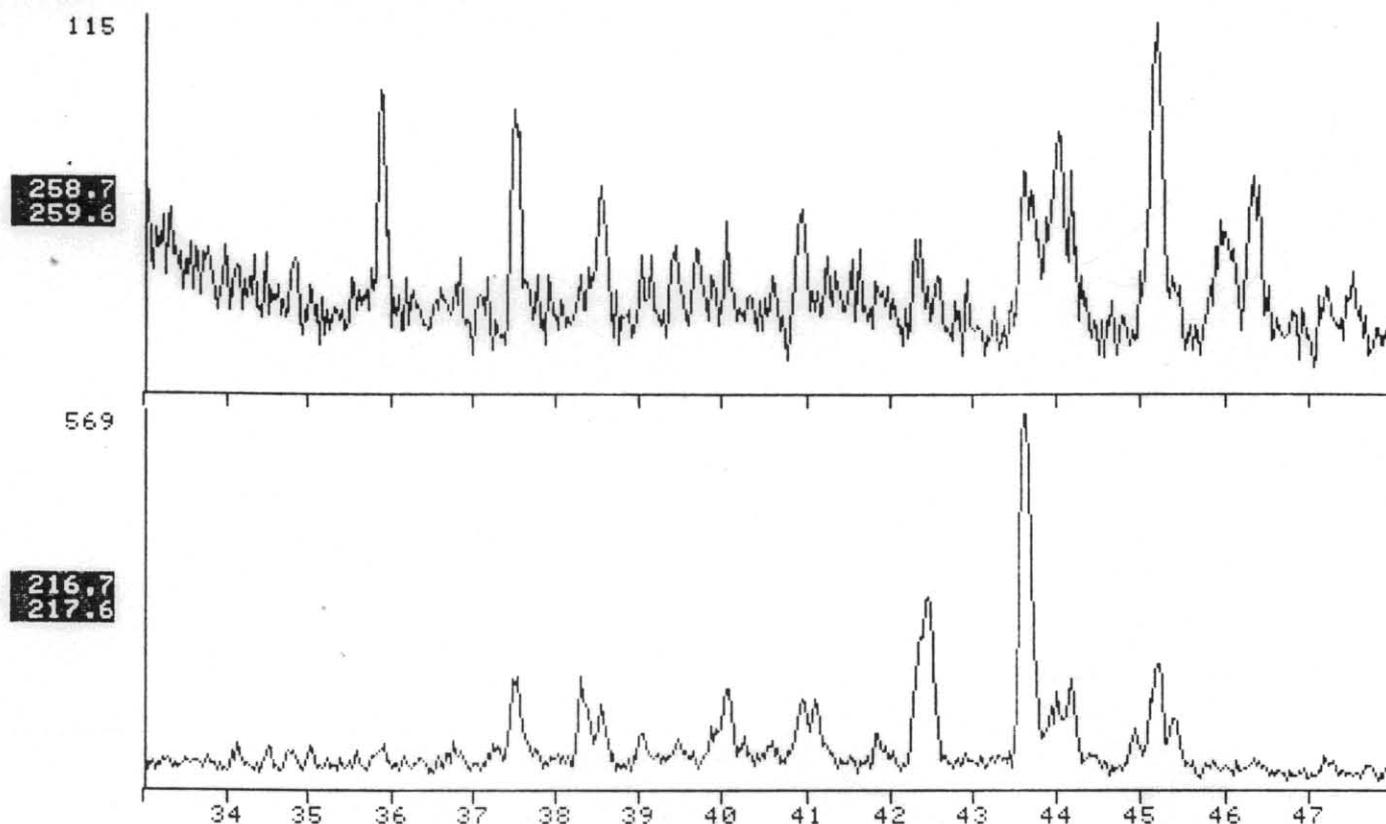


FIGURE: 2-13b

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

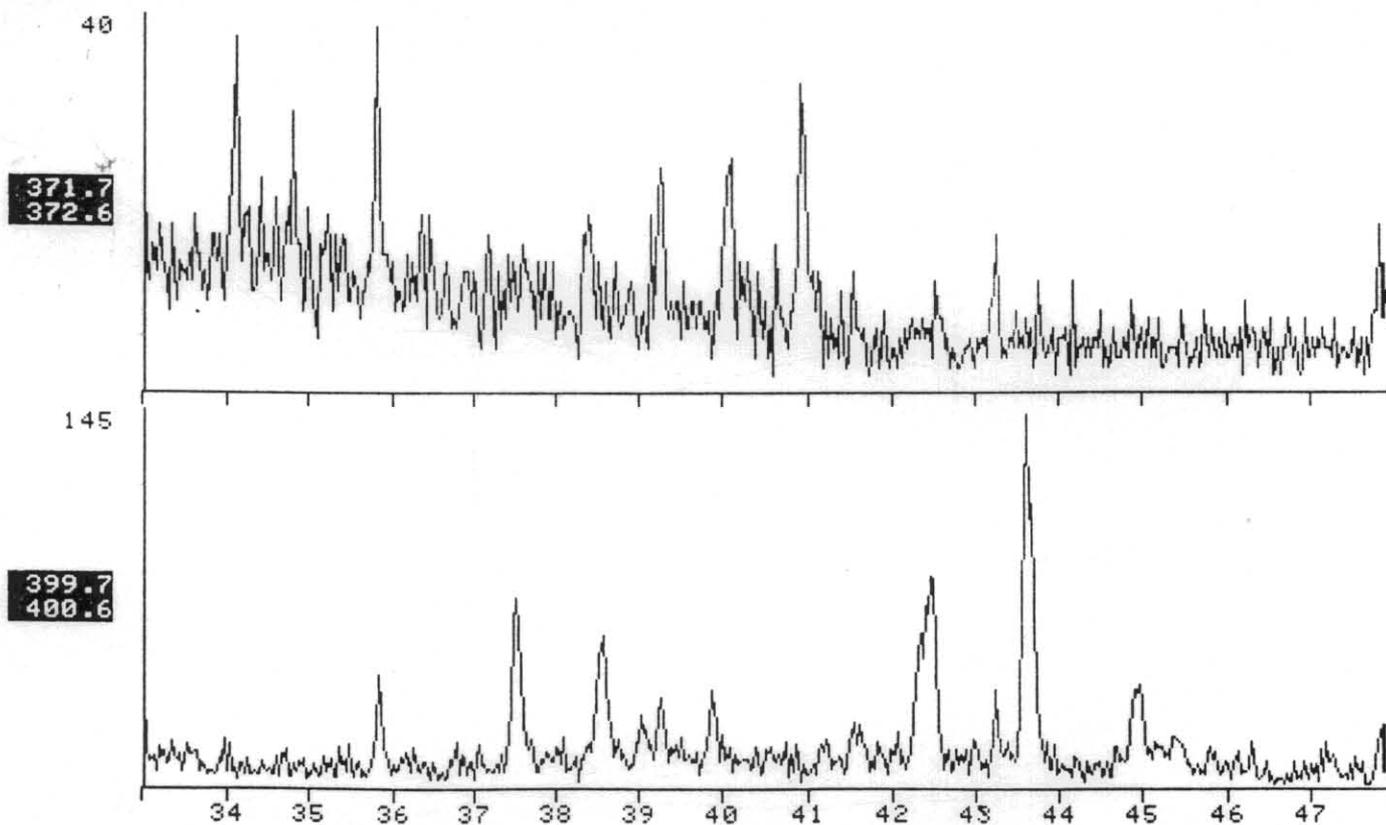
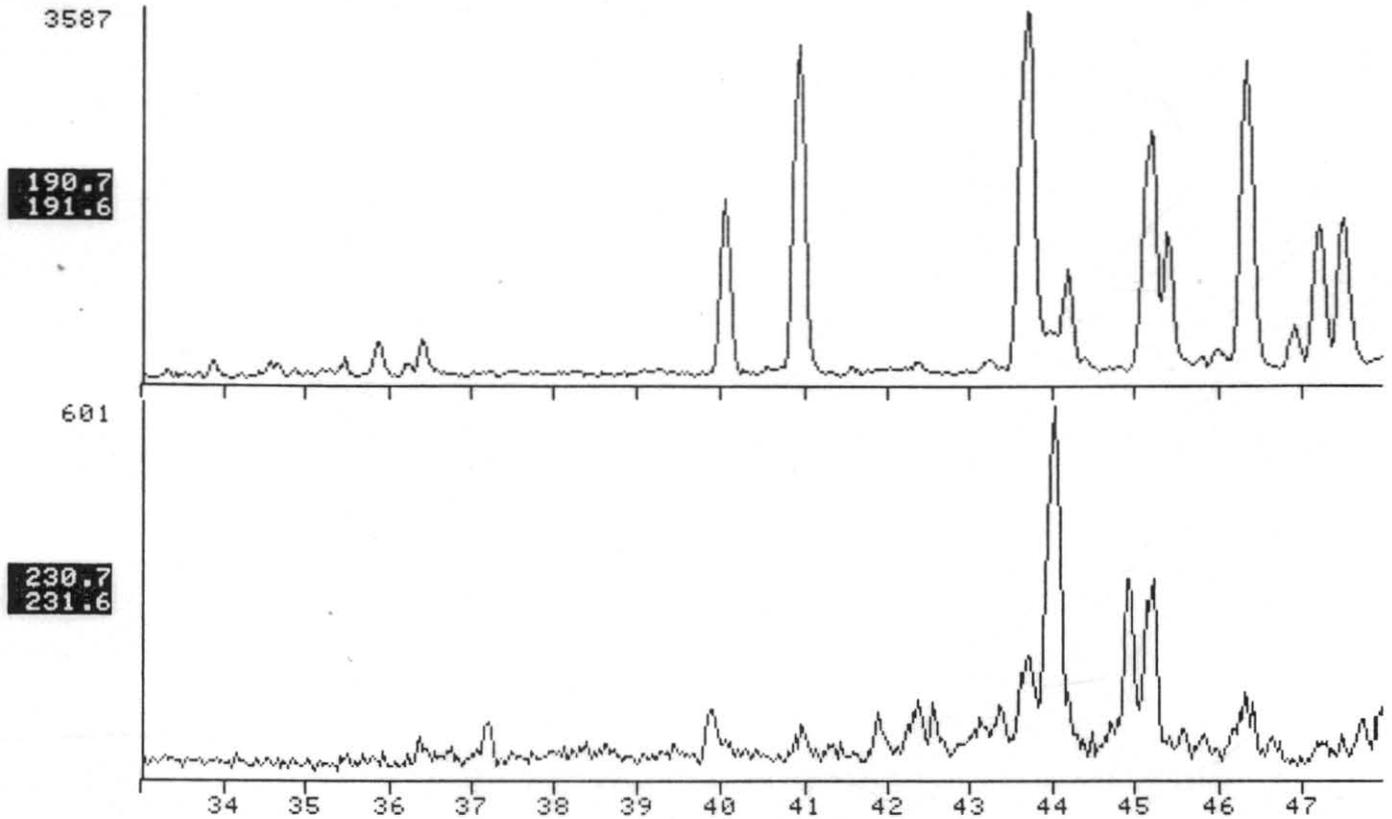


FIGURE: 2-13c

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

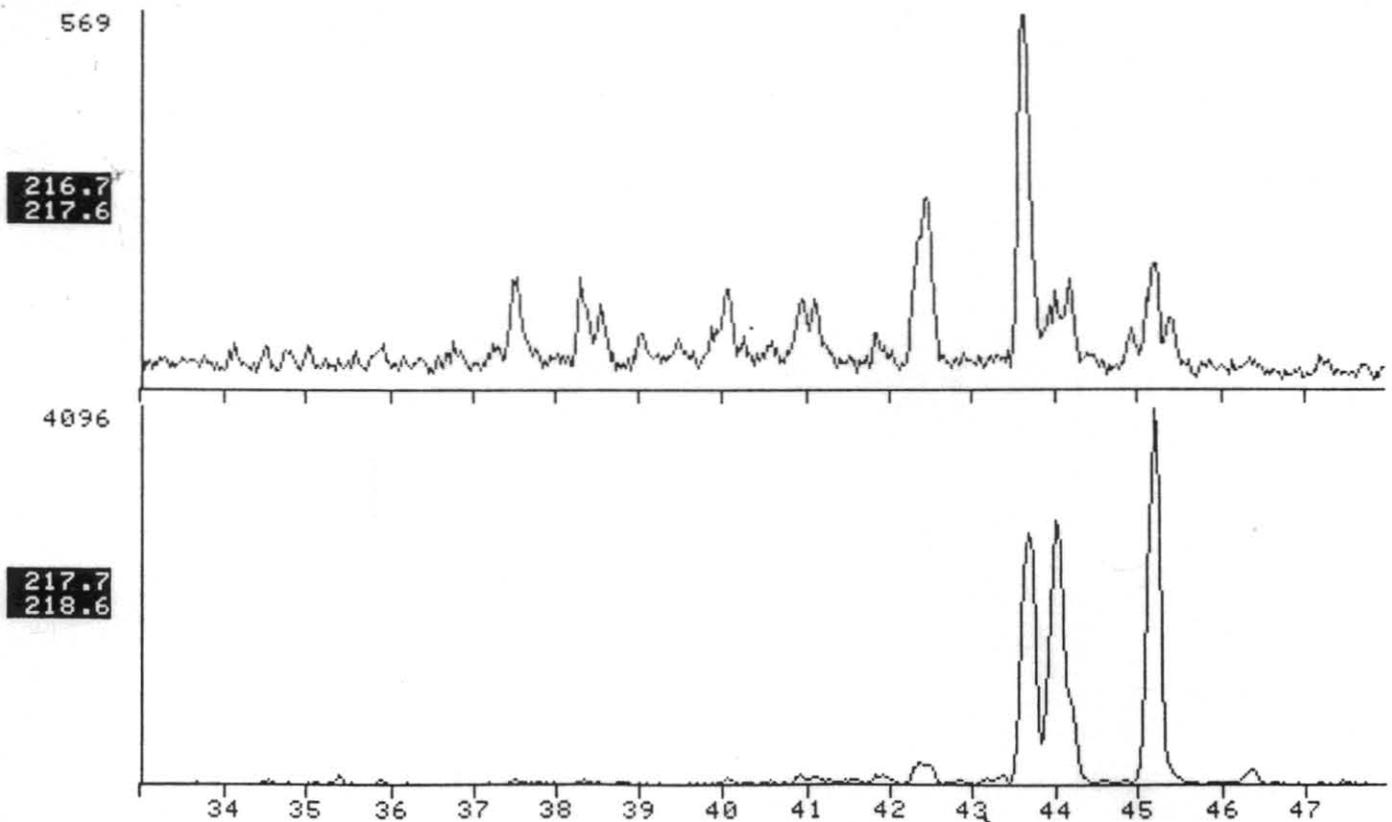
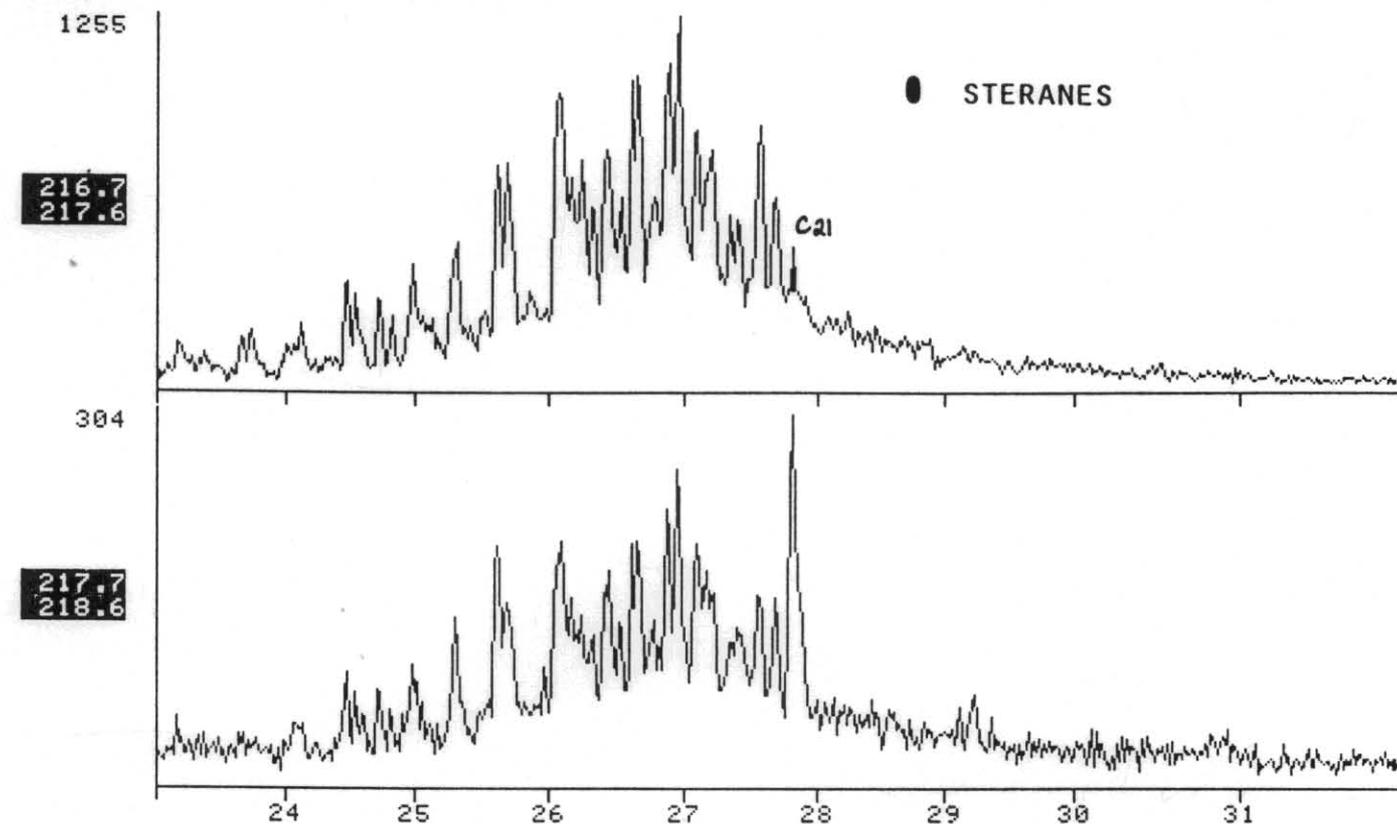


FIGURE: 2-13d

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM:
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

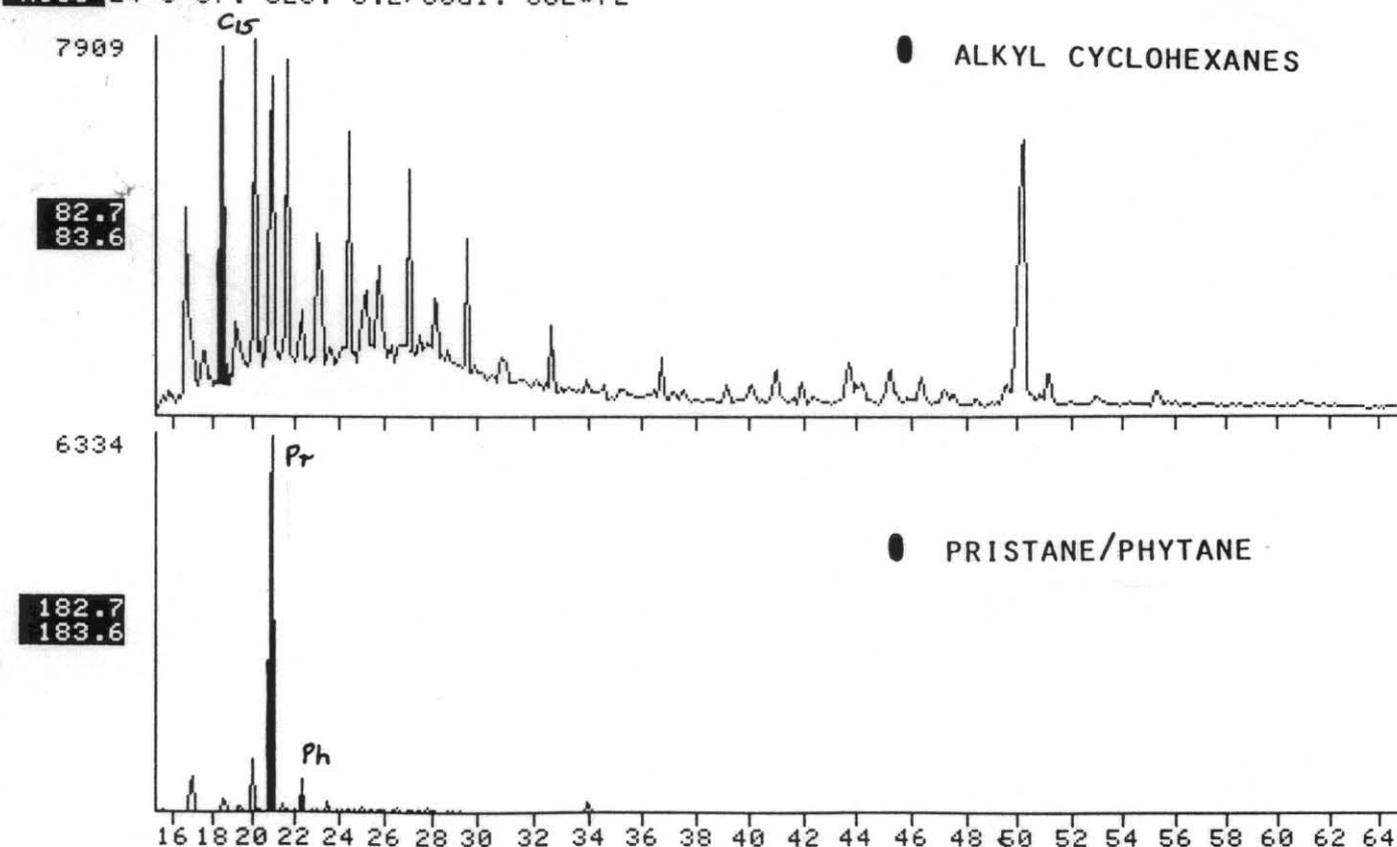
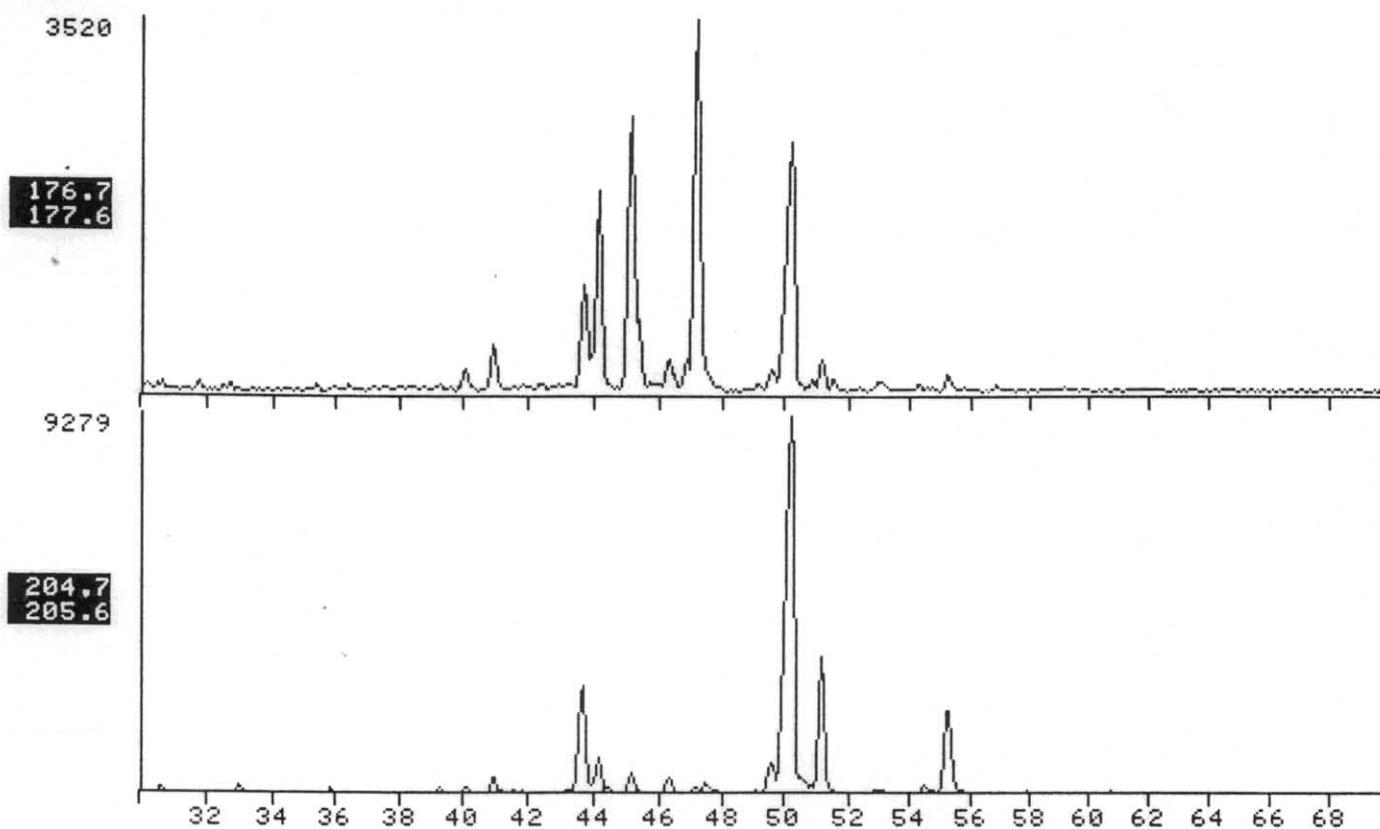


FIGURE: 2-13e

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

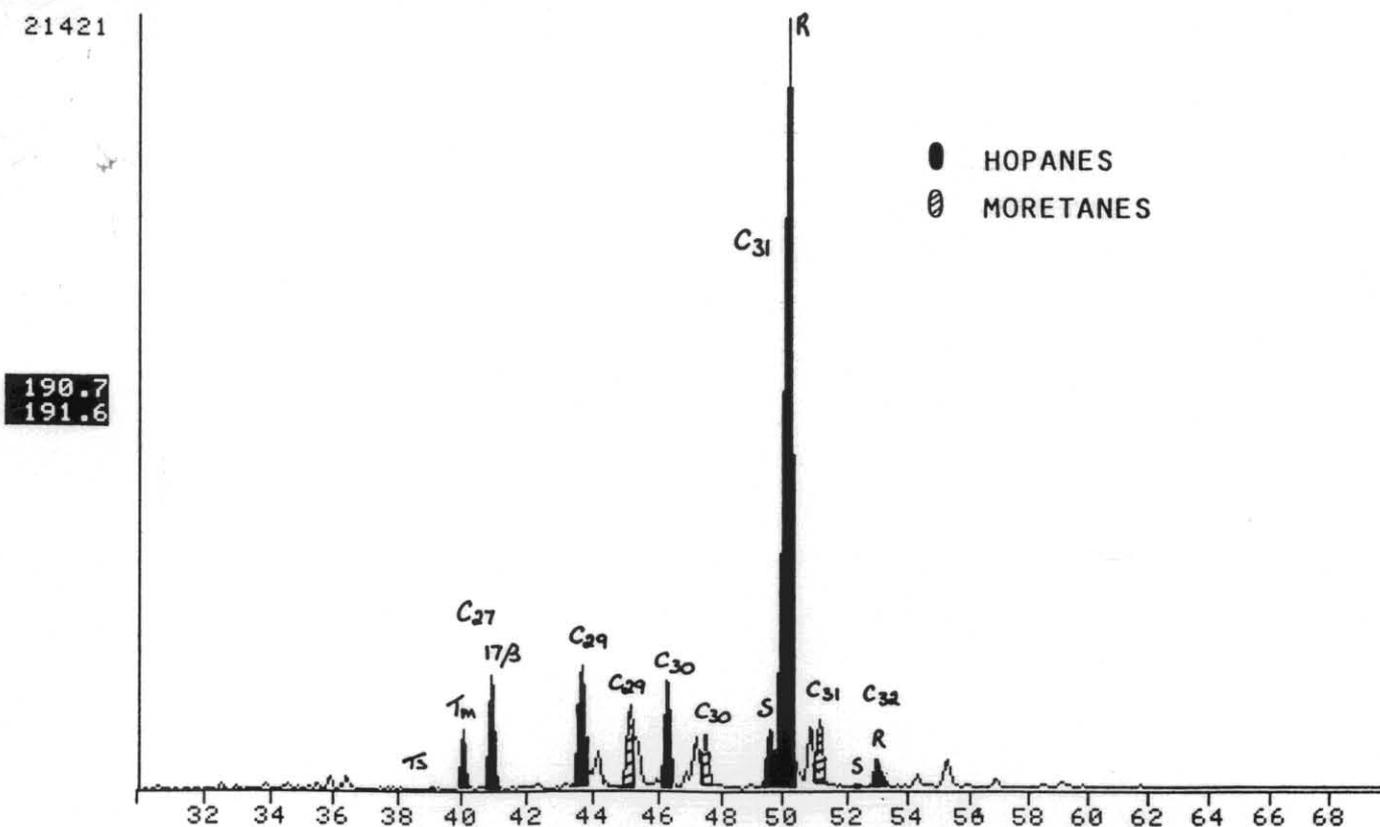
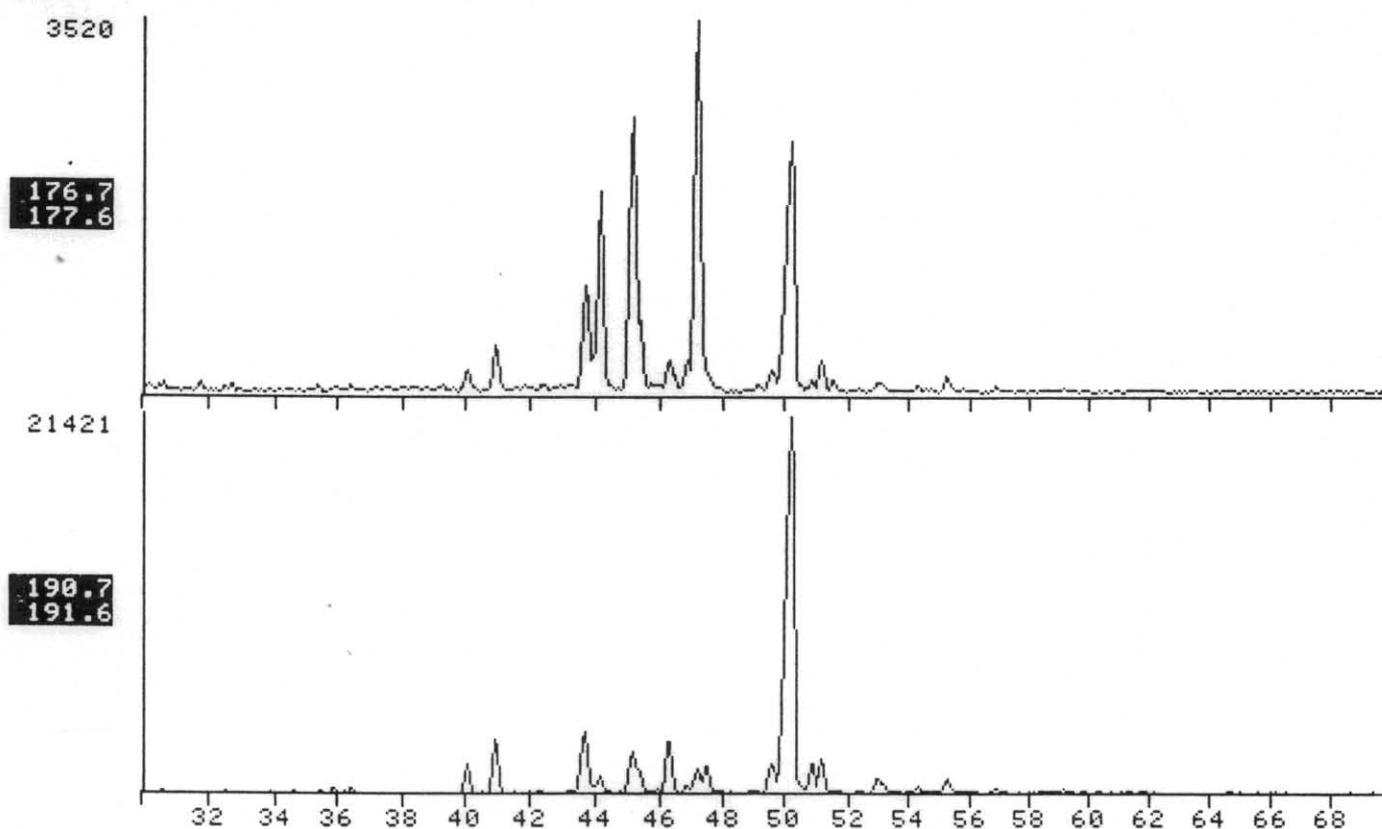


FIGURE: 2-13f

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

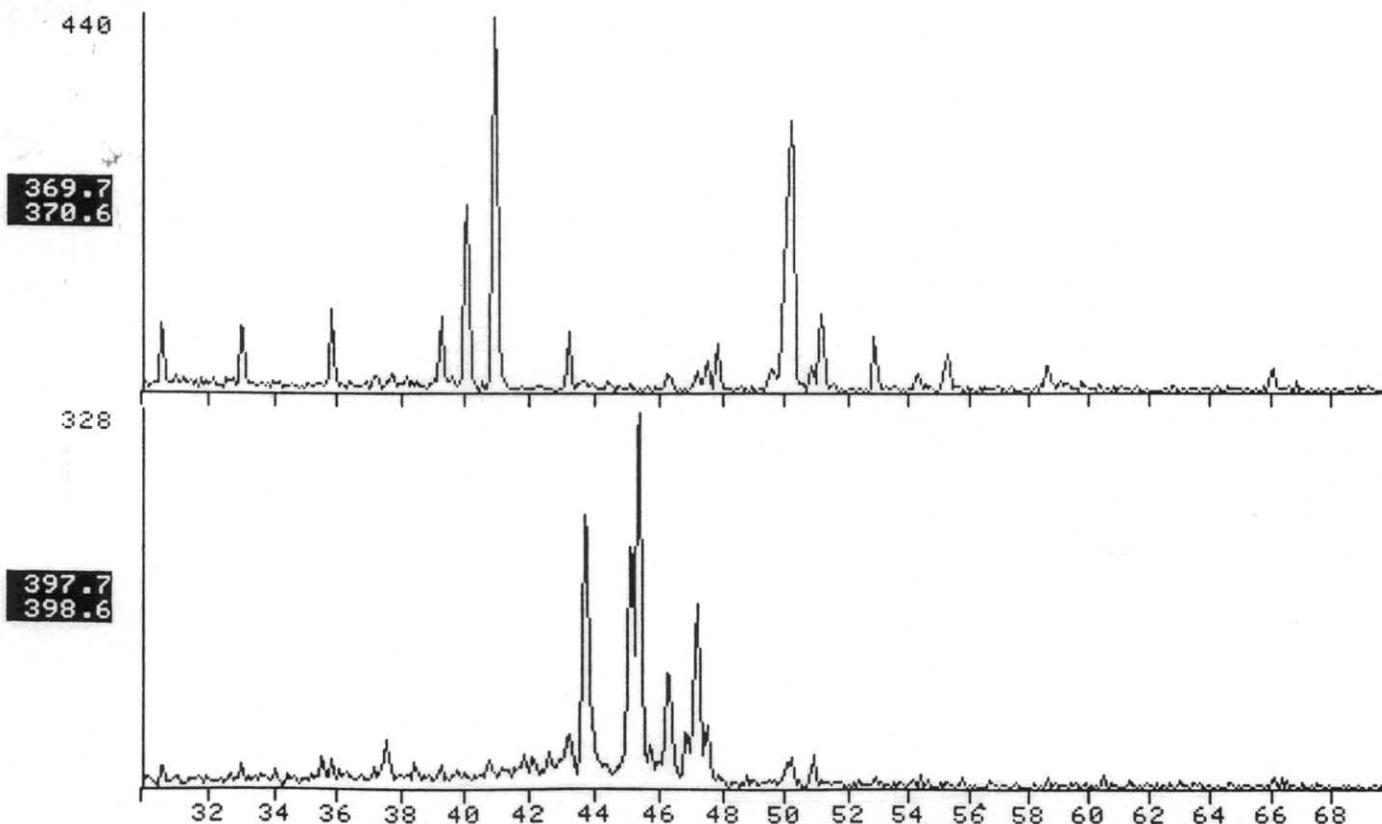
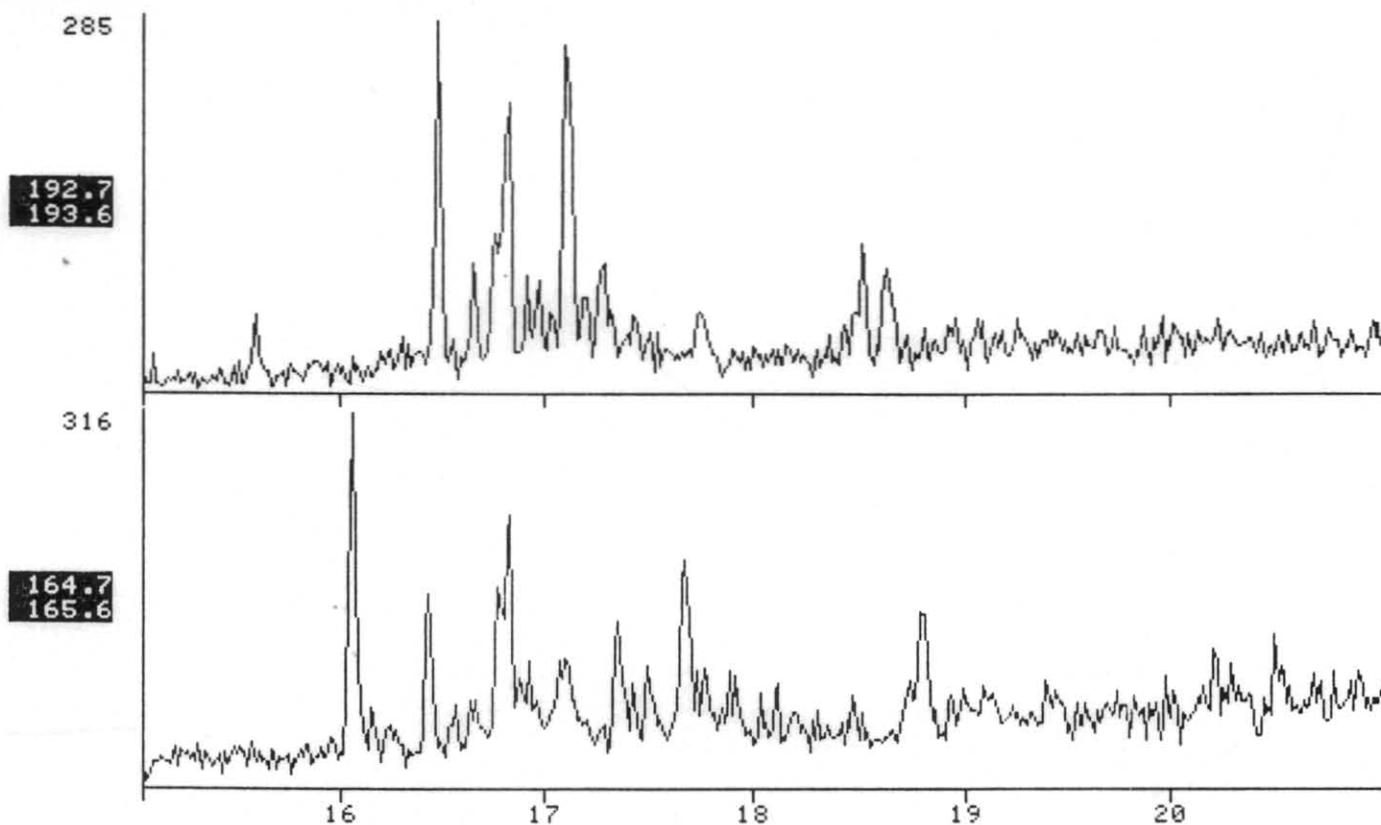


FIGURE: 2-13g

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

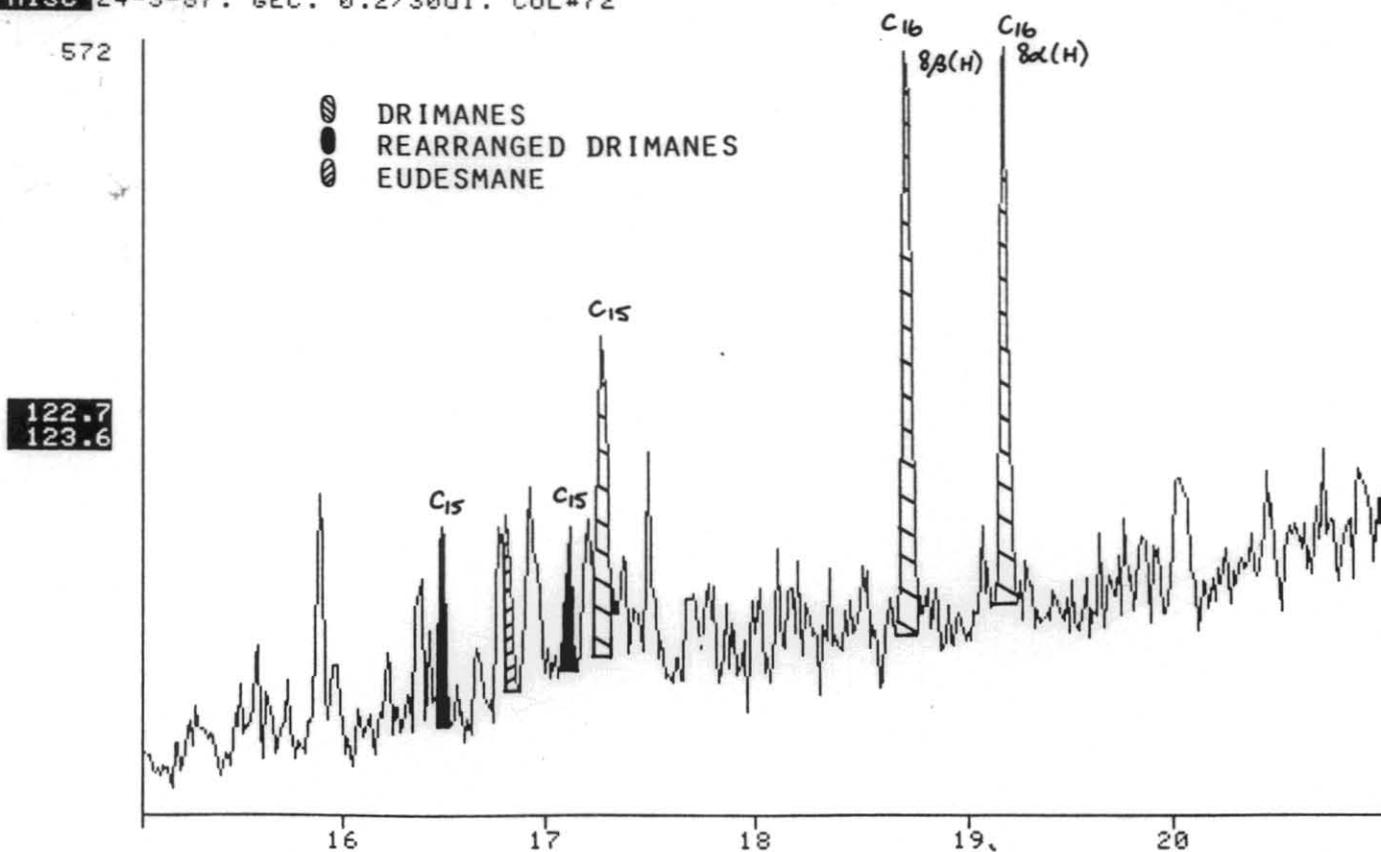
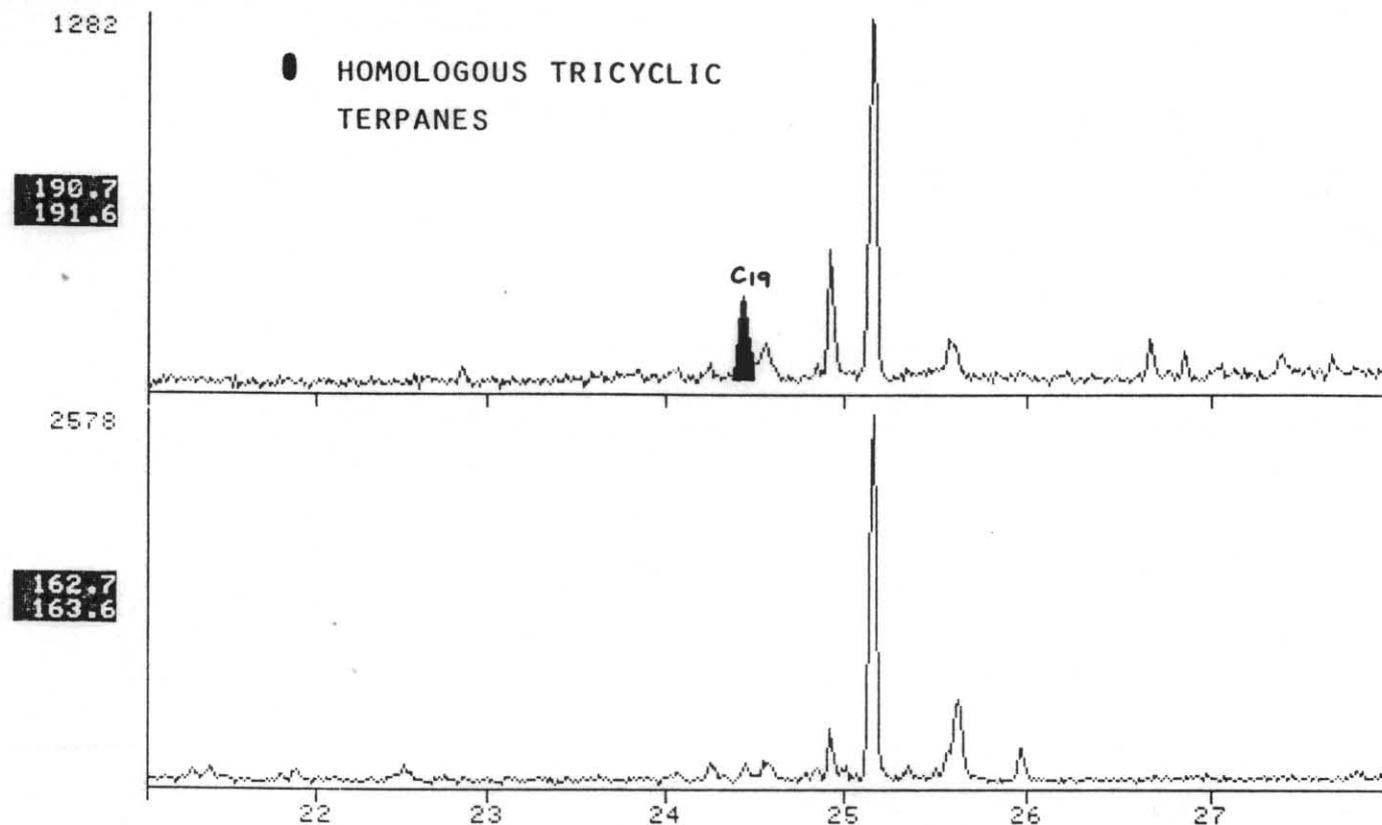


FIGURE: 2-13h

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

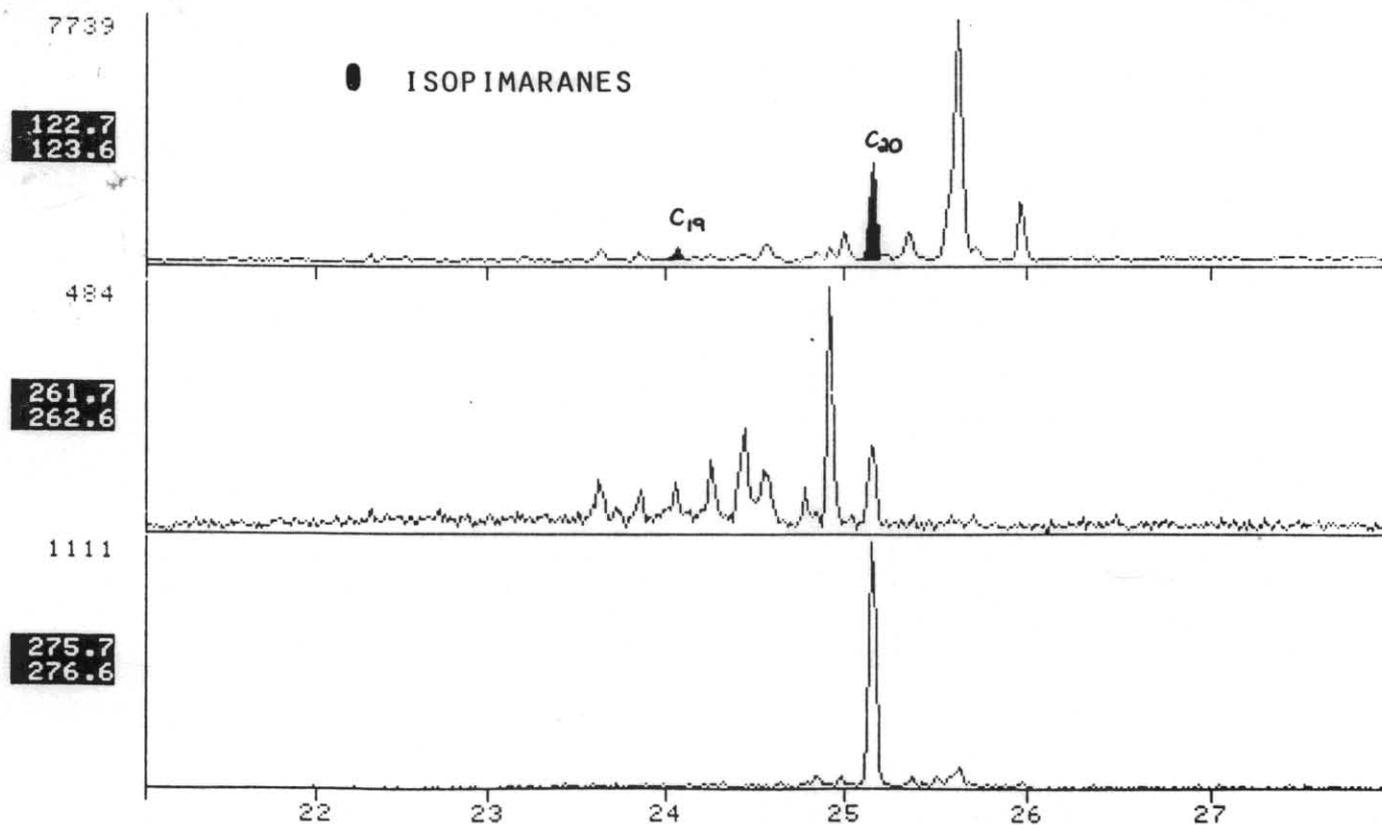
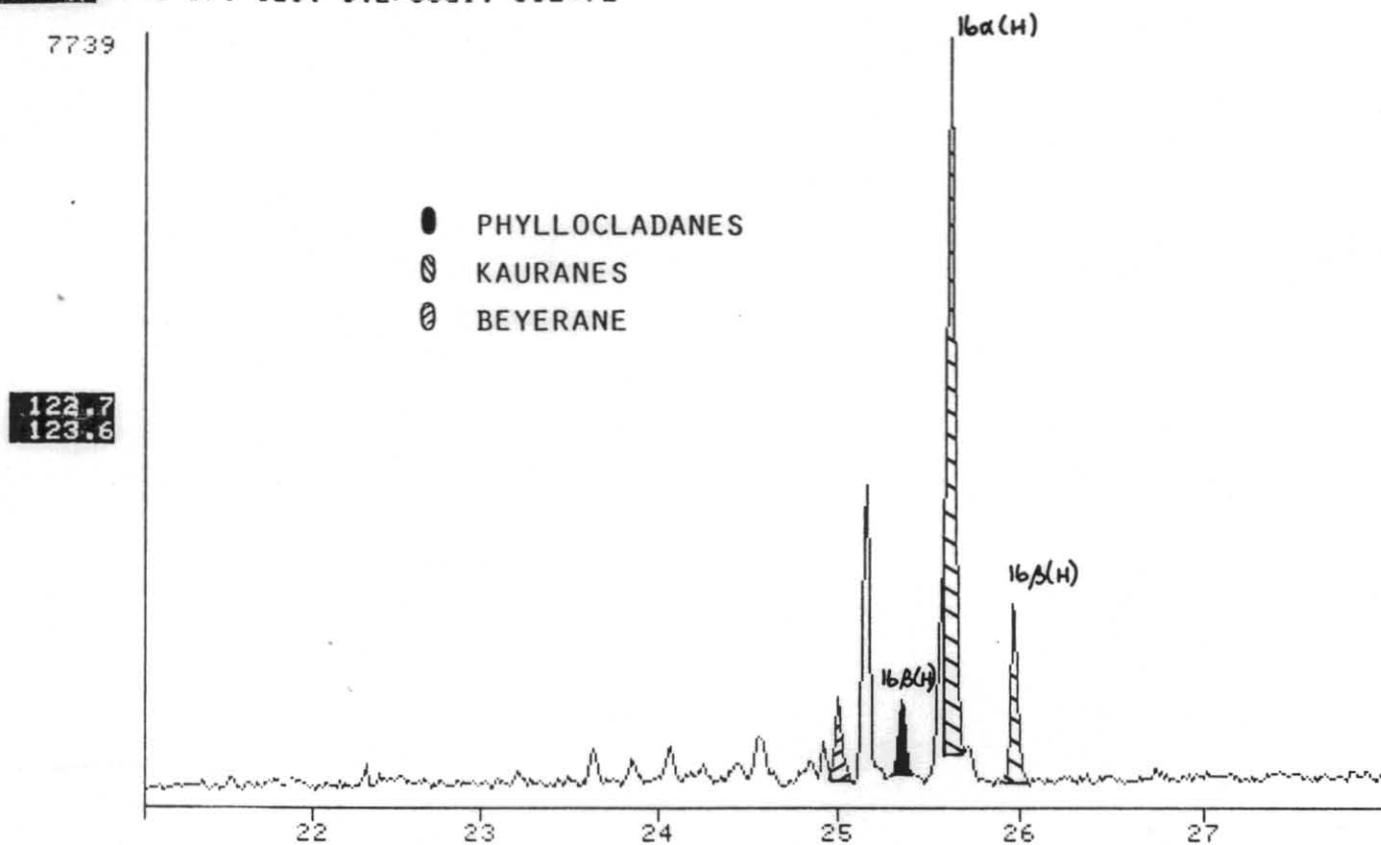


FIGURE: 2-13i

NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245



NAME KONKON#1, 4413'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72

FRN 6245

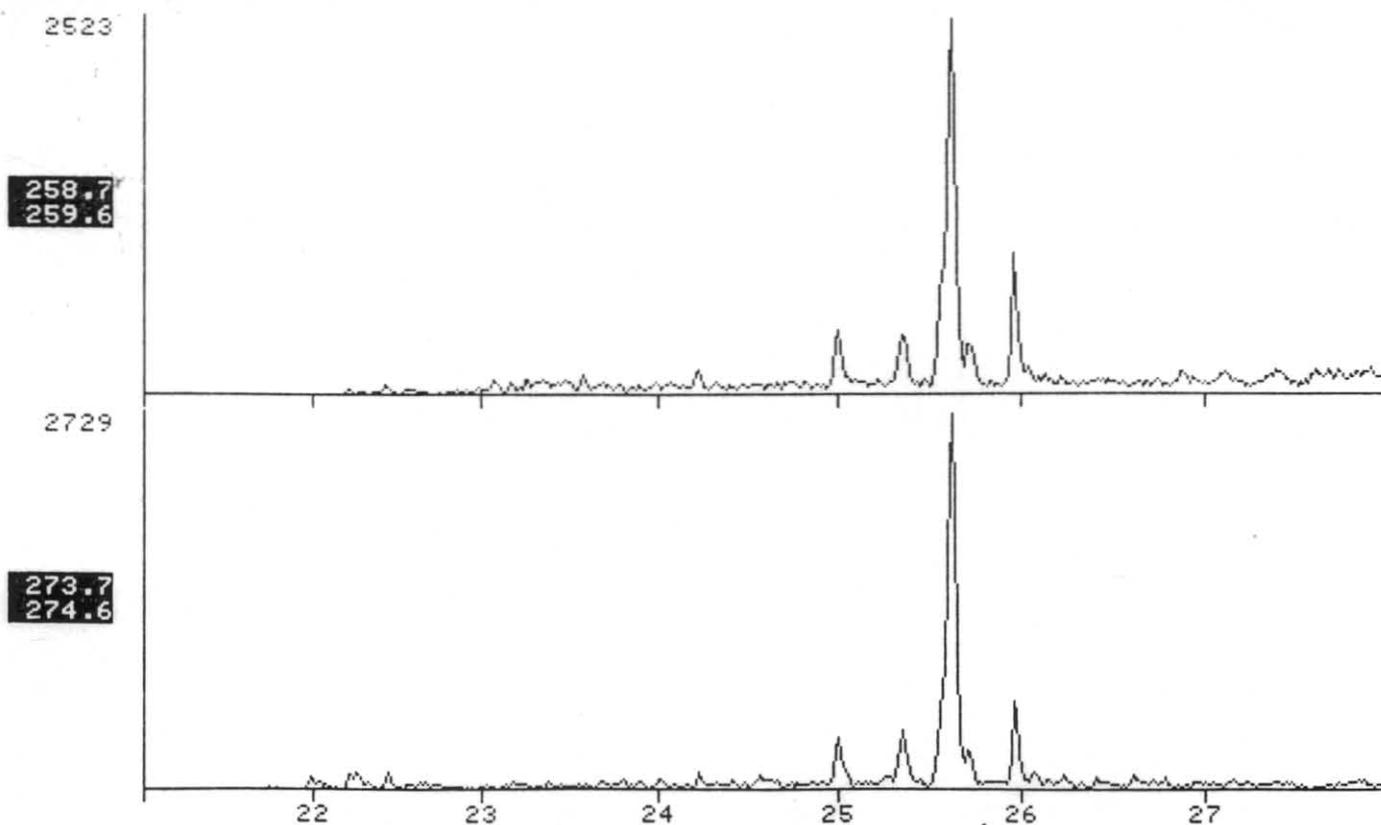
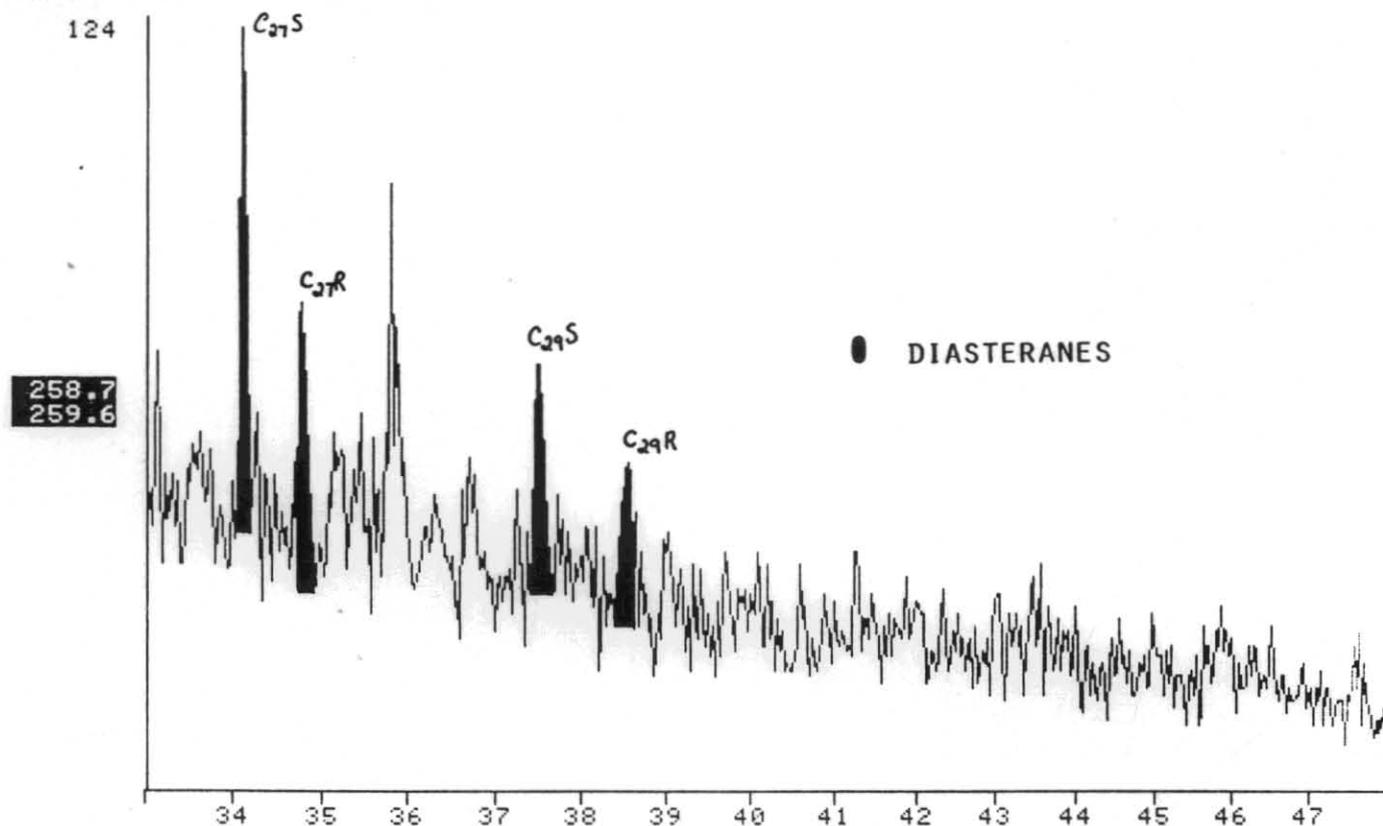


FIGURE: 2-14a

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

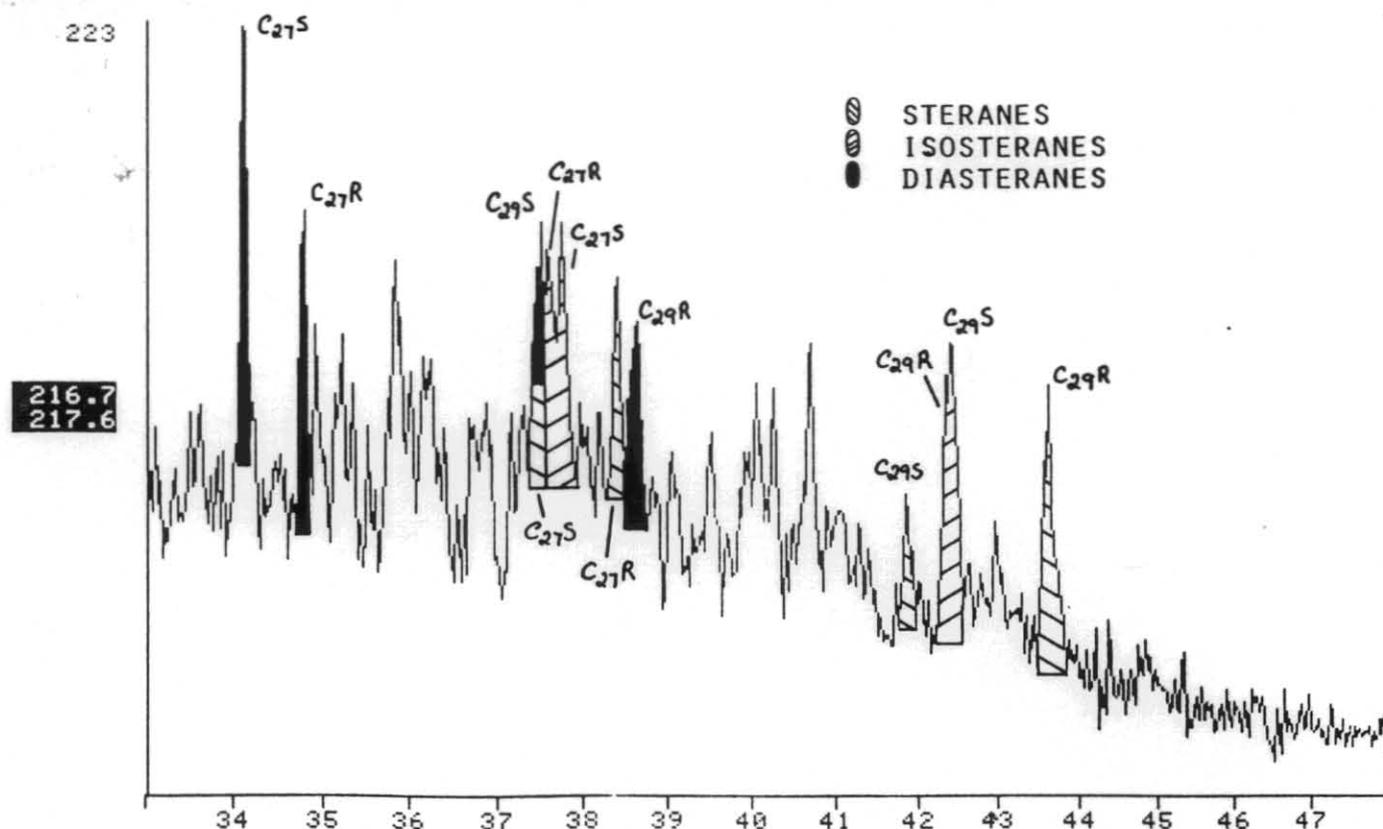
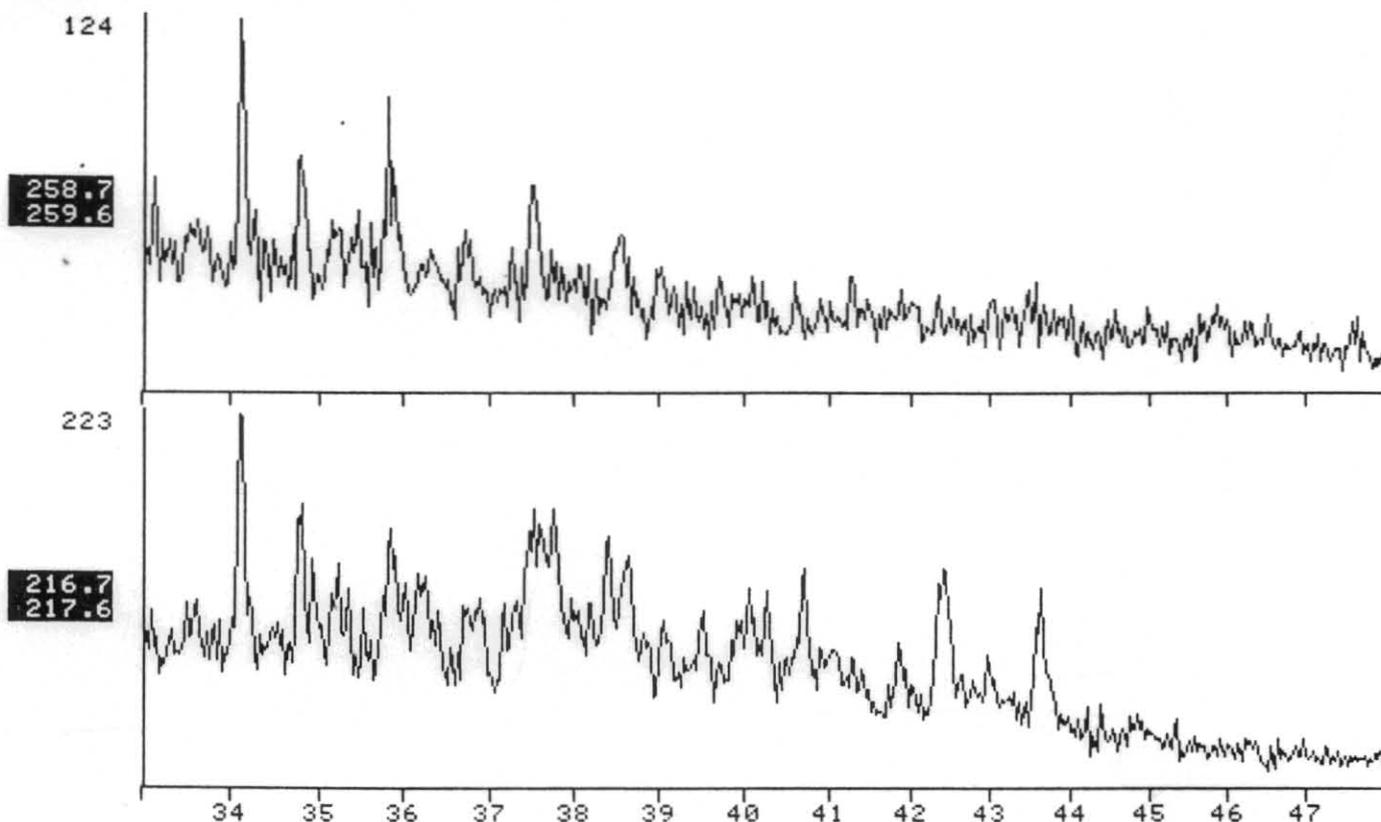


FIGURE: 2-14b

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

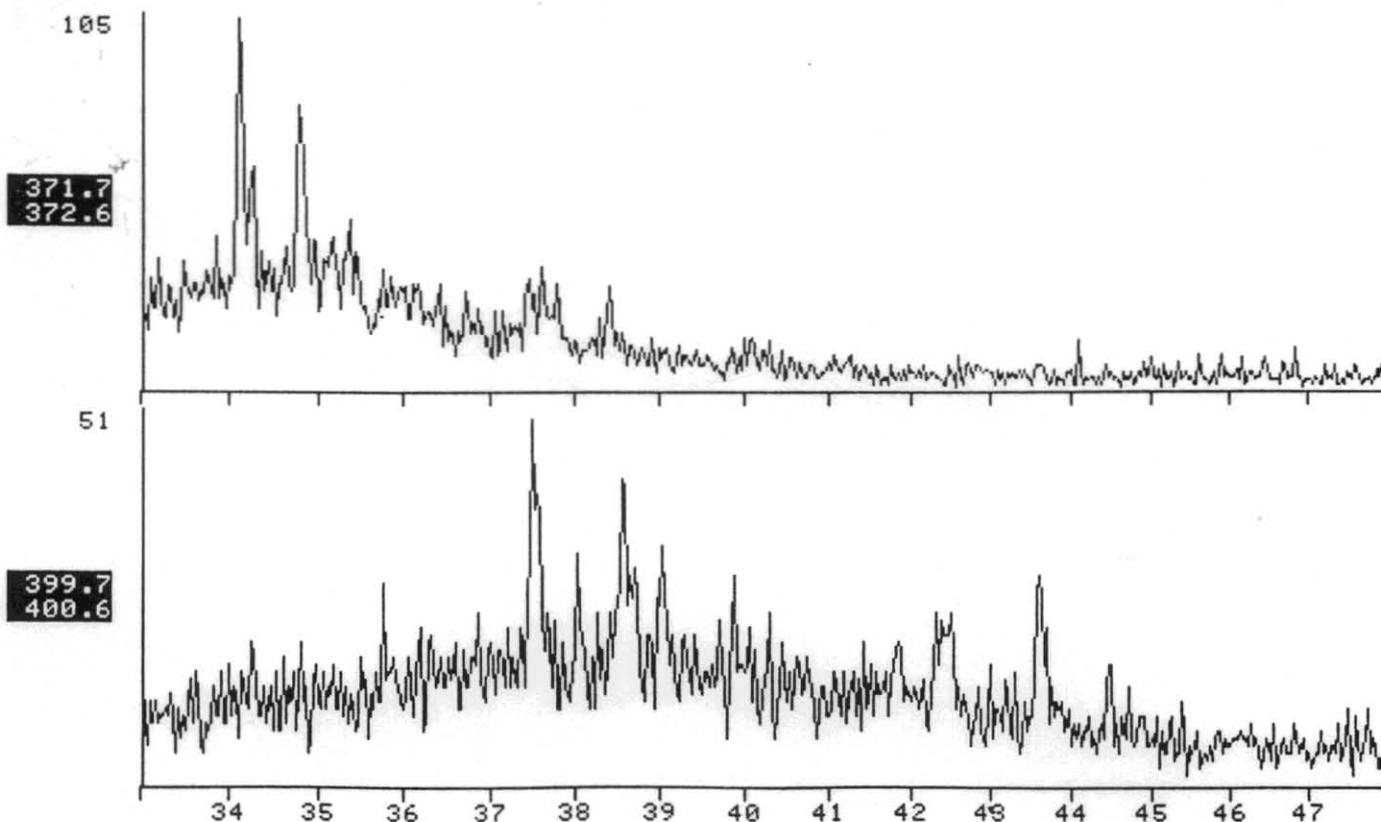
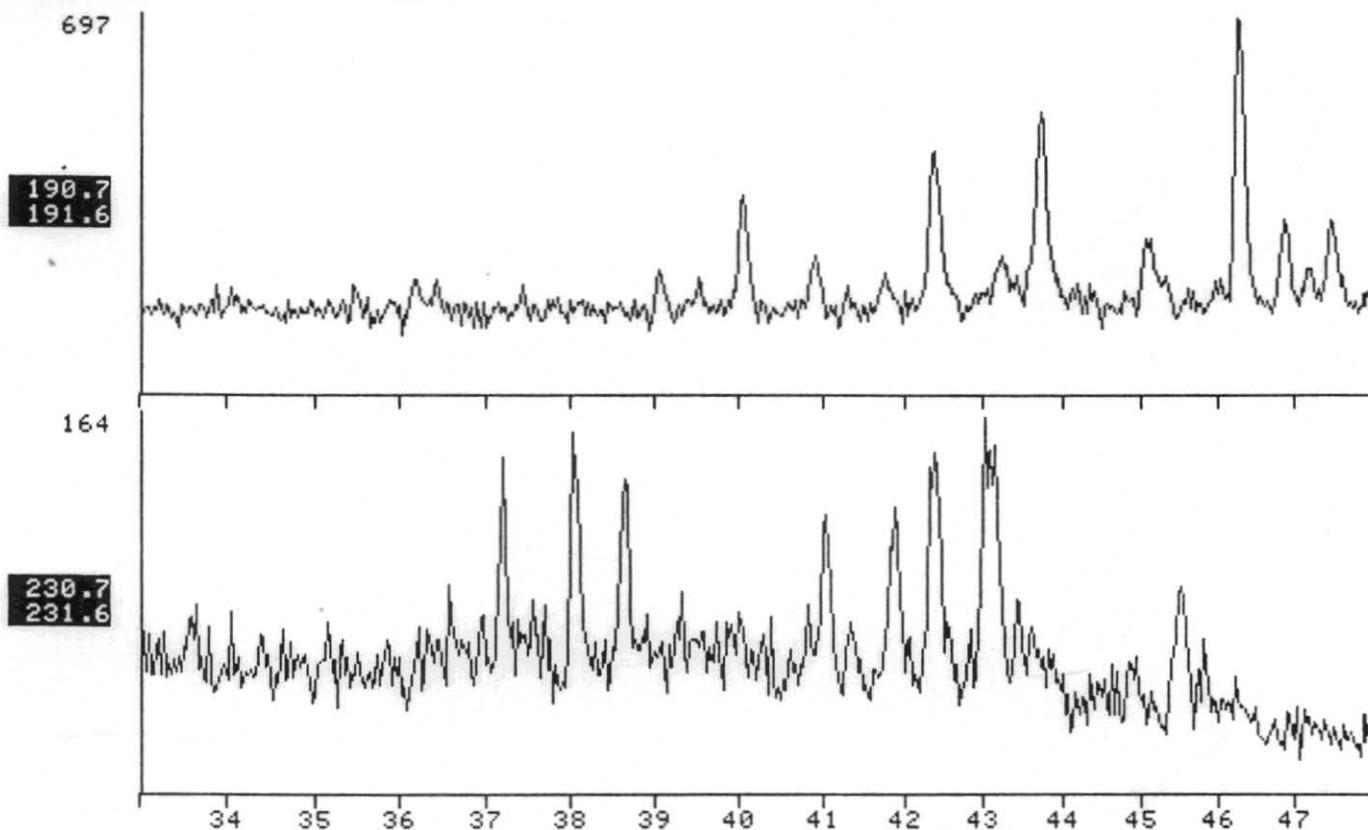


FIGURE: 2-14c

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

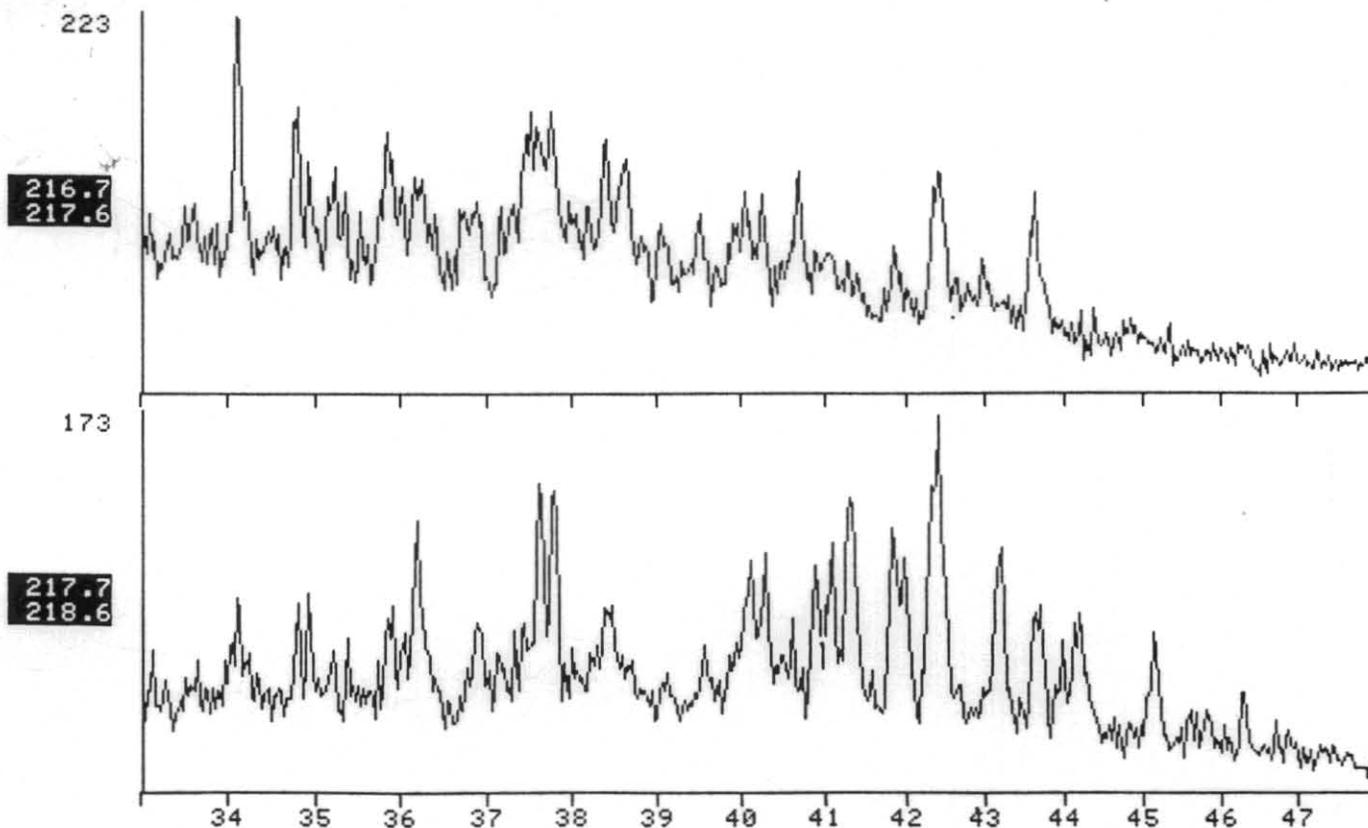
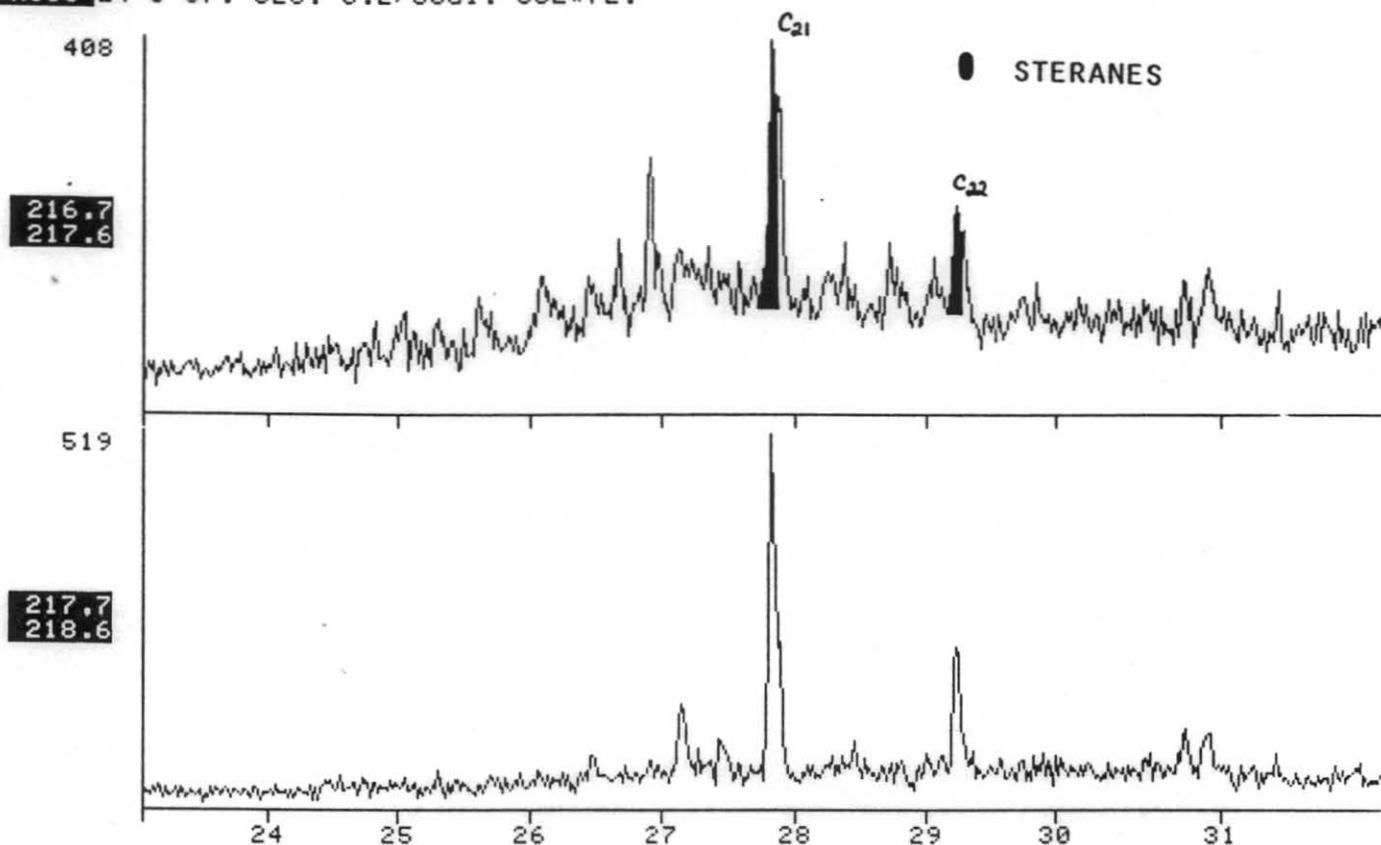


FIGURE: 2-14d

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

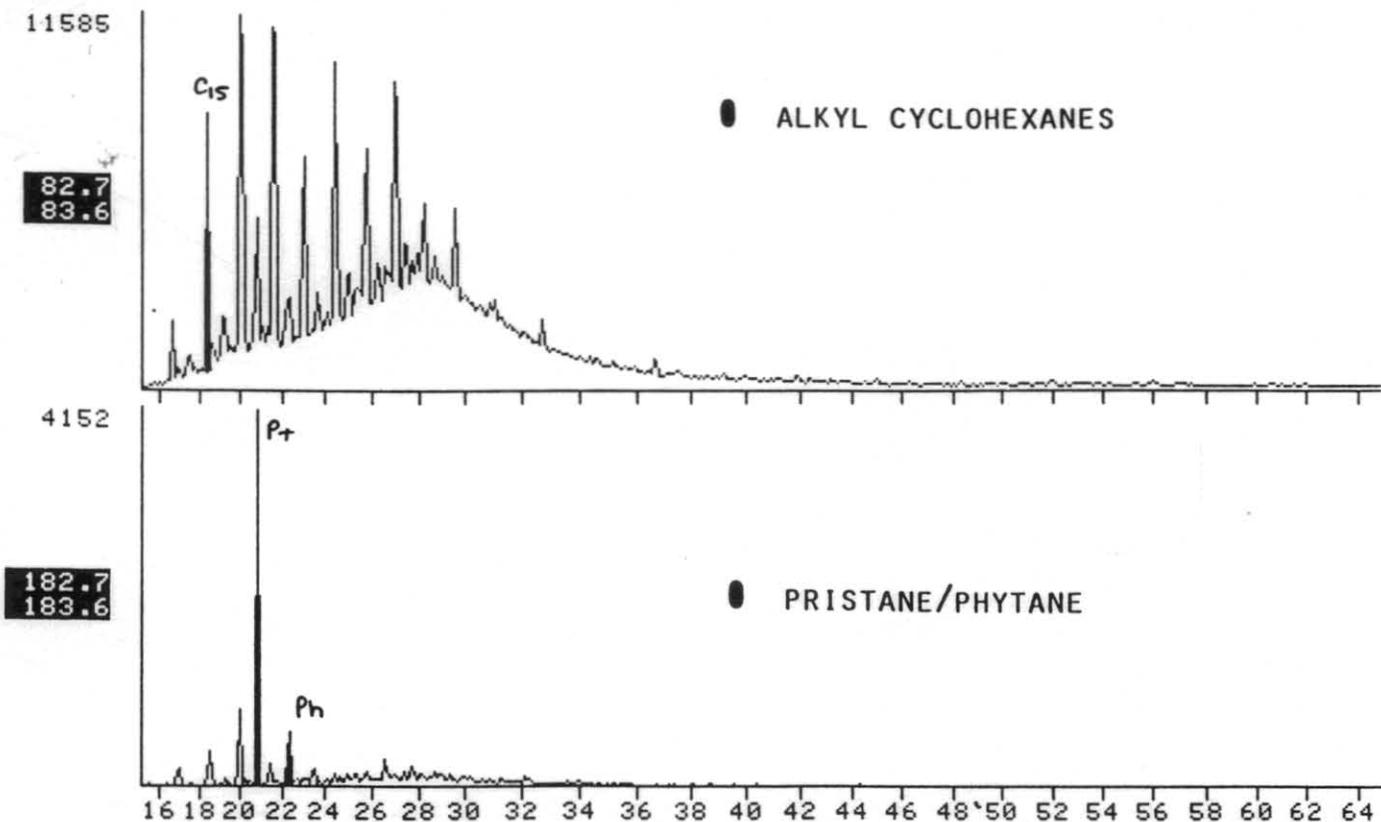
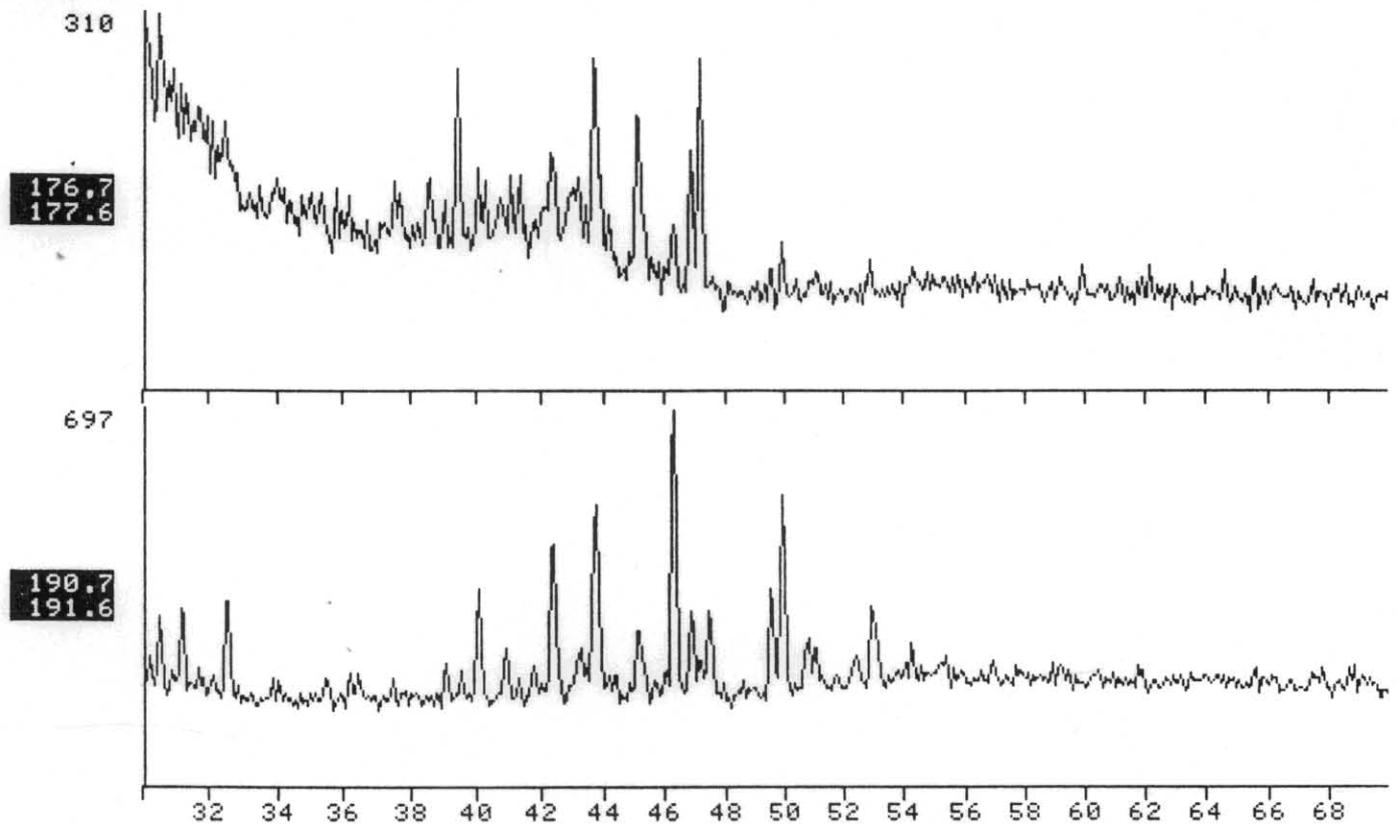


FIGURE: 2-14f

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

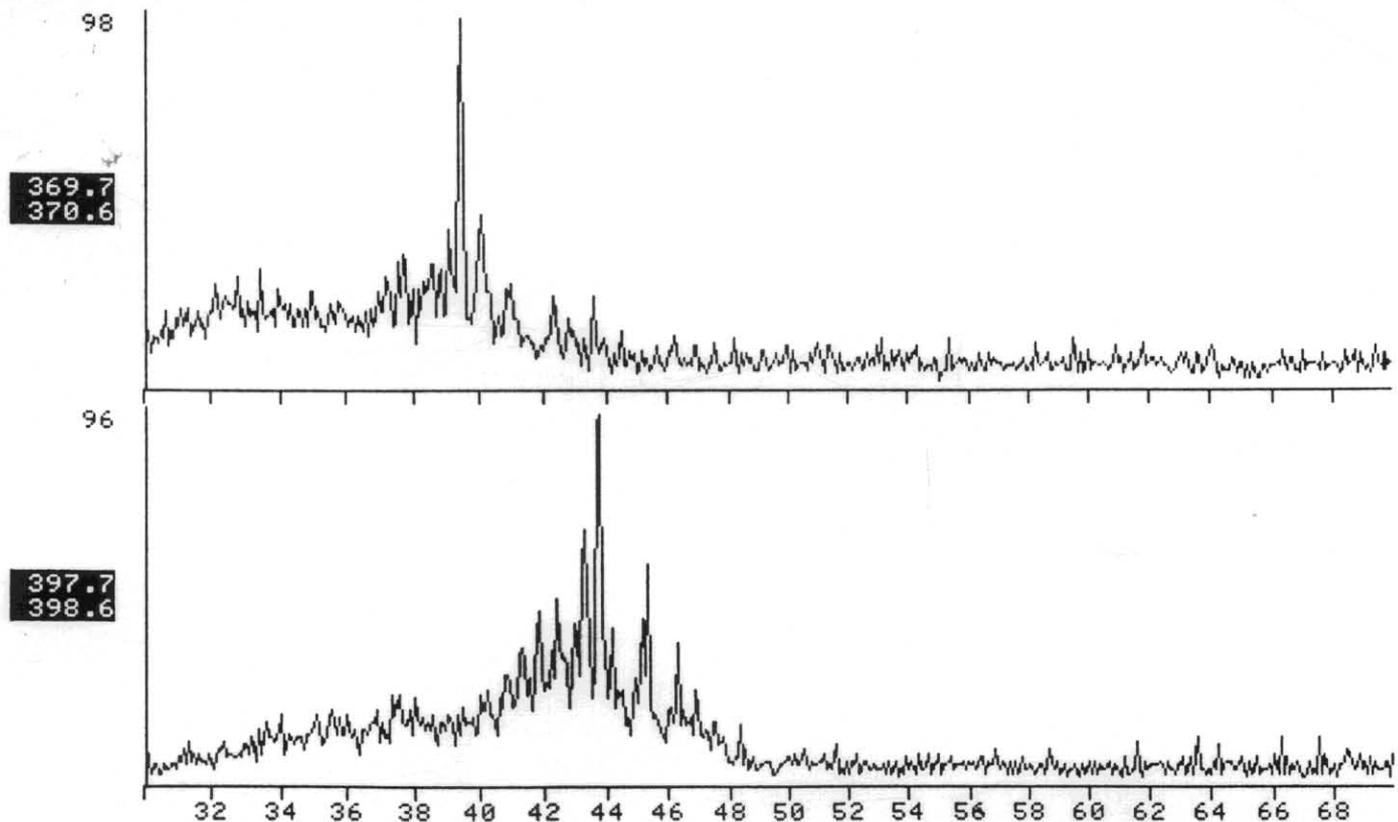
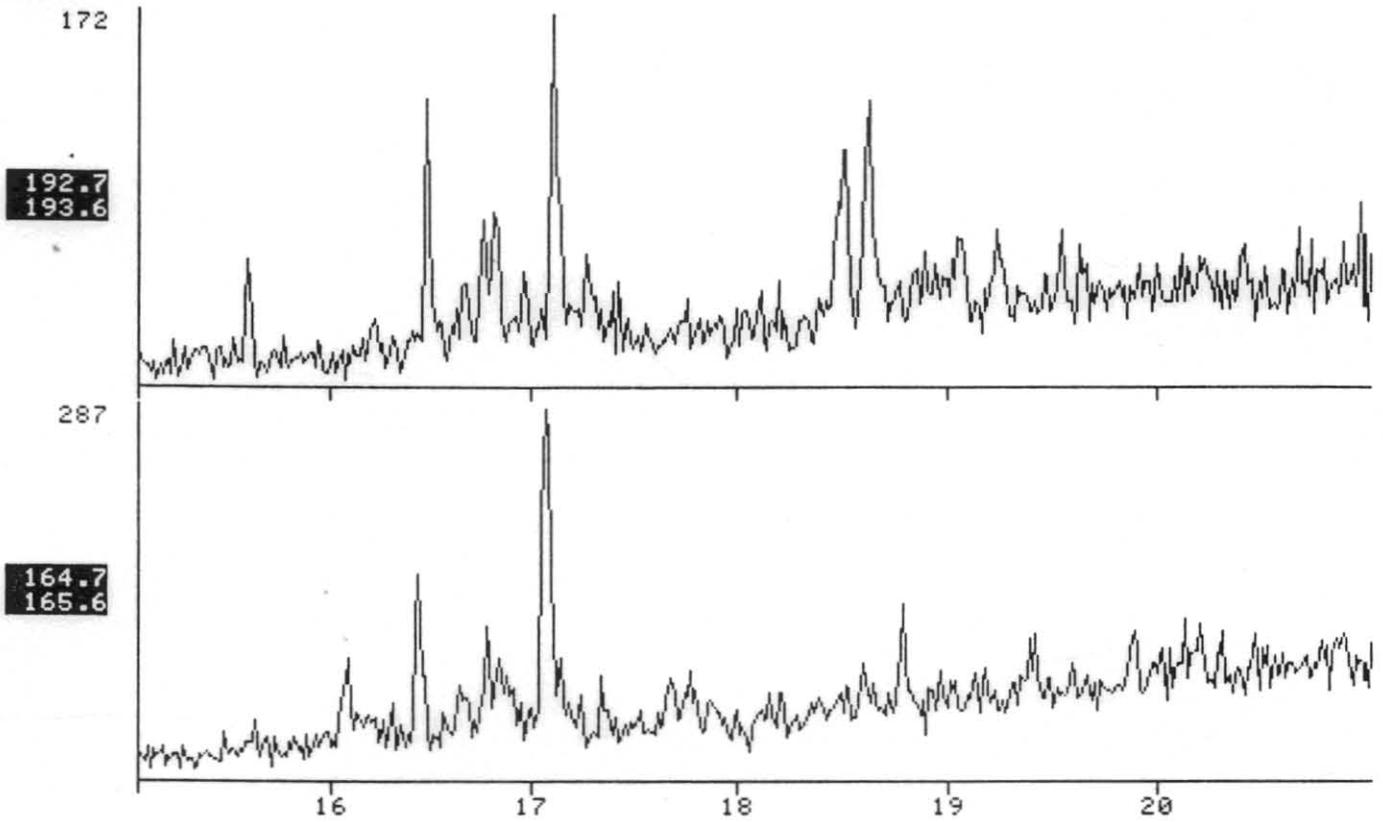


FIGURE: 2-14g

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

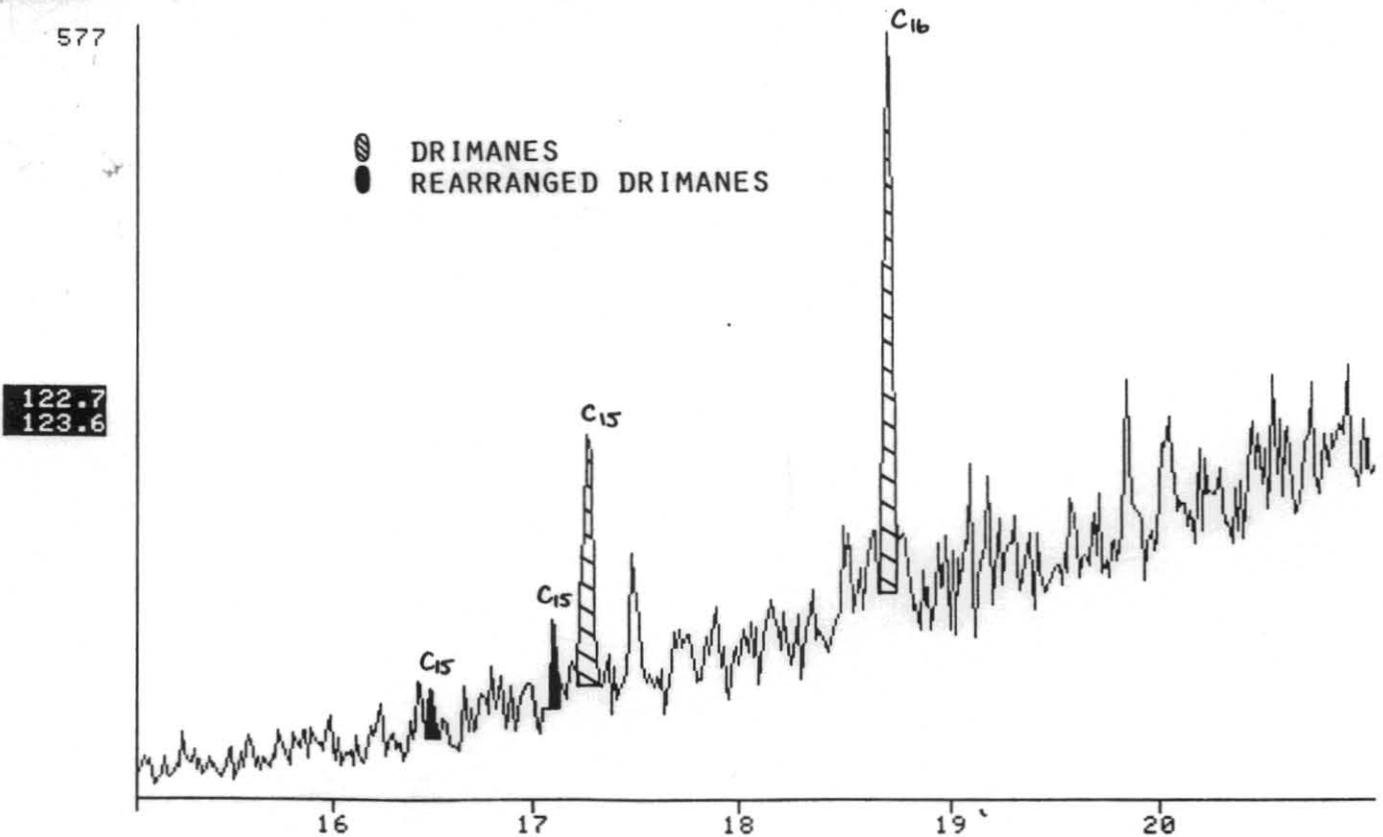
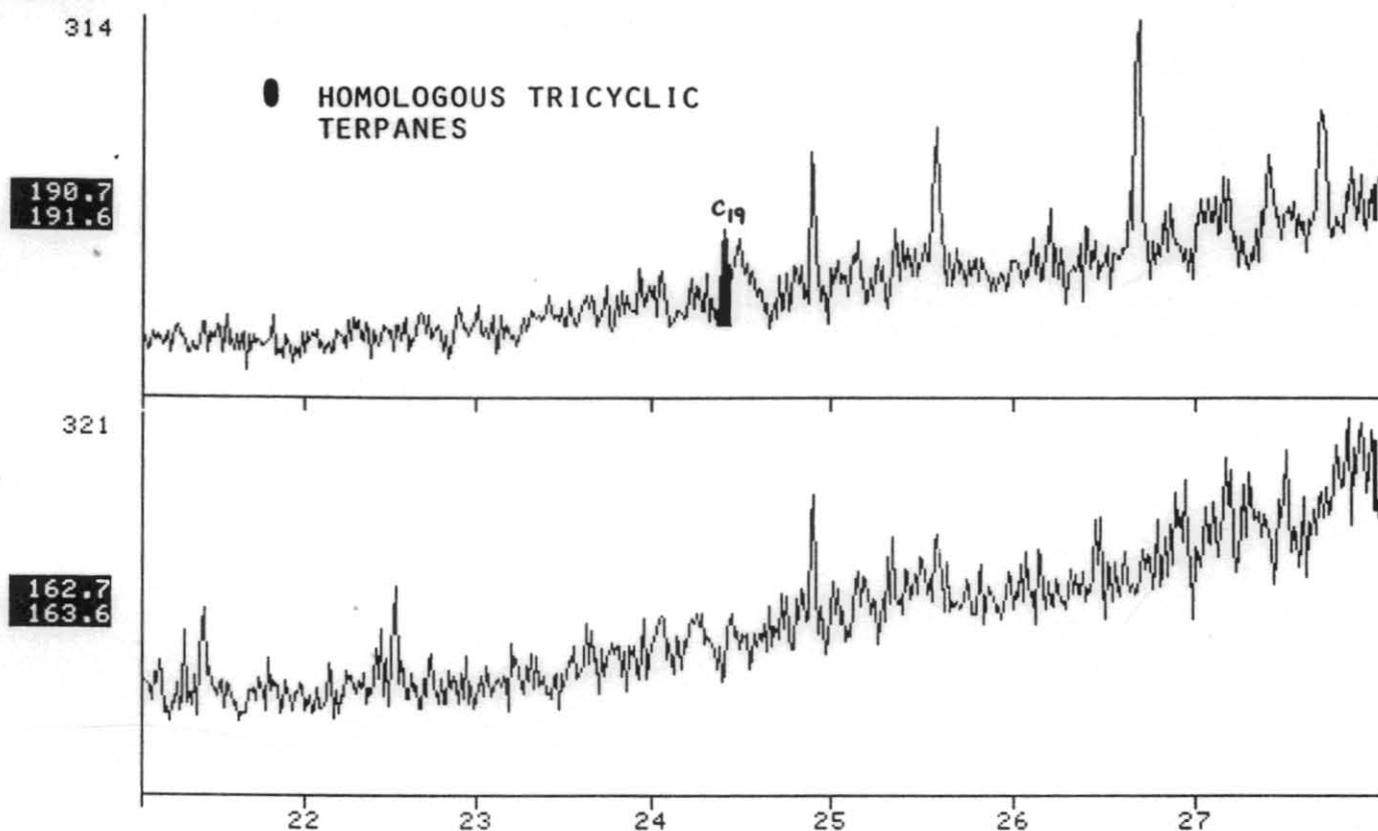


FIGURE: 2-14h

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

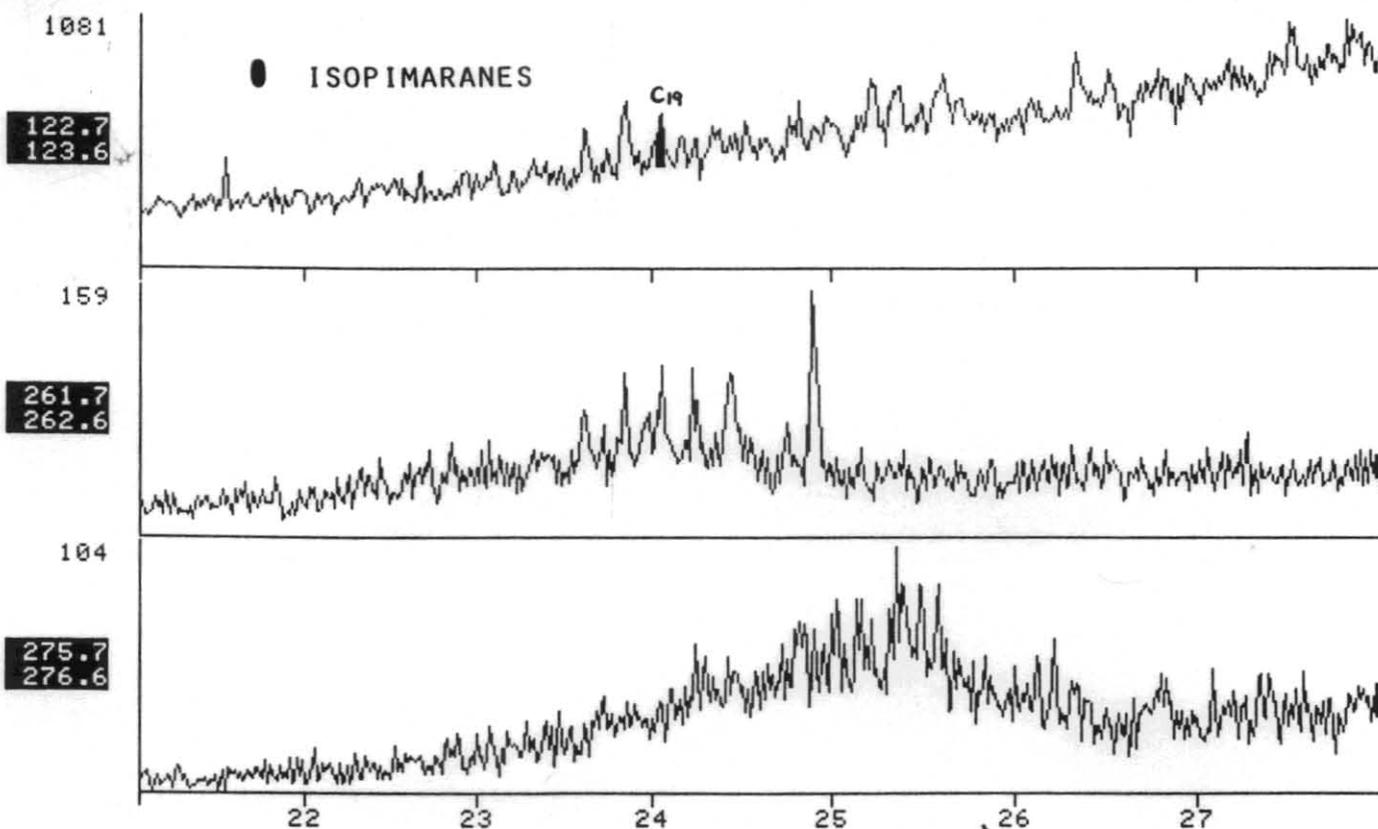
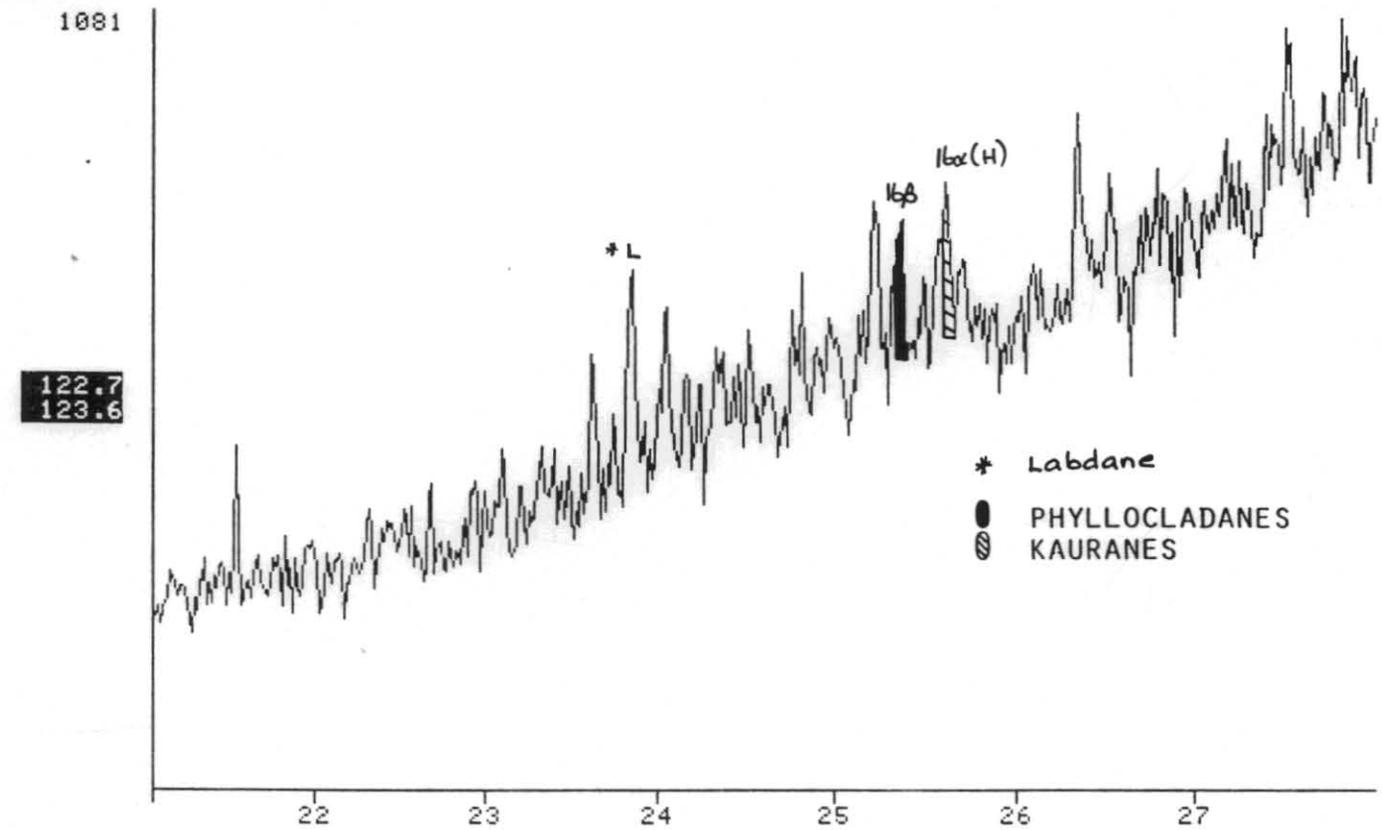


FIGURE: 2-14i

NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235



NAME PELICAN#1, 5851'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 24-3-87. GEC. 0.2/30ul. COL#72.

FRN 6235

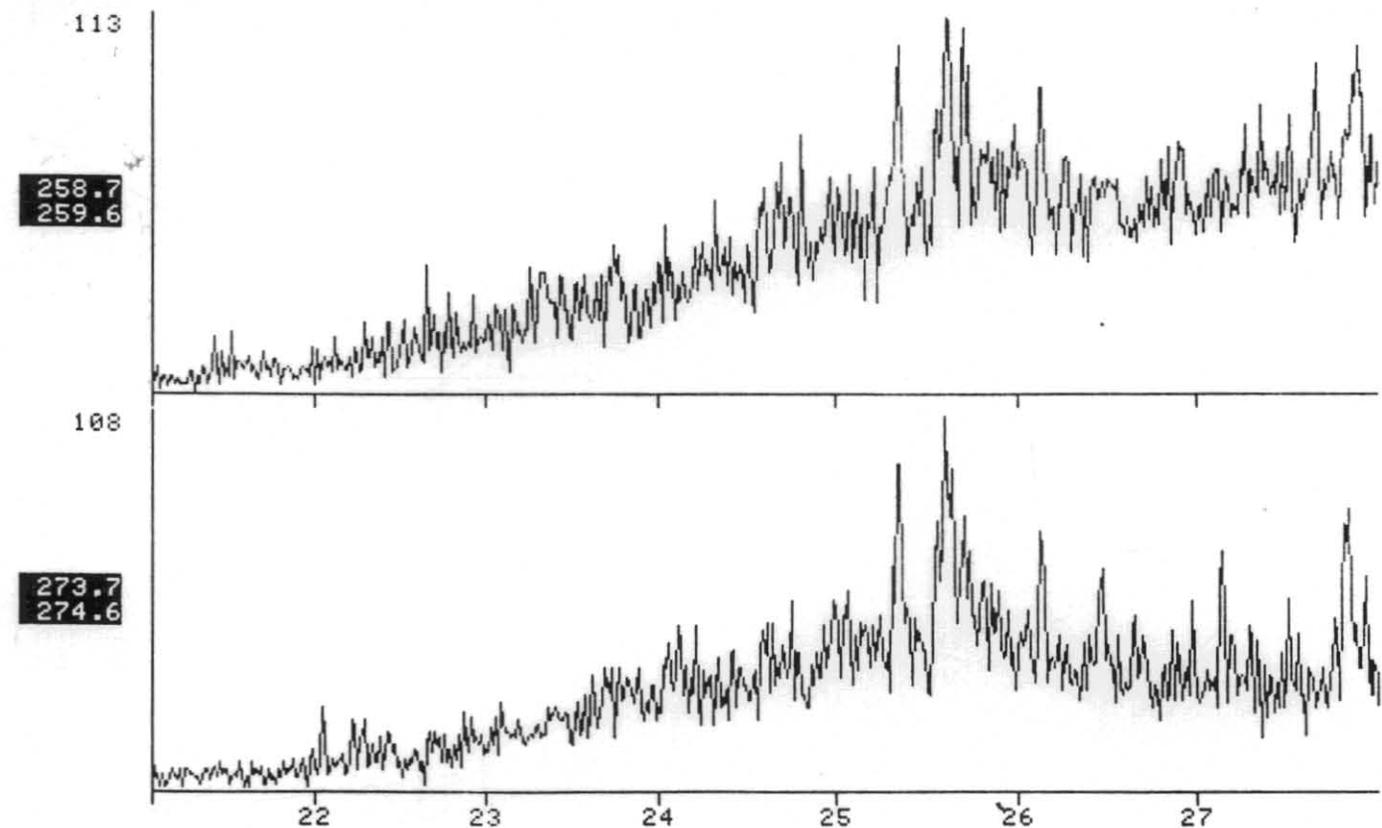
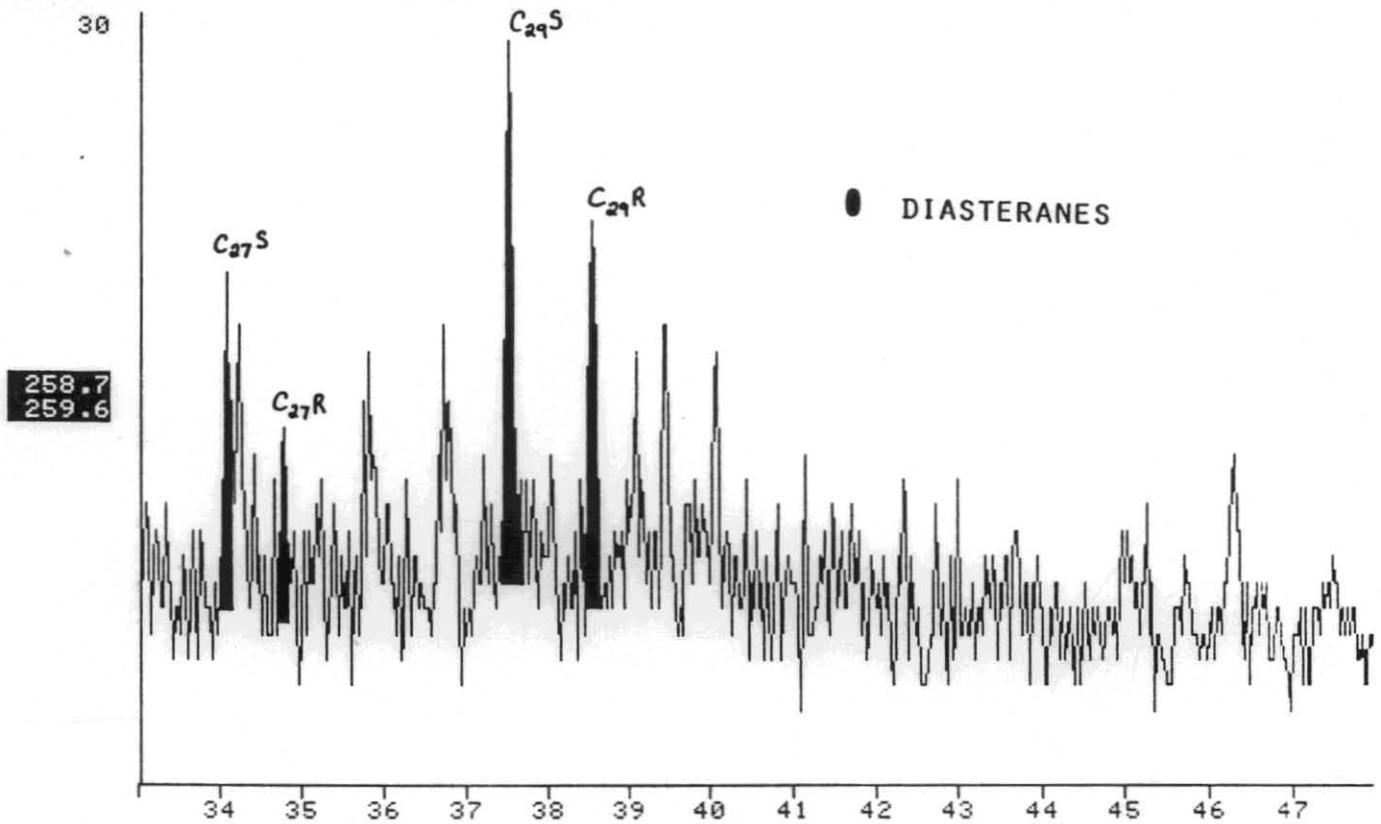


FIGURE: 2-15a

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237

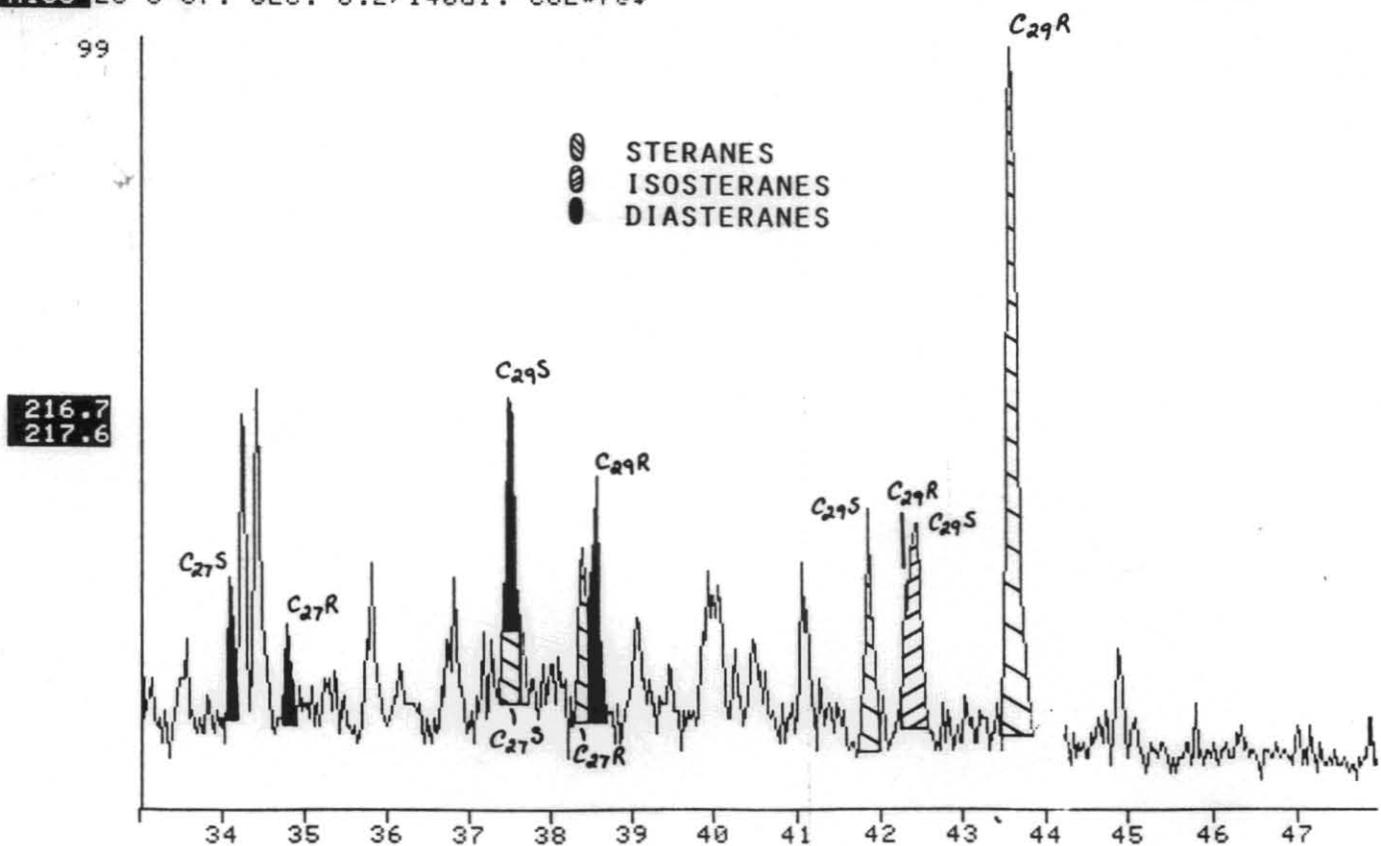
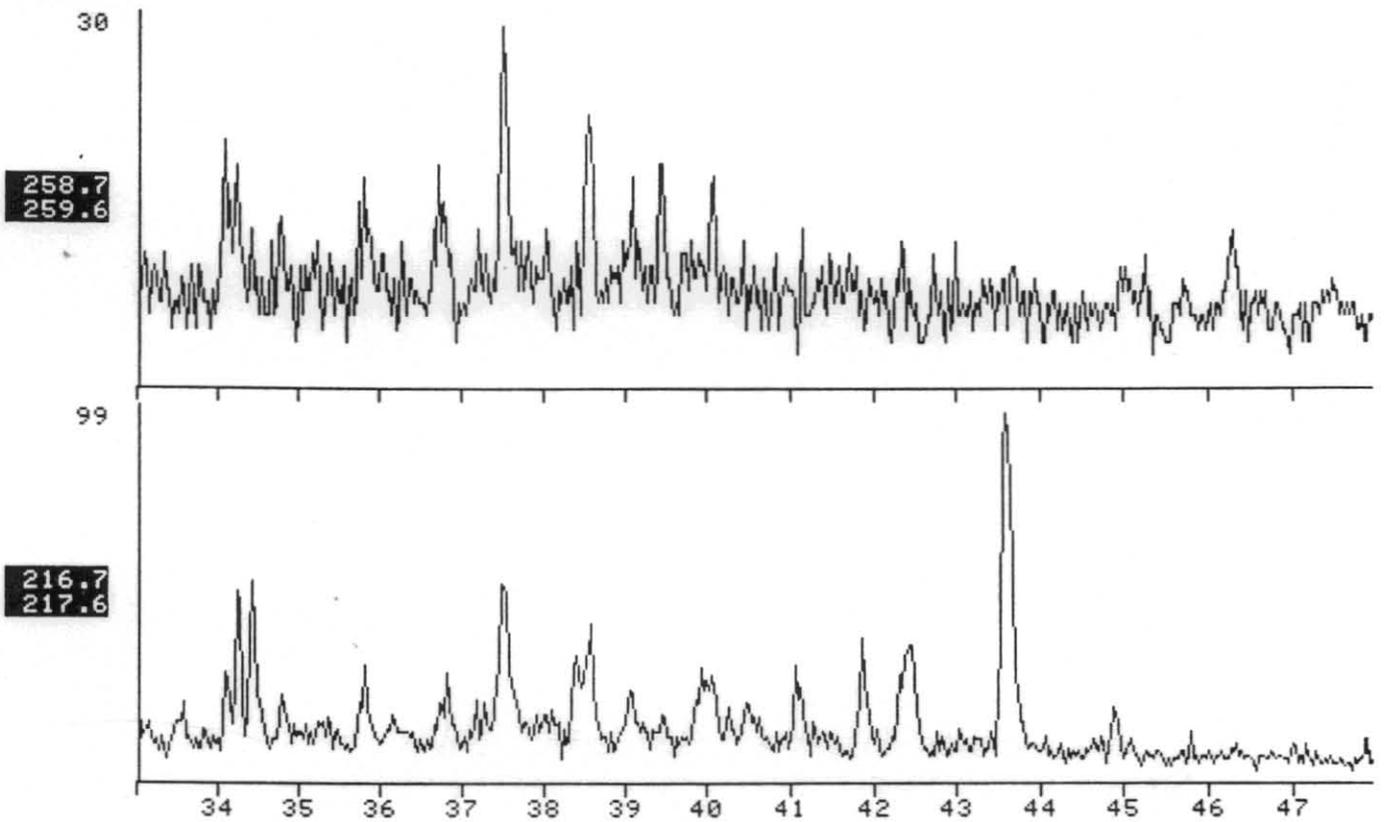


FIGURE: 2-15b

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237

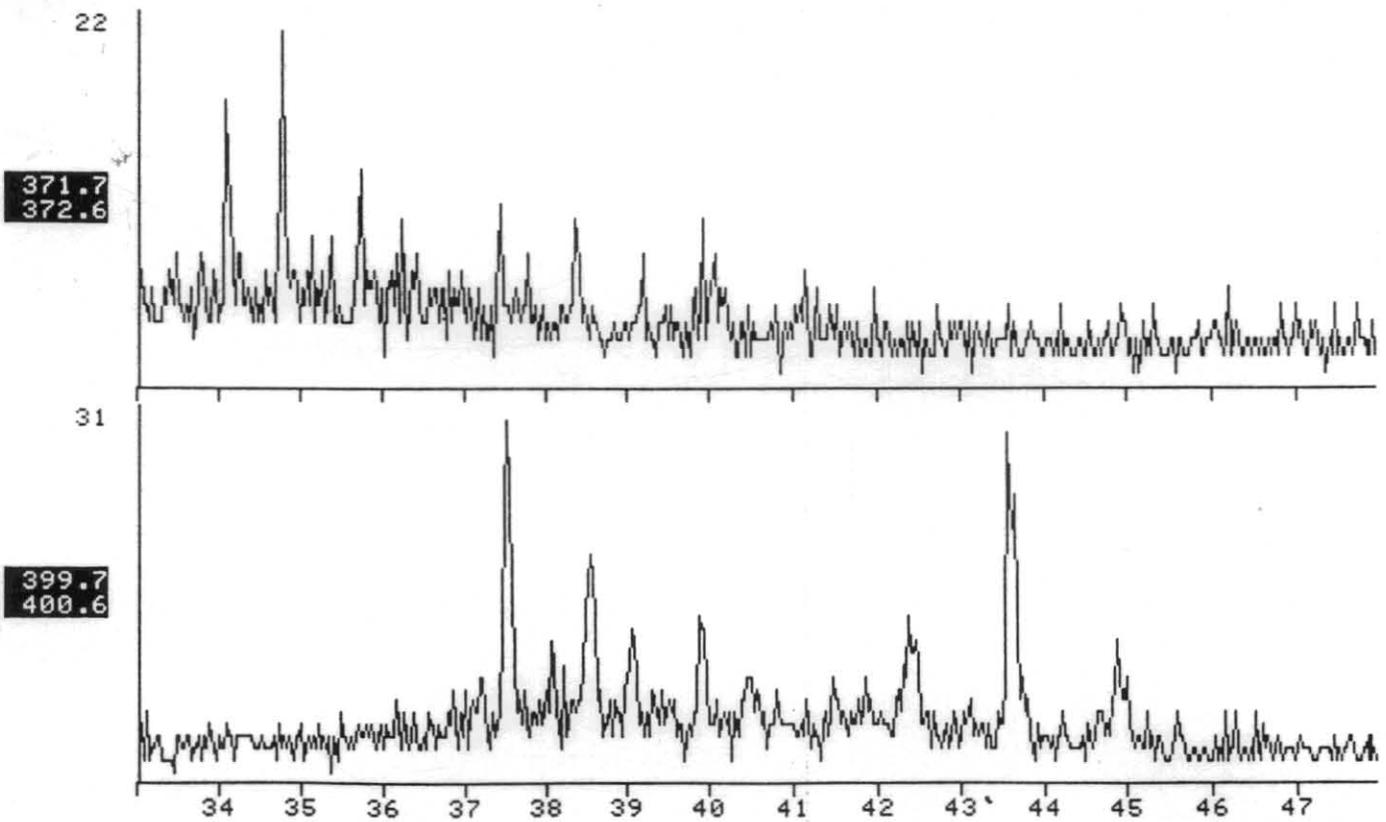
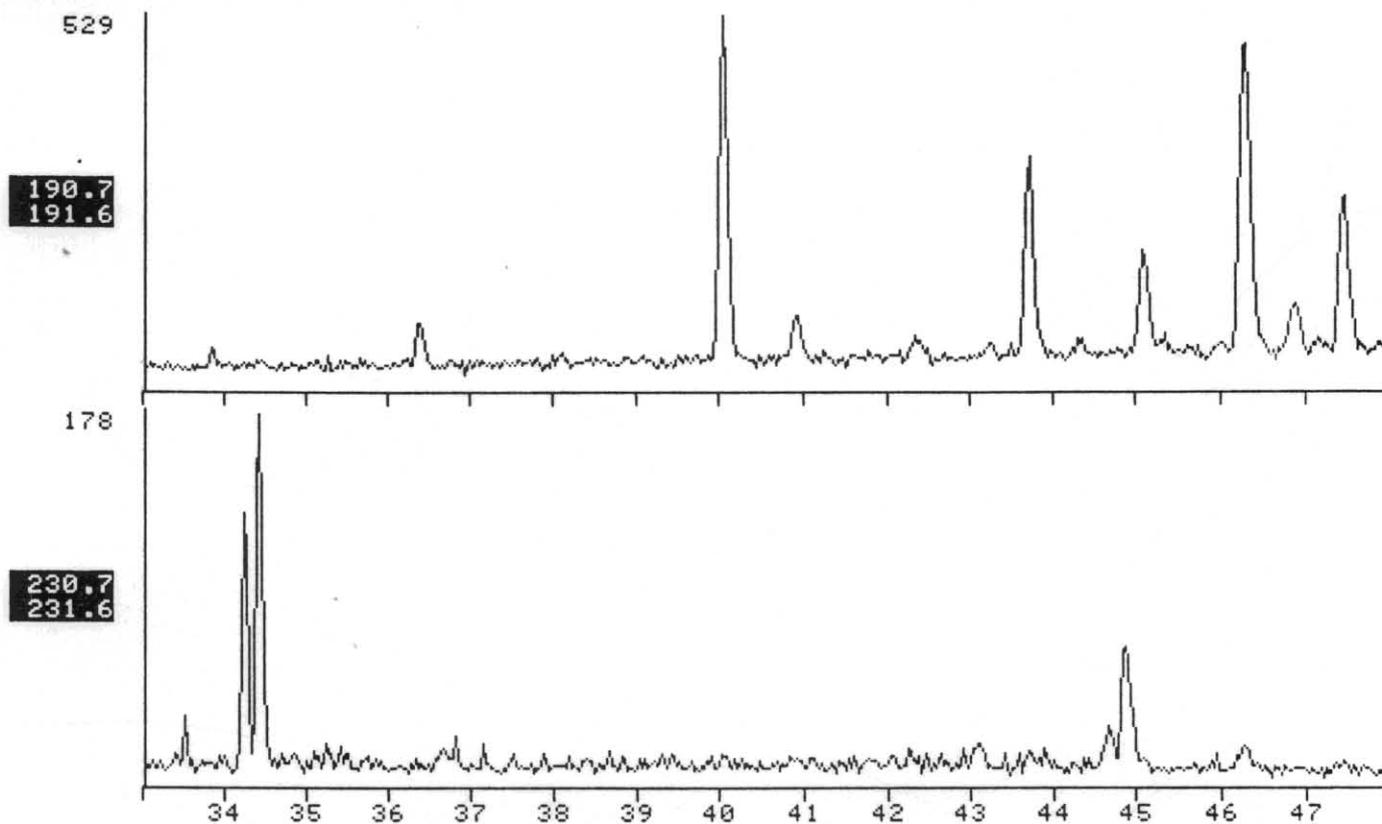


FIGURE: 2-15c

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237

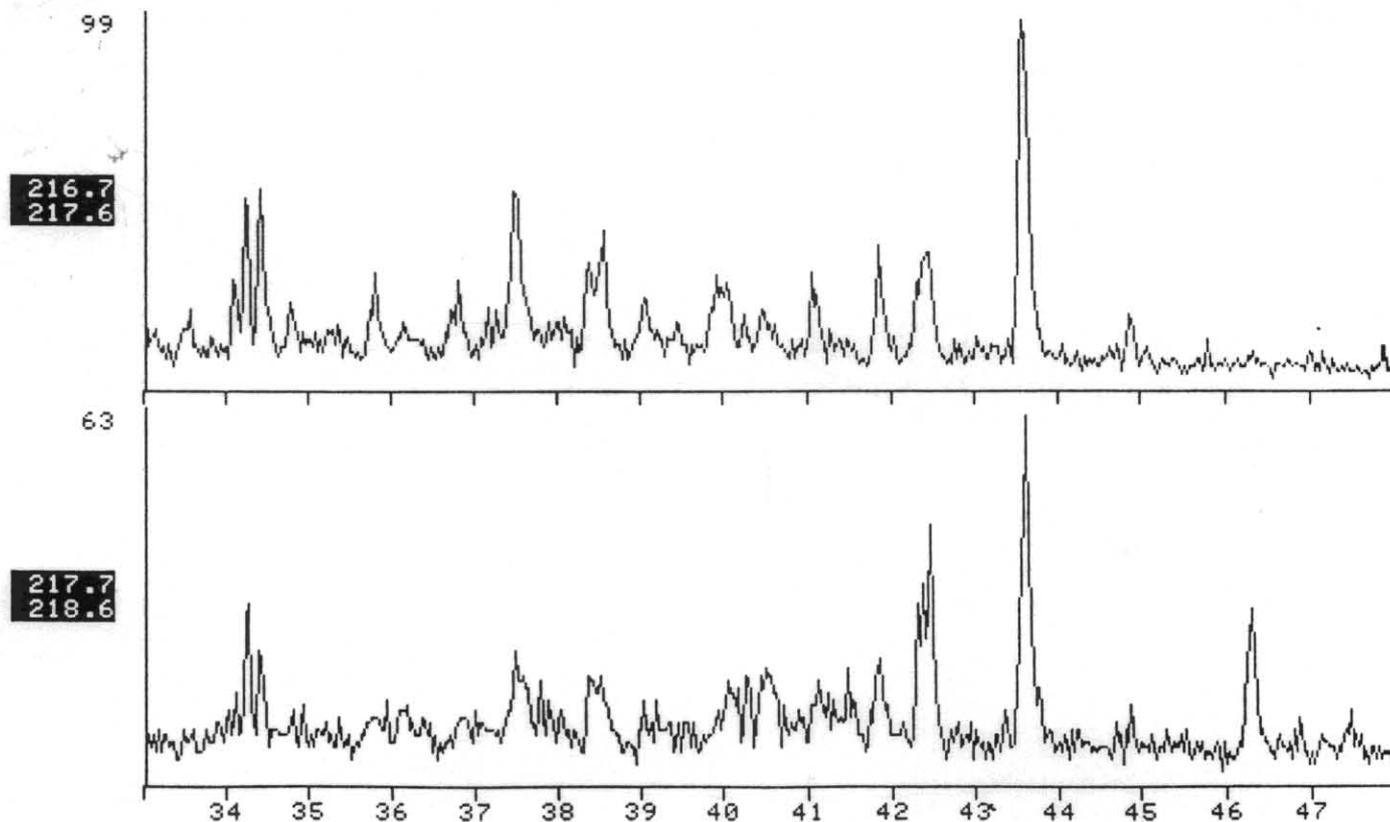
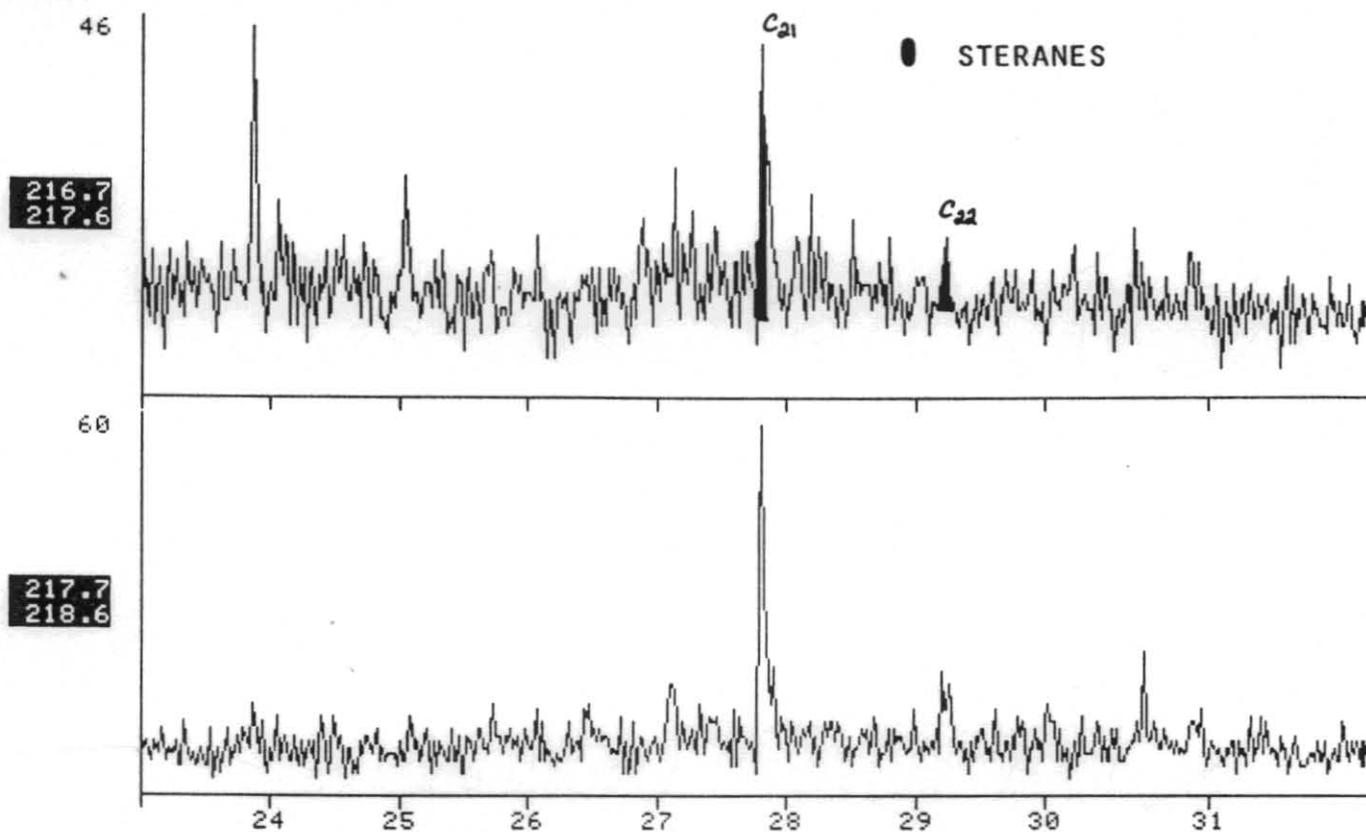


FIGURE: 2-15d

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237

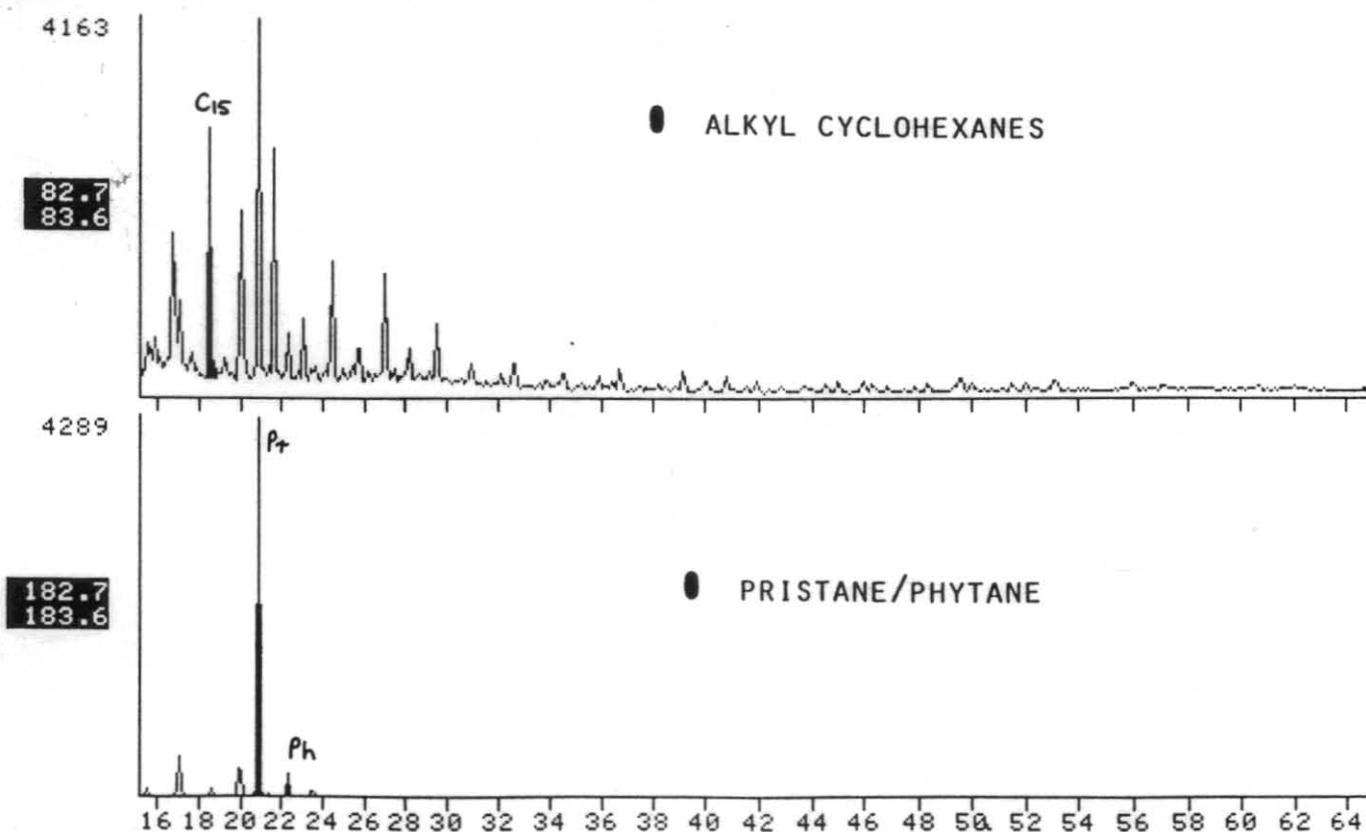
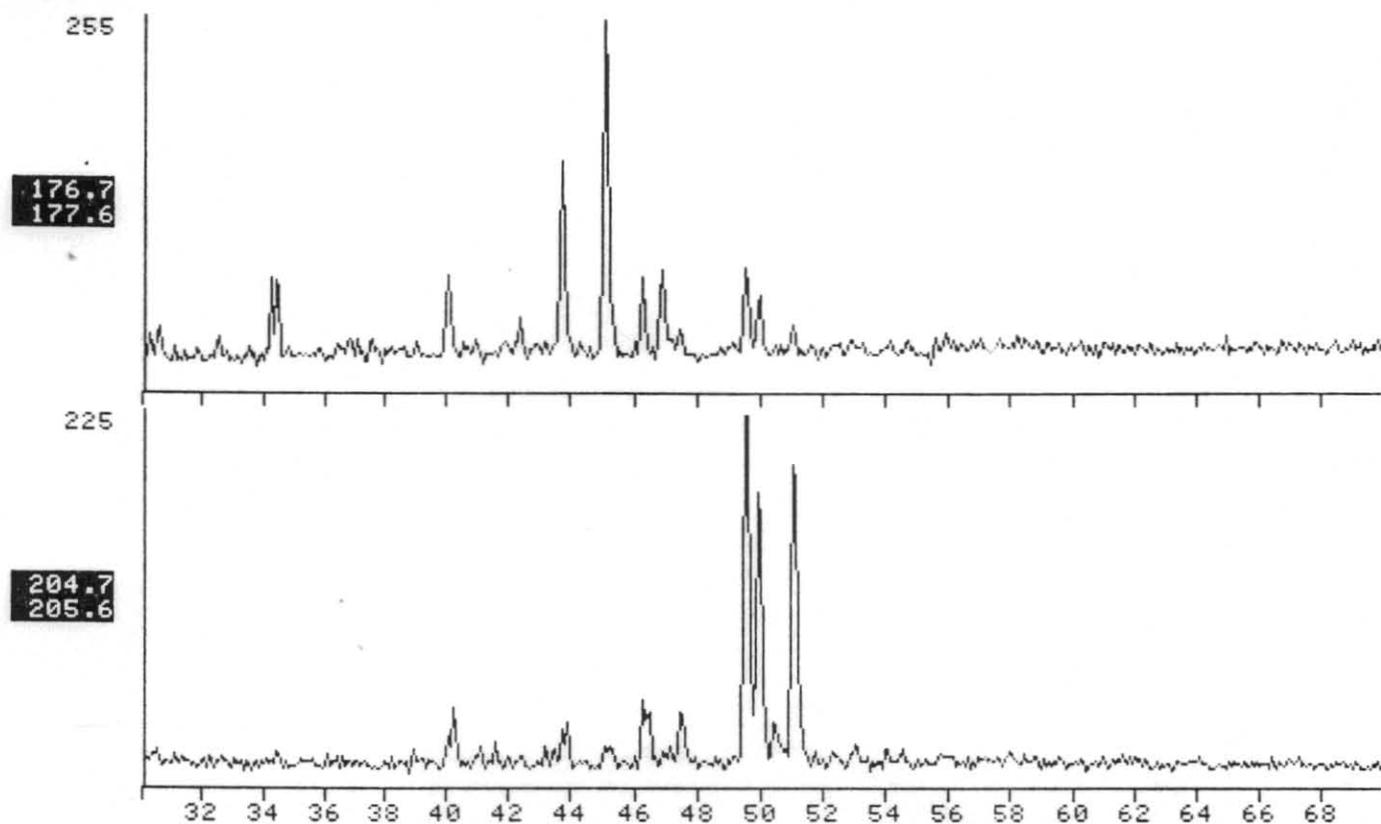


FIGURE: 2-15e

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237

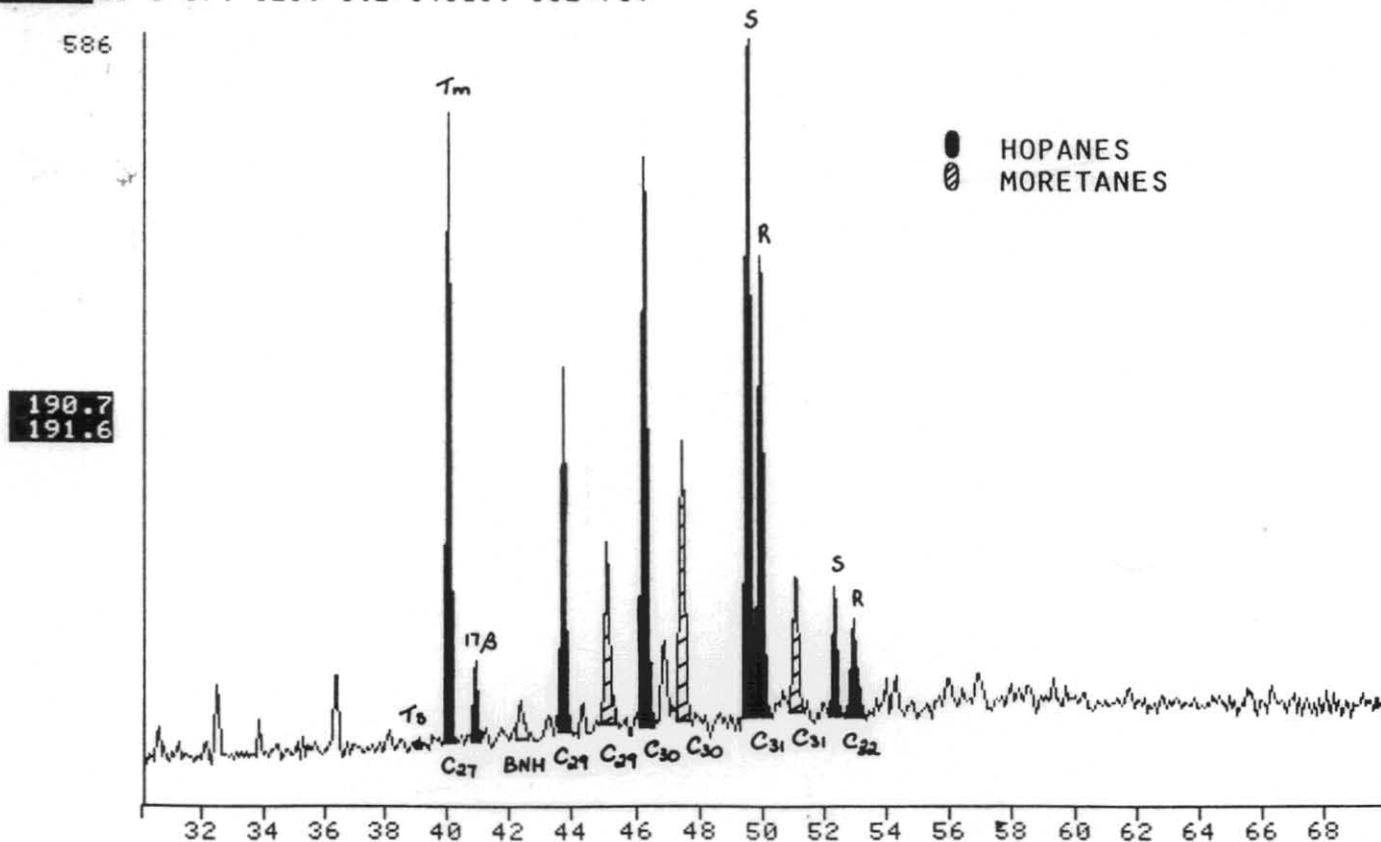
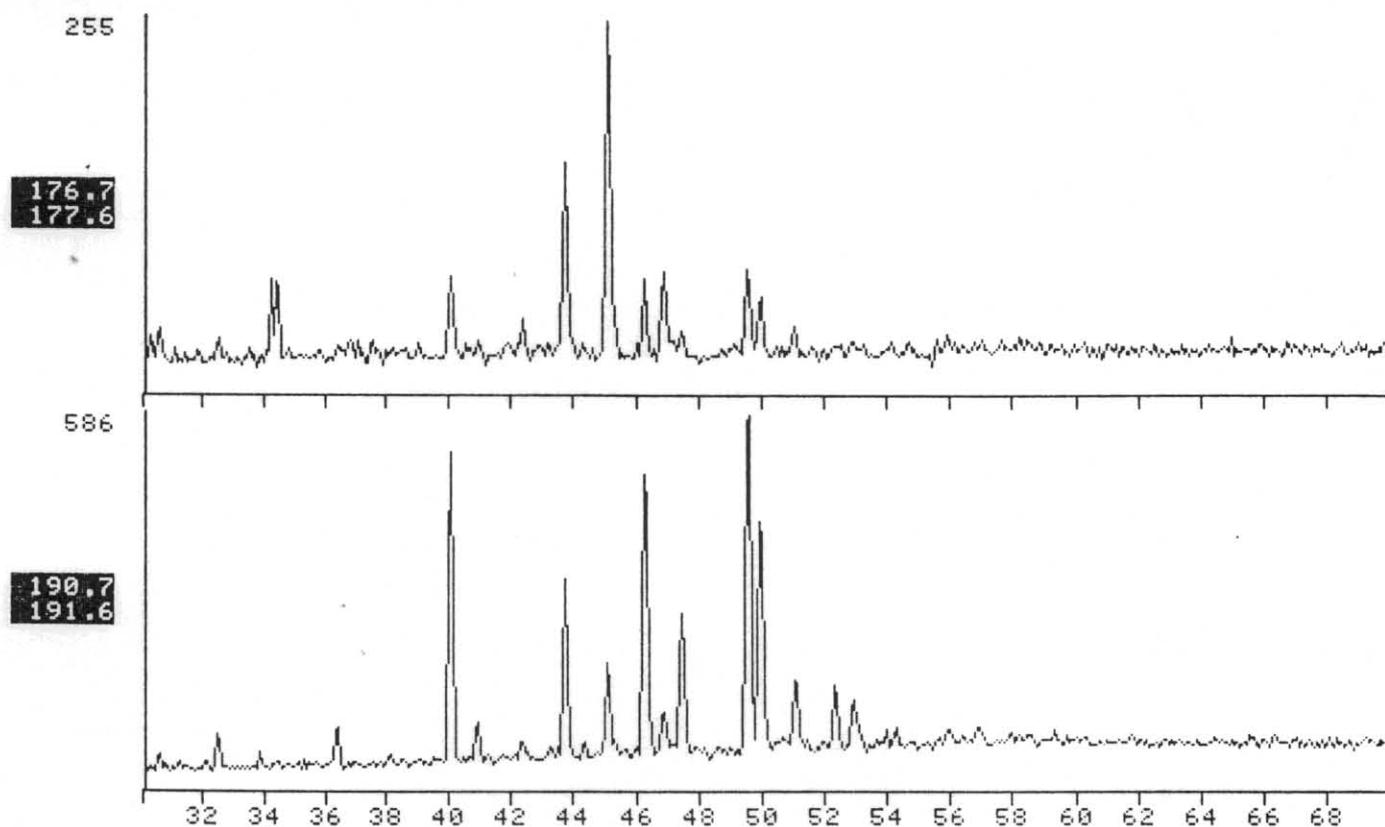


FIGURE: 2-15f

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70#

FRN 6237

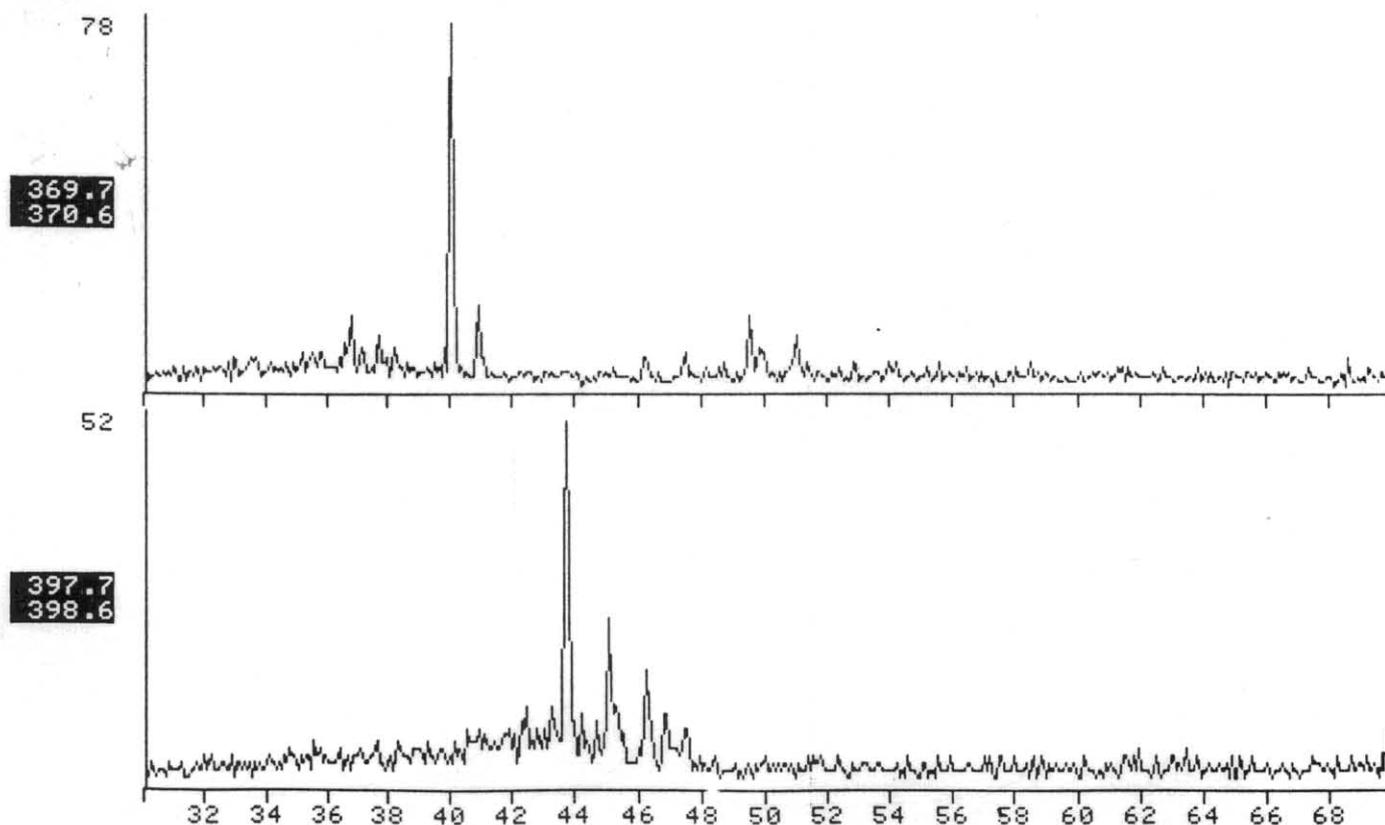
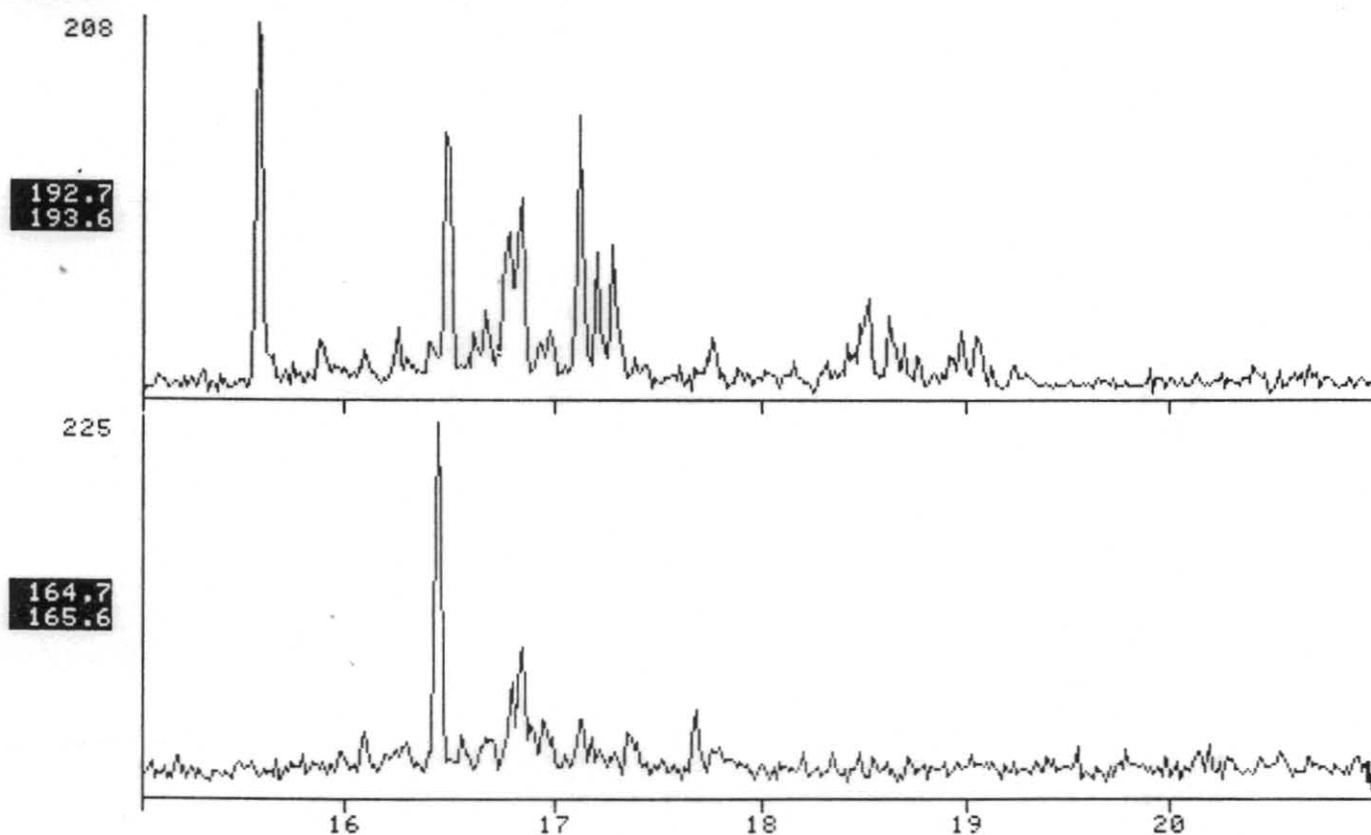


FIGURE: 2-15g

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237

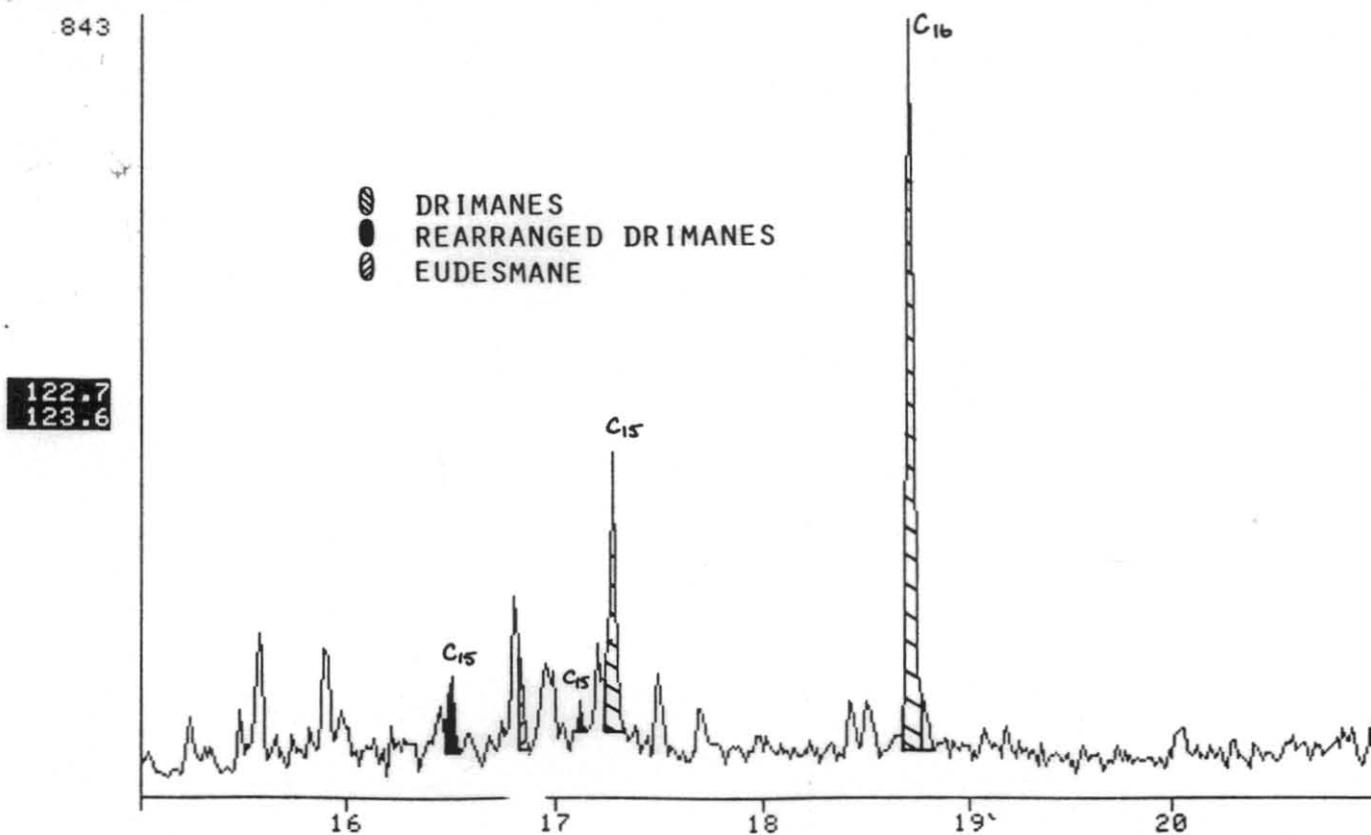
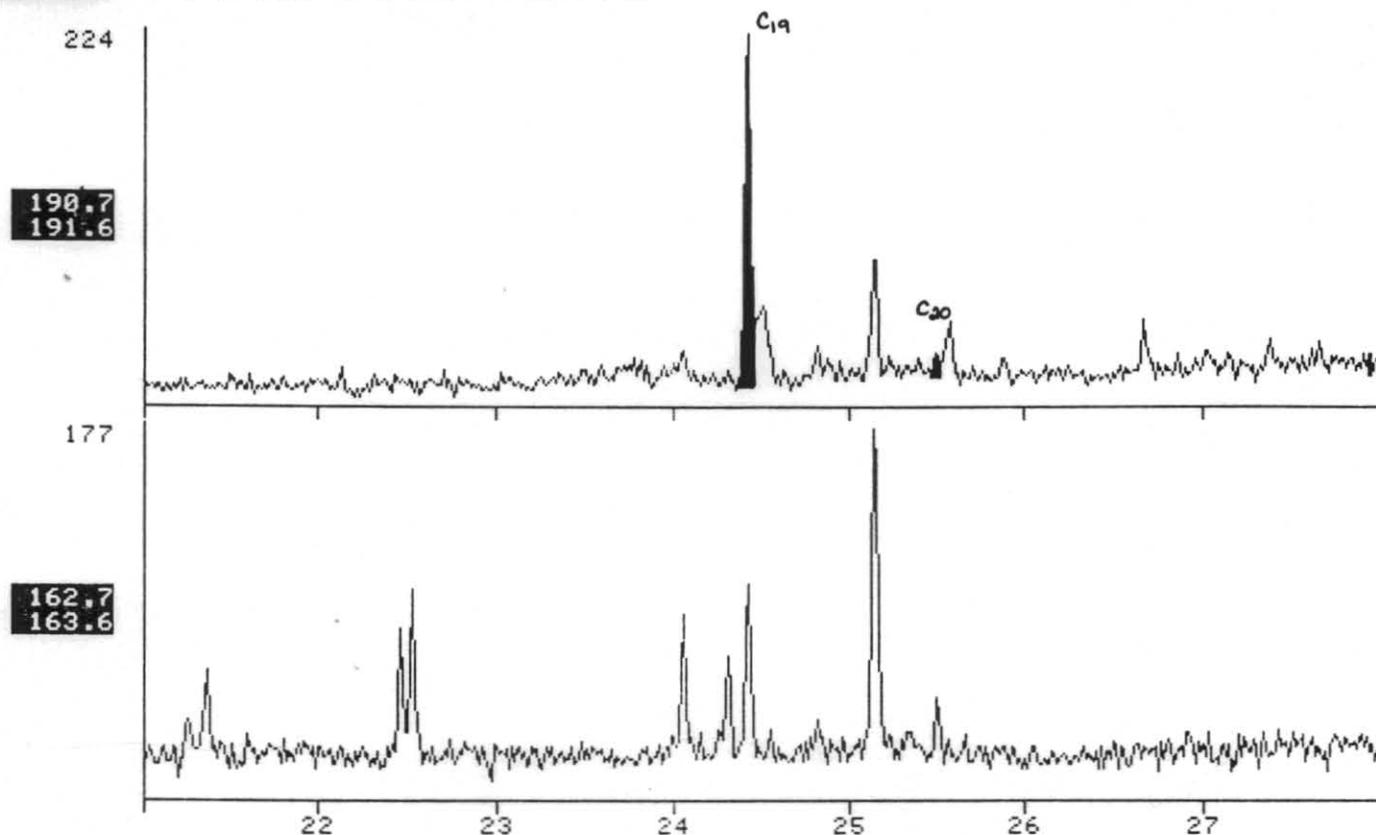


FIGURE: 2-15h

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237

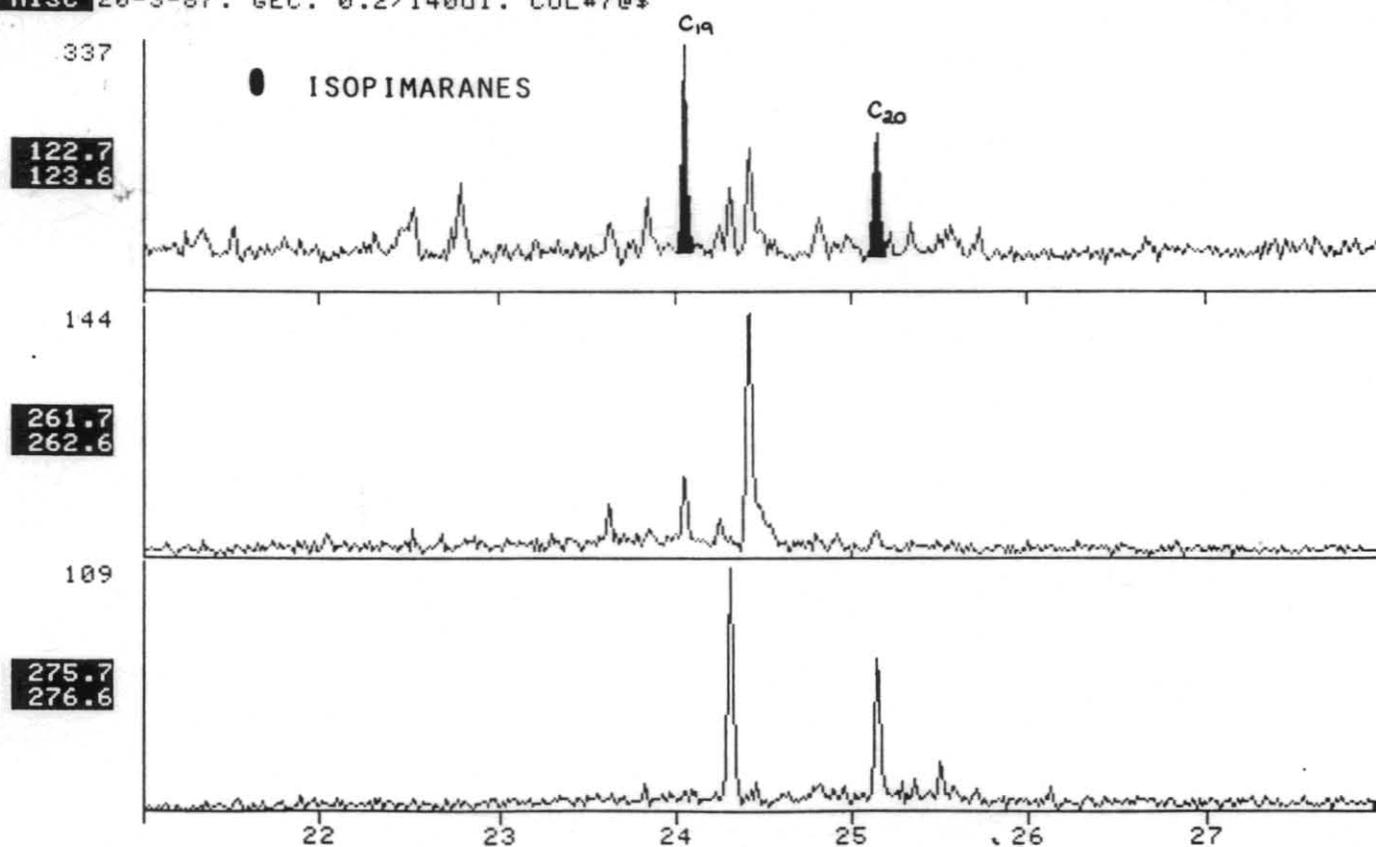
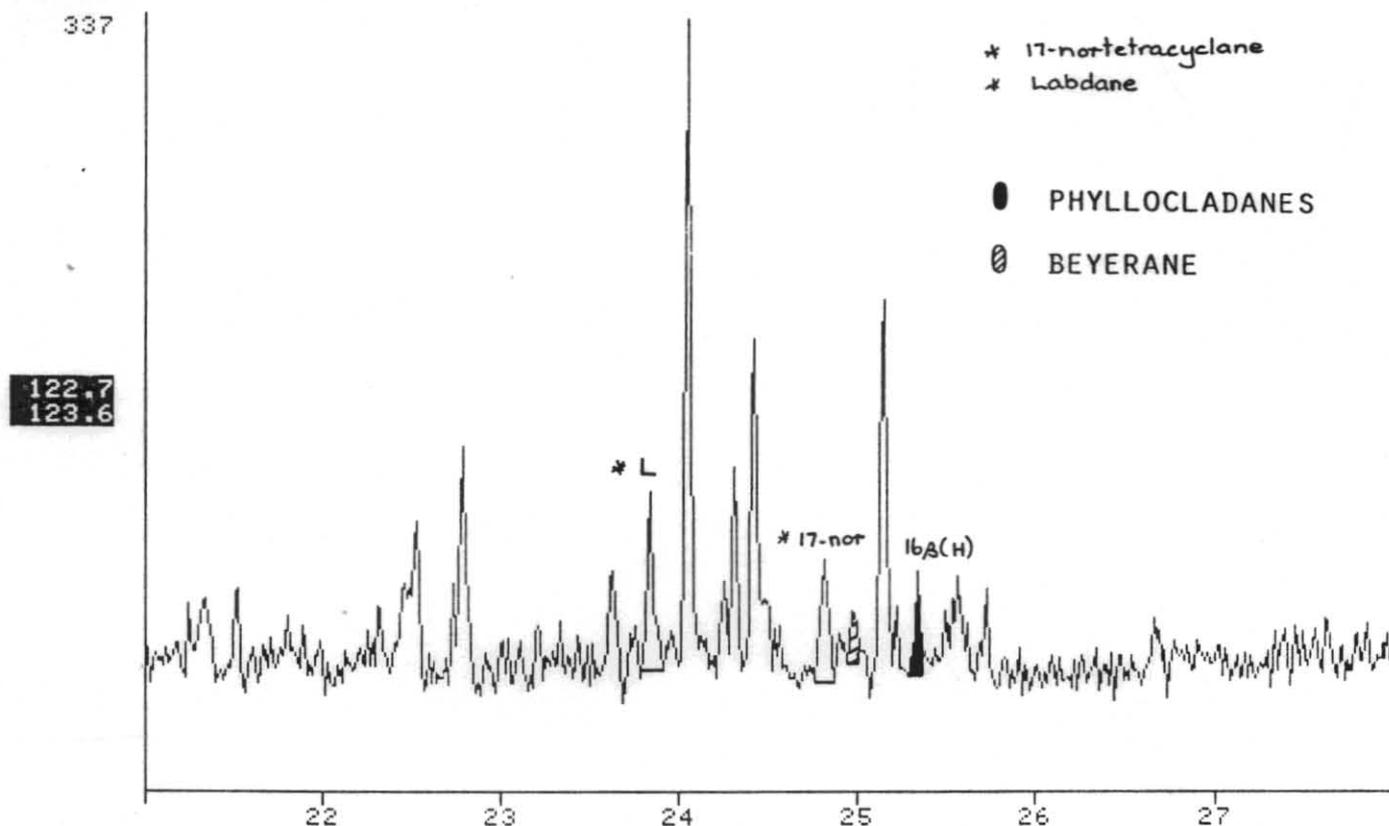


FIGURE: 2-15i

NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237



NAME PELICAN#1, 7122'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-87. GEC. 0.2/140ul. COL#70\$

FRN 6237

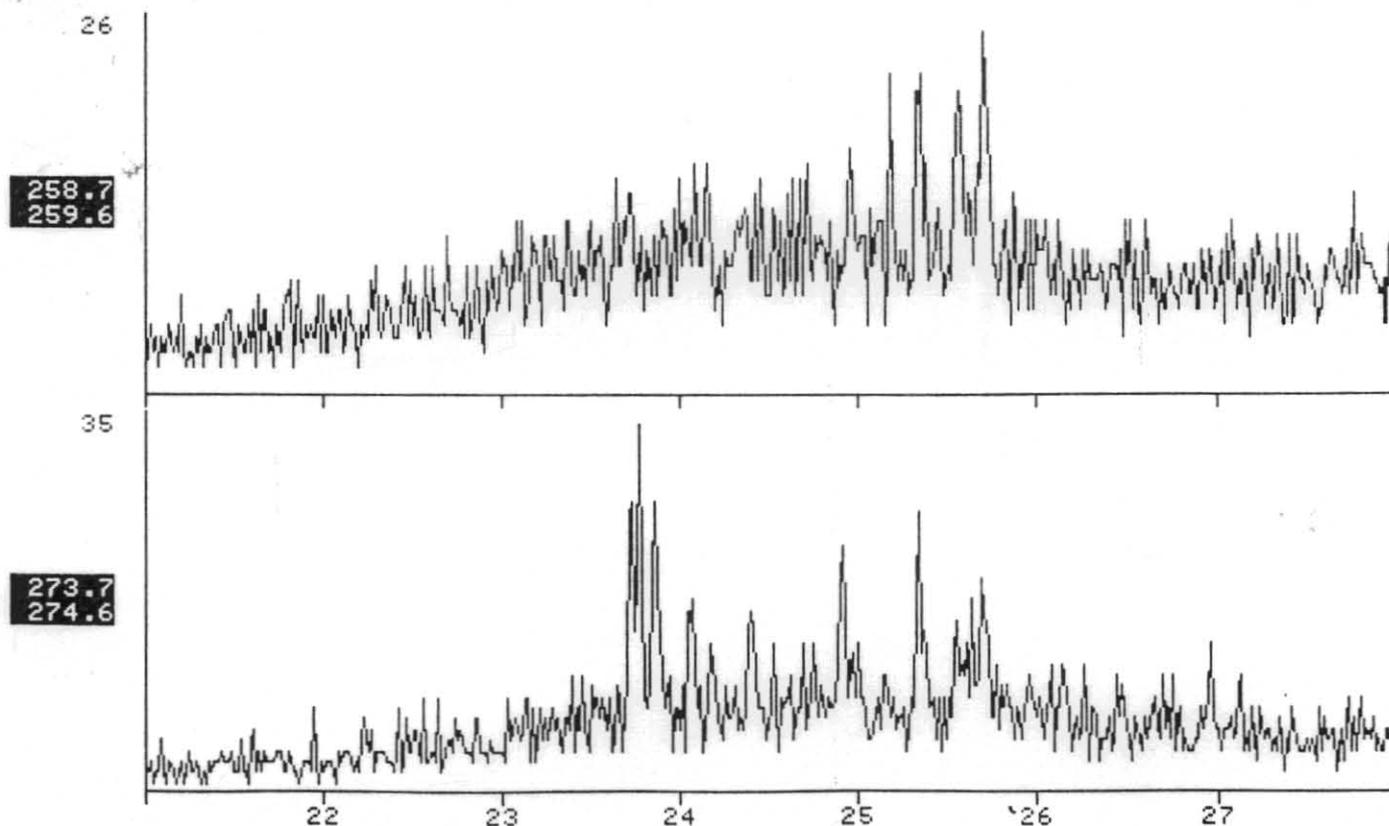
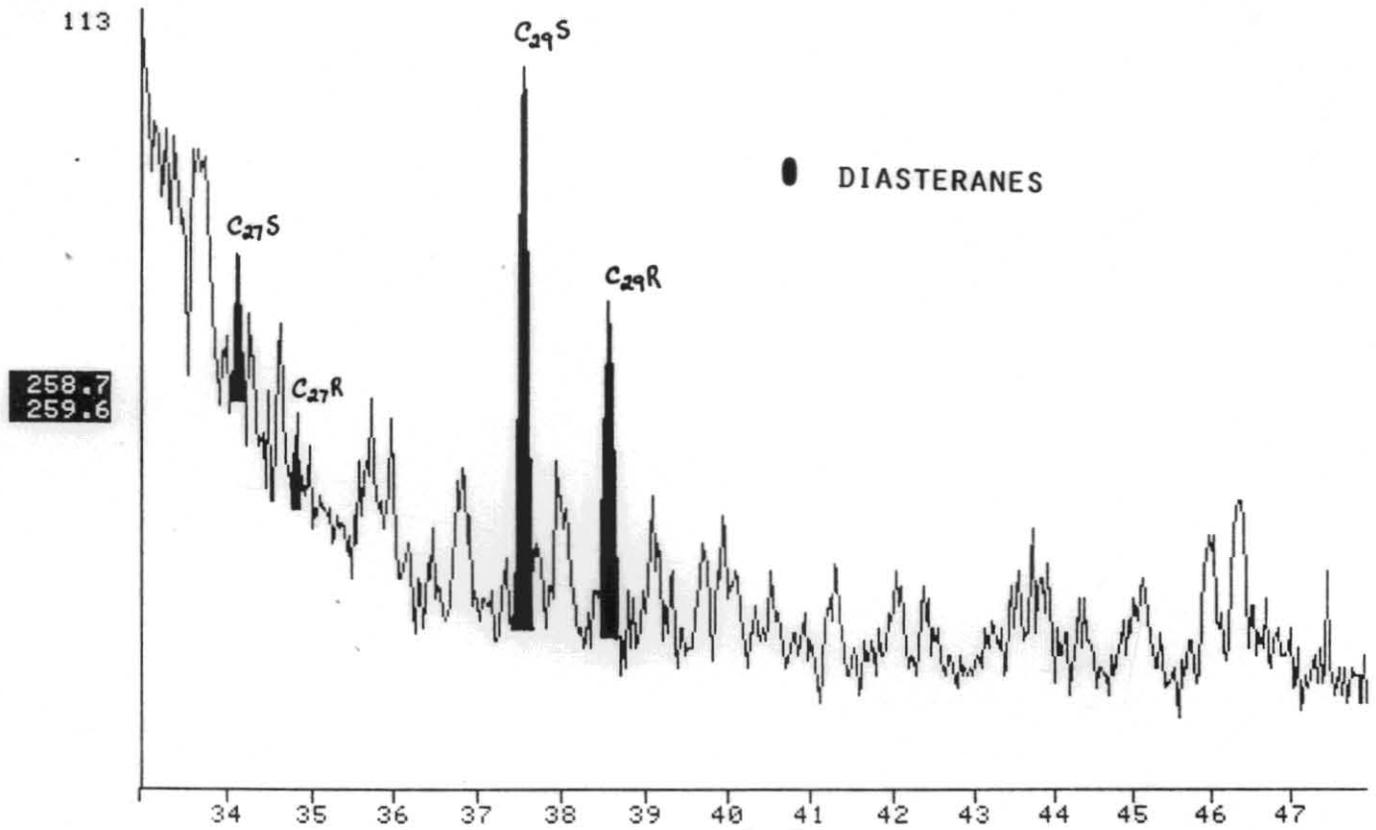


FIGURE: 2-16a

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

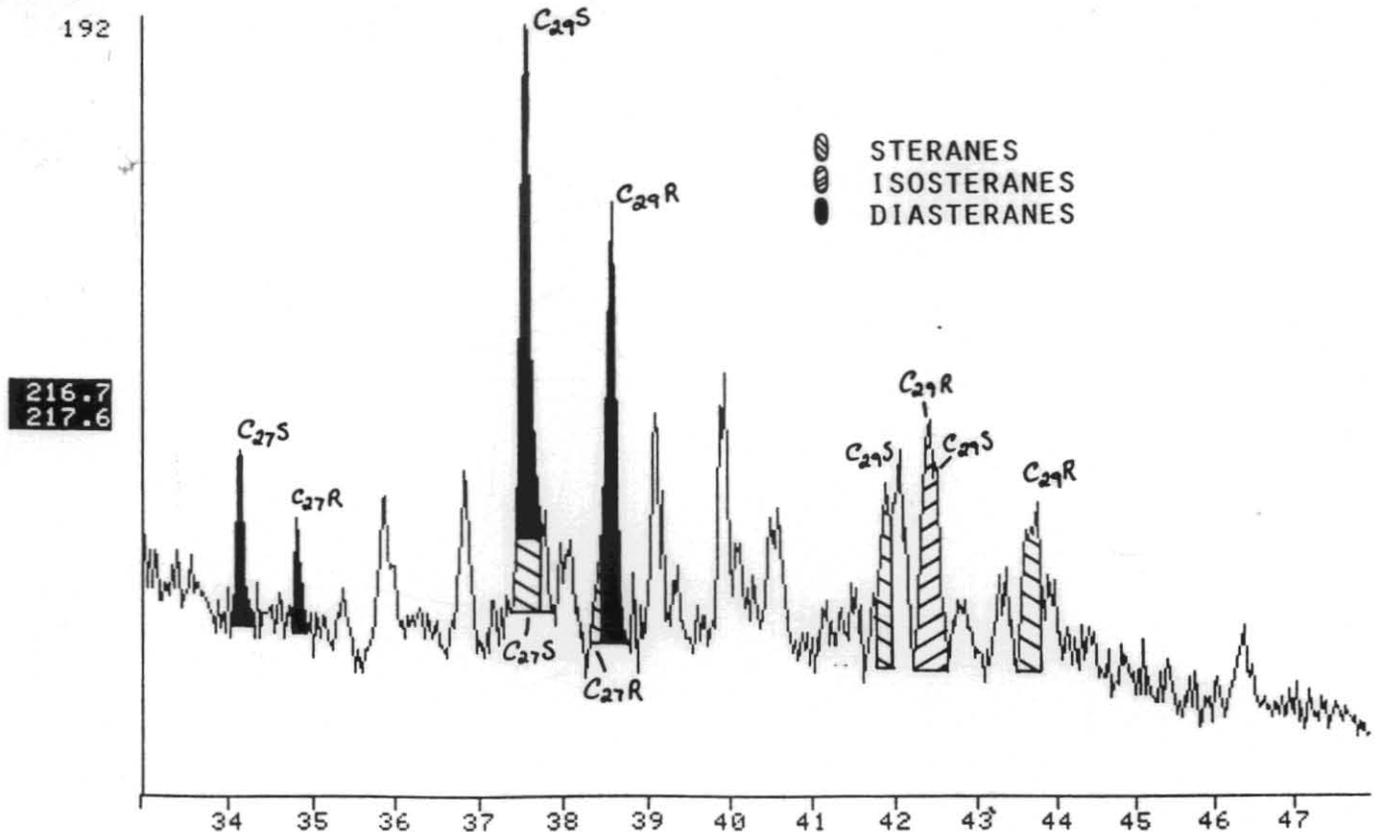
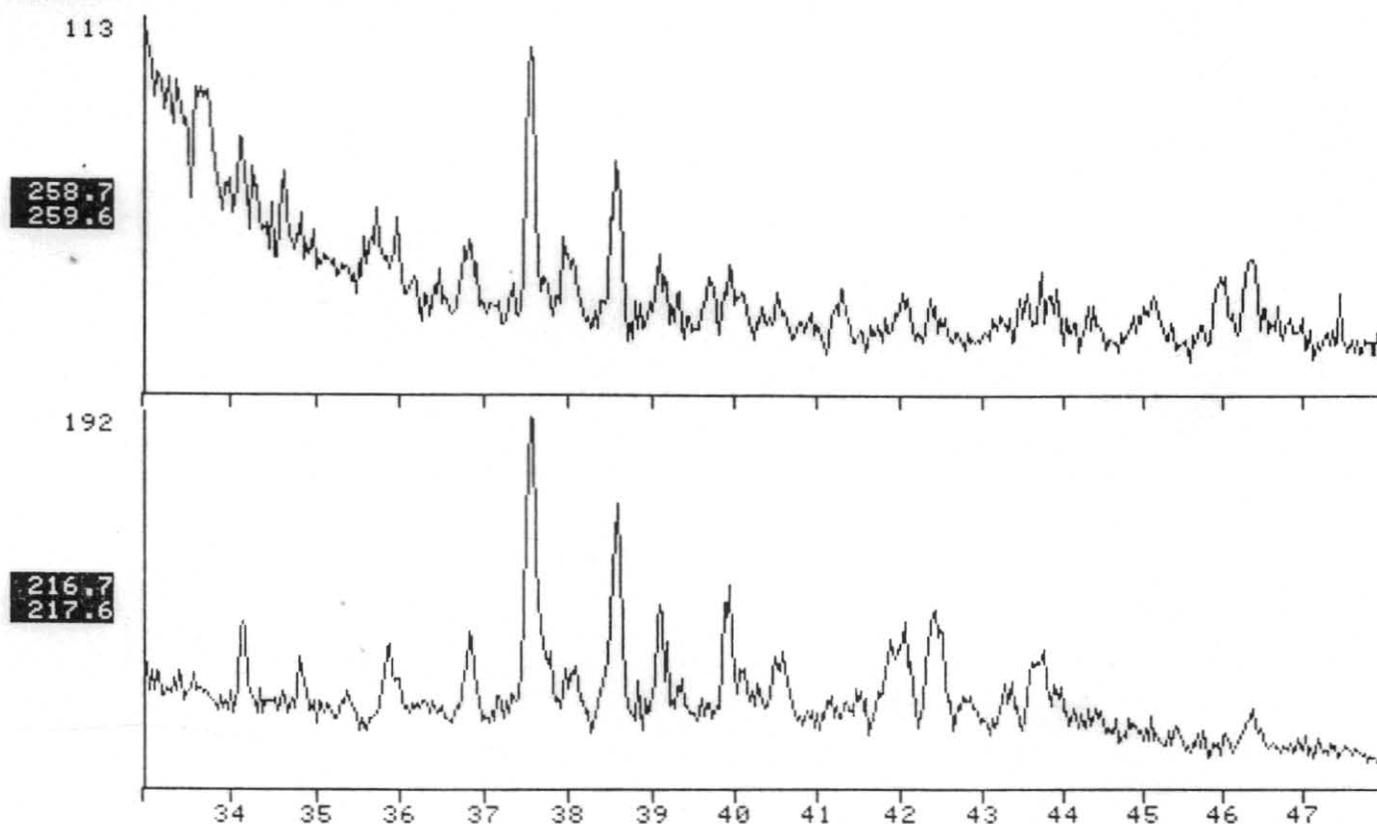


FIGURE: 2-16b

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

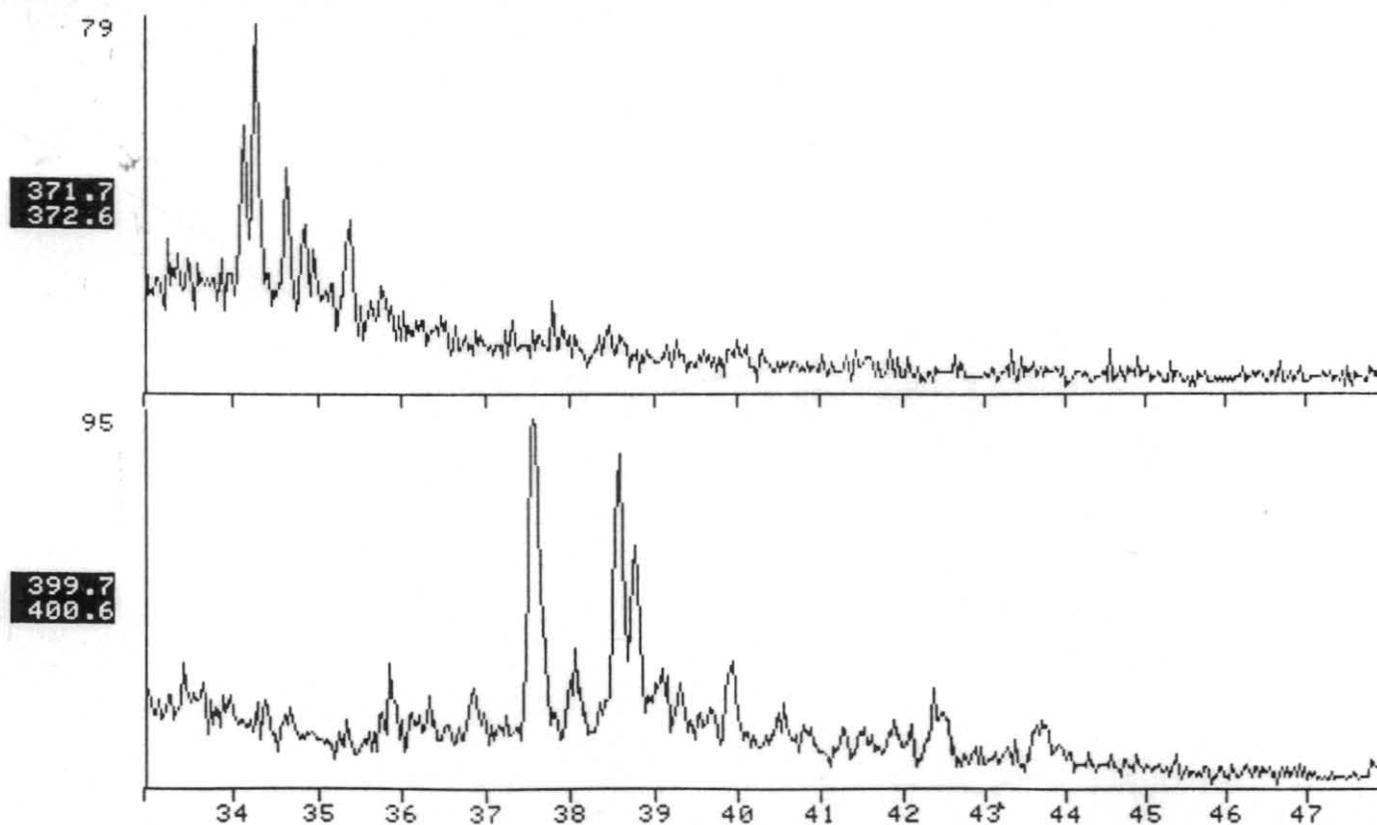
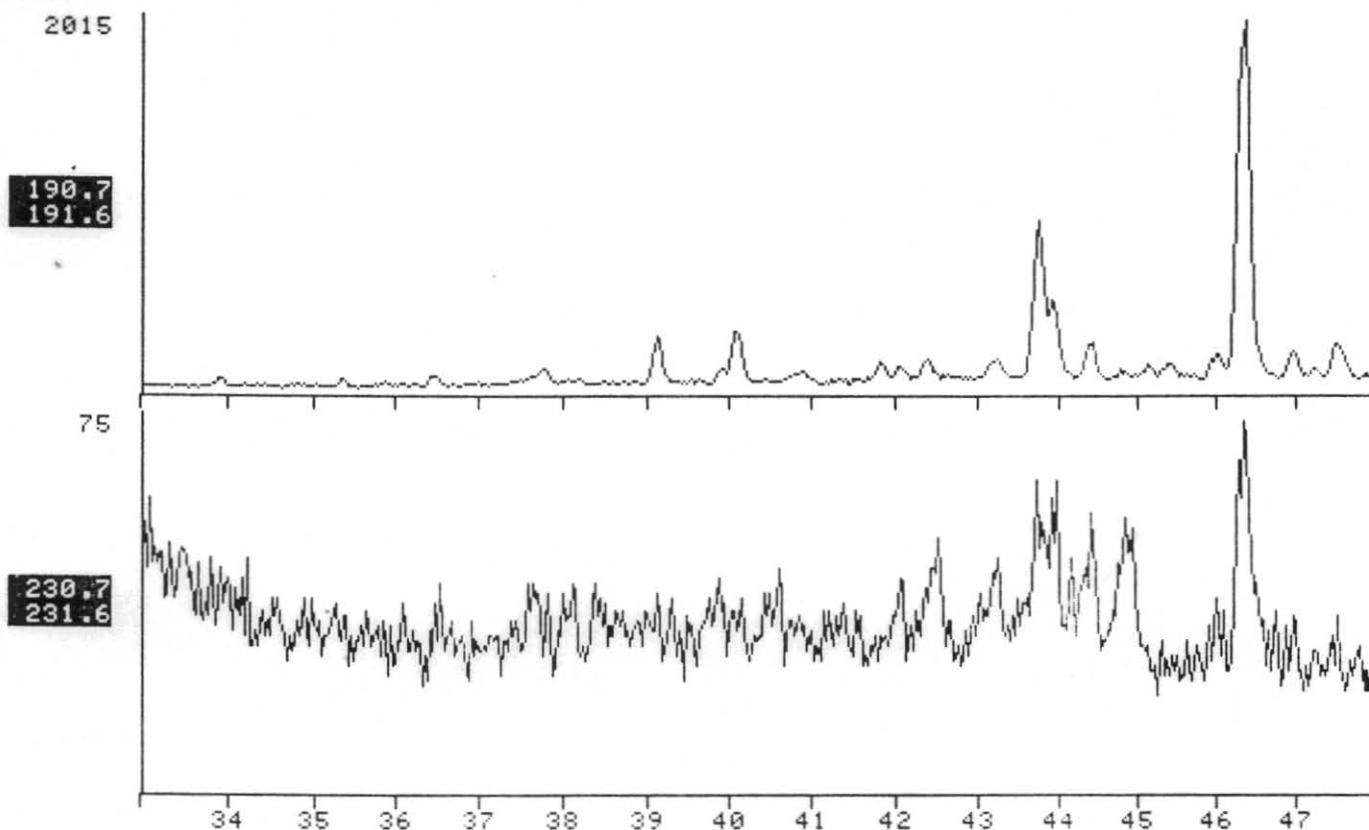


FIGURE: 2-16c

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

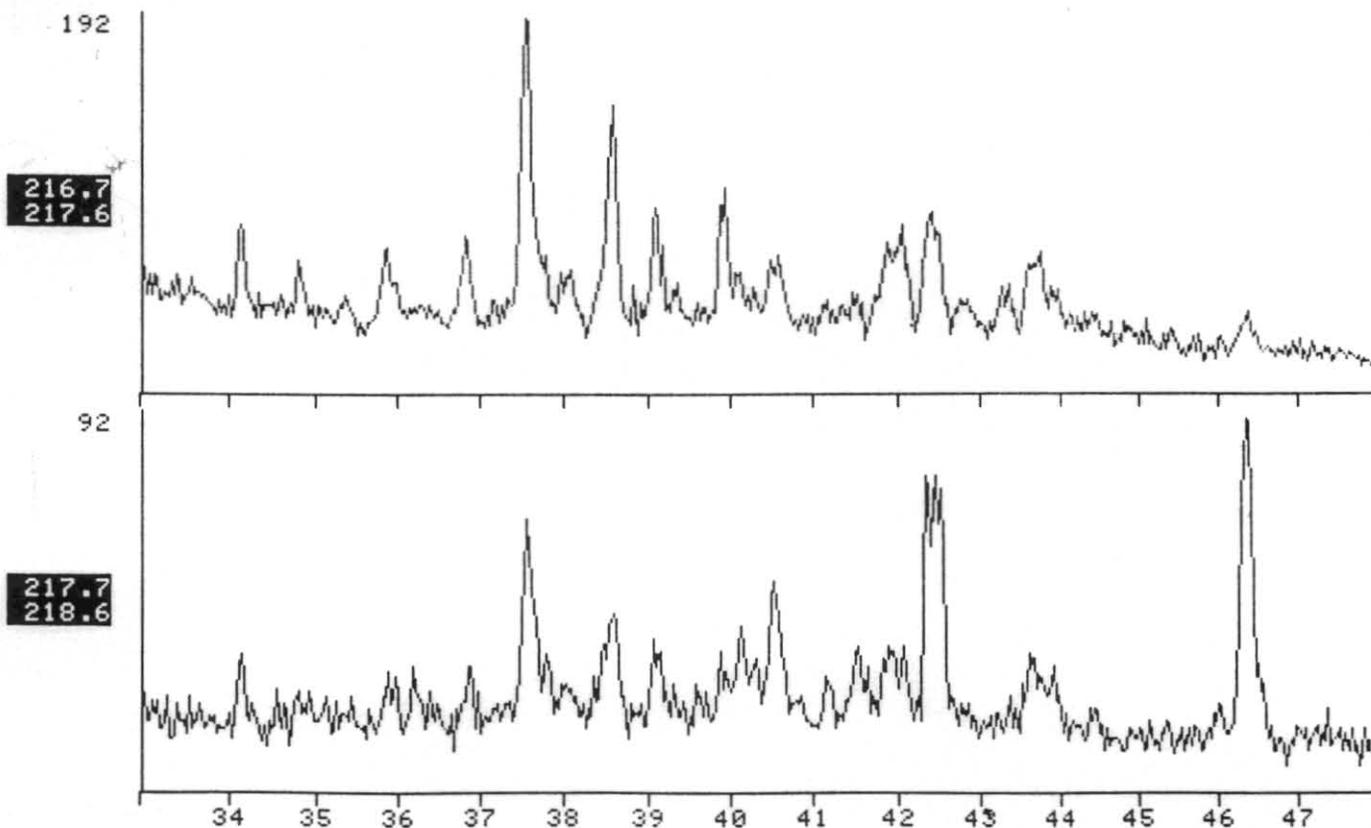
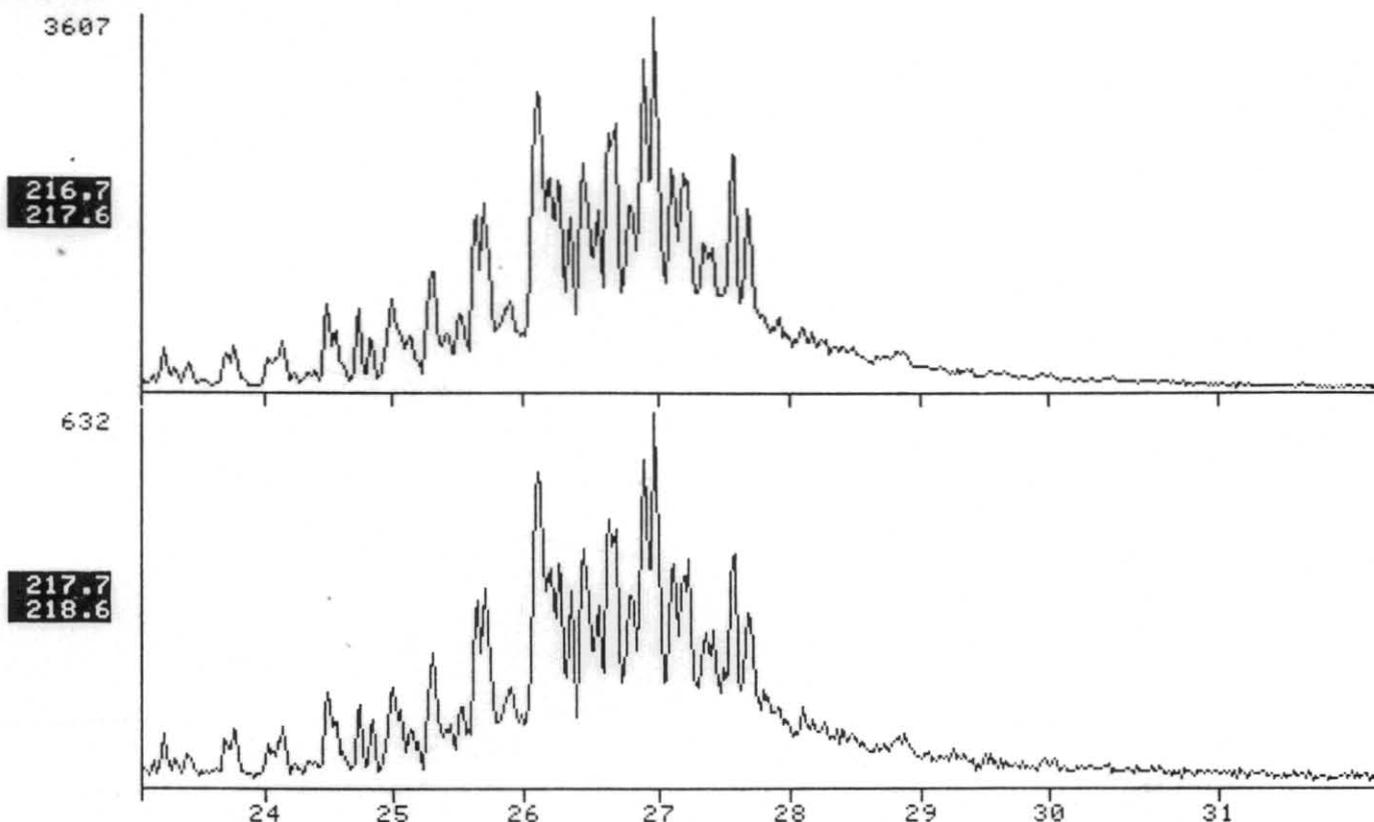


FIGURE: 2-16d

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

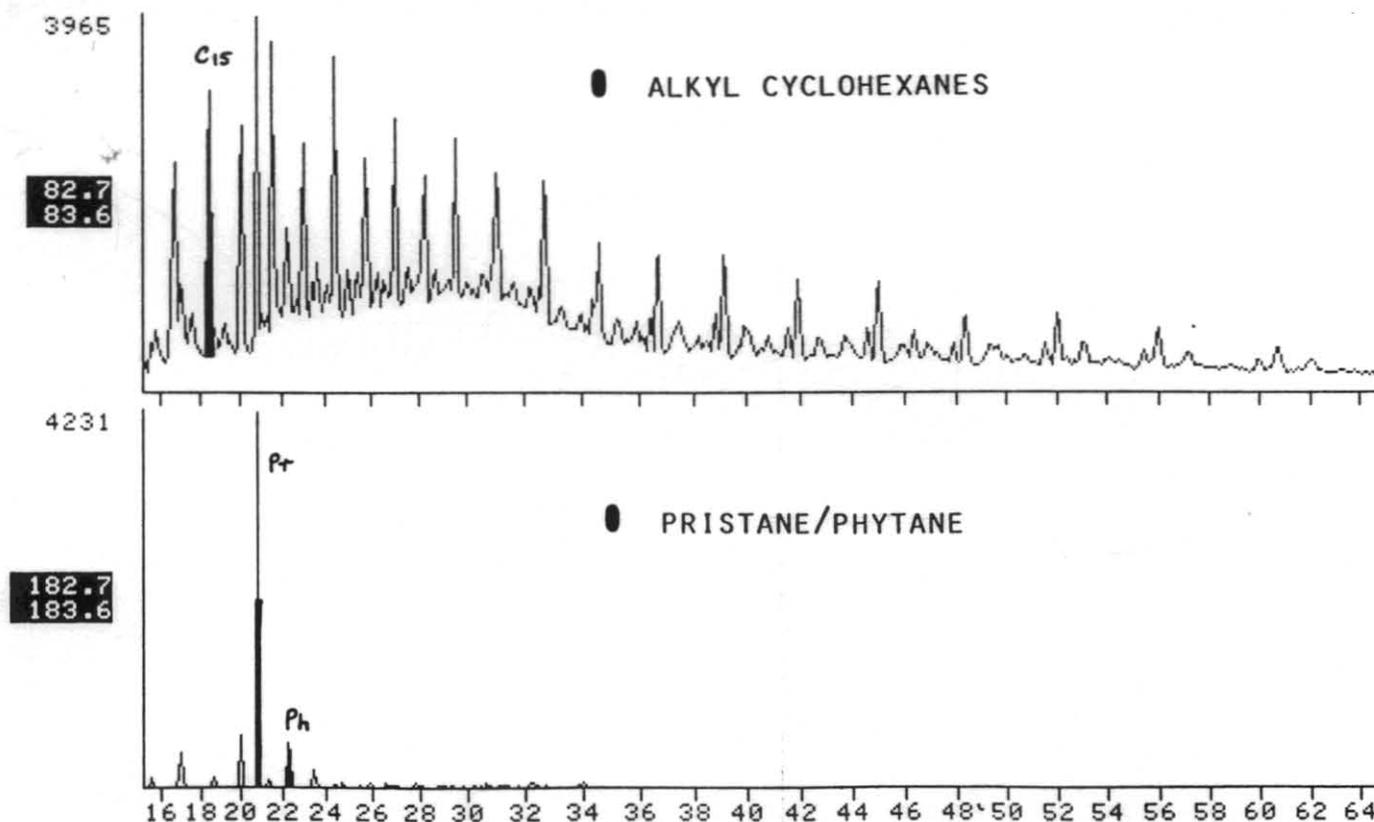
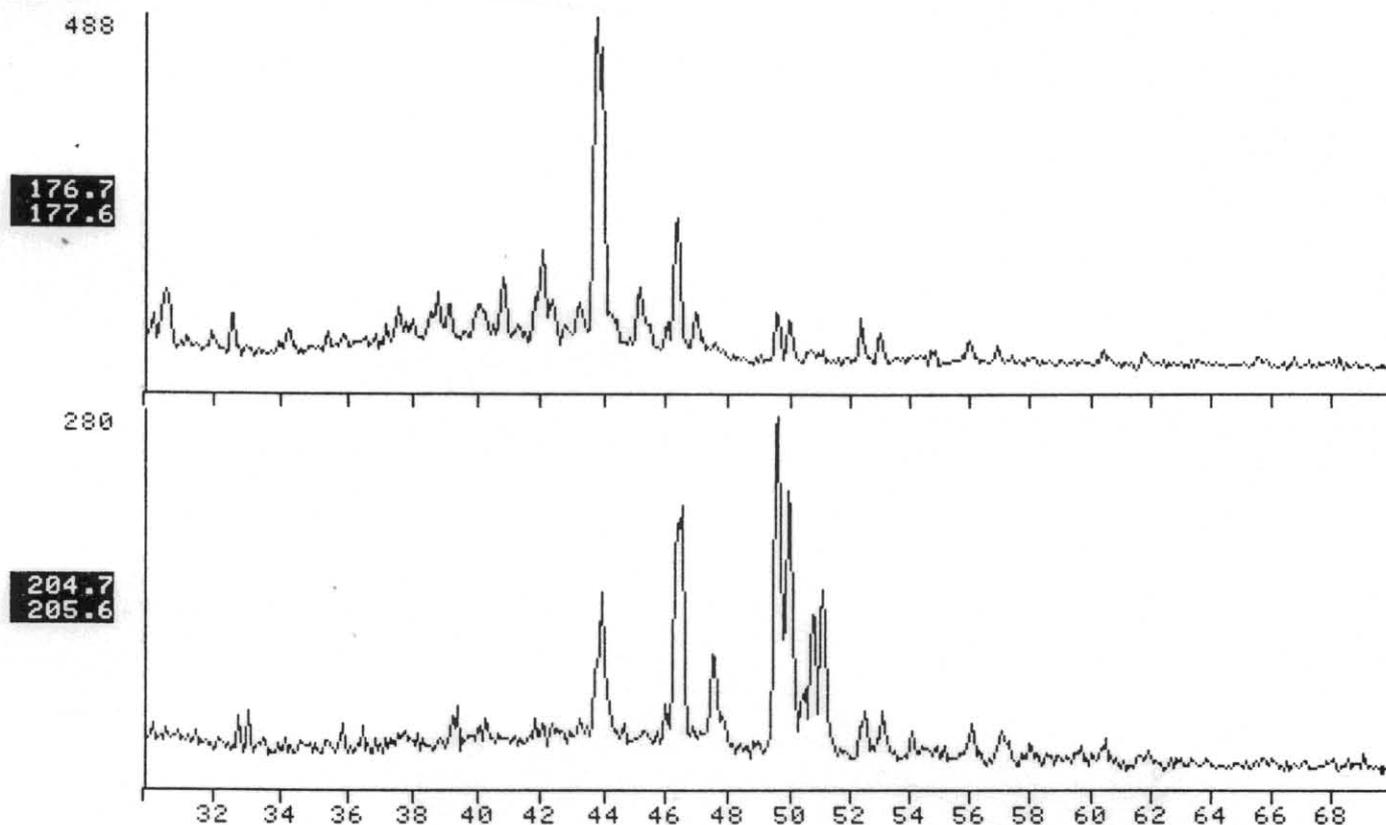


FIGURE: 2-16e

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

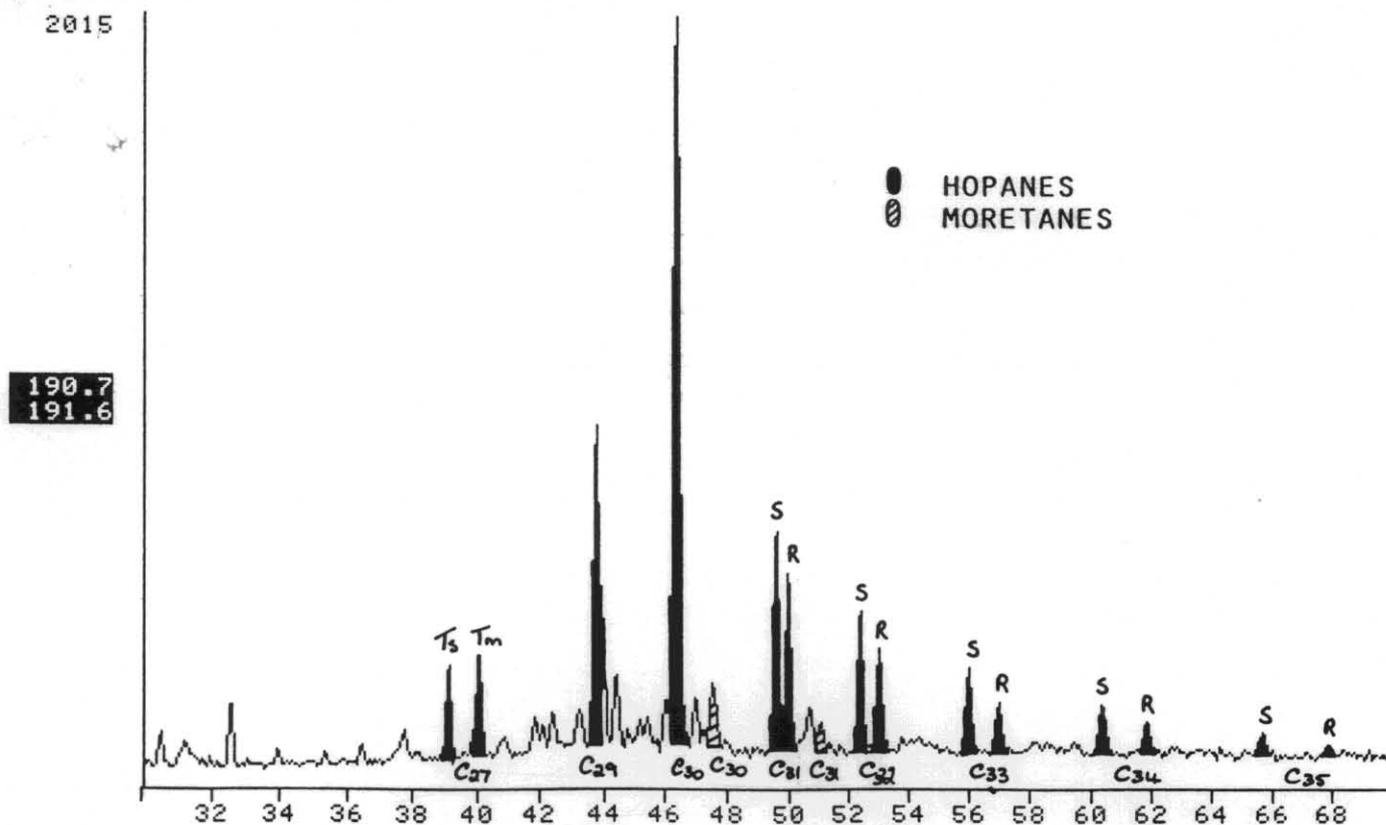
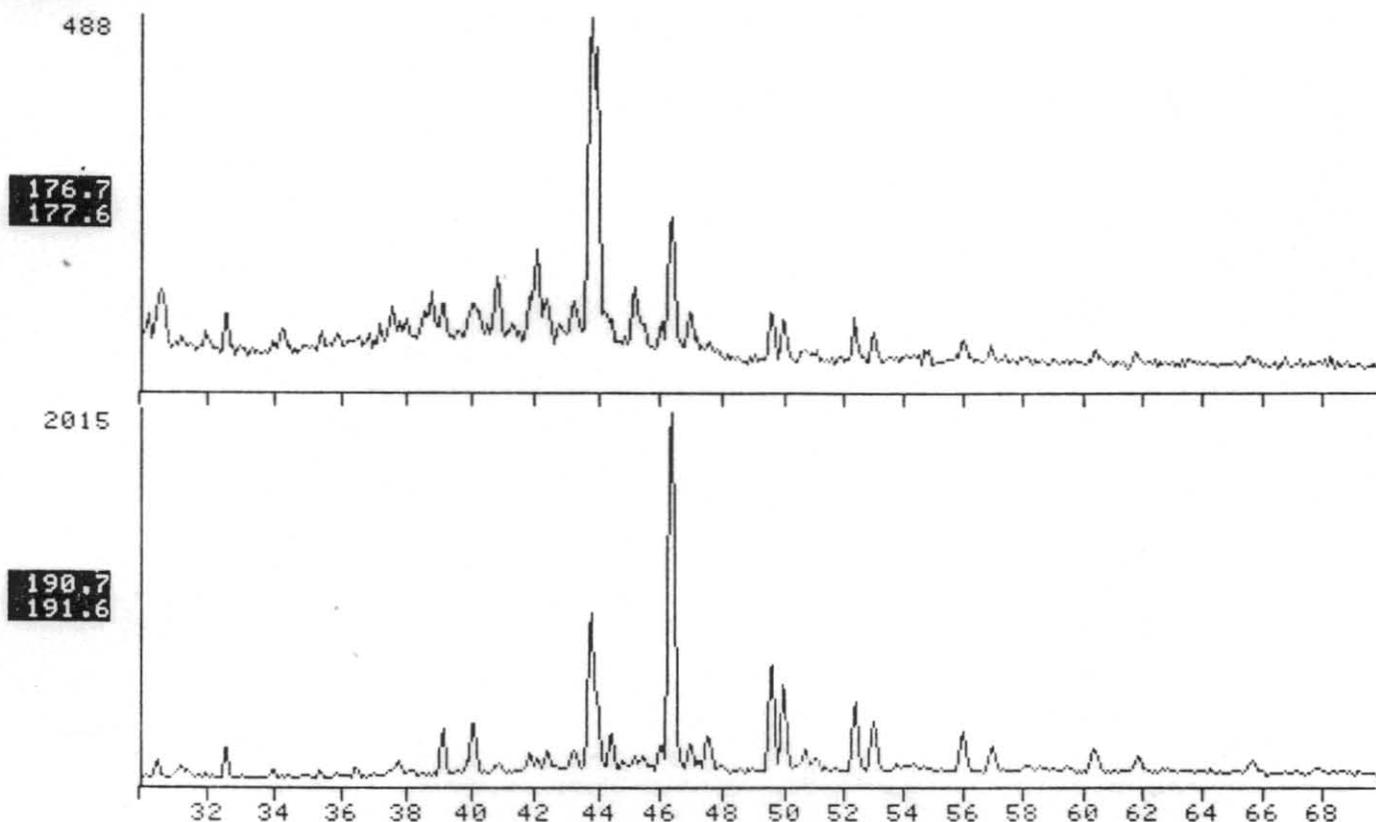


FIGURE: 2-16f

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

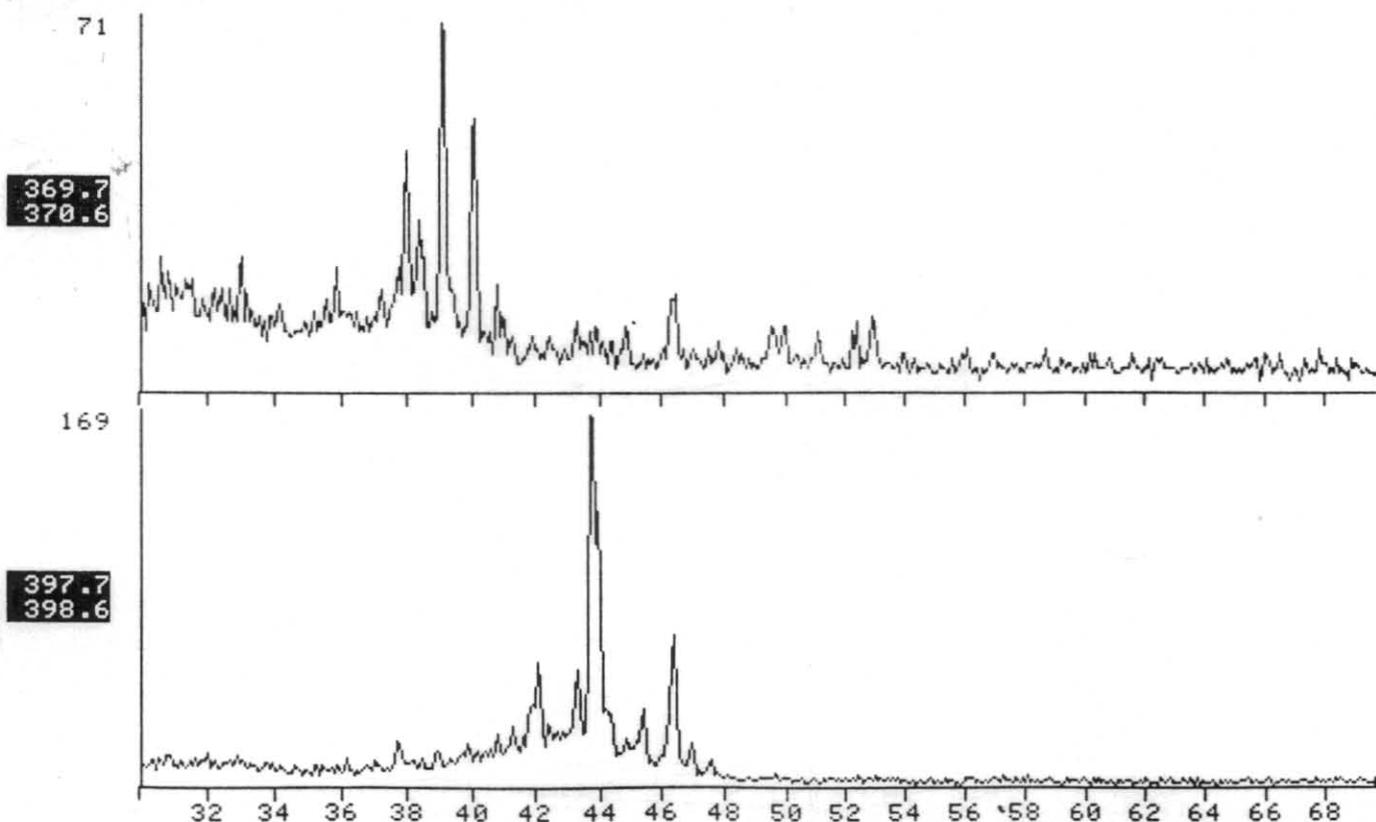
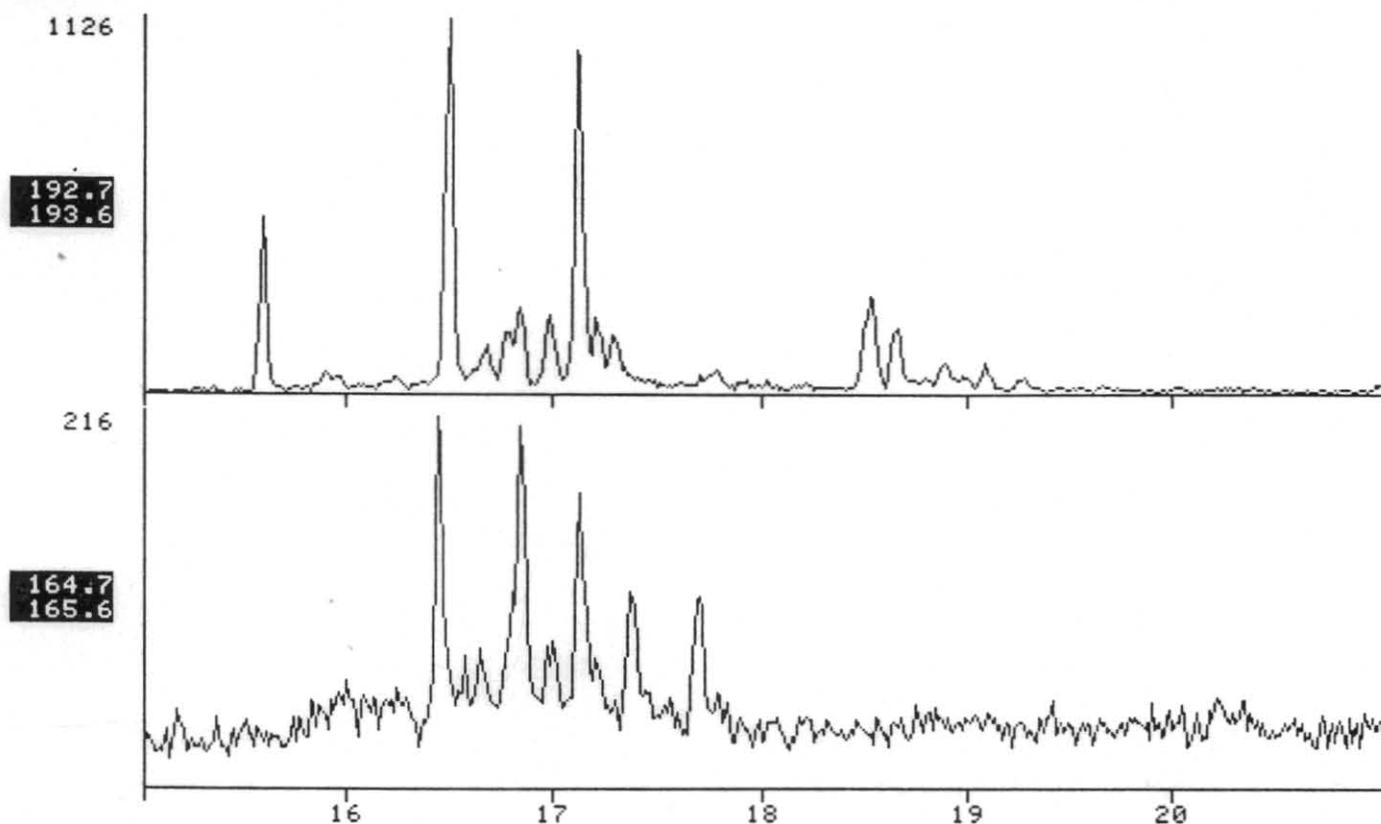


FIGURE: 2-16g

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

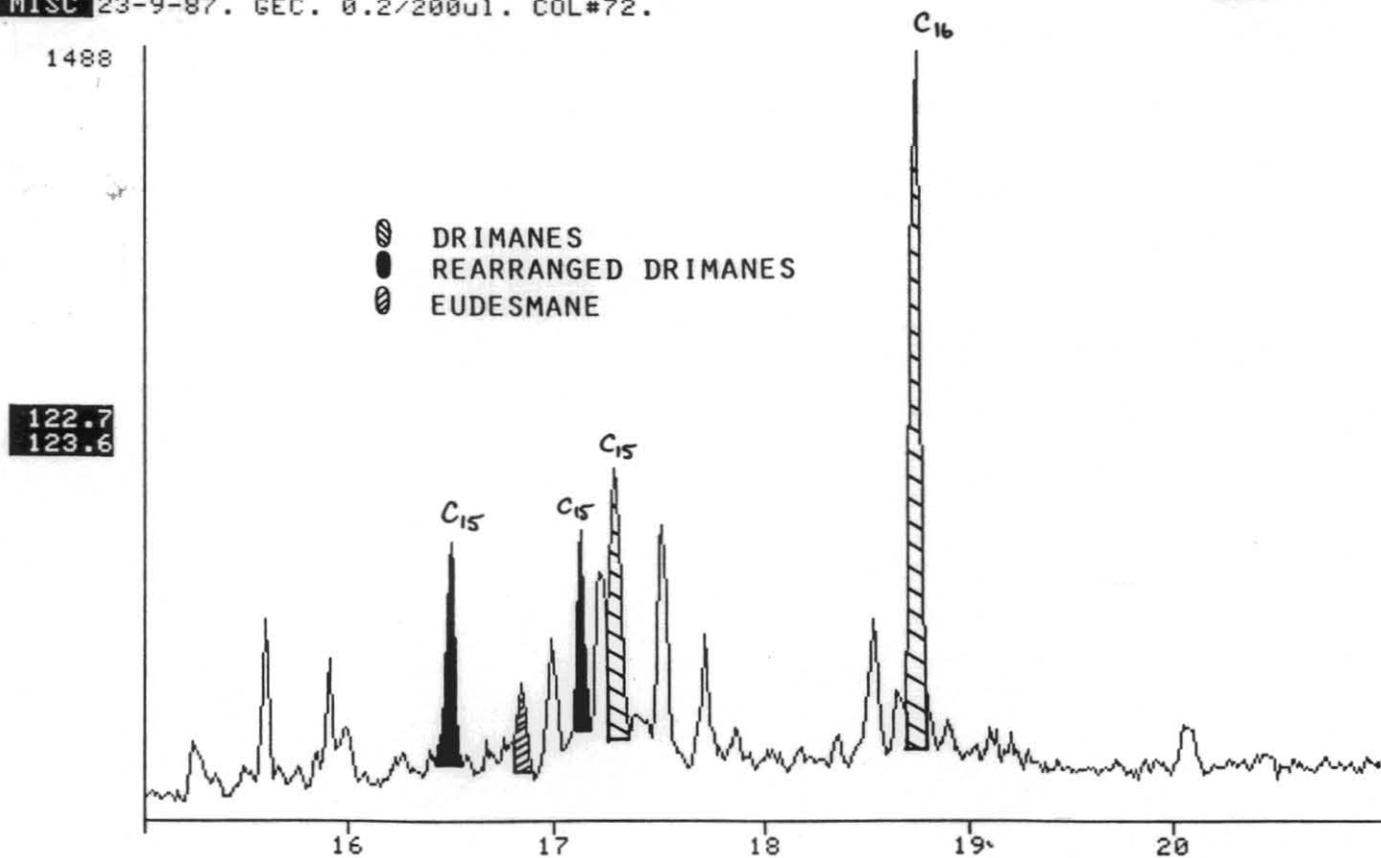
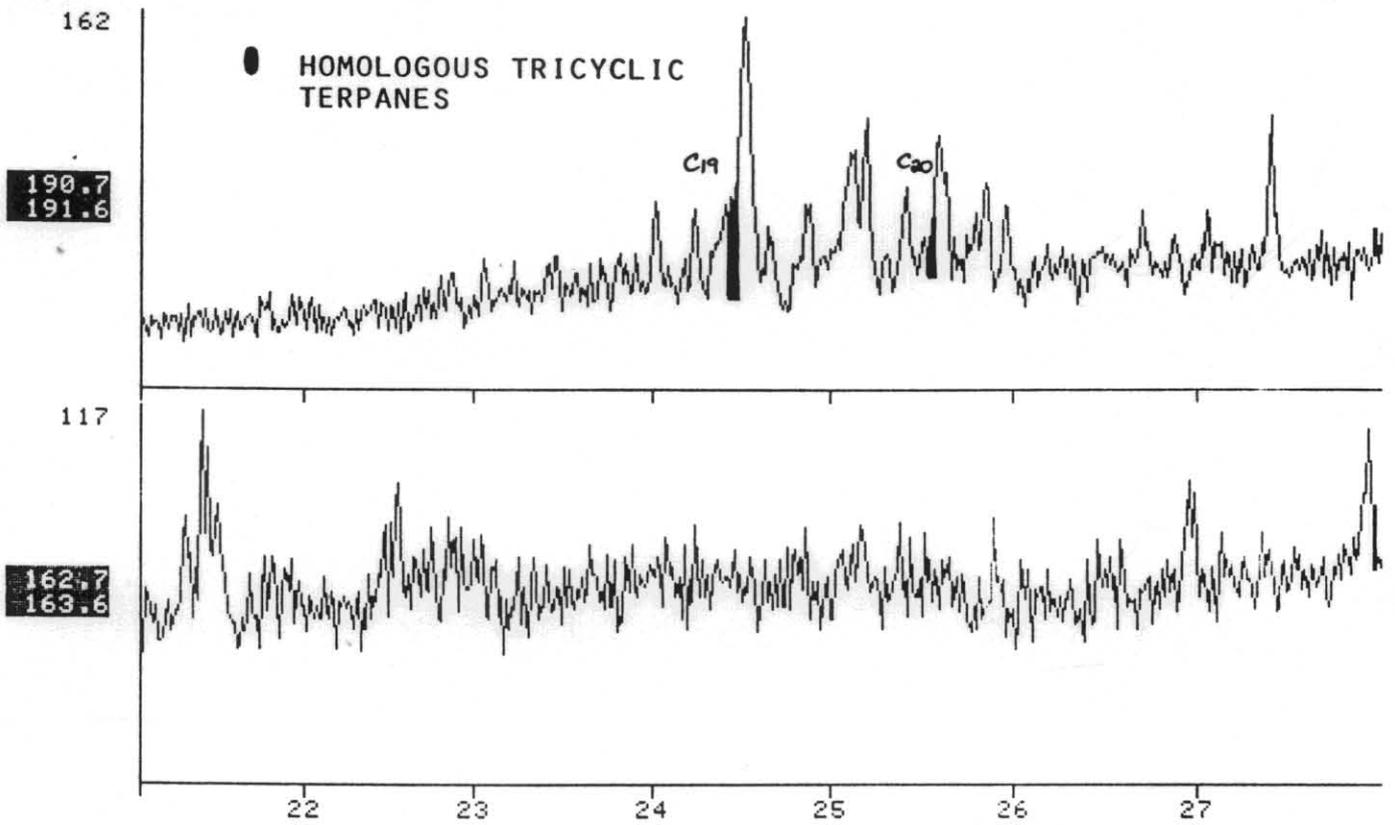


FIGURE: 2-16h

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

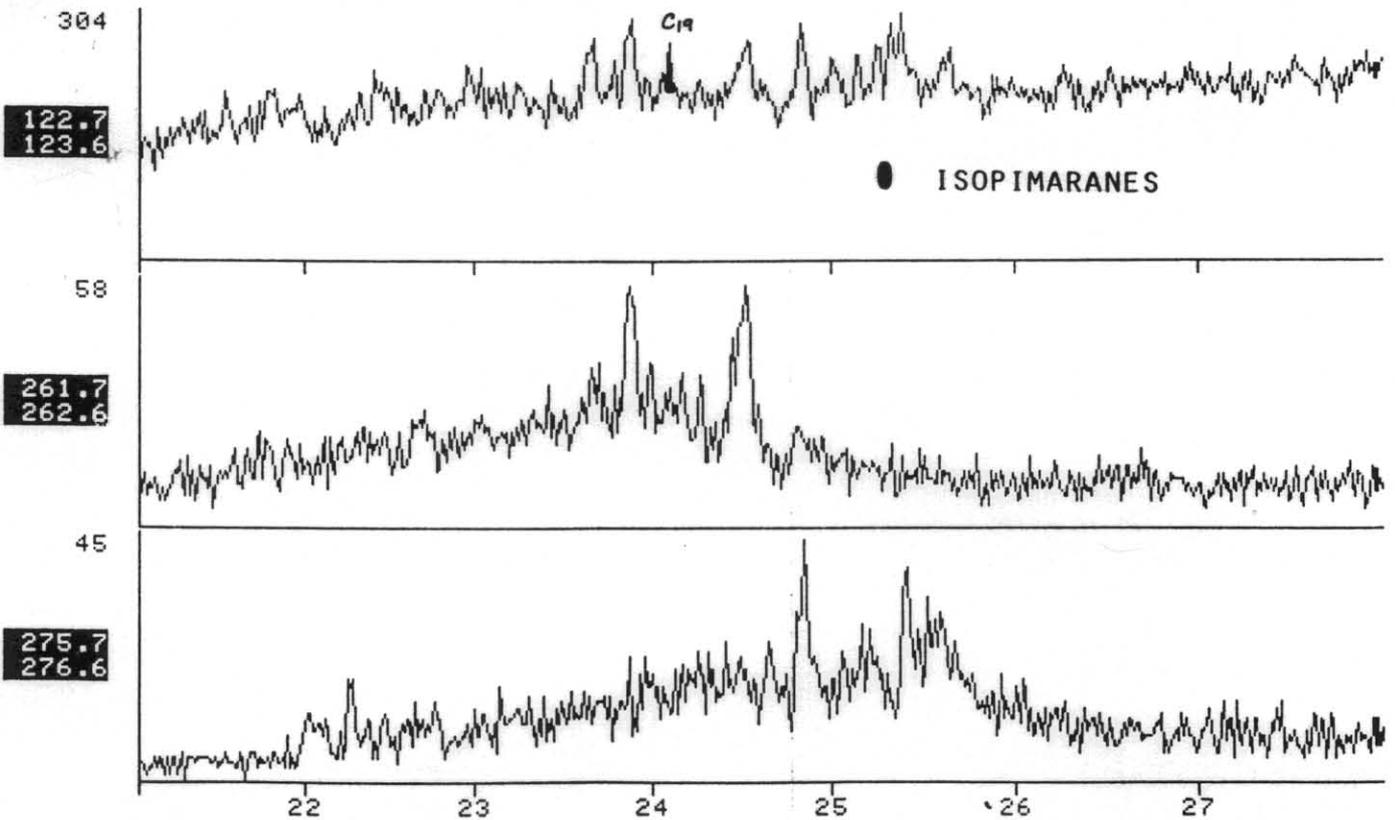
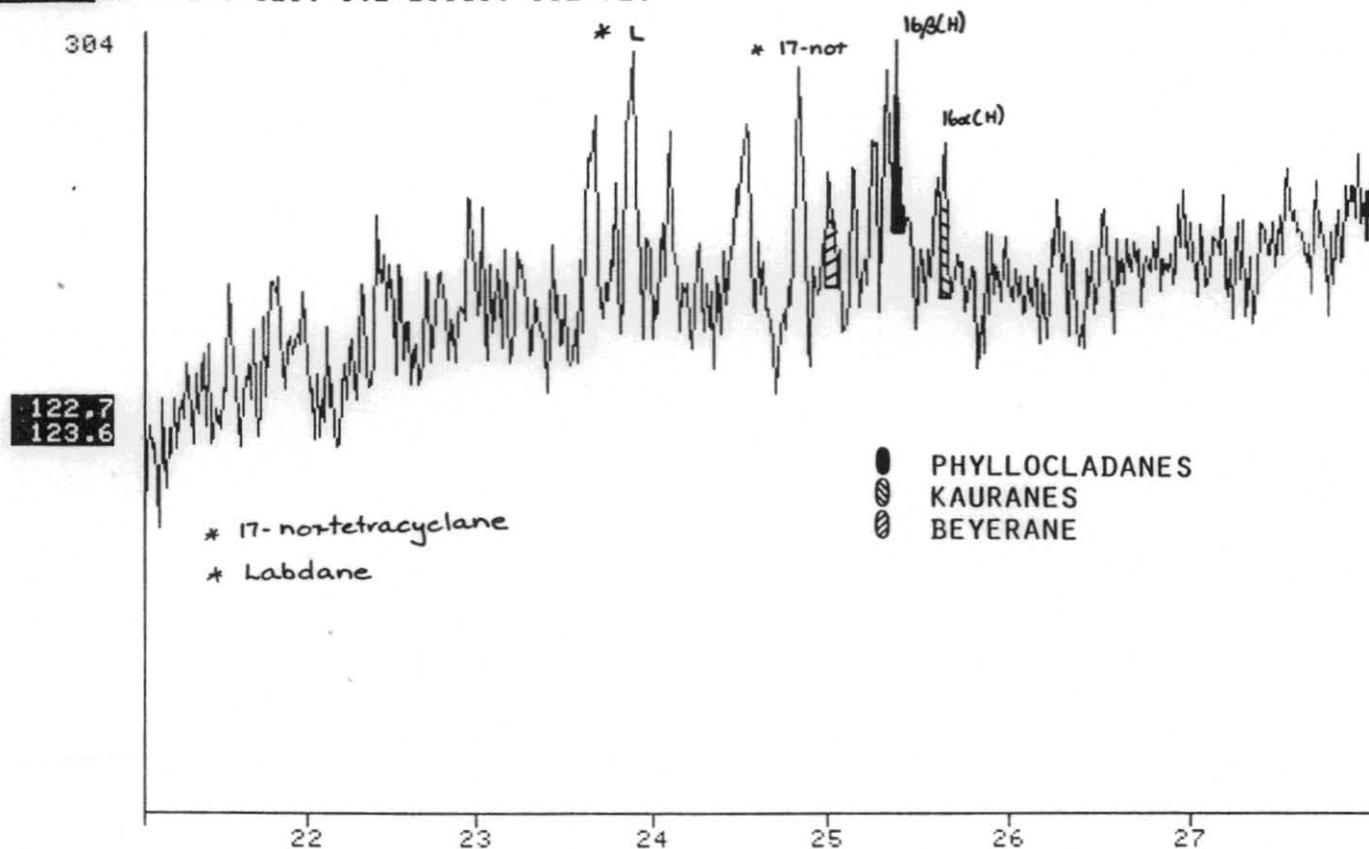


FIGURE: 2-16i

NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238



NAME PELICAN#1, 9269'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-9-87. GEC. 0.2/200ul. COL#72.

FRN 6238

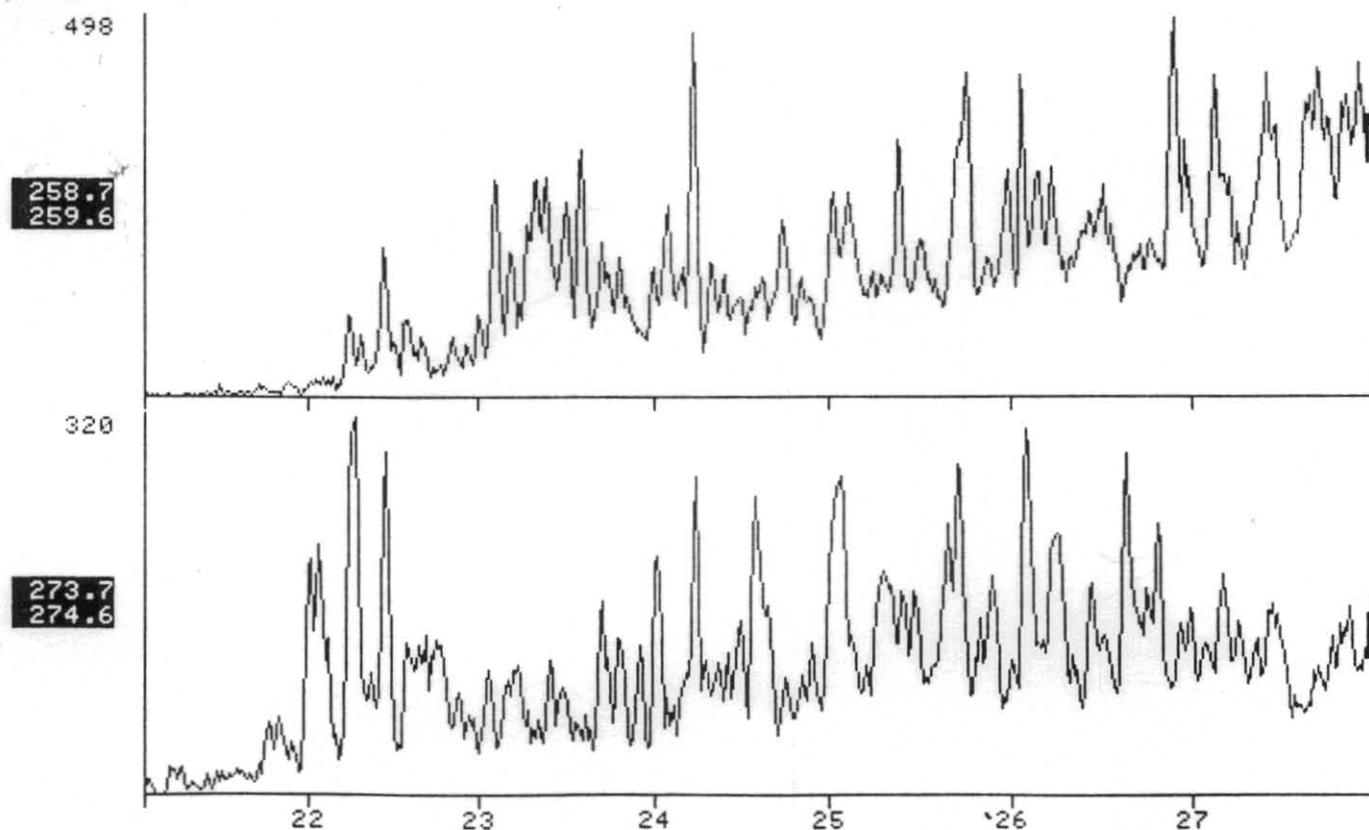
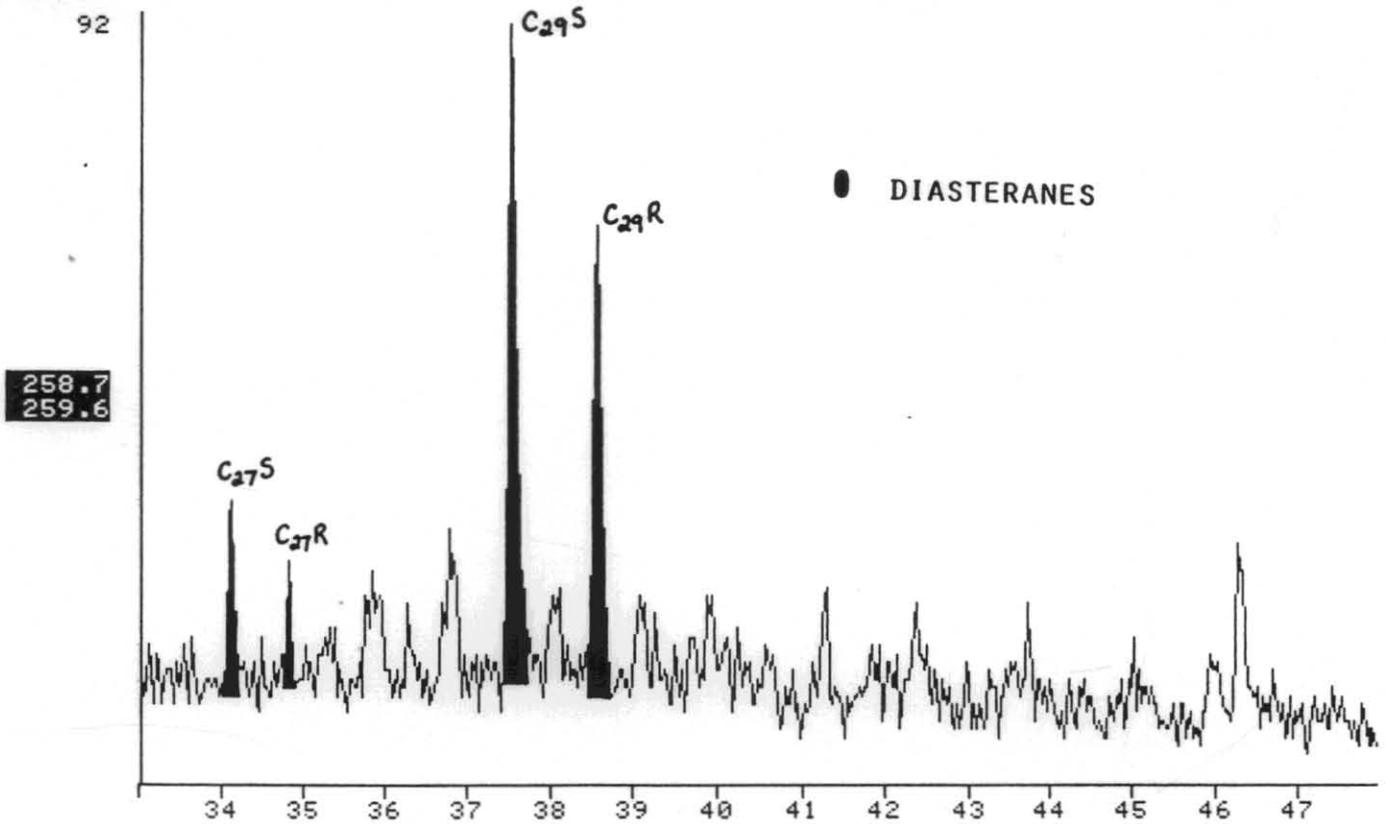


FIGURE: 2-17a

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239

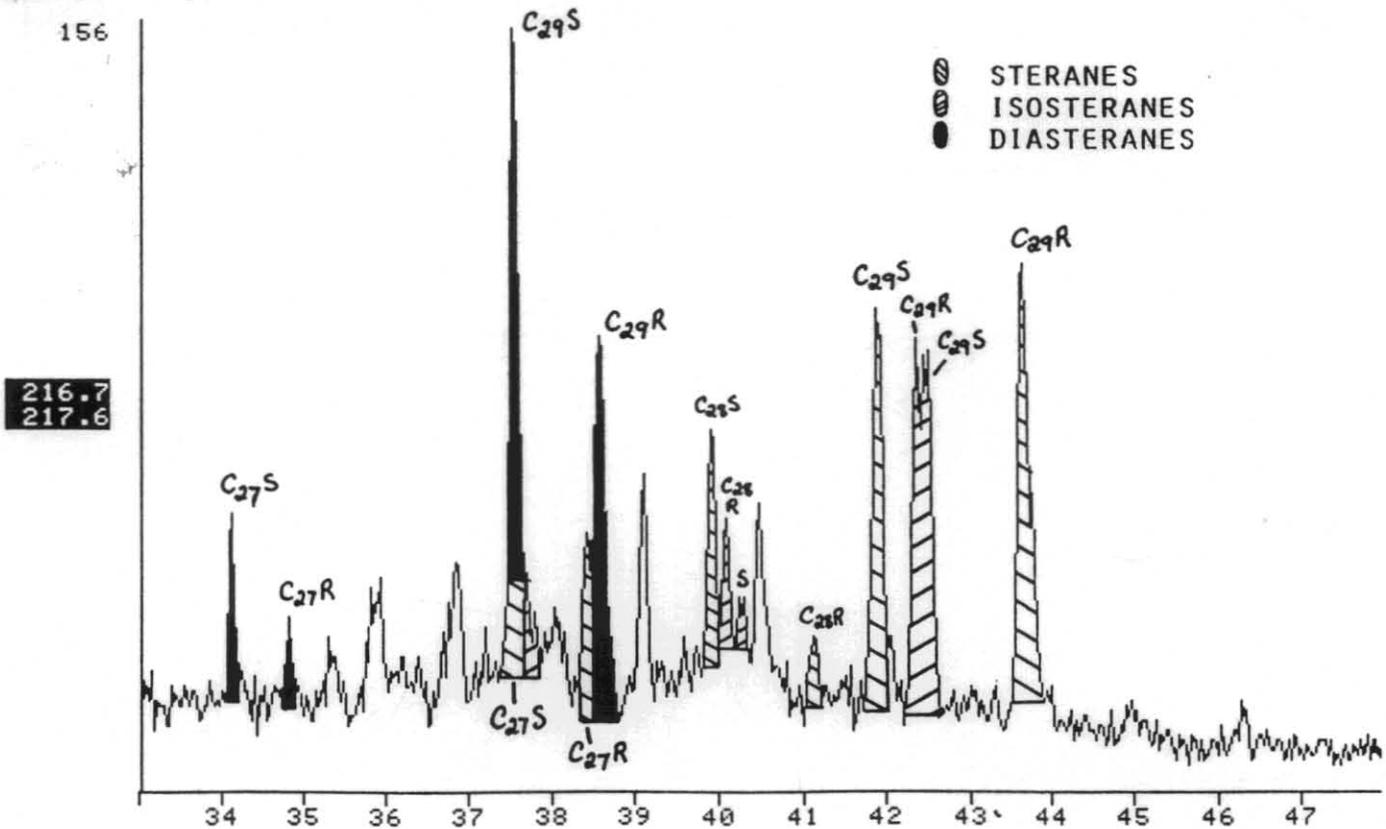
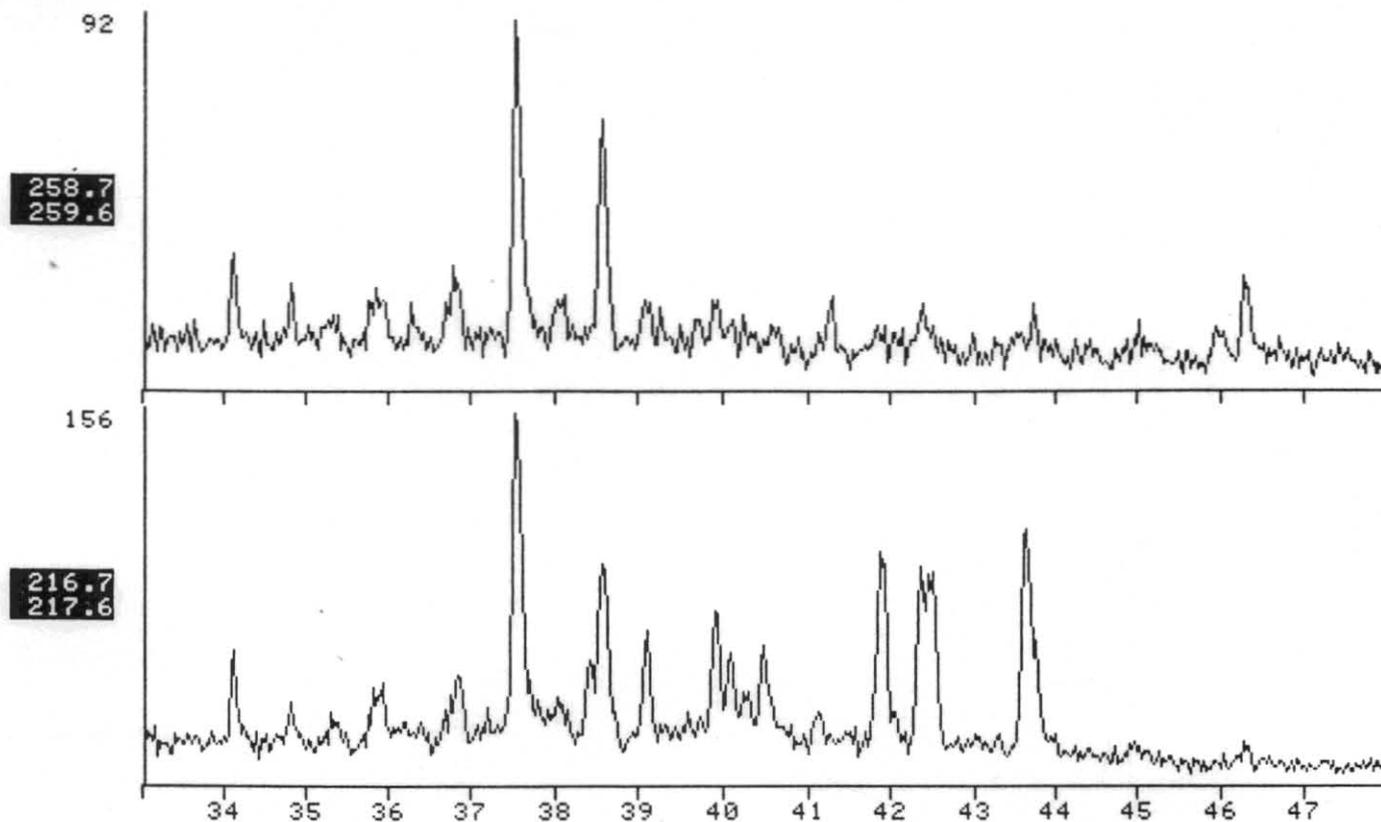


FIGURE: 2-17b

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239

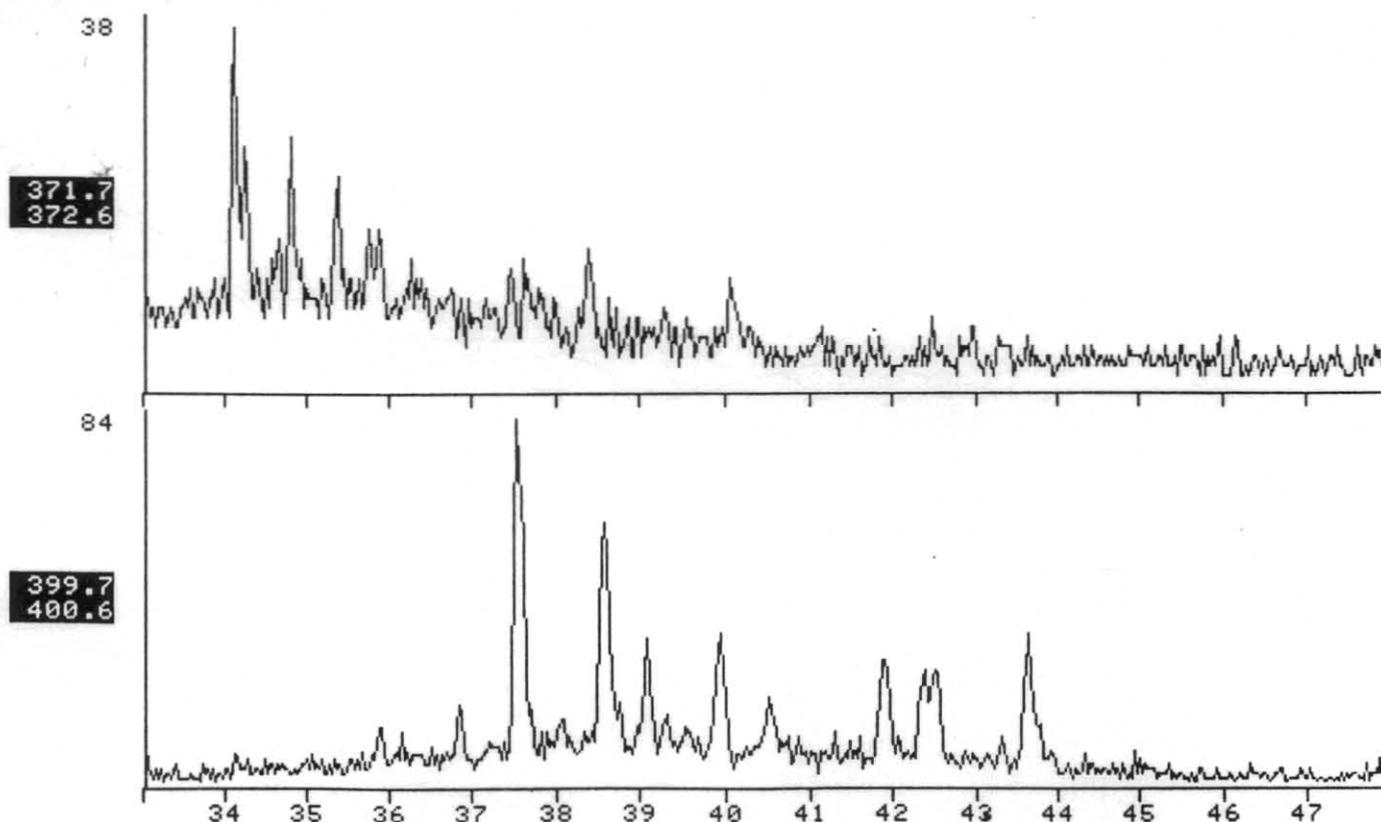
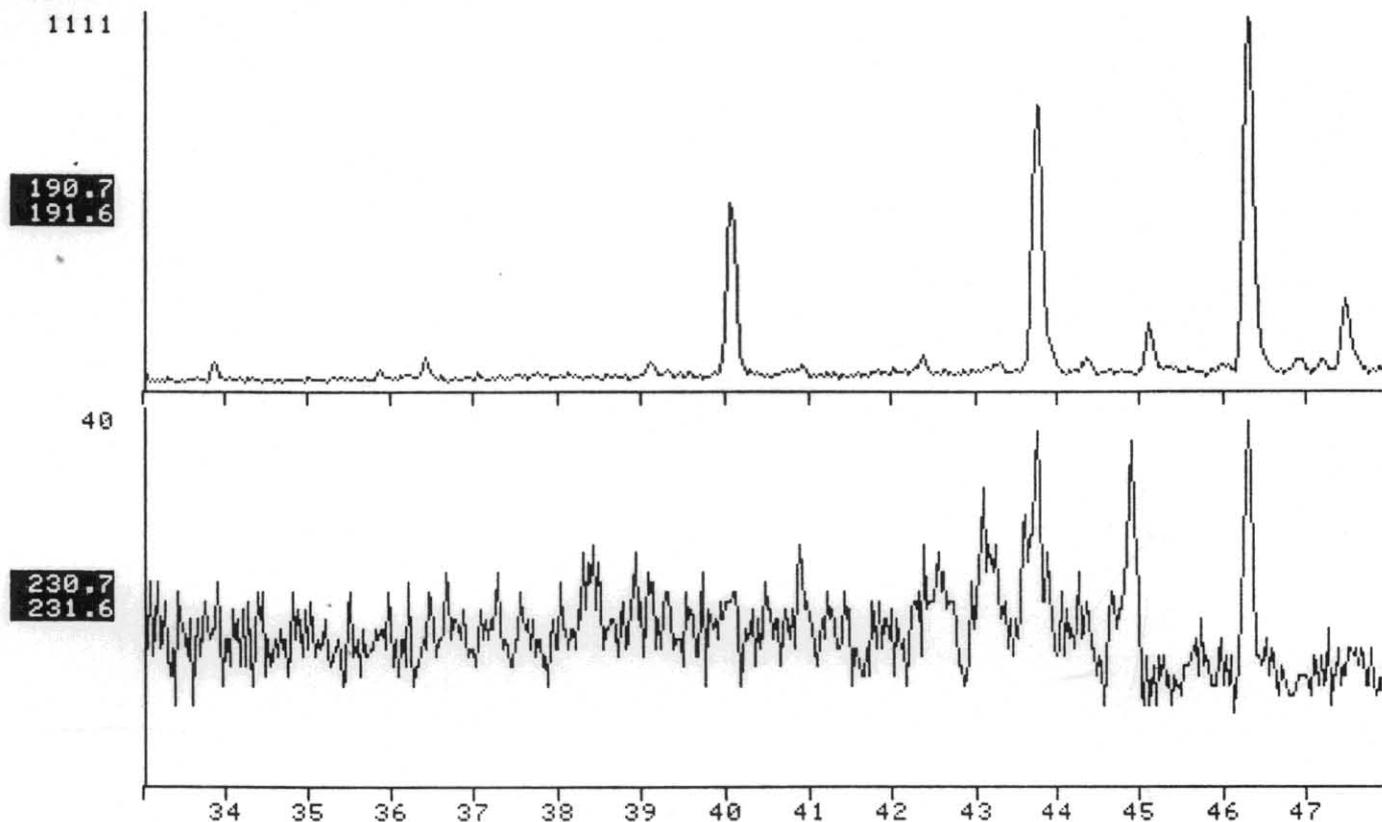


FIGURE: 2-17c

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239

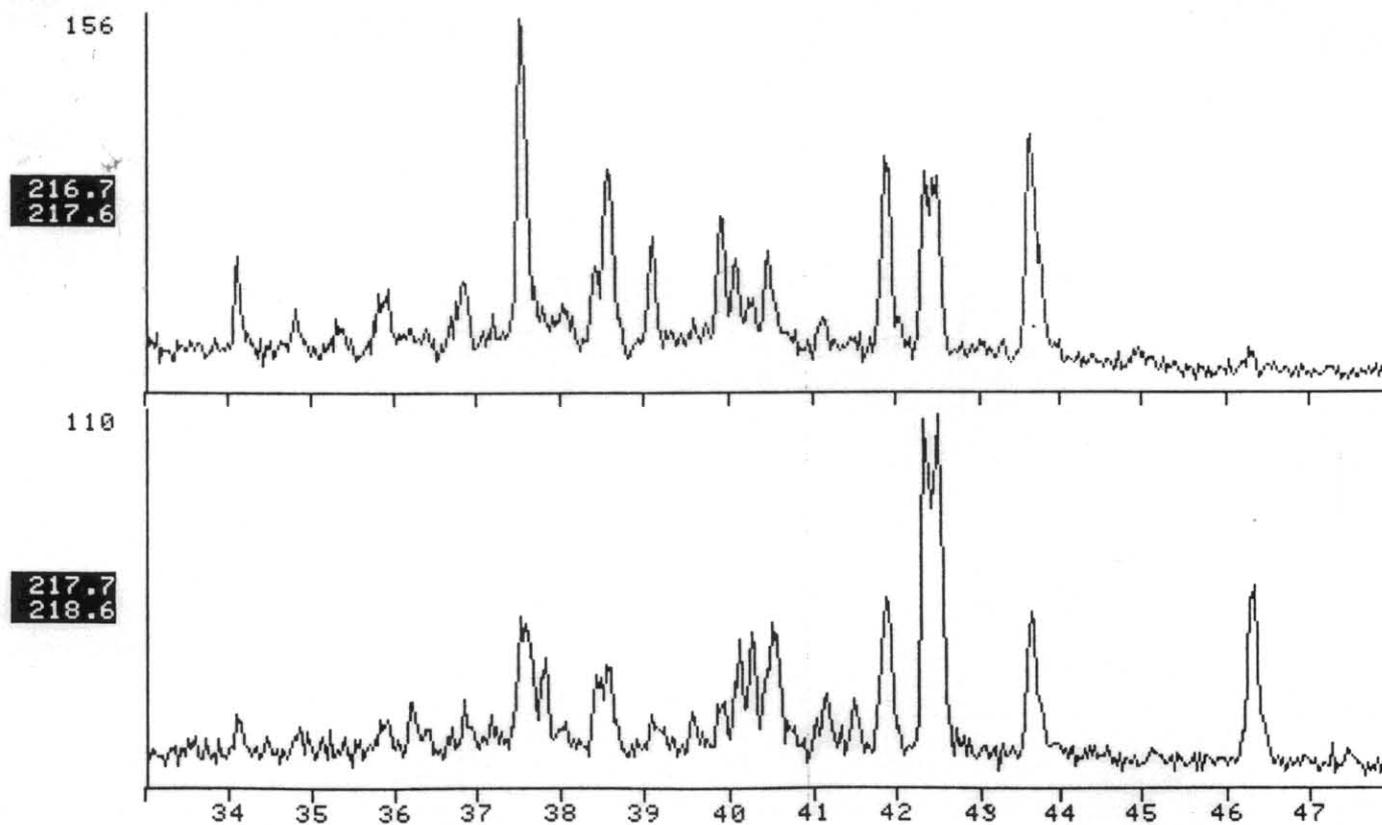
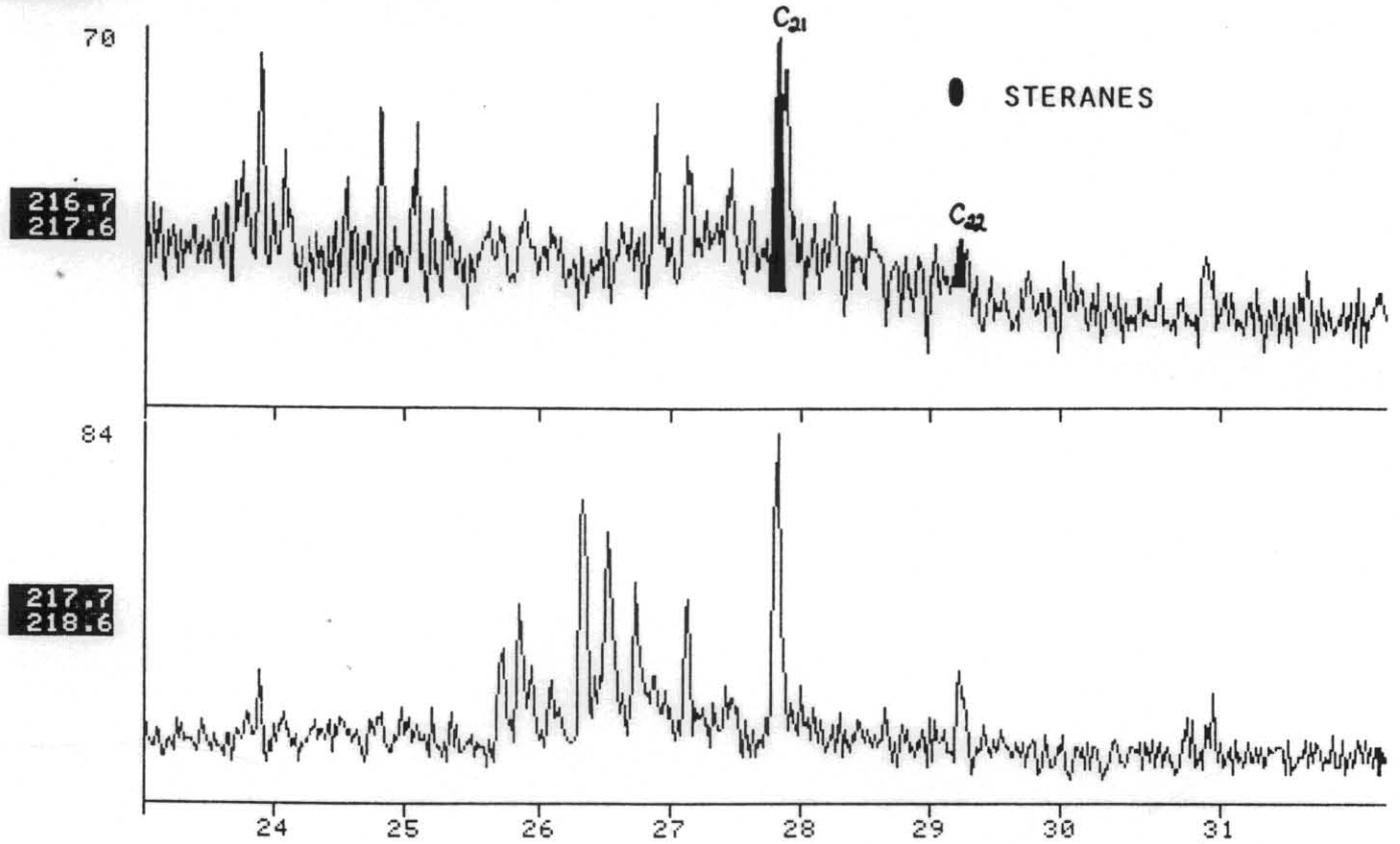


FIGURE: 2-17d

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239

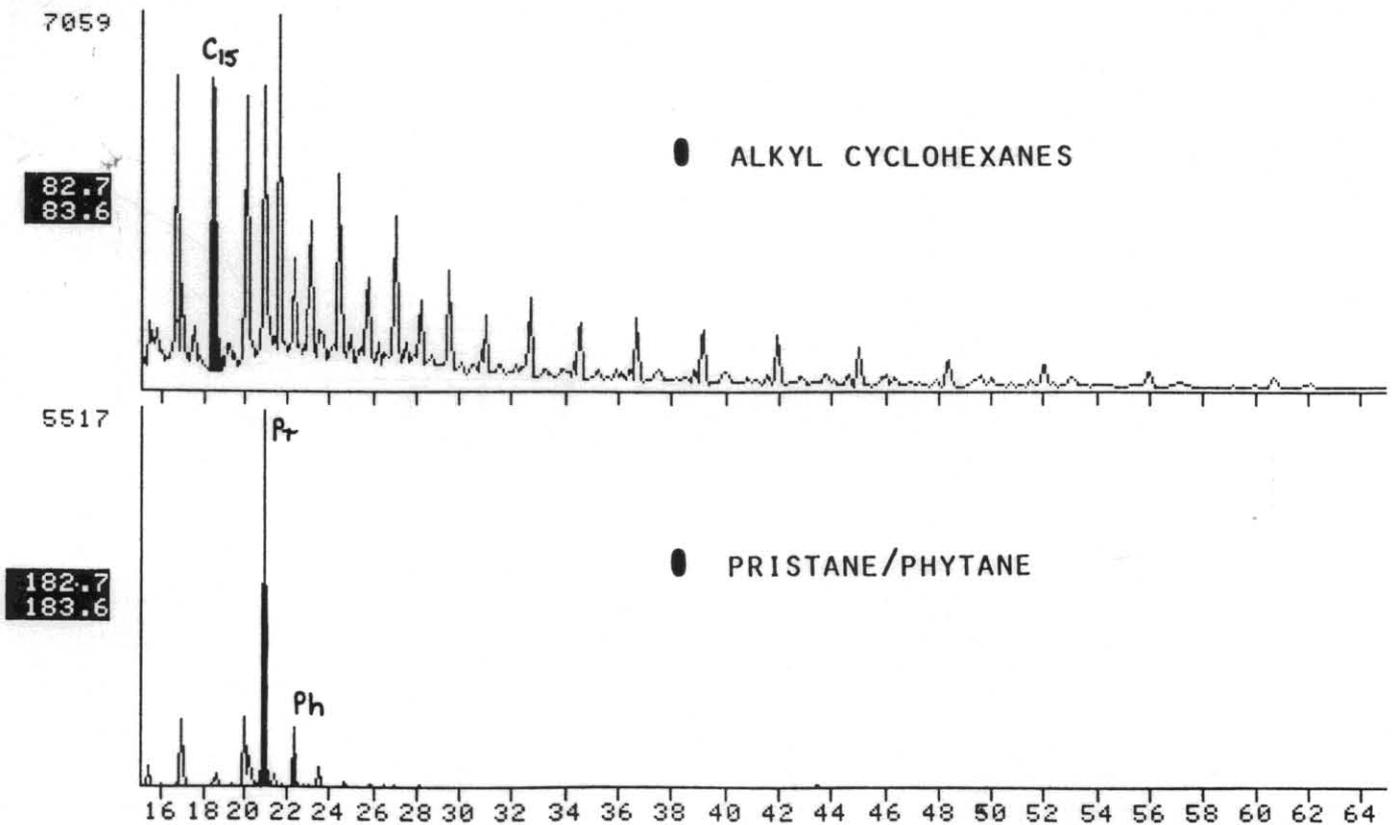
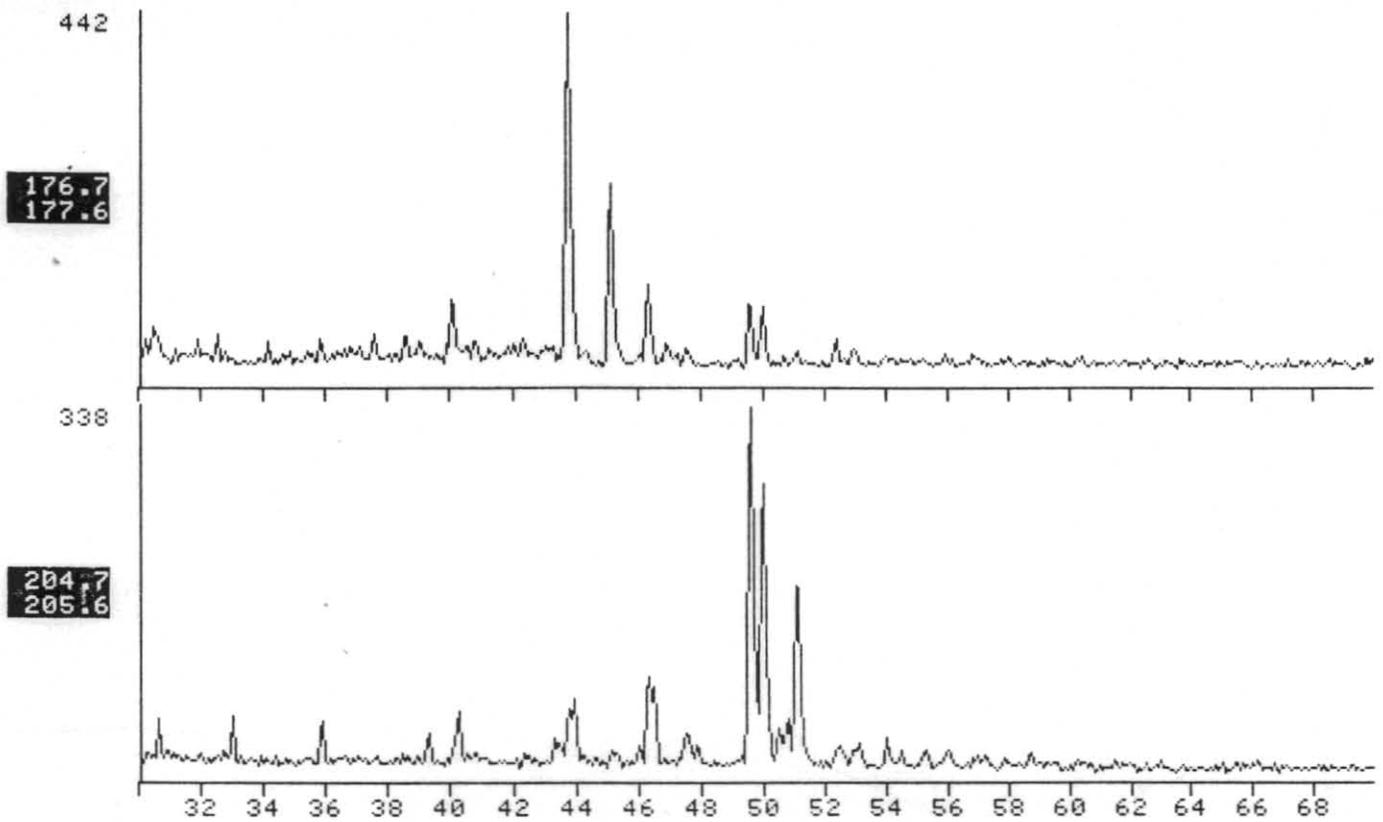


FIGURE: 2-17e

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239

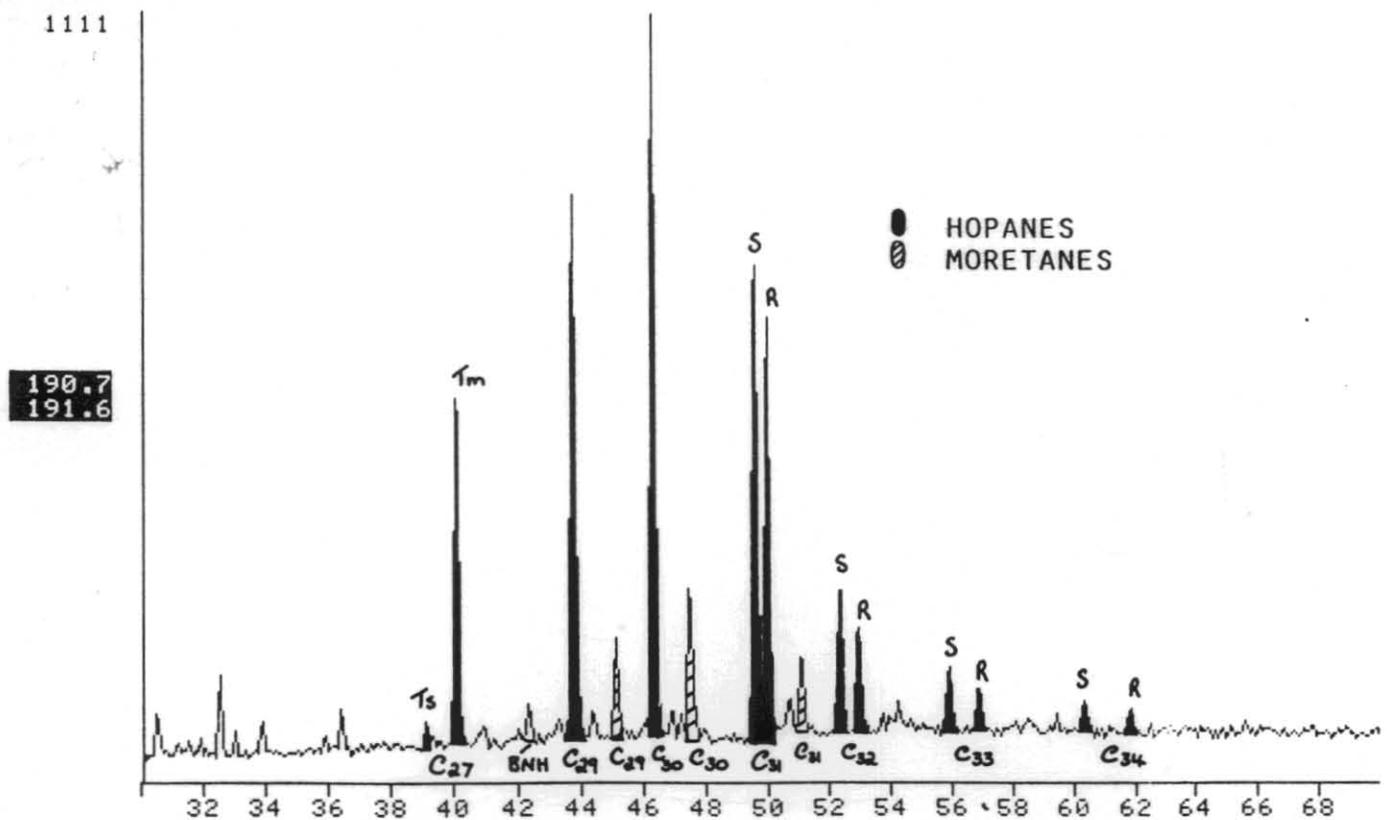
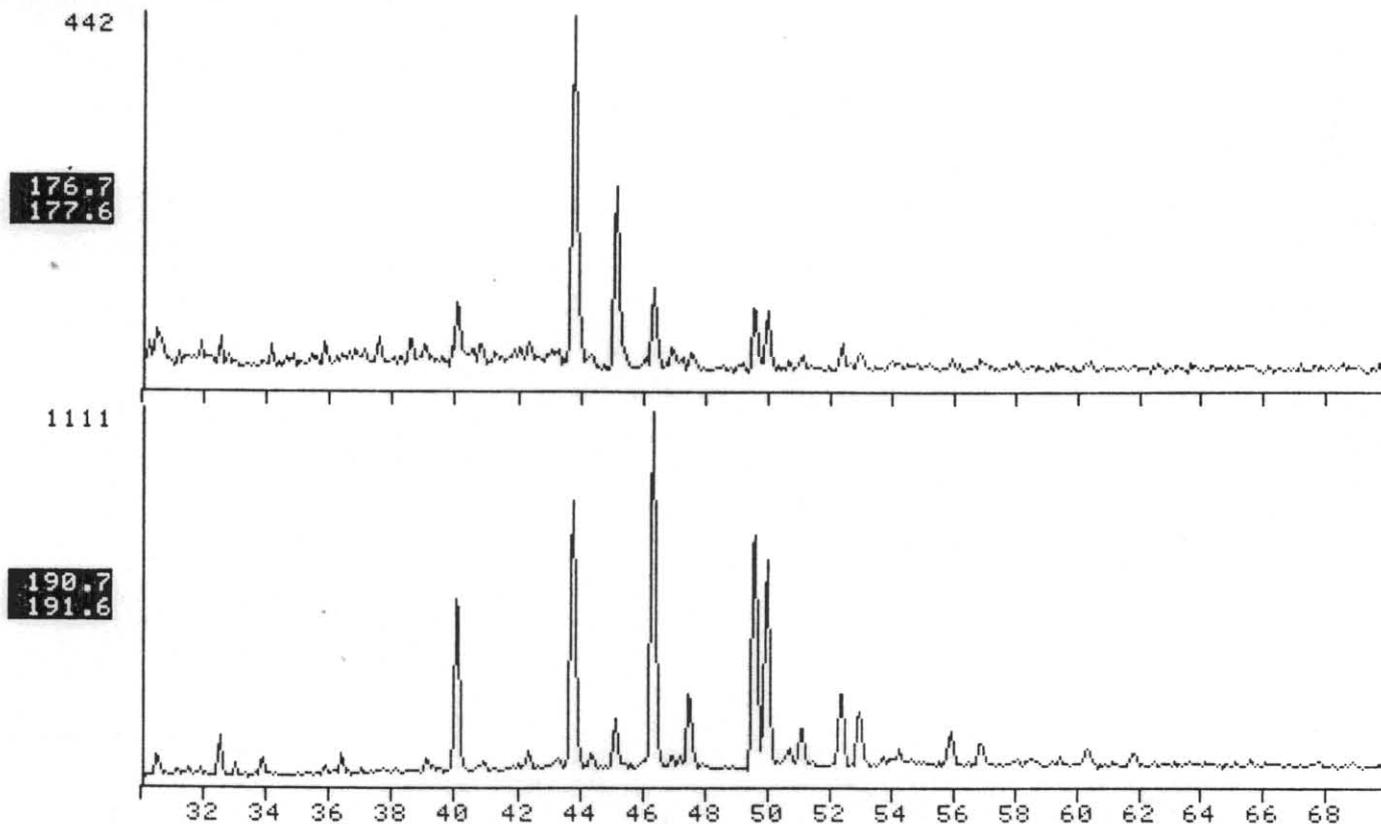


FIGURE: 2-17f

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70\$

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM:
MISC 20-3-86. GEC. 0.2/100ul. COL#70\$

FRN 6239

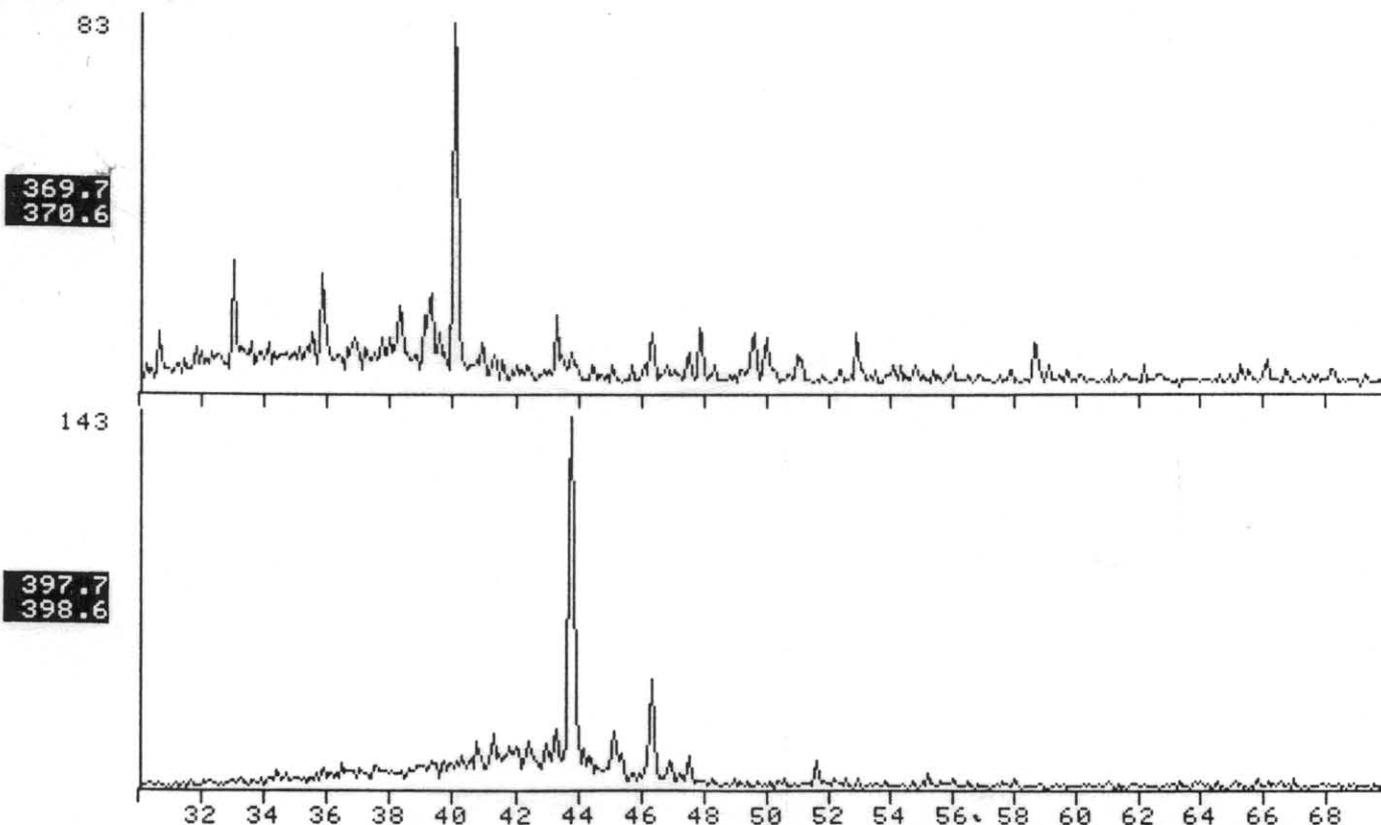
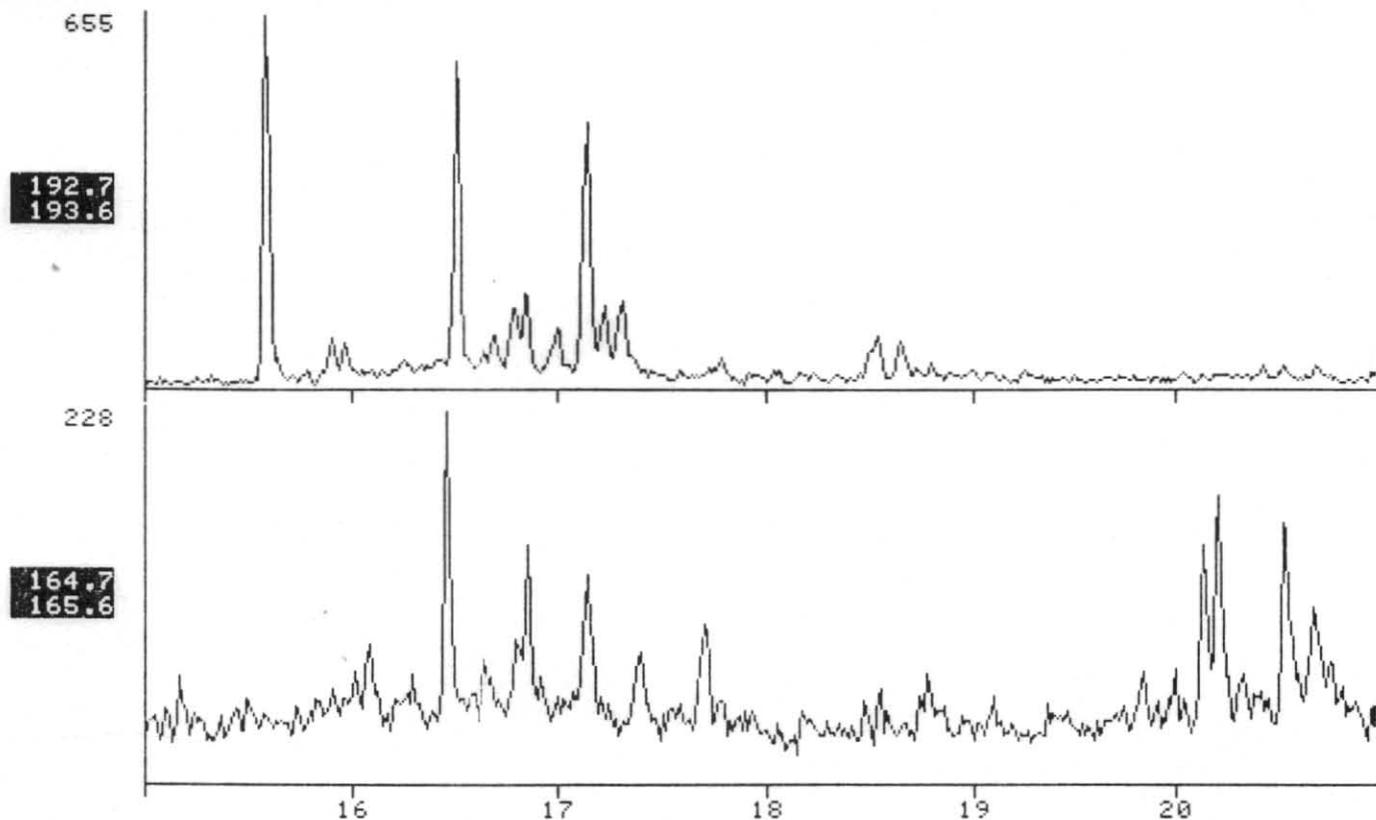


FIGURE: 2-17g

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70#

FRN 6239

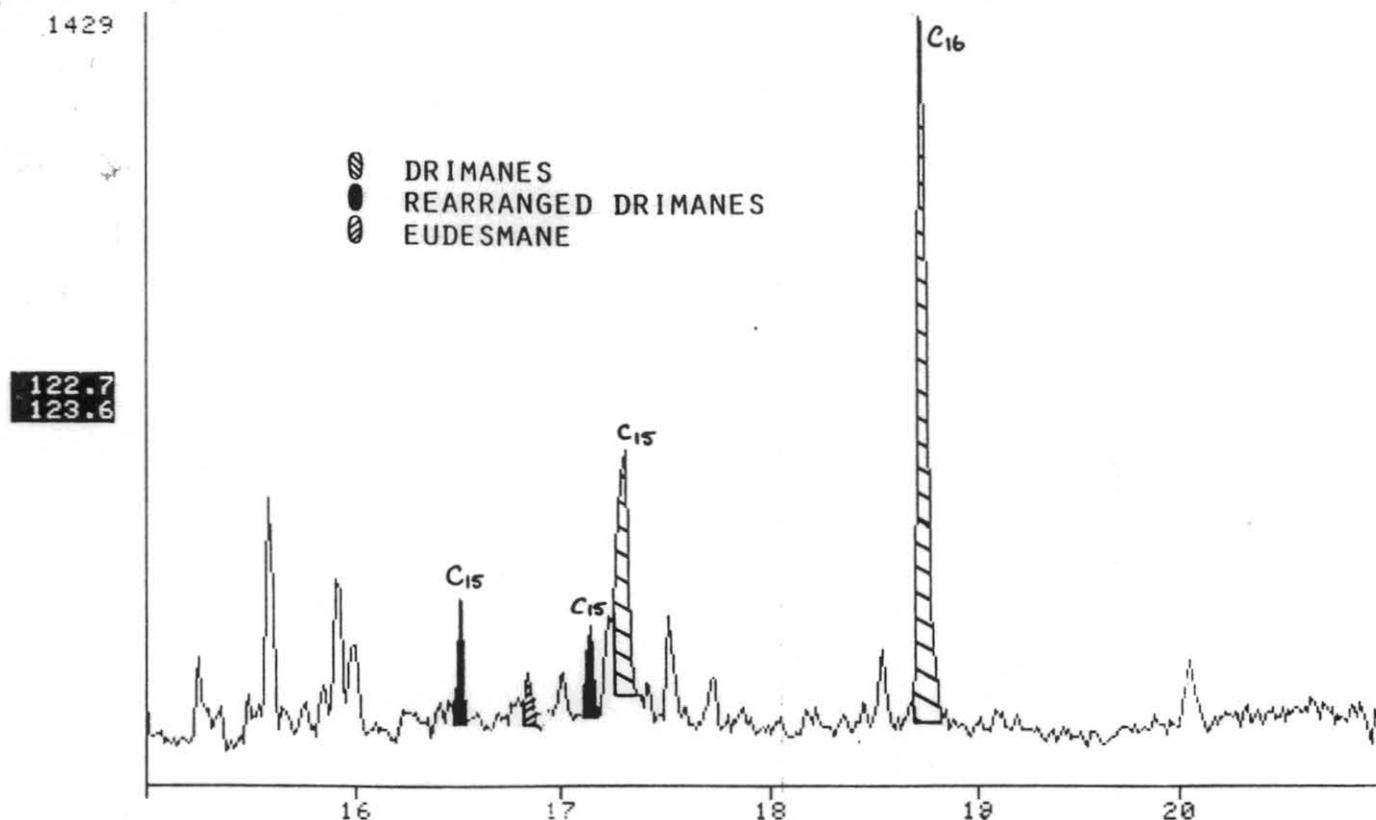
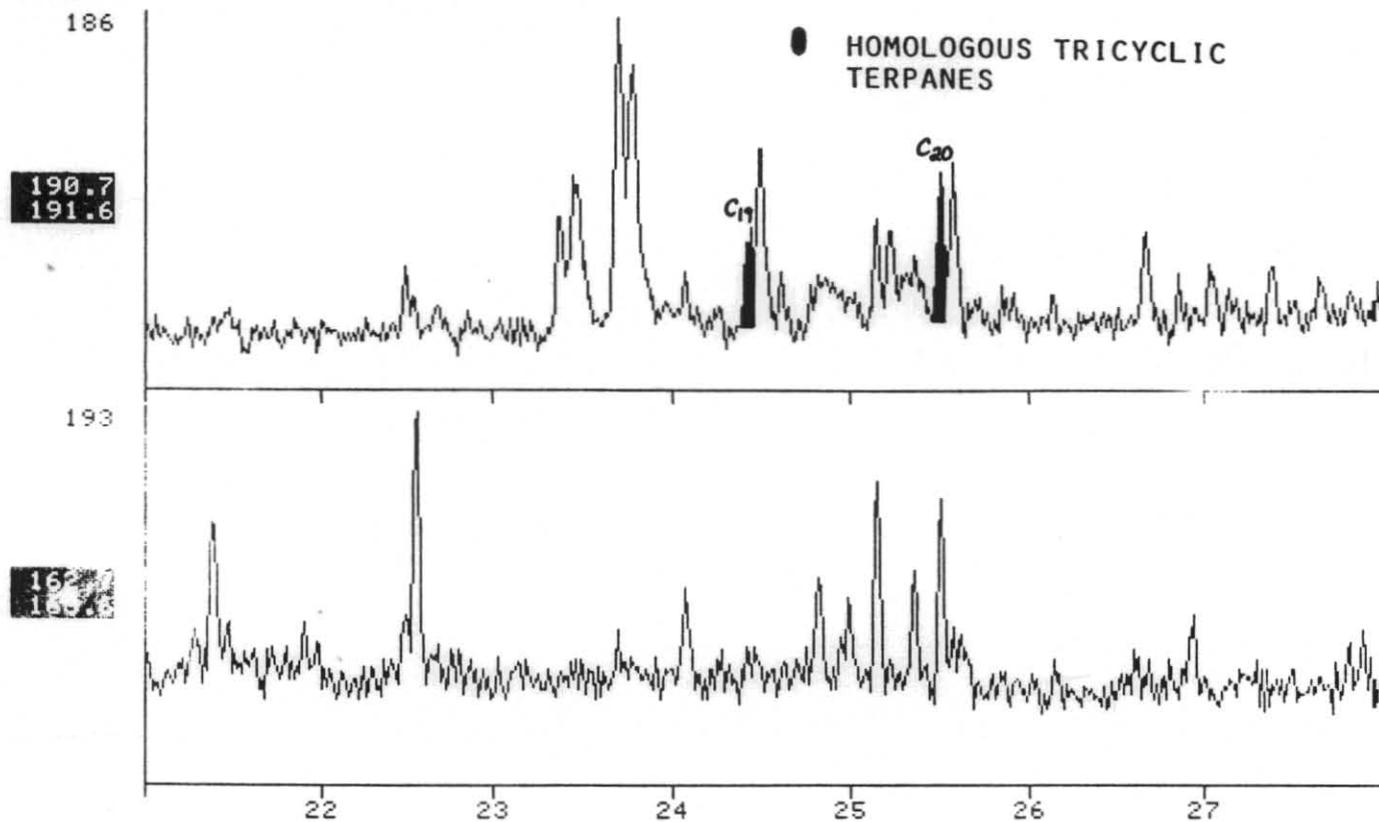


FIGURE: 2-17h

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70\$

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 20-3-86. GEC. 0.2/100ul. COL#70\$

FRN 6239

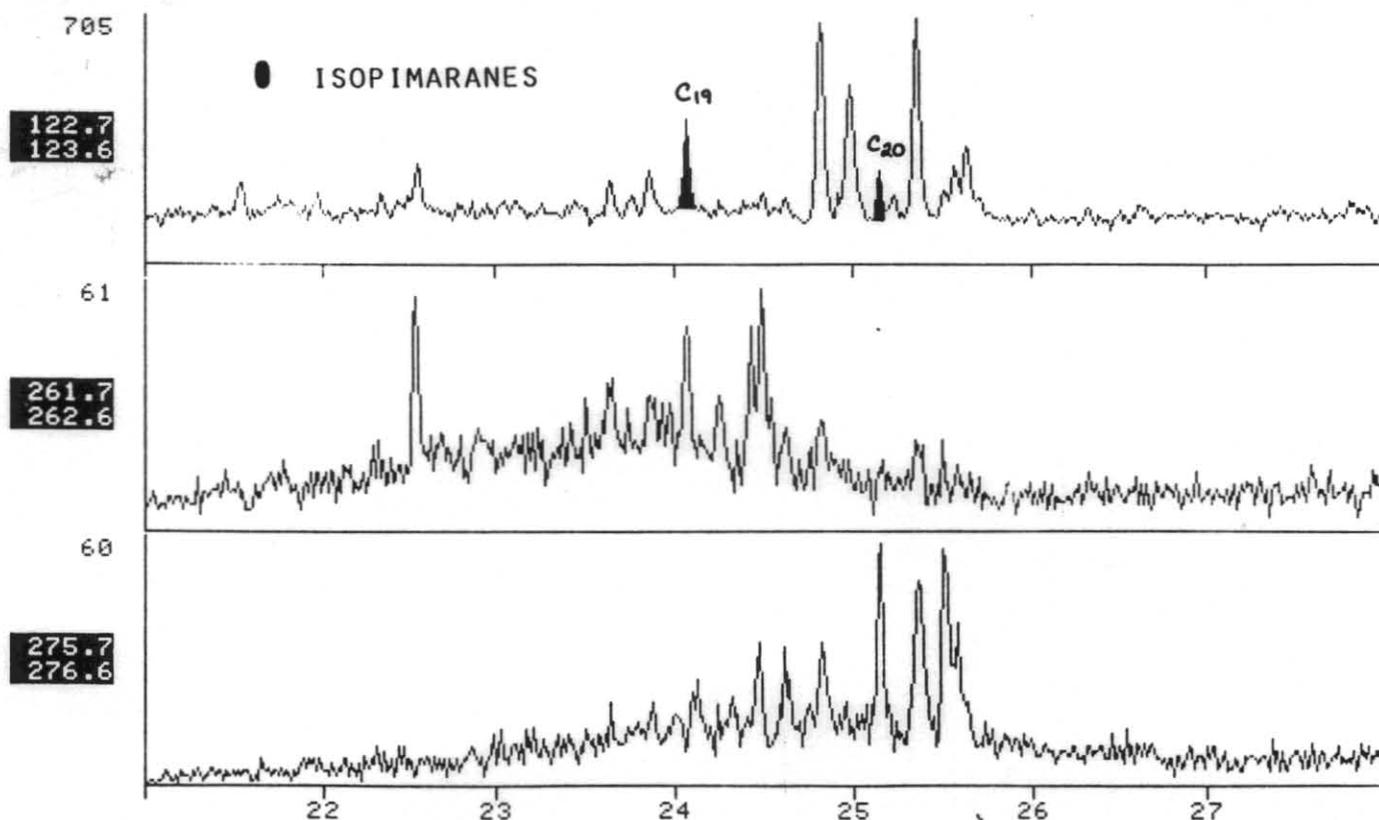
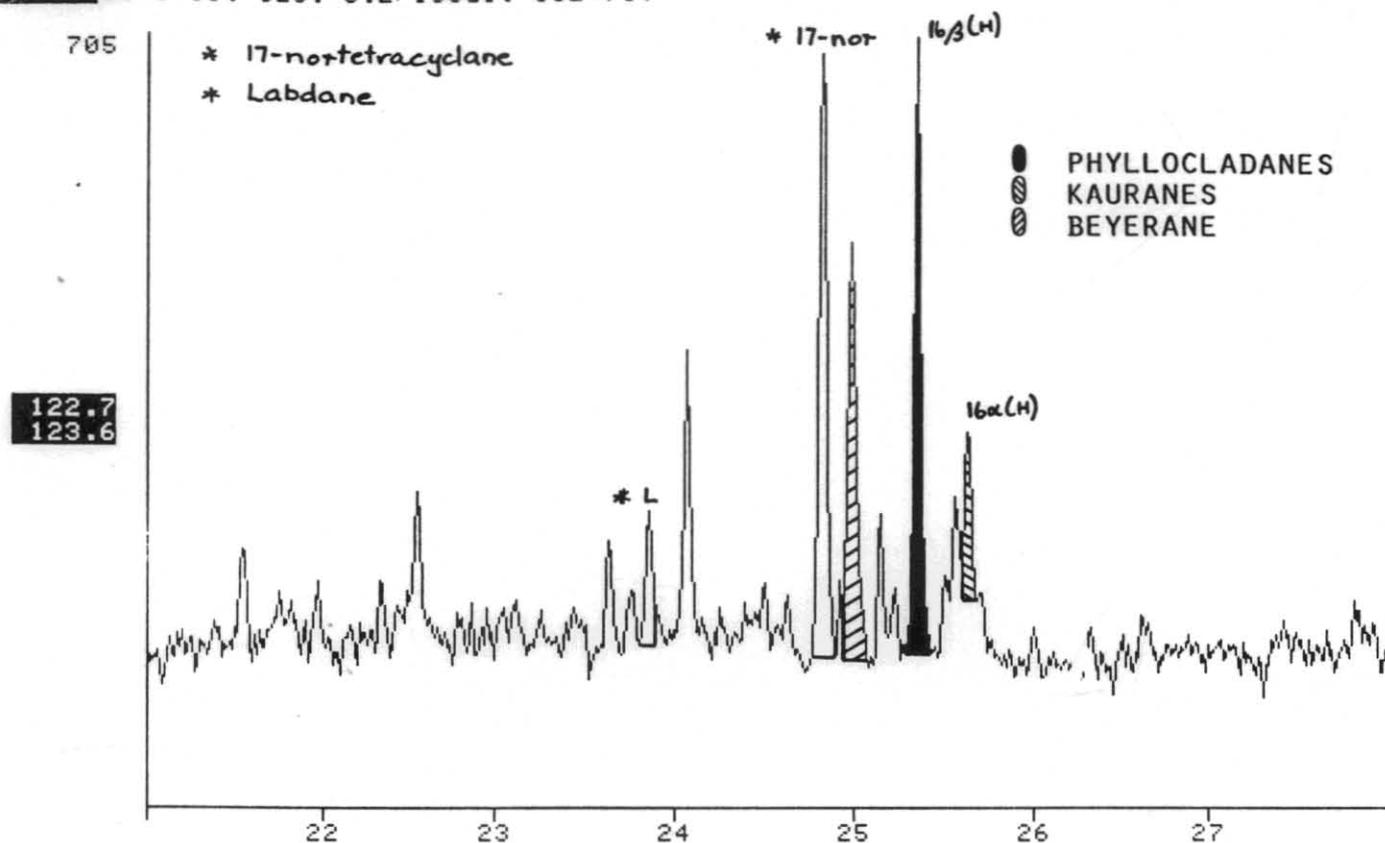


FIGURE: 2-17i

NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70\$

FRN 6239



NAME PELICAN#3, 9386.6'. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 20-3-86. GEC. 0.2/100ul. COL#70\$

FRN 6239

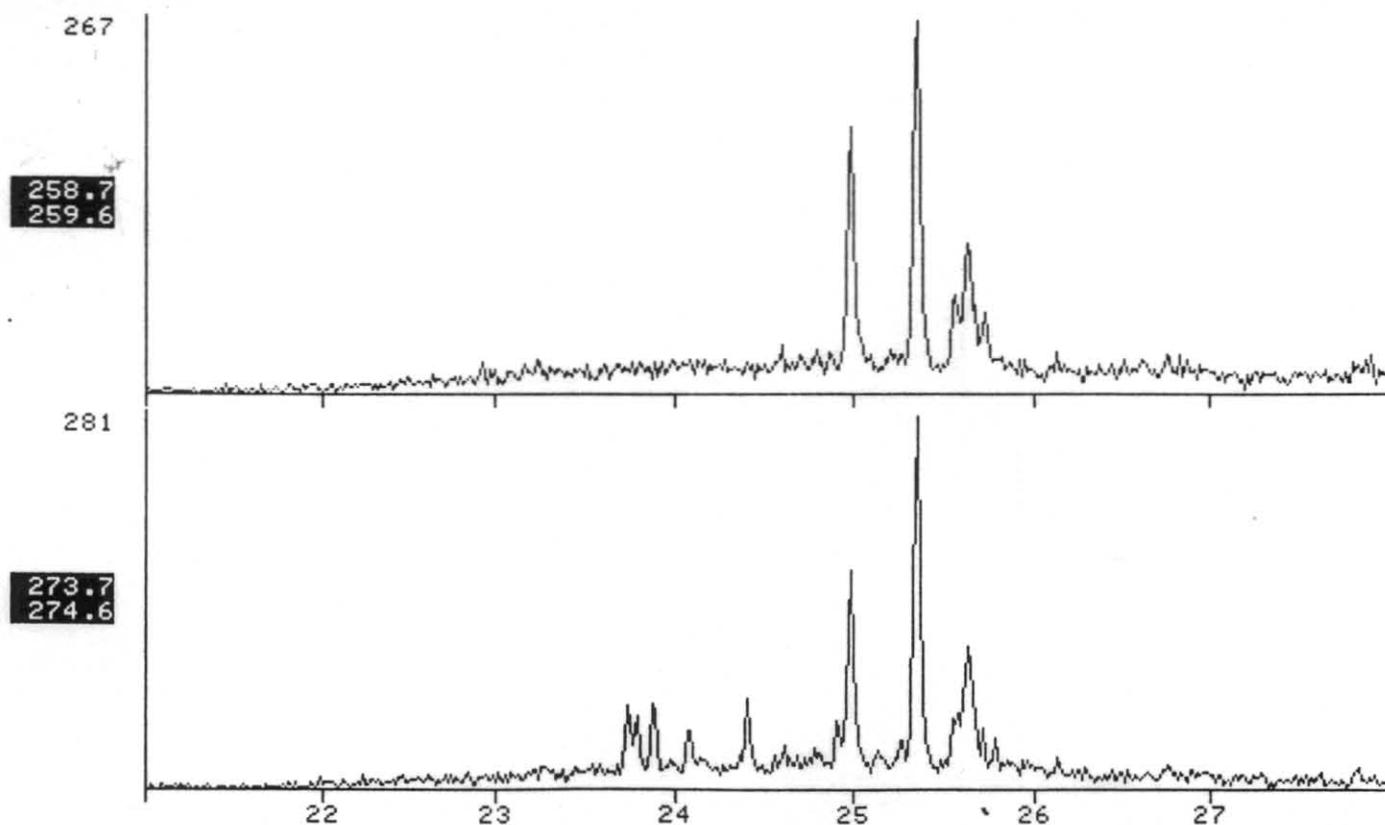
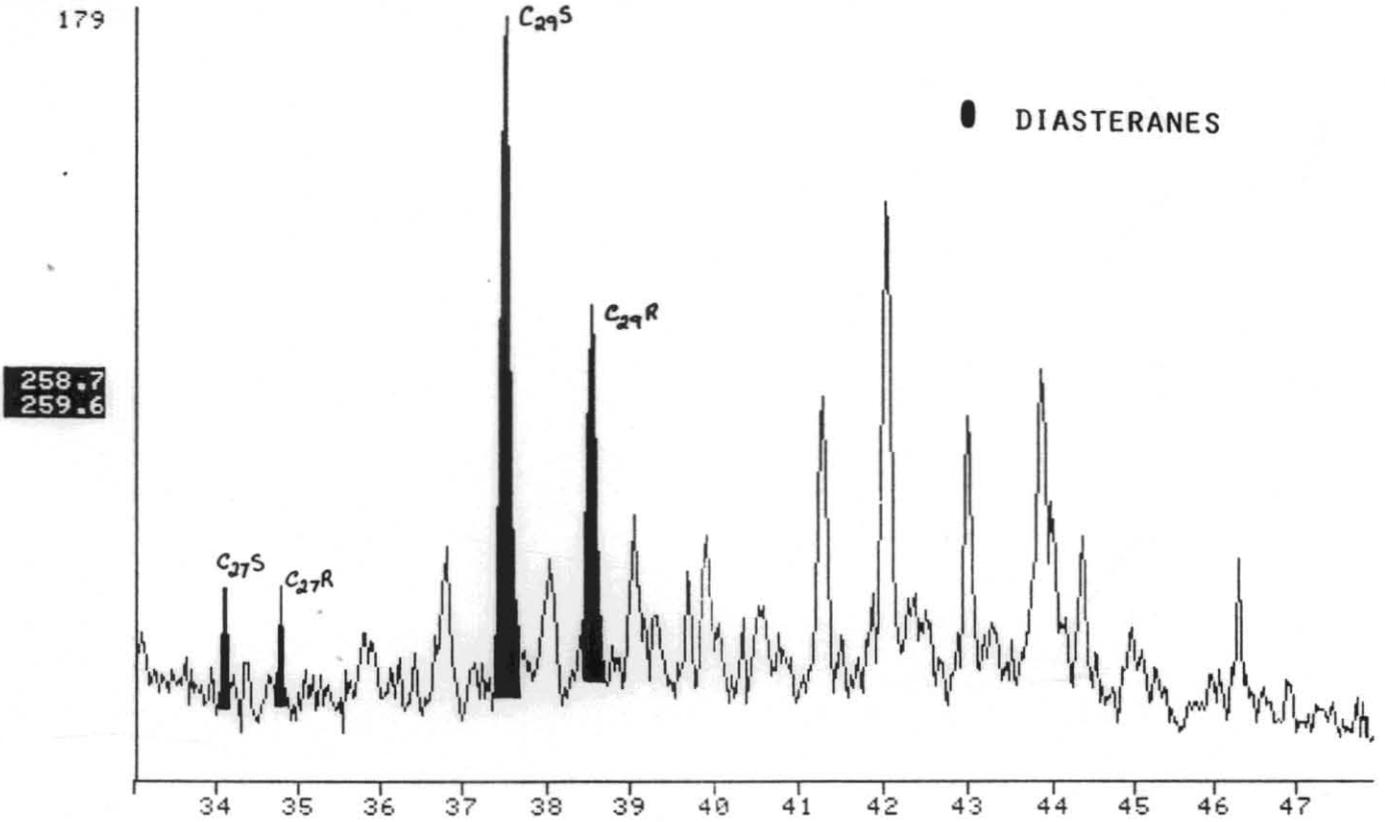


FIGURE: 2-18a

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

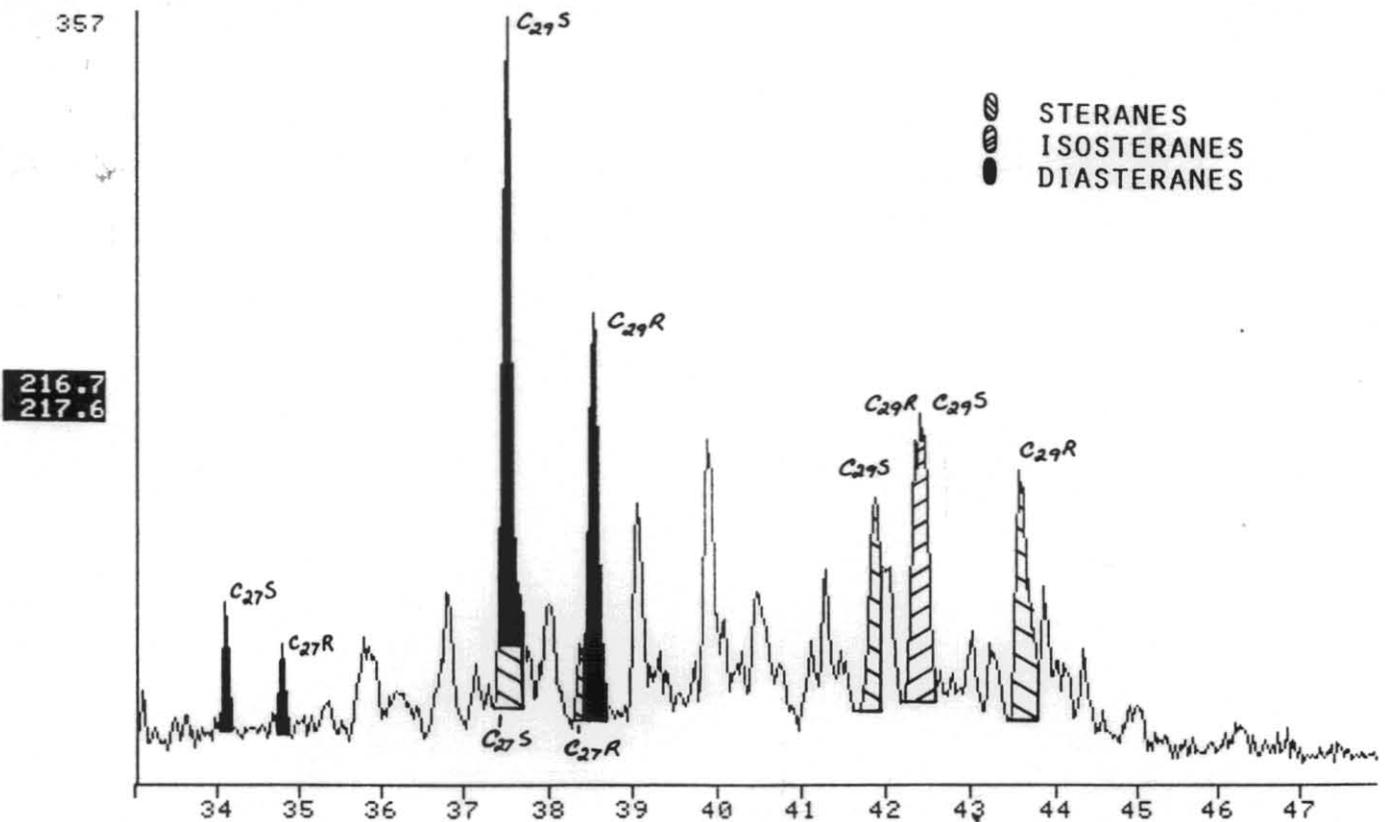
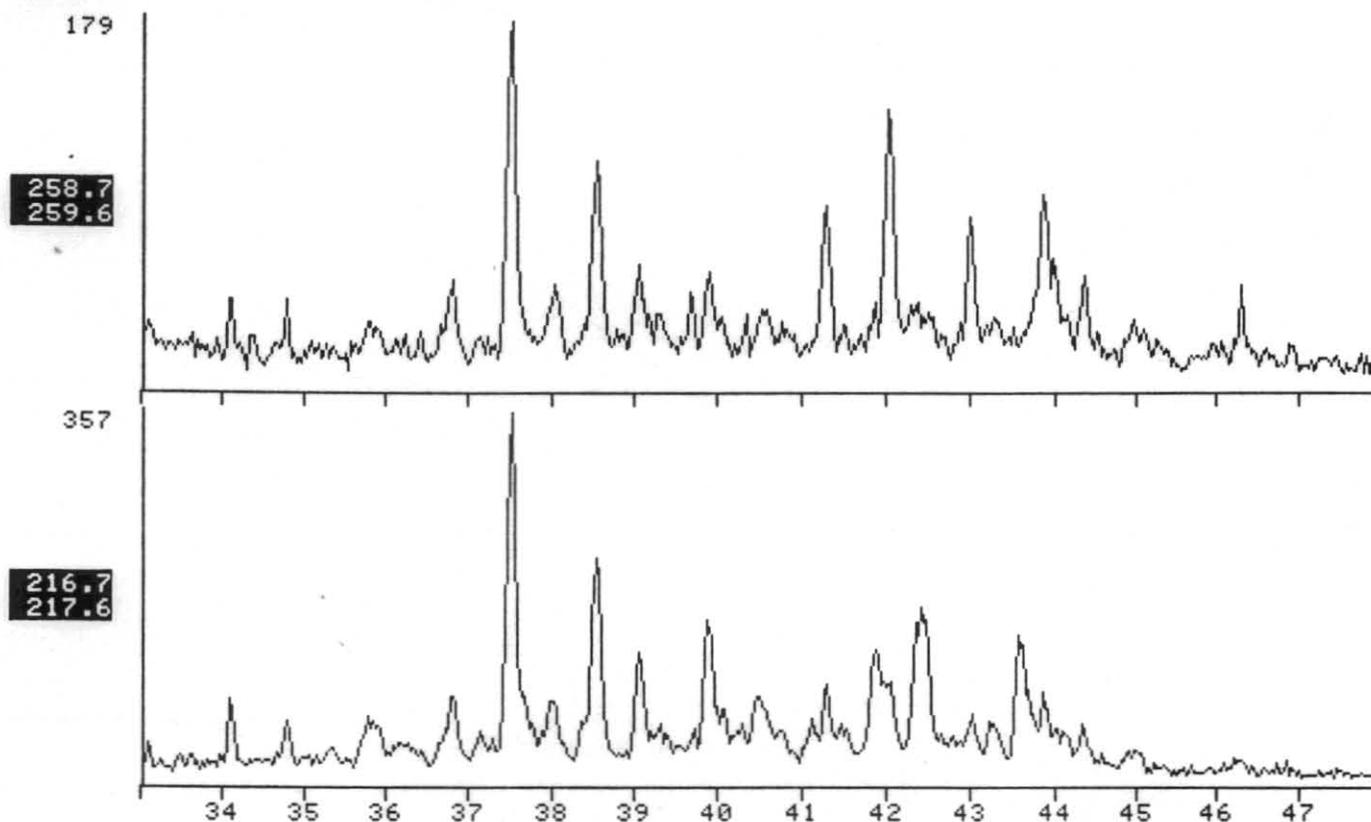


FIGURE: 2-18b

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

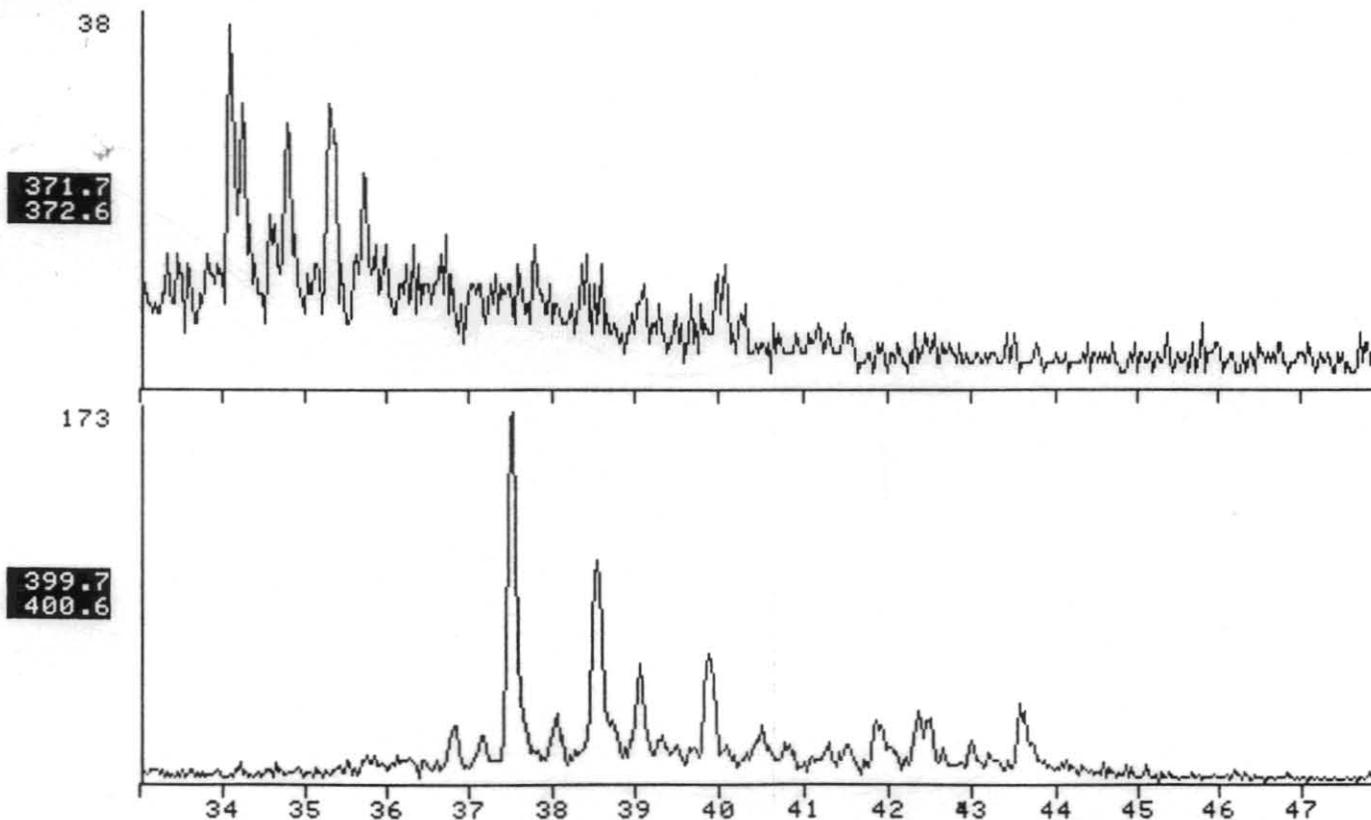
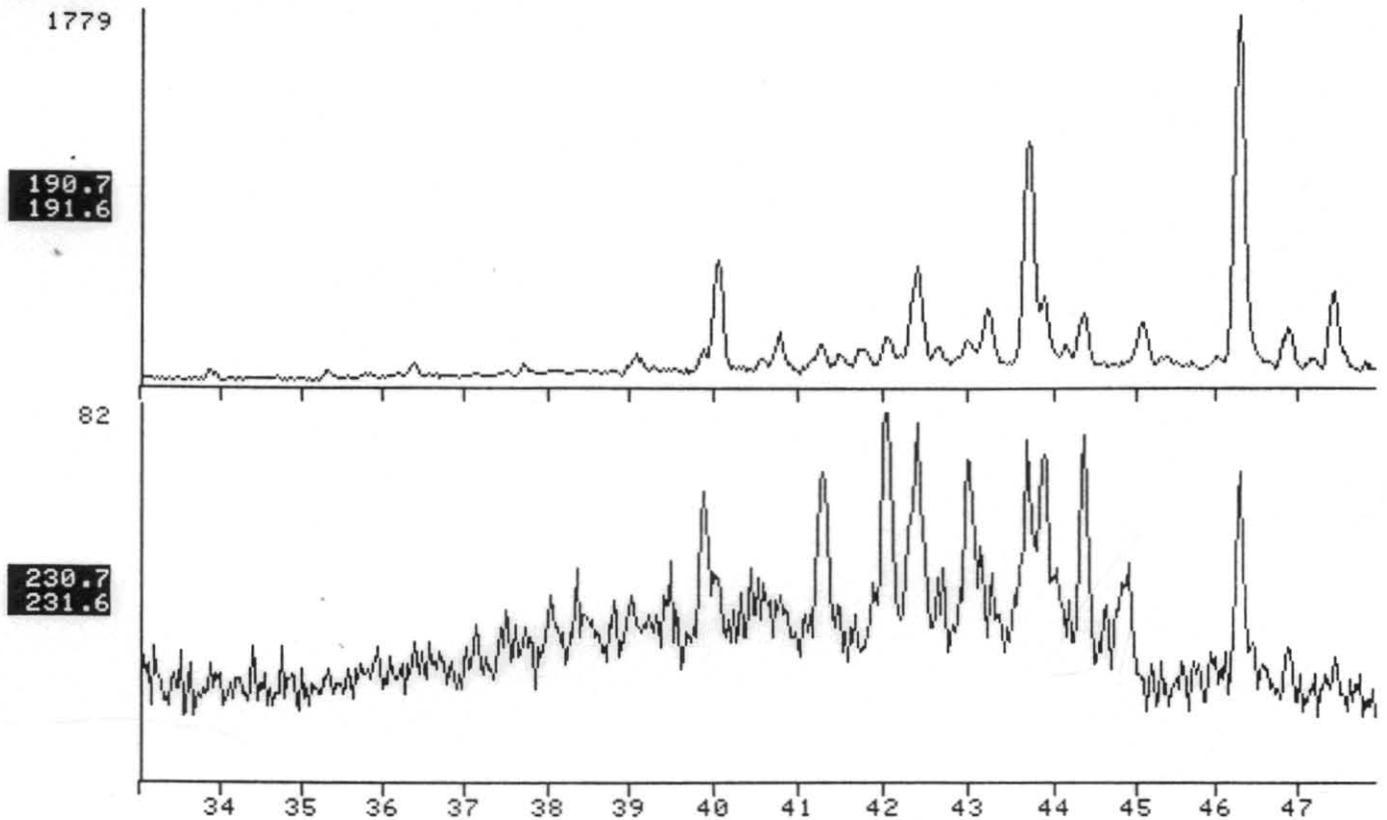


FIGURE: 2-18c

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

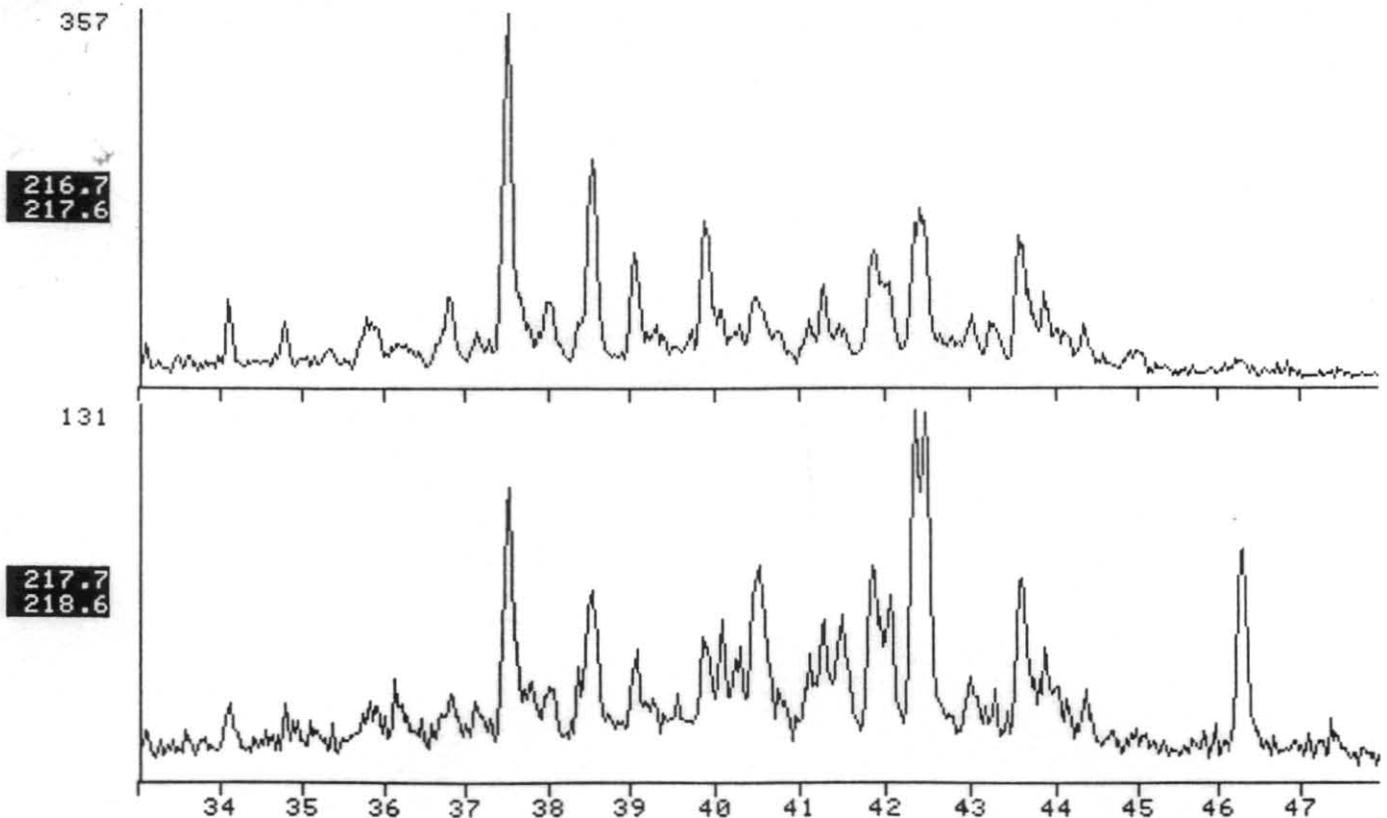
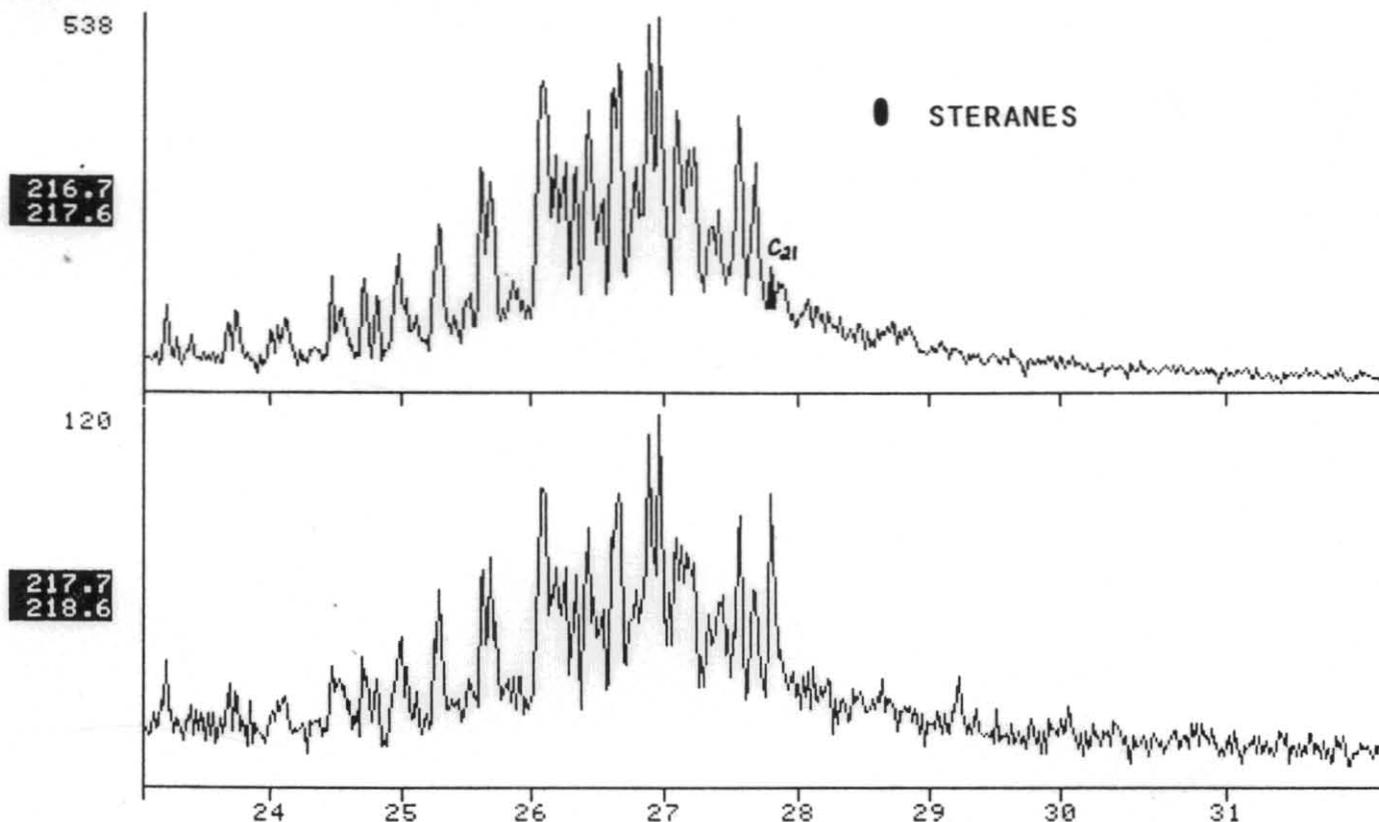


FIGURE: 2-18d

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

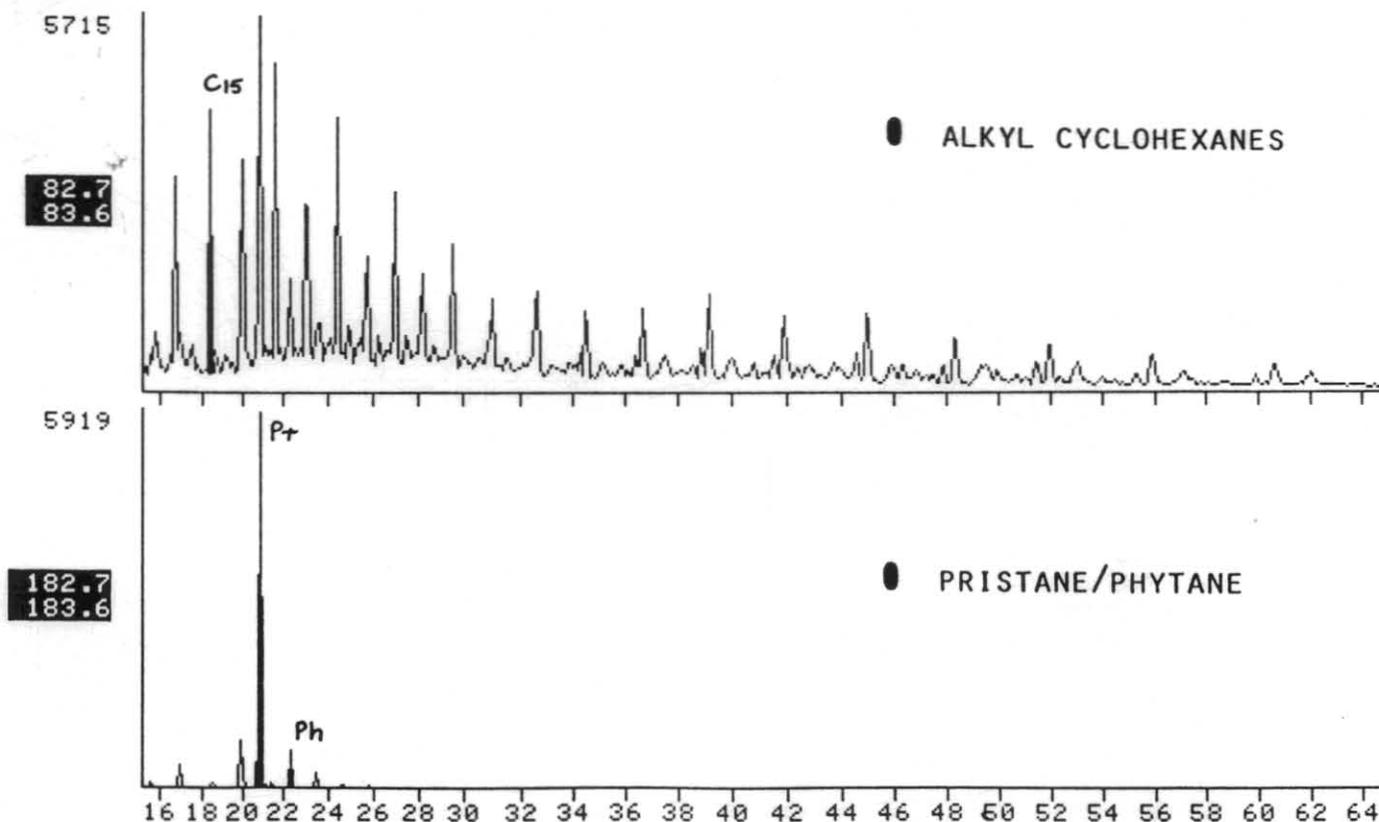
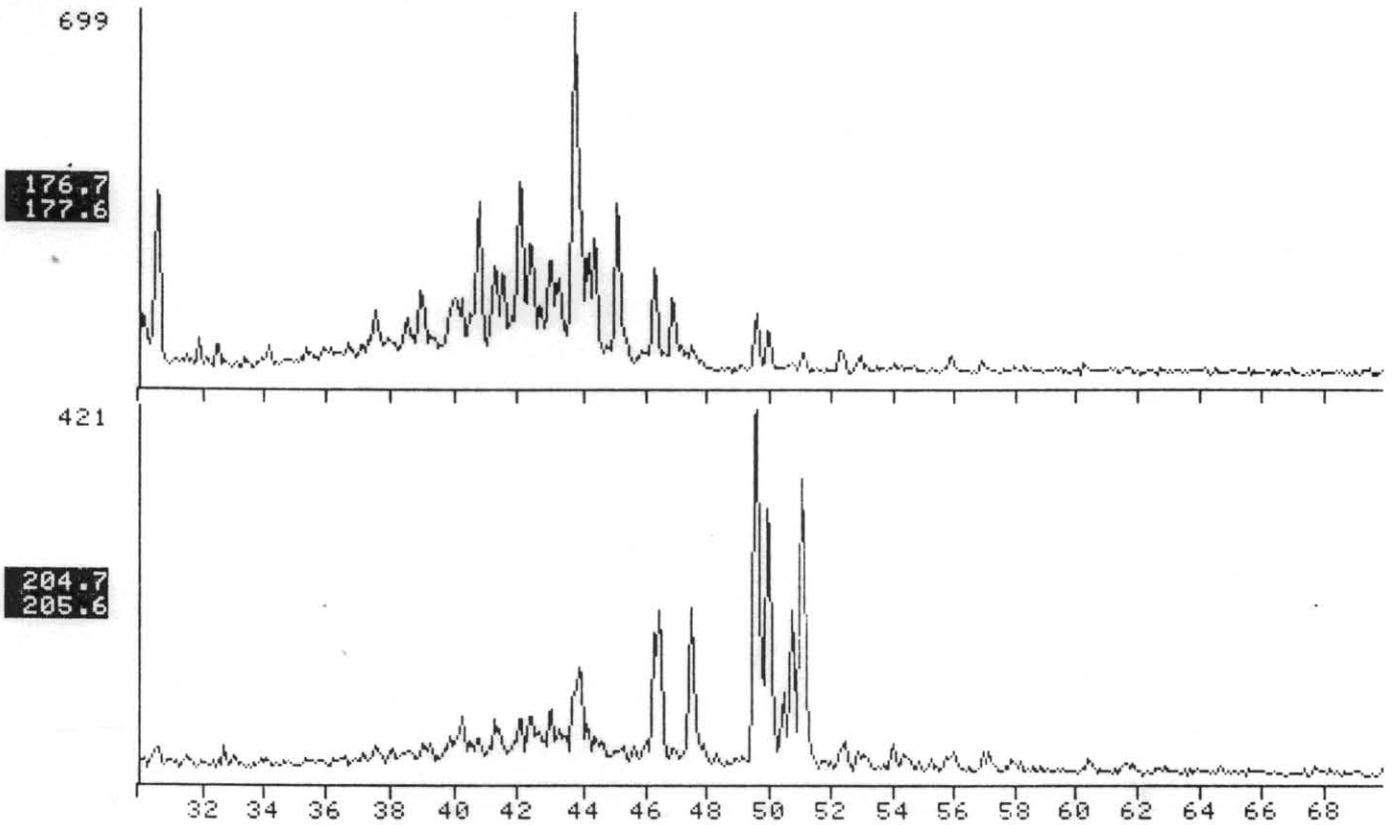


FIGURE: 2-18e

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

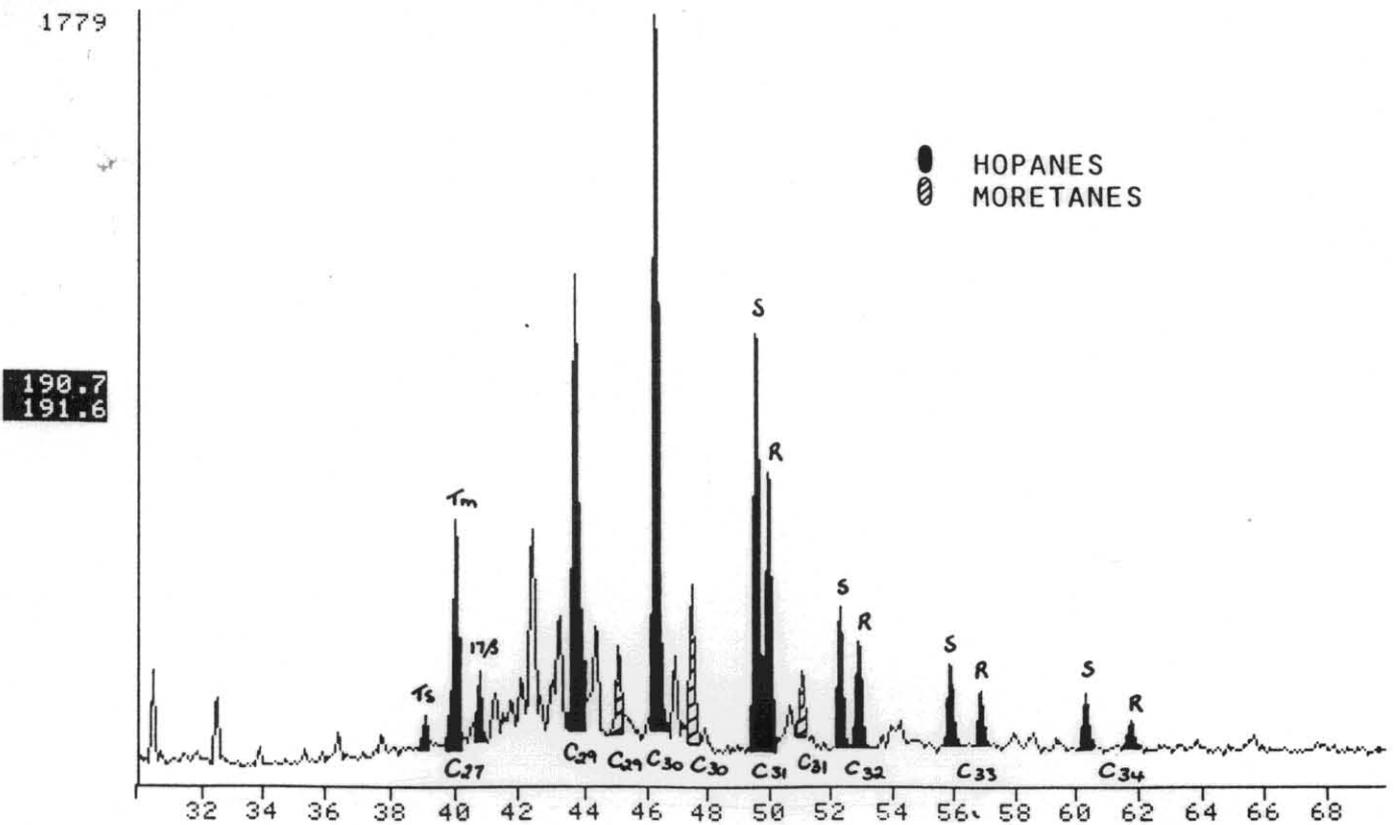
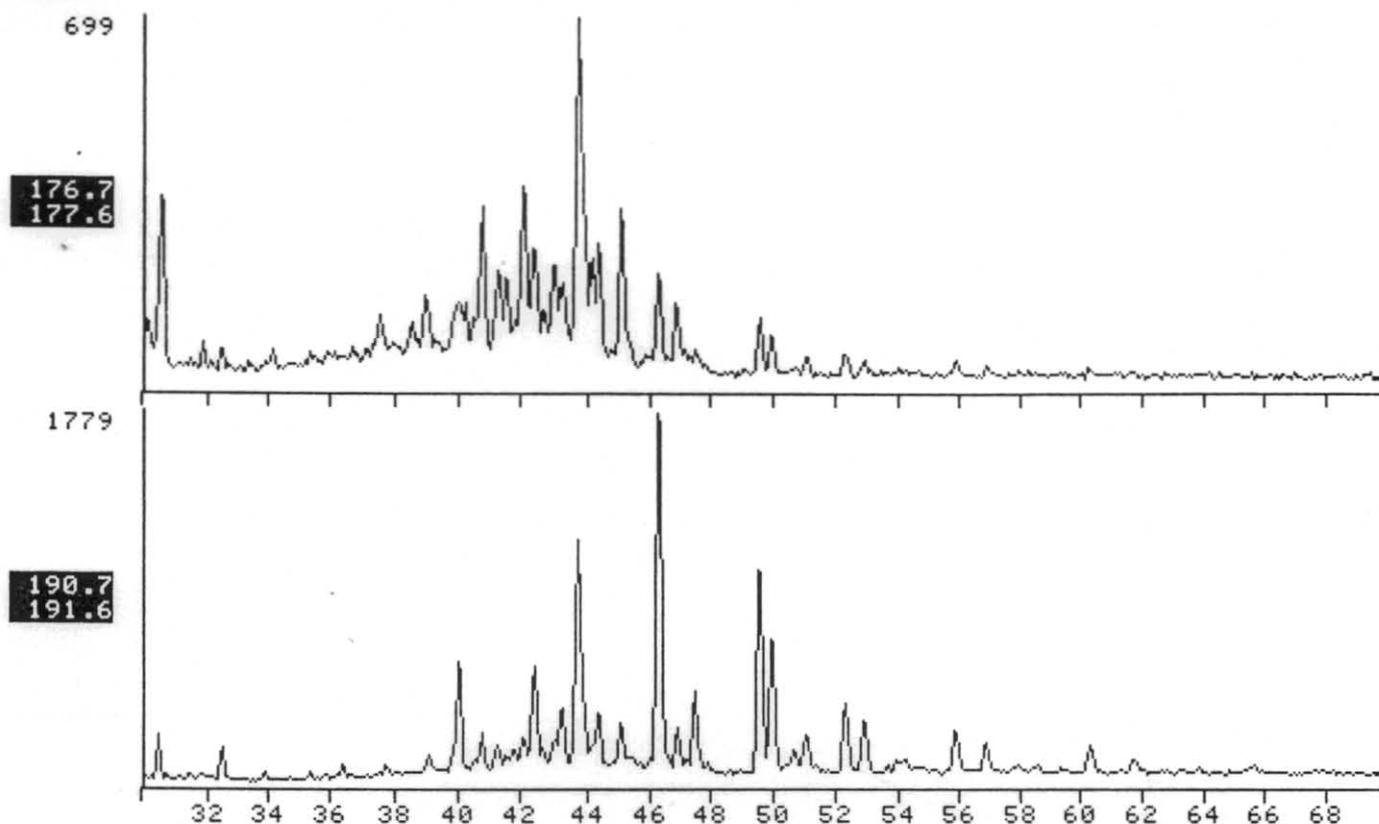


FIGURE: 2-18f

NAME: TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC: 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME: TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC: 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

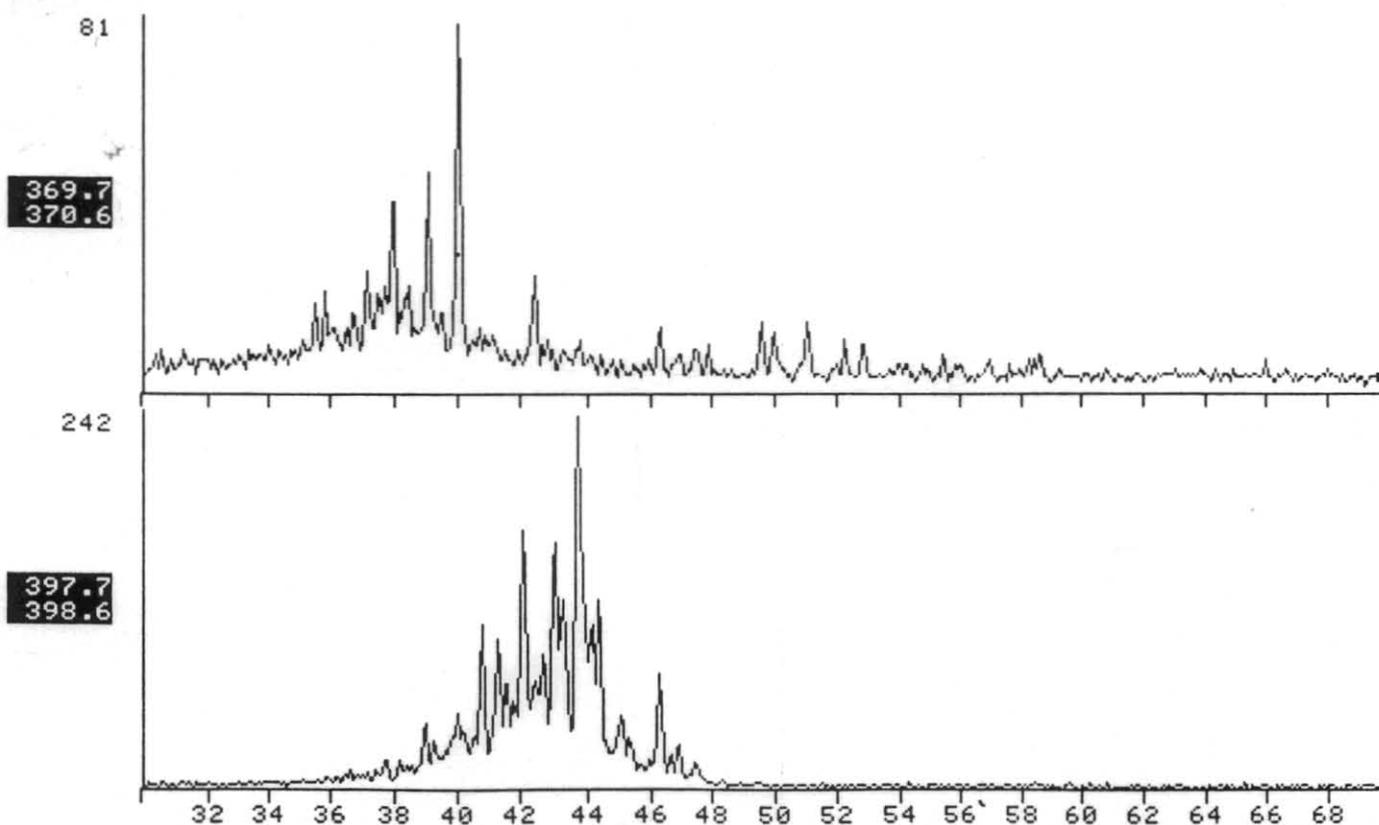
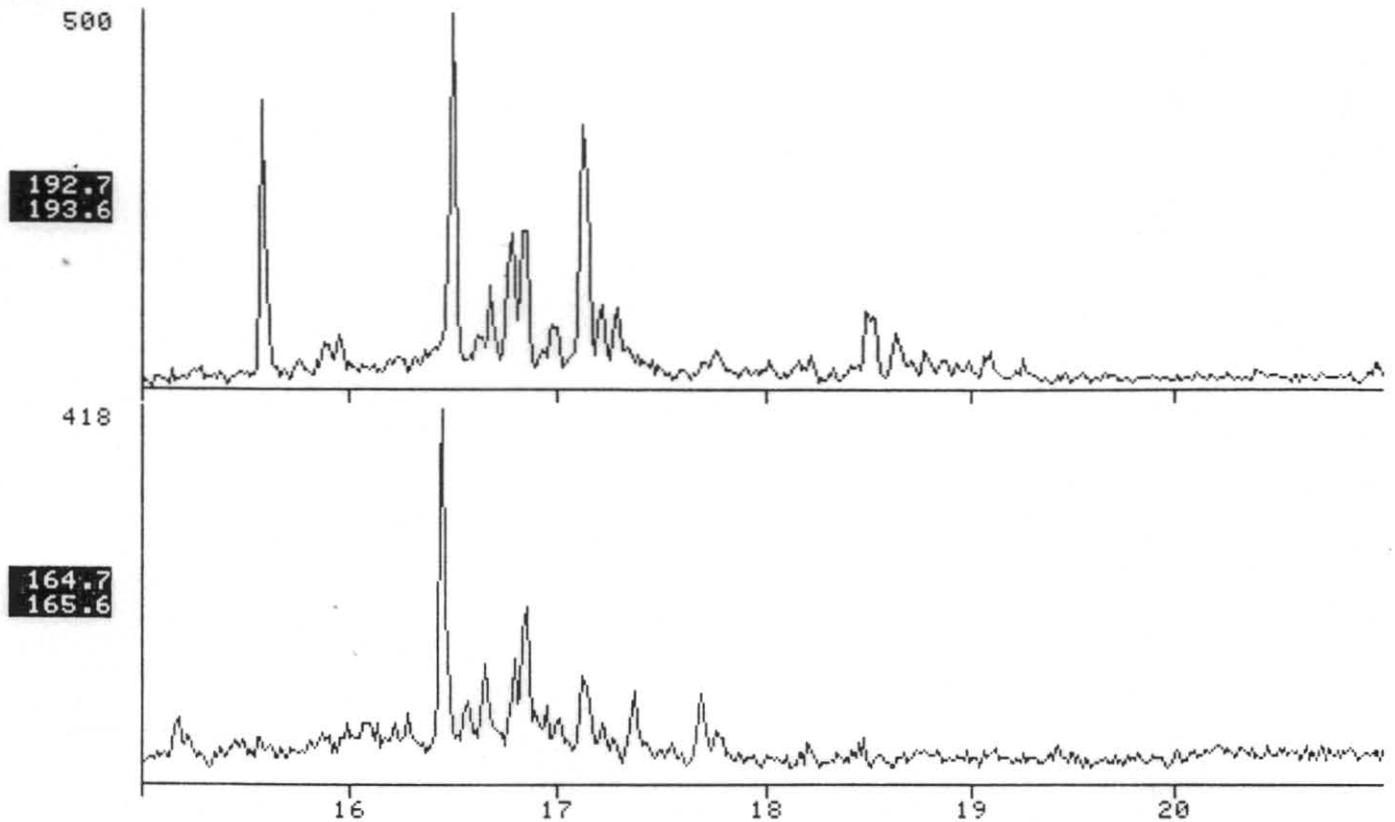


FIGURE: 2-18g

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

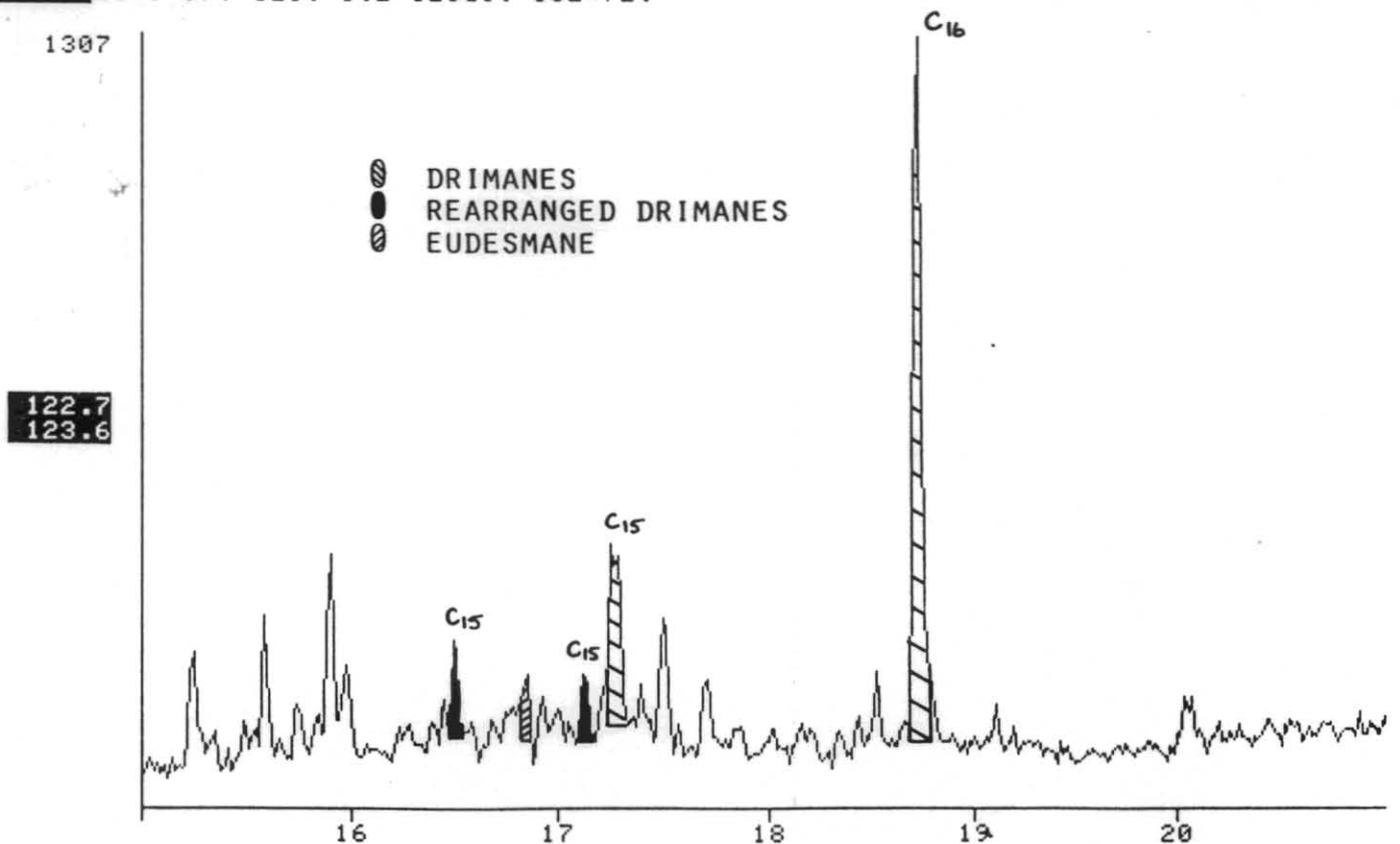
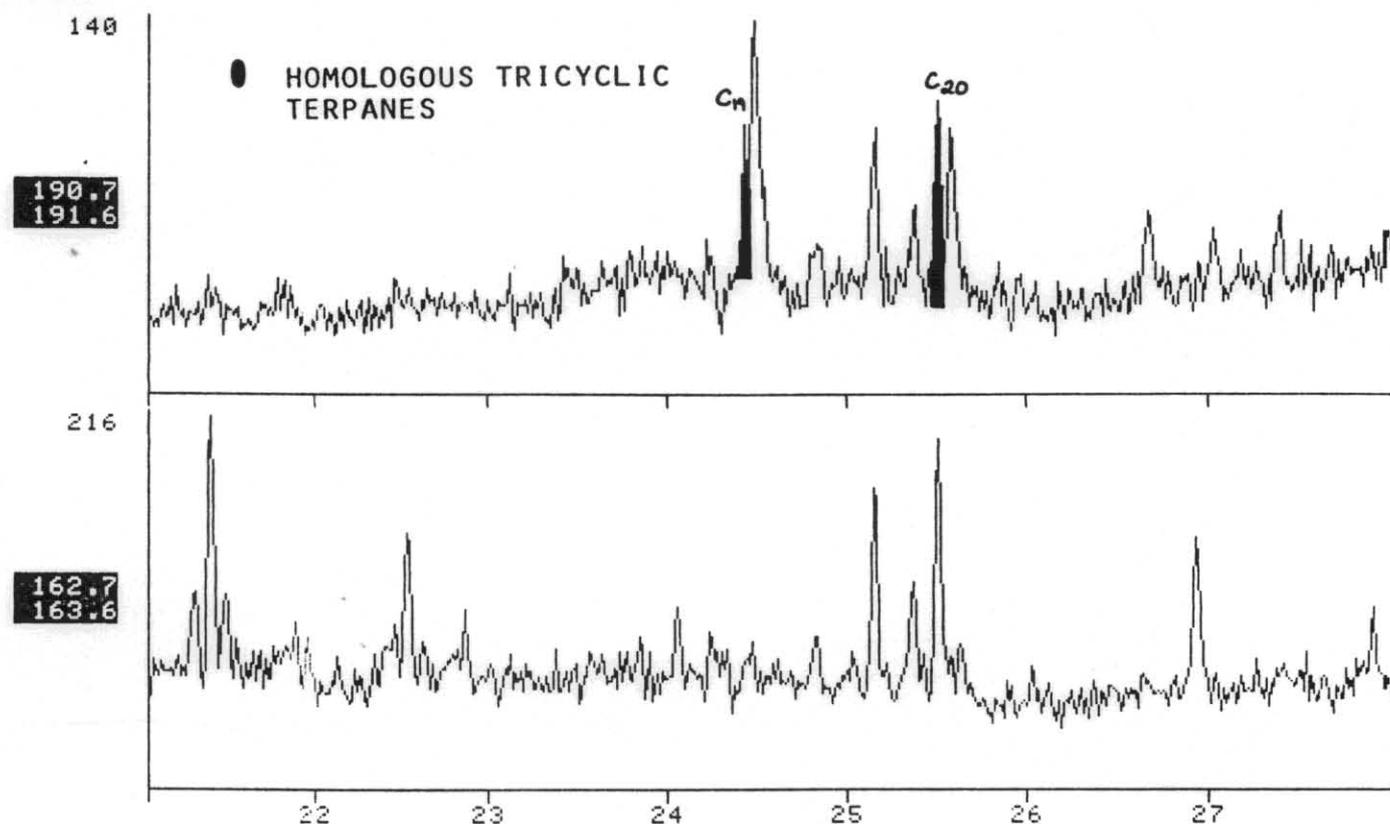


FIGURE: 2-18h

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

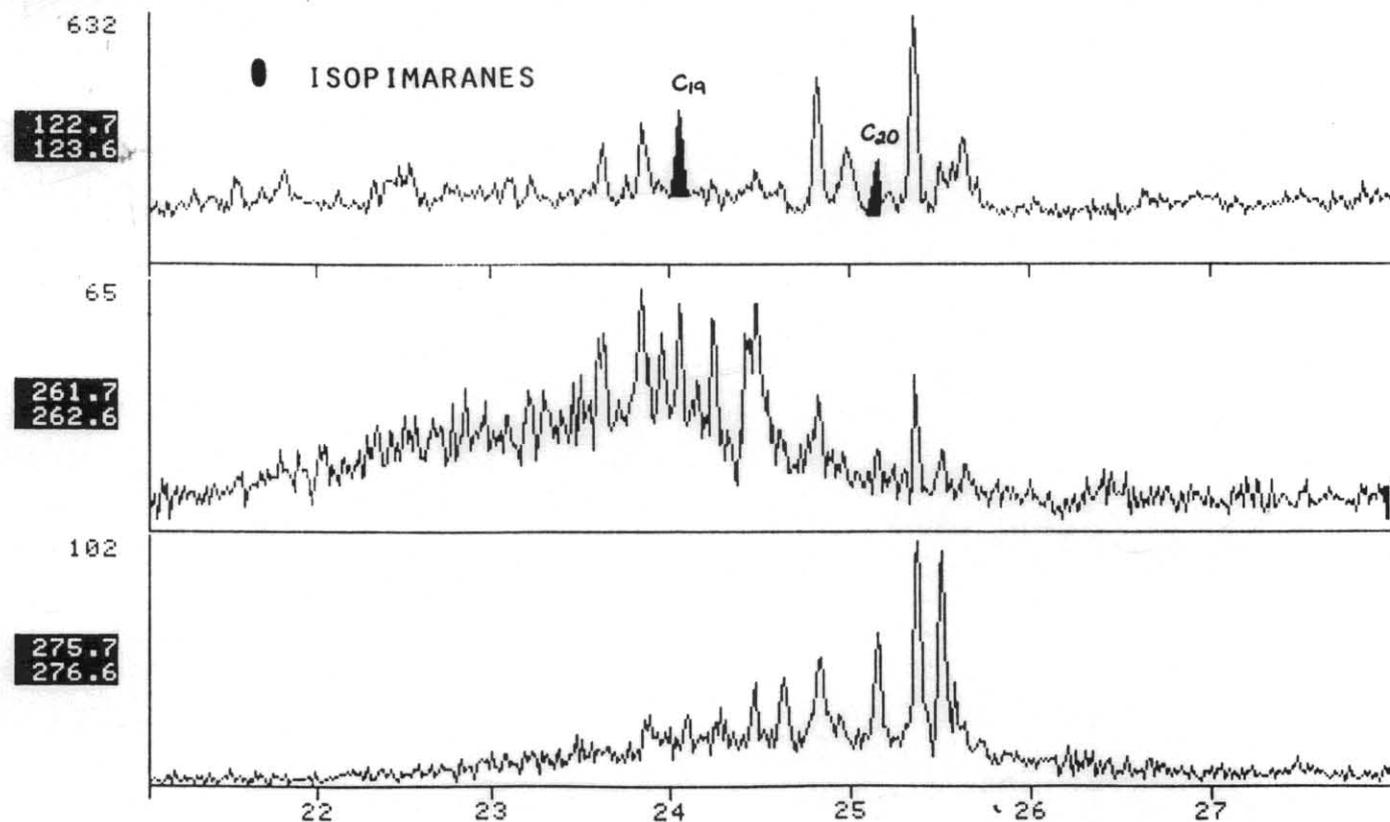
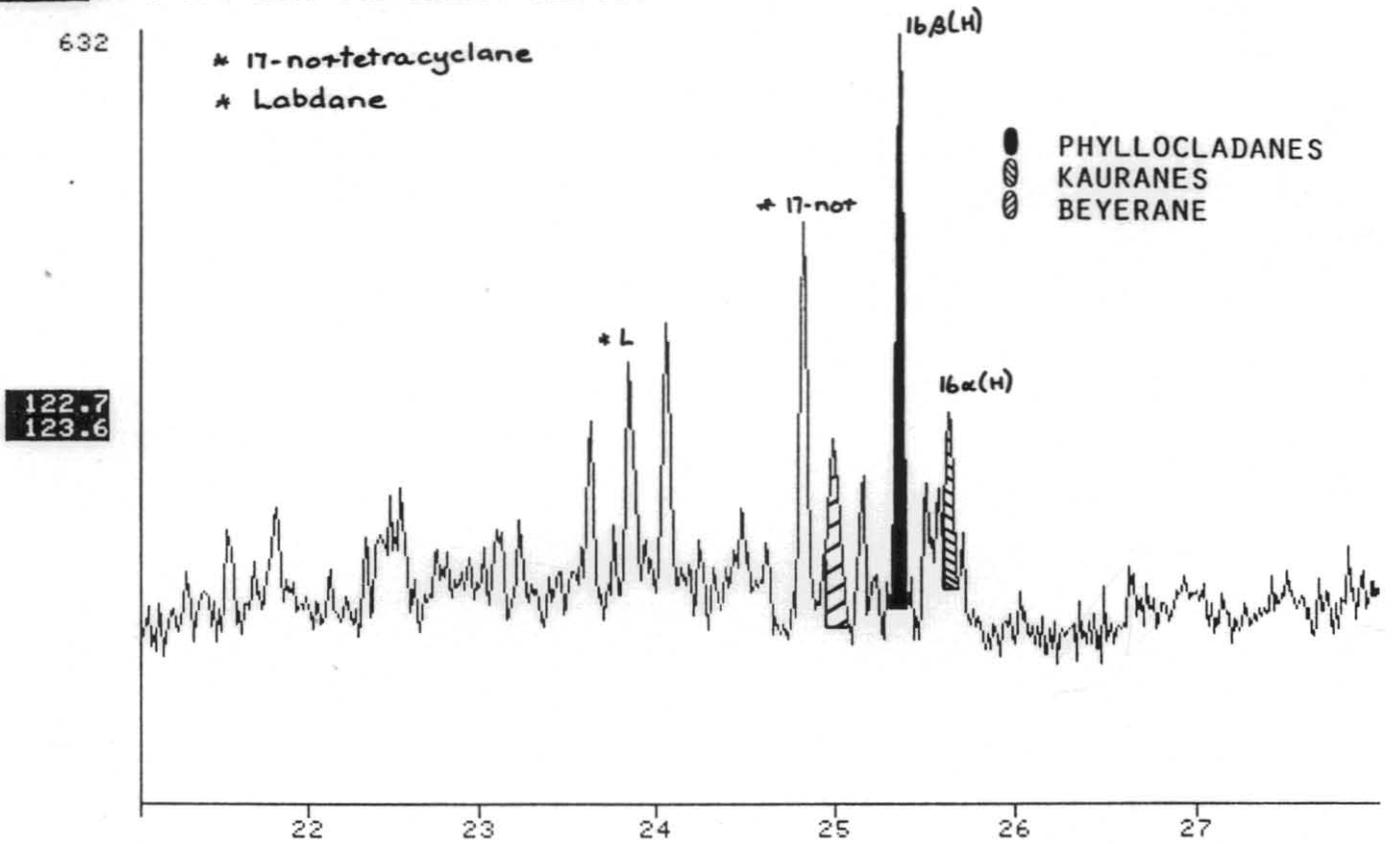


FIGURE: 2-18i

NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243



NAME TILANA#1, 2800.9m. BRANCHED CYCLIC FRAGMENTOGRAM.
 MISC 23-3-87. GEC. 0.2/120ul. COL#72.

FRN 6243

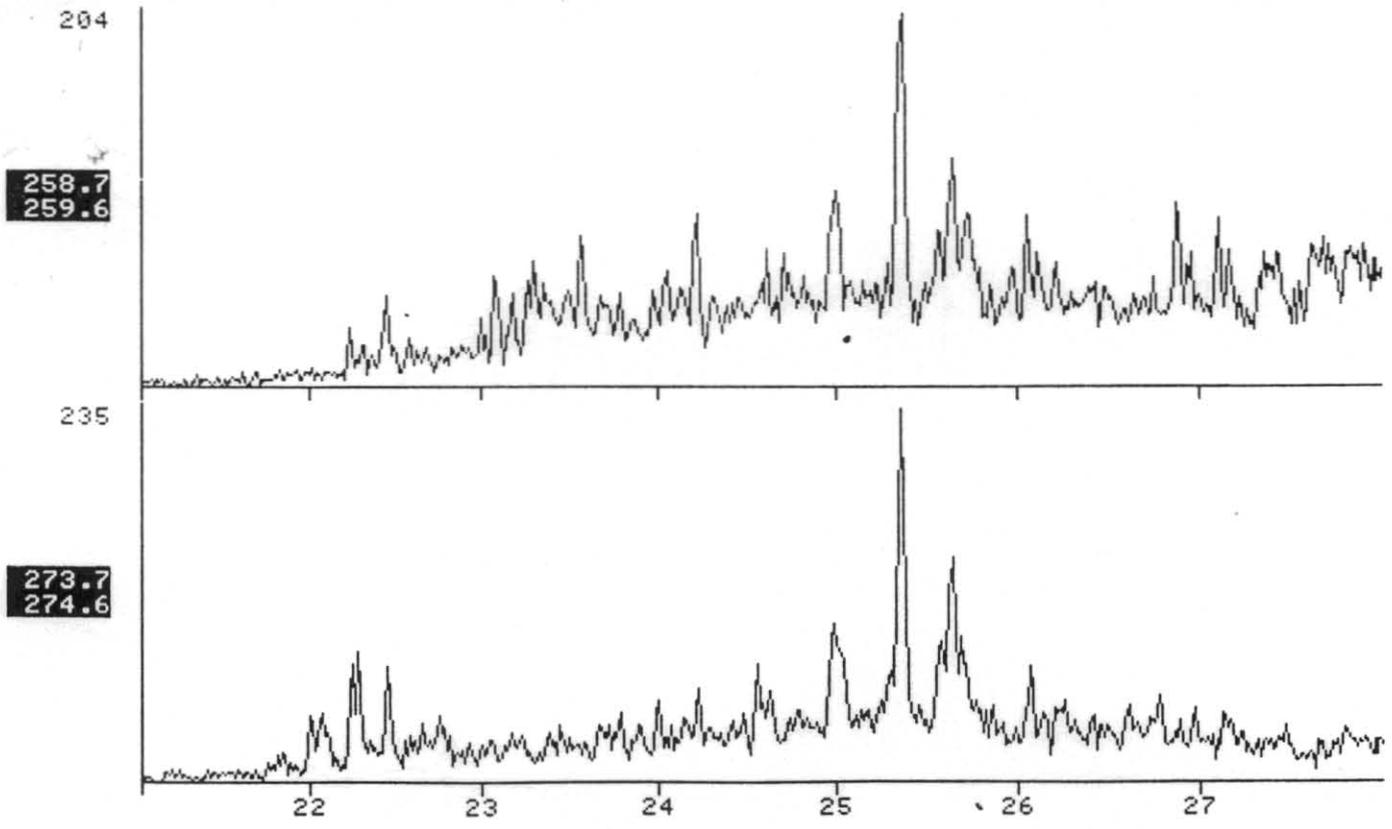
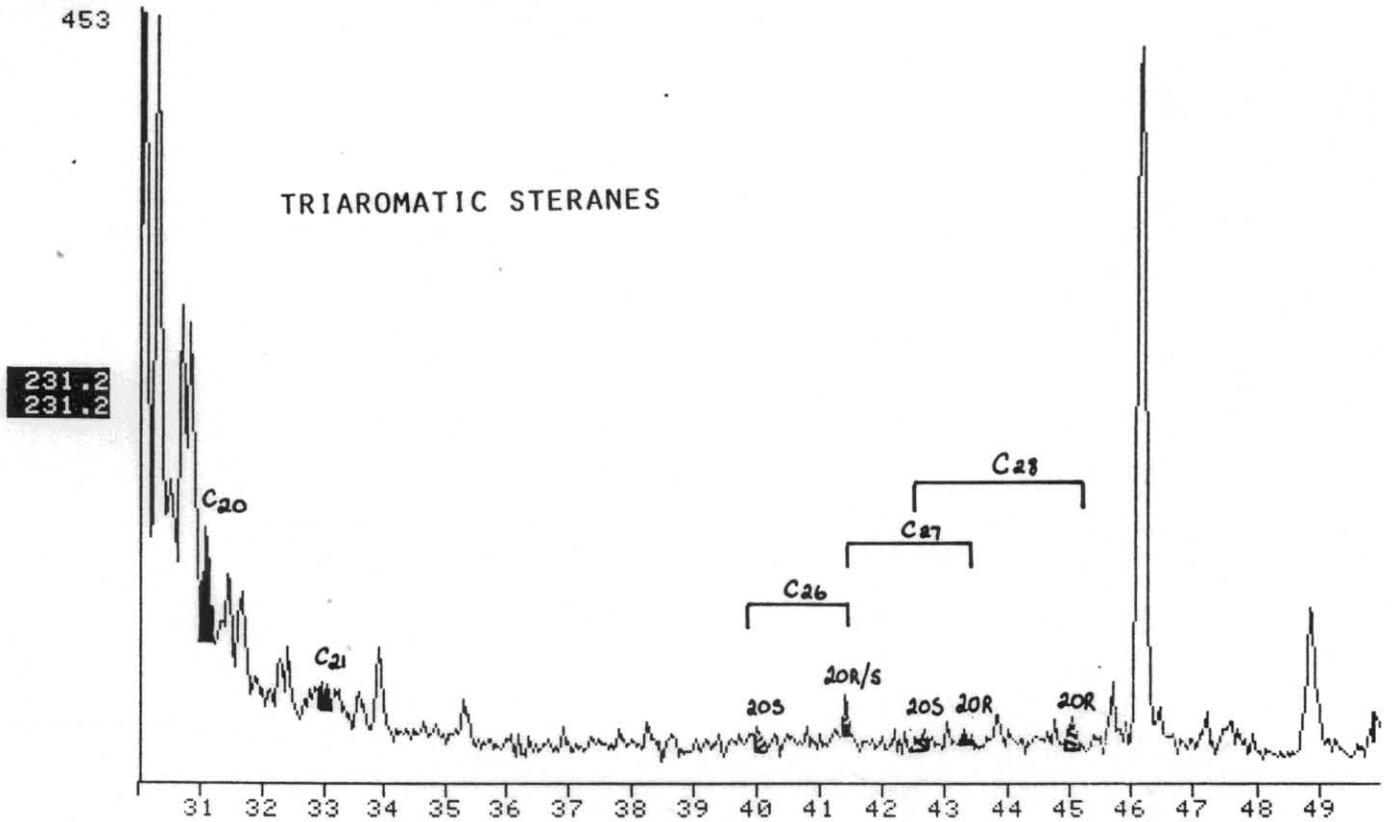


FIGURE: 3-1a

NAME BASS#1, 6405'. AROMATIC FRAGMENTOGRAM.
 MISC 5-3-87. GEC. 0.2/300ul. COL#72.

FRN 6206



NAME BASS#1, 6405'. AROMATIC FRAGMENTOGRAM.
 MISC 5-3-87. GEC. 0.2/300ul. COL#72.

FRN 6206

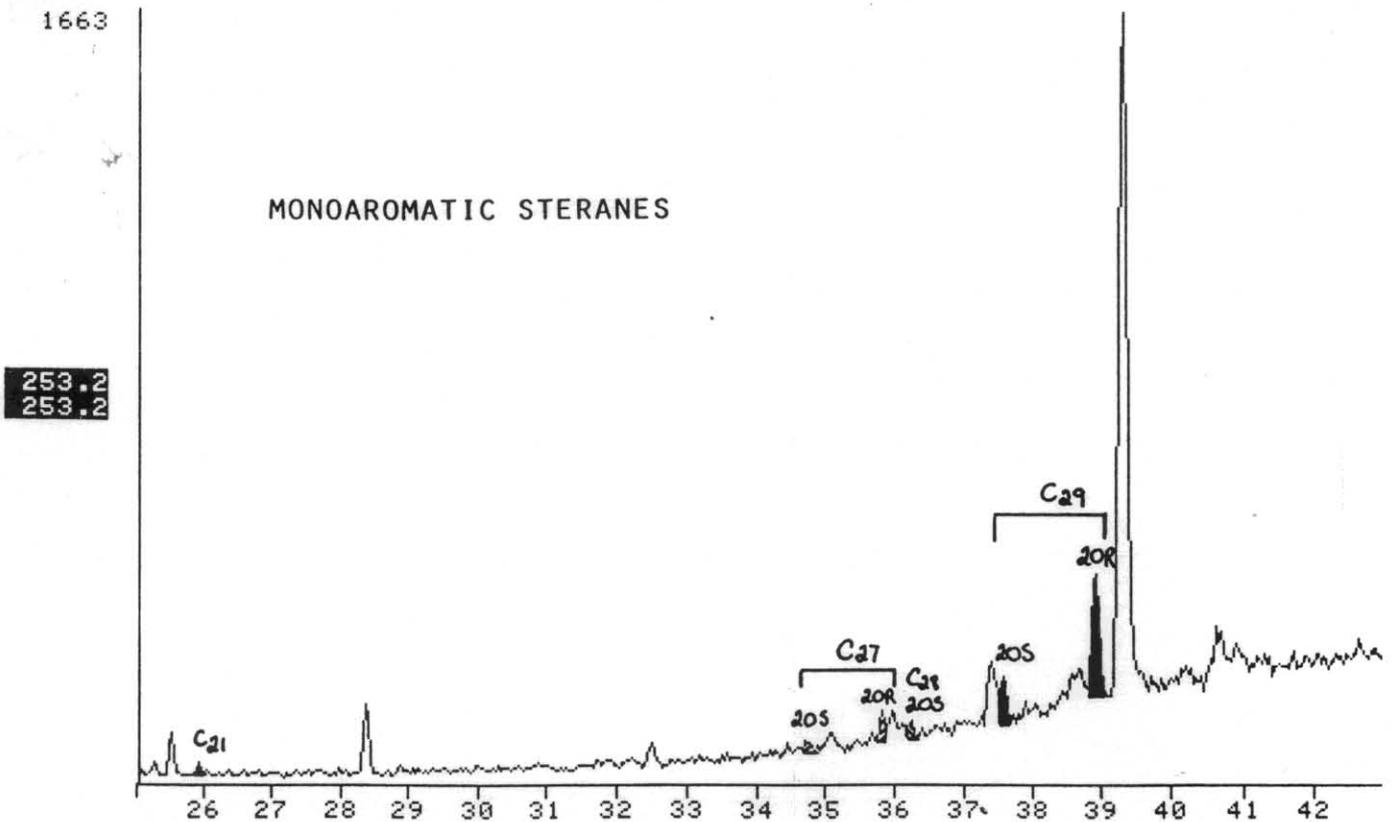
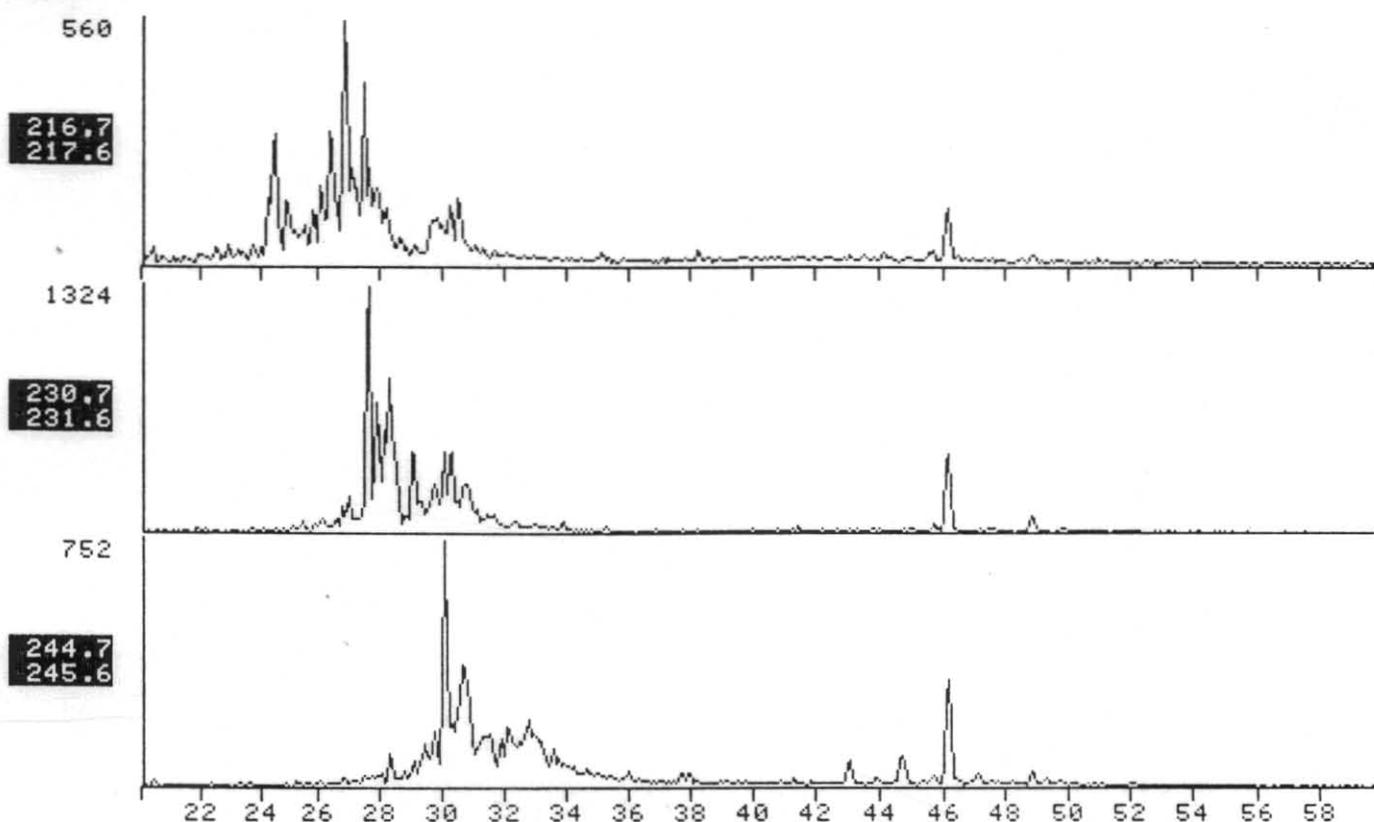


FIGURE: 3-1b

NAME BASS#1, 6405'. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/300ul. COL#72.

FRN 6206



NAME BASS#1, 6405'. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/300ul. COL#72.

FRN 6206

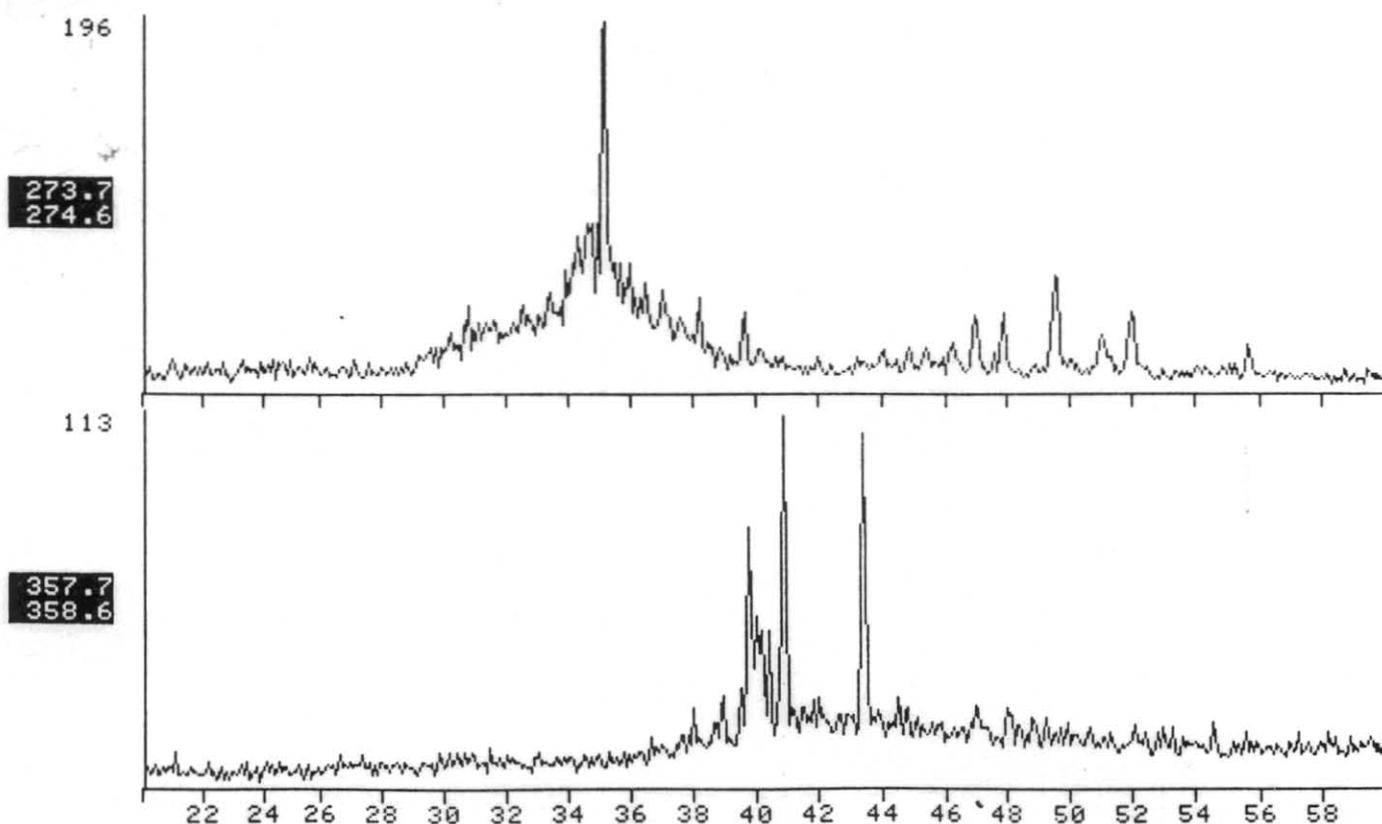
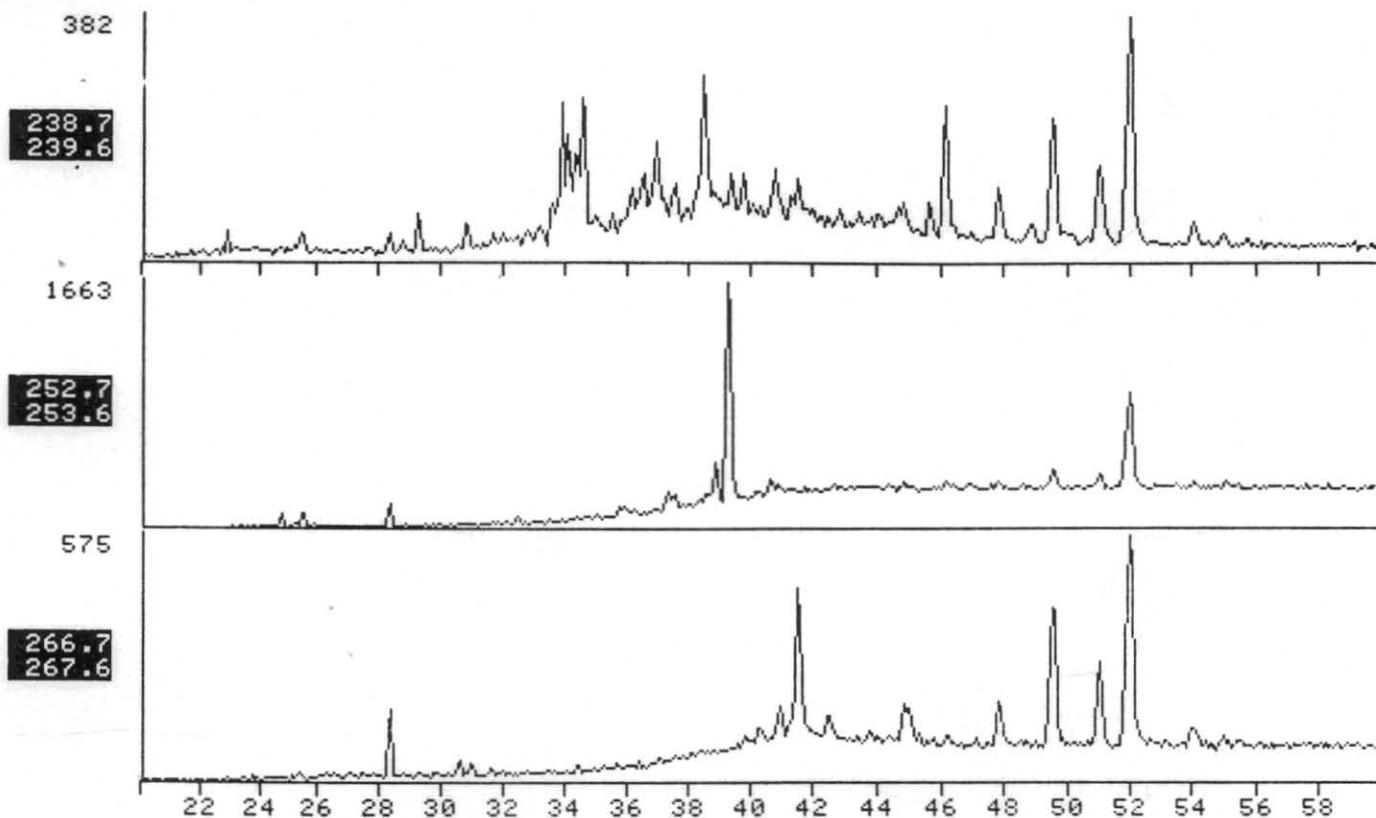


FIGURE: 3-1c

NAME BASS#1, 6405'. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/300ul. COL#72.

FRN 6206



NAME BASS#1, 6405'. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/300ul. COL#72.

FRN 6206

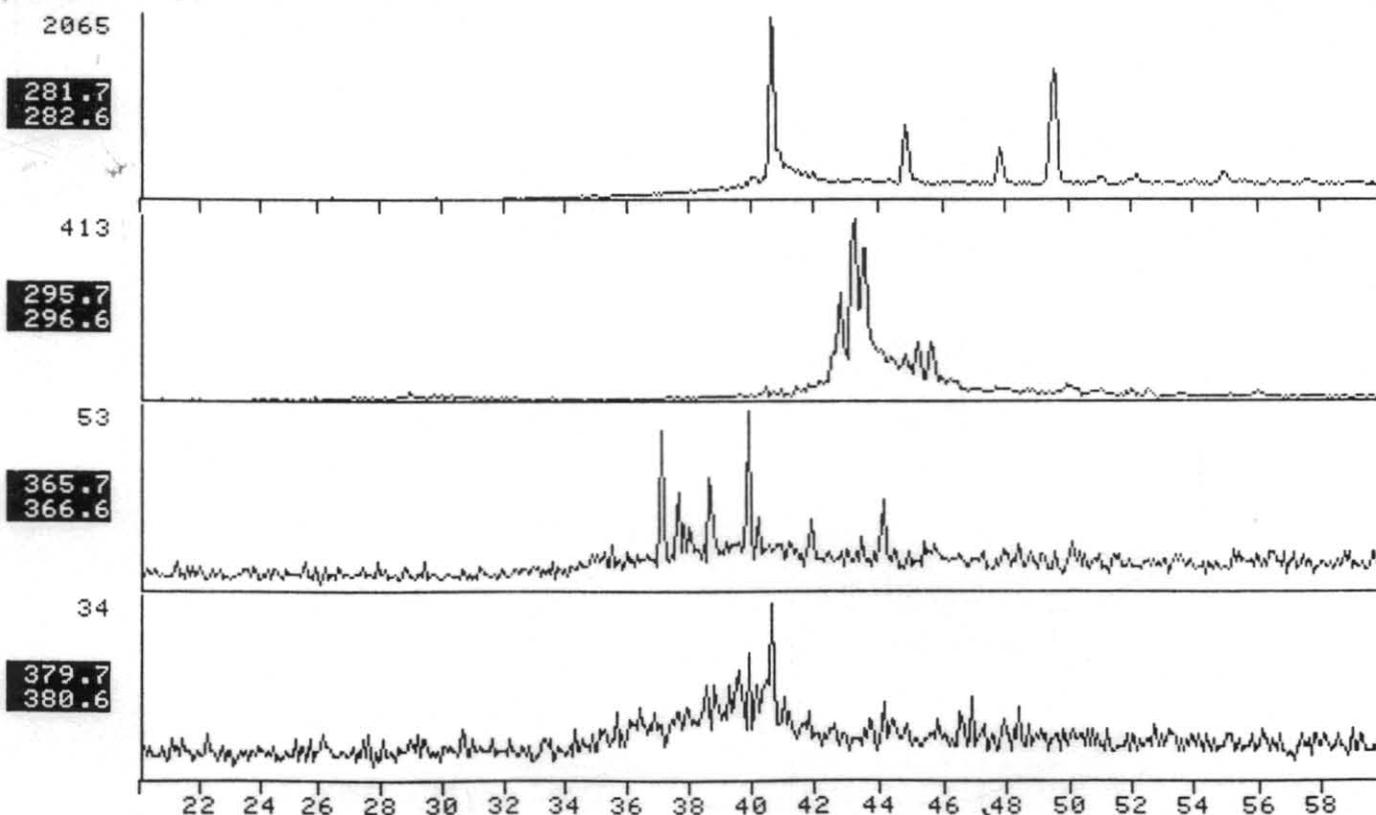
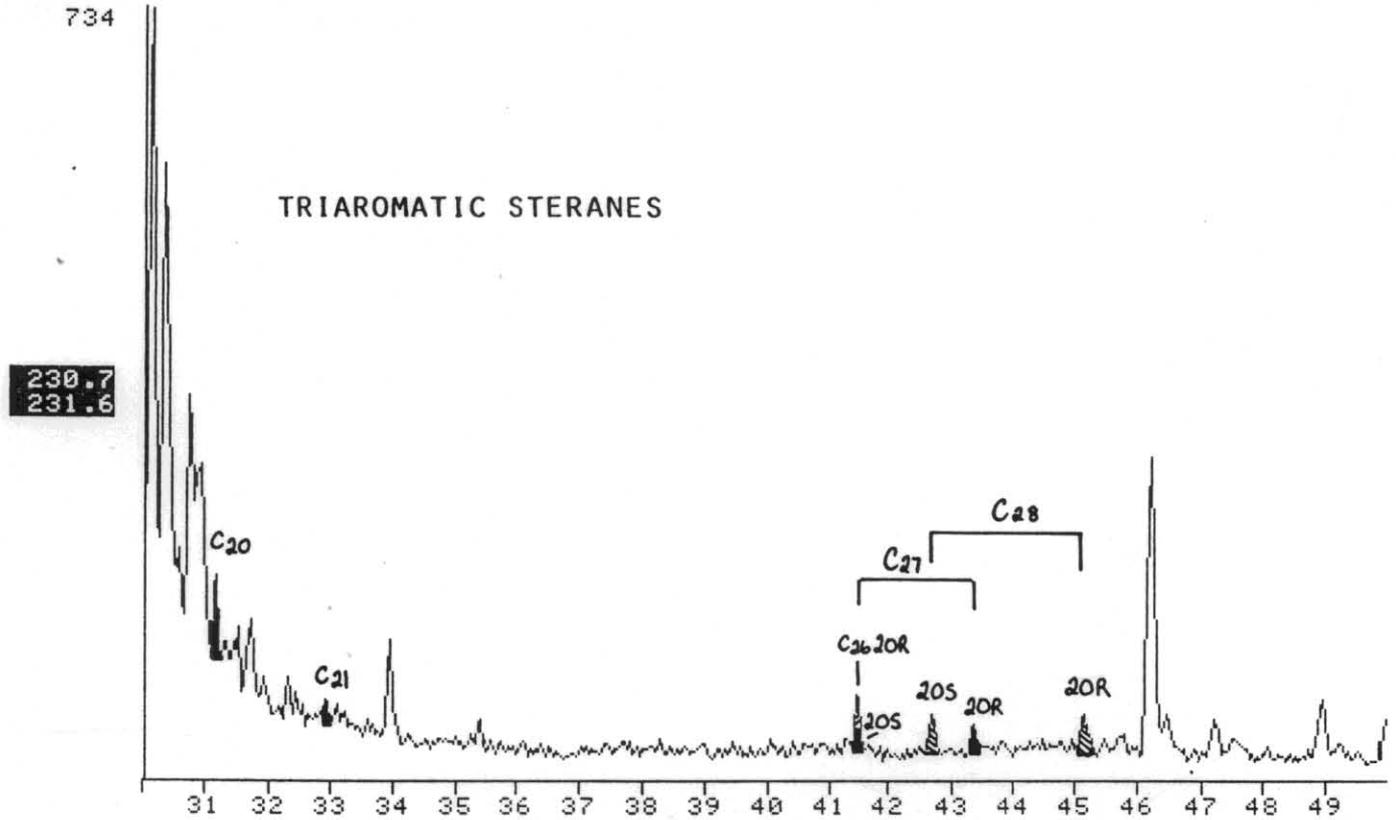


FIGURE: 3-2a

NAME BASS#1, 6930. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/150ul. COL#72.

FRN 6207



NAME BASS#1, 6930. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/150ul. COL#72.

FRN 6207

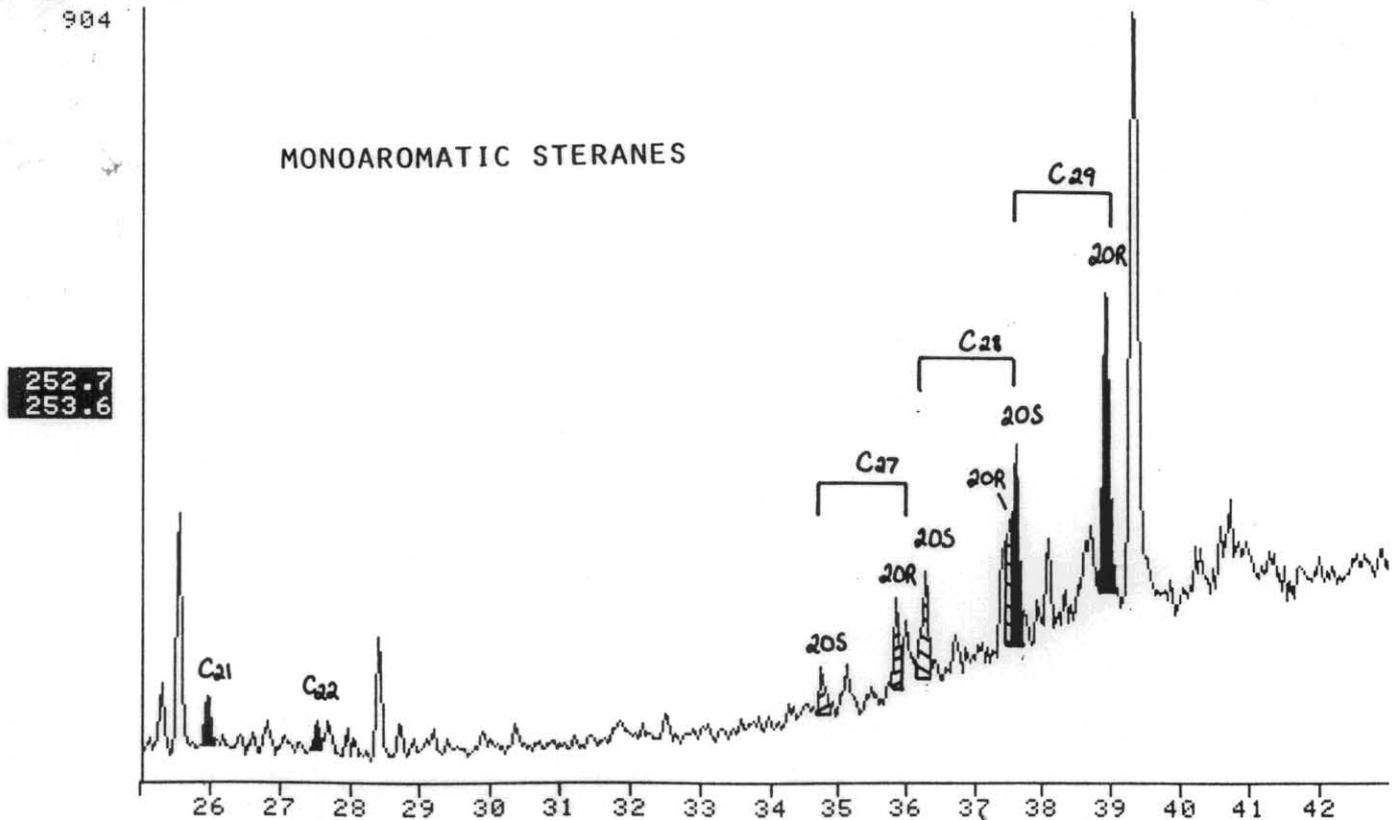
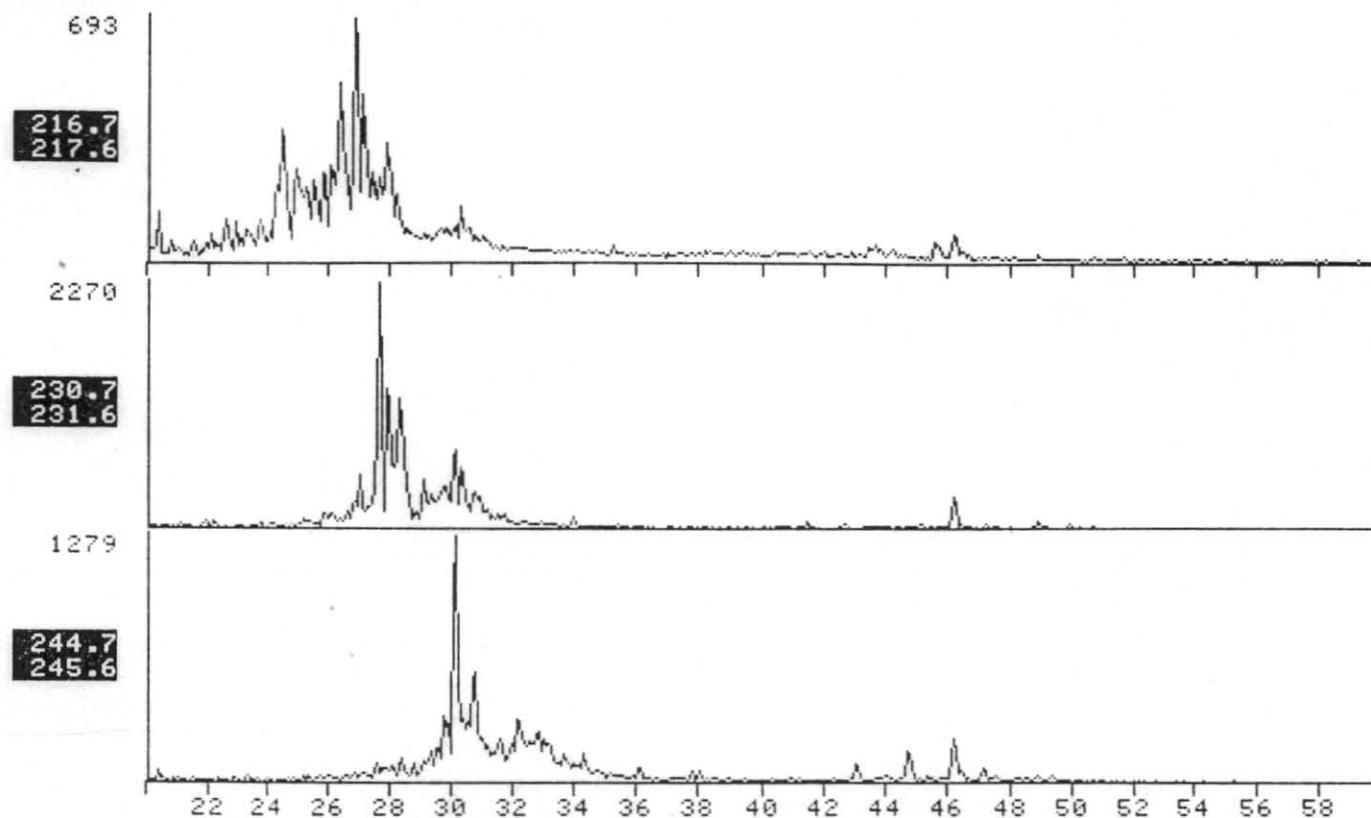


FIGURE: 3-2b

NAME BASS#1, 6930. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/150ul. COL#72.

FRN 6207



NAME BASS#1, 6930. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/150ul. COL#72.

FRN 6207

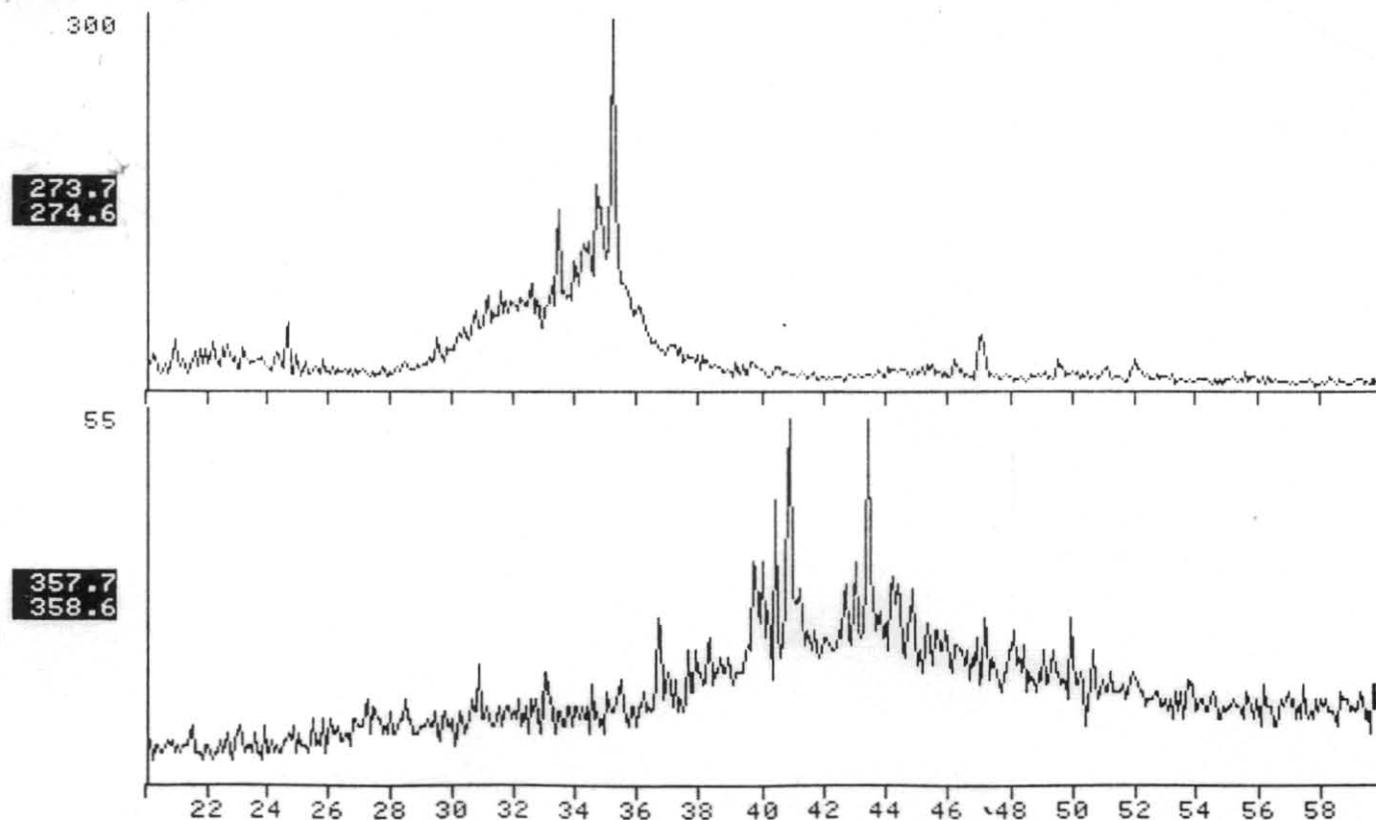
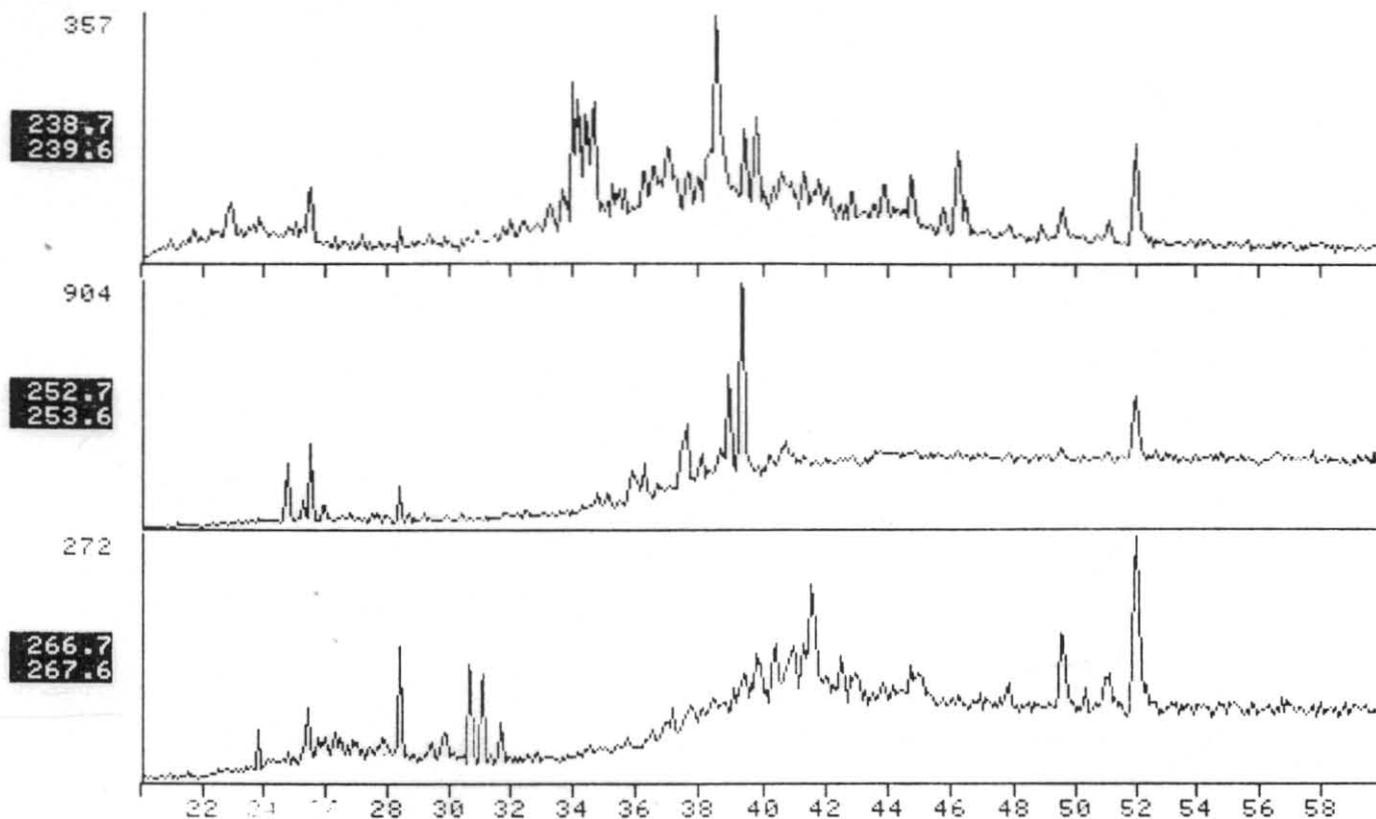


FIGURE: 3-2c

NAME BASS#1, 6930. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/150ul. COL#72.

FRN 6207



NAME BASS#1, 6930. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/150ul. COL#72.

FRN 6207

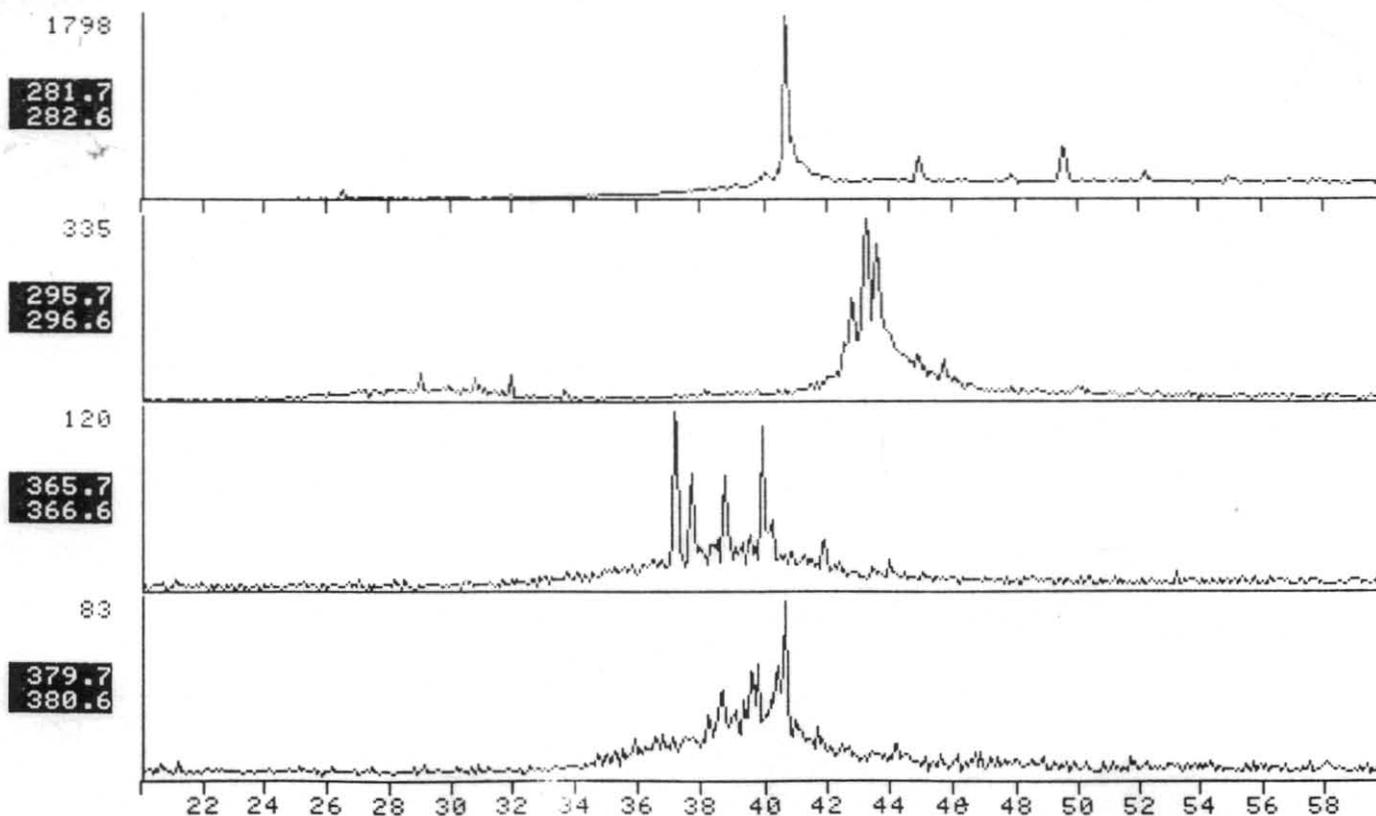
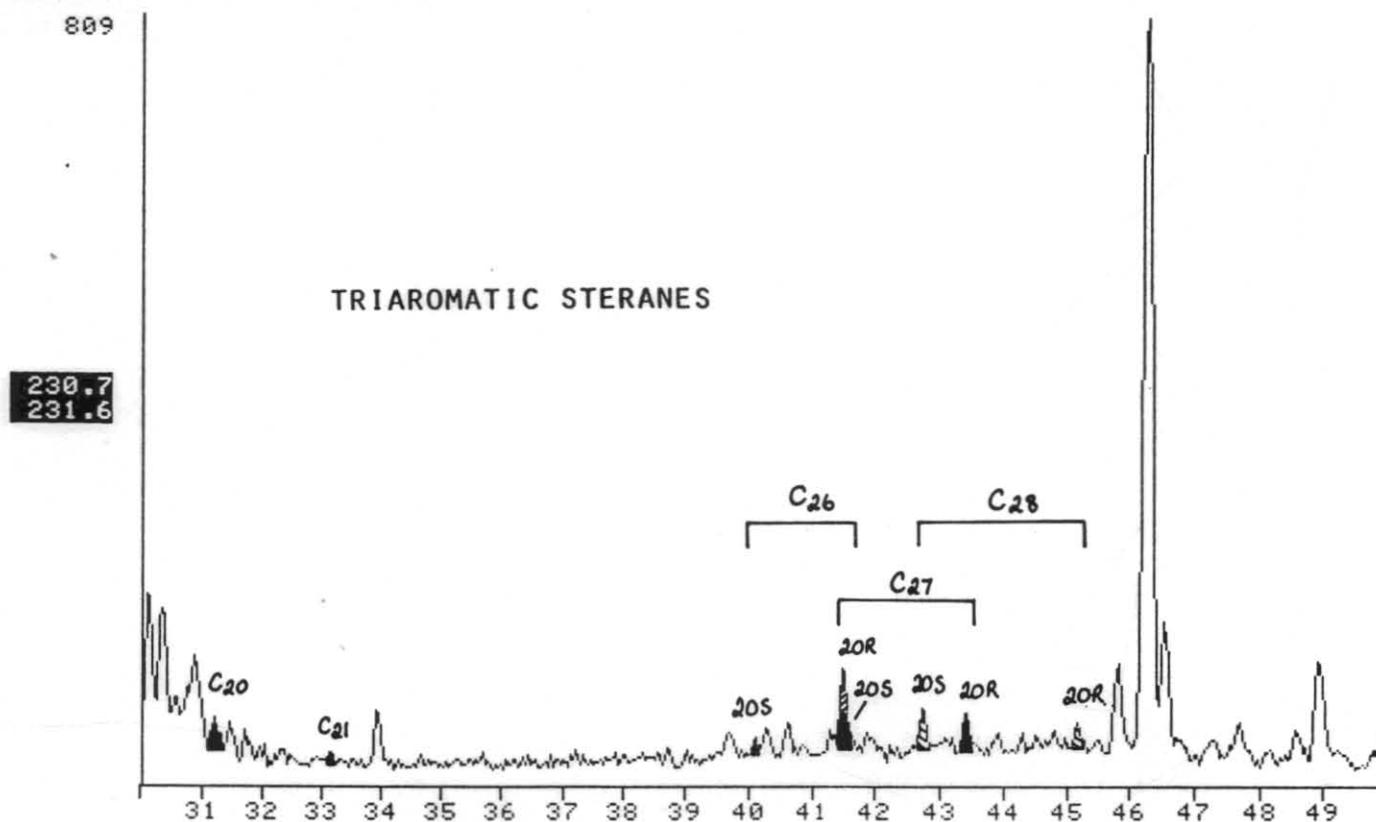


FIGURE: 3-3a

NAME BASS#2, 4135. AROMATIC FRAGMENTOGRAM.
 MISC 5-3-87. GEC. 0.2/250ul. COL#72.

FRN 6208



NAME BASS#2, 4135. AROMATIC FRAGMENTOGRAM.
 MISC 5-3-87. GEC. 0.2/250ul. COL#72.

FRN 6208

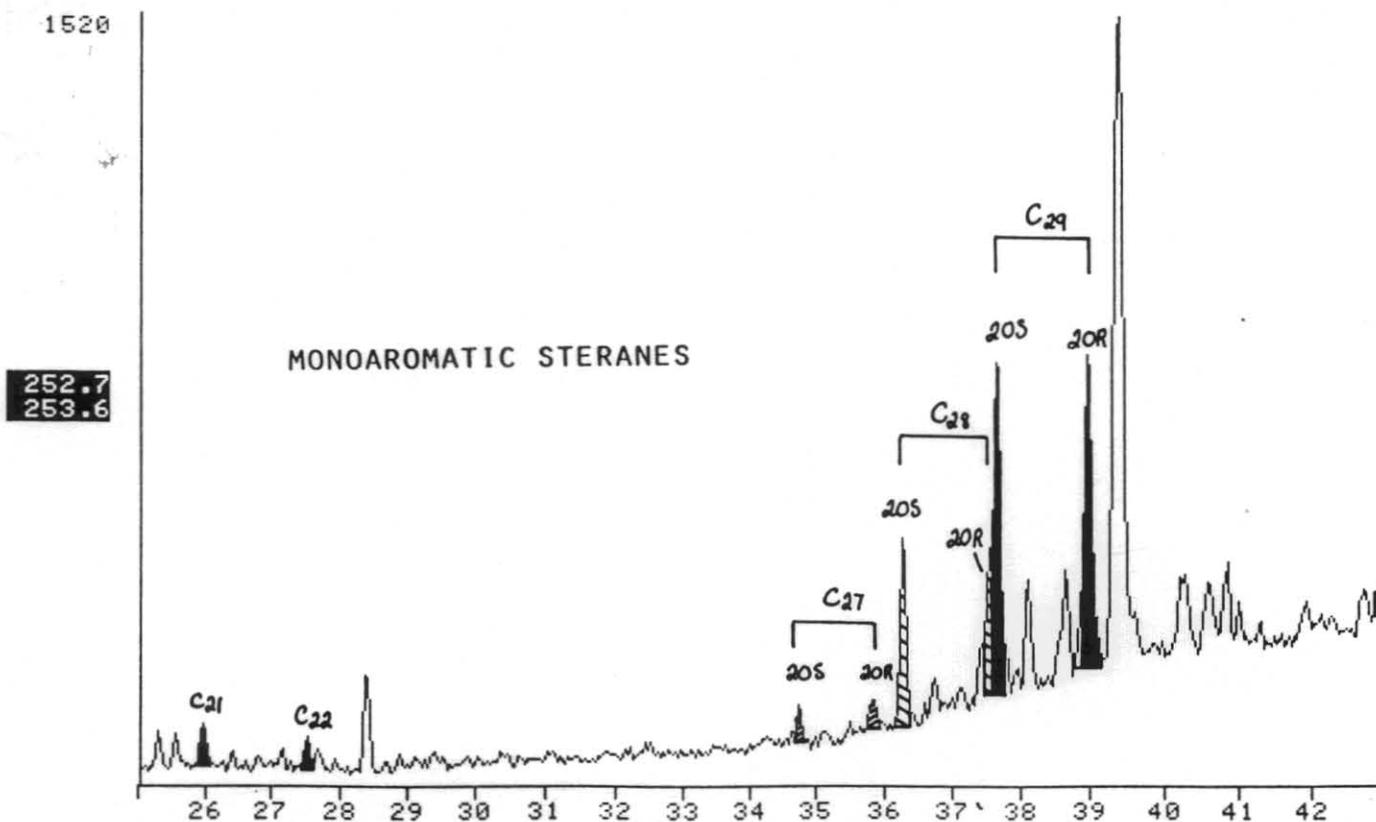
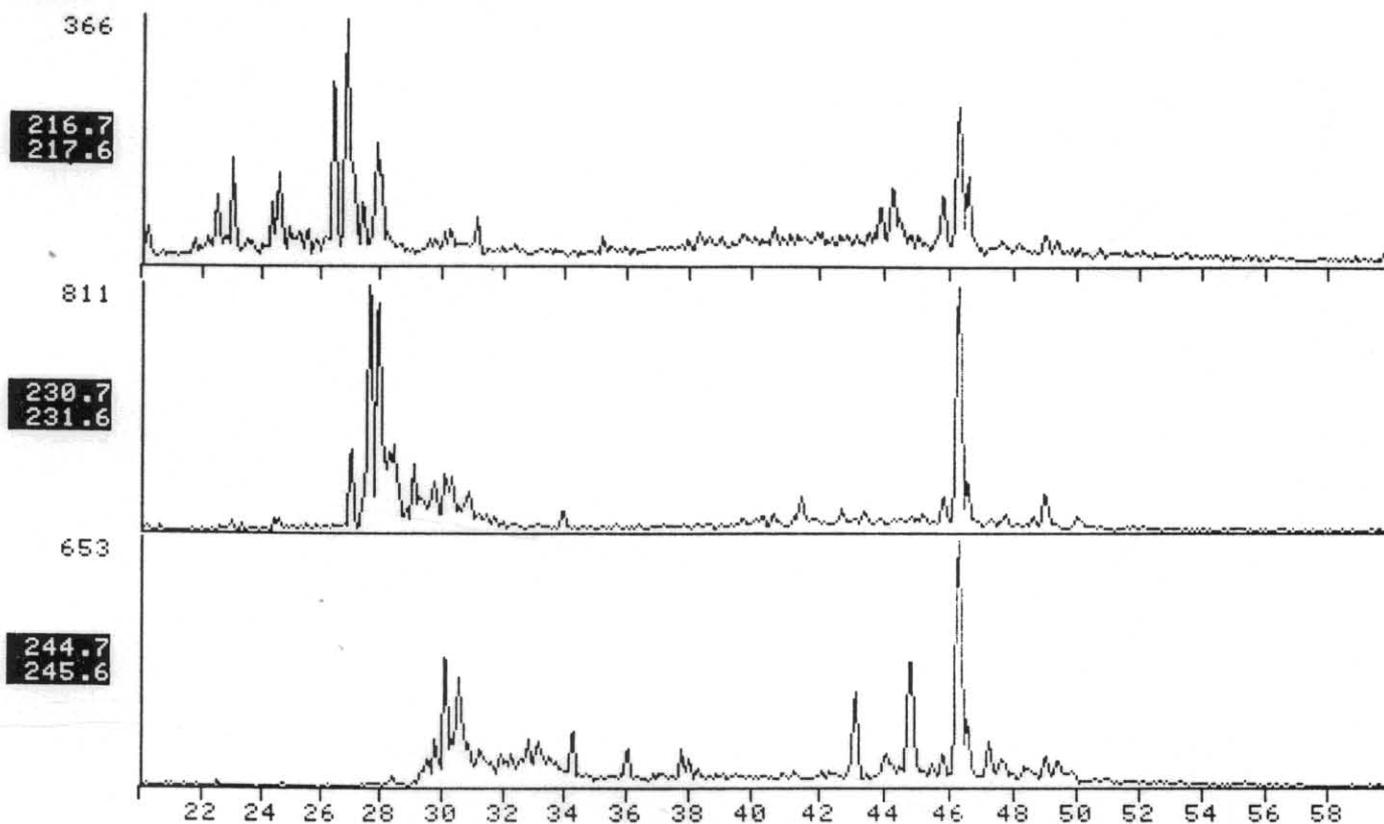


FIGURE: 3-3b

NAME BASS#2, 4135. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/250ul. COL#72.

FRN 6208



NAME BASS#2, 4135. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/250ul. COL#72.

FRN 6208

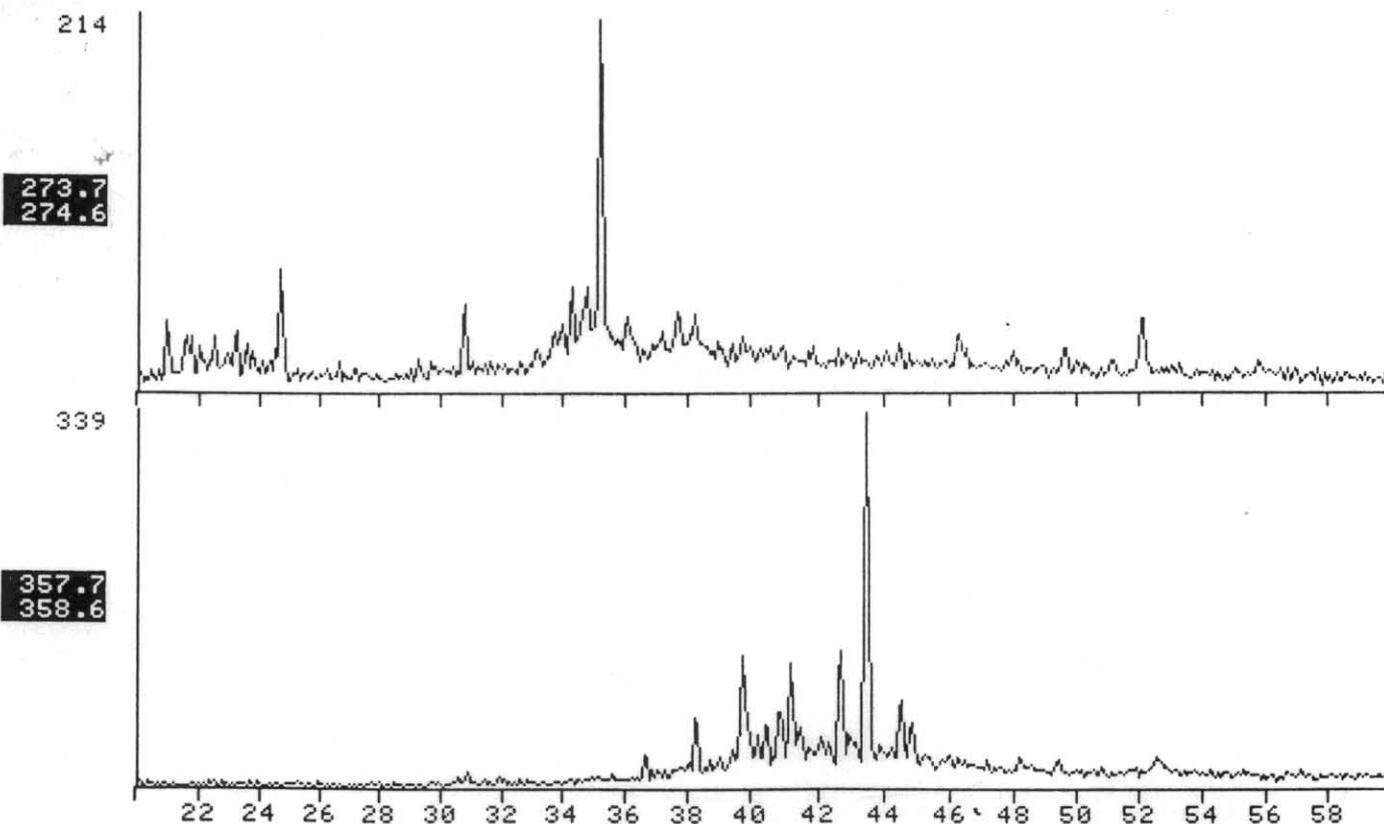
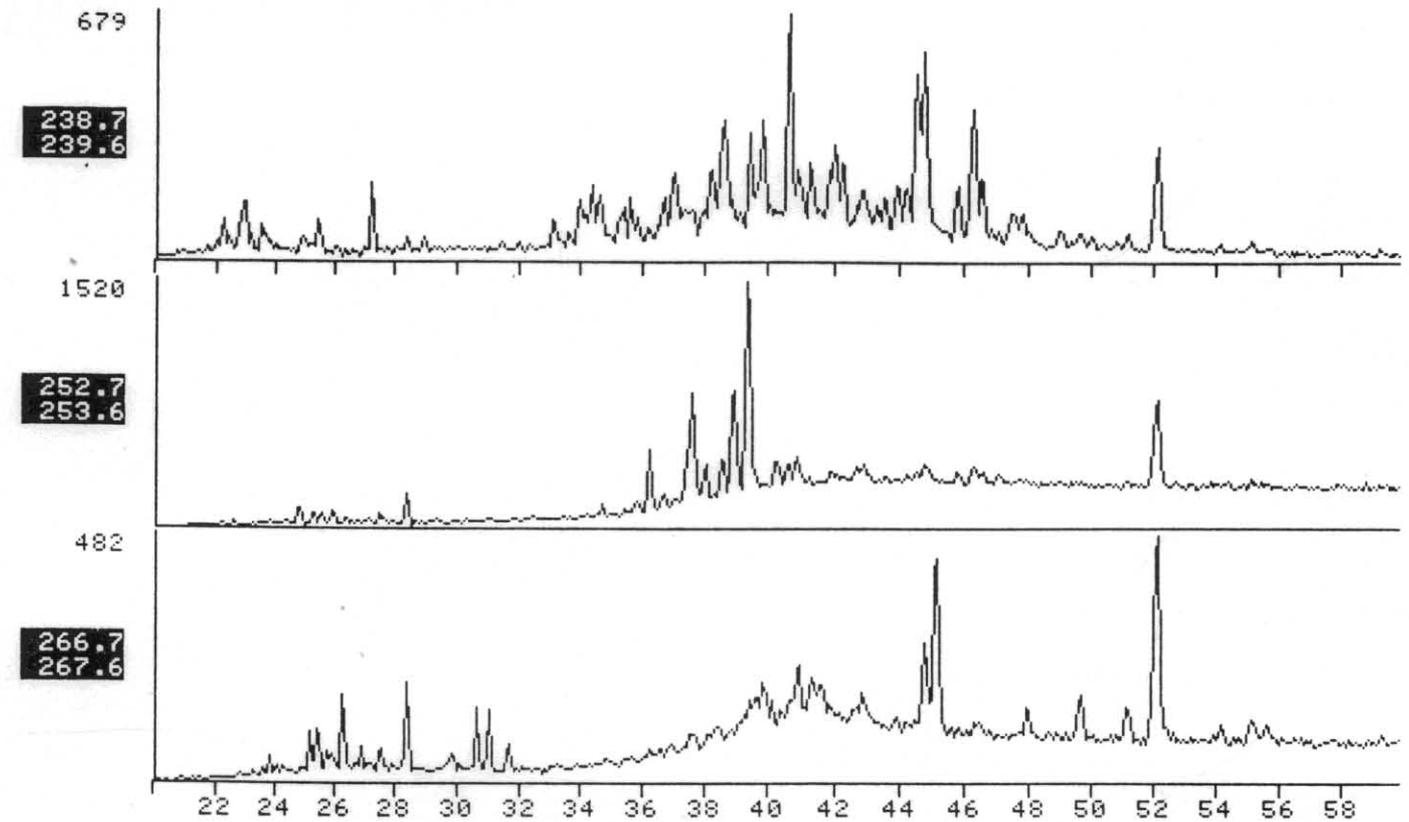


FIGURE: 3-3c

NAME BASS#2, 4135. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/250ul. COL#72.

FRN 6208



NAME BASS#2, 4135. AROMATIC FRAGMENTOGRAM.
MISC 5-3-87. GEC. 0.2/250ul. COL#72.

FRN 6208

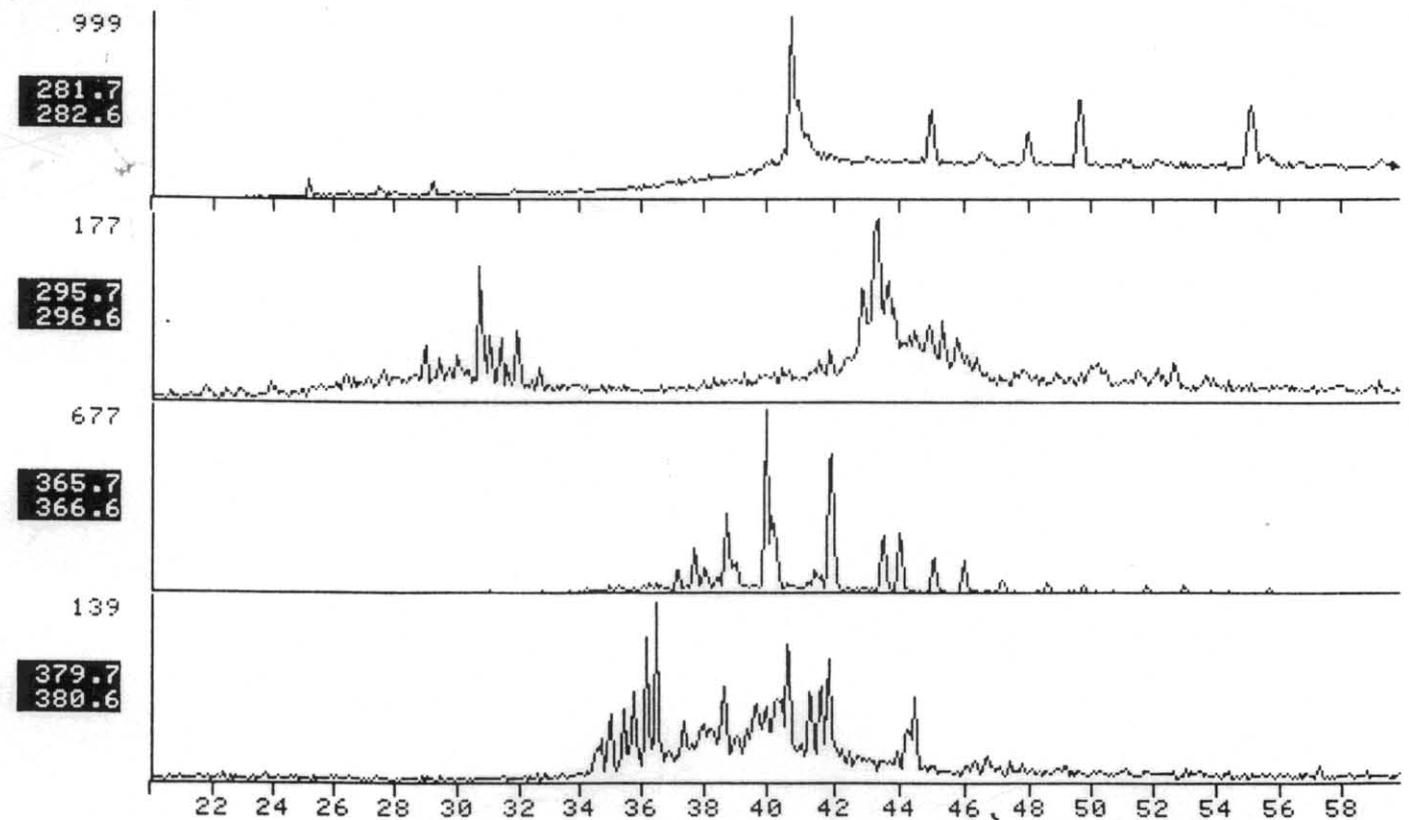
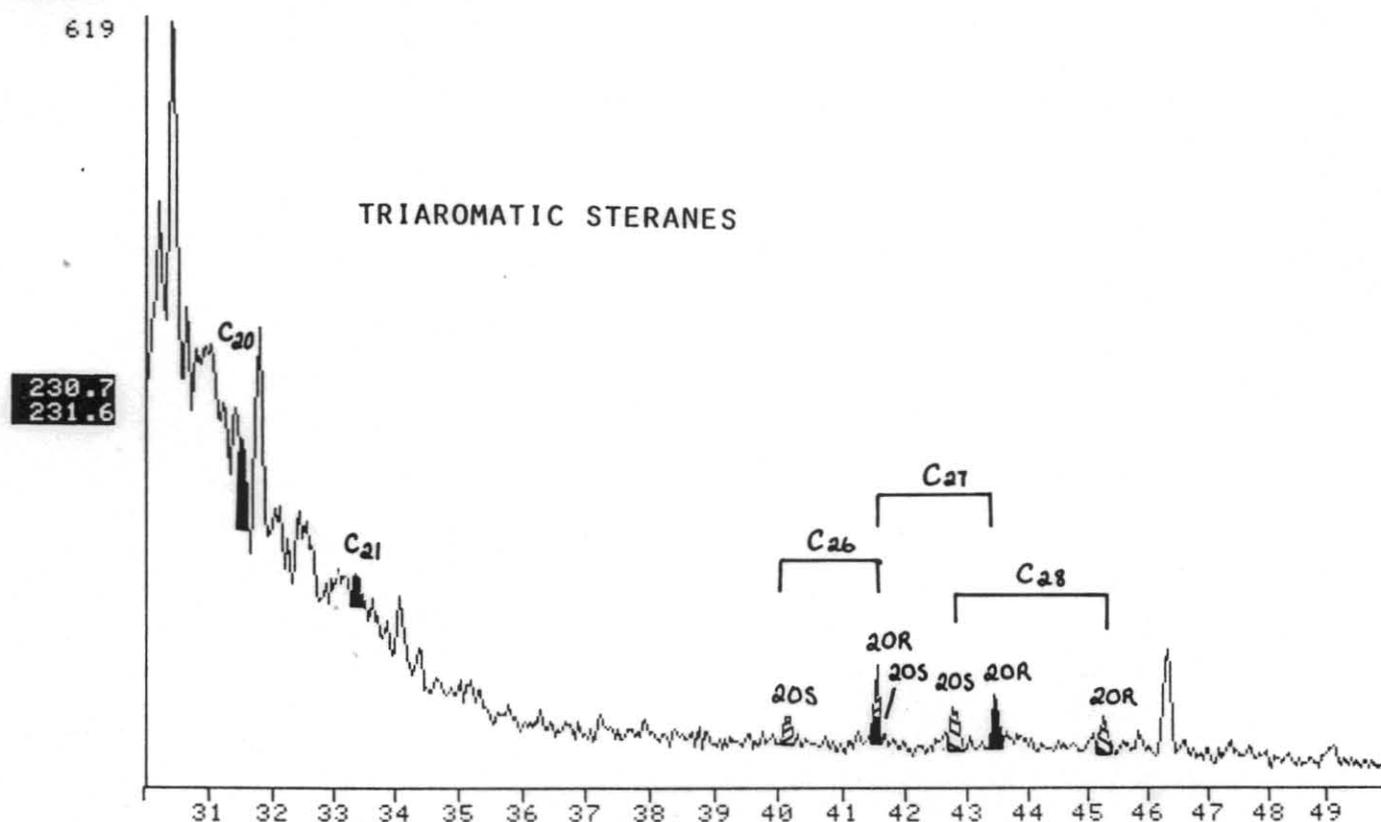


FIGURE: 3-4a

NAME BASS#2, 4740'. AROMATIC FRAGMENTOGRAM.
 MISC 6-3-87. GEC. 0.2/100ul. COL#72.

FRN 6209



NAME BASS#2, 4740'. AROMATIC FRAGMENTOGRAM.
 MISC 6-3-87. GEC. 0.2/100ul. COL#72.

FRN 6209

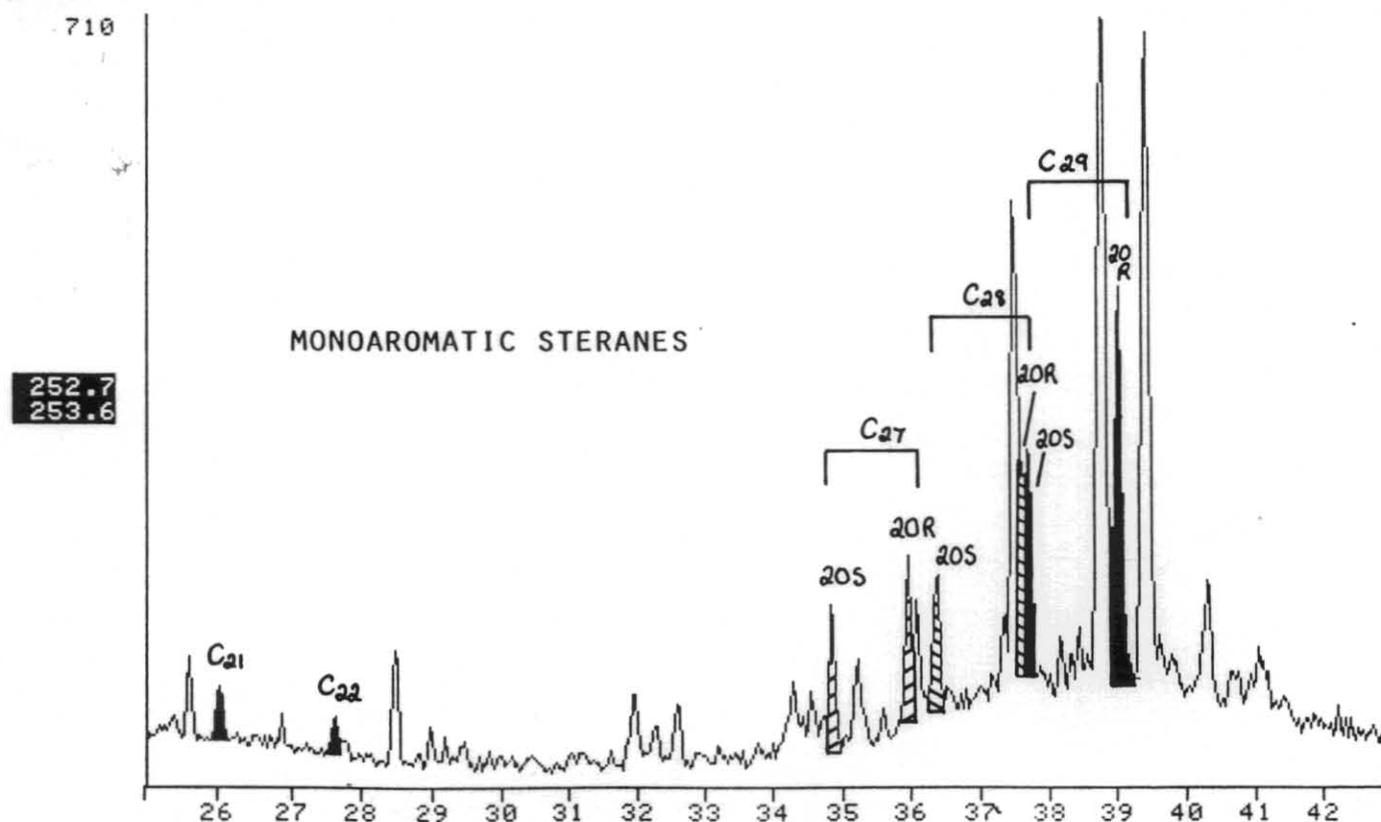
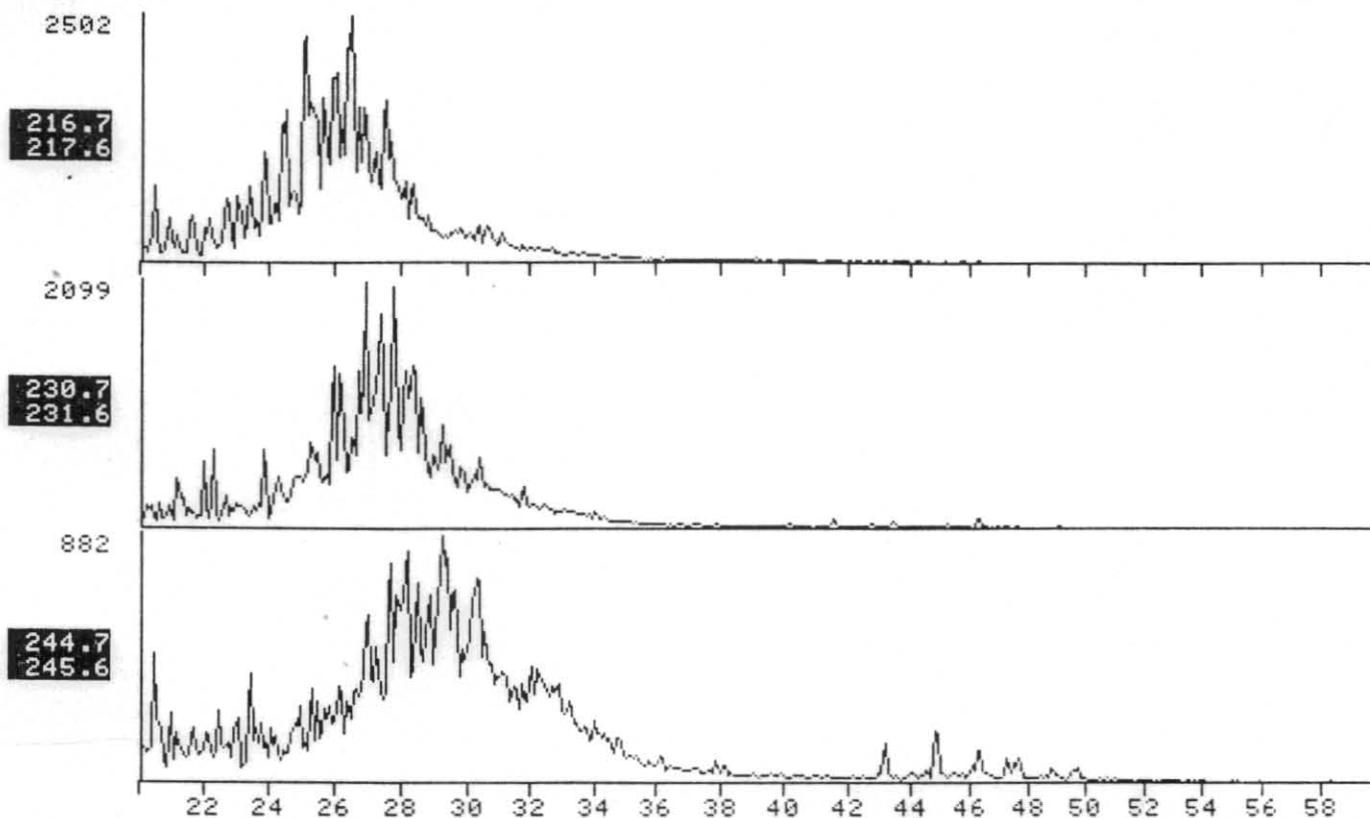


FIGURE: 3-4b

NAME BASS#2, 4740'. AROMATIC FRAGMENTOGRAM.
MISC 6-3-87. GEC. 0.2/100ul. COL#72.

FRN 6209



NAME BASS#2, 4740'. AROMATIC FRAGMENTOGRAM.
MISC 6-3-87. GEC. 0.2/100ul. COL#72.

FRN 6209

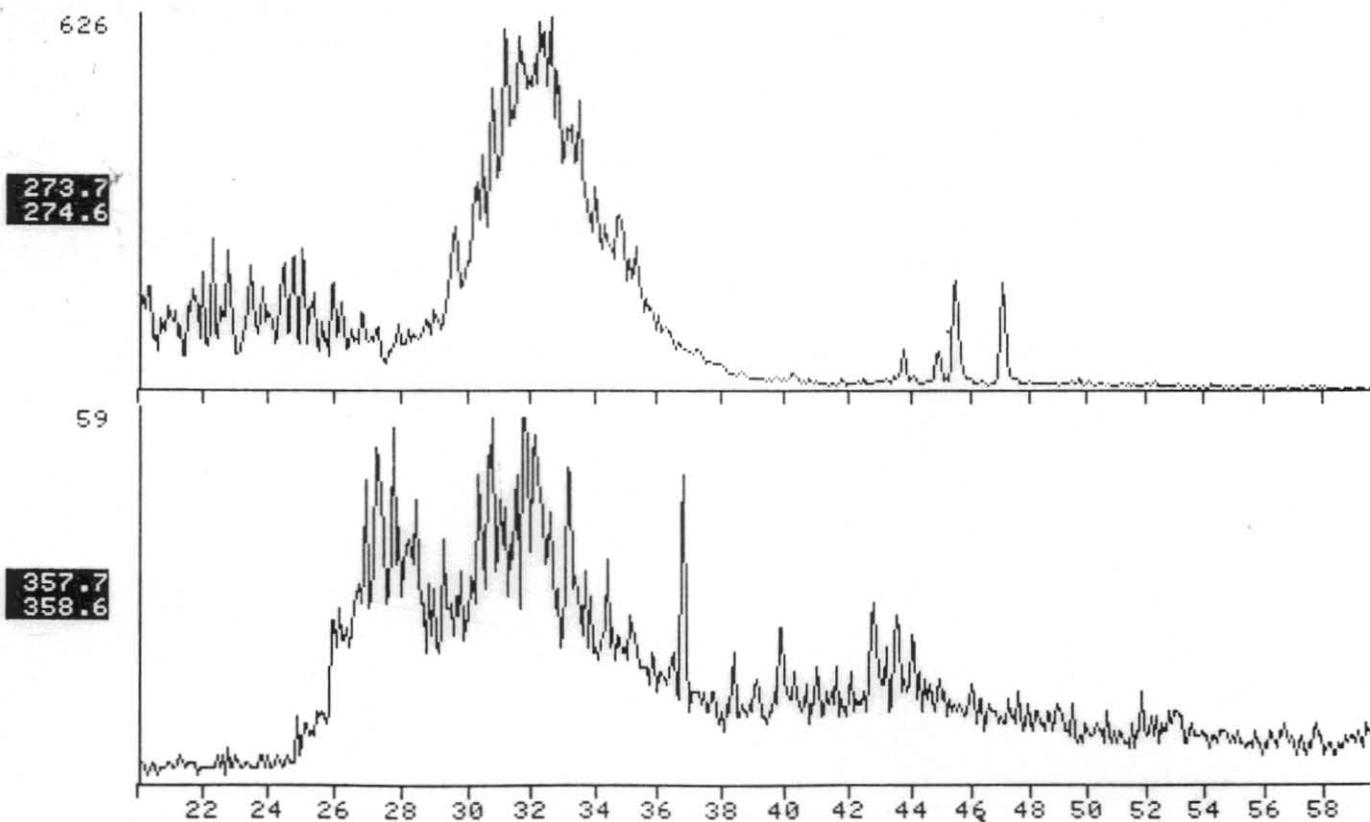
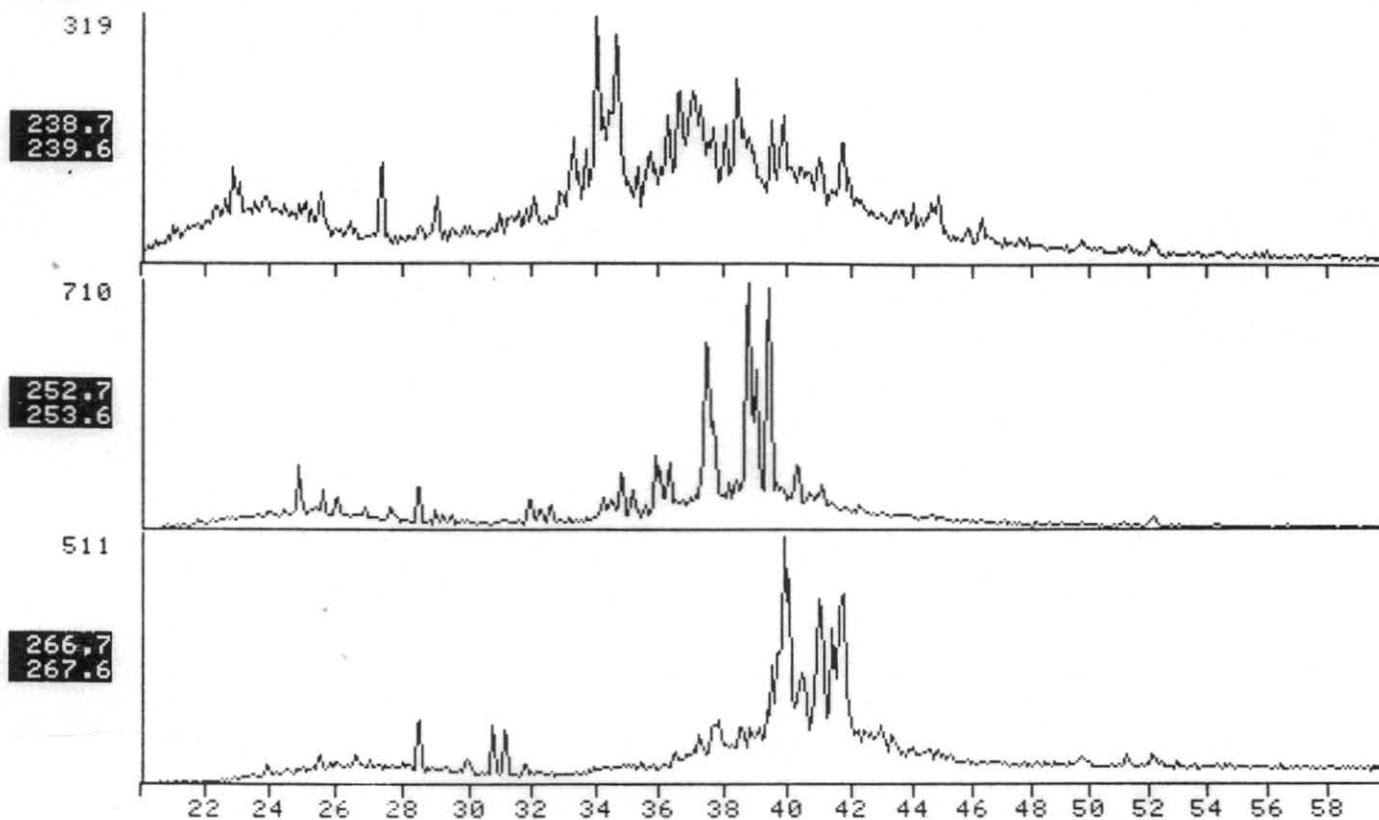


FIGURE: 3-4c

NAME BASS#2, 4740'. AROMATIC FRAGMENTOGRAM.
MISC 6-3-87. GEC. 0.2/100ul. COL#72.

FRN 6209



NAME BASS#2, 4740'. AROMATIC FRAGMENTOGRAM.
MISC 6-3-87. GEC. 0.2/100ul. COL#72.

FRN 6209

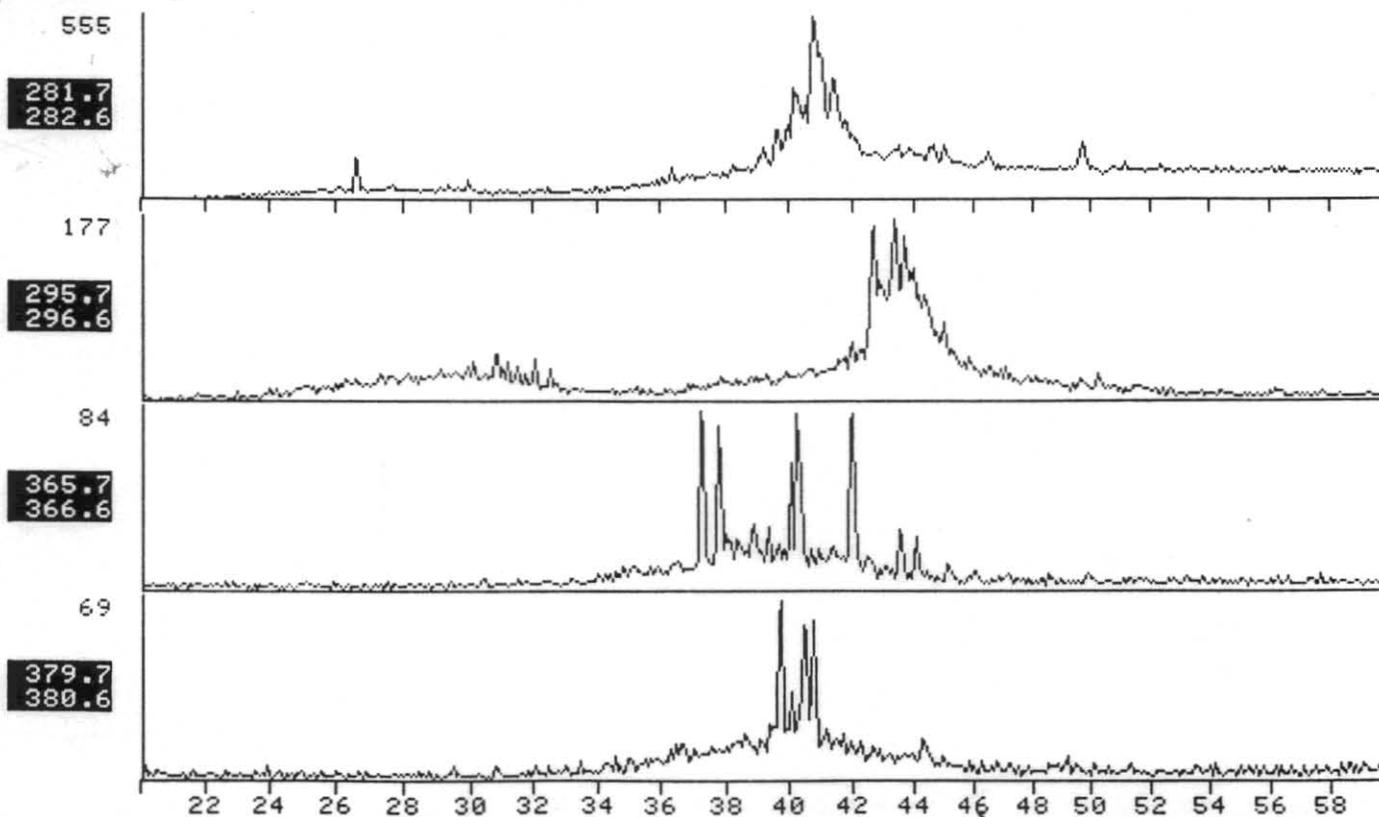
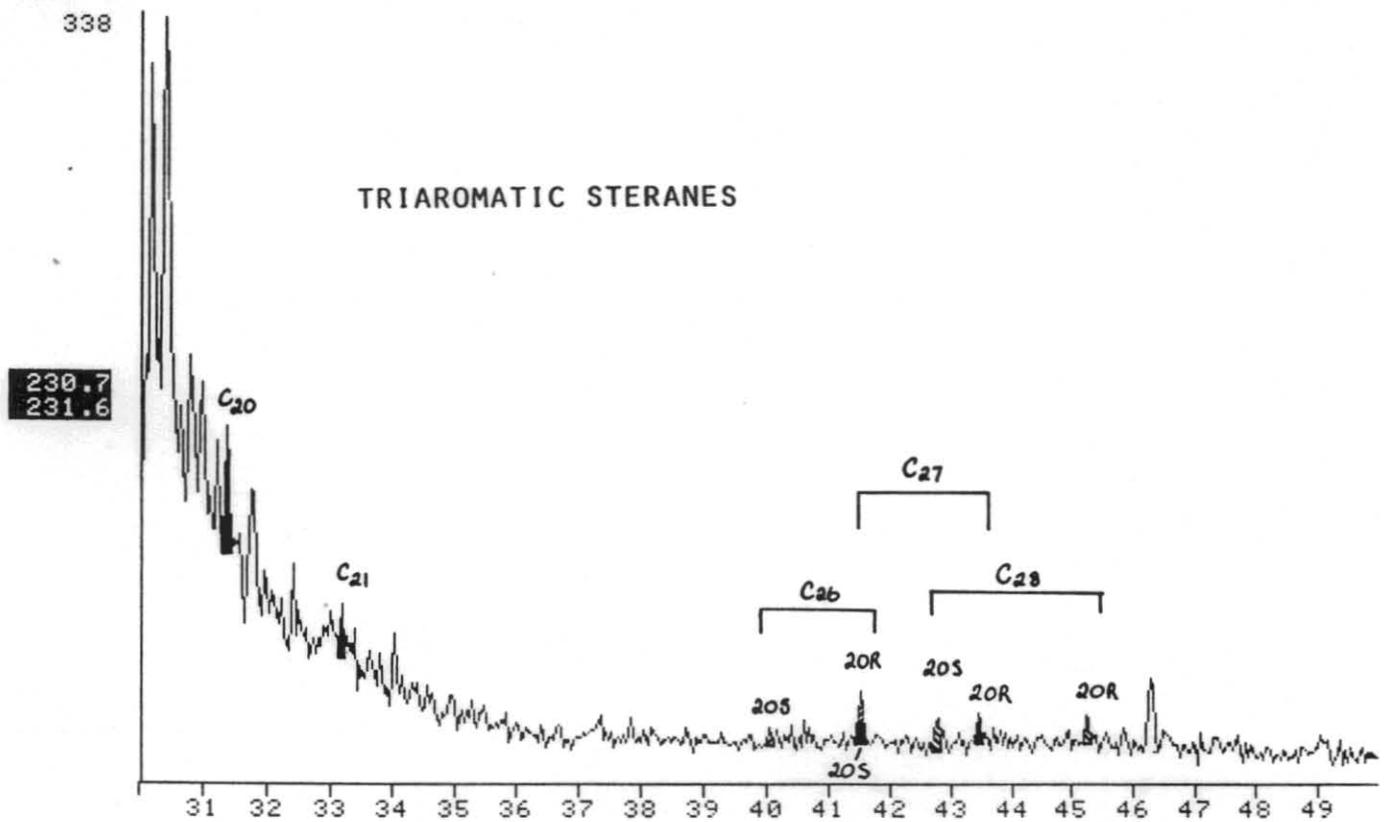


FIGURE: 3-5a

NAME BASS#2, 5068'. AROMATIC FRAGMENTOGRAM.
 MISC 9-3-87. GEC. 0.2/100ul. COL#72.

FRN 6210



NAME BASS#2, 5068'. AROMATIC FRAGMENTOGRAM.
 MISC 9-3-87. GEC. 0.2/100ul. COL#72.

FRN 6210

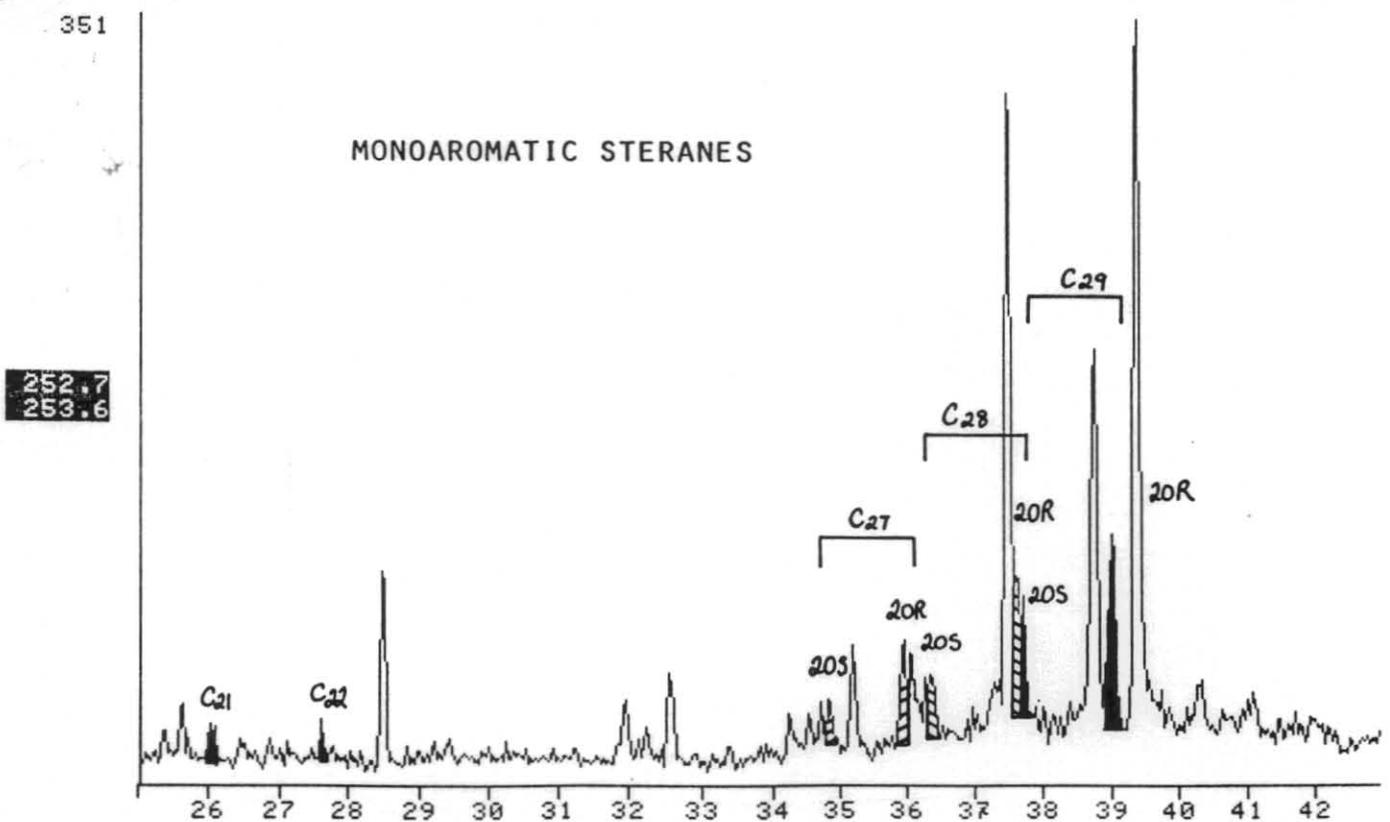
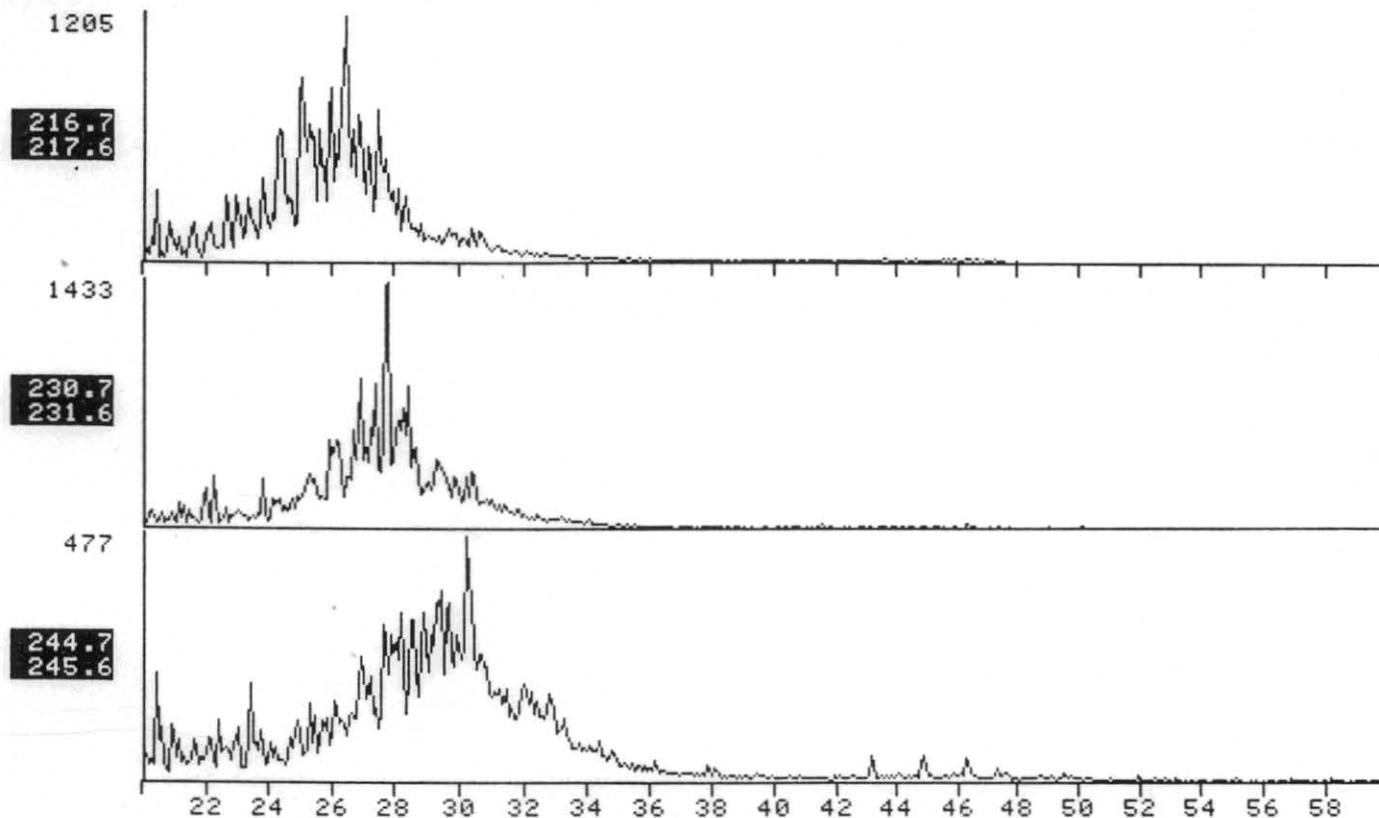


FIGURE: 3-5b

NAME BASS#2, 5068'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/100ul. COL#72.

FRN 6210



NAME BASS#2, 5068'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/100ul. COL#72.

FRN 6210

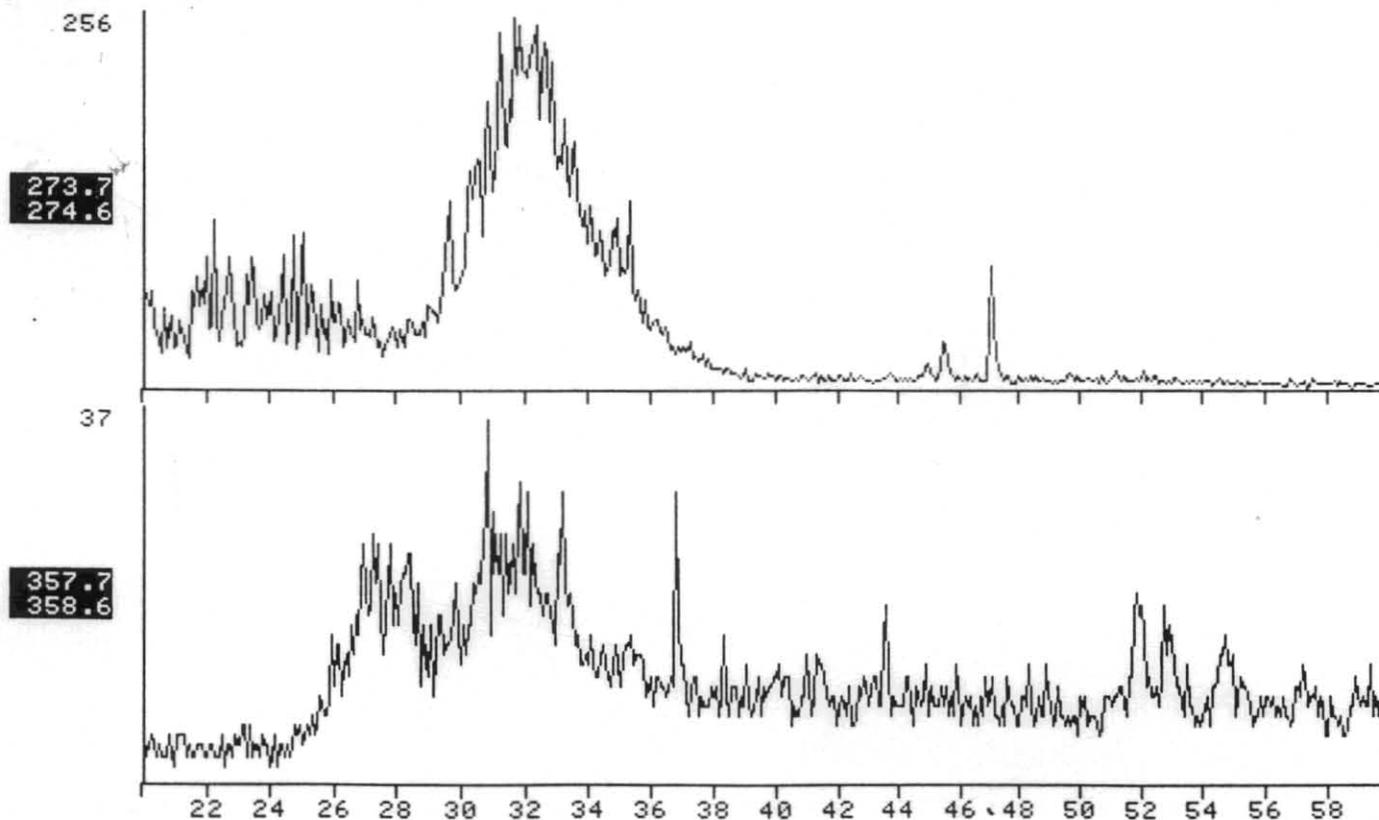
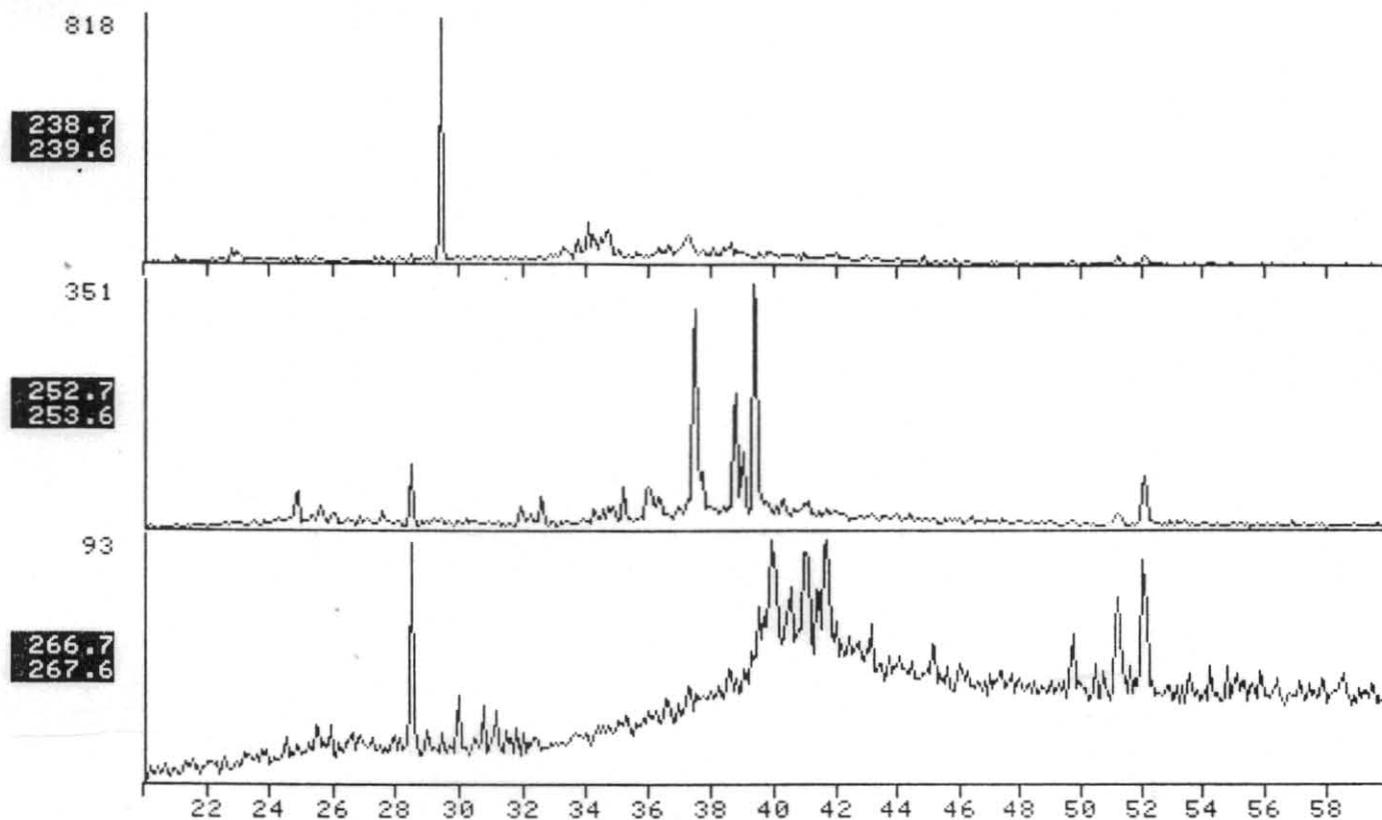


FIGURE: 3-5c

NAME BASS#2, 5068'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/100ul. COL#72.

FRN 6210



NAME BASS#2, 5068'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/100ul. COL#72.

FRN 6210

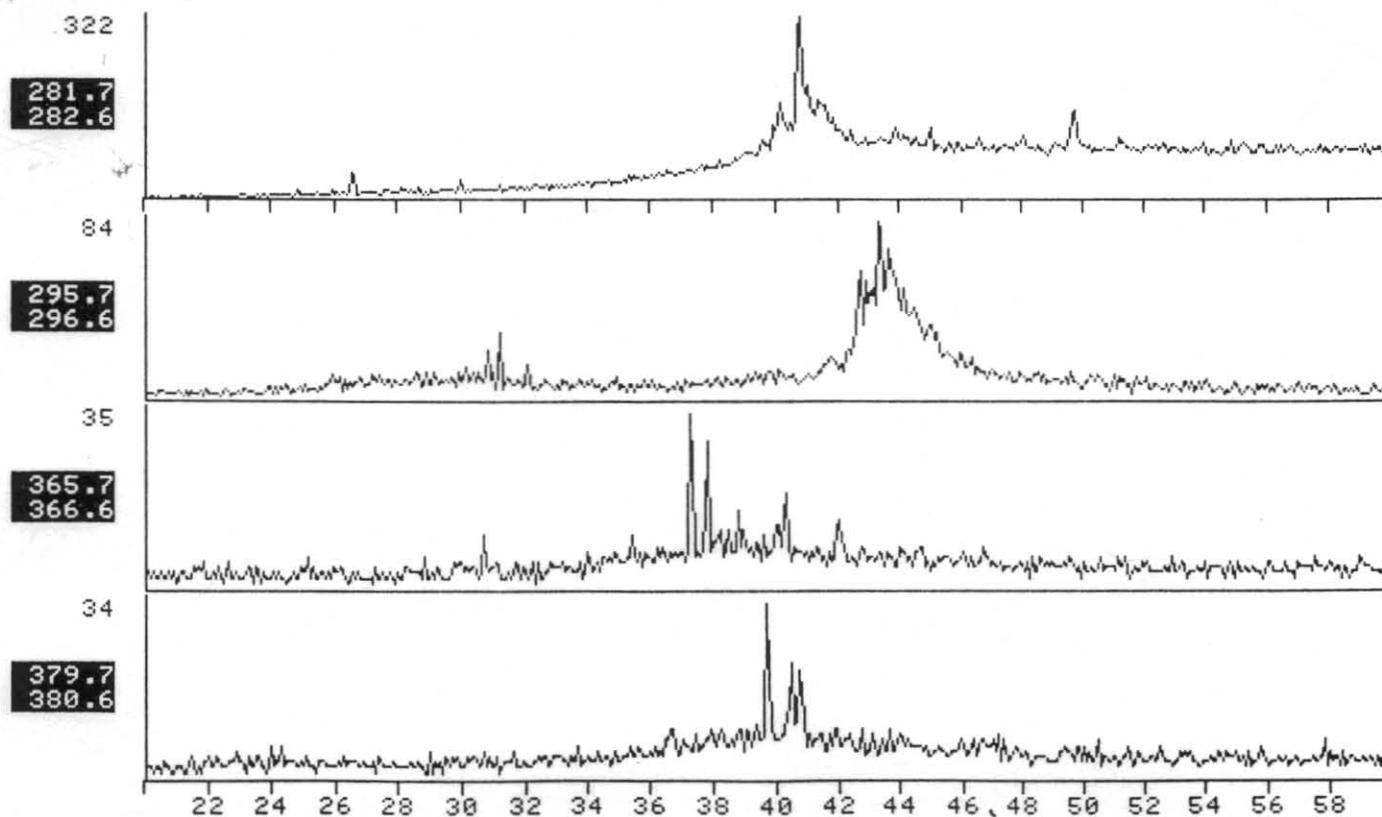
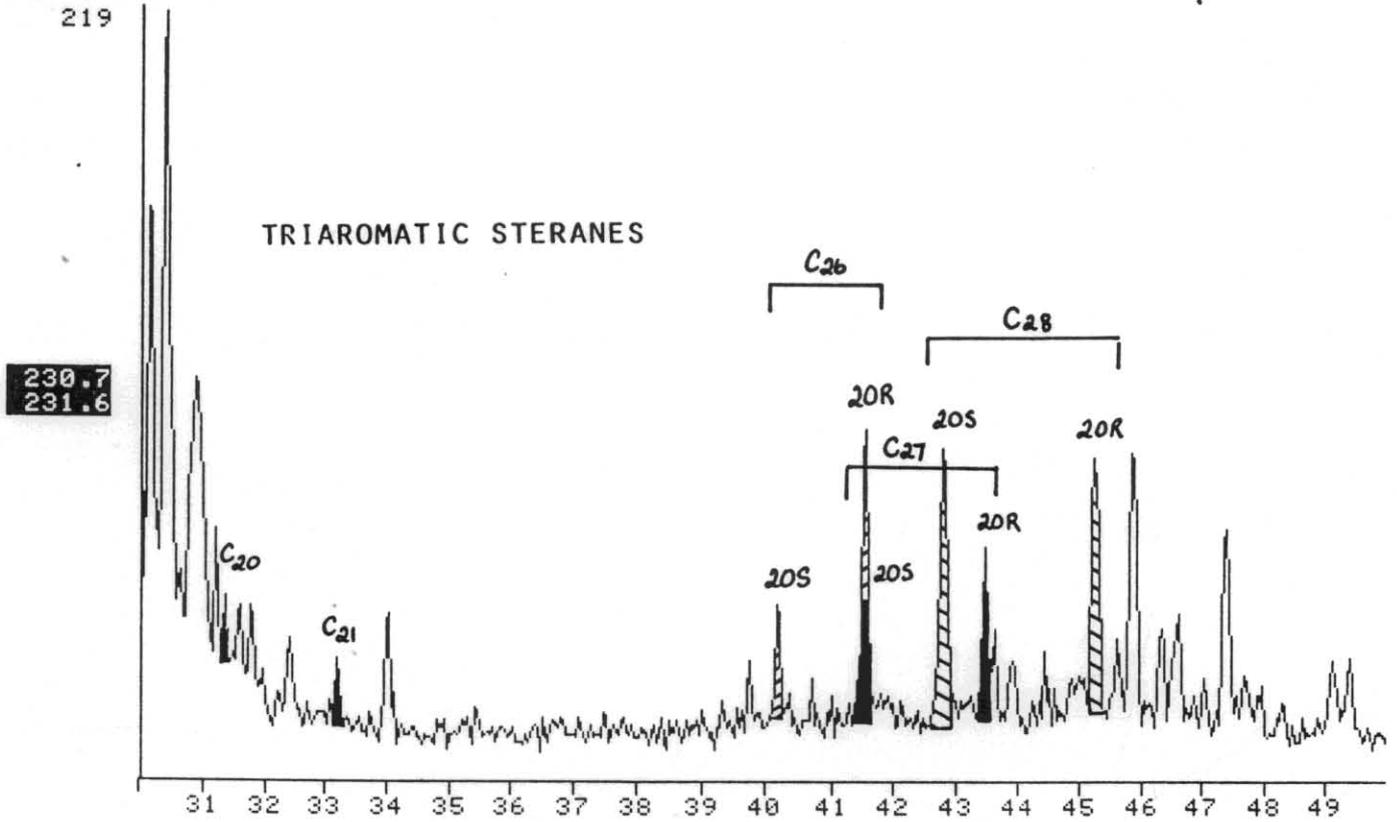


FIGURE: 3-6a

NAME BASS#2, 5509'. AROMATIC FRAGMENTOGRAM.
 MISC 6-2-87. GEC. 0.2/100ul. COL#72.

FRN 6211



NAME BASS#2, 5509'. AROMATIC FRAGMENTOGRAM.
 MISC 6-2-87. GEC. 0.2/100ul. COL#72.

FRN 6211

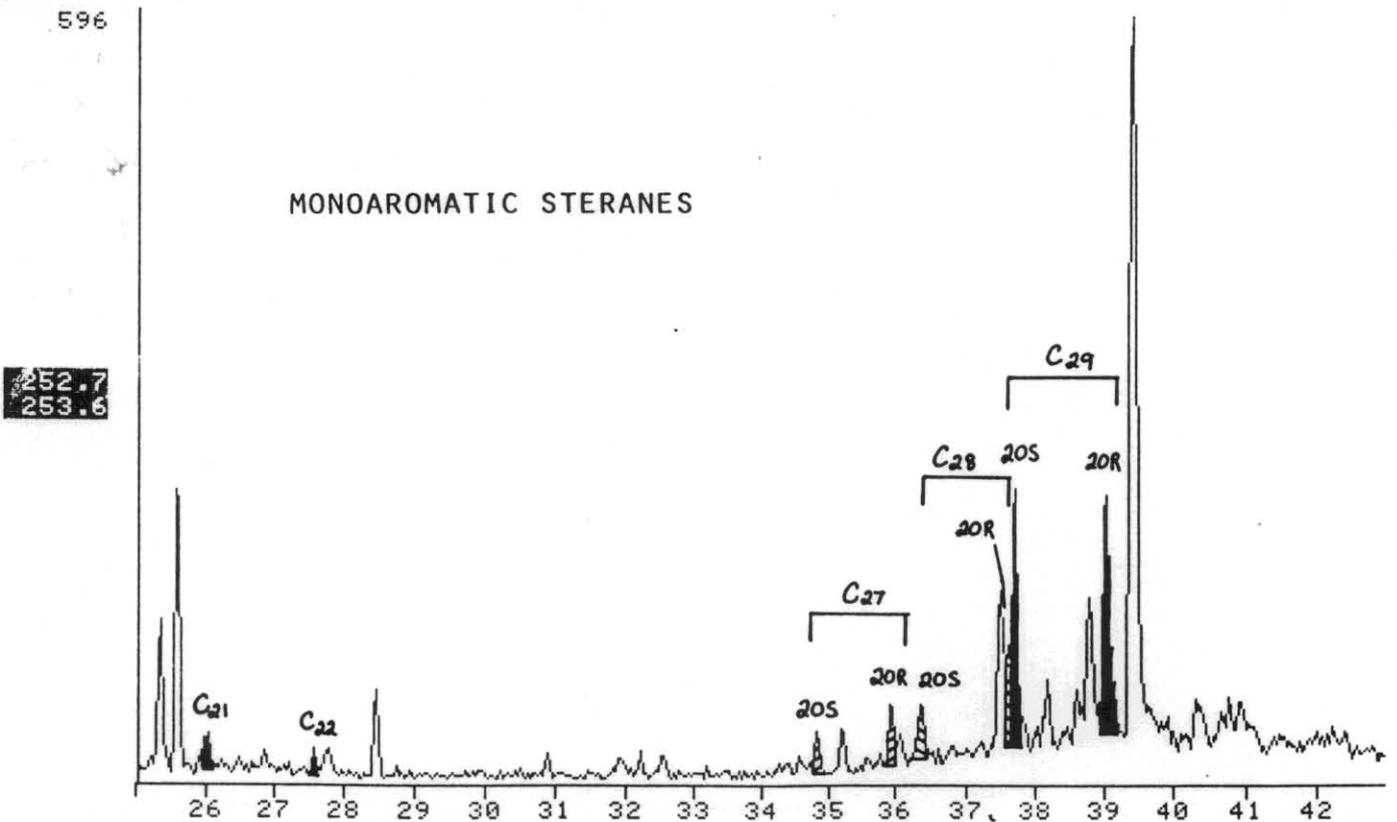
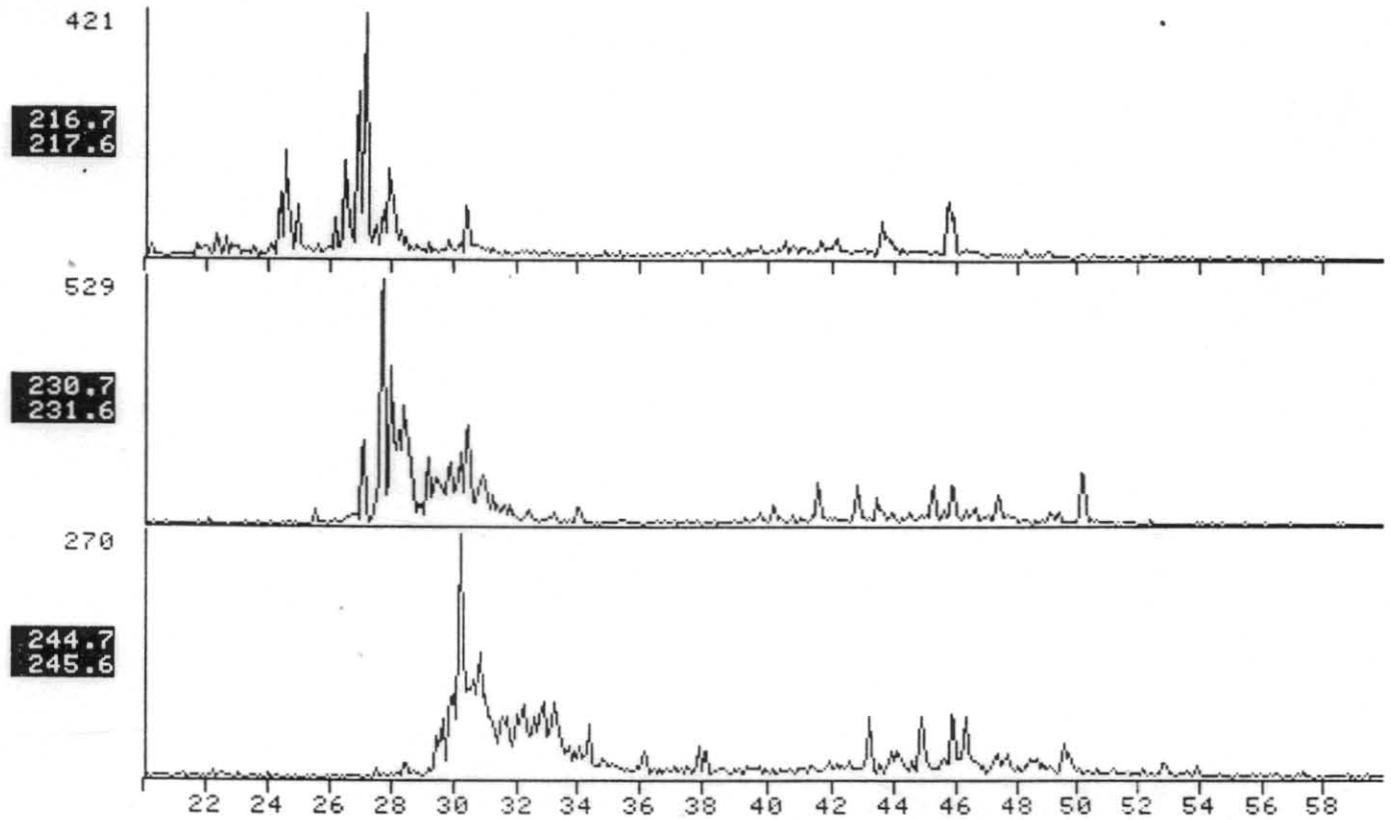


FIGURE: 3-6b

NAME BASS#2, 5509'. AROMATIC FRAGMENTOGRAM.
MISC 6-2-87. GEC. 0.2/100ul. COL#72.

FRN 6211



NAME BASS#2, 5509'. AROMATIC FRAGMENTOGRAM.
MISC 6-2-87. GEC. 0.2/100ul. COL#72.

FRN 6211

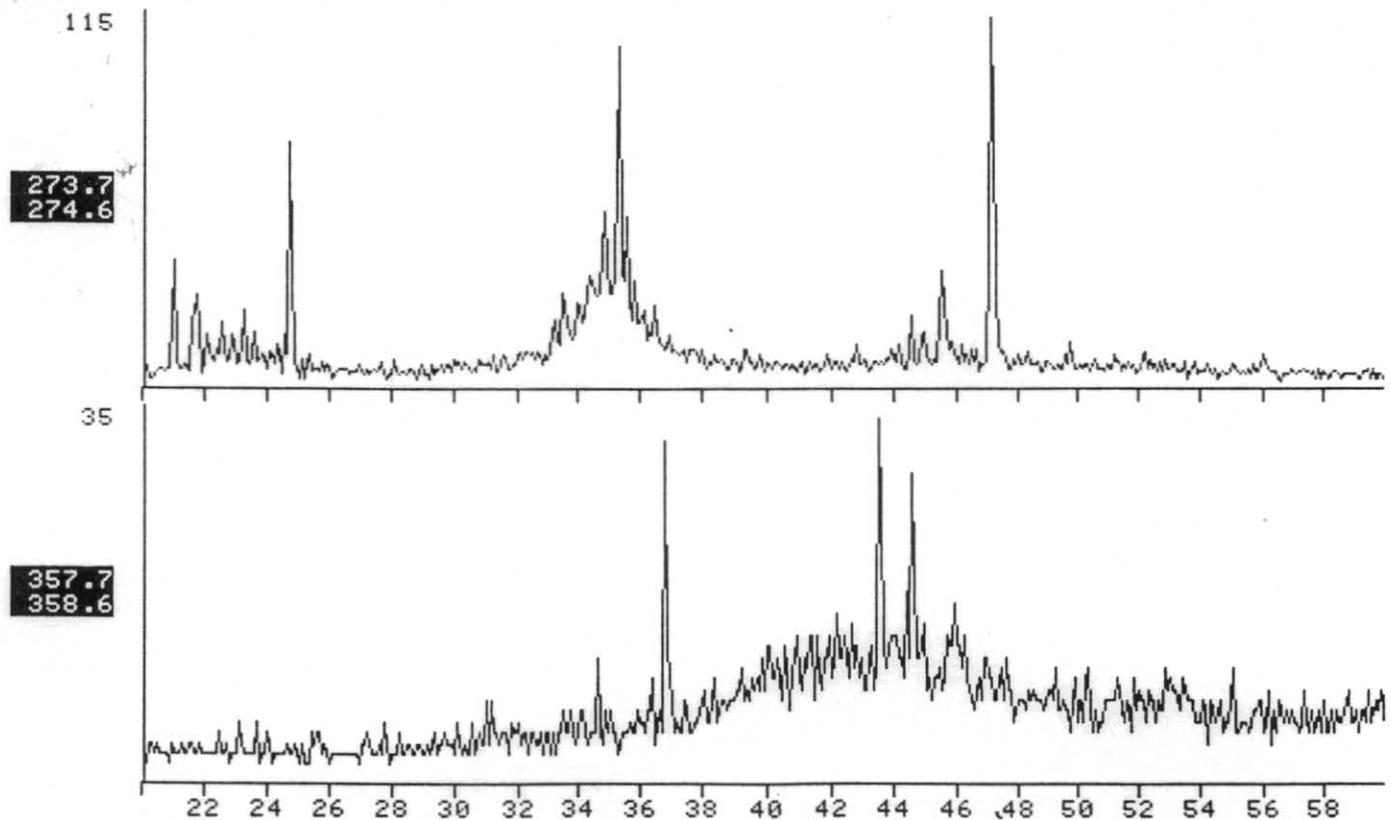
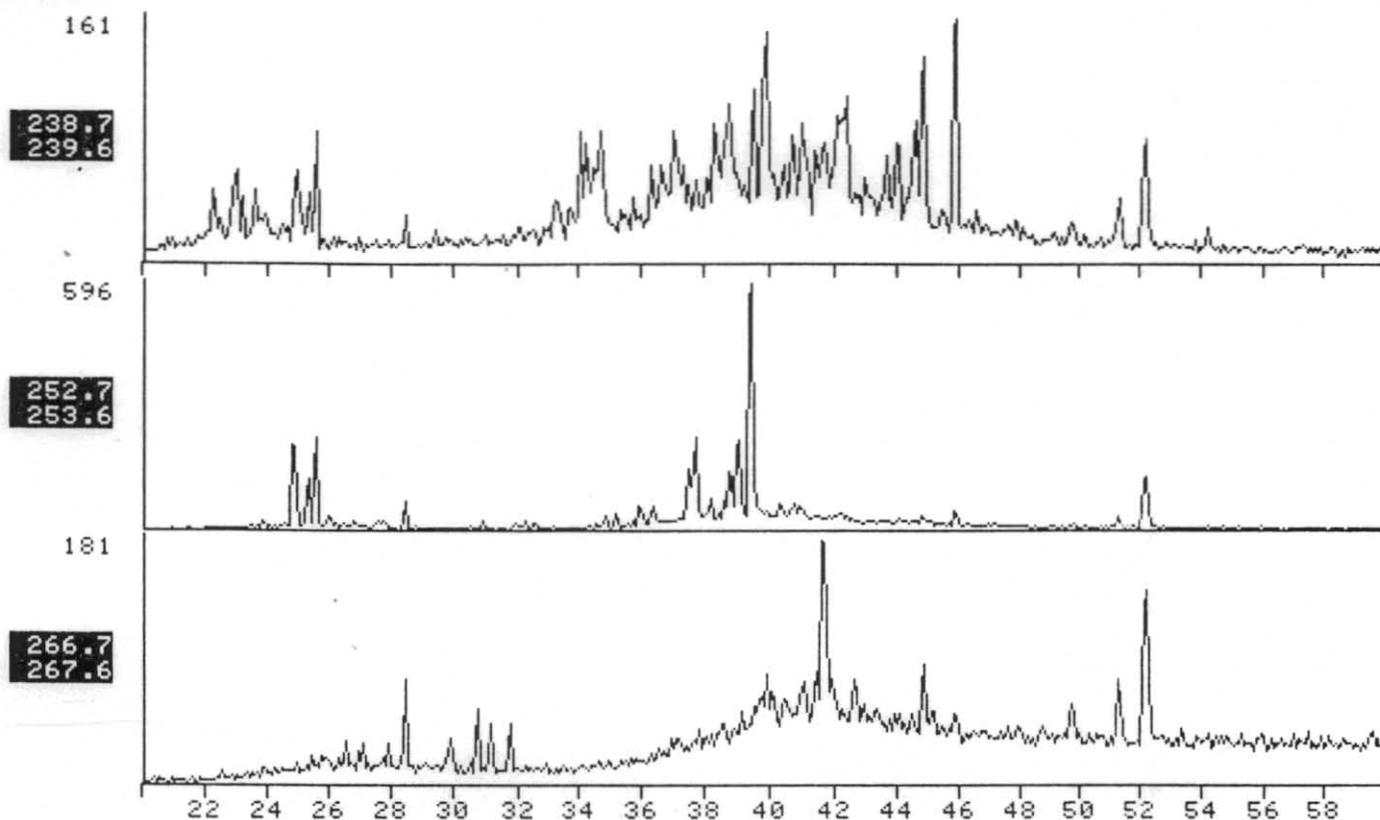


FIGURE: 3-6c

NAME BASS#2, 5509'. AROMATIC FRAGMENTOGRAM.
MISC 6-2-87. GEC. 0.2/100ul. COL#72.

FRN 6211



NAME BASS#2, 5509'. AROMATIC FRAGMENTOGRAM.
MISC 6-2-87. GEC. 0.2/100ul. COL#72.

FRN 6211

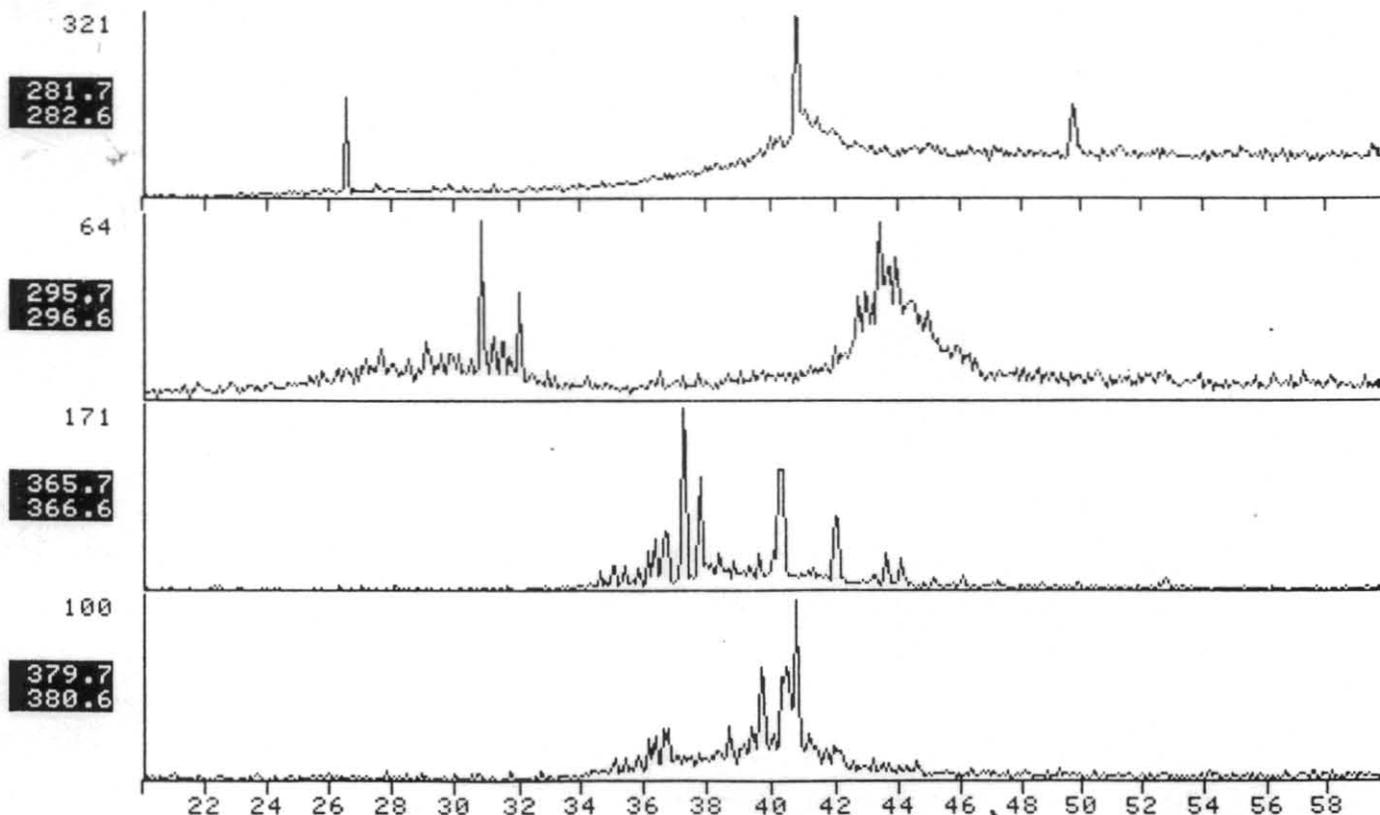
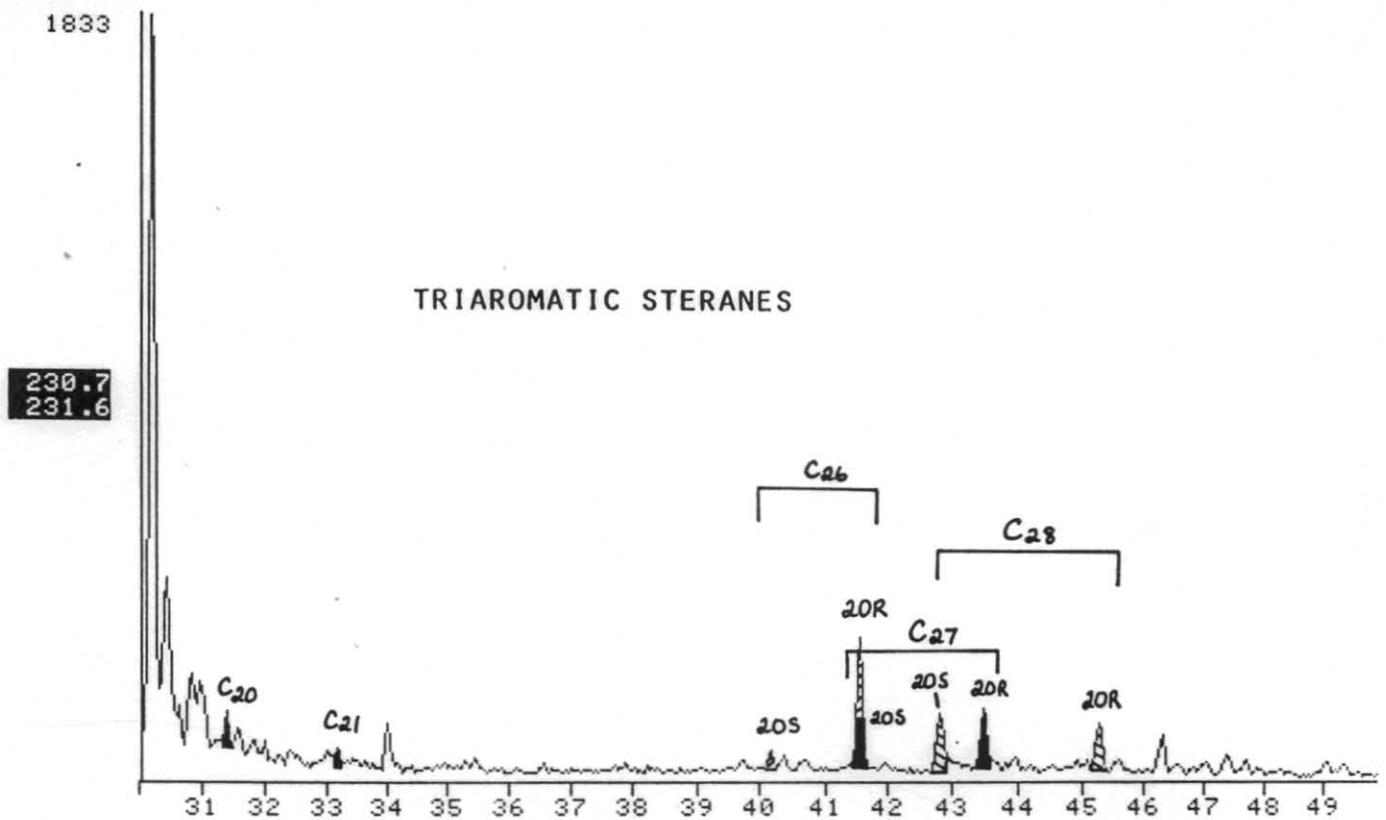


FIGURE: 3-7a

NAME BASS#3, 5023'. AROMATIC FRAGMENTOGRAM.
 MISC 9-3-87. GEC. 0.2/60ul. COL#72.

FRN 6212



NAME BASS#3, 5023'. AROMATIC FRAGMENTOGRAM.
 MISC 9-3-87. GEC. 0.2/60ul. COL#72.

FRN 6212

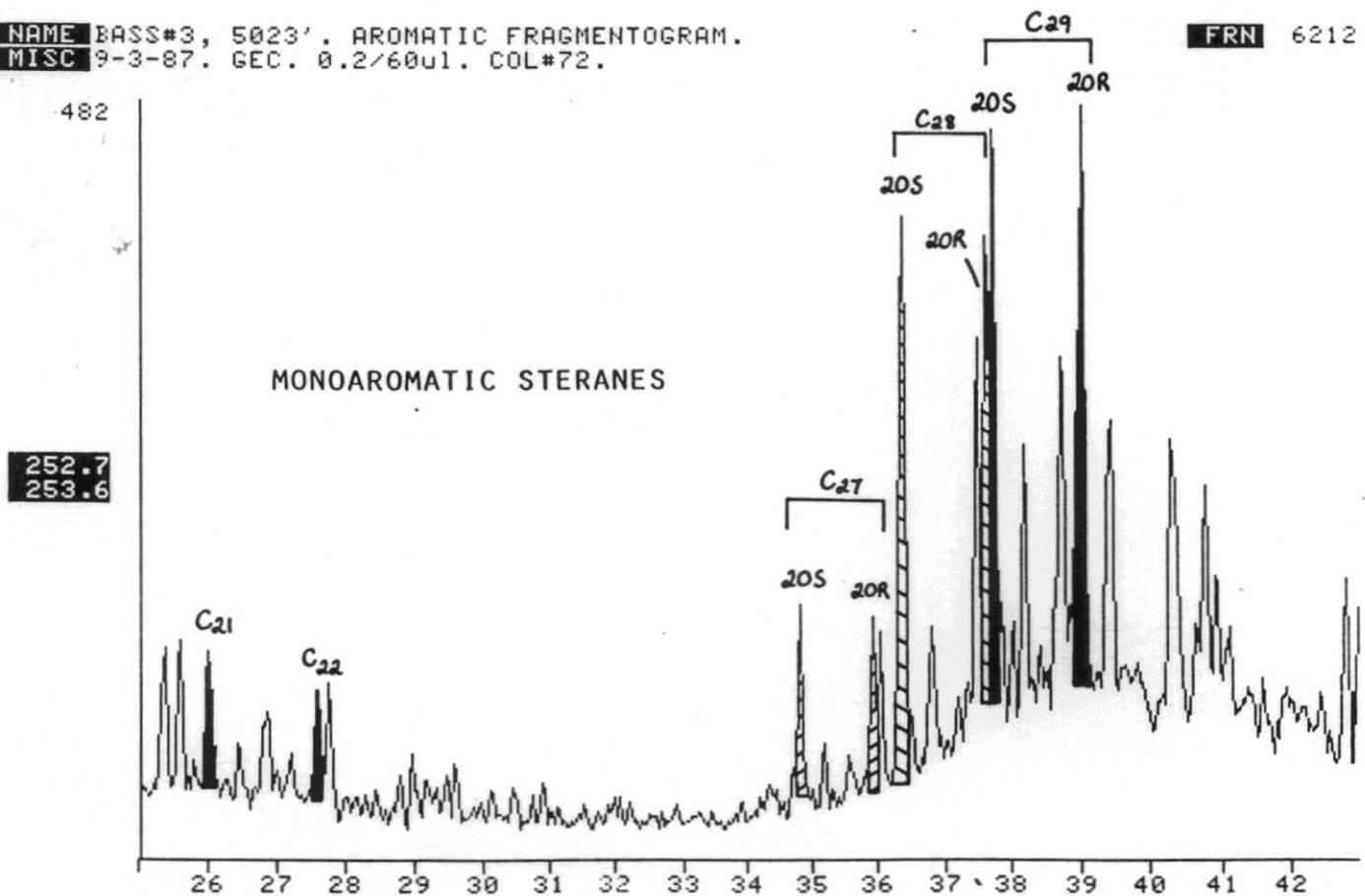
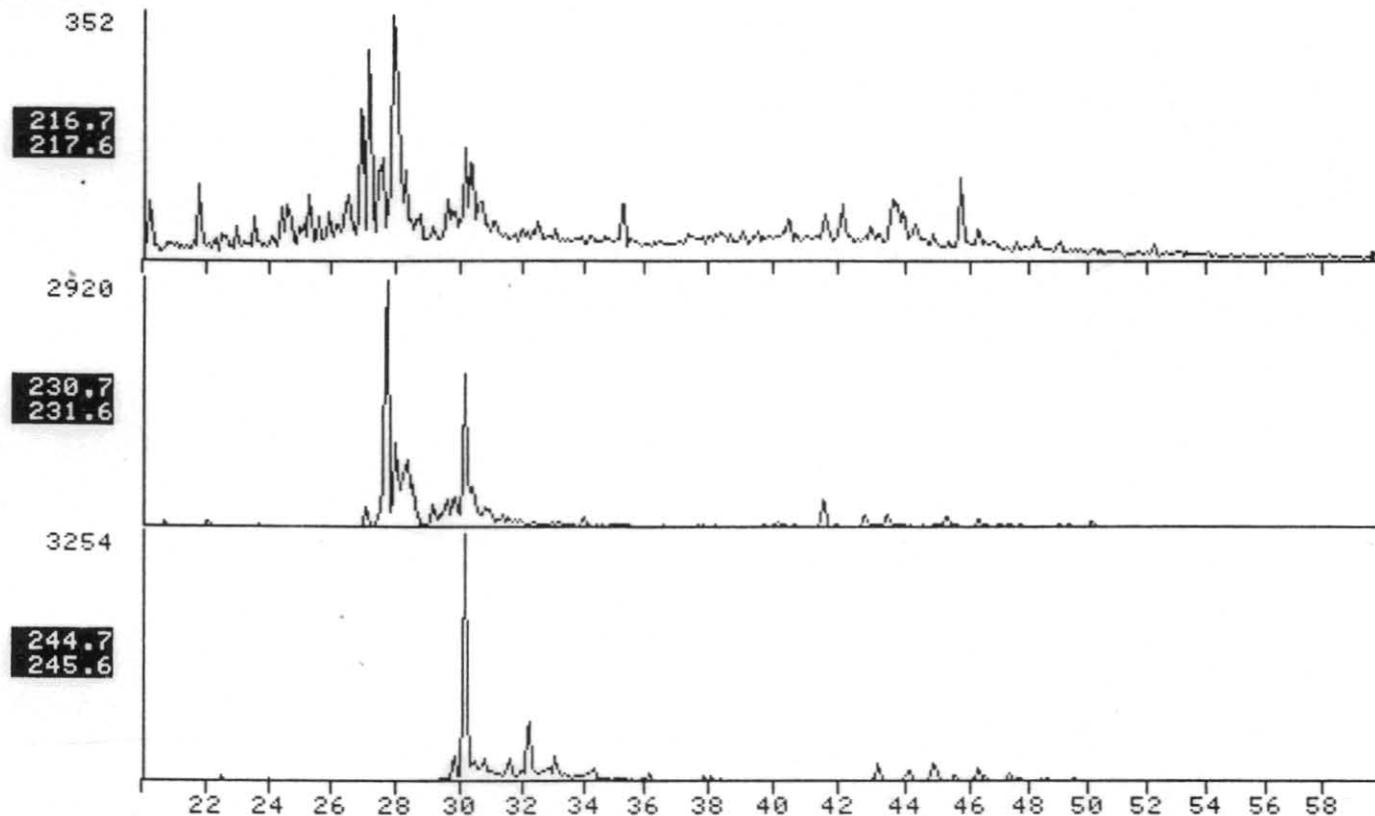


FIGURE: 3-7b

NAME BASS#3, 5023'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/60ul. COL#72.

FRN 6212



NAME BASS#3, 5023'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/60ul. COL#72.

FRN 6212

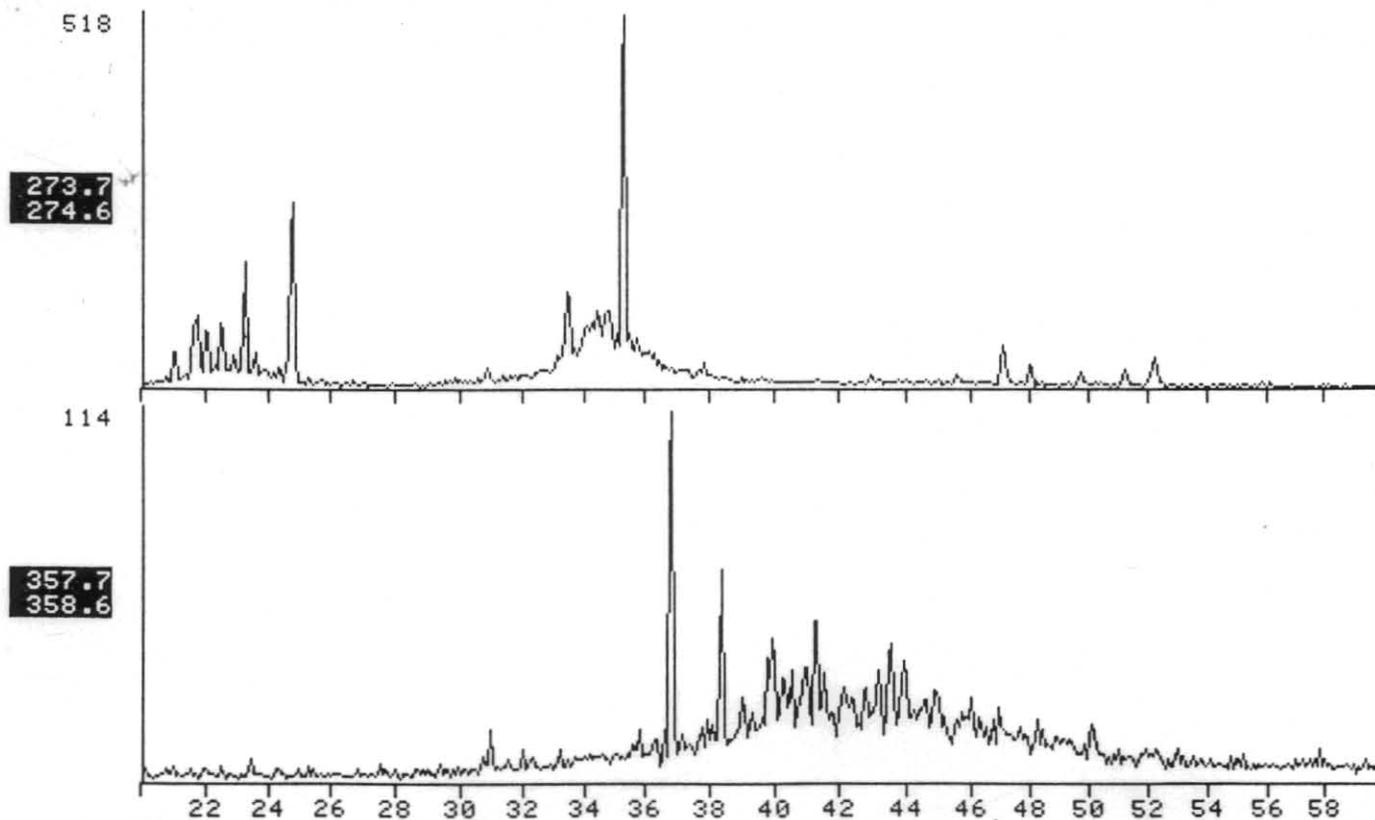
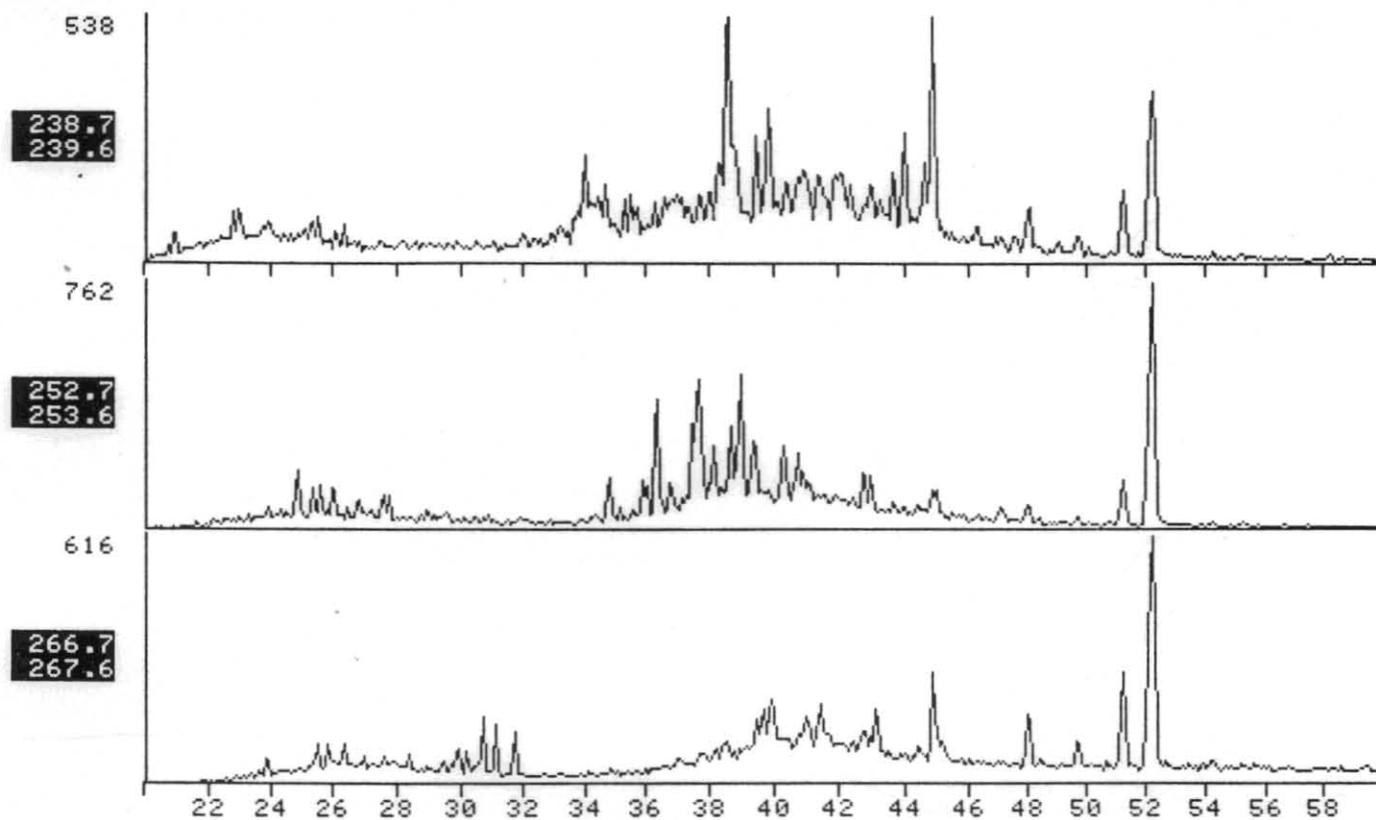


FIGURE: 3-7c

NAME BASS#3, 5023'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/60ul. COL#72.

FRN 6212



NAME BASS#3, 5023'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/60ul. COL#72.

FRN 6212

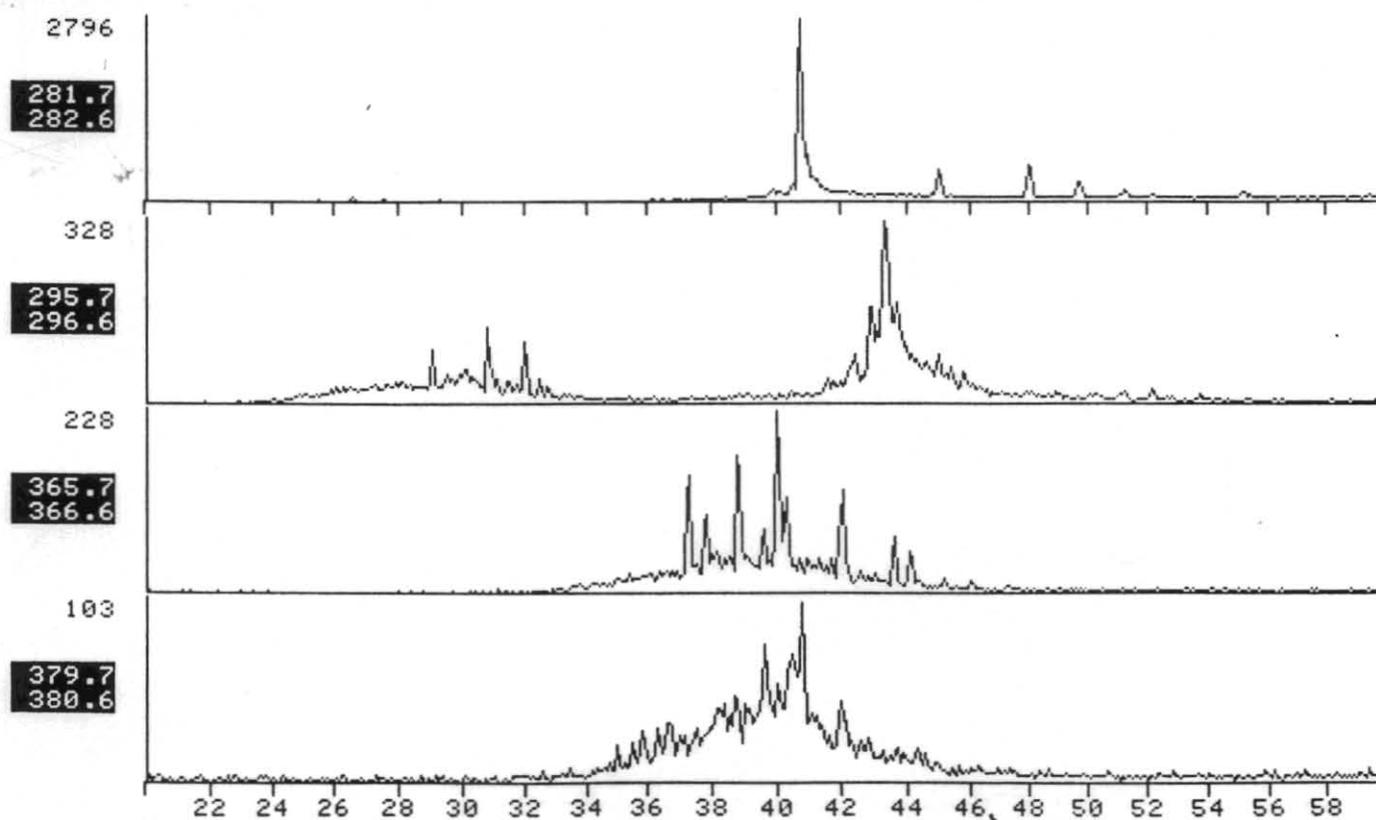
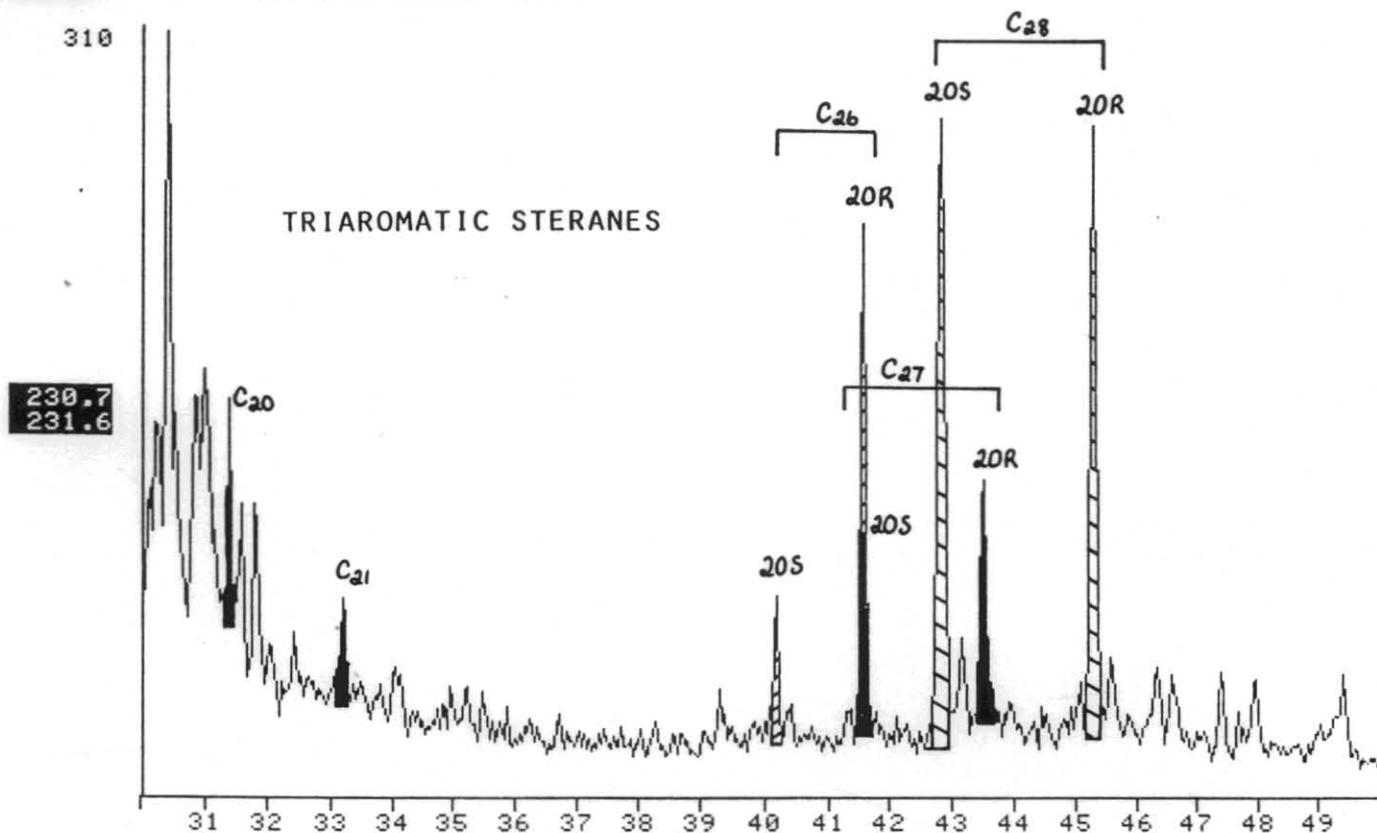


FIGURE: 3-8a

NAME BASS#3, 7434'. AROMATIC FRAGMENTOGRAM.
 MISC 9-3-87. GEC. 0.2/180ul. COL#72.

FRN 6213



NAME BASS#3, 7434'. AROMATIC FRAGMENTOGRAM.
 MISC 9-3-87. GEC. 0.2/180ul. COL#72.

FRN 6213

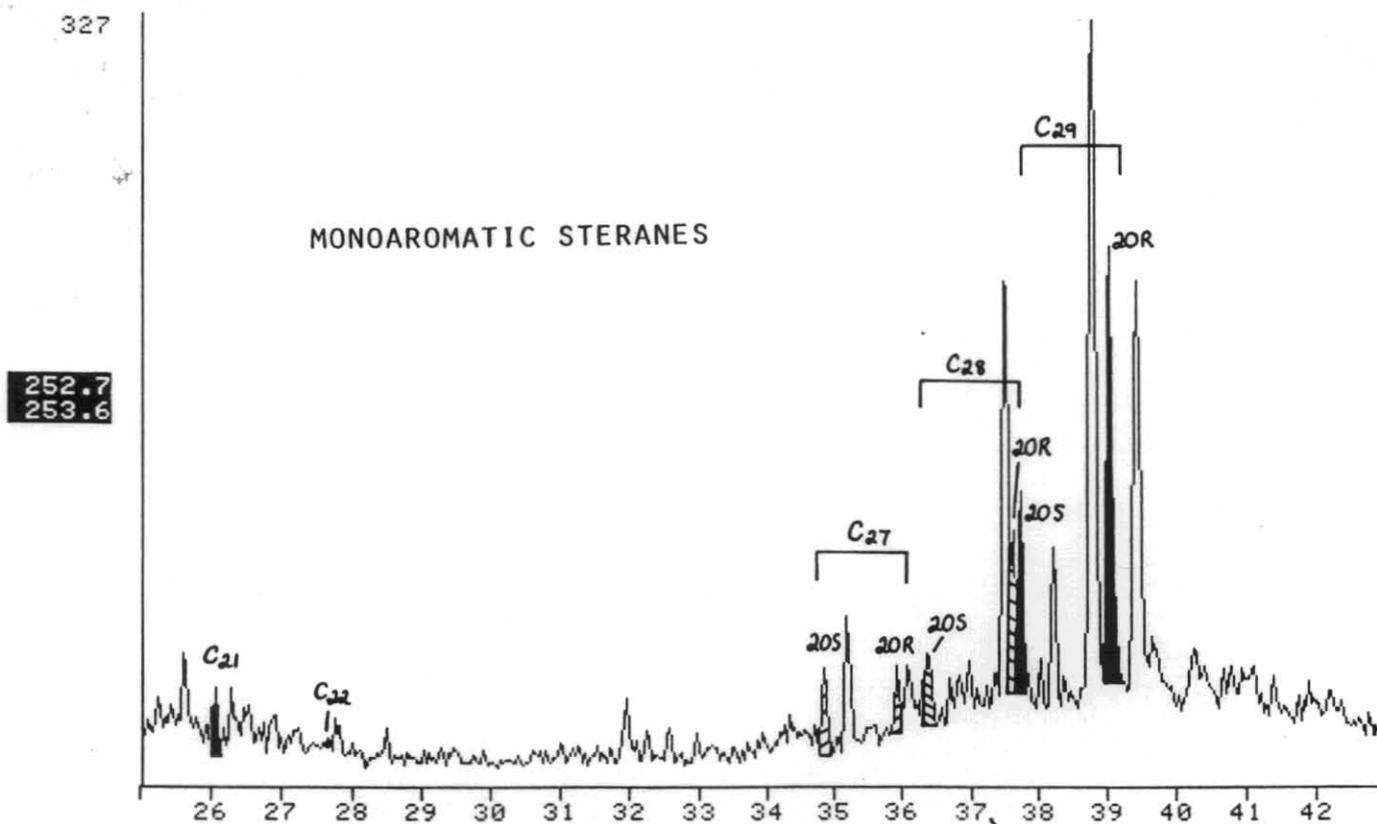
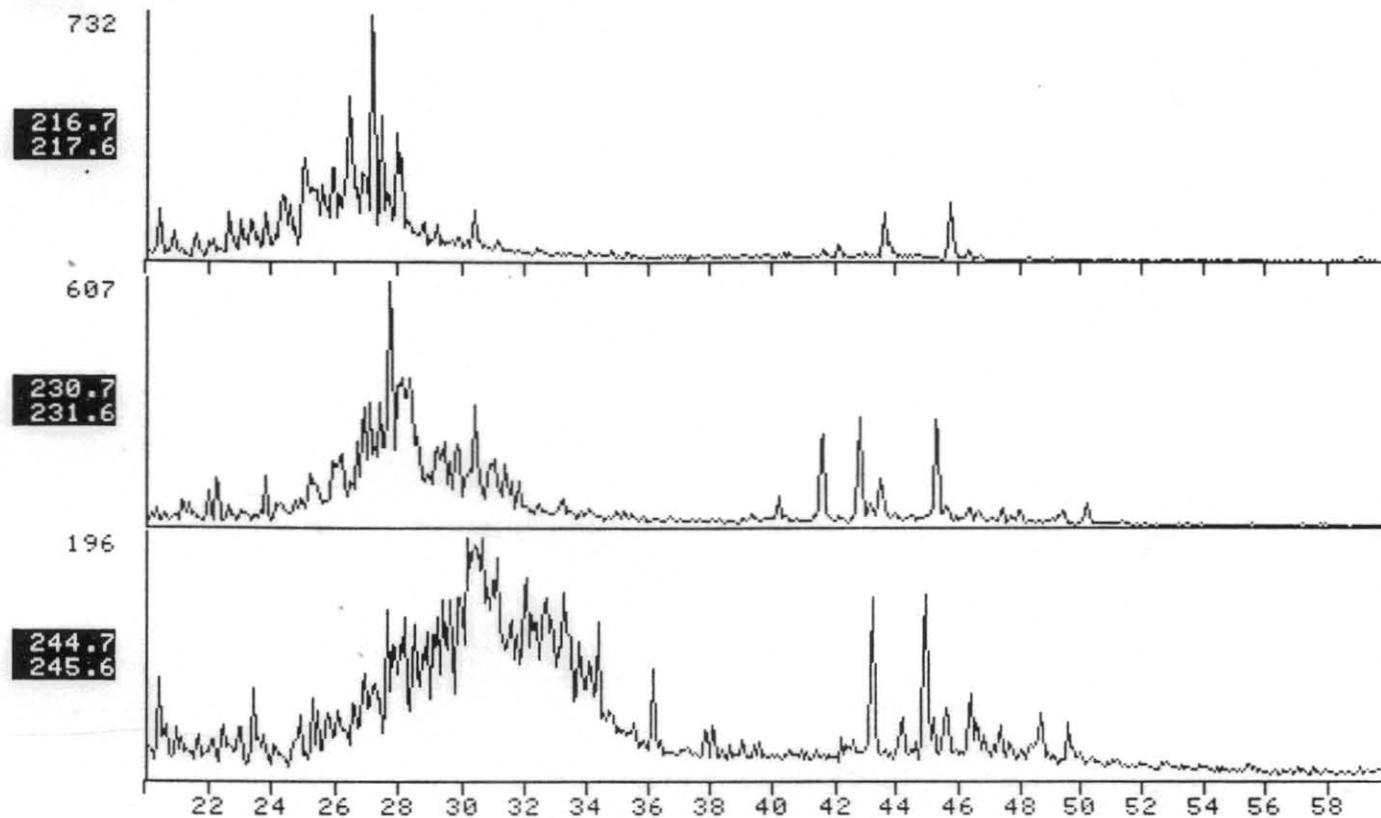


FIGURE: 3-8b

NAME BASS#3, 7434'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/180ul. COL#72.

FRN 6213



NAME BASS#3, 7434'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/180ul. COL#72.

FRN 6213

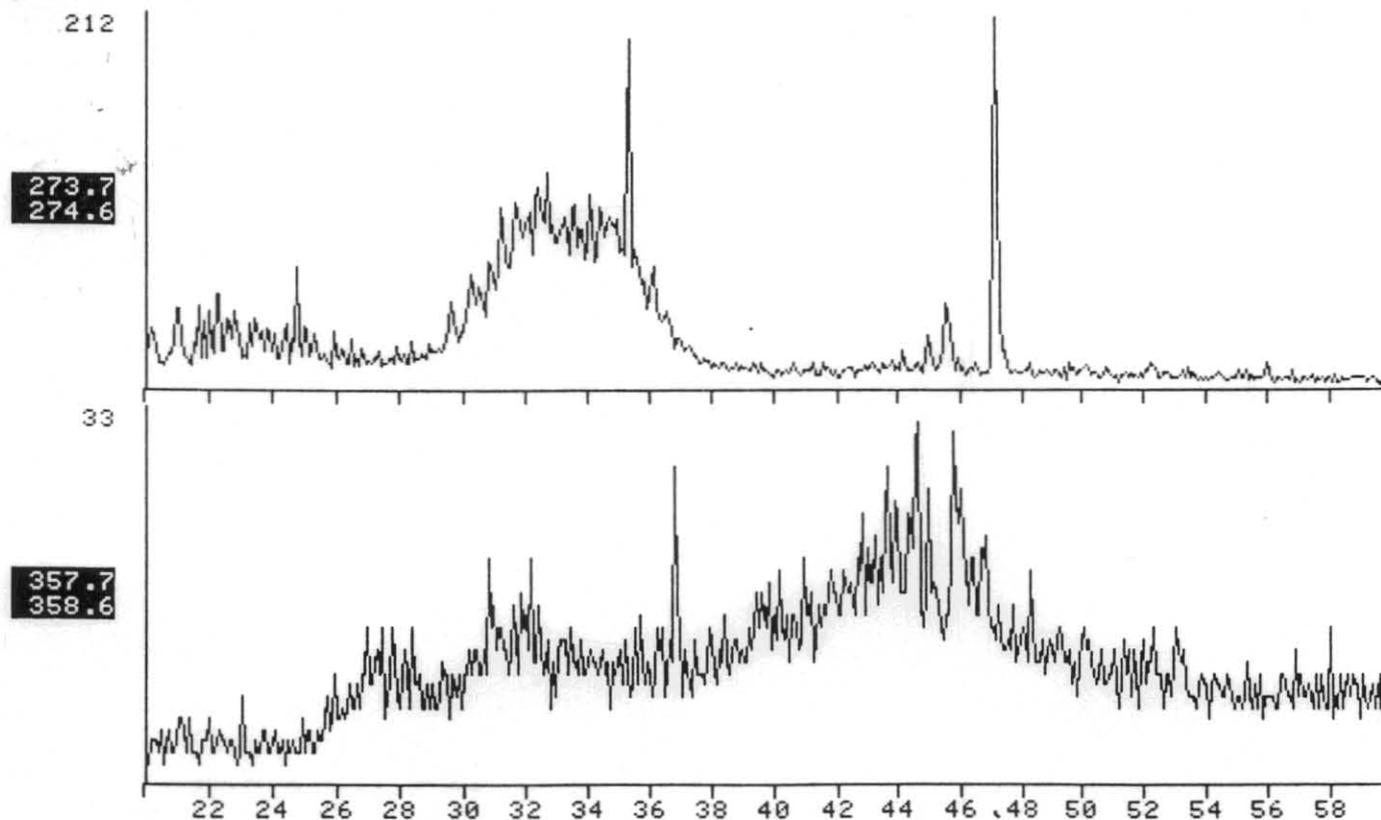
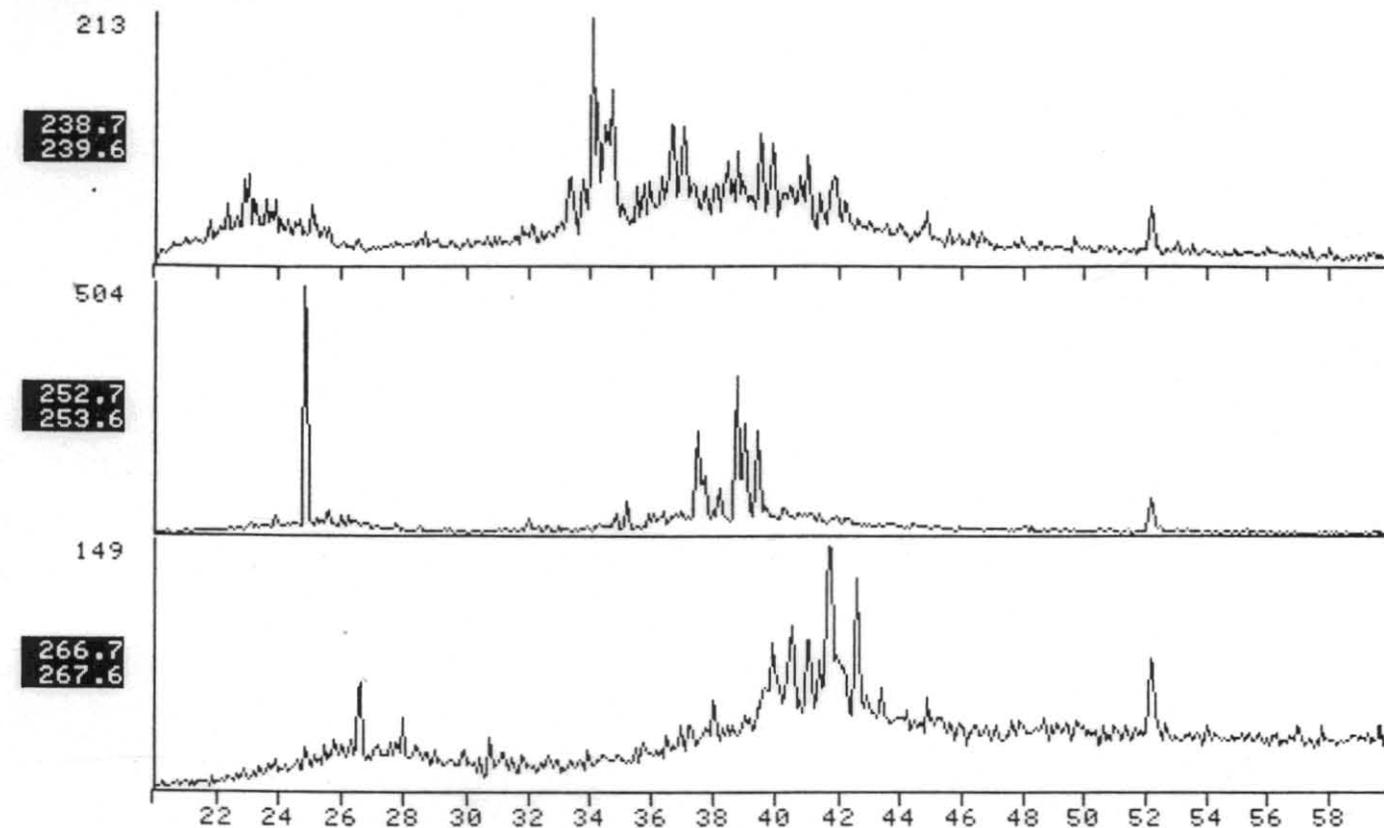


FIGURE: 3-8c

NAME BASS#3, 7434'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/180ul. COL#72.

FRN 6213



NAME BASS#3, 7434'. AROMATIC FRAGMENTOGRAM.
MISC 9-3-87. GEC. 0.2/180ul. COL#72.

FRN 6213

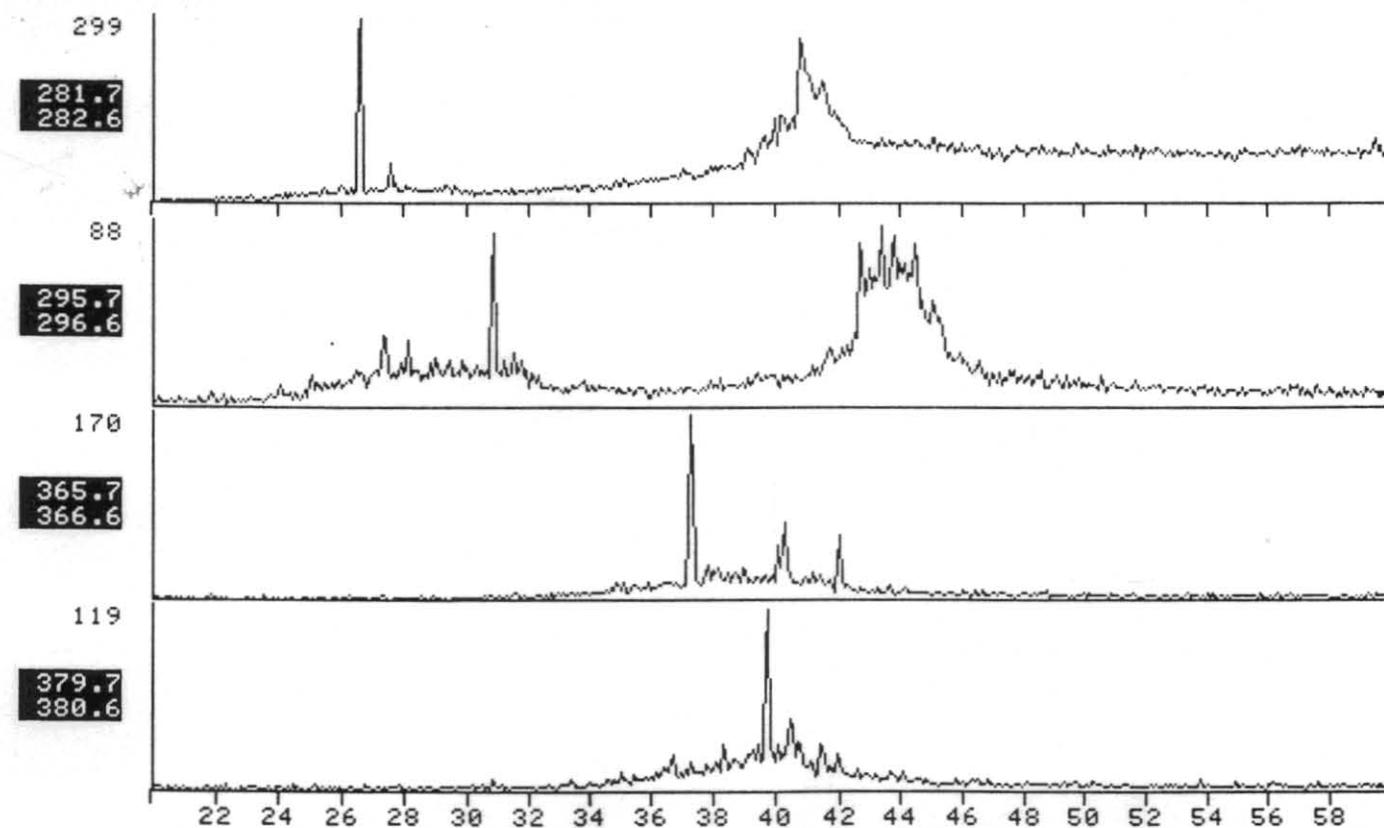
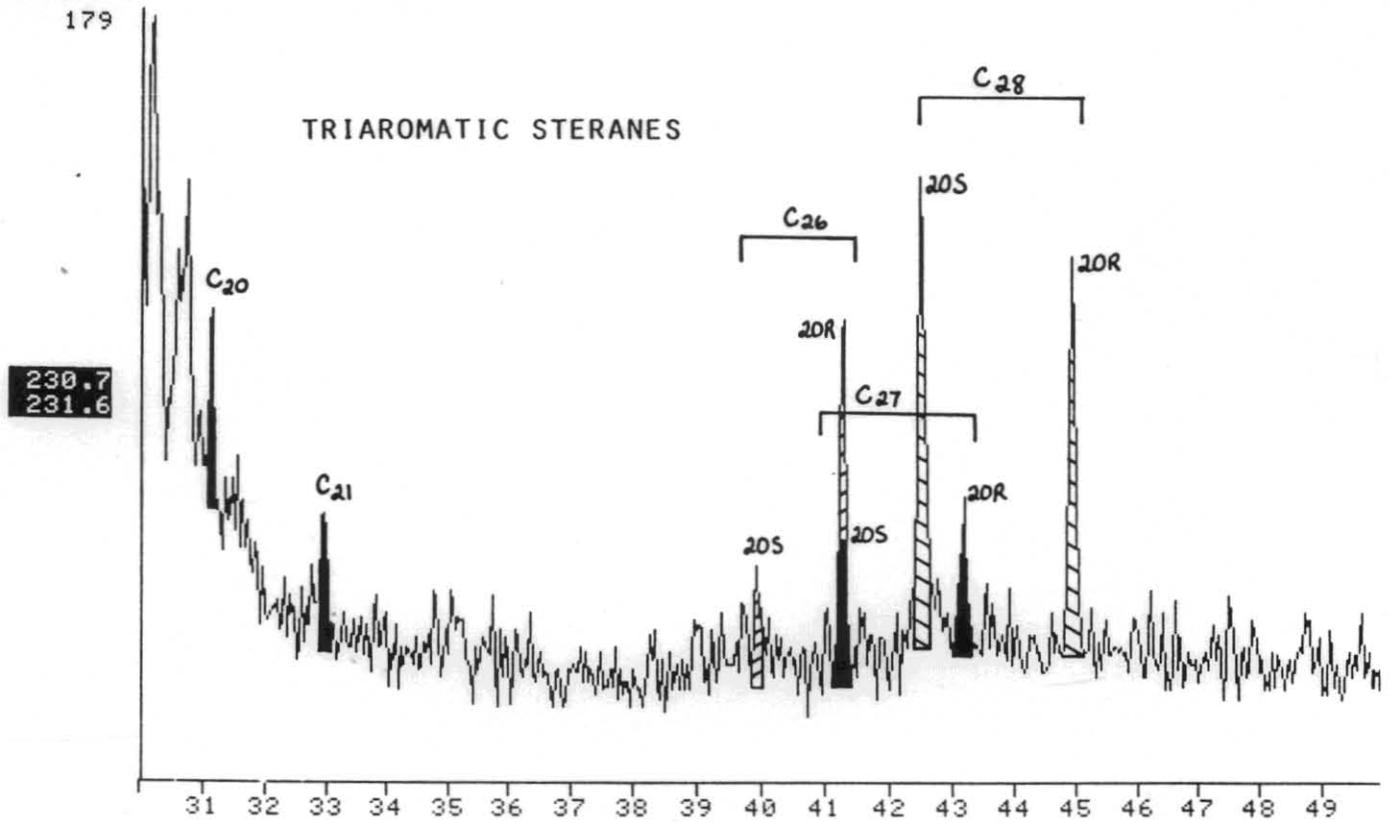


FIGURE: 33-9a

NAME DONDU#1, 7679'10". AROMATIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/60ul. COL#72.

FRN 6258



NAME DONDU#1, 7679'10". AROMATIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/60ul. COL#72.

FRN 6258

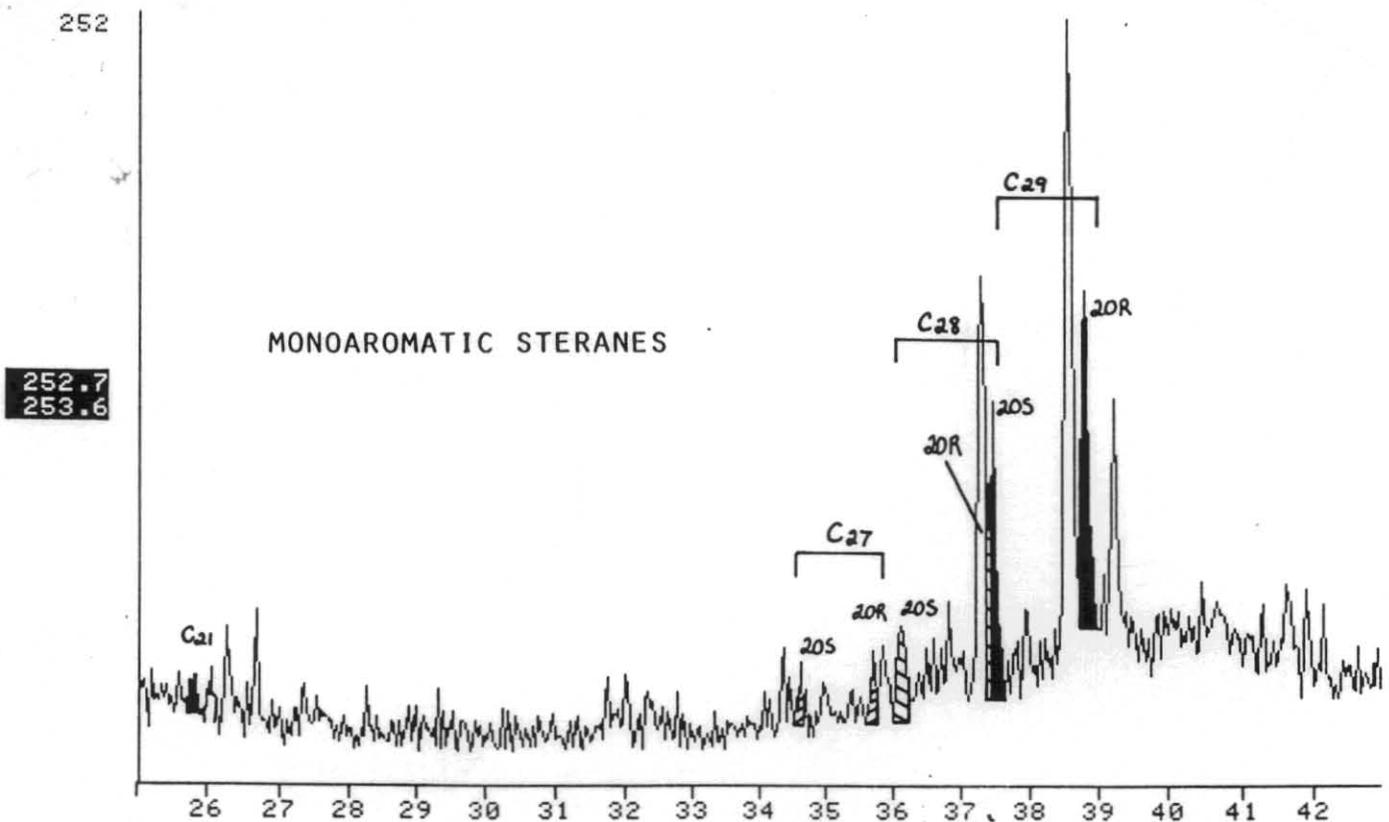
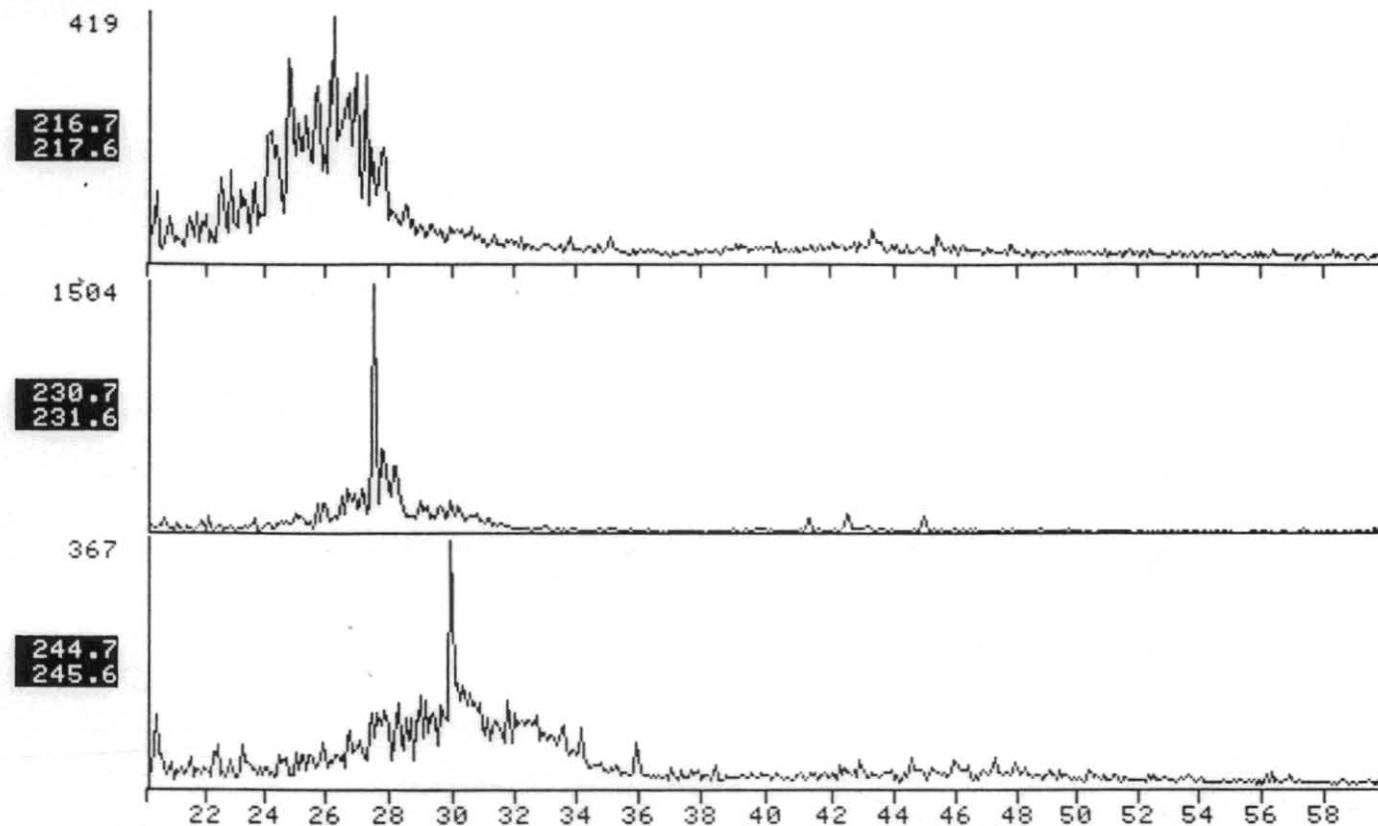


FIGURE: 3-9b

NAME DONDU#1, 7679'10". AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/60ul. COL#72.

FRN 6250



NAME DONDU#1, 7679'10". AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/60ul. COL#72.

FRN 6250

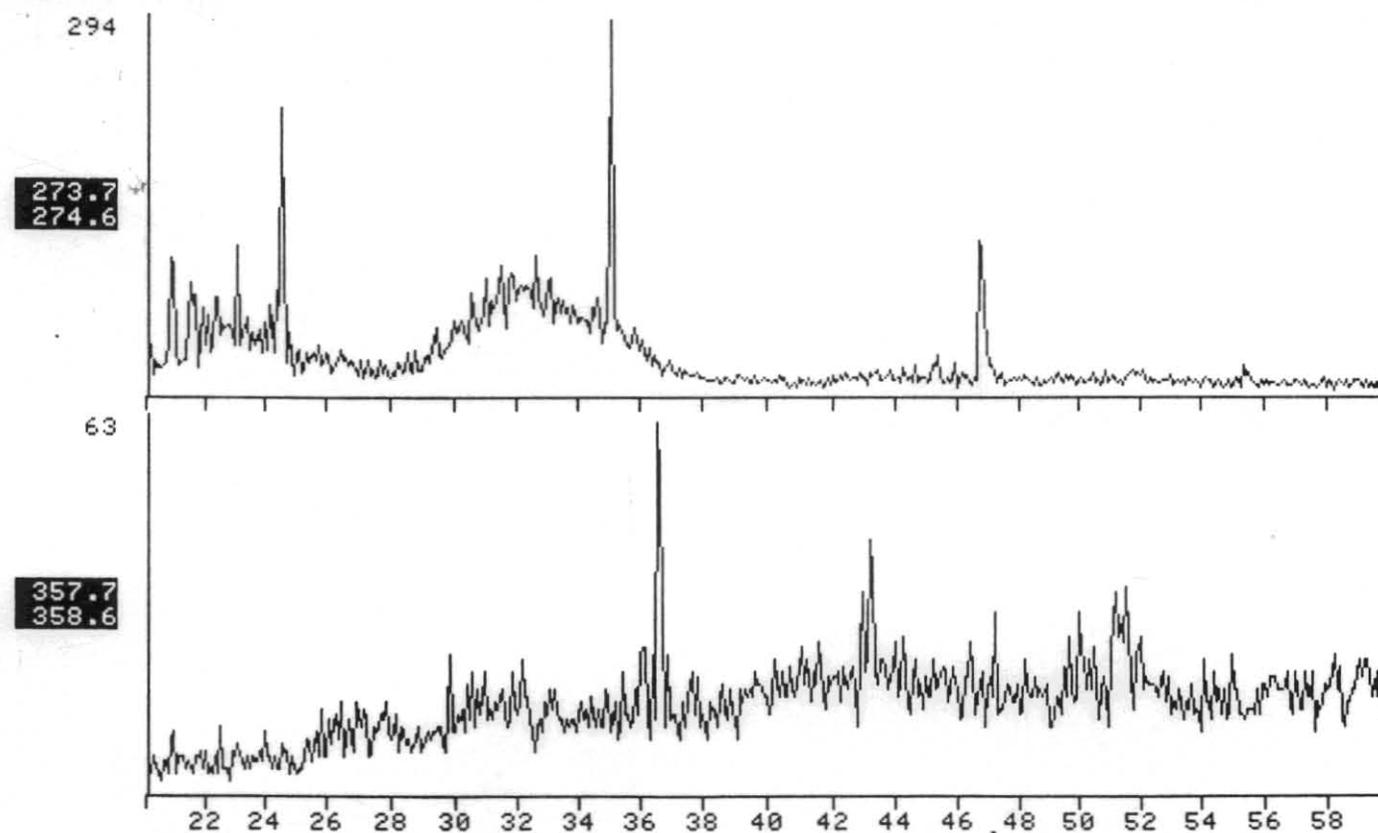
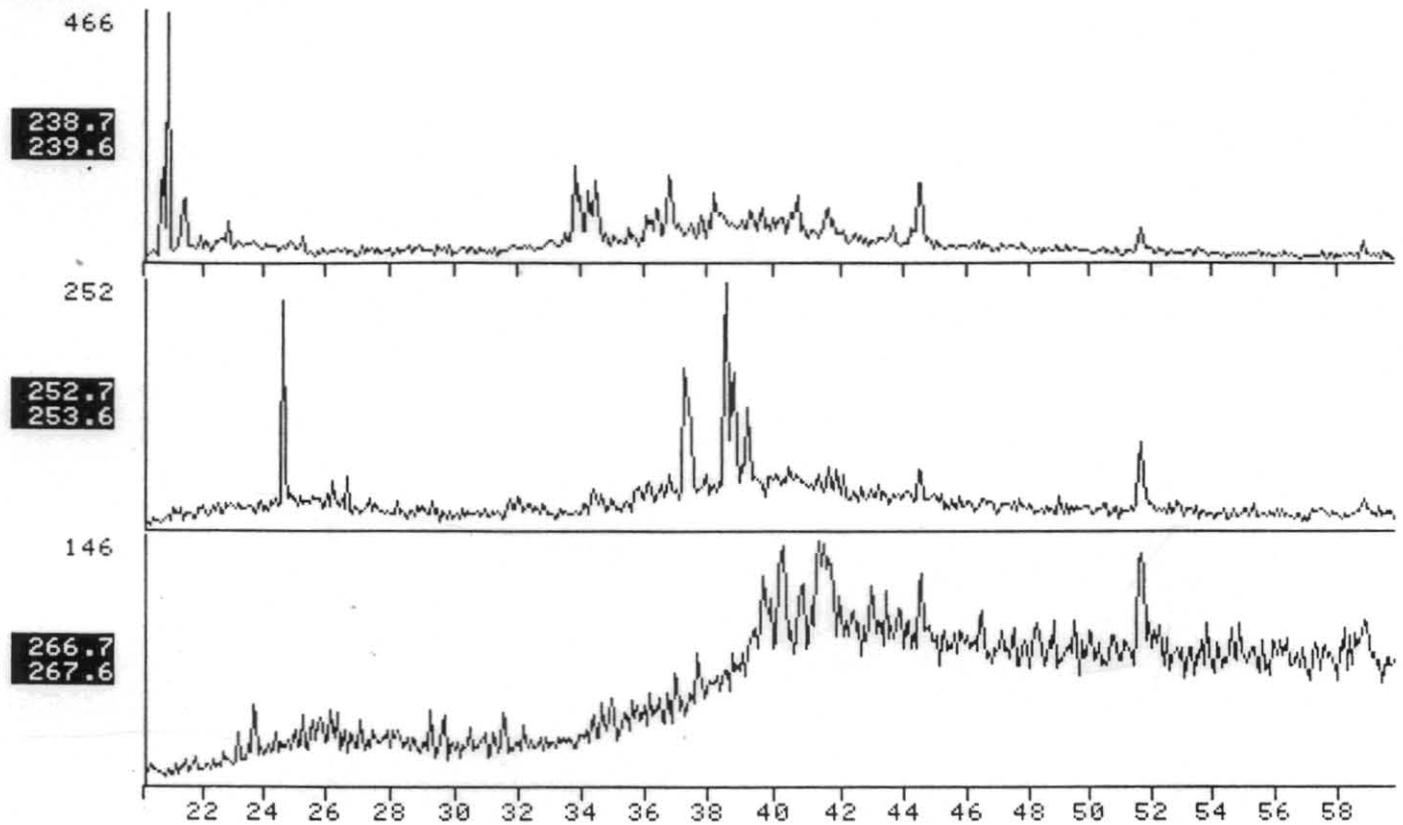


FIGURE: 3-9c

NAME DONDU#1, 7679'10". AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/60ul. COL#72.

FRN 6250



NAME DONDU#1, 7679'10". AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/60ul. COL#72.

FRN 6250

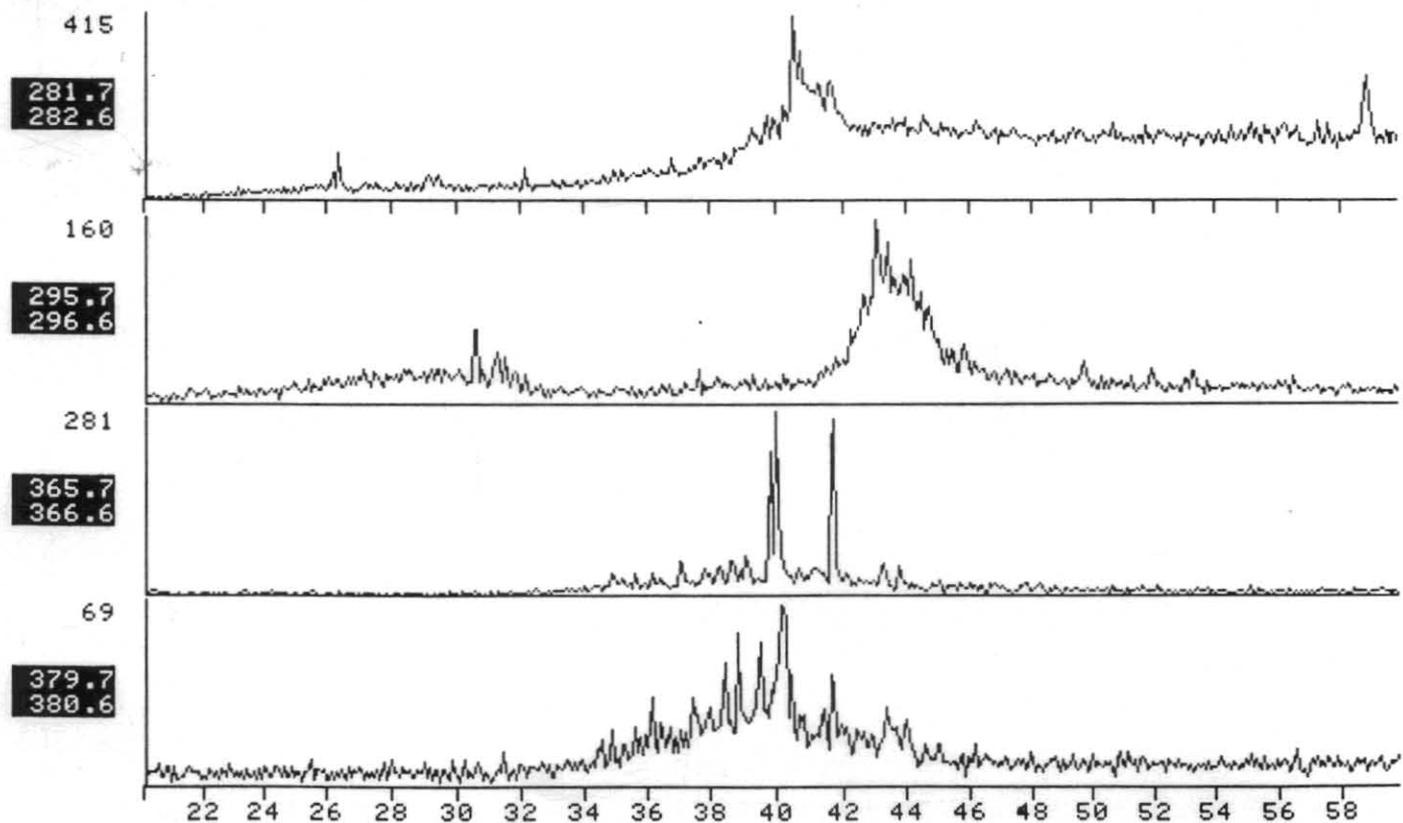
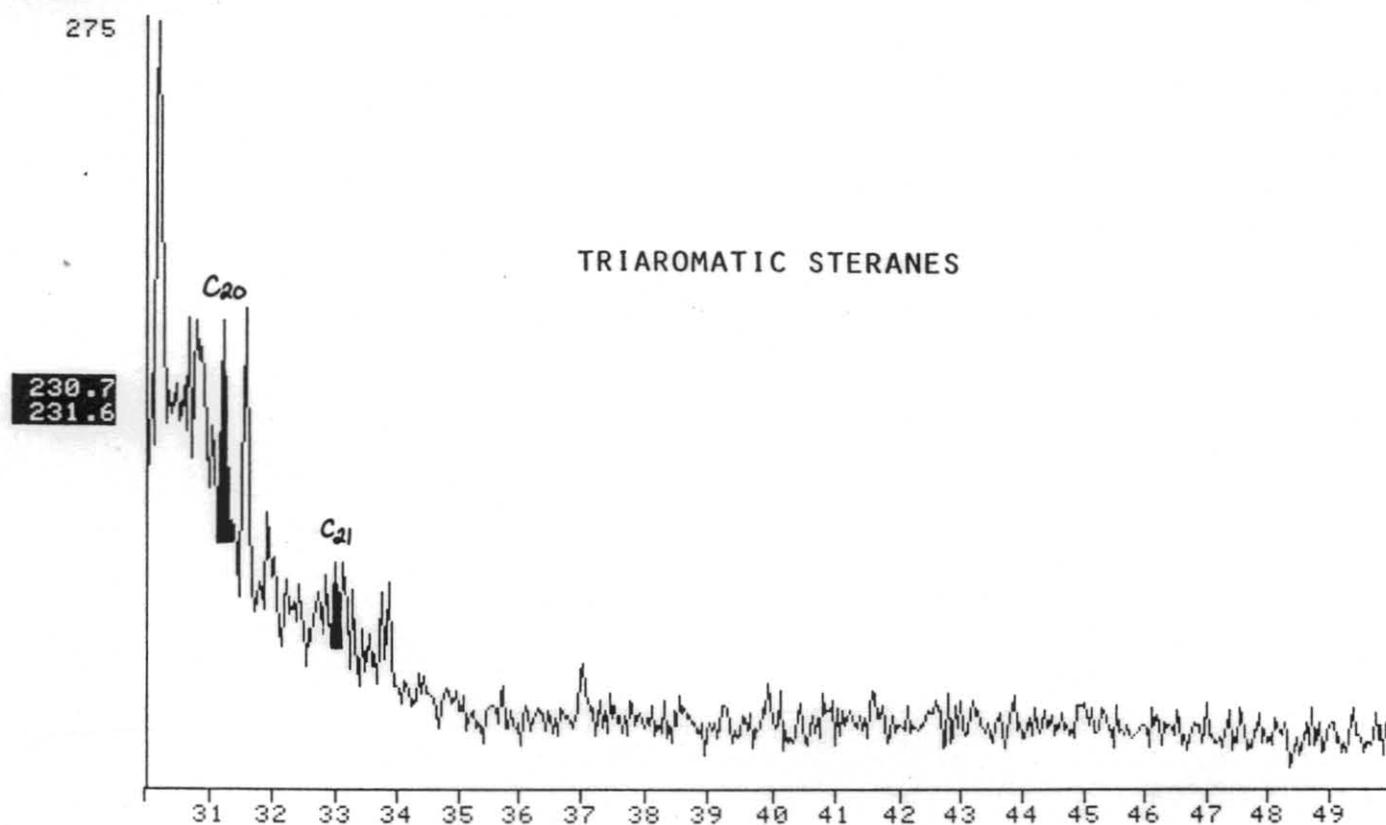


FIGURE: 3-10a

NAME DURROON#1, 5551'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. NW. 0.2/65ul. COL#72.

FRN 6247



NAME DURROON#1, 5551'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. NW. 0.2/65ul. COL#72.

FRN 6247

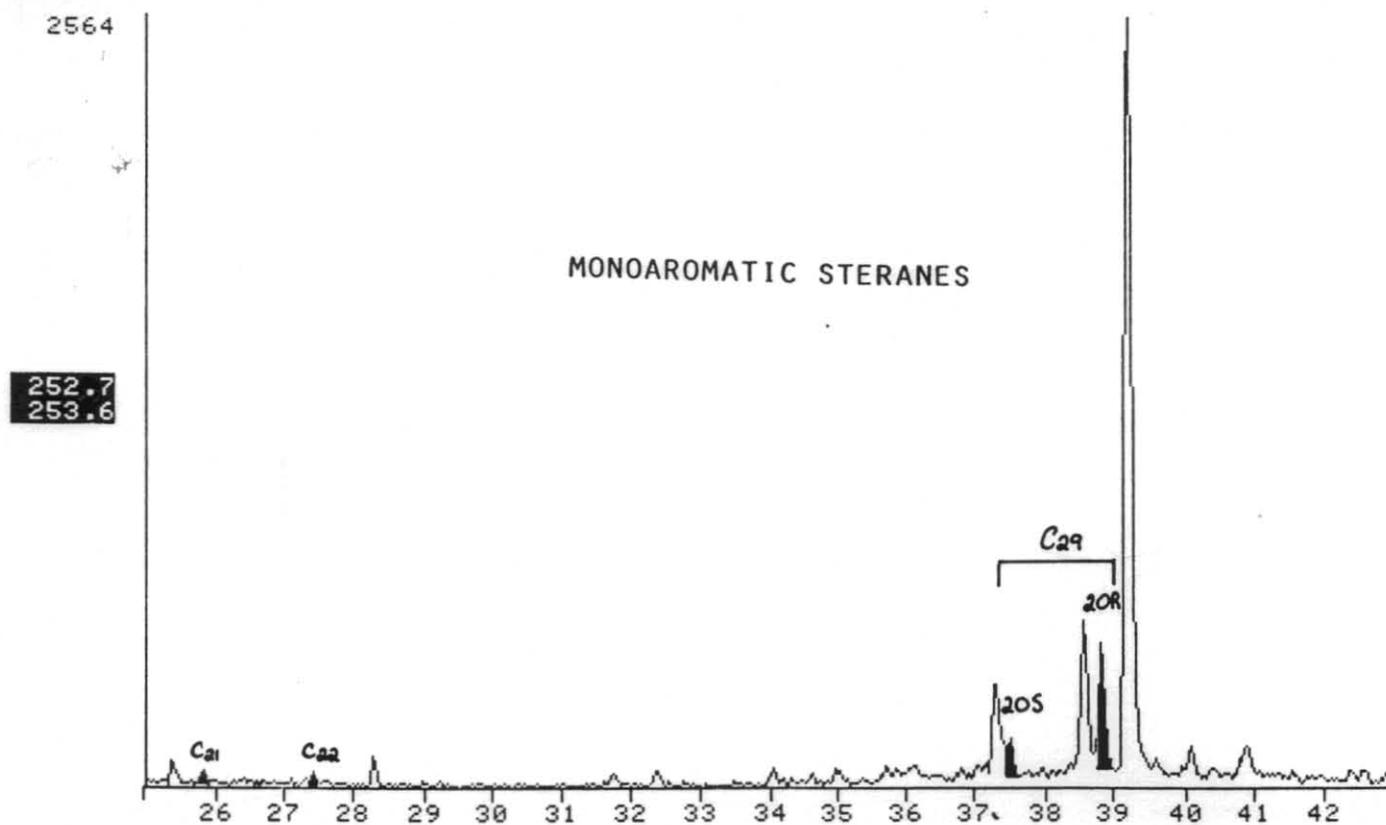
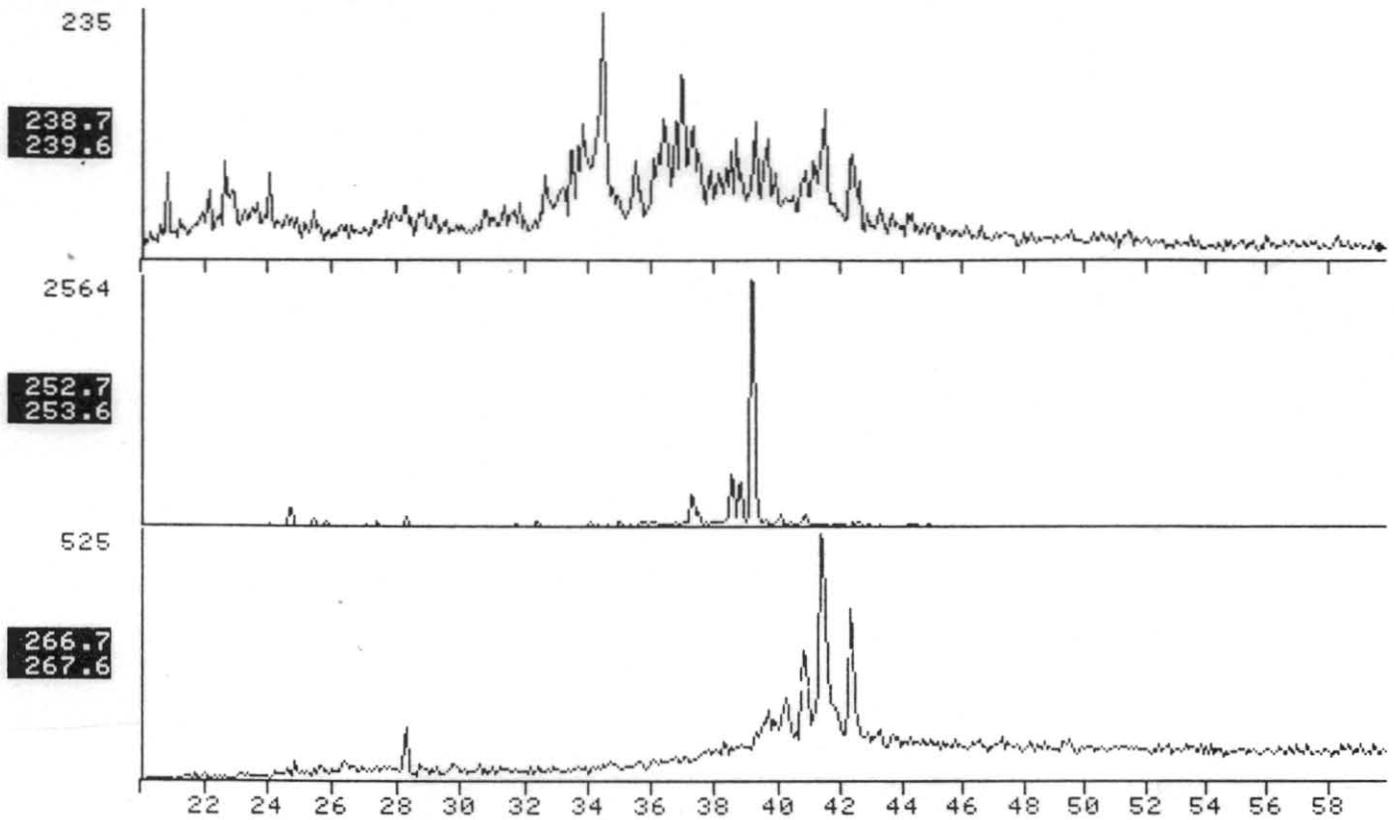


FIGURE: 3-10b

NAME DURROON#1, 5551'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. NW. 0.2/65ul. COL#72.

FRN 6247



NAME DURROON#1, 5551'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. NW. 0.2/65ul. COL#72.

FRN 6247

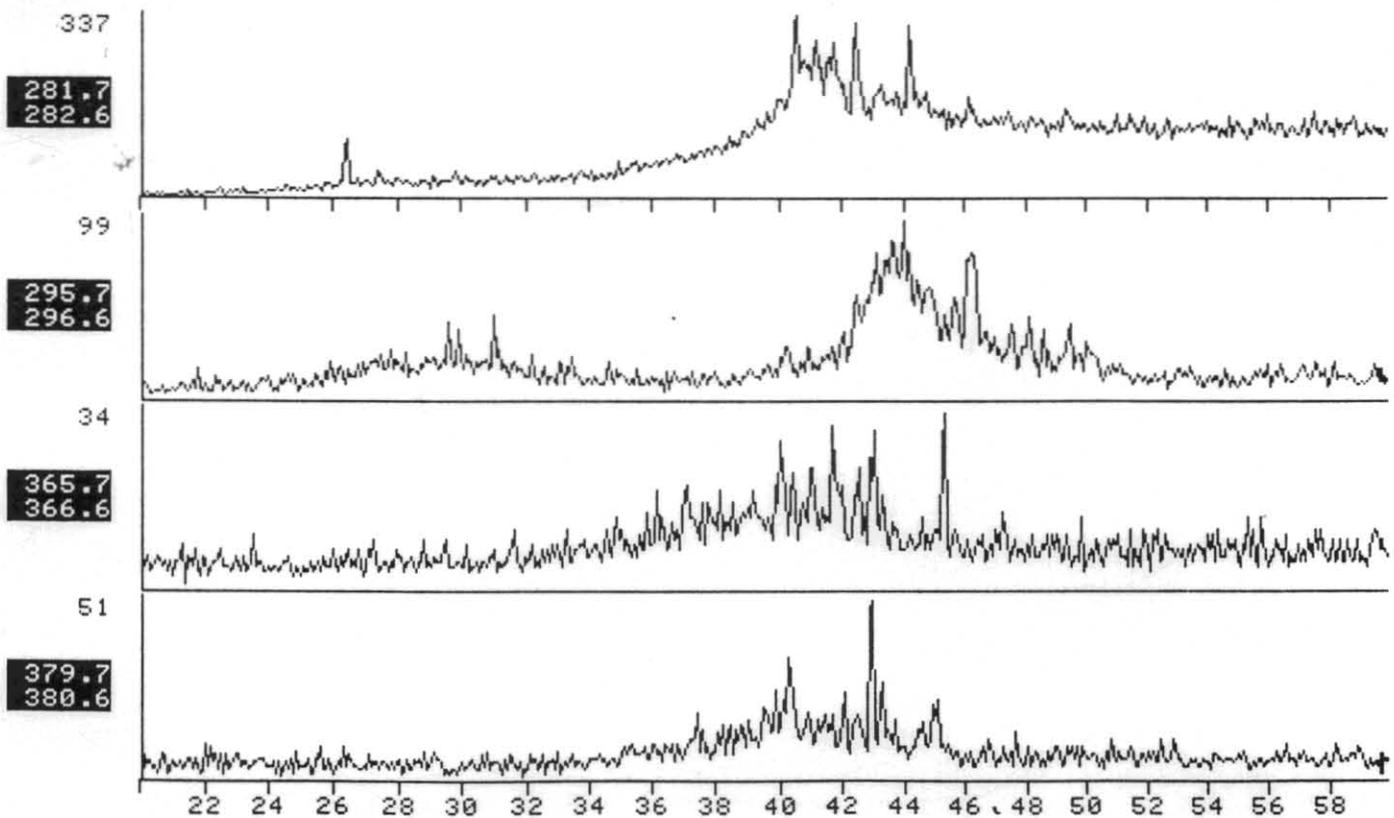
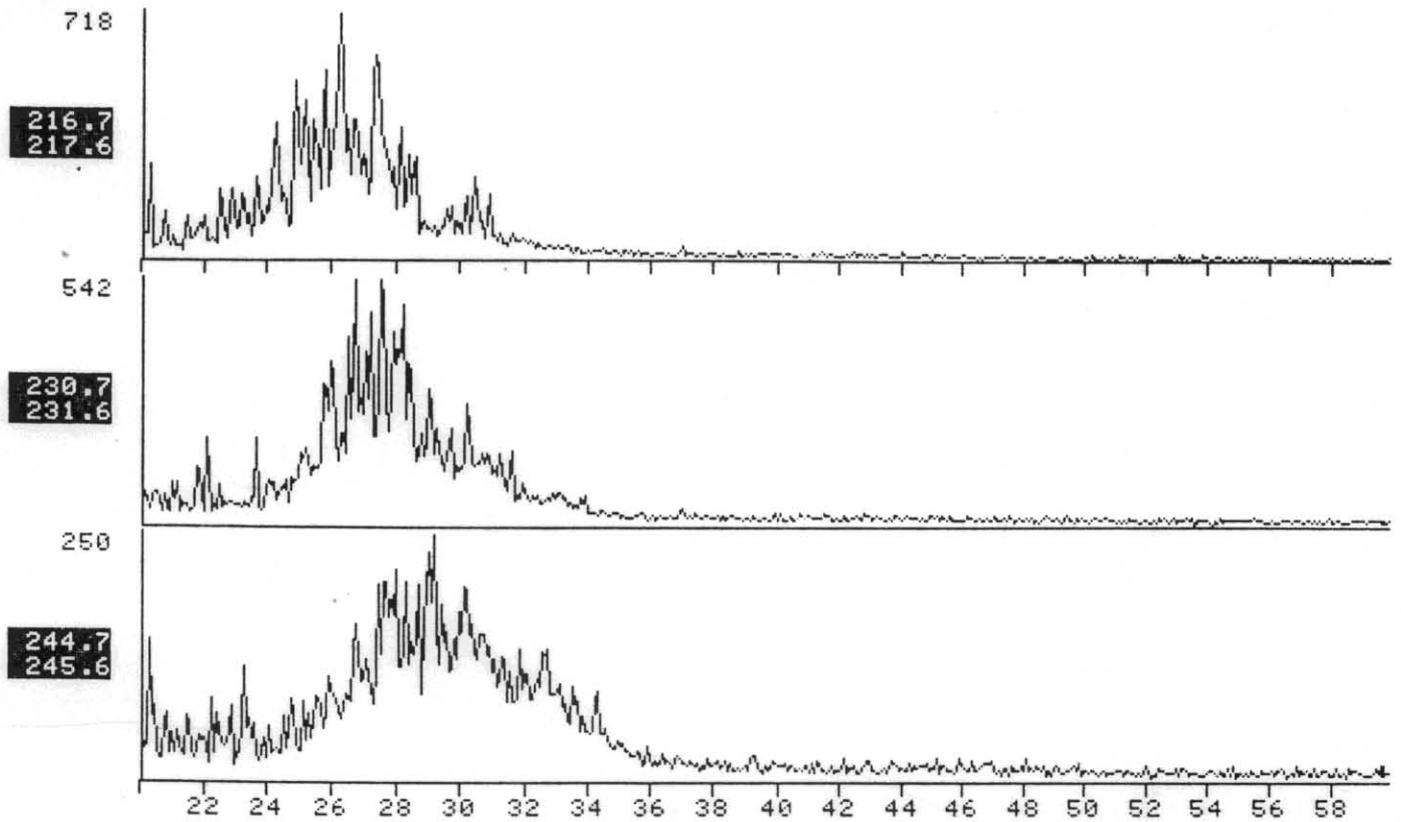


FIGURE: 3-10c

NAME DURROON#1, 5551'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. NW. 0.2/65ul. COL#72.

FRN 6247



NAME DURROON#1, 5551'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. NW. 0.2/65ul. COL#72.

FRN 6247

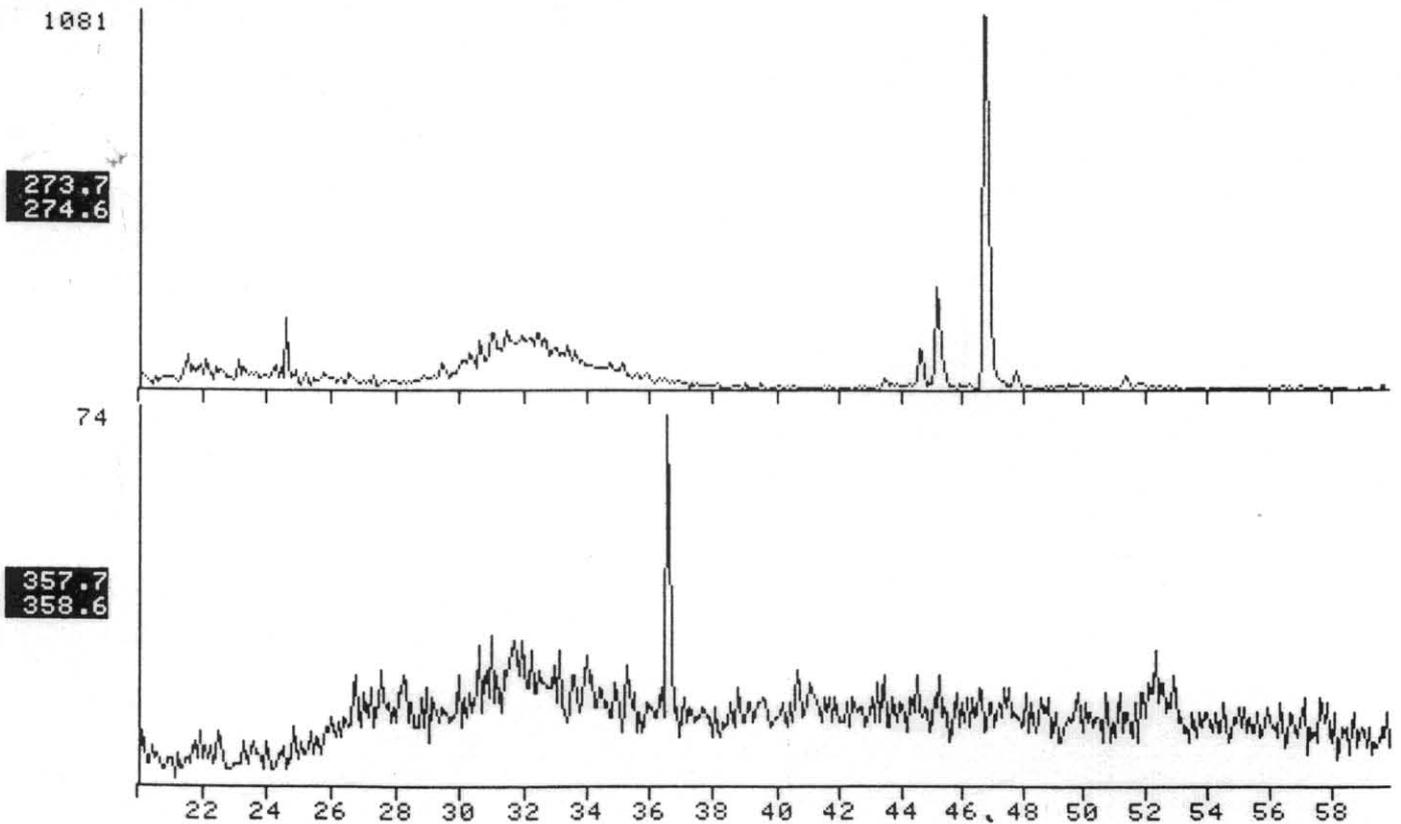
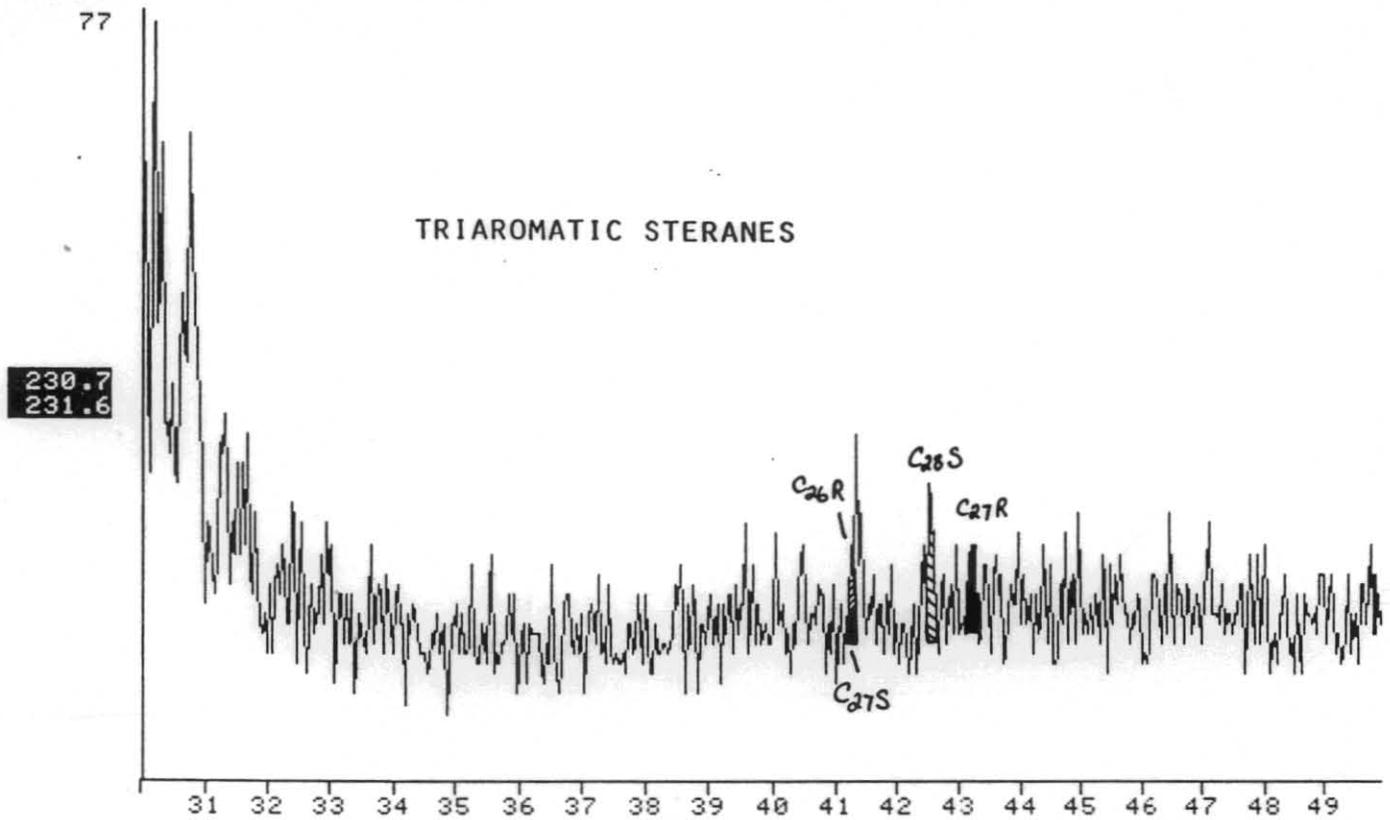


FIGURE: 3-11a

NAME DURROON#1, 8424'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/180ul. COL#72.

FRN 6199



NAME DURROON#1, 8424'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/180ul. COL#72.

FRN 6199

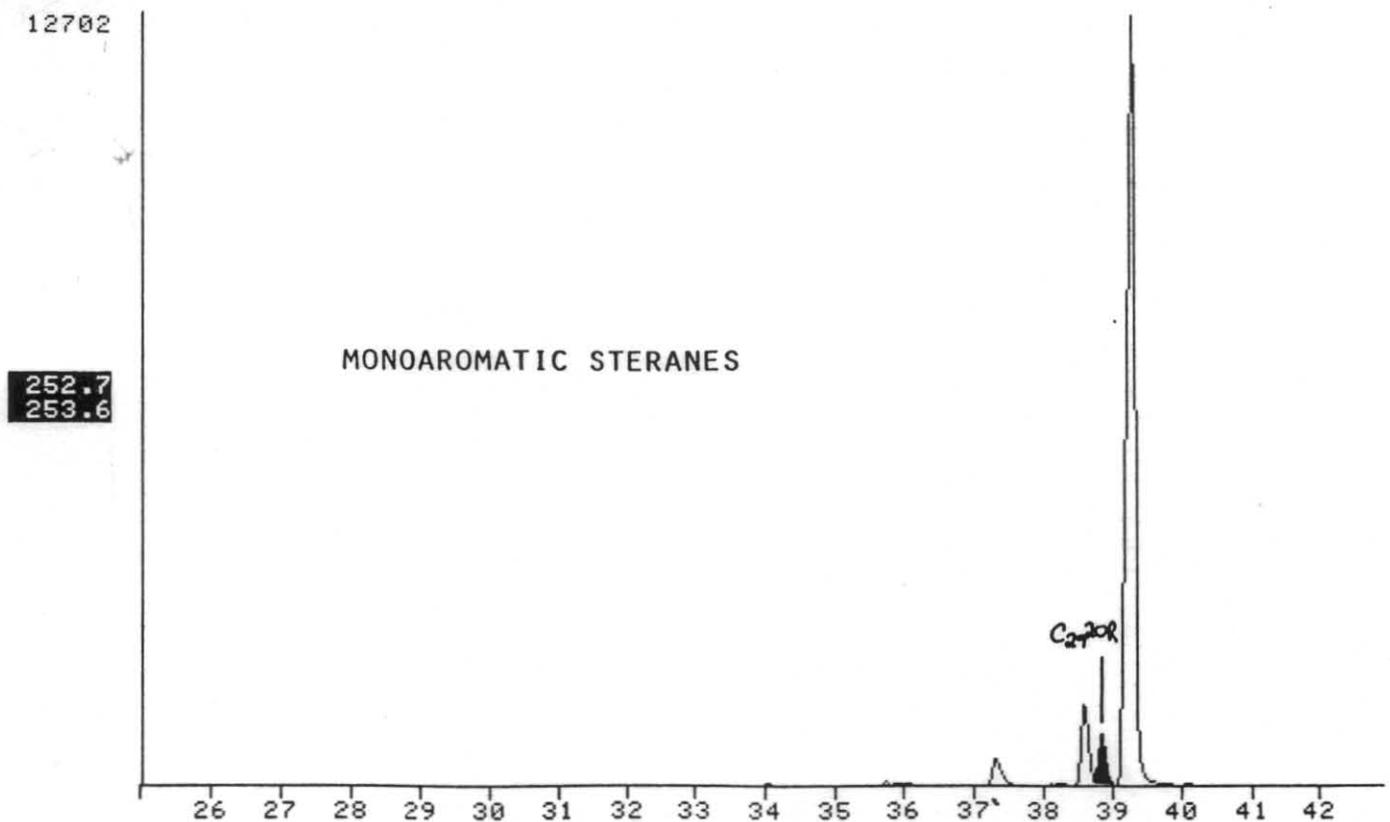
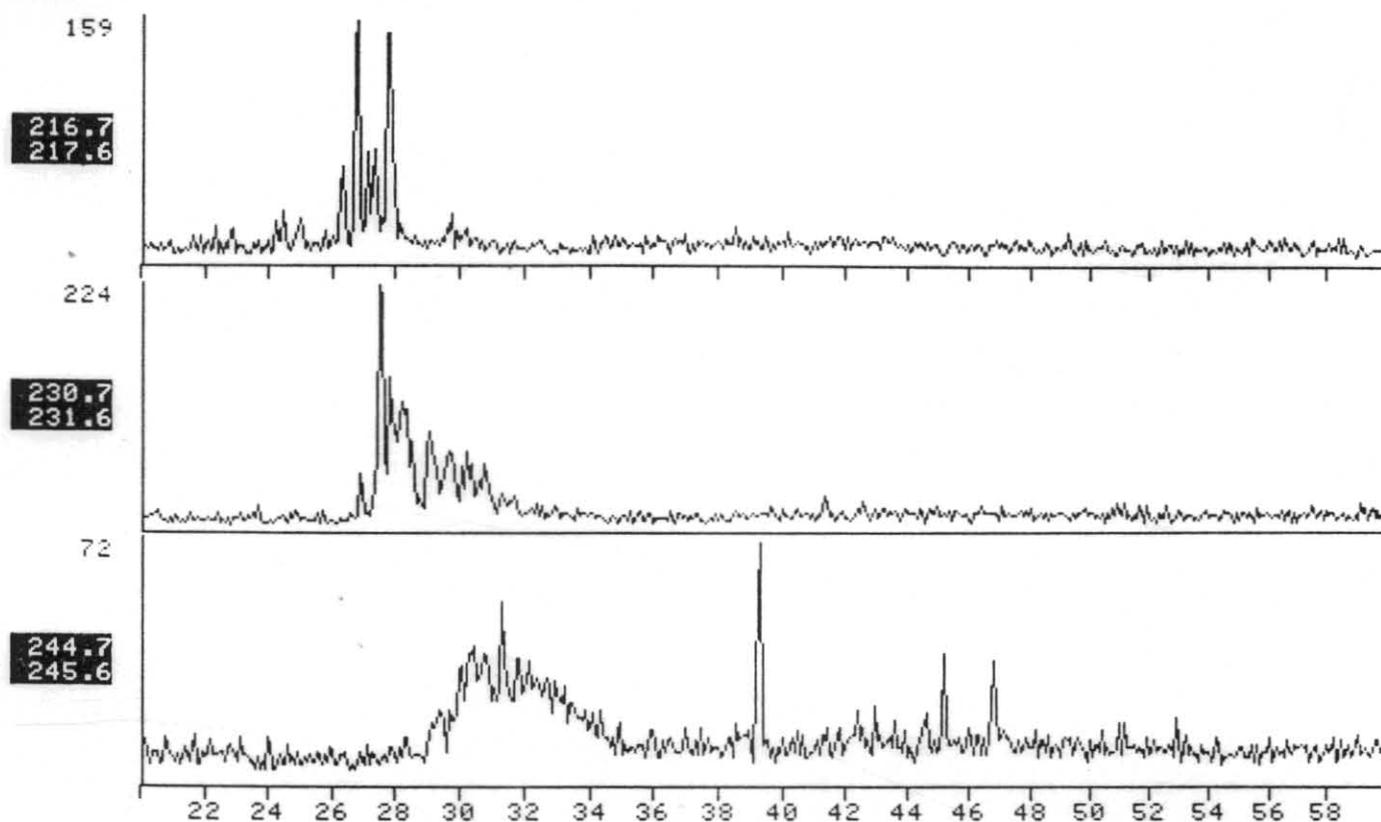


FIGURE: 3-11b

NAME DURROON#1, 8424'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/180ul. COL#72.

FRN 6199



NAME DURROON#1, 8424'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/180ul. COL#72.

FRN 6199

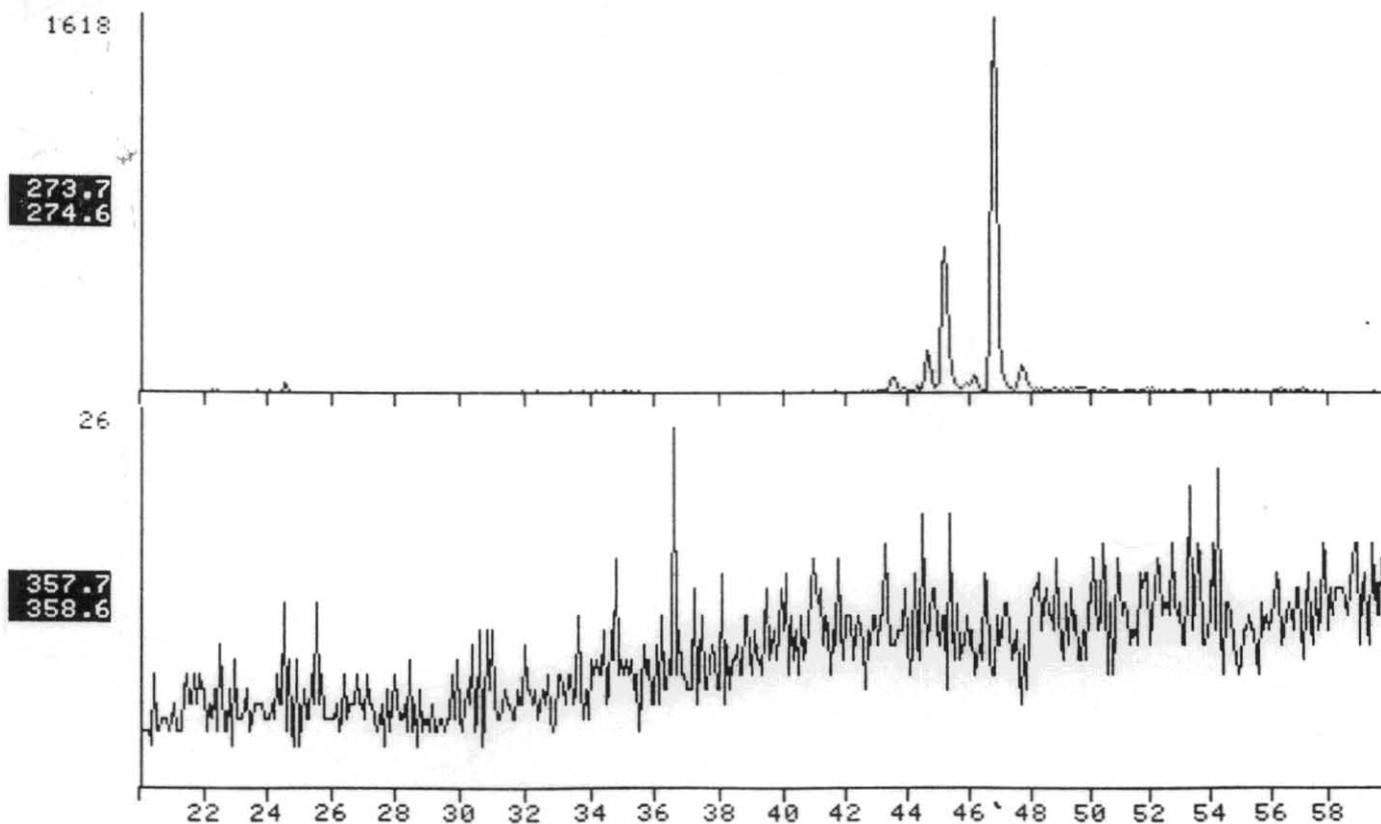
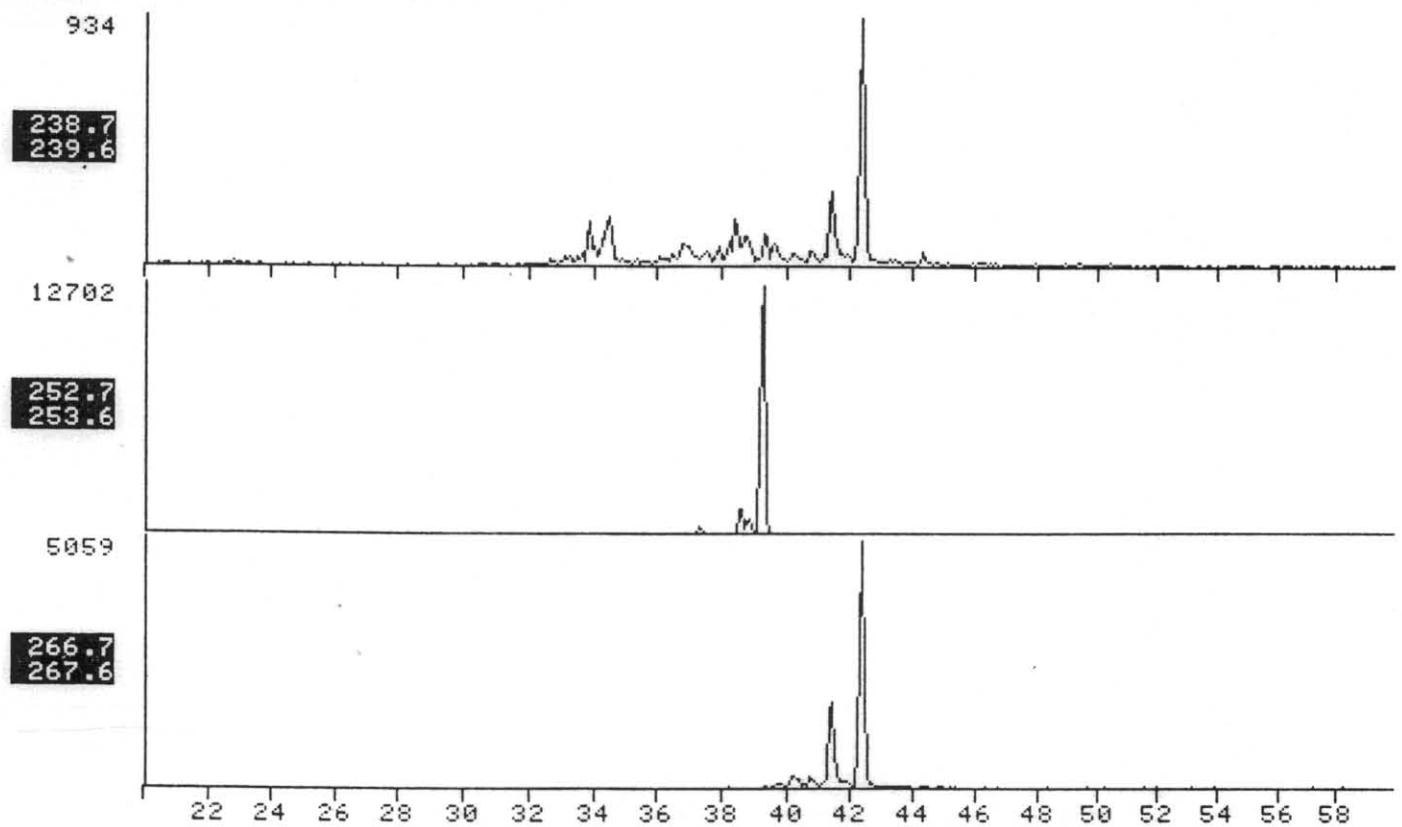


FIGURE: 3-11c

NAME DURROON#1, 8424'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/180ul. COL#72.

FRN 6199



NAME DURROON#1, 8424'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/180ul. COL#72.

FRN 6199

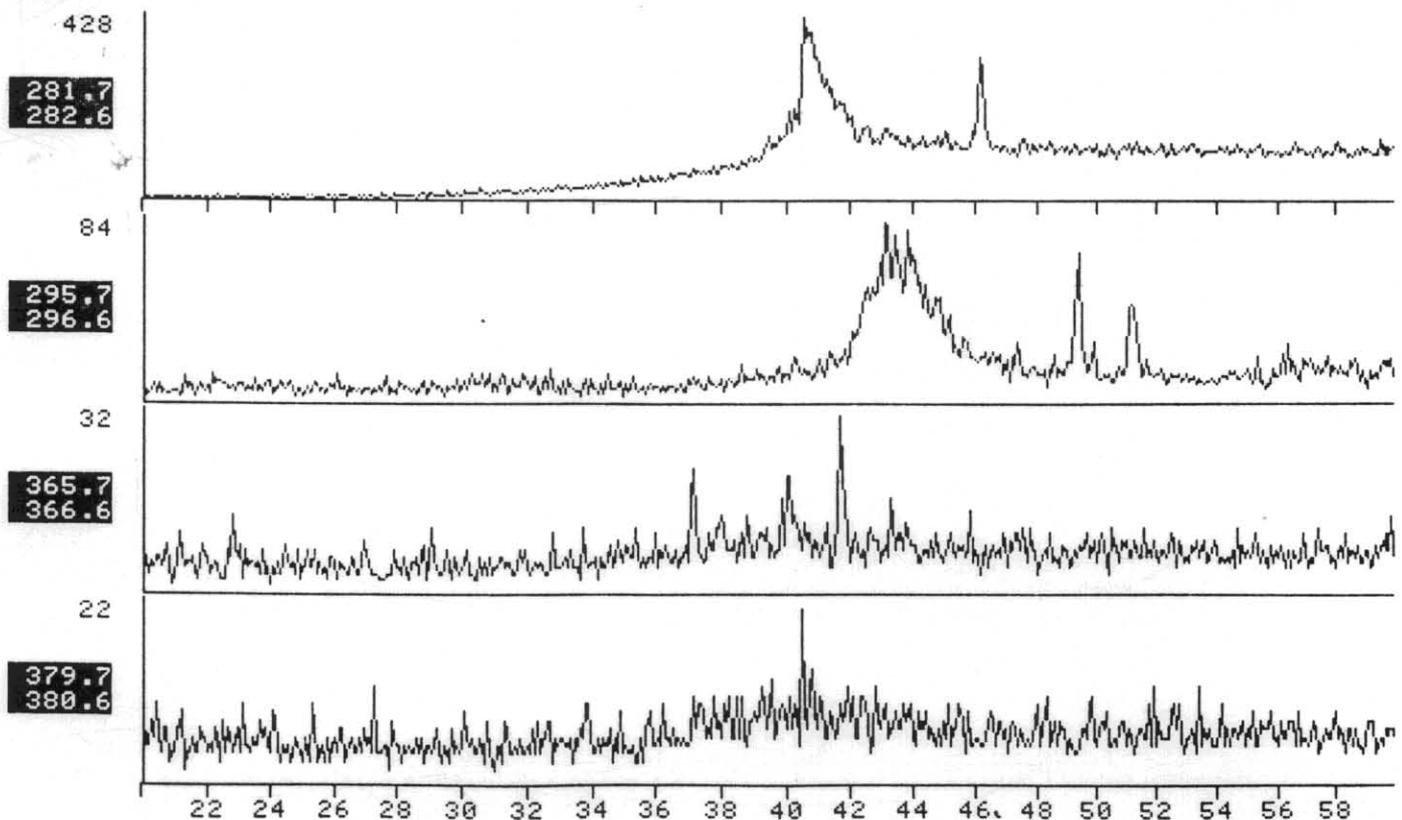
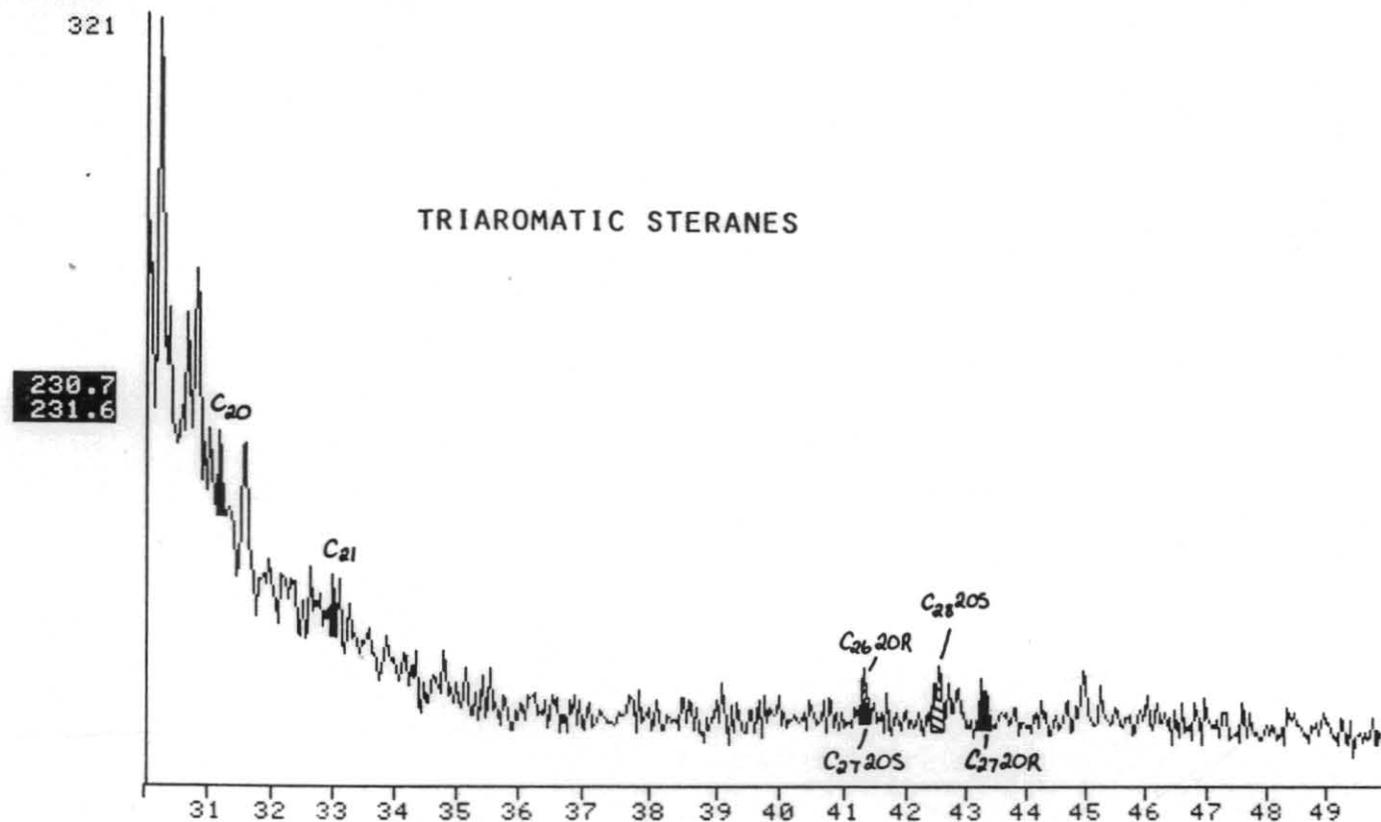


FIGURE: 3-12a

NAME DURROON 1 9915' AROMATIC FRAGMENTOGRAM.
 MISC 26/3/87 NW 0.2/50uL COL #72.

FRN 6248



NAME DURROON 1 9915' AROMATIC FRAGMENTOGRAM.
 MISC 26/3/87 NW 0.2/50uL COL #72.

FRN 6248

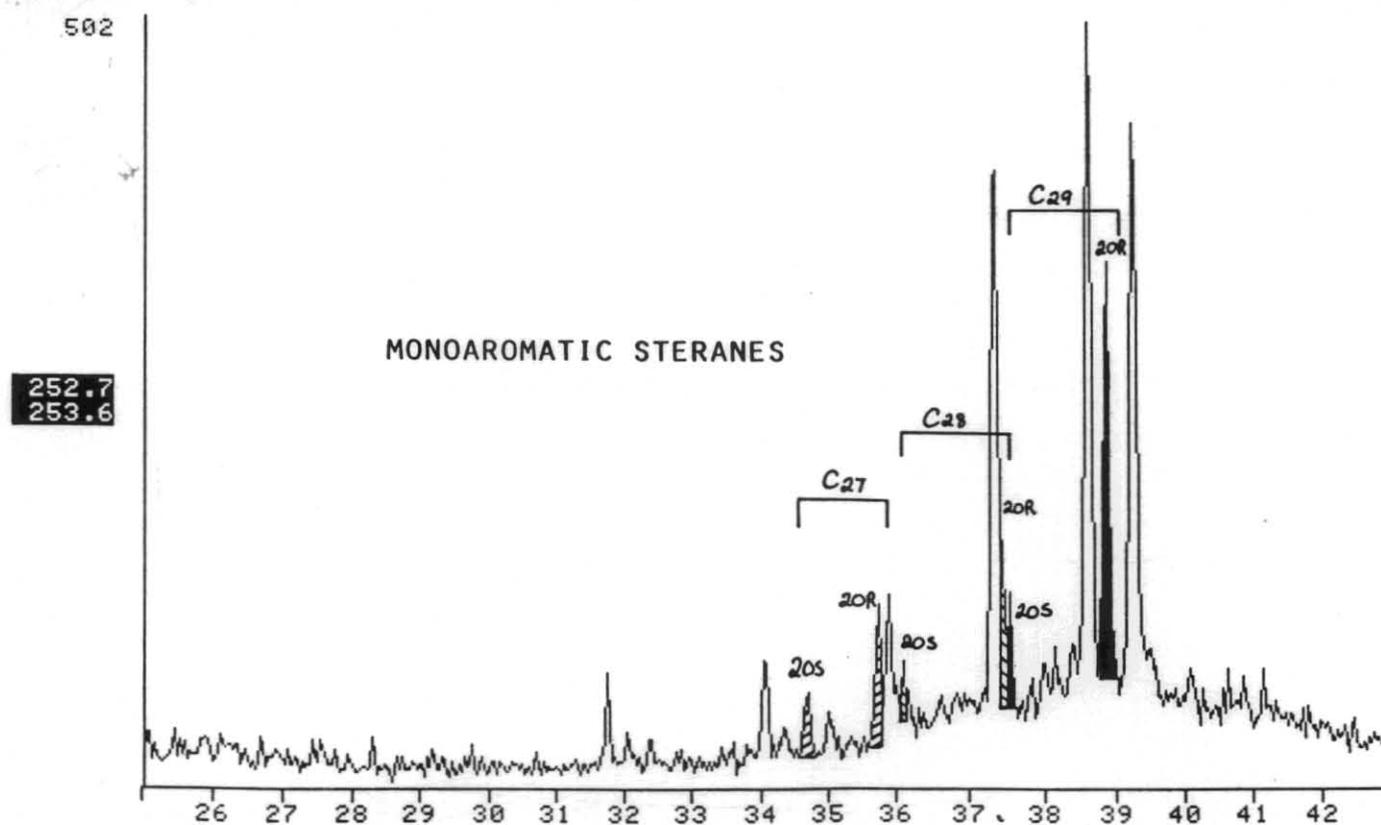
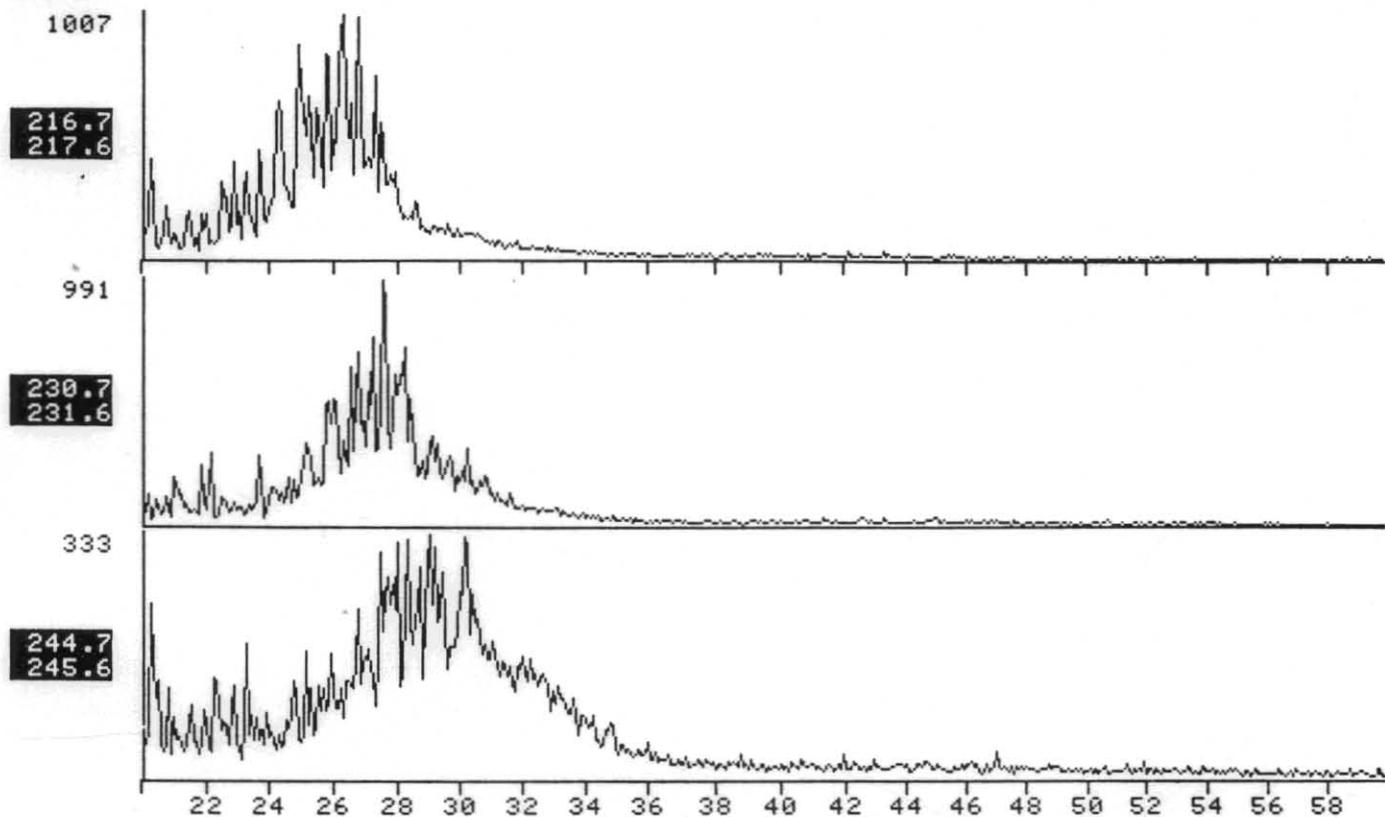


FIGURE: 3-12b

NAME DURROON 1 9915' AROMATIC FRAGMENTOGRAM.
MISC 26/3/87 NW 0.2/50uL COL #72.

FRN 6248



NAME DURROON 1 9915' AROMATIC FRAGMENTOGRAM.
MISC 26/3/87 NW 0.2/50uL COL #72.

FRN 6248

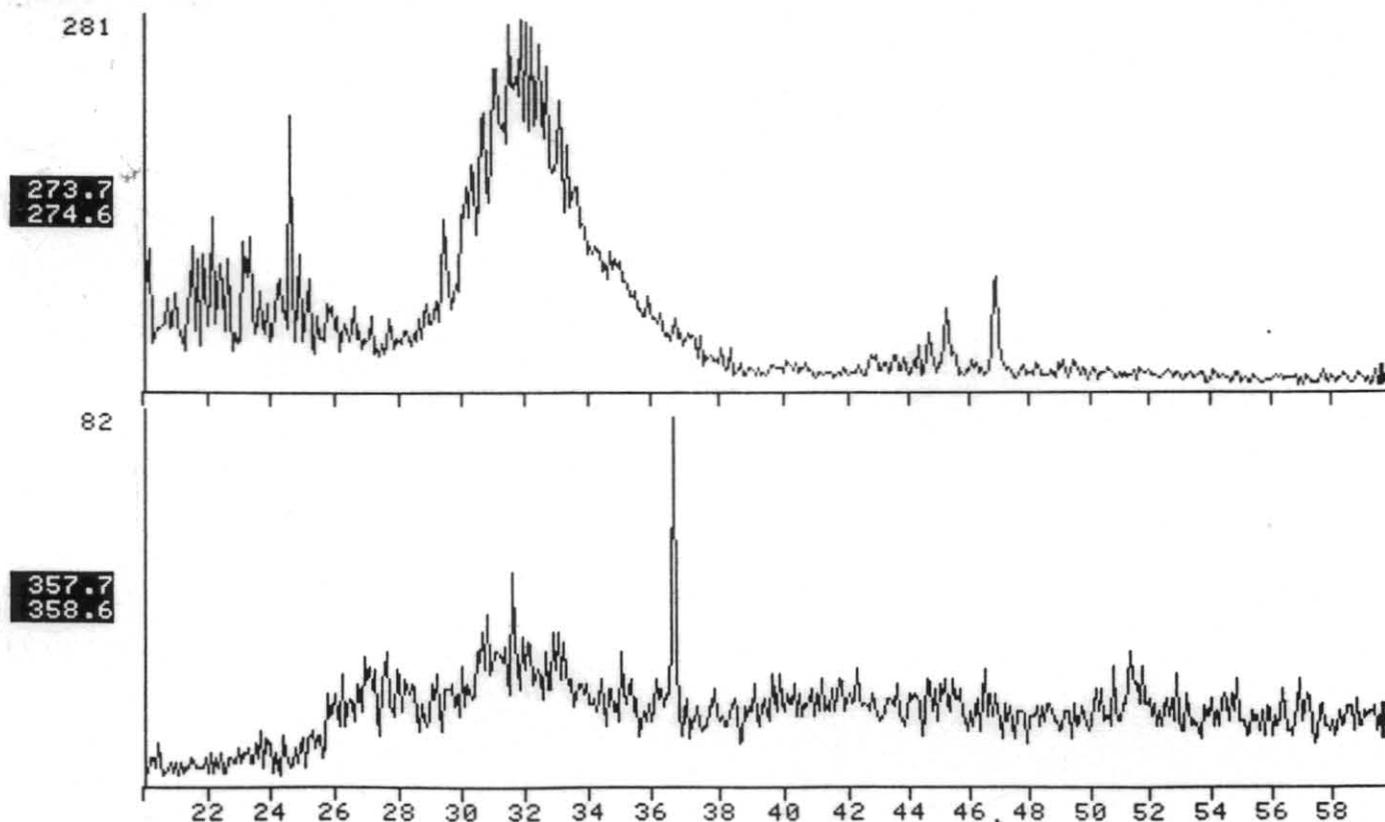
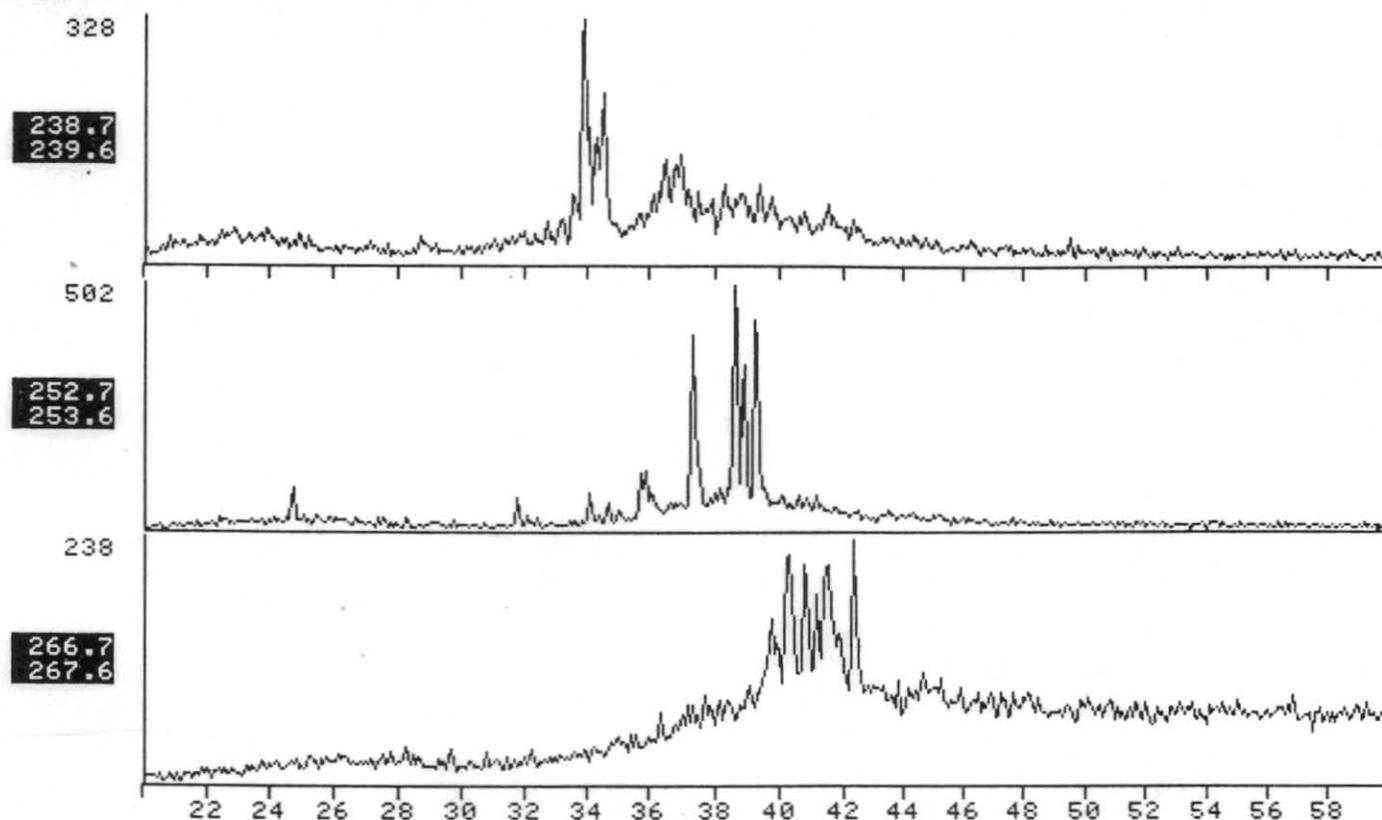


FIGURE: 3-12c

NAME DURROON 1 9915' AROMATIC FRAGMENTOGRAM.
MISC 26/3/87 NW 0.2/50uL COL #72.

FRN 6248



NAME DURROON 1 9915' AROMATIC FRAGMENTOGRAM.
MISC 26/3/87 NW 0.2/50uL COL #72.

FRN 6248

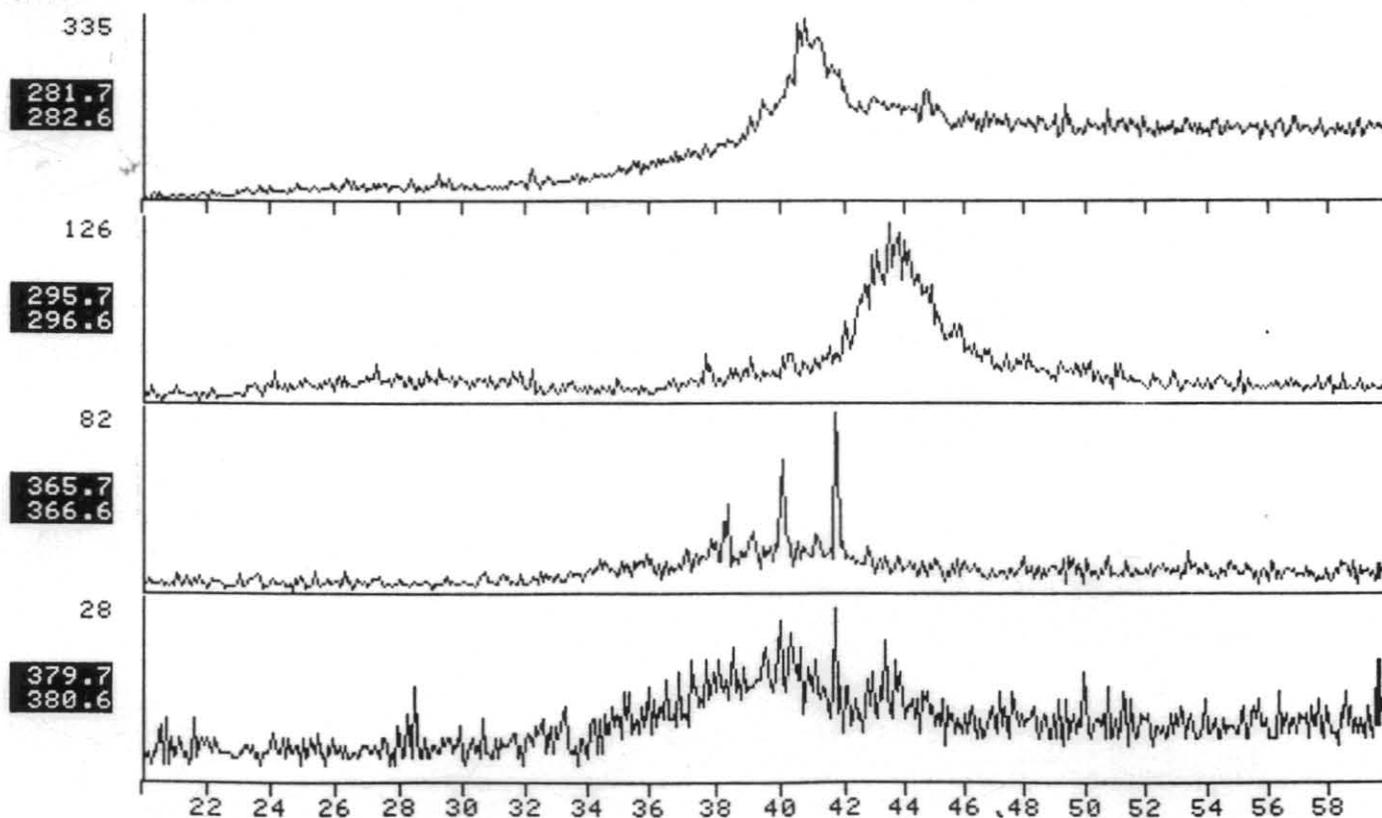
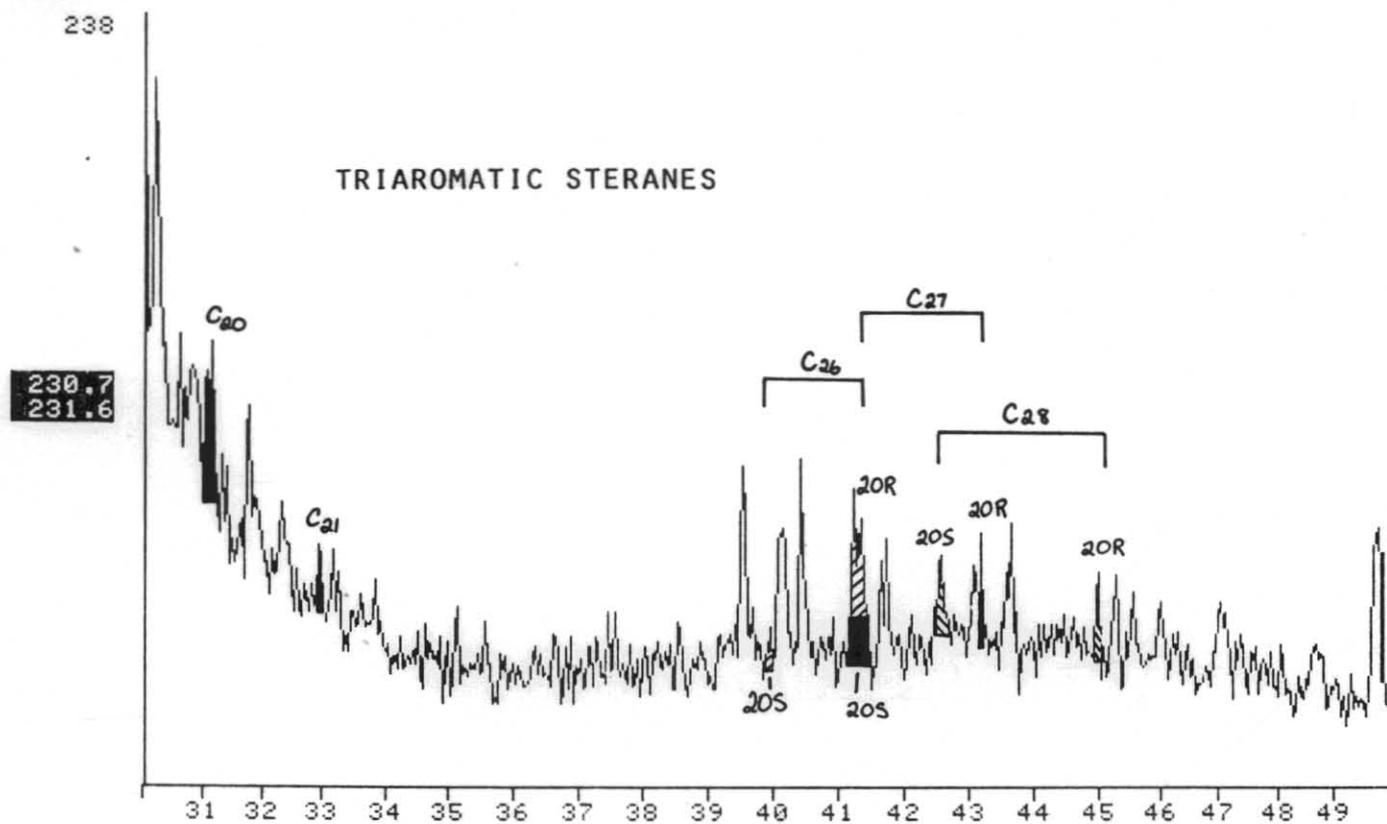


FIGURE: 3-13a

NAME KONKON#1, 4413'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/34u1. COL#72.

FRN 6251



NAME KONKON#1, 4413'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/34u1. COL#72.

FRN 6251

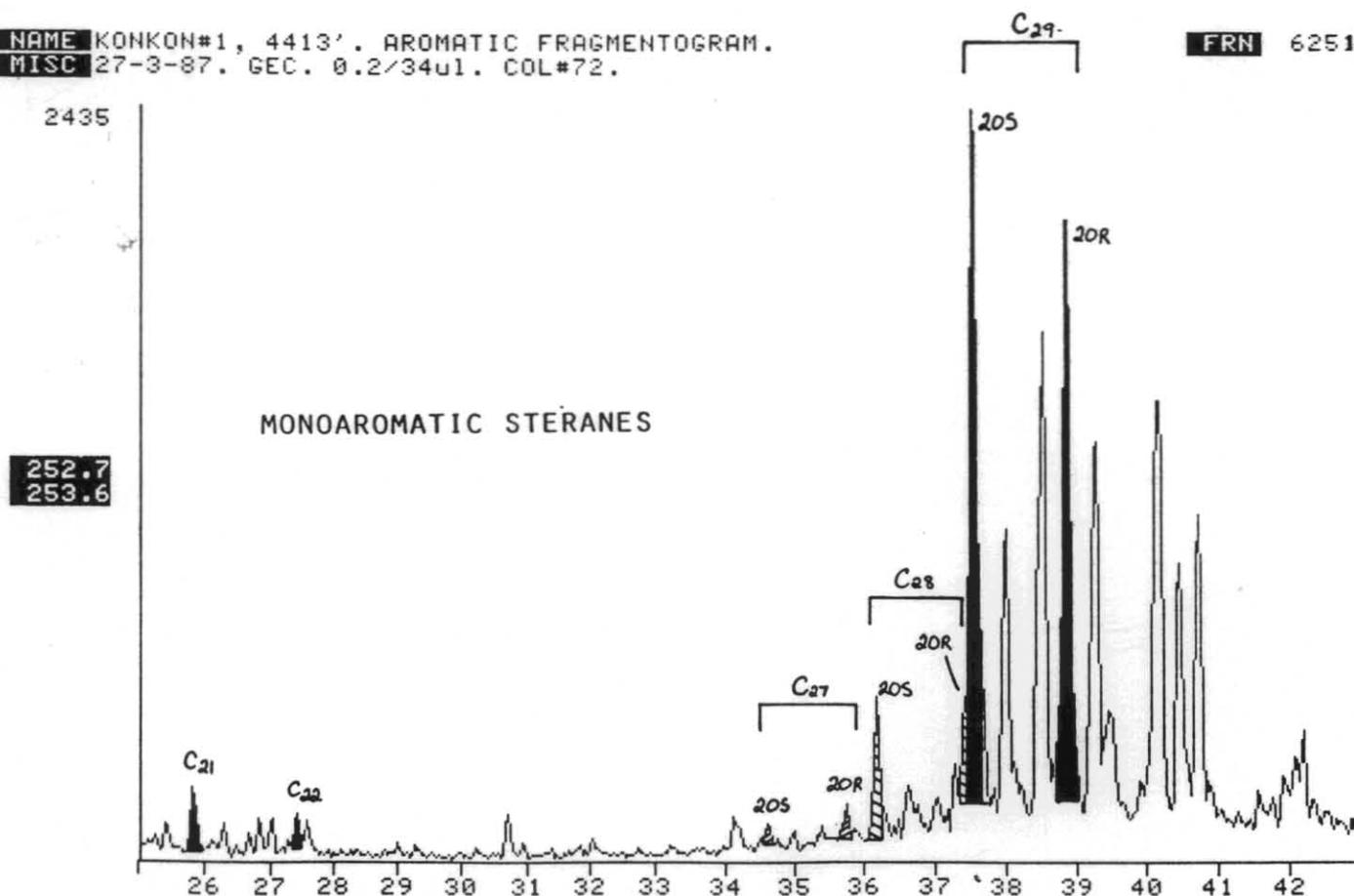
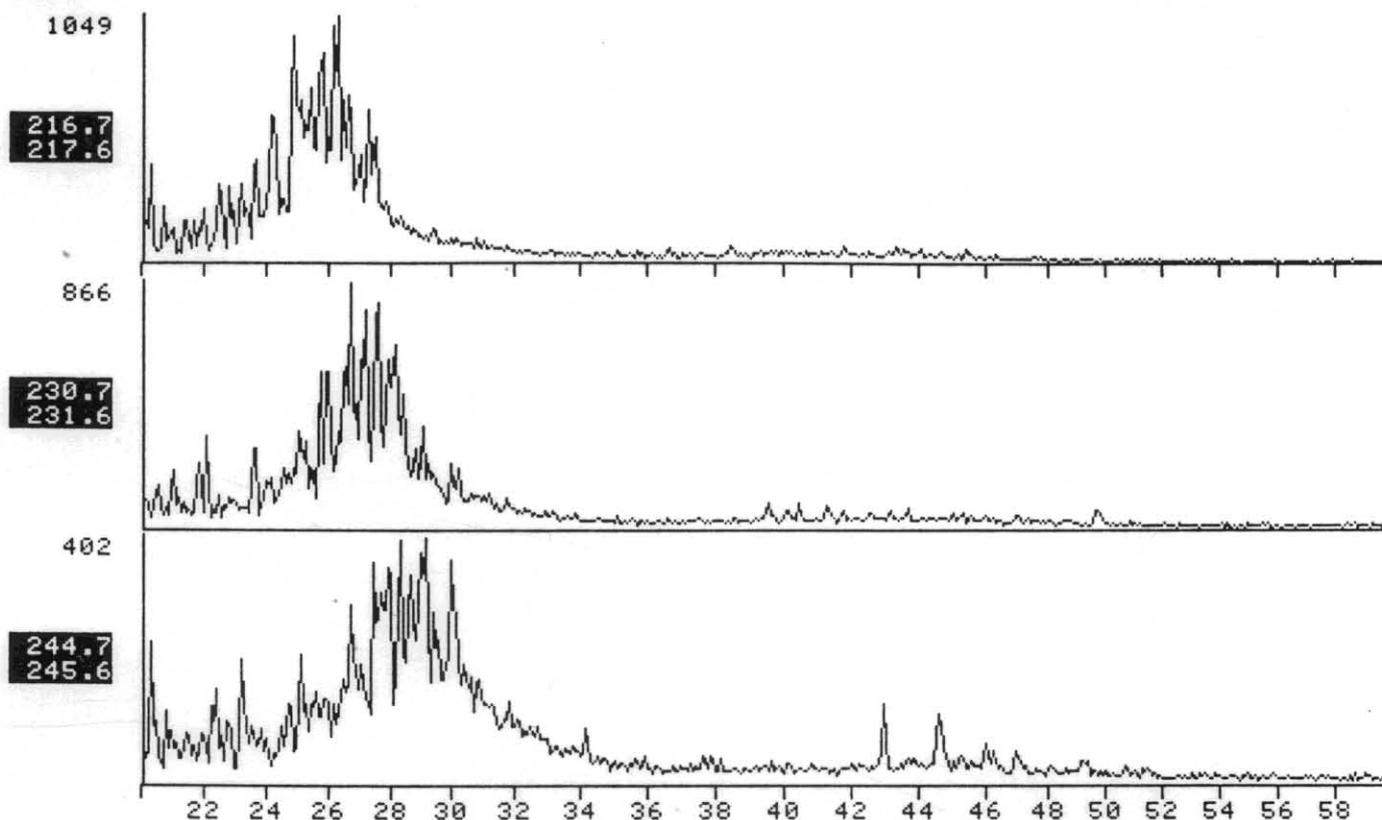


FIGURE: 3-13b

NAME KONKON#1, 4413'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/34ul. COL#72.

FRN 6251



NAME KONKON#1, 4413'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/34ul. COL#72.

FRN 6251

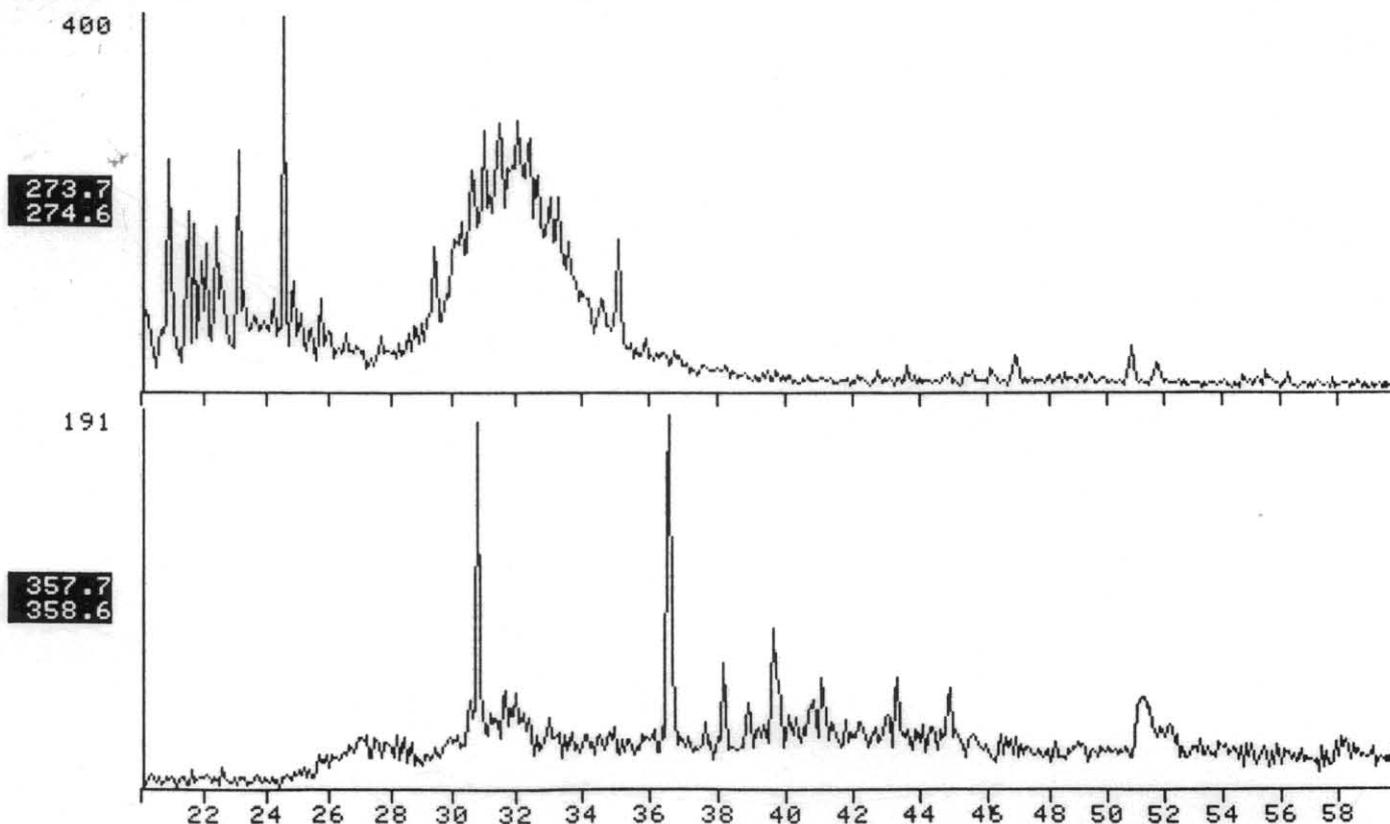
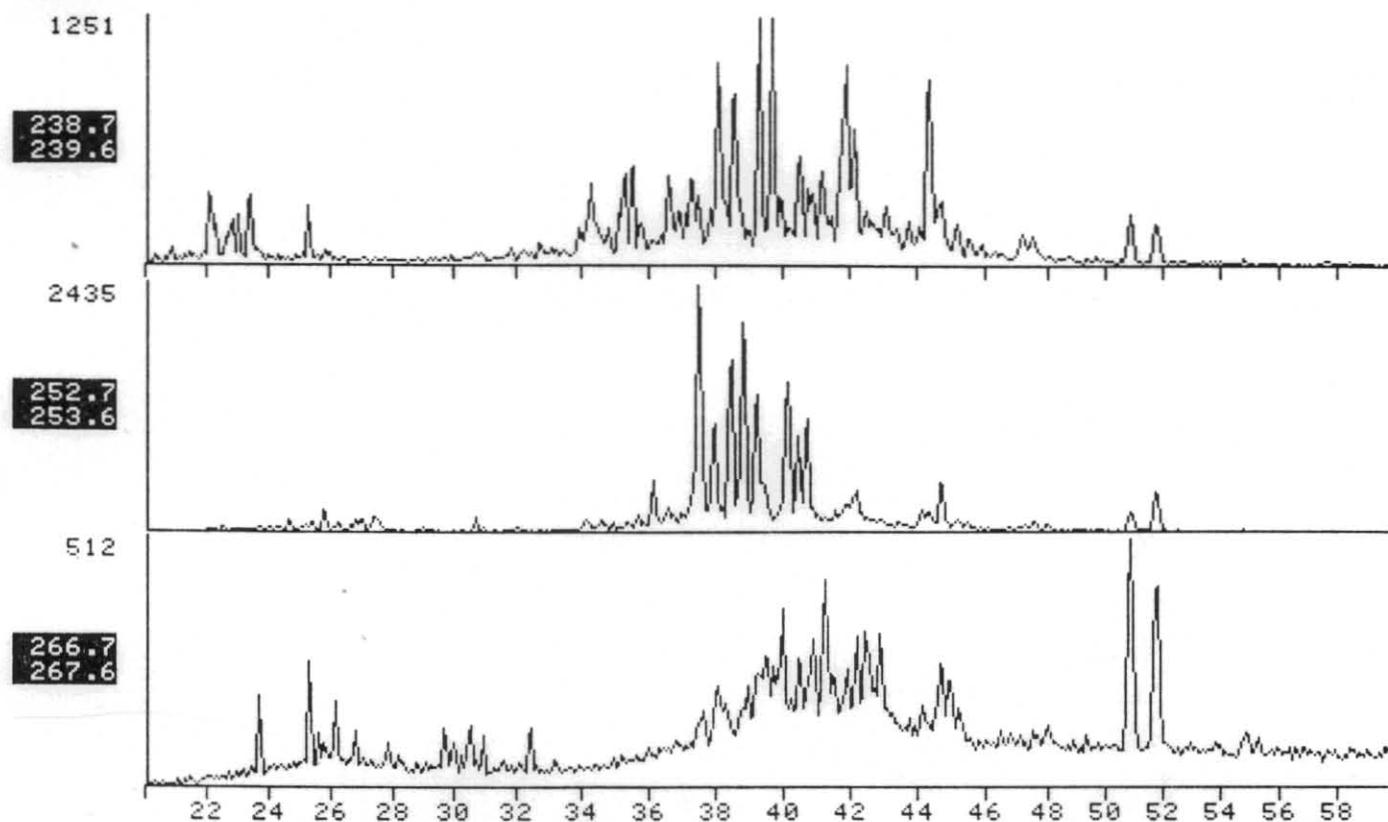


FIGURE: 3-13c

NAME KONKON#1, 4413'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/34ul. COL#72.

FRN 6251



NAME KONKON#1, 4413'. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/34ul. COL#72.

FRN 6251

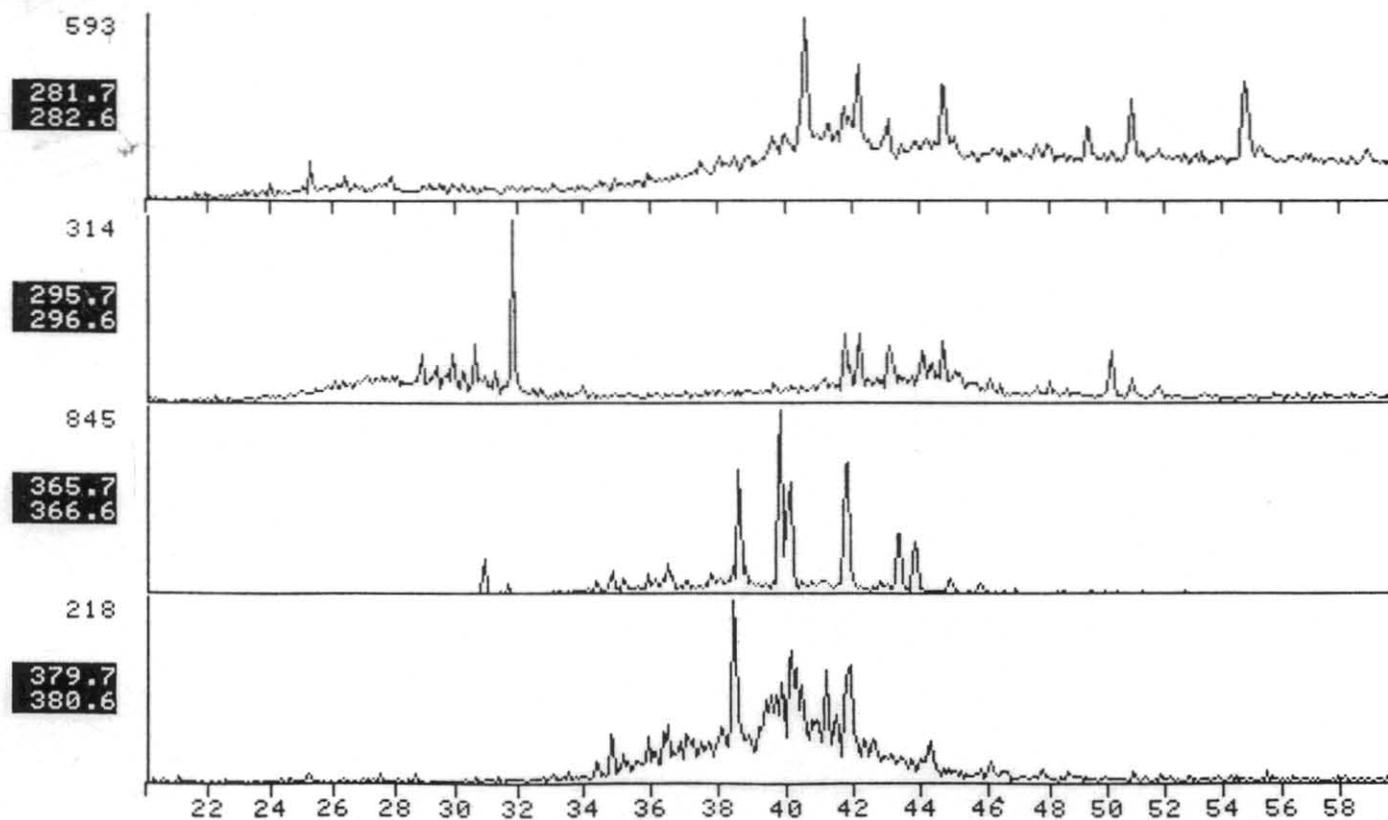
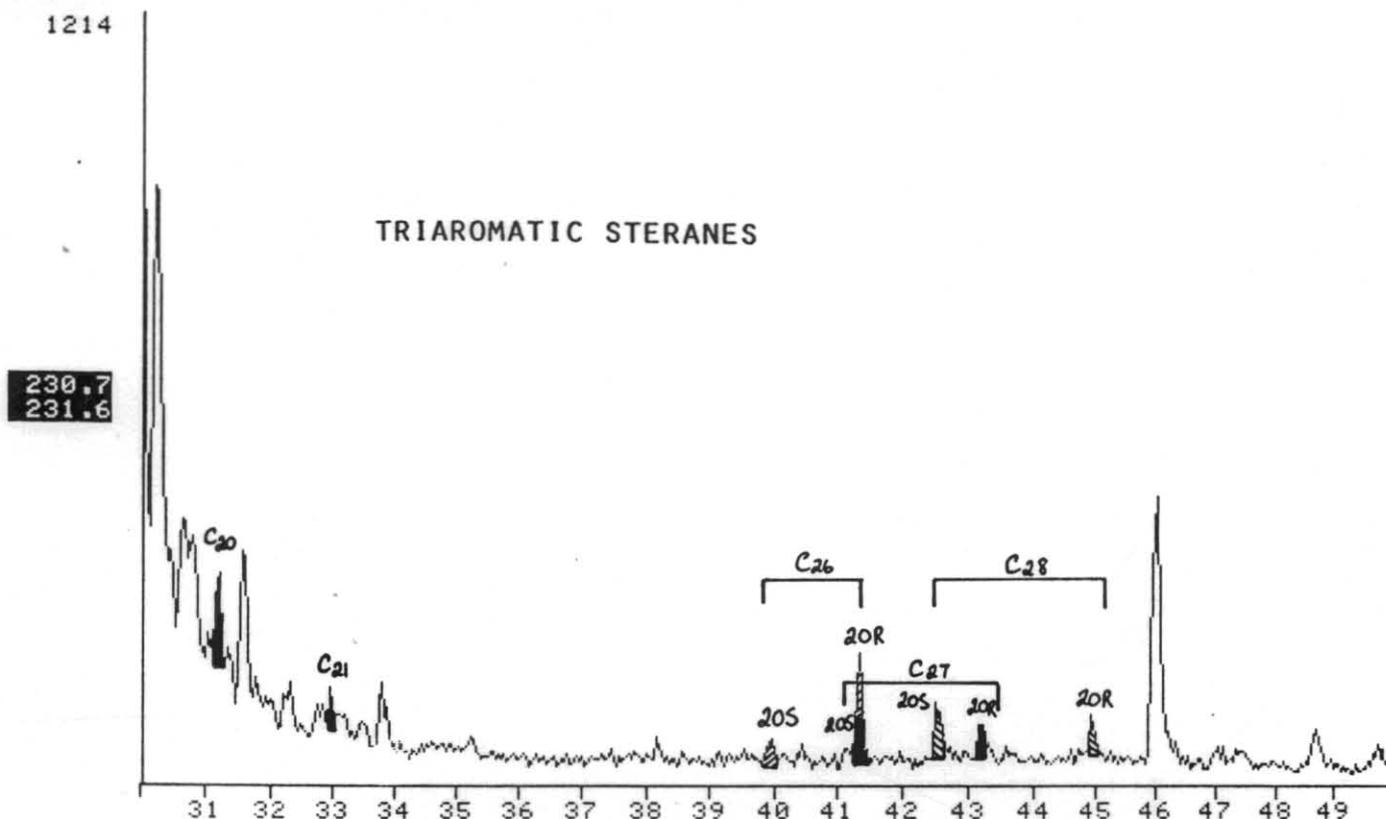


FIGURE: 3-14a

NAME PELICAN#1, 5851'. AROMATIC FRAGMENTOGRAM.
 MISC 25-3-87. GEC. 0.2/30ul. COL#72.

FRN 6203



NAME PELICAN#1, 5851'. AROMATIC FRAGMENTOGRAM.
 MISC 25-3-87. GEC. 0.2/30ul. COL#72.

FRN 6203

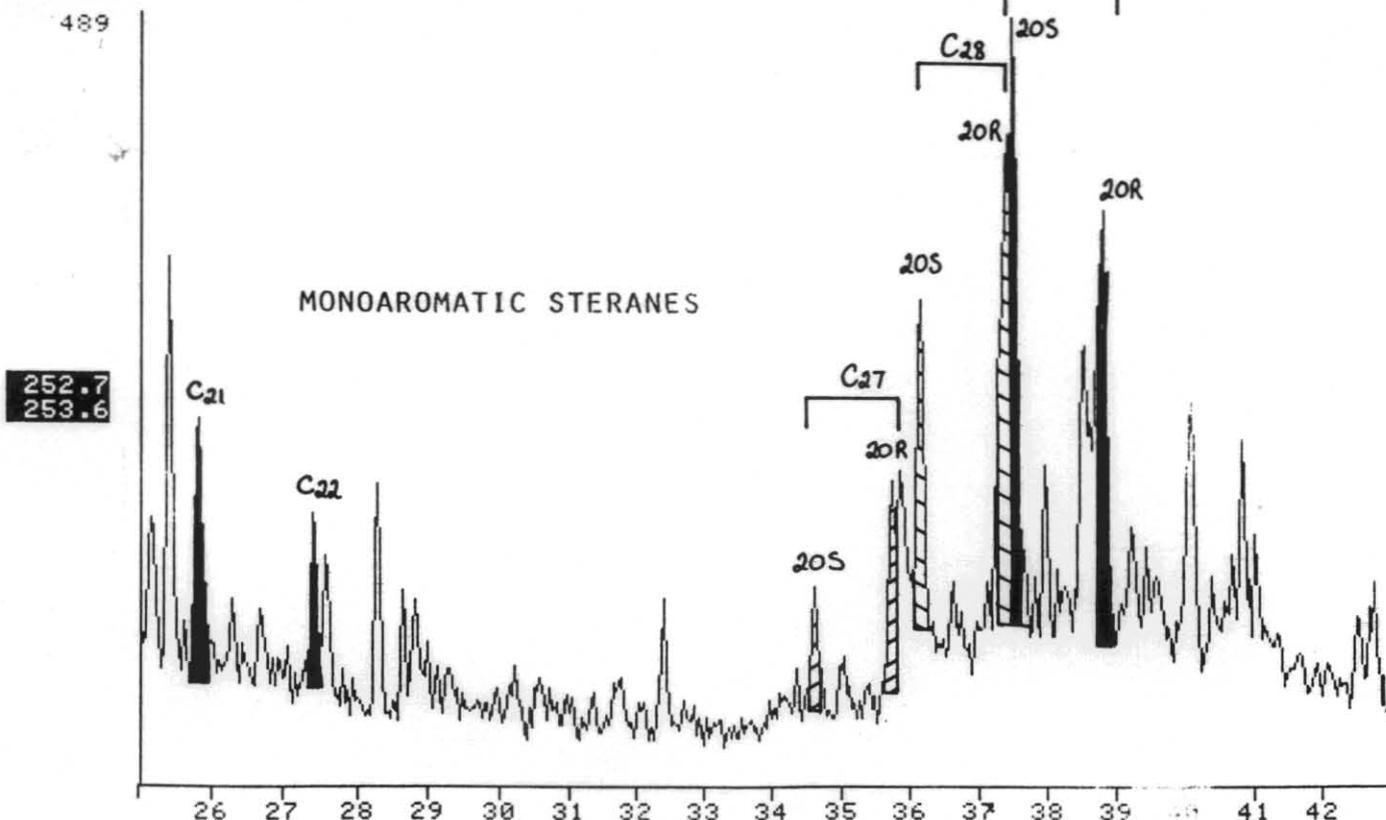
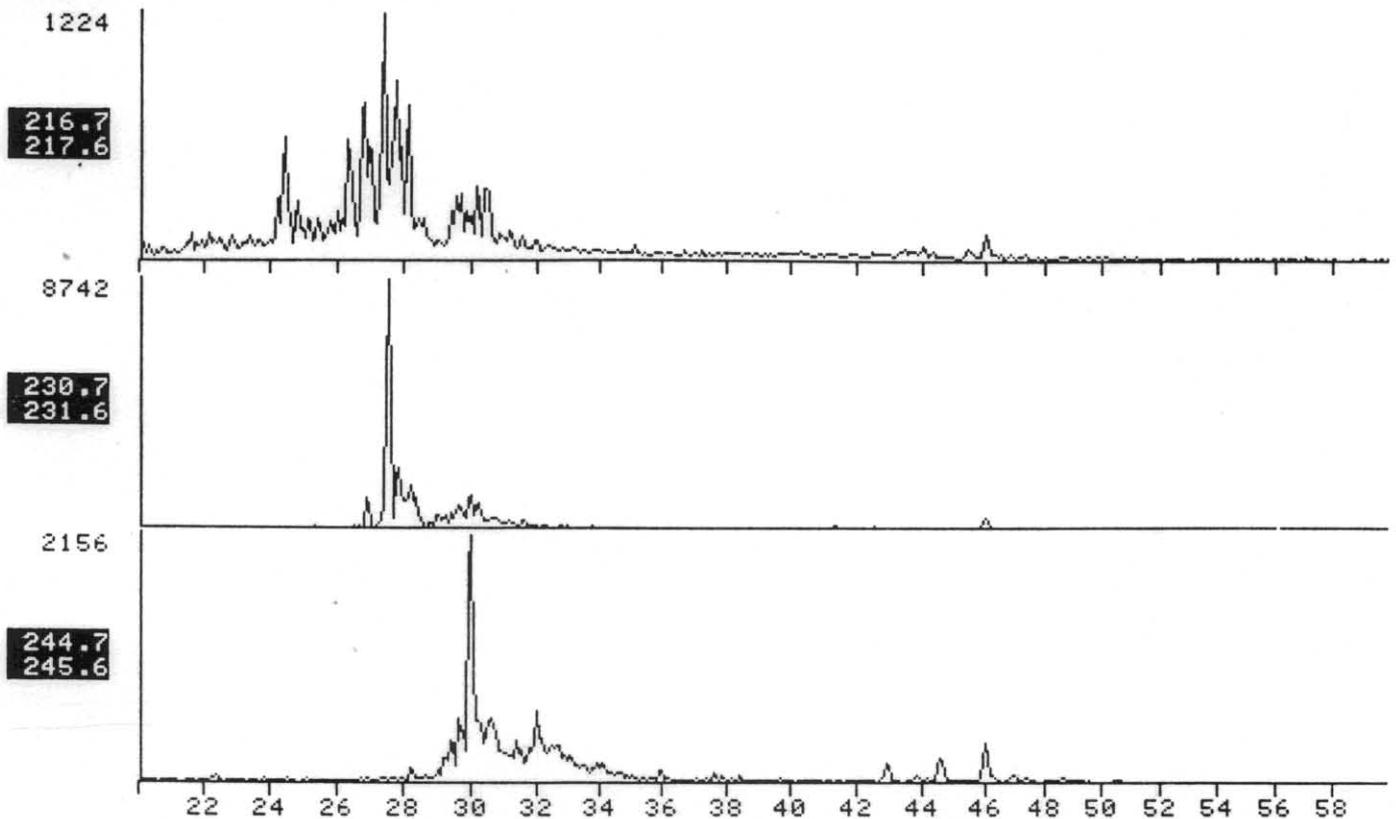


FIGURE: 3-14b

NAME PELICAN#1, 5851'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/30ul. COL#72.

FRN 6203



NAME PELICAN#1, 5851'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/30ul. COL#72.

FRN 6203

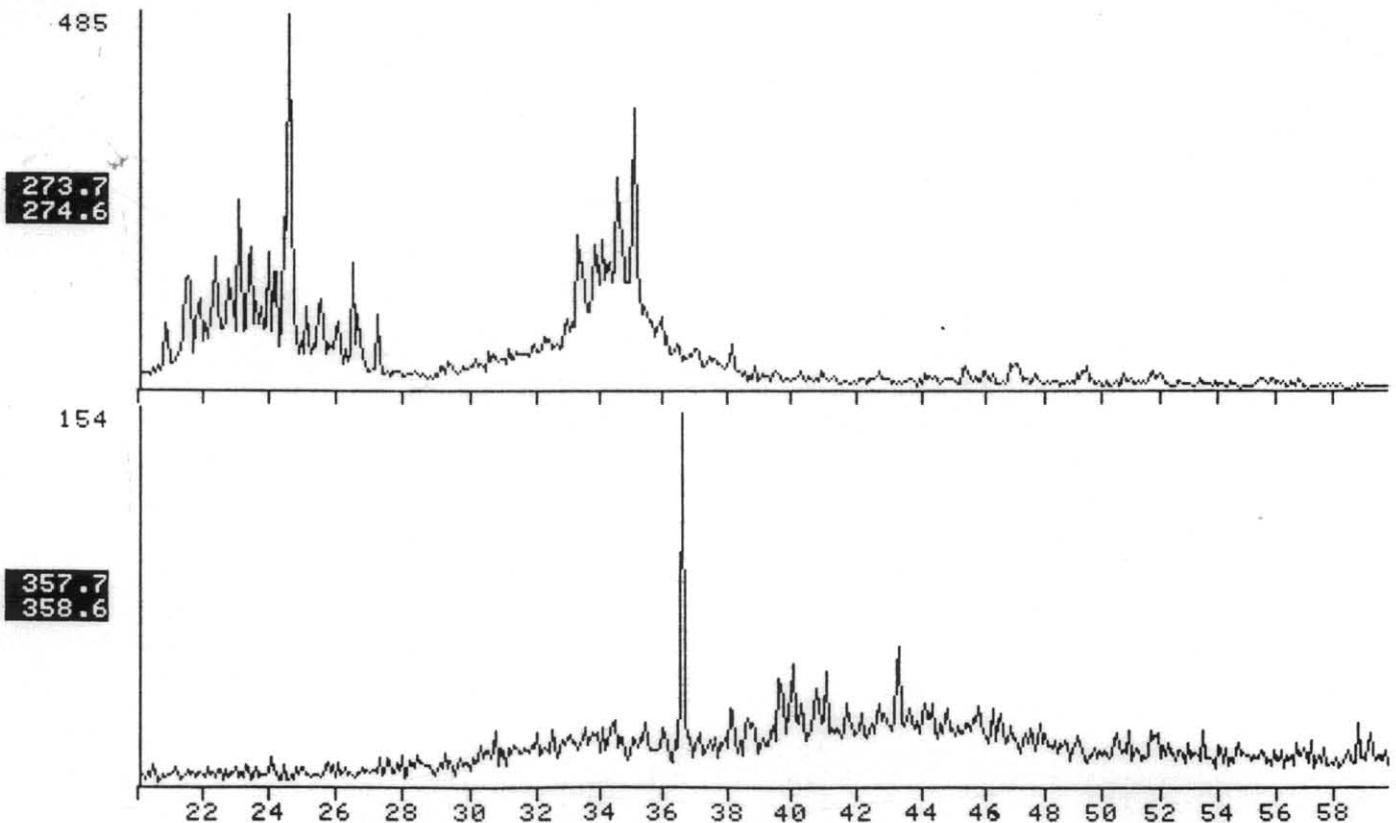
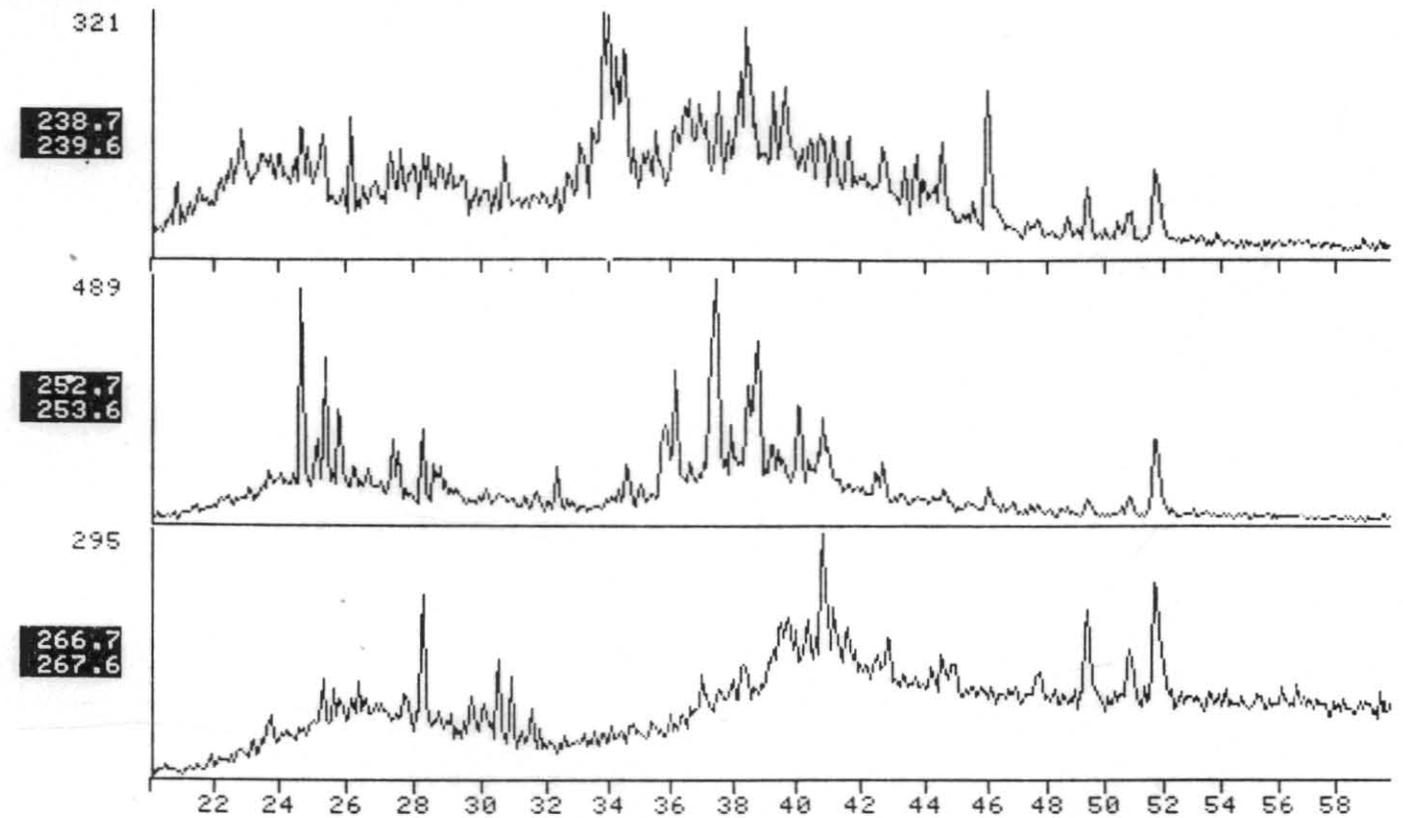


FIGURE: 3-14c

NAME PELICAN#1, 5851'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/30ul. COL#72.

FRN 6203



NAME PELICAN#1, 5851'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/30ul. COL#72.

FRN 6203

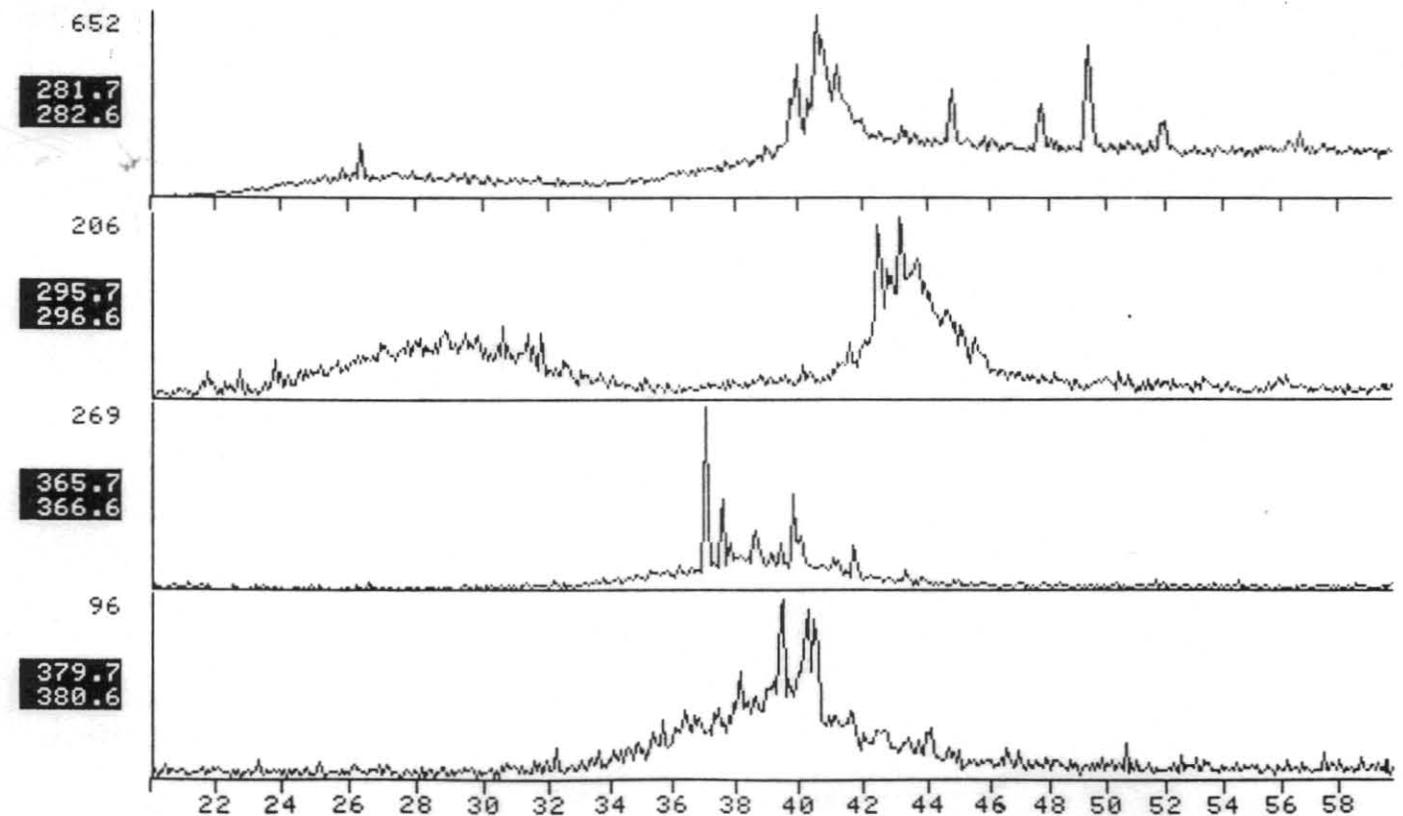
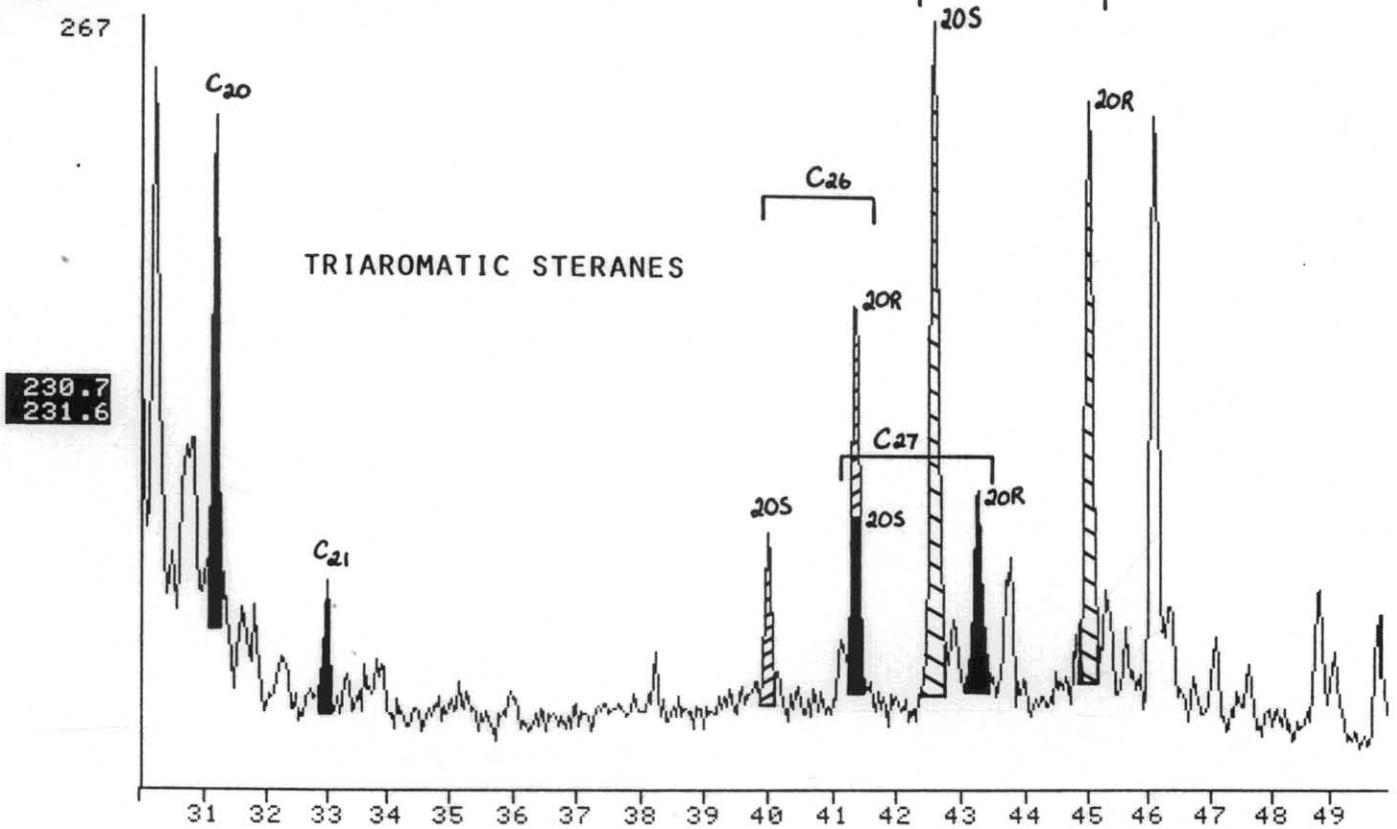


FIGURE: 3-15a

NAME PELICAN#1, 7122'. AROMATIC FRAGMENTOGRAM.
 MISC 35-3-87. GEC. 0.2/230ul. COL#72.

FRN 6204



NAME PELICAN#1, 7122'. AROMATIC FRAGMENTOGRAM.
 MISC 35-3-87. GEC. 0.2/230ul. COL#72.

FRN 6204

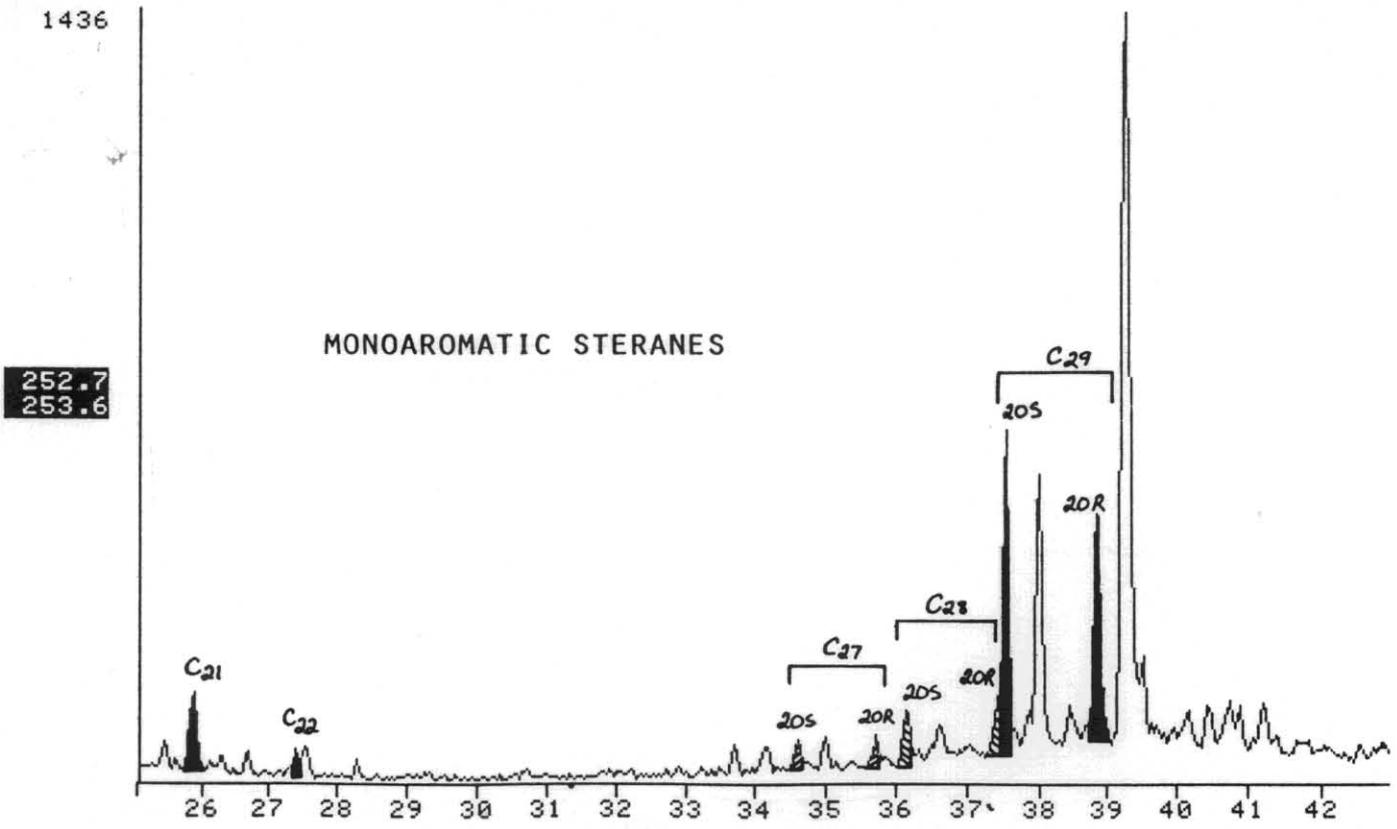
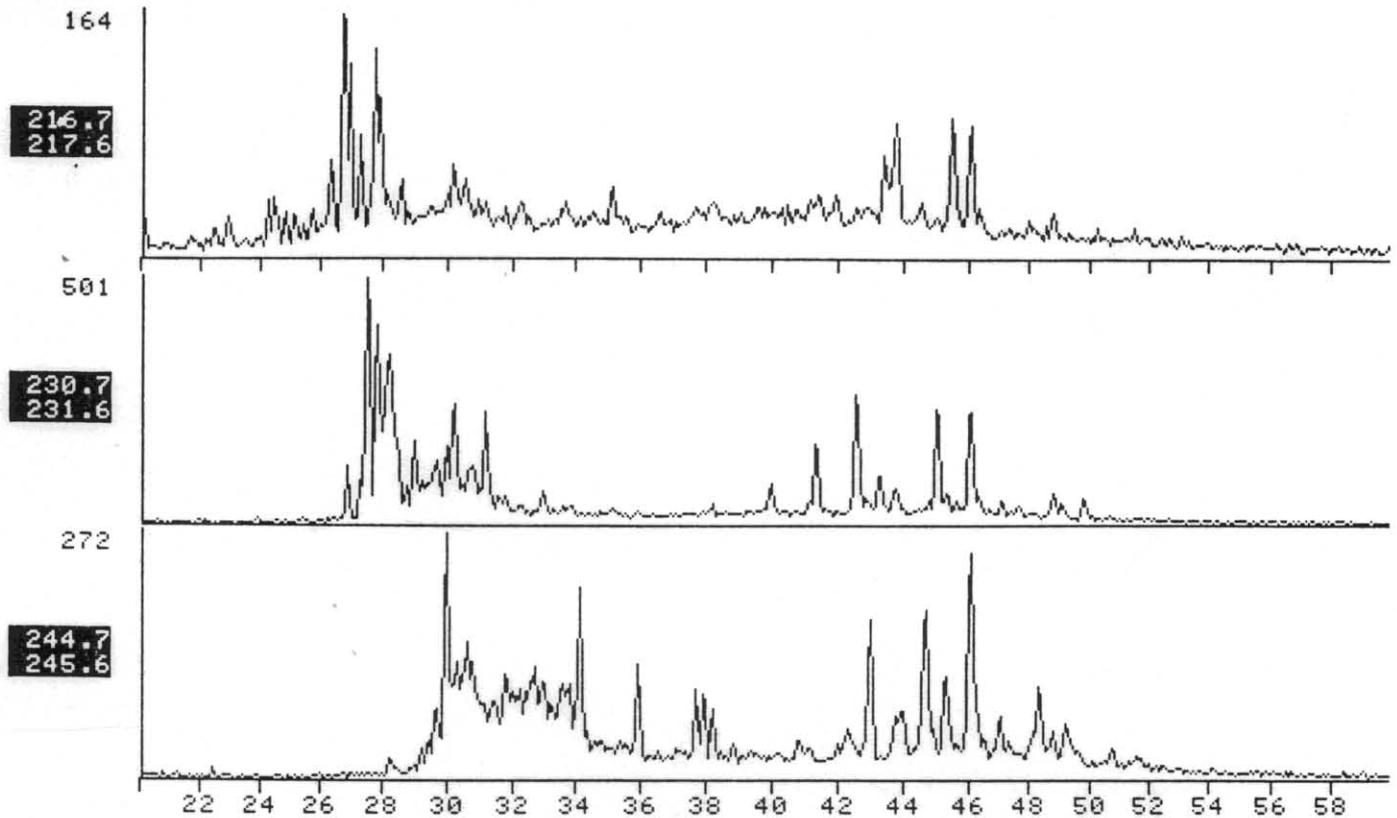


FIGURE: 3-15b

NAME PELICAN#1, 7122'. AROMATIC FRAGMENTOGRAM.
MISC 35-3-87. GEC. 0.2/230ul. COL#72.

FRN 6204



NAME PELICAN#1, 7122'. AROMATIC FRAGMENTOGRAM.
MISC 35-3-87. GEC. 0.2/230ul. COL#72.

FRN 6204

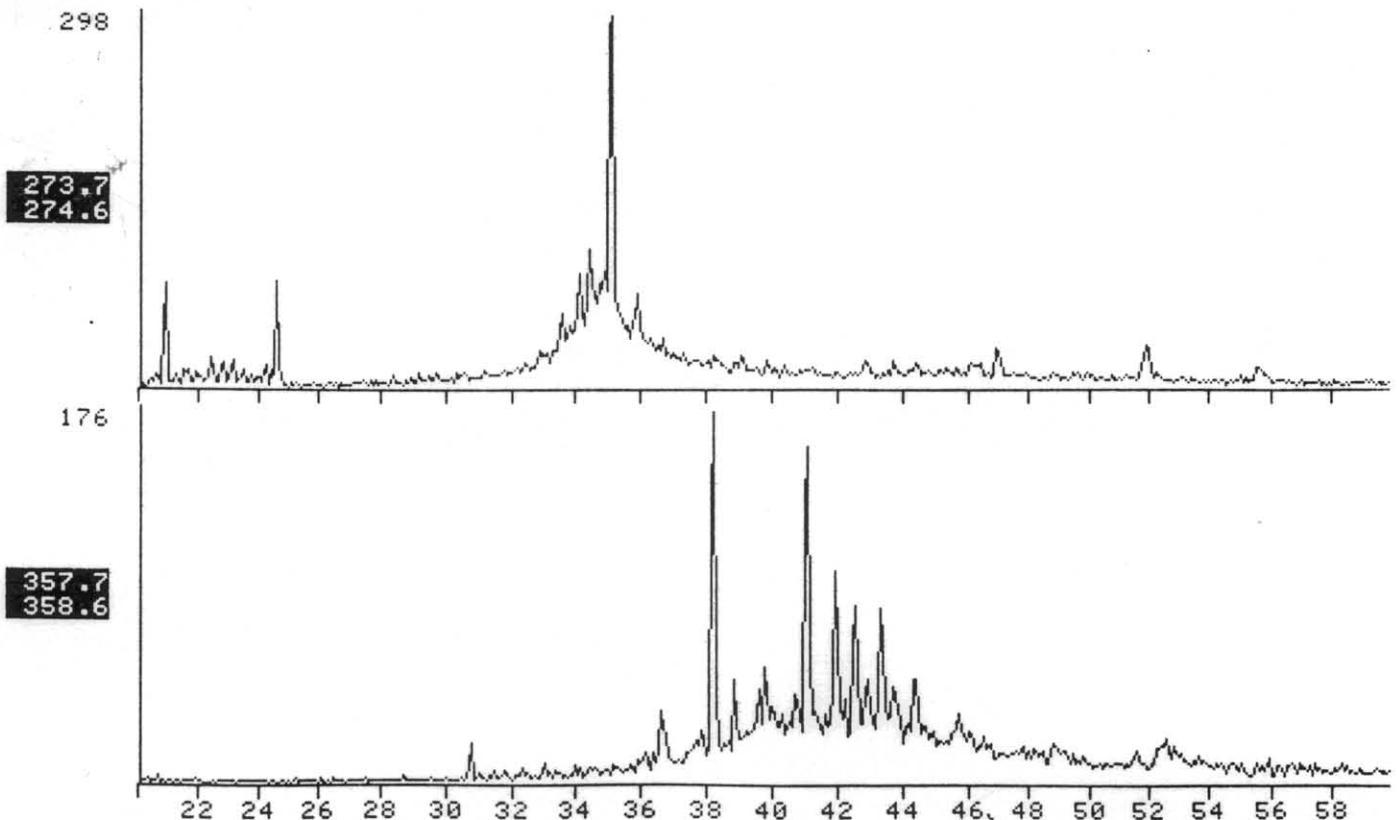
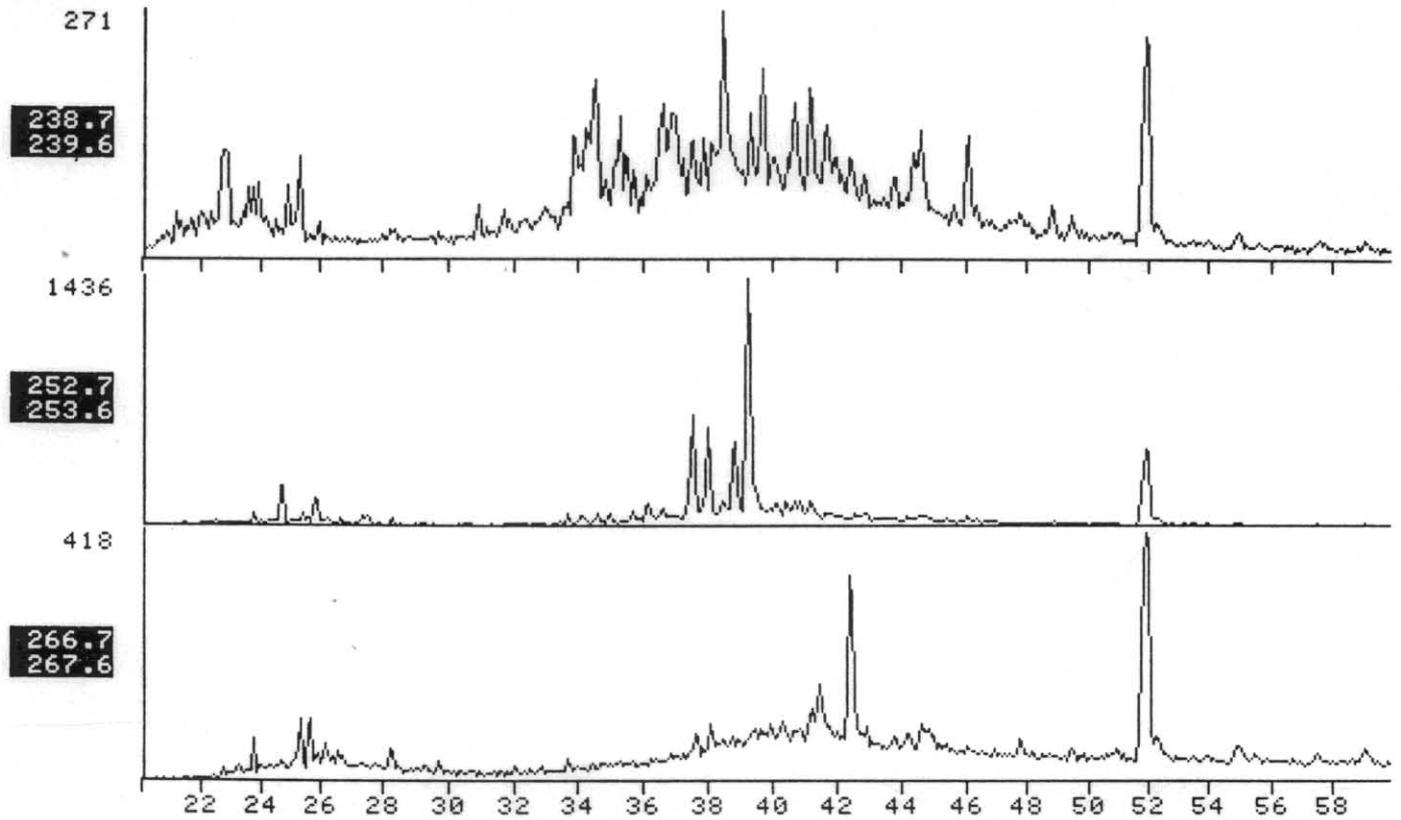


FIGURE: 3-15c

NAME PELICAN#1, 7122'. AROMATIC FRAGMENTOGRAM.
MISC 35-3-87. GEC. 0.2/230ul. COL#72.

FRN 6204



NAME PELICAN#1, 7122'. AROMATIC FRAGMENTOGRAM.
MISC 35-3-87. GEC. 0.2/230ul. COL#72.

FRN 6204

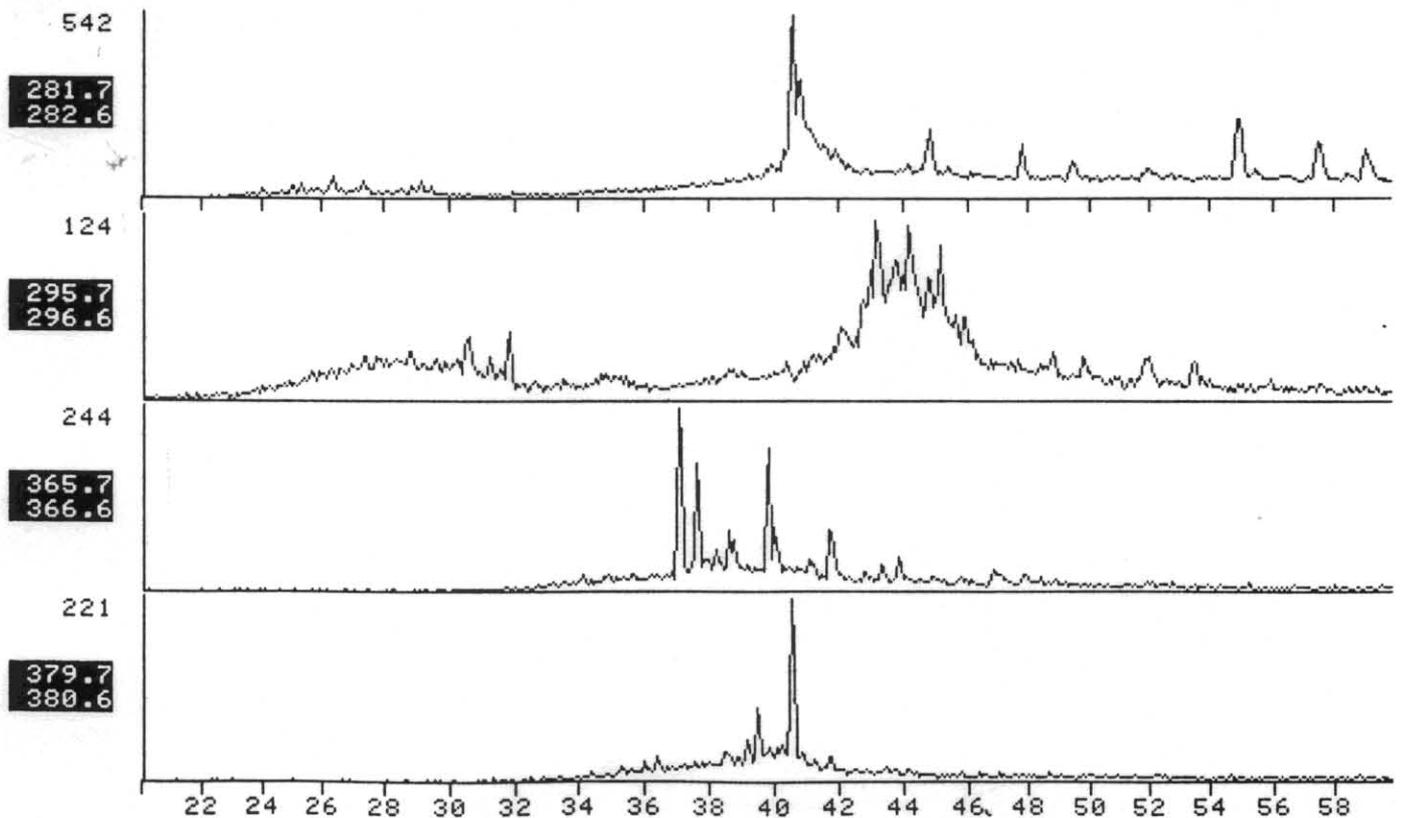
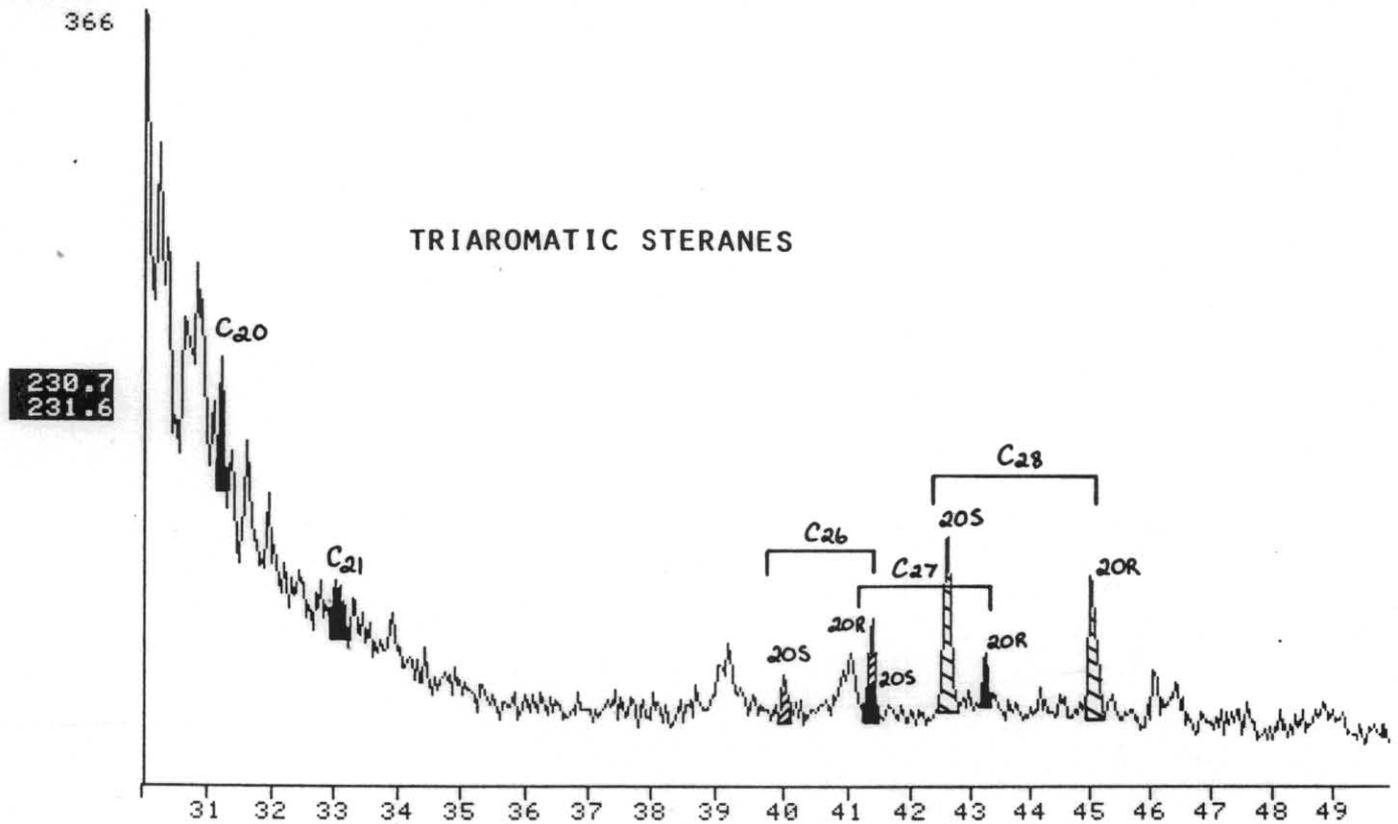


FIGURE: 3-16a

NAME PELICAN#1, 9269'. AROMATIC FRAGMENTOGRAM.
 MISC 26-3-87. GEC. 0.2/200ul. COL#72.

FRN 6246



NAME PELICAN#1, 9269'. AROMATIC FRAGMENTOGRAM.
 MISC 26-3-87. GEC. 0.2/200ul. COL#72.

FRN 6246

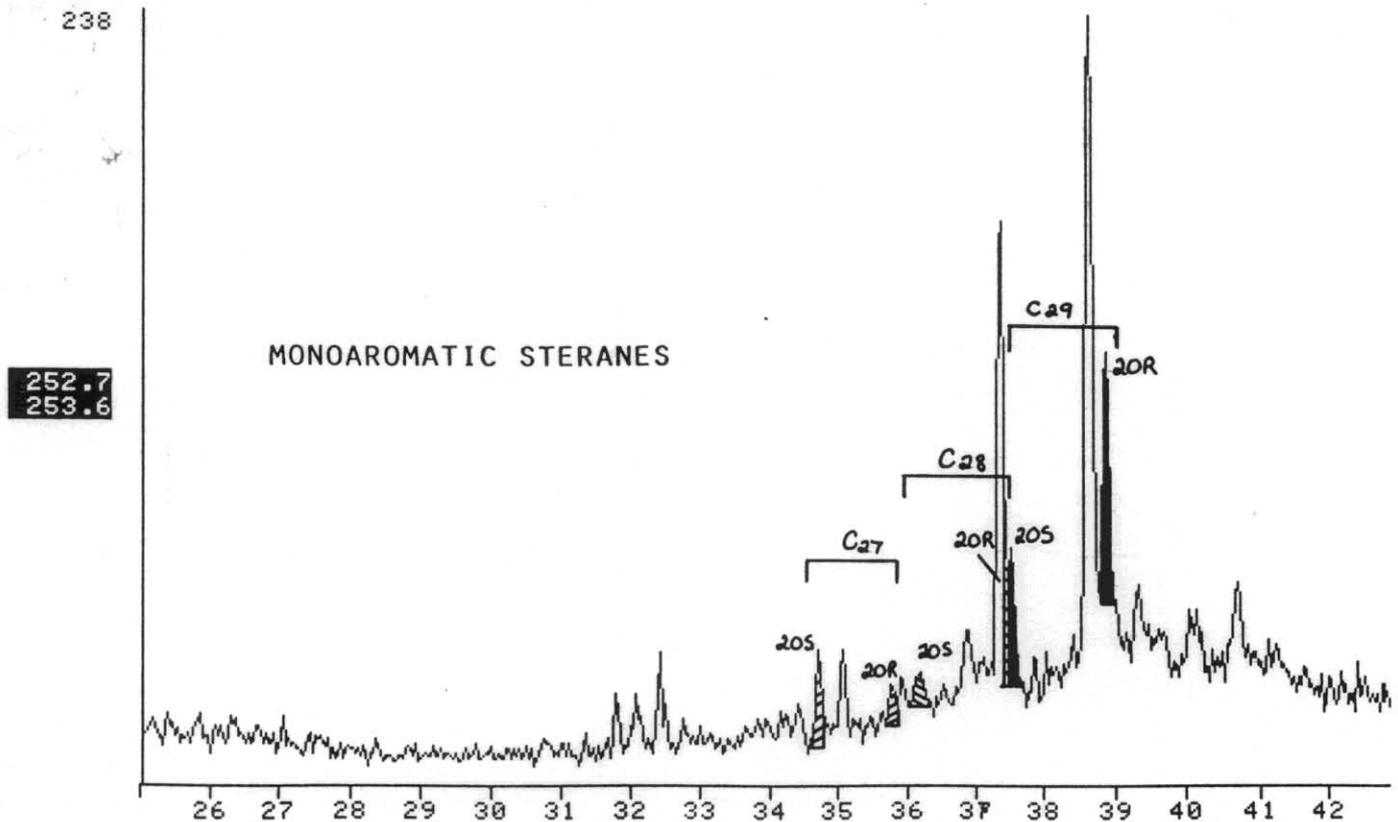
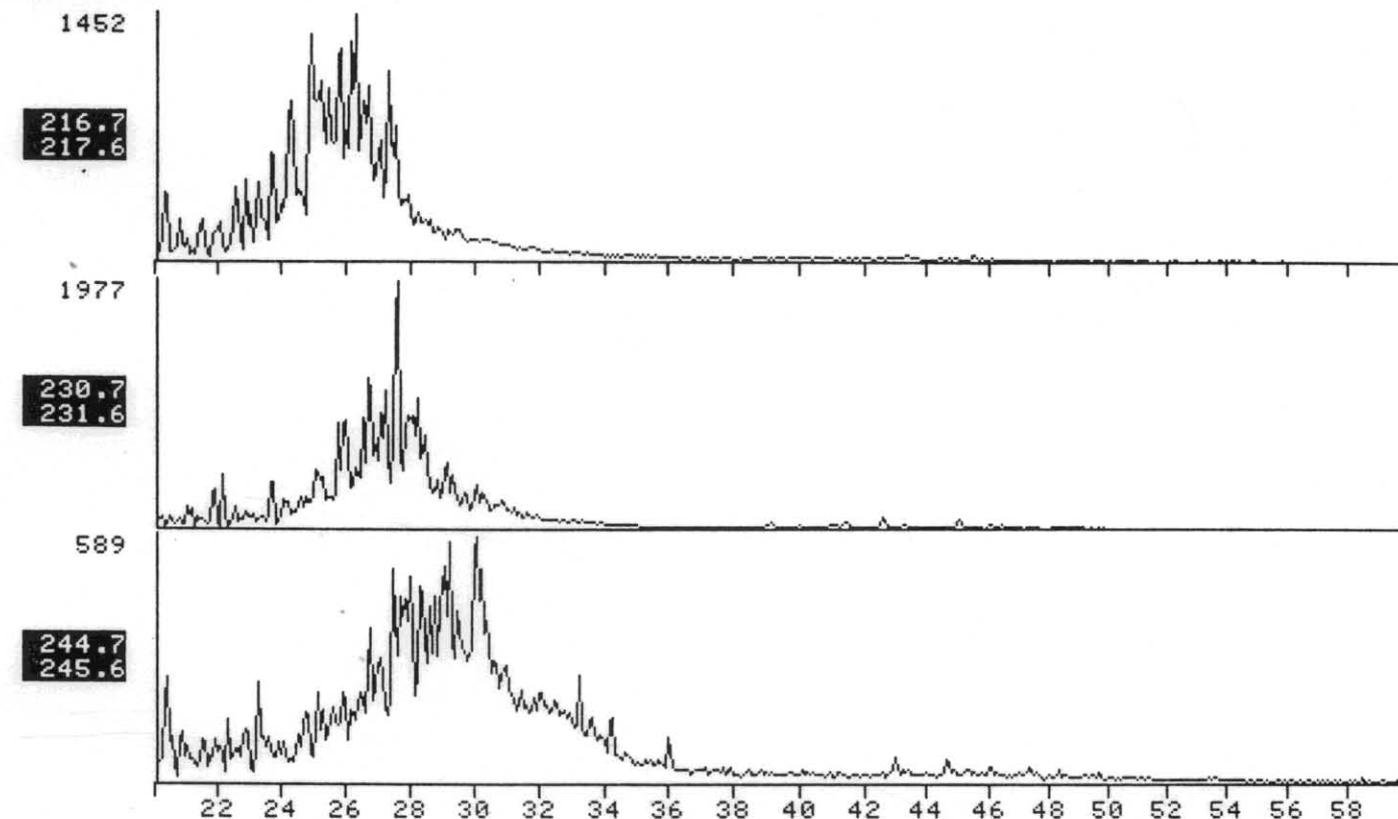


FIGURE: 3-16b

NAME PELICAN#1, 9269'. AROMATIC FRAGMENTOGRAM.
MISC 26-3-87. GEC. 0.2/200ul. COL#72.

FRN 6246



NAME PELICAN#1, 9269'. AROMATIC FRAGMENTOGRAM.
MISC 26-3-87. GEC. 0.2/200ul. COL#72.

FRN 6246

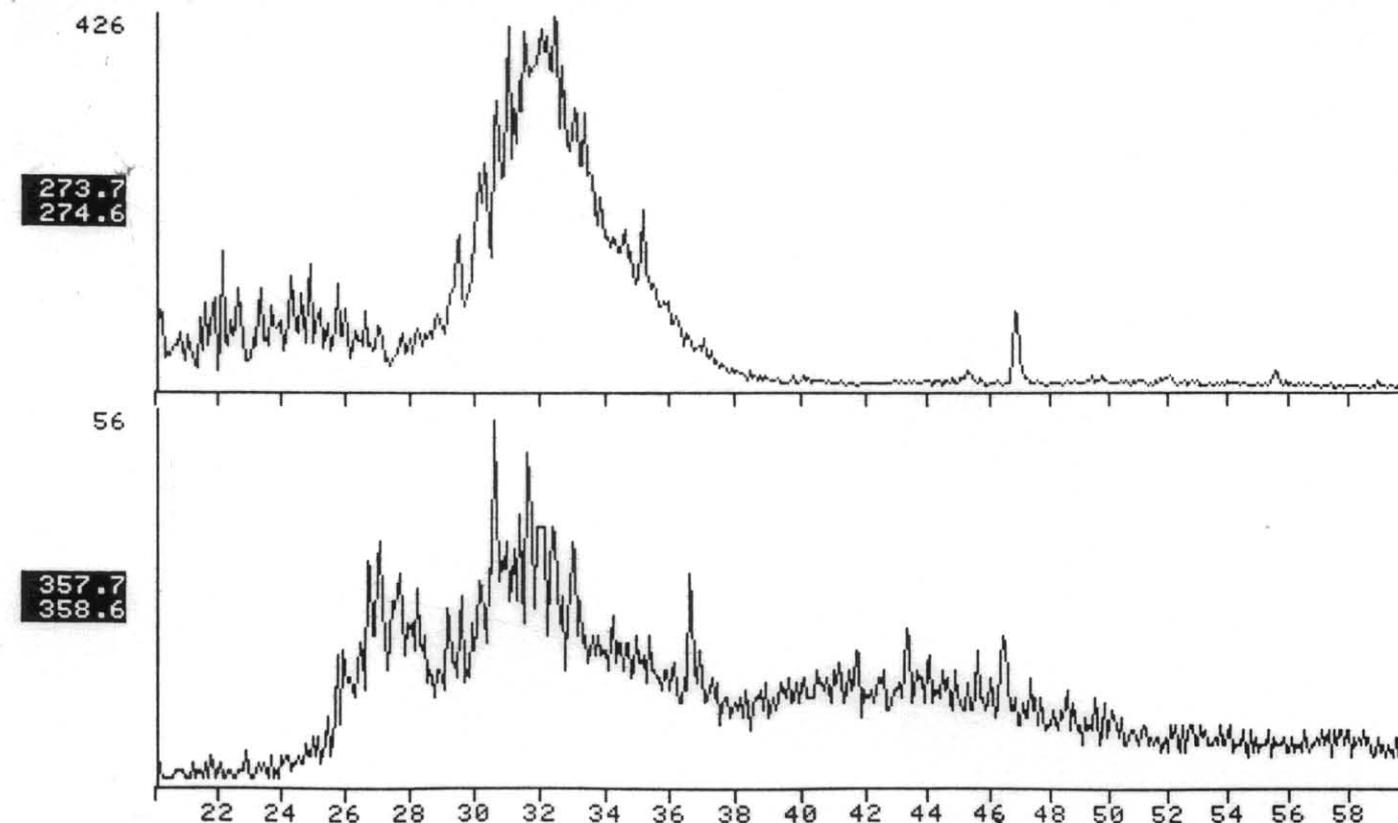
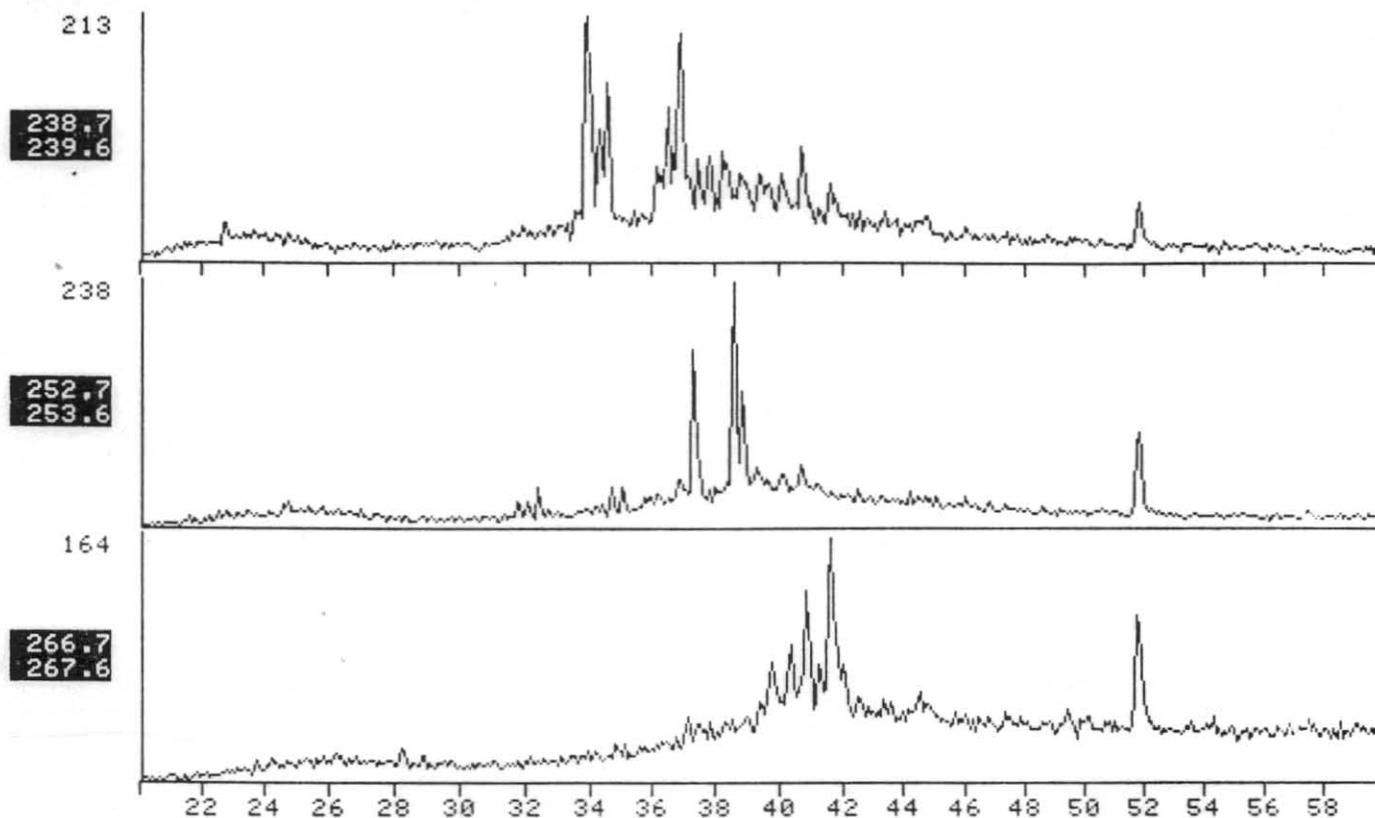


FIGURE: 3-16c

NAME PELICAN#1, 9269'. AROMATIC FRAGMENTOGRAM.
MISC 26-3-87. GEC. 0.2/200ul. COL#72.

FRN 6246



NAME PELICAN#1, 9269'. AROMATIC FRAGMENTOGRAM.
MISC 26-3-87. GEC. 0.2/200ul. COL#72.

FRN 6246

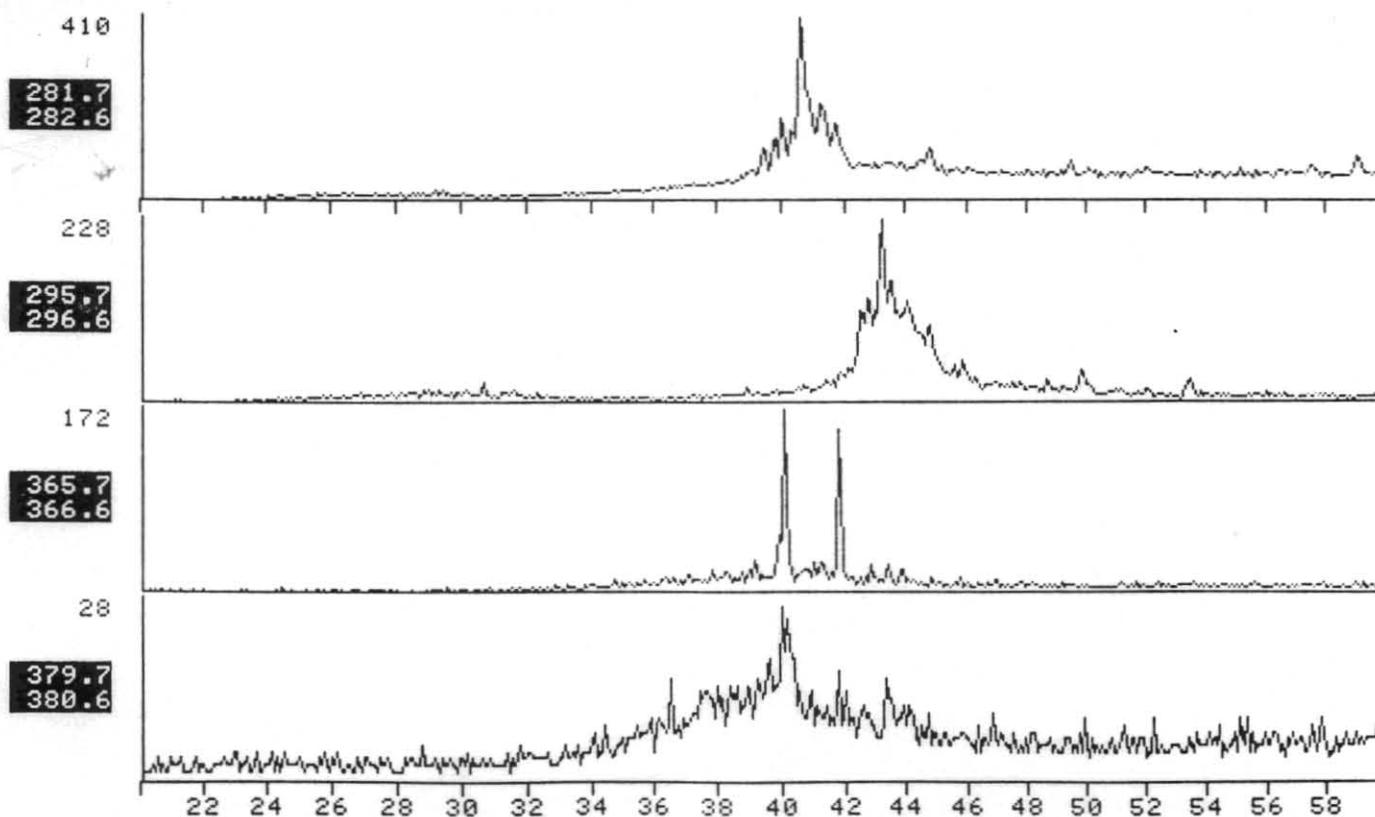
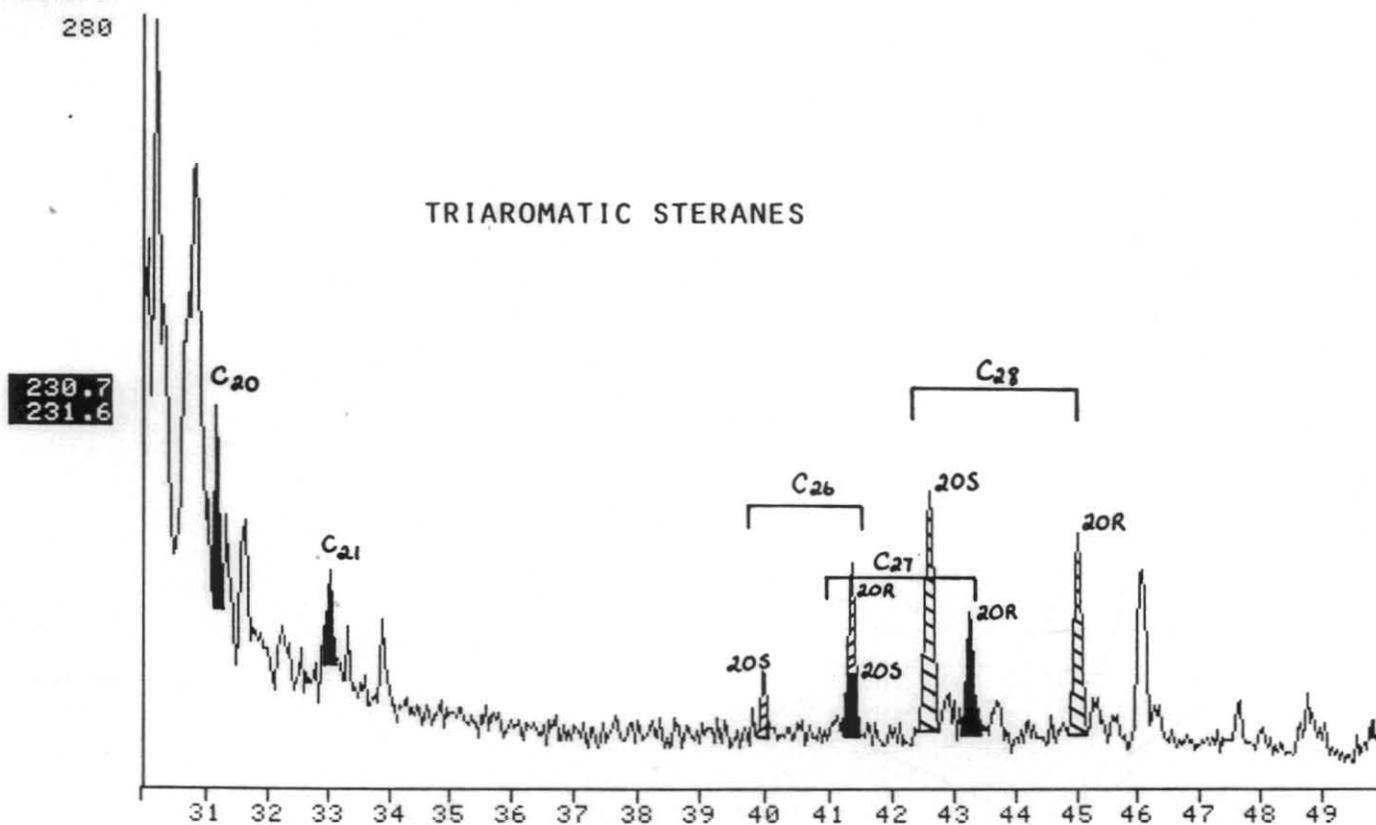


FIGURE: 3-17a

NAME PELICAN#3, 9386.6'. AROMATIC FRAGMENTOGRAM.
 MISC 25-3-87. GEC. 0.2/250ul. COL#72.

FRN 6205



NAME PELICAN#3, 9386.6'. AROMATIC FRAGMENTOGRAM.
 MISC 25-3-87. GEC. 0.2/250ul. COL#72.

FRN 6205

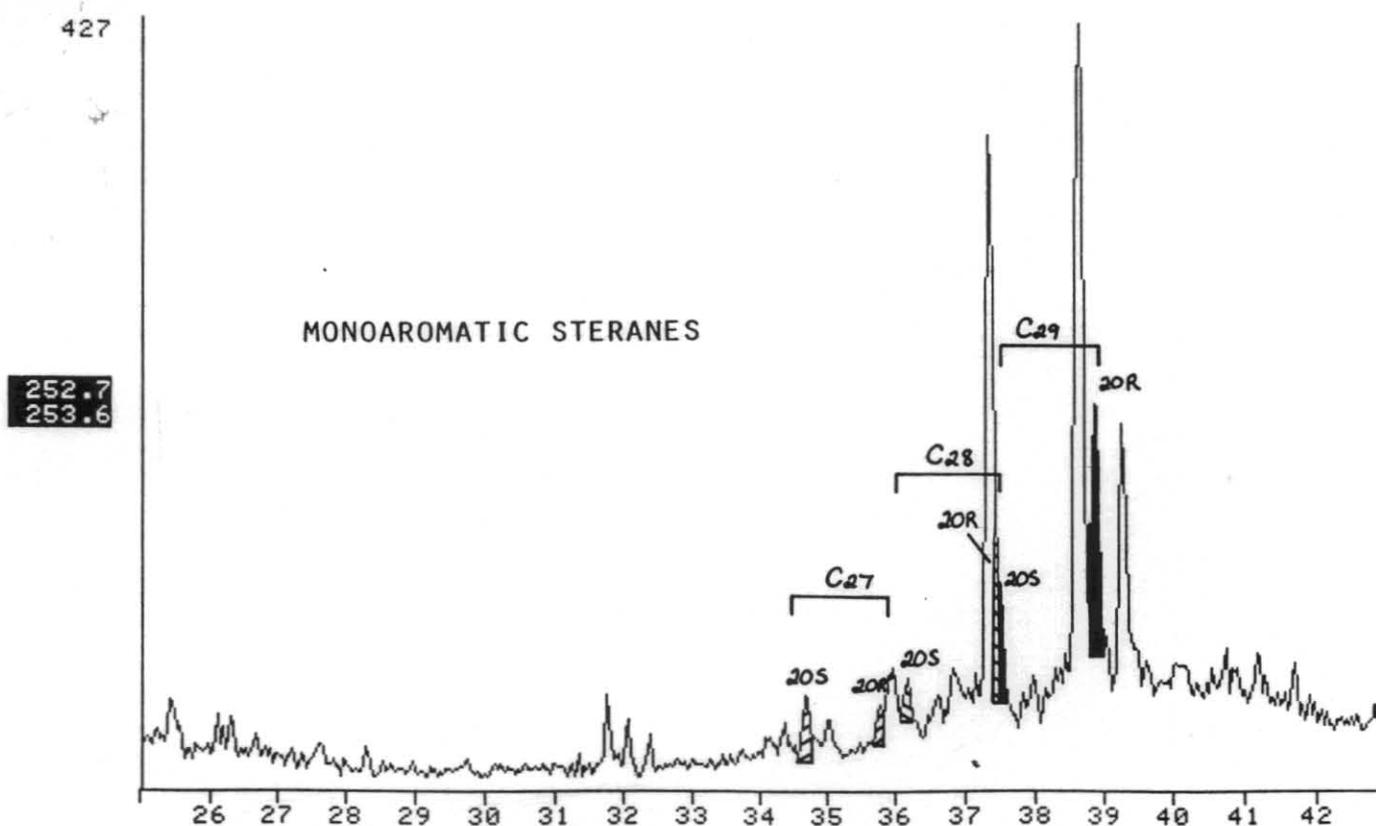
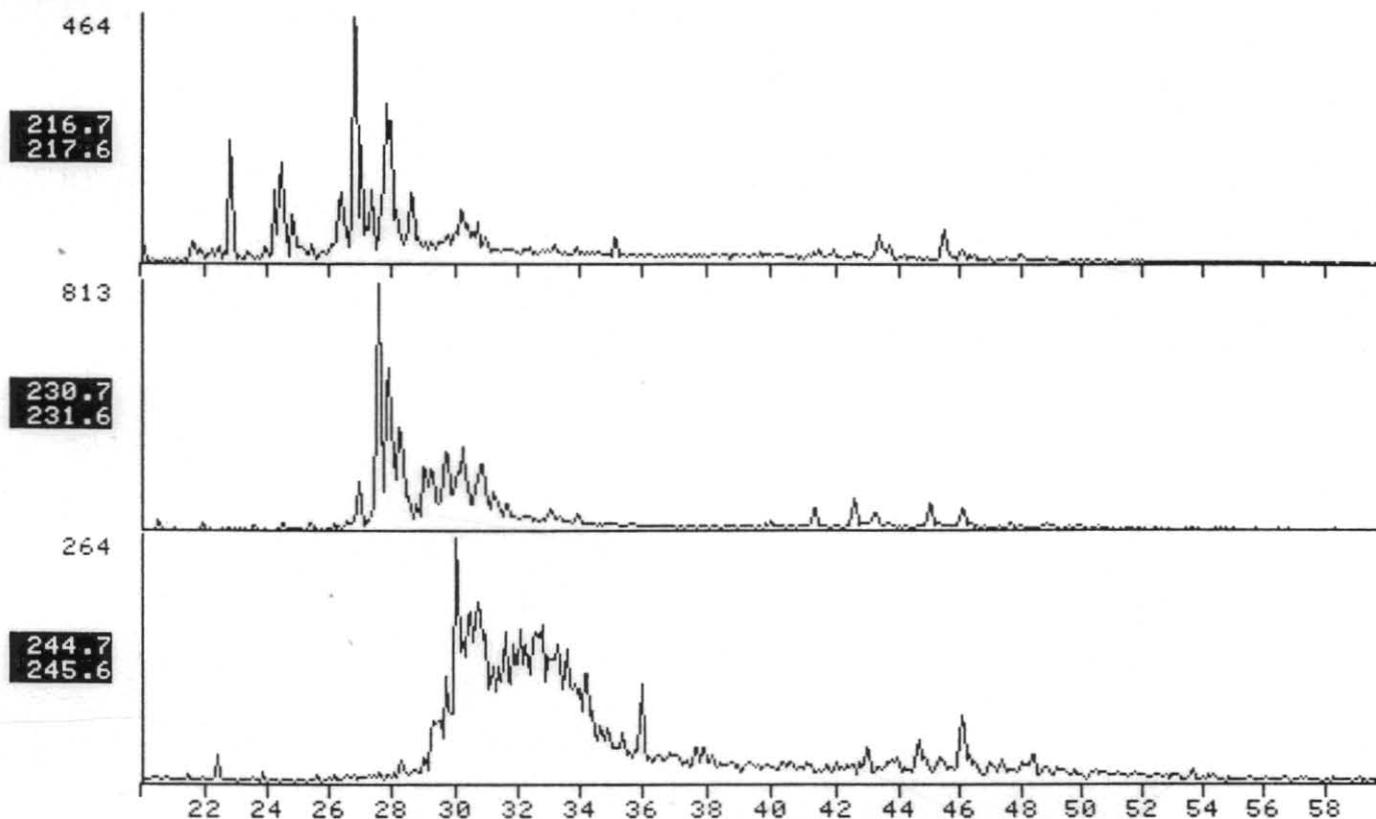


FIGURE: 3-17b

NAME PELICAN#3, 9386.6'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/250ul. COL#72.

FRN 6205



NAME PELICAN#3, 9386.6'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/250ul. COL#72.

FRN 6205

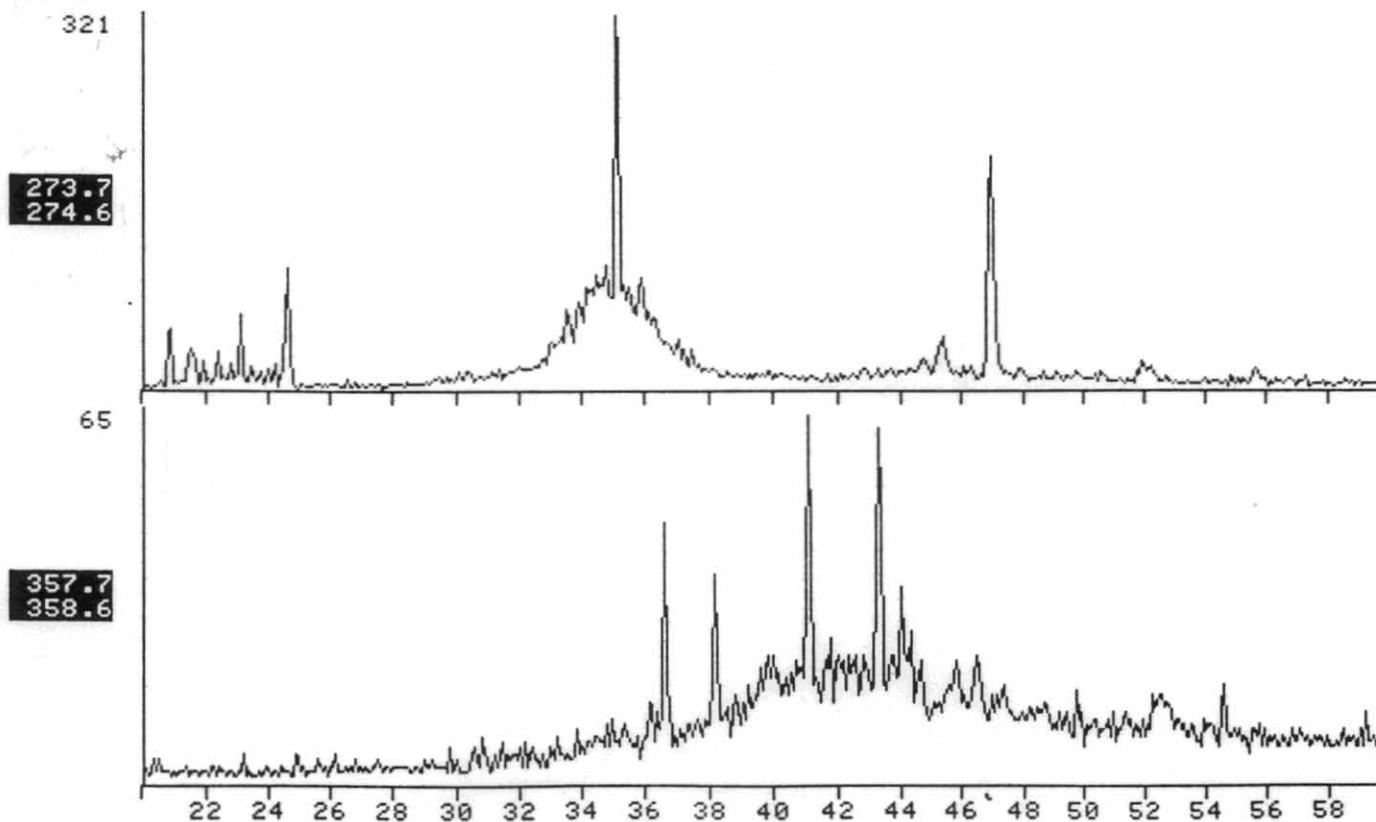
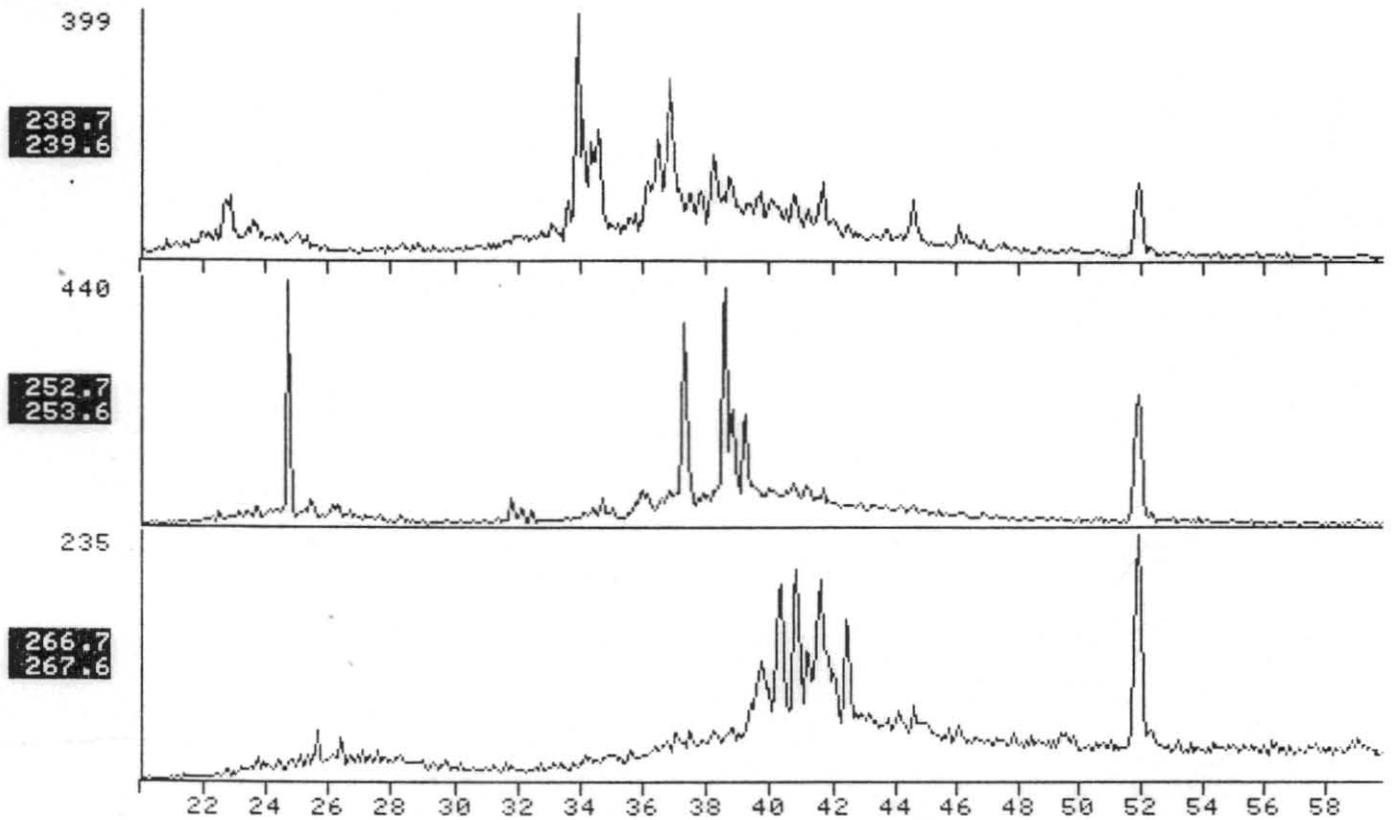


FIGURE: 3-17c

NAME PELICAN#3, 9386.6'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/250ul. COL#72.

FRN 6205



NAME PELICAN#3, 9386.6'. AROMATIC FRAGMENTOGRAM.
MISC 25-3-87. GEC. 0.2/250ul. COL#72.

FRN 6205

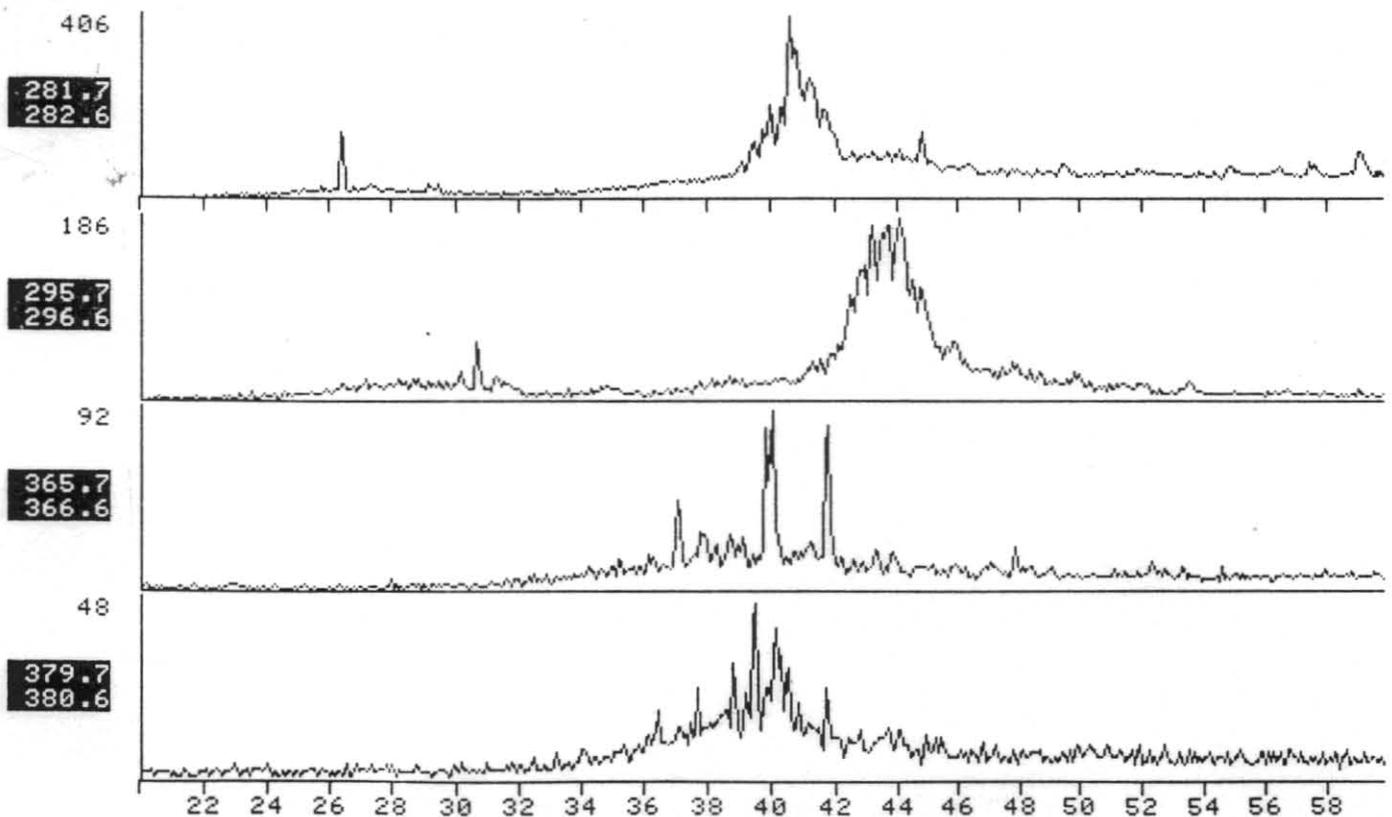
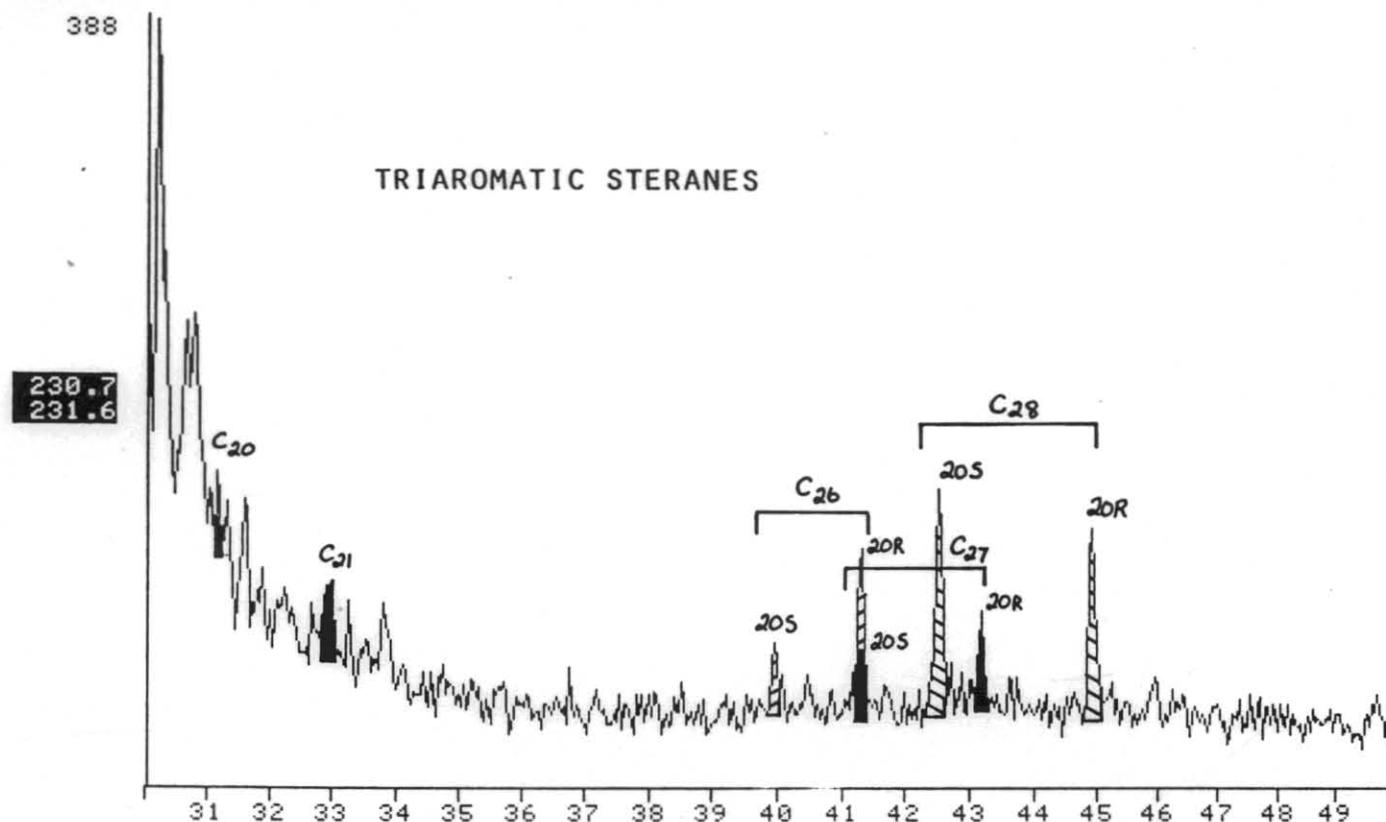


FIGURE: 3-18a

NAME TILANA#1, 2800.9m. AROMATIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/150ul. COL#72.

FRN 6249



NAME TILANA#1, 2800.9m. AROMATIC FRAGMENTOGRAM.
 MISC 27-3-87. GEC. 0.2/150ul. COL#72.

FRN 6249

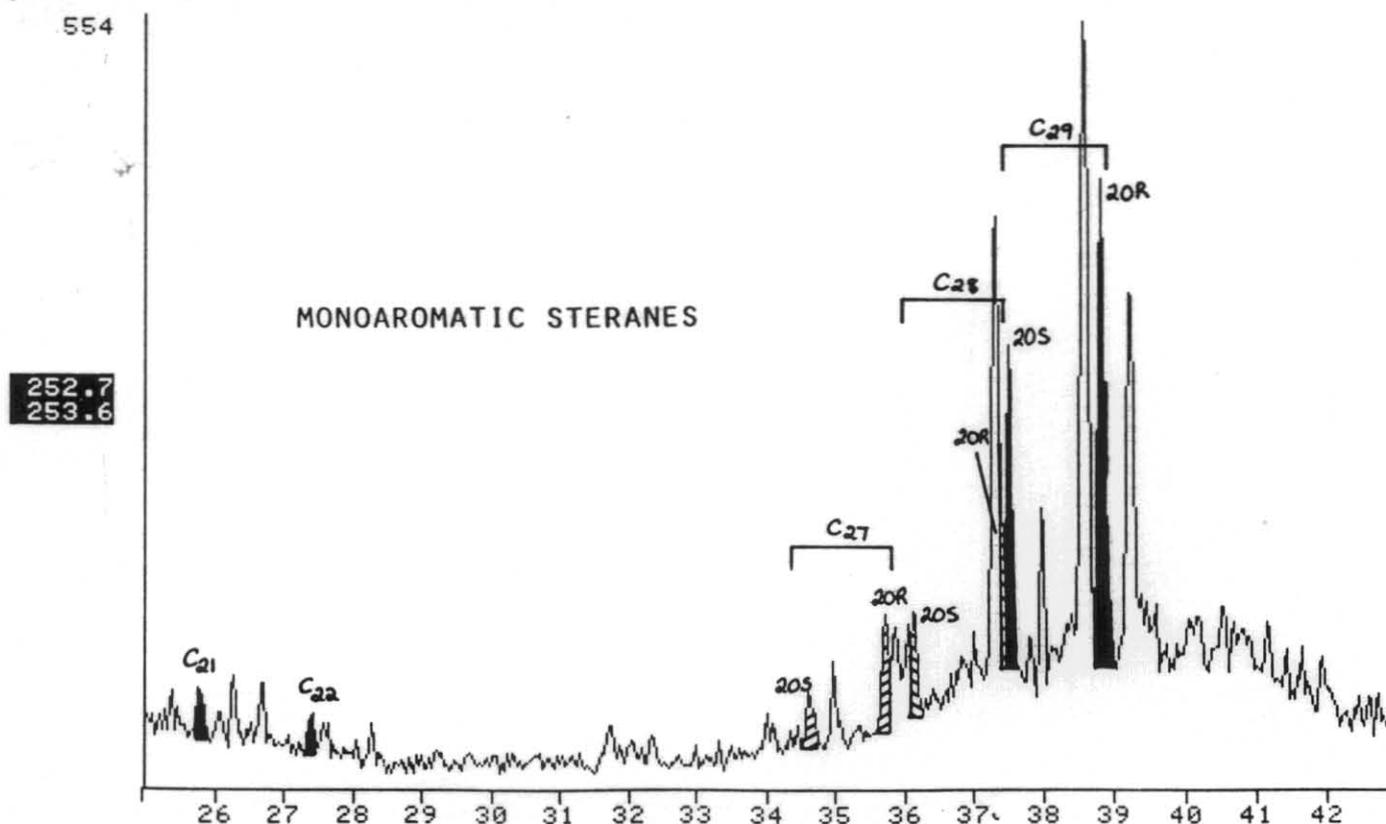
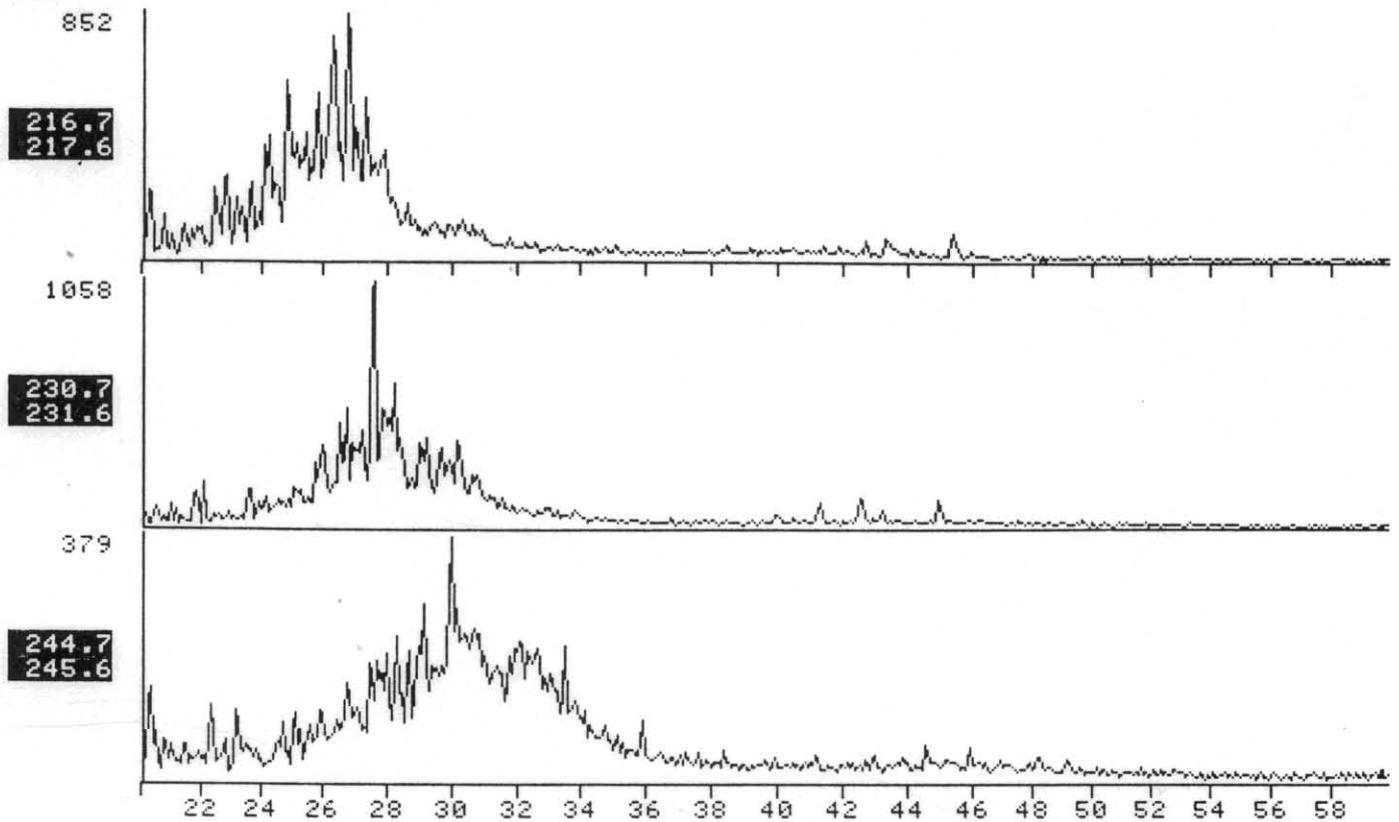


FIGURE: 3-18b

NAME TILANA#1, 2800.9m. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/150ul. COL#72.

FRN 6249



NAME TILANA#1, 2800.9m. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/150ul. COL#72.

FRN 6249

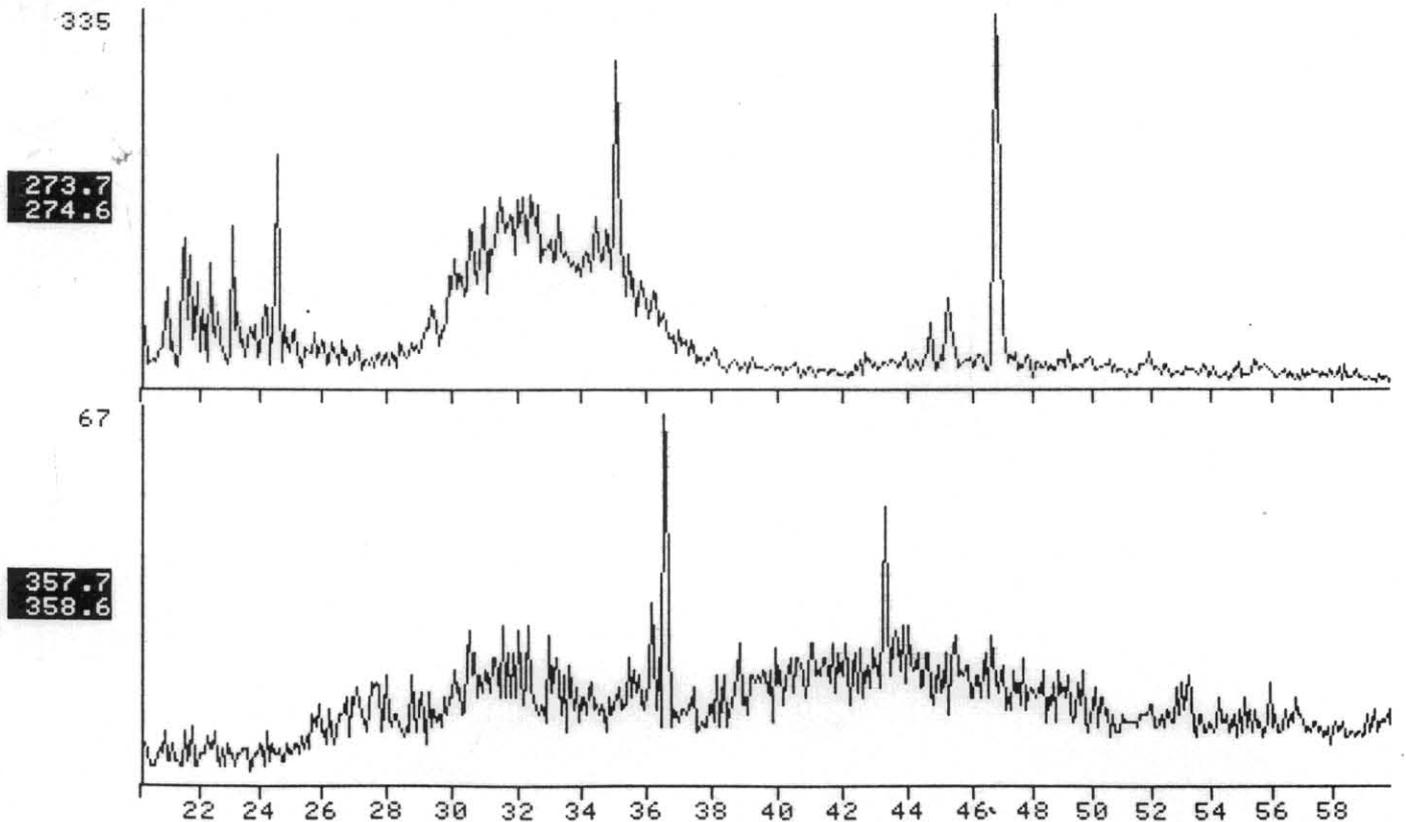
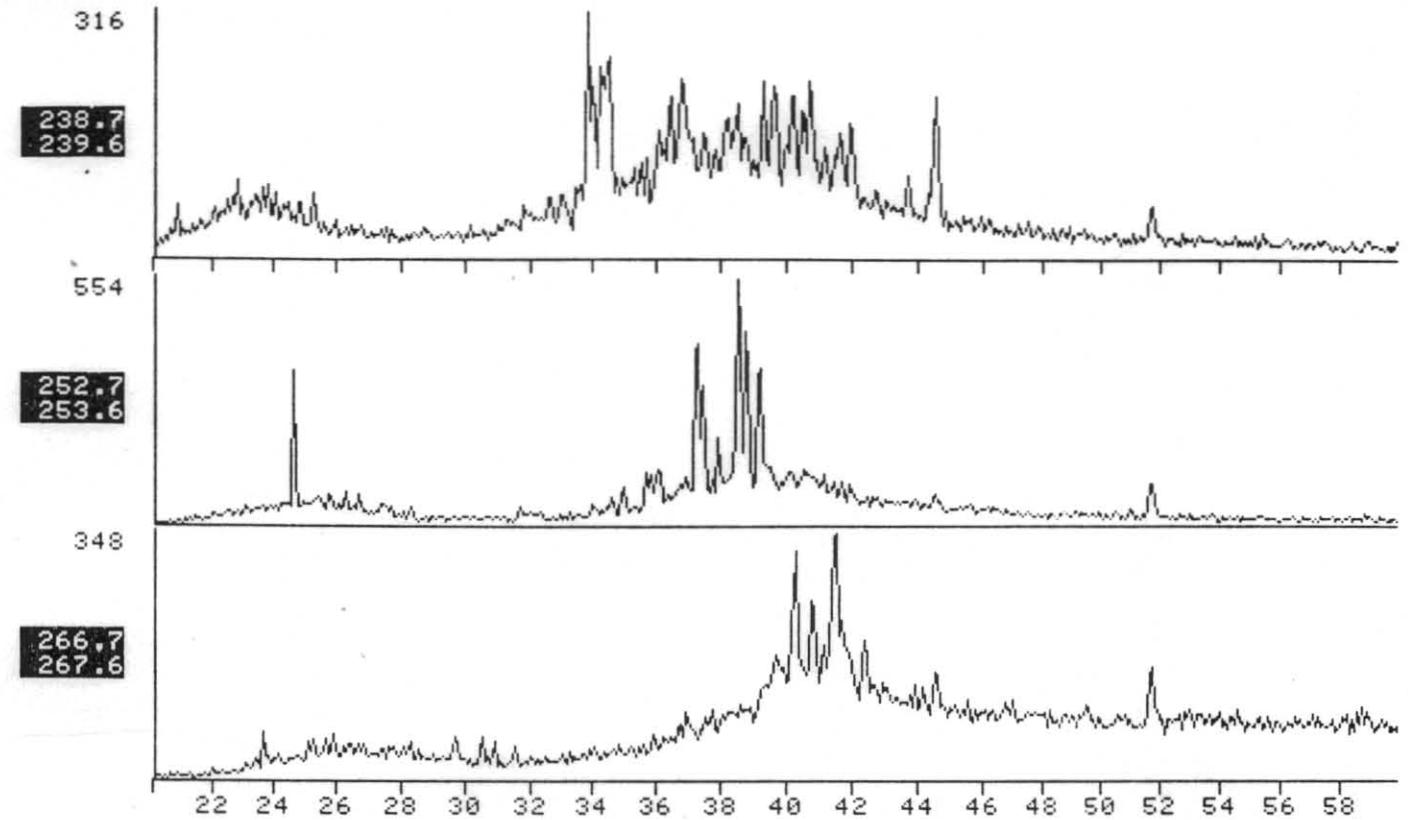


FIGURE: 3-18c

NAME TILANA#1, 2800.9m. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/150ul. COL#72.

FRN 6249



NAME TILANA#1, 2800.9m. AROMATIC FRAGMENTOGRAM.
MISC 27-3-87. GEC. 0.2/150ul. COL#72.

FRN 6249

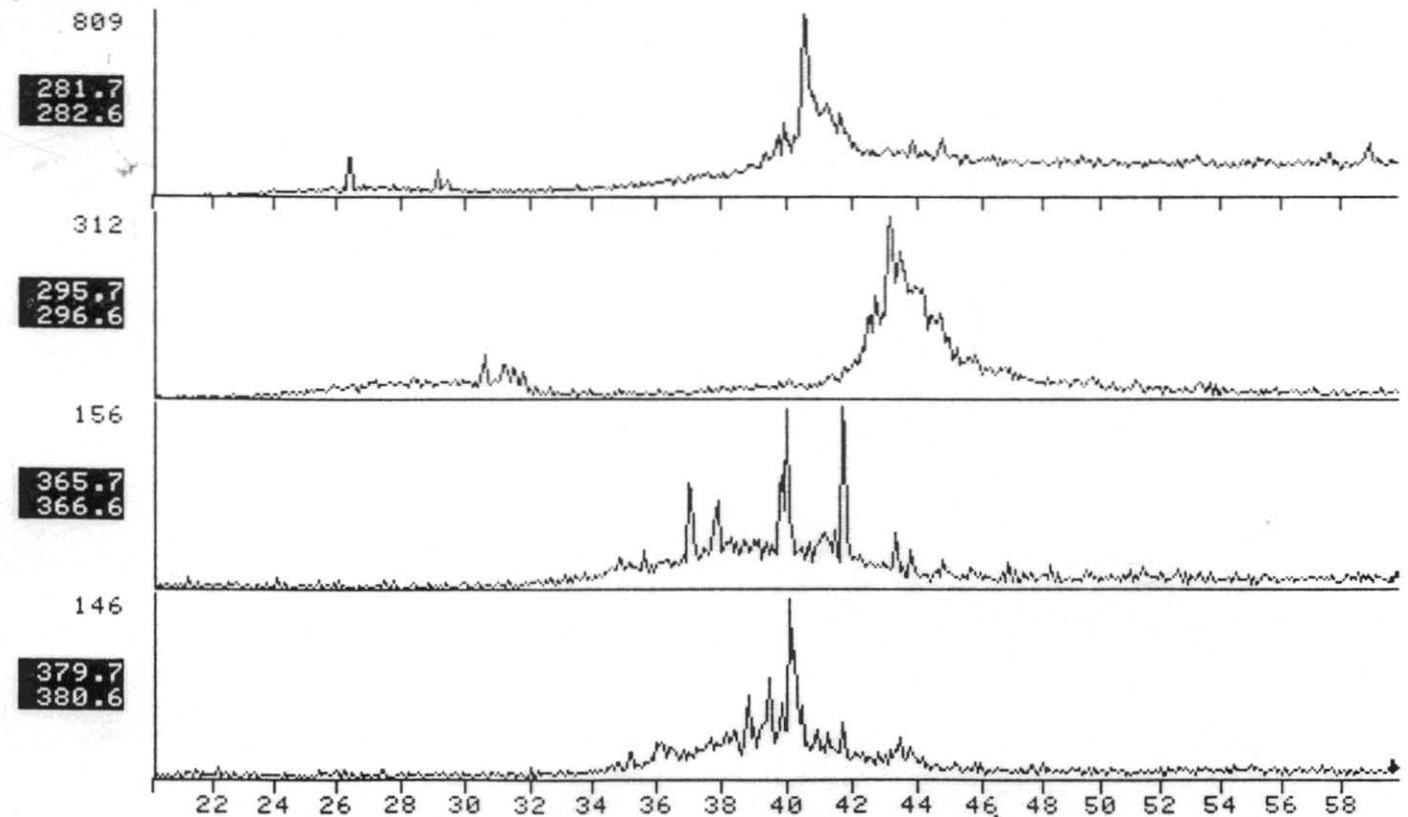


TABLE 1-1

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = AROO 1

DATE OF JOB = DECEMBER 1986

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
9566.0	nd	nd	nd	nd	nd	nd	nd	nd	1.76	nd	nd

TMAX = Max. temperature
 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

TABLE 1-2

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = BASS 1

DATE OF JOB = JANUARY 1987

SAMPLES	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
6405ft Core 12	427	0.83	11.74	1.15	12.57	10.21	0.07	1.04	3.79	309	30
6930ft Core 13	422	0.32	1.52	0.46	1.84	3.30	0.17	0.15	1.86	81	24
7421ft Core 14	nd	nd	nd	nd	nd	nd	nd	nd	61.65	nd	nd
7694ft Core 15	nd	nd	nd	nd	nd	nd	nd	nd	13.00	nd	nd

TMAX = Max. temperature
 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

TABLE 1-3

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = BASS 2

DATE OF JOB = JANUARY 1987

SAMPLES	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
4135ft Core 5	425	0.84	11.19	1.19	12.03	9.40	0.07	1.00	5.11	218	23
4740ft	429	0.33	2.47	0.13	2.80	19.00	0.12	0.23	1.20	205	10
5068ft	420	0.20	1.05	0.14	1.25	7.50	0.16	0.10	1.13	92	12
5509ft	431	0.54	8.31	0.55	8.85	15.11	0.06	0.73	2.21	376	24

TMAX = Max. temperature
 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

TABLE 1-4

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = BASS 3

DATE OF JOB = JANUARY 1987

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TDC	HI	OI
5023.0	416	0.28	1.00	0.82	1.28	1.22	0.22	0.11	3.61	27	22
5317.0	nd	nd	nd	nd	nd	nd	nd	nd	2.23	nd	nd
5625.0	nd	nd	nd	nd	nd	nd	nd	nd	1.25	nd	nd
5915.0	nd	nd	nd	nd	nd	nd	nd	nd	1.95	nd	nd
6420.0	nd	nd	nd	nd	nd	nd	nd	nd	1.80	nd	nd
6906.0	nd	nd	nd	nd	nd	nd	nd	nd	31.55	nd	nd
7434.0	437	1.22	14.46	0.70	15.68	20.66	0.08	1.30	4.88	296	14

TMAX = Max. temperature S2
 S1+S2 = Potential yield
 PC = Pyrolysable carbon
 OI = Oxygen Index

S1 = Volatile hydrocarbons (HC)
 S3 = Organic carbon dioxide
 TDC = Total organic carbon
 nd = no data

S2 = HC generating potential
 PI = Production index
 HI = Hydrogen index

TABLE 1-5

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = CORMORANT 1

DATE OF JOB = DECEMBER 1986

SAMPLES	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
4988ft Core 6	nd	nd	nd	nd	nd	nd	nd	nd	35.10	nd	nd
6550ft Core 9	nd	nd	nd	nd	nd	nd	nd	nd	1.18	nd	nd
7328ft Core 10	nd	nd	nd	nd	nd	nd	nd	nd	60.20	nd	nd

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

TABLE 1-6

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = DONDU 1

DATE OF JOB = JANUARY 1987

SAMPLES	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
7679ft 10"	435	0.52	3.24	0.77	3.76	4.21	0.14	0.31	1.60	202	48

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

TABLE 1-7

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = DURROON 1

DATE OF JOB = JANUARY 1987

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TDC	HI	OI
5551.0	438	0.03	0.87	0.66	0.90	1.32	0.03	0.07	1.99	43	33
8424.0	438	0.36	4.31	0.45	4.67	9.58	0.08	0.39	7.64	56	5
9915.0	449	0.13	0.68	0.15	0.81	4.53	0.16	0.07	1.88	36	7

TMAX = Max. temperature
 S1+S2 = Potential yield
 PC = Pyrolysable carbon
 OI = Oxygen Index

S1 = Volatile hydrocarbons (HC)
 S3 = Organic carbon dioxide
 TDC = Total organic carbon
 nd = no data

S2 = HC generating potential
 PI = Production index
 HI = Hydrogen index

TABLE 1-8

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = KONKON 1

DATE OF JOB = JANUARY 1987

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
4413.0	425	5.60	106.26	29.33	111.86	3.62	0.05	9.28	54.00	196	54
4437.0	nd	nd	nd	nd	nd	nd	nd	nd	1.18	nd	nd

TMAX = Max. temperature
 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

TABLE 1-9

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = NARIMBA 1

DATE OF JOB = DECEMBER 1986

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
9297.0	nd	nd	nd	nd	nd	nd	nd	nd	70.25	nd	nd
9552.0	nd	nd	nd	nd	nd	nd	nd	nd	2.49	nd	nd
9750.0	nd	nd	nd	nd	nd	nd	nd	nd	2.47	nd	nd

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

TABLE 1-10

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = PELICAN 1

DATE OF JOB = JANUARY 1987

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
5851.0	405	0.34	0.46	0.51	0.80	0.90	0.43	0.07	0.63	73	80
7122.0	433	3.10	64.18	7.22	67.28	8.89	0.05	5.58	28.50	225	25
7756.0	nd	nd	nd	nd	nd	nd	nd	nd	58.40	nd	nd
8379.0	nd	nd	nd	nd	nd	nd	nd	nd	2.38	nd	nd
8544.0	nd	nd	nd	nd	nd	nd	nd	nd	4.31	nd	nd
9269.0	435	0.61	3.62	2.02	4.23	1.79	0.14	0.35	2.24	161	90
9450.6	nd	nd	nd	nd	nd	nd	nd	nd	1.26	nd	nd
10086.0	nd	nd	nd	nd	nd	nd	nd	nd	1.24	nd	nd

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

TABLE 1-11

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = PELICAN 3

DATE OF JOB = JANUARY 1987

DEPTH(ft)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
9386.6	434	0.46	2.42	4.12	2.88	0.59	0.16	0.24	2.86	84	144
9439.0	nd	nd	nd	nd	nd	nd	nd	nd	1.50	nd	nd
9485.0	nd	nd	nd	nd	nd	nd	nd	nd	1.42	nd	nd

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

TABLE 1-12

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = POONBOON 1

DATE OF JOB = DECEMBER 1986

SAMPLES	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
8114ft	nd	nd	nd	nd	nd	nd	nd	nd	63.10	nd	nd
8818ft	nd	nd	nd	nd	nd	nd	nd	nd	1.93	nd	nd
9974ft 11"	nd	nd	nd	nd	nd	nd	nd	nd	27.60	nd	nd

TMAX = Max. temperature
 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

TABLE 1-13

ROCK-EVAL PYROLYSIS DATA (one run)

WELLNAME = TILANA 1

DATE OF JOB = JANUARY 1987

DEPTH(m)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
2800.9	436	0.45	3.82	1.30	4.27	2.94	0.11	0.35	2.11	181	61

TMAX = Max. temperature
 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

TABLE 2-1a

Summary of Extraction and Liquid Chromatography

Wellname: BASS 1

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
6405.0 Core 12	40.5	2133.3	481.5	619.8	474.1	1093.8	558.0	nd	558.0
6930.0 Core 13	40.5	935.8	158.0	390.1	167.9	558.0	219.8	nd	219.8

TABLE 2-1a

Summary of Extraction and Liquid Chromatography

Wellname: BASS 1

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			EOM(mg)	SAT(mg)	SAT	ASPH	HC
	%SAT.	%AROM.	%HC's	%NSO's	%ASPH.	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
6405.0 Core 12	37.5	28.7	66.2	33.8	nd	33.8	56.3	16.4	1.31	nd	2.0
6930.0 Core 13	50.2	21.6	71.7	28.3	nd	28.3	50.3	21.0	2.32	nd	2.5

na = not applicable nd = no data

TABLE 2-1b

Summary of Gas Chromatography Data

Wellname: BASS 1

Date of Job: FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
6405.0 Core 12	3.00	1.41	.90	2.17	2.15	.36
6930.0 Core 13	2.89	1.11	.69	1.87	1.92	.28

TABLE 2-1b

Summary of Gas Chromatography Data

Wellname: BASS 1

Date of Job: FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
6405.0 Core 12	1.8	3.1	4.9	6.1	7.8	7.8	11.0	4.1	3.7	4.2	2.3	1.9	2.2	3.7	2.0	3.9	2.5	7.3	3.4	7.9	2.9	5.3
6930.0 Core 13	1.4	2.4	5.4	5.8	10.3	12.4	13.8	6.9	4.8	4.4	1.9	1.1	1.4	3.1	1.3	2.3	1.4	3.8	2.9	6.0	3.0	4.6

na = not applicable nd = no data

TABLE 2-2a

Summary of Extraction and Liquid Chromatography

Wellname: BASS 2

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
4135.0 Core 5	40.1	2740.6	603.1	398.1	560.5	958.6	1178.9	nd	1178.9
4740.0	40.9	789.7	105.1	352.1	88.0	440.1	244.5	nd	244.5
5068.0	22.1	782.8	280.5	276.0	45.2	321.3	181.0	nd	181.0
5509.0	13.5	1666.7	274.1	688.9	348.1	1037.0	355.6	nd	355.6

TABLE 2-2a

Summary of Extraction and Liquid Chromatography

Wellname: BASS 2

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			EOM(mg) TOC(g)	SAT(mg) TOC(g)	SAT AROM	ASPH NSO	HC Non HC
	%SAT.	%AROM.	%HC's	%NSO's	%ASPH.	%Non HC's					
4135.0 Core 5	18.6	26.2	44.8	55.2	nd	55.2	53.6	7.8	.71	nd	.8
4740.0	51.4	12.9	64.3	35.7	nd	35.7	65.8	29.3	4.00	nd	1.8
5068.0	55.0	9.0	64.0	36.0	nd	36.0	69.3	24.4	6.10	nd	1.8
5509.0	49.5	25.0	74.5	25.5	nd	25.5	75.4	31.2	1.98	nd	2.9

na = not applicable nd = no data

TABLE 2-2b

Summary of Gas Chromatography Data

Wellname: BASS 2

Date of Job: FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
4135.0 Core 5	1.17	.71	1.14	2.13	2.02	.23
4740.0	2.26	.82	.69	1.87	1.93	.19
5068.0	2.07	.91	.68	1.92	2.07	.72
5509.0	5.82	3.60	.95	1.50	1.92	.25

TABLE 2-2b

Summary of Gas Chromatography Data

Wellname: BASS 2

Date of Job: FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
4135.0 Core 5	2.0	3.8	7.8	9.2	11.9	10.0	7.1	5.3	6.1	2.6	1.7	1.4	1.0	1.6	1.4	1.9	1.6	4.5	2.5	7.8	3.0	6.1
4740.0	.9	2.8	9.1	11.4	13.8	11.0	9.0	5.8	4.0	2.9	1.4	1.0	.9	1.2	1.1	1.7	1.2	4.2	2.9	7.3	3.0	3.4
5068.0	.9	2.5	7.9	9.0	11.1	10.4	9.5	6.7	4.6	5.0	3.9	2.4	2.5	2.3	1.4	3.2	1.5	3.7	2.1	4.7	2.3	2.6
5509.0	1.0	2.0	4.1	5.1	4.9	4.3	15.6	2.8	2.7	2.8	2.0	1.7	1.7	2.8	2.4	4.8	3.2	7.7	4.1	9.5	8.0	6.6

na = not applicable nd = no data

TABLE 2-3a

Summary of Extraction and Liquid Chromatography

Wellname: BASS 3

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
5023.0	15.0	1073.3	313.3	333.3	100.0	433.3	326.7	nd	326.7
7434.0	21.0	2652.4	828.6	819.0	266.7	1085.7	738.1	nd	738.1

TABLE 2-3a

Summary of Extraction and Liquid Chromatography

Wellname: BASS 3

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			<u>EOM(mg)</u>	<u>SAT(mg)</u>	<u>SAT</u>	<u>ASPH</u>	<u>HC</u>
	%SAT.	%AROM.	%HC's	%NSO's	%ASPH.	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
5023.0	43.9	13.2	57.0	43.0	nd	43.0	29.7	9.2	3.33	nd	1.3
7434.0	44.9	14.6	59.5	40.5	nd	40.5	54.4	16.8	3.07	nd	1.5

na = not applicable nd = no data

TABLE 2-3b

Summary of Gas Chromatography Data

Wellname: BASS 3

Date of Job: FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
5023.0	2.77	1.03	.65	1.69	2.02	.42
7434.0	5.04	3.41	.91	1.28	1.22	.41

TABLE 2-3b

Summary of Gas Chromatography Data

Wellname: BASS 3

Date of Job: FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
5023.0	1.6	3.3	8.5	10.8	13.6	10.5	10.8	5.9	3.9	3.1	1.9	1.2	1.3	3.1	1.3	2.4	1.3	3.3	1.9	4.0	3.1	3.3
7434.0	3.7	4.3	7.3	6.6	6.1	4.9	16.5	3.6	3.3	2.3	2.1	2.0	2.1	2.7	2.9	3.6	3.6	5.6	4.5	5.6	3.0	3.5

na = not applicable nd = no data

TABLE 2-4a

Summary of Extraction and Liquid Chromatography

Wellname: DONDU 1

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
7679 10"	30.0	1680.0	543.3	480.0	233.3	713.3	423.3	nd	423.3

TABLE 2-4a

Summary of Extraction and Liquid Chromatography

Wellname: DONDU 1

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			EDM(mg)	SAT(mg)	SAT	ASPH	HC
	ZSAT.	ZAROM.	ZHC's	ZNSO's	ZASPH.	ZNon HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
7679 10"	42.2	20.5	62.8	37.2	nd	37.2	105.0	30.0	2.06	nd	1.7

na = not applicable nd = no data

TABLE 2-4b

Summary of Gas Chromatography Data

Wellname: DONDU 1

Date of Job: FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
7679 10"	6.48	2.57	.59	1.15	1.15	.49

TABLE 2-4b

Summary of Gas Chromatography Data

Wellname: DONDU 1

Date of Job: FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
7679 10"	1.5	2.3	5.1	6.0	7.1	6.1	15.8	4.1	2.4	2.6	2.5	2.5	2.7	3.0	3.4	4.1	4.2	5.7	4.8	5.9	4.1	3.8

na = not applicable nd = no data

TABLE 2-5a

Summary of Extraction and Liquid Chromatography

Wellname: DURROON 1

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
5551.0	45.3	512.1	132.5	176.6	79.5	256.1	123.6	nd	123.6
8424.0	14.3	1272.7	468.5	132.9	300.7	433.6	370.6	nd	370.6
9915.0	16.8	922.6	285.7	131.0	125.0	256.0	381.0	nd	381.0

TABLE 2-5a

Summary of Extraction and Liquid Chromatography

Wellname: DURROON 1

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			EQM(mg)	SAT(mg)	SAT	ASPH	HC
	%SAT.	%AROM.	%HC's	%NSO's	%ASPH.	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
5551.0	46.5	20.9	67.4	32.6	nd	32.6	25.7	8.9	2.22	nd	2.1
8424.0	16.5	37.4	53.9	46.1	nd	46.1	16.7	1.7	.44	nd	1.2
9915.0	20.6	19.6	40.2	59.8	nd	59.8	49.1	7.0	1.05	nd	.7

na = not applicable nd = no data

TABLE 2-5b

Summary of Gas Chromatography Data

Wellname: DURROON 1

Date of Job:FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
5551.0	3.09	.63	.50	3.68	4.04	.33
8424.0	3.11	1.37	.46	1.40	1.54	1.43
9915.0	2.55	1.12	.67	1.37	1.37	1.86

TABLE 2-5b

Summary of Gas Chromatography Data

Wellname: DURROON 1

Date of Job:FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
5551.0	.3	1.5	6.0	10.8	11.8	7.2	4.6	2.9	1.5	1.7	1.1	1.3	1.5	4.1	1.9	10.3	2.8	14.5	2.7	5.8	2.0	3.7
8424.0	1.9	2.9	5.0	4.1	5.5	4.3	5.9	4.1	1.9	3.6	4.1	4.5	5.2	6.8	6.0	9.0	4.7	6.9	3.0	3.8	3.7	2.9
9915.0	3.0	4.5	6.7	7.2	10.6	8.7	9.8	5.7	3.8	3.6	3.8	3.5	3.9	4.9	3.7	5.1	2.6	2.9	2.0	1.9	1.1	1.1

na = not applicable nd = no data

TABLE 2-6a

Summary of Extraction and Liquid Chromatography

Wellname: KONKON 1

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
4413.0	1.4	21357.1	8857.1	1714.3	1642.9	3357.1	9142.9	nd	9142.9

TABLE 2-6a

Summary of Extraction and Liquid Chromatography

Wellname: KONKON 1

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			EDM(mg)	SAT(mg)	SAT	ASPH	HC
	%SAT.	%AROM.	%HC's	%NSO's	%ASPH.	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
4413.0	13.7	13.1	26.9	73.1	nd	73.1	39.6	3.2	1.04	nd	.4

na = not applicable nd = no data

TABLE 2-6b

Summary of Gas Chromatography Data

Wellname: KONKON 1

Date of Job: FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
4413.0	4.59	2.41	.97	1.87	1.64	.25

TABLE 2-6b

Summary of Gas Chromatography Data

Wellname: KONKON 1

Date of Job: FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
4413.0	2.0	2.3	5.2	5.7	4.1	3.3	7.9	1.8	1.7	1.3	1.5	1.9	2.4	3.8	3.8	6.8	6.1	11.5	5.9	11.4	3.0	6.6

na = not applicable nd = no data

TABLE 2-7a

Summary of Extraction and Liquid Chromatography

Wellname: PELICAN 1

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
5851.0	28.5	603.5	143.9	105.3	178.9	284.2	175.4	nd	175.4
7122.0	5.7	10210.5	2000.0	1824.6	2403.5	4228.1	3982.5	nd	3982.5
9269.0	29.5	1725.4	359.3	572.9	362.7	935.6	430.5	nd	430.5

TABLE 2-7a

Summary of Extraction and Liquid Chromatography

Wellname: PELICAN 1

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			<u>EOM(mg)</u>	<u>SAT(mg)</u>	<u>SAT</u>	<u>ASPH</u>	<u>HC</u>
	%SAT.	%AROM.	%HC's	%NSO's	%ASPH.	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
5851.0	22.9	38.9	61.8	38.2	nd	38.2	95.8	16.7	.59	nd	1.6
7122.0	22.2	29.3	51.5	48.5	nd	48.5	35.8	6.4	.76	nd	1.1
9269.0	41.9	26.6	68.5	31.5	nd	31.5	77.0	25.6	1.58	nd	2.2

na = not applicable nd = no data

TABLE 2-7b

Summary of Gas Chromatography Data

Wellname: PELICAN 1

Date of Job:FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
5851.0	2.48	.79	.54	1.52	1.77	1.81
7122.0	10.18	7.92	1.04	1.85	1.82	.40
9269.0	8.36	5.17	.87	1.14	1.11	.42

TABLE 2-7b

Summary of Gas Chromatography Data

Wellname: PELICAN 1

Date of Job:FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
5851.0	.6	1.5	7.4	11.7	15.7	12.7	9.9	7.4	4.0	4.6	3.4	2.2	3.0	2.2	1.4	3.0	1.5	2.4	1.2	1.7	1.6	1.0
7122.0	1.6	2.5	4.6	4.3	3.9	3.1	24.7	2.3	2.4	1.3	1.1	1.3	2.3	4.7	3.7	6.3	4.9	11.2	3.7	5.4	2.0	2.6
9269.0	2.4	3.0	5.0	4.7	4.5	3.6	18.5	2.5	2.2	2.4	2.5	2.4	2.5	3.1	3.6	4.8	5.0	5.8	5.3	6.6	4.7	4.9

na = not applicable nd = no data

TABLE 2-8a

Summary of Extraction and Liquid Chromatography

Wellname: PELICAN 3

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(ft)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
9386.6	34.5	1043.5	298.6	246.4	255.1	501.4	243.5	nd	243.5

TABLE 2-8a

Summary of Extraction and Liquid Chromatography

Wellname: PELICAN 3

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(ft)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			<u>EOM(mg)</u>	<u>SAT(mg)</u>	<u>SAT</u>	<u>ASPH</u>	<u>HC</u>
	ZSAT.	ZAROM.	ZHC's	ZNSO's	ZASPH.	ZNon HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
9386.6	33.1	34.2	67.3	32.7	nd	32.7	36.5	8.6	.97	nd	2.1

na = not applicable nd = no data

TABLE 2-8b

Summary of Gas Chromatography Data

Wellname: PELICAN 3

Date of Job:FEBRUARY 1987

A. Alkane Compositional Data

Depth(ft)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
9386.6	7.02	4.76	.85	1.25	1.15	.56

TABLE 2-8b

Summary of Gas Chromatography Data

Wellname: PELICAN 3

Date of Job:FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(ft)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
9386.6	2.8	3.7	4.8	4.6	4.3	4.2	19.8	3.3	2.8	2.3	1.6	2.6	2.9	3.3	4.0	5.1	4.4	5.7	4.7	5.2	3.0	4.9

na = not applicable nd = no data

TABLE 2-9a

Summary of Extraction and Liquid Chromatography

Wellname: TILANA 1

Date of Job: FEBRUARY 1987

A. Concentrations of Extracted Material

Depth(m)	Weight of Rock Extd. (grams)	Total Extract (ppm)	Loss on Column (ppm)	-----Hydrocarbons-----			-----Nonhydrocarbons-----		
				Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphaltenes (ppm)	NonHC Total (ppm)
2800.9	22.0	1618.2	340.9	422.7	268.2	690.9	586.4	nd	586.4

TABLE 2-9a

Summary of Extraction and Liquid Chromatography

Wellname: TILANA 1

Date of Job: FEBRUARY 1987

B. Compositional Data

Depth(m)	-----Hydrocarbons-----			-----Nonhydrocarbons-----			<u>EOM(mg)</u>	<u>SAT(mg)</u>	<u>SAT</u>	<u>ASPH</u>	<u>HC</u>
	ZSAT.	ZAROM.	ZHC's	ZNSO's	ZASPH.	ZNon HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
2800.9	33.1	21.0	54.1	45.9	nd	45.9	76.7	20.0	1.58	nd	1.2

na = not applicable nd = no data

TABLE 2-9b

Summary of Gas Chromatography Data

Wellname: TILANA 1

Date of Job:FEBRUARY 1987

A. Alkane Compositional Data

Depth(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
2800.9	8.44	7.28	1.00	1.21	1.22	.32

TABLE 2-9b

Summary of Gas Chromatography Data

Wellname: TILANA 1

Date of Job:FEBRUARY 1987

B. n-Alkane Distributions

DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
2800.9	1.2	1.9	2.6	2.2	2.2	2.5	18.1	2.1	2.1	1.7	1.5	2.4	2.6	4.1	4.5	5.9	6.1	8.5	6.6	8.9	6.3	5.8

na = not applicable nd = no data

TABLE 3-1

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 1, 6405ft, Core 12

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.17
2.	C ₃₀ hopane/C ₃₀ moretane	191	2.90
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.37
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.28
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.18
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.59
7.	C ₂₇ /C ₂₉ diasteranes	259	0.45
8.	C ₂₇ /C ₂₉ steranes	217	0.36
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.34
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.05
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	1.48
13.	Rearranged drimanes/normal drimanes	123	0.12
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	1.53
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	4.42

n.d. = not detectable

TABLE 3-2

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 1, 6930ft, Core 13

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.16
2.	C ₃₀ hopane/C ₃₀ moretane	191	2.07
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.96
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.31
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.18
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.70
7.	C ₂₇ /C ₂₉ diasteranes	259	0.53
8.	C ₂₇ /C ₂₉ steranes	217	0.34
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.22
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.56
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.89
13.	Rearranged drimanes/normal drimanes	123	0.24
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	1.84
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	7.38

n.d. = not detectable

TABLE 3-3

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 2, Core 5, 4135ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.01
2.	C ₃₀ hopane/C ₃₀ moretane	191	3.44
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.23
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.34
5.	C ₂₉ 20S $\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha$ sterane	217	0.36
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.43
7.	C ₂₇ /C ₂₉ diasteranes	259	0.57
8.	C ₂₇ /C ₂₉ steranes	217	0.43
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.20
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.54
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.42
13.	Rearranged drimanes/normal drimanes	123	0.25
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	3.73
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	7.86

n.d. = not detectable

TABLE 3-4

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 2, 4740ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.24
2.	C ₃₀ hopane/C ₃₀ moretane	191	5.36
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.85
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.47
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.33
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.54
7.	C ₂₇ /C ₂₉ diasteranes	259	1.36
8.	C ₂₇ /C ₂₉ steranes	217	0.98
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.52
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.92
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.78
13.	Rearranged drimanes/normal drimanes	123	0.56
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	2.58
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	17.41

n.d. = not detectable

TABLE 3-5

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 2, 5068ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.29
2.	C ₃₀ hopane/C ₃₀ moretane	191	3.64
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.28
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.28
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.24
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.41
7.	C ₂₇ /C ₂₉ diasteranes	259	0.82
8.	C ₂₇ /C ₂₉ steranes	217	0.51
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	1.01
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	1.79
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.45
13.	Rearranged drimanes/normal drimanes	123	0.26
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	3.31
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	6.94

n.d. = not detectable

TABLE 3-6

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 2, 5509ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.34
2.	C ₃₀ hopane/C ₃₀ moretane	191	5.09
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.87
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.49
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.06
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.39
7.	C ₂₇ /C ₂₉ diasteranes	259	0.23
8.	C ₂₇ /C ₂₉ steranes	217	0.21
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.45
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	3.94
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.49
13.	Rearranged drimanes/normal drimanes	123	0.30
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.32
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	8.91

n.d. = not detectable

TABLE 3-7

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 3, 5023ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.08
2.	C ₃₀ hopane/C ₃₀ moretane	191	2.27
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.43
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.22
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.12
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.47
7.	C ₂₇ /C ₂₉ diasteranes	259	0.62
8.	C ₂₇ /C ₂₉ steranes	217	0.68
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.33
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	4.55
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.42
13.	Rearranged drimanes/normal drimanes	123	0.33
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	2.47
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	14.39

n.d. = not detectable

TABLE 3-8

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: BASS 3, 7434ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.20
2.	C ₃₀ hopane/C ₃₀ moretane	191	6.15
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.72
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	n.d.
5.	C ₂₉ 20S $\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha$ sterane	217	1.38
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.56
7.	C ₂₇ /C ₂₉ diasteranes	259	n.d.
8.	C ₂₇ /C ₂₉ steranes	217	n.d.
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	1.42
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	1.87
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.52
13.	Rearranged drimanes/normal drimanes	123	0.18
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	2.34
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	3.75

n.d. = not detectable

TABLE 3-9

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: DONDU 1, 7679' 10"

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.16
2.	C ₃₀ hopane/C ₃₀ moretane	191	5.34
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.42
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	1.48
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.52
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.52
7.	C ₂₇ /C ₂₉ diasteranes	259	0.11
8.	C ₂₇ /C ₂₉ steranes	217	0.42
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	1.31
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	5.94
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.31
13.	Rearranged drimanes/normal drimanes	123	0.17
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	1.17
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	3.28

n.d. = not detectable

TABLE 3-10

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: DURROON 1, 5551ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.70
2.	C ₃₀ hopane/C ₃₀ moretane	191	23.72
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.34
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.84
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.02
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.34
7.	C ₂₇ /C ₂₉ diasteranes	259	0.11
8.	C ₂₇ /C ₂₉ steranes	217	0.11
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.17
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	1.81
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.77
13.	Rearranged drimanes/normal drimanes	123	0.39
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.31
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	24.27

n.d. = not detectable

TABLE 3-11

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: DURROON 1, 8424ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.09
2.	C ₃₀ hopane/C ₃₀ moretane	191	1.87
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.18
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.77
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.68
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.30
7.	C ₂₇ /C ₂₉ diasteranes	259	0.74
8.	C ₂₇ /C ₂₉ steranes	217	0.83
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.33
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	4.32
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.29
13.	Rearranged drimanes/normal drimanes	123	0.16
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.85
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	4.56

n.d. = not detectable

TABLE 3-12

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: DURROON 1, 9915ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.12
2.	C ₃₀ hopane/C ₃₀ moretane	191	2.50
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.31
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	2.57
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.86
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.32
7.	C ₂₇ /C ₂₉ diasteranes	259	n.d.
8.	C ₂₇ /C ₂₉ steranes	217	n.d.
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.29
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	6.38
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.25
13.	Rearranged drimanes/normal drimanes	123	0.16
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.37
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	3.11

n.d. = not detectable

TABLE 3-13

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: KONKON 1, 4413ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.03
2.	C ₃₀ hopane/C ₃₀ moretane	191	2.04
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.07
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.04
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.06
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.36
7.	C ₂₇ /C ₂₉ diasteranes	259	0.20
8.	C ₂₇ /C ₂₉ steranes	217	0.24
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.22
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	3.67
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.58
13.	Rearranged drimanes/normal drimanes	123	0.35
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.52
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	14.95

n.d. = not detectable

TABLE 3-14

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: PELICAN 1, 5851ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.35
2.	C ₃₀ hopane/C ₃₀ moretane	191	3.17
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	0.55
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	0.43
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.29
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.54
7.	C ₂₇ /C ₂₉ diasteranes	259	1.25
8.	C ₂₇ /C ₂₉ steranes	217	0.83
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.81
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.31
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.54
13.	Rearranged drimanes/normal drimanes	123	0.13
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	2.87
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	12.74

n.d. = not detectable

TABLE 3-15

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: PELICAN 1, 7122ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.01
2.	C ₃₀ hopane/C ₃₀ moretane	191	2.05
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.50
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	1.25
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.23
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.20
7.	C ₂₇ /C ₂₉ diasteranes	259	0.36
8.	C ₂₇ /C ₂₉ steranes	217	0.25
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.36
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	3.47
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.43
13.	Rearranged drimanes/normal drimanes	123	0.10
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	1.38
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	3.87

n.d. = not detectable

TABLE 3-16

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: PELICAN 1, 9269ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.71
2.	C ₃₀ hopane/C ₃₀ moretane	191	10.34
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.41
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	1.27
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	1.06
6.	$\frac{C_{29} \alpha\beta\beta \text{ steranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	0.48
7.	C ₂₇ /C ₂₉ diasteranes	259	0.16
8.	C ₂₇ /C ₂₉ steranes	217	0.57
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \alpha\alpha\alpha \text{ steranes} + C_{29} \alpha\beta\beta \text{ steranes}}$	217	1.49
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	8.07
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.48
13.	Rearranged drimanes/normal drimanes	123	0.35
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.31
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	1.69

n.d. = not detectable

TABLE 3-17

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: PELICAN 3, 9386.6ft

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.07
2.	C ₃₀ hopane/C ₃₀ moretane	191	5.62
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.38
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	1.44
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.75
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.41
7.	C ₂₇ /C ₂₉ diasteranes	259	0.14
8.	C ₂₇ /C ₂₉ steranes	217	0.35
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.73
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.37
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.42
13.	Rearranged drimanes/normal drimanes	123	0.17
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	1.36
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	3.67

n.d. = not detectable

TABLE 3-18

SELECTED PARAMETERS FROM GC/MS ANALYSIS

Sample: TILANA 1, 2800.9m

	<u>Parameter</u>	<u>Ion(s)</u>	<u>Value</u>
1.	18 α (H)-hopane/17 α (H)-hopane (Ts/Tm)	191	0.19
2.	C ₃₀ hopane/C ₃₀ moretane	191	5.27
3.	C ₃₁ 22S hopane/C ₃₁ 22R hopane	191	1.56
4.	C ₃₂ 22S hopane/C ₃₂ 22R hopane	191	1.54
5.	C ₂₉ 20S $\alpha\alpha\alpha$ sterane/C ₂₉ 20R $\alpha\alpha\alpha$ sterane	217	0.95
6.	$\frac{C_{29} \text{ } \alpha\beta\beta \text{ steranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	0.46
7.	C ₂₇ /C ₂₉ diasteranes	259	0.09
8.	C ₂₇ /C ₂₉ steranes	217	0.31
9.	18 α (H)-oleanane/C ₃₀ hopane	191	n.d.
10.	$\frac{C_{29} \text{ diasteranes}}{C_{29} \text{ } \alpha\alpha\alpha \text{ steranes} + C_{29} \text{ } \alpha\beta\beta \text{ steranes}}$	217	1.27
11.	$\frac{C_{30} \text{ (hopane + moretane)}}{C_{29} \text{ (steranes + diasteranes)}}$	191/217	2.19
12.	C ₁₅ drimane/C ₁₆ homodrimane	123	0.39
13.	Rearranged drimanes/normal drimanes	123	0.17
14.	C ₁₅ alkyl cyclohexane/C ₃₀ hopane	83/191	0.55
15.	C ₁₅ alkyl cyclohexane/C ₁₆ homodrimane	83/123	3.32

n.d. = not detectable

TABLE 4-1

AROMATIC FRACTION GC/MS DATA

Sample: BASS 1, 6405ft, Core 12

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>	
			(area counts)	(%)		
C ₂₀	Triaromatic Sterane	(A)	231	423	8.41	*
C ₂₁	Triaromatic Sterane		231	105	2.09	*
C ₂₆	S Triaromatic Sterane	(B)	231	62	1.23	*
C ₂₆	R Triaromatic Sterane		231	105	2.09	
C ₂₇	S Triaromatic Sterane		231	105	2.09	
C ₂₇	R Triaromatic Sterane	(C)	231	62	1.23	*
C ₂₈	S Triaromatic Sterane	(D)	231	119	2.37	*
C ₂₈	R Triaromatic Sterane	(E)	231	140	2.78	*
C ₂₁	Monoaromatic Sterane		253	97	1.93	*
C ₂₂	Monoaromatic Sterane		253	nd	nd	
C ₂₇	S Monoaromatic Sterane		253	186	3.70	*
C ₂₇	R Monoaromatic Sterane		253	421	8.37	*
C ₂₈	S Monoaromatic Sterane		253	120	2.39	*
C ₂₈	R Monoaromatic Sterane		253	nd	nd	*
C ₂₉	S Monoaromatic Sterane		253	850	16.91	*
C ₂₉	R Monoaromatic Sterane	(F)	253	2233	44.41	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.06
A/(A+E)	0.75
B/D	0.52
C/E	0.44

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-2

AROMATIC FRACTION GC/MS DATA

Sample: BASS 1, 6930ft, Core 13

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	439	4.72	*
C ₂₁	Triaromatic Sterane	231	61	0.66	*
C ₂₆	S Triaromatic Sterane (B)	231	nd	nd	
C ₂₆	R Triaromatic Sterane	231	166	1.79	
C ₂₇	S Triaromatic Sterane	231	167	1.79	
C ₂₇	R Triaromatic Sterane (C)	231	177	1.90	*
C ₂₈	S Triaromatic Sterane (D)	231	260	2.80	*
C ₂₈	R Triaromatic Sterane (E)	231	195	2.10	*
C ₂₁	Monoaromatic Sterane	253	442	4.76	*
C ₂₂	Monoaromatic Sterane	253	188	2.02	*
C ₂₇	S Monoaromatic Sterane	253	211	2.27	*
C ₂₇	R Monoaromatic Sterane	253	547	5.89	*
C ₂₈	S Monoaromatic Sterane	253	827	8.90	*
C ₂₈	R Monoaromatic Sterane	253	939	10.11	*
C ₂₉	S Monoaromatic Sterane	253	1735	18.67	*
C ₂₉	R Monoaromatic Sterane (F)	253	2938	31.62	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.06
A/(A+E)	0.69
B/D	nd
C/E	0.91

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-3

AROMATIC FRACTION GC/MS DATA

Sample: BASS 2, 4135ft, Core 5

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	321	1.47	*
C ₂₁	Triaromatic Sterane	231	72	0.33	*
C ₂₆	S Triaromatic Sterane (B)	231	62	0.28	*
C ₂₆	R Triaromatic Sterane	231	243	1.11	
C ₂₇	S Triaromatic Sterane	231	243	1.11	
C ₂₇	R Triaromatic Sterane (C)	231	364	1.66	*
C ₂₈	S Triaromatic Sterane (D)	231	300	1.37	*
C ₂₈	R Triaromatic Sterane (E)	231	188	0.86	*
C ₂₁	Monoaromatic Sterane	253	540	2.47	*
C ₂₂	Monoaromatic Sterane	253	341	1.56	*
C ₂₇	S Monoaromatic Sterane	253	382	1.75	*
C ₂₇	R Monoaromatic Sterane	253	585	2.67	*
C ₂₈	S Monoaromatic Sterane	253	2457	11.23	*
C ₂₈	R Monoaromatic Sterane	253	2044	9.34	*
C ₂₉	S Monoaromatic Sterane	253	6849	31.30	*
C ₂₉	R Monoaromatic Sterane (F)	253	6892	31.49	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.03
A/(A+E)	0.63
B/D	0.21
C/E	1.94

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-4

AROMATIC FRACTION GC/MS DATA

Sample: BASS 2, 4740ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	551	4.04	*
C ₂₁	Triaromatic Sterane	231	206	1.51	*
C ₂₆	S Triaromatic Sterane (B)	231	154	1.13	*
C ₂₆	R Triaromatic Sterane	231	188	1.38	
C ₂₇	S Triaromatic Sterane	231	189	1.39	
C ₂₇	R Triaromatic Sterane (C)	231	309	2.27	*
C ₂₈	S Triaromatic Sterane (D)	231	352	2.58	*
C ₂₈	R Triaromatic Sterane (E)	231	235	1.72	*
C ₂₁	Monoaromatic Sterane	253	338	2.48	*
C ₂₂	Monoaromatic Sterane	253	257	1.89	*
C ₂₇	S Monoaromatic Sterane	253	941	6.91	*
C ₂₇	R Monoaromatic Sterane	253	941	6.91	*
C ₂₈	S Monoaromatic Sterane	253	1089	7.99	*
C ₂₈	R Monoaromatic Sterane	253	2100	15.41	*
C ₂₉	S Monoaromatic Sterane	253	2193	16.10	*
C ₂₉	R Monoaromatic Sterane (F)	253	3582	26.29	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.06
A/(A+E)	0.70
B/D	0.44
C/E	1.31

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-5

AROMATIC FRACTION GC/MS DATA

Sample: BASS 2, 5068ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	150	4.68	*
C ₂₁	Triaromatic Sterane	231	61	1.91	*
C ₂₆	S Triaromatic Sterane (B)	231	14	0.44	*
C ₂₆	R Triaromatic Sterane	231	63	1.98	
C ₂₇	S Triaromatic Sterane	231	64	1.98	
C ₂₇	R Triaromatic Sterane (C)	231	66	2.06	*
C ₂₈	S Triaromatic Sterane (D)	231	104	3.25	*
C ₂₈	R Triaromatic Sterane (E)	231	52	1.62	*
C ₂₁	Monoaromatic Sterane	253	107	3.34	*
C ₂₂	Monoaromatic Sterane	253	65	2.03	*
C ₂₇	S Monoaromatic Sterane	253	151	4.72	*
C ₂₇	R Monoaromatic Sterane	253	239	7.46	*
C ₂₈	S Monoaromatic Sterane	253	240	7.50	*
C ₂₈	R Monoaromatic Sterane	253	596	18.61	*
C ₂₉	S Monoaromatic Sterane	253	521	16.27	*
C ₂₉	R Monoaromatic Sterane (F)	253	709	22.14	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.07
A/(A+E)	0.74
B/D	0.13
C/E	1.27

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-6.

AROMATIC FRACTION GC/MS DATA

Sample: BASS 2, 5509ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>	
			(area counts)	(%)		
C ₂₀	Triaromatic Sterane	(A)	231	67	1.03	*
C ₂₁	Triaromatic Sterane		231	66	1.02	*
C ₂₆	S Triaromatic Sterane	(B)	231	136	2.10	*
C ₂₆	R Triaromatic Sterane		231	301	4.65	
C ₂₇	S Triaromatic Sterane		231	302	4.65	
C ₂₇	R Triaromatic Sterane	(C)	231	262	4.04	*
C ₂₈	S Triaromatic Sterane	(D)	231	683	10.53	*
C ₂₈	R Triaromatic Sterane	(E)	231	529	8.16	*
C ₂₁	Monoaromatic Sterane		253	197	3.04	*
C ₂₂	Monoaromatic Sterane		253	77	1.19	*
C ₂₇	S Monoaromatic Sterane		253	159	2.45	*
C ₂₇	R Monoaromatic Sterane		253	237	3.65	*
C ₂₈	S Monoaromatic Sterane		253	344	5.30	*
C ₂₈	R Monoaromatic Sterane		253	600	9.25	*
C ₂₉	S Monoaromatic Sterane		253	1270	19.58	*
C ₂₉	R Monoaromatic Sterane	(F)	253	1256	19.36	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.30
A/(A+E)	0.11
B/D	0.20
C/E	0.50

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-7

AROMATIC FRACTION GC/MS DATA

Sample: BASS 3, 5023ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>	
			(area counts)	(%)		
C ₂₀	Triaromatic Sterane	(A)	231	273	1.44	*
C ₂₁	Triaromatic Sterane		231	295	1.55	*
C ₂₆	S Triaromatic Sterane	(B)	231	241	1.27	*
C ₂₆	R Triaromatic Sterane		231	1086	5.72	
C ₂₇	S Triaromatic Sterane		231	1086	5.72	
C ₂₇	R Triaromatic Sterane	(C)	231	1190	6.26	*
C ₂₈	S Triaromatic Sterane	(D)	231	1316	6.93	*
C ₂₈	R Triaromatic Sterane	(E)	231	965	5.08	*
C ₂₁	Monoaromatic Sterane		253	598	3.15	*
C ₂₂	Monoaromatic Sterane		253	581	3.06	*
C ₂₇	S Monoaromatic Sterane		253	522	2.75	*
C ₂₇	R Monoaromatic Sterane		253	694	3.65	*
C ₂₈	S Monoaromatic Sterane		253	2624	13.81	*
C ₂₈	R Monoaromatic Sterane		253	1685	8.87	*
C ₂₉	S Monoaromatic Sterane		253	2405	12.66	*
C ₂₉	R Monoaromatic Sterane	(F)	253	3440	18.10	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.22
A/(A+E)	0.22
B/D	0.18
C/E	1.23

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-8

AROMATIC FRACTION GC/MS DATA

Sample: BASS 3, 7434ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>	
			(area counts)	(%)		
C ₂₀	Triaromatic Sterane	(A)	231	293	2.90	*
C ₂₁	Triaromatic Sterane		231	286	2.83	*
C ₂₆	S Triaromatic Sterane	(B)	231	346	3.42	*
C ₂₆	R Triaromatic Sterane		231	641	6.34	
C ₂₇	S Triaromatic Sterane		231	641	6.34	
C ₂₇	R Triaromatic Sterane	(C)	231	764	7.55	*
C ₂₈	S Triaromatic Sterane	(D)	231	2230	22.05	*
C ₂₈	R Triaromatic Sterane	(E)	231	1807	17.86	*
C ₂₁	Monoaromatic Sterane		253	171	1.69	*
C ₂₂	Monoaromatic Sterane		253	10	0.10	*
C ₂₇	S Monoaromatic Sterane		253	205	2.03	*
C ₂₇	R Monoaromatic Sterane		253	131	1.30	*
C ₂₈	S Monoaromatic Sterane		253	247	2.44	*
C ₂₈	R Monoaromatic Sterane		253	510	5.04	*
C ₂₉	S Monoaromatic Sterane		253	603	5.96	*
C ₂₉	R Monoaromatic Sterane	(F)	253	1230	12.16	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.59
A/(A+E)	0.14
B/D	0.16
C/E	0.42

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-9

AROMATIC FRACTION GC/MS DATA

Sample: DONDU 1, 7679ft 10"

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>	
			(area counts)	(%)		
C ₂₀	Triaromatic Sterane	(A)	231	179	3.37	*
C ₂₁	Triaromatic Sterane		231	250	4.70	*
C ₂₆	S Triaromatic Sterane	(B)	231	206	3.87	*
C ₂₆	R Triaromatic Sterane		231	291	5.47	
C ₂₇	S Triaromatic Sterane		231	292	5.49	
C ₂₇	R Triaromatic Sterane	(C)	231	252	4.74	*
C ₂₈	S Triaromatic Sterane	(D)	231	950	17.87	*
C ₂₈	R Triaromatic Sterane	(E)	231	636	11.96	*
C ₂₁	Monoaromatic Sterane		253	54	1.02	*
C ₂₂	Monoaromatic Sterane		253	nd	nd	
C ₂₇	S Monoaromatic Sterane		253	68	1.28	*
C ₂₇	R Monoaromatic Sterane		253	120	2.26	*
C ₂₈	S Monoaromatic Sterane		253	269	5.06	*
C ₂₈	R Monoaromatic Sterane		253	260	4.89	*
C ₂₉	S Monoaromatic Sterane		253	540	10.16	*
C ₂₉	R Monoaromatic Sterane	(F)	253	950	17.87	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.40
A/(A+E)	0.22
B/D	0.22
C/E	0.40

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-10

AROMATIC FRACTION GC/MS DATA

Sample: DURROON 1, 5551ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	482	10.07	*
C ₂₁	Triaromatic Sterane	231	69	1.44	*
C ₂₆	S Triaromatic Sterane (B)	231	nd	nd	
C ₂₆	R Triaromatic Sterane	231	nd	nd	
C ₂₇	S Triaromatic Sterane	231	nd	nd	
C ₂₇	R Triaromatic Sterane (C)	231	nd	nd	
C ₂₈	S Triaromatic Sterane (D)	231	nd	nd	
C ₂₈	R Triaromatic Sterane (E)	231	nd	nd	
C ₂₁	Monoaromatic Sterane	253	355	7.42	*
C ₂₂	Monoaromatic Sterane	253	229	4.78	*
C ₂₇	S Monoaromatic Sterane	253	nd	nd	
C ₂₇	R Monoaromatic Sterane	253	nd	nd	
C ₂₈	S Monoaromatic Sterane	253	nd	nd	
C ₂₈	R Monoaromatic Sterane	253	nd	nd	
C ₂₉	S Monoaromatic Sterane	253	830	17.34	*
C ₂₉	R Monoaromatic Sterane (F)	253	2822	58.95	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	nd
A/(A+E)	1.00
B/D	nd
C/E	nd

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-11

AROMATIC FRACTION GC/MS DATA

Sample: DURROON 1, 8424ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane	(A)	231	nd	nd
C ₂₁	Triaromatic Sterane		231	nd	nd
C ₂₆	S Triaromatic Sterane	(B)	231	nd	nd
C ₂₆	R Triaromatic Sterane		231	49	4.66
C ₂₇	S Triaromatic Sterane		231	49	4.66
C ₂₇	R Triaromatic Sterane	(C)	231	62	5.89 *
C ₂₈	S Triaromatic Sterane	(D)	231	84	7.98 *
C ₂₈	R Triaromatic Sterane	(E)	231	nd	nd
C ₂₁	Monoaromatic Sterane		253	nd	nd
C ₂₂	Monoaromatic Sterane		253	nd	nd
C ₂₇	S Monoaromatic Sterane		253	nd	nd
C ₂₇	R Monoaromatic Sterane		253	nd	nd
C ₂₈	S Monoaromatic Sterane		253	nd	nd
C ₂₈	R Monoaromatic Sterane		253	nd	nd
C ₂₉	S Monoaromatic Sterane		253	nd	nd
C ₂₉	R Monoaromatic Sterane	(F)	253	808	76.81 *

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	nd
A/(A+E)	nd
B/D	nd
C/E	nd

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-12

AROMATIC FRACTION GC/MS DATA

Sample: DURROON 1, 9915ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	69	2.01	*
C ₂₁	Triaromatic Sterane	231	41	1.20	*
C ₂₆	S Triaromatic Sterane (B)	231	nd	nd	
C ₂₆	R Triaromatic Sterane	231	28	0.82	
C ₂₇	S Triaromatic Sterane	231	28	0.82	
C ₂₇	R Triaromatic Sterane (C)	231	92	2.68	*
C ₂₈	S Triaromatic Sterane (D)	231	141	4.11	*
C ₂₈	R Triaromatic Sterane (E)	231	nd	nd	
C ₂₁	Monoaromatic Sterane	253	nd	nd	
C ₂₂	Monoaromatic Sterane	253	nd	nd	
C ₂₇	S Monoaromatic Sterane	253	244	7.12	*
C ₂₇	R Monoaromatic Sterane	253	630	18.38	*
C ₂₈	S Monoaromatic Sterane	253	98	2.86	*
C ₂₈	R Monoaromatic Sterane	253	nc	nc	
C ₂₉	S Monoaromatic Sterane	253	238	6.94	*
C ₂₉	R Monoaromatic Sterane (F)	253	1818	53.05	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	nd
A/(A+E)	1.00
B/D	nd
C/E	nd

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-13

AROMATIC FRACTION GC/MS DATA

Sample: KONKON 1, 4413ft

COMPOUND ABUNDANCE

<u>Compound</u>	<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
		(area counts)	(%)	
C ₂₀ Triaromatic Sterane (A)	231	423	0.76	*
C ₂₁ Triaromatic Sterane	231	25	0.04	*
C ₂₆ S Triaromatic Sterane (B)	231	39	0.07	*
C ₂₆ R Triaromatic Sterane	231	241	0.43	
C ₂₇ S Triaromatic Sterane	231	241	0.43	
C ₂₇ R Triaromatic Sterane (C)	231	53	0.10	*
C ₂₈ S Triaromatic Sterane (D)	231	112	0.20	*
C ₂₈ R Triaromatic Sterane (E)	231	145	0.26	*
C ₂₁ Monoaromatic Sterane	253	1636	2.94	*
C ₂₂ Monoaromatic Sterane	253	711	1.28	*
C ₂₇ S Monoaromatic Sterane	253	809	1.46	*
C ₂₇ R Monoaromatic Sterane	253	775	1.39	*
C ₂₈ S Monoaromatic Sterane	253	3433	6.18	*
C ₂₈ R Monoaromatic Sterane	253	1814	3.26	*
C ₂₉ S Monoaromatic Sterane	253	23443	42.17	*
C ₂₉ R Monoaromatic Sterane (F)	253	21695	39.02	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.01
A/(A+E)	0.74
B/D	0.35
C/E	0.37

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-14

AROMATIC FRACTION GC/MS DATA

Sample: PELICAN 1, 5851ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	1242	6.53	*
C ₂₁	Triaromatic Sterane	231	445	2.34	*
C ₂₆	S Triaromatic Sterane (B)	231	440	2.31	*
C ₂₆	R Triaromatic Sterane	231	621	3.26	
C ₂₇	S Triaromatic Sterane	231	621	3.26	
C ₂₇	R Triaromatic Sterane (C)	231	732	3.85	*
C ₂₈	S Triaromatic Sterane (D)	231	623	3.27	*
C ₂₈	R Triaromatic Sterane (E)	231	445	2.34	*
C ₂₁	Monoaromatic Sterane	253	1660	8.73	*
C ₂₂	Monoaromatic Sterane	253	654	3.44	*
C ₂₇	S Monoaromatic Sterane	253	516	2.71	*
C ₂₇	R Monoaromatic Sterane	253	1184	6.22	*
C ₂₈	S Monoaromatic Sterane	253	1591	8.36	*
C ₂₈	R Monoaromatic Sterane	253	1815	9.54	*
C ₂₉	S Monoaromatic Sterane	253	2497	13.12	*
C ₂₉	R Monoaromatic Sterane (F)	253	3939	20.70	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.10
A/(A+E)	0.74
B/D	0.71
C/E	1.64

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-15

AROMATIC FRACTION GC/MS DATASample: PELICAN 1, 7122ftCOMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	1132	5.77	*
C ₂₁	Triaromatic Sterane	231	338	1.72	*
C ₂₆	S Triaromatic Sterane (B)	231	416	2.12	*
C ₂₆	R Triaromatic Sterane	231	577	2.94	
C ₂₇	S Triaromatic Sterane	231	578	2.95	
C ₂₇	R Triaromatic Sterane (C)	231	790	4.03	*
C ₂₈	S Triaromatic Sterane (D)	231	2494	12.71	*
C ₂₈	R Triaromatic Sterane (E)	231	1868	9.52	*
C ₂₁	Monoaromatic Sterane	253	1261	6.43	*
C ₂₂	Monoaromatic Sterane	253	300	1.53	*
C ₂₇	S Monoaromatic Sterane	253	344	1.75	*
C ₂₇	R Monoaromatic Sterane	253	389	1.98	*
C ₂₈	S Monoaromatic Sterane	253	975	4.97	*
C ₂₈	R Monoaromatic Sterane	253	960	4.89	*
C ₂₉	S Monoaromatic Sterane	253	4107	20.93	*
C ₂₉	R Monoaromatic Sterane (F)	253	3090	15.75	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.38
A/(A+E)	0.38
B/D	0.17
C/E	0.42

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-16

AROMATIC FRACTION GC/MS DATA

Sample: PELICAN 1, 9269ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀ Triaromatic Sterane	(A)	231	240	6.87	*
C ₂₁ Triaromatic Sterane		231	104	2.98	*
C ₂₆ S Triaromatic Sterane	(B)	231	127	3.64	*
C ₂₆ R Triaromatic Sterane		231	181	5.18	
C ₂₇ S Triaromatic Sterane		231	181	5.18	
C ₂₇ R Triaromatic Sterane	(C)	231	125	3.58	*
C ₂₈ S Triaromatic Sterane	(D)	231	671	19.21	*
C ₂₈ R Triaromatic Sterane	(E)	231	558	15.97	*
C ₂₁ Monoaromatic Sterane		253	nd	nd	
C ₂₂ Monoaromatic Sterane		253	nd	nd	
C ₂₇ S Monoaromatic Sterane		253	206	5.90	*
C ₂₇ R Monoaromatic Sterane		253	78	2.23	*
C ₂₈ S Monoaromatic Sterane		253	110	3.15	*
C ₂₈ R Monoaromatic Sterane		253	nc	nc	
C ₂₉ S Monoaromatic Sterane		253	421	12.05	*
C ₂₉ R Monoaromatic Sterane	(F)	253	491	14.06	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.53
A/(A+E)	0.30
B/D	0.19
C/E	0.22

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-17

AROMATIC FRACTION GC/MS DATA

Sample: PELICAN 3, 9386.6ft

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀ Triaromatic Sterane	(A)	231	316	6.57	*
C ₂₁ Triaromatic Sterane		231	125	2.60	*
C ₂₆ S Triaromatic Sterane	(B)	231	125	2.60	*
C ₂₆ R Triaromatic Sterane		231	259	5.38	
C ₂₇ S Triaromatic Sterane		231	259	5.38	
C ₂₇ R Triaromatic Sterane	(C)	231	404	8.39	*
C ₂₈ S Triaromatic Sterane	(D)	231	847	17.60	**
C ₂₈ R Triaromatic Sterane	(E)	231	647	13.44	*
C ₂₁ Monoaromatic Sterane		253	nd	nd	
C ₂₂ Monoaromatic Sterane		253	nd	nd	
C ₂₇ S Monoaromatic Sterane		253	270	5.61	*
C ₂₇ R Monoaromatic Sterane		253	151	3.14	*
C ₂₈ S Monoaromatic Sterane		253	149	3.10	*
C ₂₈ R Monoaromatic Sterane		253	nc	nc	
C ₂₉ S Monoaromatic Sterane		253	nc	nc	
C ₂₉ R Monoaromatic Sterane	(F)	253	1261	26.20	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.34
A/(A+E)	0.33
B/D	0.15
C/E	0.62

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

TABLE 4-18

AROMATIC FRACTION GC/MS DATA

Sample: TILANA 1, 2800.9m

COMPOUND ABUNDANCE

<u>Compound</u>		<u>Ion Used</u>	<u>Relative Abundance</u>		<u>Confirmed</u>
			(area counts)	(%)	
C ₂₀	Triaromatic Sterane (A)	231	98	0.91	*
C ₂₁	Triaromatic Sterane	231	405	3.77	*
C ₂₆	S Triaromatic Sterane (B)	231	212	1.97	*
C ₂₆	R Triaromatic Sterane	231	353	3.28	
C ₂₇	S Triaromatic Sterane	231	354	3.29	
C ₂₇	R Triaromatic Sterane (C)	231	295	2.74	*
C ₂₈	S Triaromatic Sterane (D)	231	1079	10.04	*
C ₂₈	R Triaromatic Sterane (E)	231	758	7.05	*
C ₂₁	Monoaromatic Sterane	253	319	2.97	*
C ₂₂	Monoaromatic Sterane	253	147	1.37	*
C ₂₇	S Monoaromatic Sterane	253	308	2.87	*
C ₂₇	R Monoaromatic Sterane	253	662	6.16	*
C ₂₈	S Monoaromatic Sterane	253	350	3.26	*
C ₂₈	R Monoaromatic Sterane	253	549	5.11	*
C ₂₉	S Monoaromatic Sterane	253	1440	13.40	*
C ₂₉	R Monoaromatic Sterane (F)	253	3418	31.80	*

CALCULATED VALUES

<u>Parameter</u>	<u>Value</u>
E/(E+F)	0.18
A/(A+E)	0.11
B/D	0.20
C/E	0.39

NOTES: Confirmed samples (*) are those which have been reliably identified and integrated.

% = % of all compounds integrated.

nd = no data.

THEORY AND METHODS

This section details a series of geochemical methods which are commonly used in our laboratory, including those used to obtain the data presented in this report. Where applicable, the discussion is accompanied by a summary of the general theory used to interpret the data generated by each method.

1. SEDIMENTARY GAS ANALYSIS

a) Headspace Analysis

Headspace analysis is carried out using sealed containers (usually tinned cans) of wet cuttings. The containers are approximately three quarters filled with the cuttings and water to leave an appreciable headspace into which volatile hydrocarbons contained in the cuttings diffuse.

After covering about 1cm² of the container lid with silicone and allowing the silicone to dry, the procedure involves placing a small hole in the lid through the silicone, then sampling an aliquot of the headspace gas with a gas injection syringe, and finally gas chromatographing this sample of gas under the following conditions: instrument = Shimadzu GC-8APF; column = 6' x 1/8" Chromosorb 102; column temperature = 110 Deg. C; carrier gas = nitrogen at 23mls/min; injector temperature = 120 Deg. C.; analysis cycle = C1-C4 components are flushed from the column in the forward direction and then the C5-C7 compounds are removed from the column by backflushing.

The integrated areas of peaks representing each of the C1-C7 components of the headspace gas are compared to the areas of corresponding components of a standard gas of known composition. The calculated amount of each component in the sample gas is adjusted for the total headspace volume and reported as ppm (parts of gas per million parts of sediment by volume).

Data from headspace analysis is commonly used to identify the zone of oil generation by plotting gas wetness (C2-C4/C1-C4) expressed as a % against sediment burial depth. Gas containing appreciable quantities of C2-C4 components, termed wet gas (Fuex, 1977), is generally considered to be gas associated with oil generation. In addition, the ratio of isomeric butanes can sometimes be used for assessment of sediment maturity (Alexander et. al., 1981). The amount of gas in sediments can be used to identify zones of significant gas generation and out-of-place gas (LeTran et. al., 1975).

b) Cuttings Gas Analysis

This analysis is the same as Headspace Analysis with the exception that instead of analysing the gas in the container headspace, a known volume of the wet cuttings are transferred to the blender bowl of a Kenwood electronic blender with the lid modified to incorporate a septum, water at 75 Deg. C is added to leave a headspace of 160ml, and the mixture is blended at maximum speed for 2 minutes. Following a 2 minute settling period 1ml of the blending bowl headspace gas is analysed as described in section 1a.

It is recommended that for the most meaningful gas data both headspace and cuttings gas analysis are carried out. In such cases we provide tabulations of the headspace, gas, and combined headspace/cuttings gas data. Normally, the combined data is used for plotting purposes.

2. SAMPLE PREPARATION

a) Cuttings

Cuttings samples are inspected by our qualified geological staff and then water washed according to the drilling mud content and lithology. In special cases (e.g. diesel contamination) it is necessary to lightly solvent wash samples. After washing, the samples are air dried, either sieved or picked free of cavings, and crushed to 0.1mm using a ring pulveriser.

b) Sidewall Cores

Sidewall samples are freed of mud cake and any other visible contaminants, and are also inspected for lithologic homogeneity. For homogeneous samples, the minimum amount of material required for the requested analyses is air dried and handcrushed to 0.1mm. For non-homogeneous samples, the whole sample is air dried and handcrushed to 0.1mm.

c) Conventional Core and Outcrop Samples

These sample types are firstly inspected for visible contaminants, and where applicable, are freed of these contaminants to the best of our ability. Commonly, the surface of conventional core and outcrop samples are lightly solvent washed. The samples are then crushed to approximately 1/8" chips using a jaw crusher, air dried, and finally further crushed to 0.1mm using a ring pulveriser.

d) Petroleum/Aqueous Mixtures

The most common sample type in this category are RFT tests containing oil, water and mud. The mixture is placed in a separation funnel and allowed to stand for several hours which enables the petroleum and water/mud fractions to separate. The neat petroleum is isolated by removal of the lower layer (water/mud) from the funnel. To remove the last traces of water and mud, the neat petroleum is centrifuged at moderate speed.

When the volume of petroleum accounts for only a very small part of the sample the method above is unsatisfactory and the petroleum is solvent extracted from the mixture with dichloromethane. The petroleum is recovered by careful evaporation of the solvent from the organic layer.

3. TOTAL ORGANIC CARBON DETERMINATION

The total organic carbon value (TOC) is determined on the unextracted sediment sample. The value is determined by treating a known weight of sediment with hot dilute HCl for 1 hour to remove carbonate minerals, and then heating the residue to 1700 Deg. C (Leco Induction Furnace CS-044) in an atmosphere of pure oxygen. The carbon dioxide produced is transferred to an infra-red detector which has been calibrated with a series of standards, and the microprocessor of the Leco unit then automatically calculates the % TOC in the sample. To ensure reliable data a standard is run after every 10 samples, regular sample repeats are carried out, and at least one blank determination is carried out for each batch of samples.

The following scales are normally used for source rock classification based on % TOC data:

<u>Classification</u>	<u>Clastics</u>	<u>Carbonates</u>
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

4. ROCK-EVAL PYROLYSIS

Although a preliminary source rock classification is made using TOC data a more accurate assessment accounting for organic source type and maturity is made by pyrolysis analysis. Two types of Rock-Eval pyrolysis services 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 sediment which has been rendered free of carbonate minerals by treatment with hot dilute HCl. The two run service offers considerably more reliable S3 data.

The method involves accurately weighing approximately 100mg of the sample into a sintered steel crucible and subjecting it to the following pyrolysis cycle:

- Stage (i) - Sample purged with helium for 3.5 minutes in unheated part of pyrolysis furnace;
- Stage (ii) - Sample heated at 300 Deg. C for 3 minutes to liberate free petroleum (S1 peak);
- Stage (iii) - Sample heated from 300 Deg. C to 550 Deg. C at 25 Deg. C/minute to produce petroleum from kerogen (S2 peak). The furnace is maintained at 550 Deg. C for one minute. Carbon dioxide produced during this pyrolysis up to 390 Deg. C in the case of "one run" and 550 Deg. C for "two run" is absorbed on a molecular sieve trap;
- Stage (iv) - During the cool down period the carbon dioxide produced during pyrolysis is measured (S3 peak).

The units used for Rock-Eval data are as follows:

S1, S2, S3 = kg/tonne or mg/g of rock

Tmax = Deg. C

Hydrogen Index = $\frac{S2}{TOC} \times \frac{100}{1}$

Oxygen Index = $\frac{S3}{TOC} \times \frac{100}{1}$

Rock-Eval data is most commonly used in the following manner:

- (i) S1 - indicates the level of oil and or/gas already generated by the sample according to the following scale:

<u>S1 (mg/g or kg/tonne)</u>	<u>Classification</u>
0.00 - 0.20	Poor
0.20 - 0.40	Fair
0.40 - 0.80	Good
0.80 - 1.60	Very Good
> 1.60	Excellent

- (ii) S1+S2 - referred to as the genetic potential this parameter is used for source rock classification according to the following criteria:

<u>S1+S2 (mg/g or kg/tonne)</u>	<u>Classification</u>
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

- (iii) S1/(S1+S2)- this parameter is the production index (PI) which is a measure of the level of maturity of the sample. For oil prone sediments, values less than 0.1 are indicative of immaturity, the values increase from 0.1 to 0.4 over the oil window and values greater than 0.4 represent over maturity. For gas prone sediments, the PI data shows a relatively smaller change with increasing maturity.

- (iv) Tmax - the temperature corresponding to the S2 maxima. This temperature increases with increasingly mature sediments. Values less than 430 Deg. C are indicative of immaturity while values from 430/435 to 460 Deg. C represent the maturity range of the oil window. Tmax values greater than 460 Deg. C are indicative of over maturity.

- (v) HI, OI - the hydrogen ((S2 x 100)/TOC) and oxygen ((S3 x 100)/TOC) indices when plotted against one another provide information about the type of kerogen contained in the sample and the maturity of the sample. Both parameters decrease in value with increasing maturity. Samples with large HI and low OI are dominantly oil prone and conversely samples with low HI and large OI are at best gas prone.

5. EXTRACTION OF SEDIMENT SAMPLES

Crushed sediment (maximum of 250g) and 300mls of purified dichloromethane are placed in a 500ml conical flask and are then blended for ten minutes with a Janke and Kunkel Ultra-Turrax T45/2G high efficiency disperser. After a ten minute settling period the solvent is separated from the sediment using a large Buchner filtration system. The extract is recovered by careful evaporation of the solvent on a steam bath and weighed. The weight of extract is used to calculate % EOM and ppm EOM using the following formulae:

$$\% \text{ EOM} = \frac{\text{Wt EOM}}{\text{Wt Sediment Extracted (g)}} \times 100$$

$$\text{ppm EOM} = \frac{\text{Wt EOM (mg)}}{\text{Wt Sediment Extracted (kg)}}$$

The following scale is used to classify the source rock richness of samples based on C12+ extractables:

<u>Classification</u>	<u>ppm Total Extract</u>
Poor	0 - 500
Fair	500 - 1000
Good	1000 - 2000
Very Good	2000 - 4000
Excellent	> 4000

6. SEPARATION OF PETROLEUM INTO CONSTITUENT FRACTIONS

Sediment extracts and crude oil or condensate samples are separated into saturate, aromatic and NSO (asphaltenes plus resins) fractions by medium pressure liquid chromatography (MPLC). That part of the petroleum which is soluble in pentane is applied to the MPLC system via a sample loop and is then pumped using pentane to a partially activated silicic acid pre-column which prevents further movement of the non-hydrocarbon compounds. The hydrocarbon components are pumped further to a Merck Si60 column where the saturate fraction is obtained by forward flushing and the aromatic fraction is recovered by reverse flushing. This separation procedure is monitored using a refractive index detector. To complete the separation the pre-column is removed from the MPLC system and flushed with dichloromethane: methanol (1:10). This non-hydrocarbon fraction is combined with the pentane insoluble material which is not applied to the MPLC system, and is labelled as the NSO fraction. The neat fractions are recovered by careful removal of the solvent by distillation and are weighed.

The weight of each fraction is used to calculate the % of each fraction in the sediment according to the following formulas:

$$\% \text{ Fraction} = \frac{\text{Wt Fraction}}{\text{Wt all Fractions}} \times 100$$

$$\text{ppm Fraction} = \frac{\text{Wt Fraction (mg)}}{\text{Wt Sediment Extracted (kg)}}$$

The ppm hydrocarbon (saturates and aromatics) and ppm saturate values can be used to classify source rock richness and oil source potential respectively according to the following criteria:

<u>Classification</u>	<u>ppm Hydrocarbon</u>	<u>ppm Saturates</u>
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 increased 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.

N.B. If requested by a client the NSO fraction is separated into asphaltenes and resins by conventional methods.

7. EXTRACTABLE/TOTAL ORGANIC CARBON RATIOS

The ratios of EOM(mg)/TOC(g) and SAT(mg)/TOC(g) are determined from the appropriate data. The EOM(mg)/TOC(g) ratio can be used as a maturation indicator, especially if the parameter is plotted against depth for a given sedimentary sequence. In an absolute sense it is less reliable as a maturation indicator, although previous work (Tissot et. al., 1971; LeTran et. al., 1974) suggests that the following criteria can be used to determine maturity with this parameter.

< 50	Low maturity
50 - 100	Moderate maturity
> 100	High maturity

The ratios of EOM(mg)/TOC(g) and SAT(mg)/TOC(g) can be used collectively to provide information about source type. For example, if SOM(mg)/TOC(g) is > 100, suggesting a high level of maturity, but the SAT(mg)/TOC(g) < 20 it is very likely that the organic matter is gas prone. Conversely, the same EOM(mg)/TOC(g) value with a SAT(mg)/TOC(g) value > 40 suggests oil prone source type.

8. PYROLYSIS GAS CHROMATOGRAPHY

Pyrolysis-gas chromatography (PGC) incorporates a Chemical Data System Pyroprobe 150 flash pyrolysis unit interfaced with a capillary gas chromatograph. A sample (5-10mg) of extracted sediment is placed in a quartz tube inside the element coil of the pyrolysis probe and is then heated to 610 Deg. C in a few milliseconds, and is maintained at this temperature for 20 seconds. Products generated from the pyrolysis are swept onto the bonded phase capillary column of the gas chromatograph and are chromatographed from -20 Deg. C (isothermal for two minutes) to 280 Deg. C at 4 Deg. C/minute. The product distribution is dominated by the nature of the kerogen from which it is derived.

9. C12+ GAS CHROMATOGRAPHY

C12+ gas chromatography is commonly carried out on the saturate fraction but in certain instances is carried out on neat oil, condensate or extract. The analysis is carried out under the following conditions: instrument = Shimadzu GC-9A; column = 50m x 0.2mm ID OV101 vitreous silica; column temperature = programmed from 60 Deg. C

to 280 Deg. C at 4 Deg. C/min; injection system = Grob splitless using a 30 second dump time and split ratio of 25:1, carrier gas = hydrogen at 2mls/min; sample = 1 μ l of 0.5% soln in pentane.

The following information is commonly obtained from C12+ gas chromatographic analysis:

(a) n-Alkane Distribution - The C12-C31 n-alkane distribution is determined from the area under peaks representing each of these n-alkanes. This distribution can yield information about both the level of maturity and the source type (LeTran et. al., 1974).

(b) Carbon Preference Index - Two values are determined:

$$\text{CPI (1)} = \frac{(\text{C23} + \text{C25} + \text{C27} + \text{C29}) \text{ Wt\%} + (\text{C25} + \text{C27} + \text{C29} + \text{C31}) \text{ Wt\%}}{2 \times (\text{C24} + \text{C26} + \text{C28} + \text{C30}) \text{ Wt\%}}$$

$$\text{CPI (2)} = \frac{(\text{C23} + \text{C25} + \text{C27}) \text{ Wt\%} + (\text{C25} + \text{C27} + \text{C29}) \text{ Wt\%}}{2 \times (\text{C24} + \text{C26} + \text{C28}) \text{ Wt\%}}$$

The CPI is believed to be a function of both the level of maturity (Cooper and Bray, 1963; Scalan and Smith, 1970) and the source type (Tissot and Welte, 1978). Marine extracts tend to have values close to 1.0 irrespective of maturity whereas values for terrestrial extracts decrease with maturity from values as high as 20 but do not usually reach a value of 1.0

(c) (C21+C22)/(C28+C29) - This parameter provides information about the source of the organic matter (Philippi, 1974). Generally, terrestrial source material gives values <1.2 whereas a aquatic source material results in values >1.5.

(d) Pristane/Phytane Ratio - This value was determined from the areas of peaks representing these compounds. The ratio renders information about the depositional environment according to the following scale (Powell and McKirdy, 1975):

< 3.0	Relatively reducing depositional environment
3.0-4.5	Reducing/oxidizing depositional environment
>4.5	Relatively oxidizing depositional environment

(e) Pristane/n-C17 Ratio - This ratio was determined from the areas of peaks representing these compounds. The value can provide information about both the depositional environment and the level of maturation (Lijmbach, 1975). Very immature crude oil has a pristane/n-C17 ratio >1.0, irrespective of the depositional environment. However, the following classification can be applied to mature crude oil:

<0.5	Open water depositional environment
0.5-1.0	Mixed depositional environment
>1.0	Peat-swamp depositional environment

In the case of sediment extracts these values are significantly higher and the following classification is used:

<1.0	Open water depositional environment
1.0-1.5	Mixed depositional environment
>1.5	Peat-swamp depositional environment

- (f) Phytane/n-C18 Ratio - This ratio was determined from the areas of peaks representing these compounds. The value usually only provides information about the level of maturity of petroleum. The value decreases with increased maturation.
- (g) Relative Amounts of n-Alkanes and Naphthenes - Since n-alkanes and naphthenes are the two dominant classes of compounds in the saturate fraction, a semi-quantitative estimate of the relative amounts of these compounds can be made from saturate GLC's. This information can be used to assess the degree of maturation and/or the source type of the petroleum (Philippi, 1974; Tissot and Welte, 1978). Very immature petroleum has only small proportions of n-alkanes, but as maturity increases the relative amount of n-alkanes increases. In addition, terrestrial petroleum has a greater proportion of high molecular weight naphthenes than petroleum comprising aquatic source material.

10. API/SPECIFIC GRAVITY

A specific gravity (SG) bottle was accurately weighed, then filled with crude oil at 60 Deg. F and finally reweighed. The weight difference was divided by the weight of an equal volume of water at 60 Deg. F to obtain the specific gravity. The following formula was then used to calculate the API gravity:

$$\text{API Gravity} = \left[\frac{141.5}{\text{SG (60 Deg. F)}} \right] - 131.5$$

The reported gravity value is the average of duplicate determinations.

11. SULPHUR DETERMINATION

The % sulphur by weight is determined by dissolving 0.5g of the petroleum in 50mls kerosene and then analysing this mixture with an inductively coupled plasma (ICP) instrument which has been calibrated with a series of sulphur standards.

This parameter is influenced by the nature of the source material from which a crude is derived, the depositional environment of the source rocks, and reservoir alteration processes such as bacterial alteration.

12. C1-C31 WHOLE SAMPLE GAS CHROMATOGRAPHY

This method of analysis is normally only applied to oil or condensate samples. The technique provides a "picture" of the sample which shows good resolution of the low, medium and high molecular weight components. Whole sample GC data is considered to be more useful than C12+ saturate fraction GC data for oil or condensate samples.

The analysis is carried out under the same conditions as for the C12+ GC analysis with the following exceptions: column temperature = programmed from -20 Deg. C to 280 Deg. C at 4 Deg. C/min (uses cryogenic mode); injection is carried out in split mode; sample = 0.1 µl of neat petroleum.

C1-C31 analysis data can be used to obtain the same information as that obtained from C12+ GC but further provides detailed compositional data on the C1-C11 fraction and enables calculation of the distillation range of the sample.

13. MOLECULAR SIEVE EXTRACTION

This technique is used to isolate the branched/cyclic alkanes from the saturate fraction for gas chromatography/mass spectrometry analysis. A mixture of saturates: 5A molecular sieves: purified benzene in the proportions 1:5:12 by weight is placed in a 100ml round bottom flask and refluxed for 24 hours. After cooling, the sieves are filtered from the liquid phase and are washed with 4 x 10ml aliquots of benzene. The liquid phase plus washing are freed of benzene by distillation yielding the branched/cyclic compounds.

14. COMPUTERIZED GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

Gas chromatography/mass spectrometry employs a capillary column gas chromatograph linked in series with a mass spectrometer and data system (GC/MS/DS). As molecules are eluted from the capillary column they are bled into the analyser tube of the mass spectrometer where they are bombarded with high energy electrons and consequently fragment to form several ions each with molecular weights less than that of the parent molecule. The fragmentation pattern is characteristic of the particular molecular type. The spectrum of these ions (referred to as a mass spectrum) is recorded approximately once every second and all of the mass spectra recorded during a GC/MS/DS analysis are memorised by the data system. Since any given class of molecules will breakdown in the analyser type to give one or more characteristic ion fragments of known molecular weight, after a GC/MS/DS analysis it is possible to examine the distribution of compounds within a given class by having the data system reproduce a mass fragmentogram (plot of ion concentration against gas chromatography retention time) representative of the particular class.

GC/MS/DS analyses can be carried out using one of the two following modes of operation:

- (i) Acquire mode - in which all ions 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.

At present the sterane/triterpane/bicyclane fraction of petroleum is considered most useful for GC/MS/DS analysis and therefore we commonly use the second of the above mentioned modes of operation and run the following twenty-two ions which are pertinent to the sterane/triterpane/bicuclane fraction.

<u>Ion</u>	<u>Molecular Type</u>
177	Demethylated triterpanes
191	Normal triterpanes
205	Methyl triterpanes
163	Specific dehylyated triterpanes
356	Parent ion - C26 triterpanes
370	Parent ion - C27 triterpanes
384	Parent ion - C28 triterpanes
398	Parent ion - C29 triterpanes

412	Parent ion - C30 triterpanes
426	Parent ion - C31 triterpanes
183	Isoprenoids
217	Normal steranes
218	Normal steranes
231	4-methylsteranes
259	Diasteranes
358	Parent ion - C26 steranes
372	Parent ion - C27 steranes
386	Parent ion - C28 steranes
400	Parent ion - C29 steranes
414	Parent ion - C30 steranes

GC/MS/DS analysis of the sterane/triterpane/bicyclane fraction can often provide information about the maturity and source type of petroleum and whether it has been affected by micro-organisms. This technique is also often useful for oil:oil and oil:source rock correlation. The following sections indicate which parameters are used to obtain this information and summarize the theory behind their use.

Maturity

(i) Based on Steranes

- (a) The biologically produced $\alpha\alpha\alpha$ (20R) stereoisomer is converted in sediment to a mixture of the $\alpha\alpha\alpha$ (20R) and $\alpha\alpha\alpha$ (20S) compounds. The ratio of $\alpha\alpha\alpha$ (20S) C29 ----- expressed as a percentage is about 25% at the $\alpha\alpha\alpha$ (20R)+ $\alpha\alpha\alpha$ (20S) onset of oil generation and increases almost linearly to a value of about 50% at the peak of oil generation.

(ii) Based on Triterpanes

- (a) The C31, C32, C33, C34 and C35 hopanes have the biological R configuration at C22. On mild thermal maturation equilibration occurs to produce a 60/40 mixture of S/R. This equilibration occurs before the onset of oil generation.
- (b) The conversion of the biological $17\beta,21\beta$ hopanes to the corresponding $17\alpha,21\beta$ and $17\beta,21\alpha$ compounds is also maturation dependant. For $17\beta,21\alpha$ C30 triterpanes the ratio of ----- decreases steadily from a $17\alpha,21\beta$ value of about 0.4 at the onset of oil generation to a value of about 0.1 at peak oil generation.
- (c) Two of the C27 triterpanes can also be used as maturity indicators. The ratio of 18α (H) trisnorhopane to 17α (H) trisnorhopane increases exponentially with increasing maturity from a value of approximately 0.2 at the onset of oil generation to approximately 1.0 at peak oil generation.
- (d) It is our experience that the ratio of the C27 18α (H) + C27 17α (H) triterpanes to C30 $17\alpha,21\beta$ triterpane is maturity dependent. The ratio decreased from values around 1.0 at the onset of oil generation to a value of approximately 0.4 at peak oil generation. With increasing maturity at levels greater than that equivalent to peak oil generation the ratio

increases steadily to values greater than 3.0.

Source Type

(i) Based on Steranes

Algal organic matter contains steranes in which the C27 compounds are more abundant than the C29 compounds. General aquatic organic matter has approximately equivalent amounts of the C27 and C29 compounds while organic matter rich in land-plants usually has a lot more of the C29 steranes.

(ii) Based on Triterpanes

The triterpane components in petroleum can be derived from both bacteria and higher plants. The common bacterial products are the C27-C35 hopanes and moretanes whereas the higher plant triterpanes are compounds other than hopanes or moretanes and are commonly C30 compounds.

(iii) Based on Diasteranes

The diasteranes are not produced biologically but are formed during early diagenesis from sterane precursors. The diasterane ratios

$$\frac{C27(20R)}{C29(20R)} \quad \text{and} \quad \frac{C27(20R+20S)}{C29(20R+20S)}$$

should reflect the nature of the organic matter in the same manner as that outlined above for the steranes.

Biodegradation

It has been observed that in severely biodegraded petroleum the series of normal hopanes are converted to a series of A ring demethylated hopanes and the C29 (20R) sterane is selectively removed. For altered crudes which have not been degraded to this extent the severity of biodegradation can often be gauged by studying the isoprenoid and aromatic fractions. However, this type of investigation extends beyond a standard GC/MS/DS analysis.

Correlation

Our present approach to oil:oil or oil:source rock correlation problems is as follows:

(i) Compare the distribution of compounds in the 123, 177, 191, 205, 217, 218, 231 and 259 mass fragmentograms for an oil or sediment extract to the distribution of compounds in the respective fragmentograms for the other oil(s) or sediment extract(s). It is necessary in this type of comparison to make allowance for small variations due to possible maturity differences.

(ii) Examine the fragmentograms for peaks or sets of peaks which may represent compounds that are specific to the geological system under investigation. Normal steranes, diasteranes and bacterial hopanes cannot be used for this purpose because they are present in virtually all crude oils and sediment extracts. However, compounds like higher plant triterpanes, bisnorhopane and botryococcane can often prove very useful for this purpose.

15. CARBON ISOTOPE ANALYSIS

The measurement is carried out on one or more of the following mixtures; topped oil; saturate fraction; aromatic fraction; NSO fraction. The organic matter is combusted at 860 Deg. C in oxygen and the carbon dioxide formed is purified and transferred to an isotope mass spectrometer. The carbon isotope ratio is measured relative to a standard gas of known isotopic composition. In our case the standard gas is prepared from the NBS No. 22 oil. However, since the isotopic relationship between NBS No. 22 oil and the international reference PDB limestone are known, the values are adjusted to be relative to PDB limestone.

Although carbon isotope data has been commonly used for oil:oil and oil:source rock correlation its most significant application is the identification of the source of gas according to the following criteria (Fuex, 1977):

<u>$\delta^{13}C$ (PDB)</u>	<u>Gas Type</u>
-85 to -58	Biogenic methane
-58 to -40	Wet gas/associated with oil
-40 to -25	Thermal methane

16. VITRINITE REFLECTANCE MEASUREMENT

Vitrinite is a coal maceral which responds to increasing levels of thermal maturity. This response can be measured by the percent of light reflected off a polished surface of a vitrinite particle immersed in oil. Reflectance measurements are made on a number (40 if possible) of vitrinite particles in each sample, in order to establish a range and mean for reflectance values. Immature rocks have low reflectance values (0.2% Ro to 0.6% Ro), with mature values ranging from 0.6% Ro to 1.2% Ro. Very mature values are between 1.2 % Ro and 1.8% Ro, while severely altered rocks have reflectances above 1.8% Ro.

Vitrinite reflectance results are best obtained from coals or rocks deposited in environments receiving large influxes of terrestrially-derived organic matter. Unfortunately, these environments are not conducive to the accumulation of large quantities of oil-prone organic mater. Also vitrinite reflectance cannot be performed on rocks older than Devonian Age, due to the absence of land plants in the older geological time periods.

17. VISUAL KEROGEN

Visual kerogen assessment is carried out by the coal petrologist and/or the palynologist. In the case of the petrologist the assessment is made in reflected light using the plug prepared for vitrinite reflectance measurement, and reports the relative amounts of alginite, exinite, vitrinite and inertinite particles.

Visual study of kerogen by the palynologist is carried out in transmitted light and can indicate the relative abundance, size and state of preservation of the various recognizable kerogen types and hence indicates the source character of a sedimentary rock. In addition, the colour of the kerogen is related to the thermal maturity of the sediments and is often used as a maturation indicator.

The preparation of slides for visual kerogen assessment by the palynologist firstly involves concentration of the organic matter by removal of the rock matrix using hydrochloric and hydrofluoric acid treatment and heavy liquid separation. The organic concentrate is then mounted on a glass slide using Petropoxy.

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