



# Geochemical Report

## Isotopic Analysis of Gas Samples

Moonfish-1

Moonfish-st 1

by CSIRO

August 1992

## APPENDIX 2b

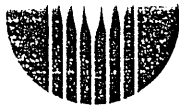
### Isotopic Analysis of Gas Samples by CSIRO

#### Moonfish #1:-

Sample #1: 1914.5mMDRT (1724.0mTVDSS)  
Sample #2: 2260.5mMDRT (2036.8mTVDSS)

#### Moonfish #ST1:-

Sample #1: 1819.0mMDRT (1638.0mTVDSS)  
Sample #2: 1819.0mMDRT (1638.0mTVDSS)



CSIRO  
AUSTRALIA

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28th August 1992

Esso Australia Limited  
360 Elizabeth Street  
MELBOURNE VIC 3000

Attention: K. Kuttan

Dear Sir/Madam,

Please find attached the chemical and isotopic analyses of Moonfish No. 1 samples #1 and #2.

The isotopic composition of methane in Moonfish 1 sample #2 is more depleted in  $\delta^{13}\text{C}$  than can be expected from isotopic differences between adjacent higher hydrocarbon pairs. This has been found in other natural gases from high maturity source that have been analysed in this laboratory. In both samples the isotopic differences that exist between adjacent higher hydrocarbon pairs in the  $\text{C}_1$ - $\text{C}_5$  range are not in the range expected from theoretical considerations and therefore the maturity of the samples cannot be determined by the method of James<sup>1</sup>, 1983.

An estimate of the maturity of the source has been made using the empirical data of Faber<sup>2</sup>, 1987. Based on the isotopic differences that exist between  $\text{C}_2$  and  $\text{C}_3$  the maturity of Moonfish 1 samples #1 and #2 equate to a vitrinite reflectance  $R_{\text{o(max)}}$  of 1.6% and 1.7% respectively which places both samples in the middle of the condensate and wet gas window.

It can be concluded from the chemical and isotopic analyses of the gases that Moonfish 1 sample #1 is of lower maturity than Moonfish 1 sample #2. On the basis of the chemical composition sample #1 is "wetter" than sample #2.

Yours sincerely,

R. Pallasser

- 1 James, A.T. 1983. Correlation of natural gas using the carbon isotopic distribution between hydrocarbon components. Bull. Am. Assoc. Pet. Geol. 67, 1176-1191.
- 2 Faber, E. 1987. Zur Isotopengeochemie gasformiger kohlenwasserstoffe. Erdol, Erdgas and Kohle 103, p210-218.

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Moonfish #1

Sample #1 1914.5 mD / 1724 m T10      Sample #2 2260.5 mD / 2036.8 T

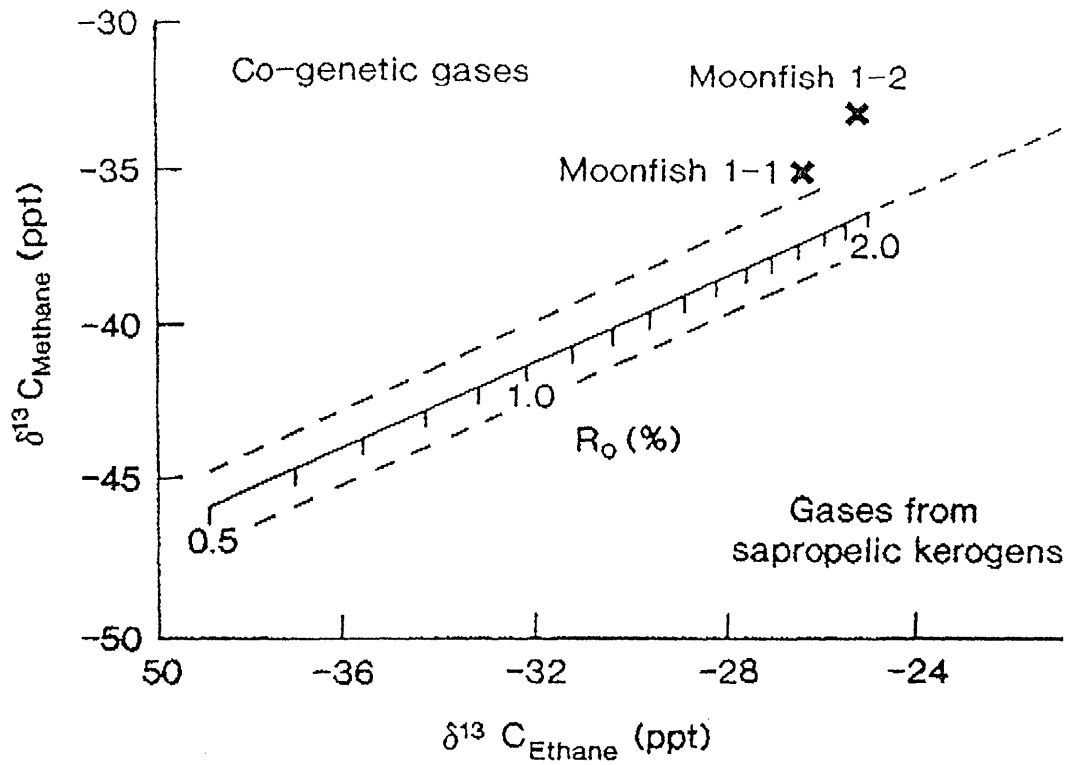
Chemical Analyses

Methane	76.29	79.20
Ethane	9.60	5.83
Propane	4.63	2.51
i-butane	0.73	0.36
n-butane	0.96	0.44
i-pentane	0.20	0.08
n-pentane	0.20	0.10
C <sub>6</sub> <sup>+</sup>	0.01	0.01
CO <sub>2</sub>	6.75	11.23
O <sub>2</sub> (includes Ar)	0.08	0.01
N <sub>2</sub>	0.55	0.23

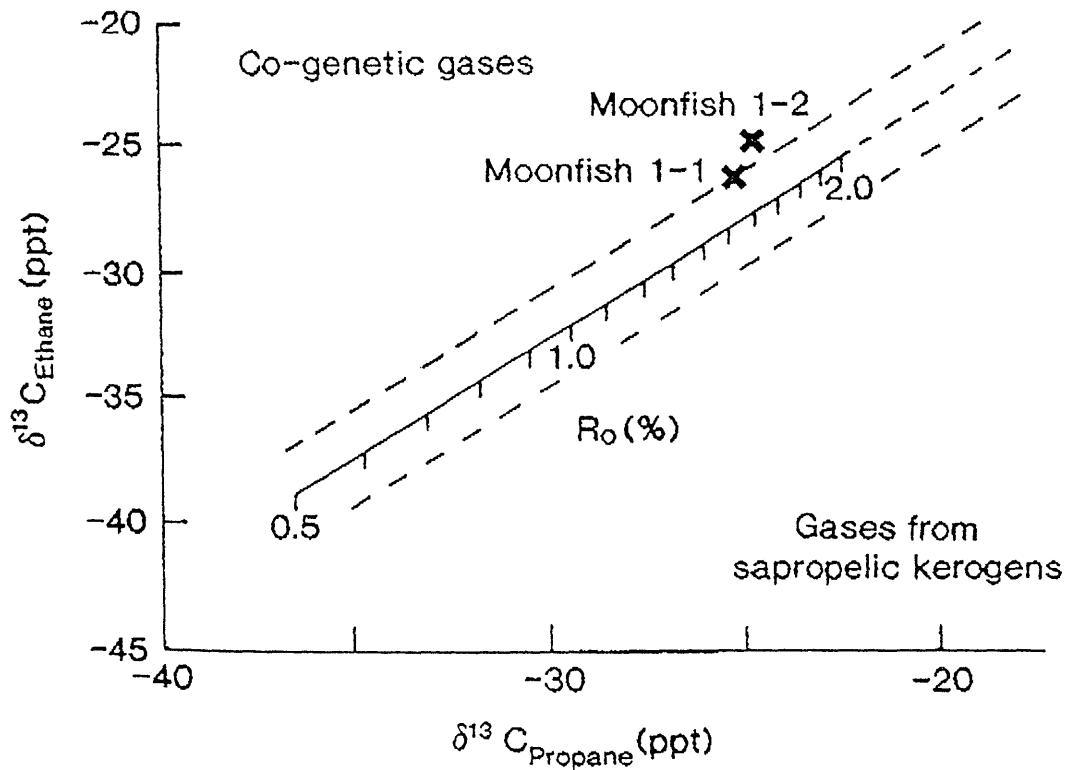
Stable Isotope Analyses\*

Methane	$\delta^{13}\text{C} \text{ ‰}$	-35.2	-33.5
Ethane	"	-26.6	-25.4
Propane	"	-25.5	-24.9
n-butane	"	-25.3	-24.8
n-pentane	"	-25.5	-24.9

\*determined on Finnigan MAT-252 mass spectrometer



Maturation line of co-genetic methane and ethane pairs  
 After Faber, 1987



Maturation line of co-genetic ethane and propane pairs  
 After Faber, 1987



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Chief: Dr B.F. Hobbs

23rd December 1992

Esso Australia Limited  
360 Elizabeth Street  
MELBOURNE VIC 3000

Attention: Dr P. Moore

Dear Peter,

Please find attached the chemical and isotopic analyses of Moonfish 1 ST 1, Samples #1 and #2.

Please note that the isotopic compositions from these two samples resemble those of Moonfish 1, sample #1 (RFS AD 1131) analysed by us in August this year.

Yours sincerely,

R. Pallasser

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Moonfish 1 ST 1

Compositional Analyses

	Sample 1	Sample 2
Methane	87.72	86.77
Ethane	6.45	6.59
Propane	2.43	2.58
i-Butane	0.37	0.31
n-Butane	0.43	0.40
i-Pentane	0.12	0.14
n-Pentane	0.10	0.15
C <sub>6</sub> <sup>+</sup>	tr	0.12
CO <sub>2</sub>	2.2	2.28
O <sub>2</sub> (includes Ar)	-	-
N <sub>2</sub>	0.19	0.67

Stable Isotope Analyses

	$\delta^{13}\text{C}^{\circ}/\text{‰}$		
Methane		-35.4	-35.4
Ethane	"	-27.1	-27.0
Propane	"	-25.3	-25.5
n-Butane	"	-25.5	-25.5
n-Pentane	"	-25.0	-25.1



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