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1987/33. Coal samples from Macquarie Island and the wreck of the 'Litherland'.

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Abstract

Two samples of coal were submitted to the Department to determine the origin of the coal. Neither sample proved to be Tasmanian coal. The Litherland coal appears to be from the Newcastle Coal Measures of New South Wales, and the Macquarie Island sample from the Greta Coal Measures of New South Wales. In both cases the coals have originated from New South Wales and would have been shipped from the Port of Newcastle.

INTRODUCTION

One sample of coal from an area called "The Nuggets" on Macquarie Island, and another sample recovered from among the cargo of the wreck of the ship 'Litherland', were given to the Department to ascertain the origin of each sample.

The sample from the 'Litherland' (which was wrecked near the Furneaux Group in Bass Strait in 1853) was part of a general cargo including 400 tonnes of coal. This cargo was thought to have originated from either Tasmania or Newcastle.

The coal from Macquarie Island was apparently used in whaling operations, and the sample in question probably dates from around 1917-1920, and possible sources of supply included New South Wales, New Zealand and Tasmania (K. Townrow, pers. comm.).

Both samples were subjected to petrographic and proximate analyses at the CCI laboratories at Newcastle.

RESULTS

	Litherland	*Macquarie Island*
Mean maximum reflectance	0.84	
TPI	0.6	0.3
GI	0.6	3.7

Proximate analysis (dry basis)

Moisture (%)	-	2.2
Ash (%)	8.7	4.4
Total Sulphur (%)	-	0.70

Maceral analysis

VITRINITE	(27.6)	(65.0)
Vitrinite A	4.8	6.8
Vitrinite B	22.8	58.2
EXINITE	(6.2)	(10.0)
Sporinite	5.0	6.4
Cutinite	0.2	1.0
Resinite	1.0	2.6
INERTINITE	(62.4)	(25.0)
Micrinite	5.0	2.4
Macrinite	4.6	2.6
Semifusinite	21.6	9.0
Fusinite	5.8	4.4
Inertodetrinite	25.4	4.6
MINERALS	3.8	2.0

DISCUSSION

The formation of coal is dependent on a wide range of physical and chemical conditions, which lead to differences in coals from different coalfields, and even between coal from different seams within one coalfield.

The source material from which peat is initially derived can vary over a wide range of plant types and constituents, from algal to gymnospermous origin. For example, after the Carboniferous, gymnosperms replaced pteridophytes in peat bogs, with the result that post-Carboniferous coals are low in spores and have a high content of derivatives of plant resin from the gymnospermous wood.

Factors relating to plant nutrition, the rate of production of vegetative matter, acidity or otherwise of the peat are also important. The climate (temperature and precipitation) is linked to the quantity and variety of the vegetation, and governs the rate of decay of accumulated plant matter. The water level within the peat bog is of critical importance in determining the type of coal produced. Whether the change in water level results from active crustal subsidence or is produced by eustatic changes in sea level also has a bearing on the coalification process.

The geological setting, plant material available, quantity of water in the environment, and post-depositional history are all important in the process of coalification. Different combinations of these, and many more factors related to the transition from peat formation to coalification, result in subtle differences between coals, which are reflected in the results of chemical and maceral (petrographic) analyses (Diessel, 1982).

'Macerals' is the term given to elementary microscopic constituents of coals, analogous to mineral grains in rocks. Coal macerals evolve from different organs or tissues of plants during coal formation. Both the starting material and subsequent treatment are important in determining which macerals will form. For example in wet environments, woody material forms telinite and telocollinite, while in drier environments the same starting material produces fusinite and semifusinite, and if the peat dries out, inertodetrinite or pyrofusinite are formed. The chemical and physical properties of a coal are determined by the proportion and association of different maceral groups.

The petrographic (maceral) composition of coal is related to factors prevailing in the environment of deposition. The calculation of two indices, Gelification Index (GI) and Tissue Preservation Index (TPI), as described by Diessel (1986), give an indication of the degree of moisture in the peat swamp and the proportion of material derived from woody sources respectively. Use of these indices (Diessel, 1986) can determine environmental conditions in the original peat swamps, from which various seams are now derived.

Using this method, the Macquarie Island coal sample accords close agreement with coal from the Greta Seam of the Greta Coal Measures in NSW. The Greta Seam is the most extensively worked seam in these coal measures, and formed (Diessel, 1986) from peat accumulated on a lower delta plain environment, separated from an advancing sea by a barrier beach (see Figure 1).

'Litherland' coal

The maceral and proximate analyses indicate similarities with coal from the Newcastle Coal Measures (Late Permian age) of New South Wales. Mining of the Newcastle Coal Measures began in a small way in 1798. Organised mining began in 1801, and production from these coal measures has since been continuous.

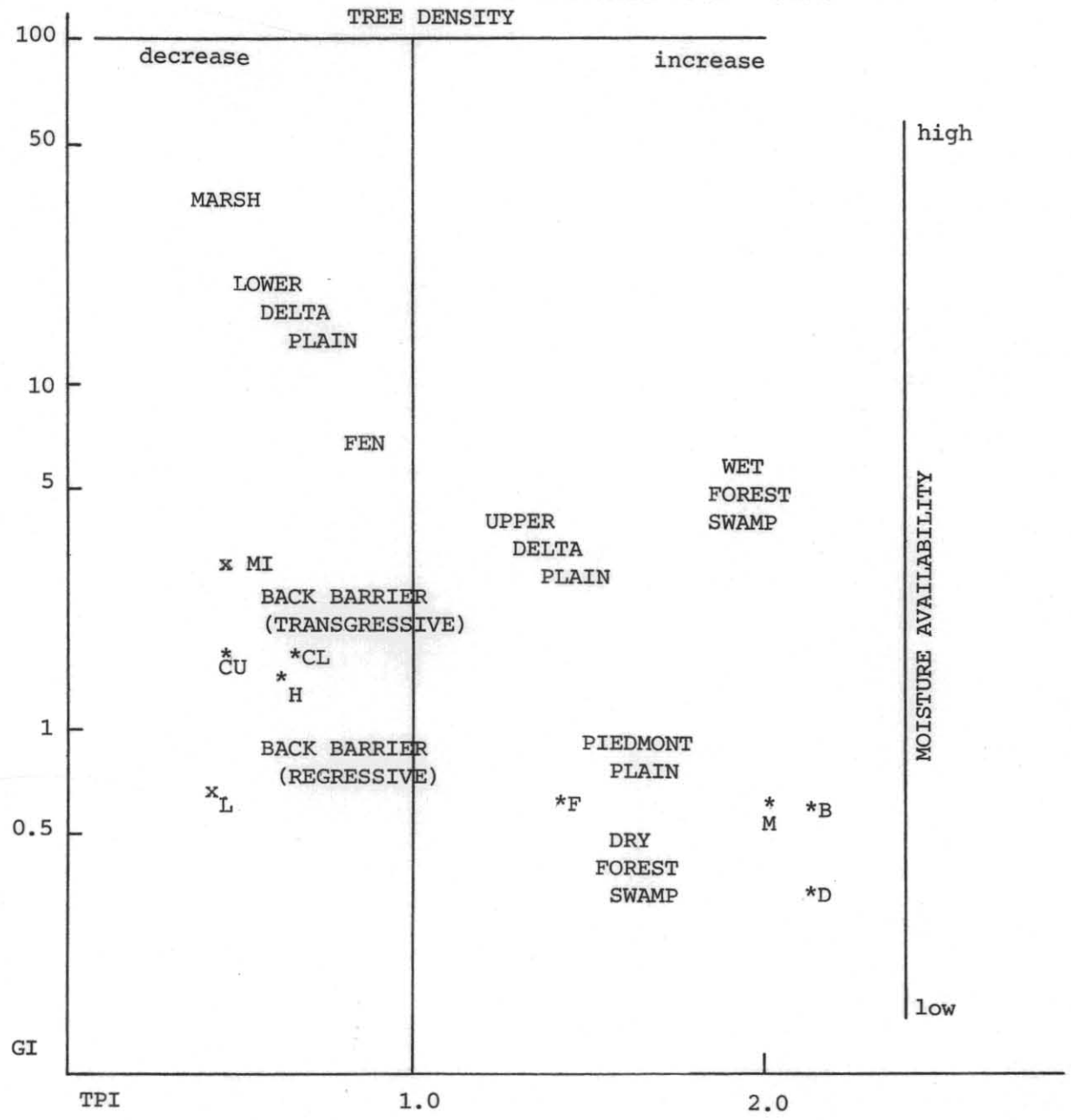
Macquarie Island coal

This coal shows similarities to coal from the Greta Coal Measures (Early Permian age) of New South Wales. These coal measures were discovered in 1864. The first mechanical coal mining machine to be used in Australia was installed at Greta in 1890 (Martin, 1986). Coal is still produced from the Greta Coal Measures.

CONCLUSIONS

'Litherland' coal: The cargo of coal on the 'Litherland' originated from the Newcastle area of New South Wales. Shortly after organised mining began in 1801, enough coal was being produced to ship to Sydney, Hobart, Launceston and Cape Town. The convicts "loaded it into ships' holds in wicker baskets which had to be free of rocks, clay or dust" (Carroll, 1977).

Macquarie Island: The coal left by whalers at The Nuggets on Macquarie Island was probably mined from the Greta Seam in the Greta Coal Measures in the Cessnock-Singleton area of New South Wales.



* TASMANIAN EARLY PERMIAN SEAMS

CU = Catos Creek Upper
CL = Catos Creek Lower
H = Huntsmans Creek

x L Newcastle Coal Measures (seam unknown) from wreck of the 'Litherland'

x MI Greta Seam, Greta Coal Measures. Sample from Macquarie Island.

* TASMANIAN LATE TRIASSIC SEAMS

D = Duncan
B = Blue
M = Merrywood
F = Fenton

Diagram based on Diessel (1986)

5 cm

Figure 1.

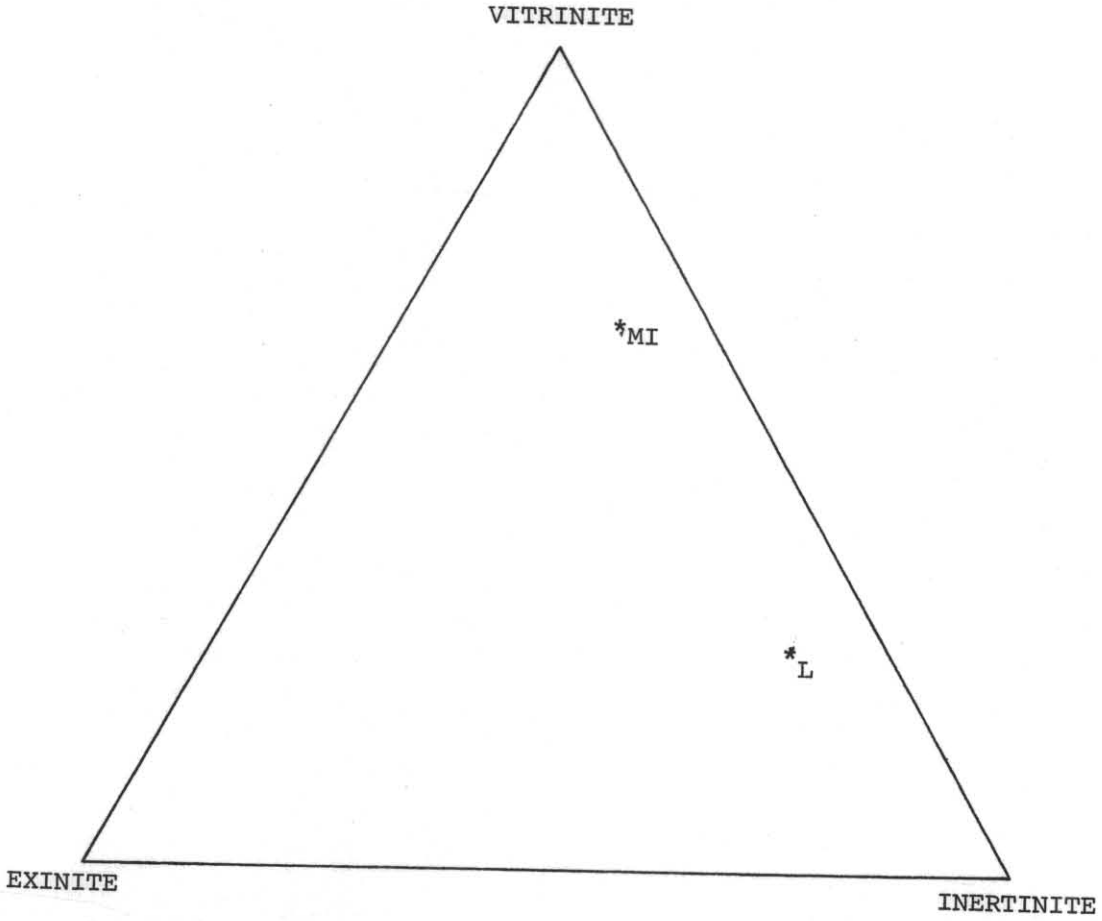


Figure 2. *Petrographic composition of samples*

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