DEPOSITIONAL ENVIRONMENT OF THE TOOLEBUC FORMATION AND ITS EQUIVALENTS, EROMANGA BASIN, AUSTRALIA

S. OZIMIC

Division of Continental Geology,
Bureau of Mineral Resources, Geology and Geophysics,
P.O. Box 378, Canberra City, A.C.T. 2601
AUSTRALIA

BIOGRAPHY

Stanley Ozimic, 1981 Churchill Fellow obtained his B.Sc. from the Australian National University and his Ph.D. from the University of Wollongong. Post-graduate research at the University of Wollongong involved the study of Permian arenites for potential subsurface gas storage reservoirs.

He has been employed by the Bureau of Mineral Resources, Geology and Geophysics since 1962, except for a period of 3 years (1964-66) when he was a member of the Institut Francaise Du Petrole (Mission in Australia). While employed by BMR and IFP he was closely assoicated with subsurface studies of various sedimentary basins in Australia, and estimation of Australia's hydrocarbon reserves.

Currently he holds a position of senior geologist in the BMR Division of Continental Geology and is working on a BMR/CSIRO joint project involving the study of the Toolebuc Formation in the Eromanga Basin. He is a member of the Society of Professional Well Log Analysts, U.S.A.

SUMMARY

The widespread Early Creataceous oil shale-bearing Toolebuc Formation facies, and their lateral equivalents (Fig. 1) which (Wooldridge Limestone Member and 'Urisino beds') lack oil shale, are interpreted to have been deposited:

- in and towards the southern boundary of a late Albian transgressive Toolebuc sea;

- on a northerly dipping palaeoslope, and

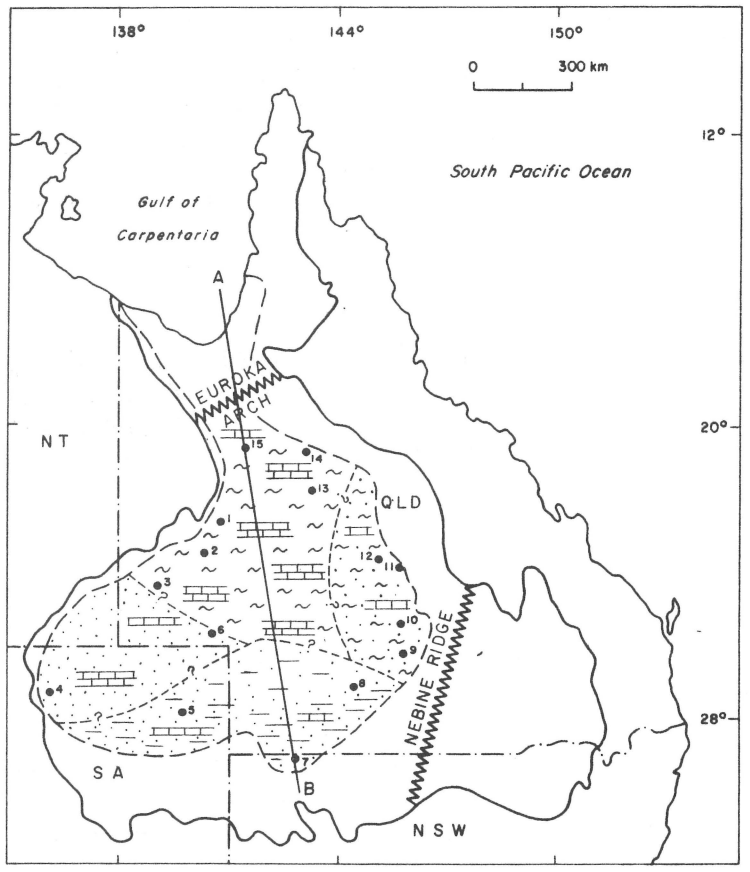
- in a quiet anaerobic, relatively deep-water marine environment in the north, grading to a higher energy aerobic, shallow-water marine to brackish environment in the south and southwest.

The conditions envisaged are those of a 'positive water balance basin' (Demaison & Moore, 1980) in which saline water entered over the narrow Euroka Arch in the north and fresh water from the basin hinterland flowed northwards out of the area (Fig. 1). The sea was therefore most likely stratified with a permanent halocline below a layer of fresh water. Such conditions would have:

- enhanced prolific productivity in the euphotic zone;

- led to permanent or intermittent oxygen depletion in the lower part of the water column of the deeper parts of the basin;

- limited the establishment of normal benthonic marine fauna;



Toolebuc Formation - kerogenous facies A

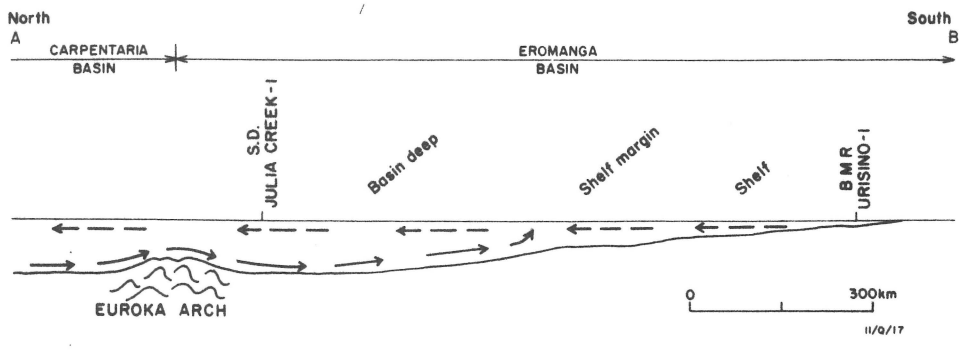
Toolebuc Formation - kerogenous facies B

Wooldridge Limestone Member

Major data points (Ozimic, 1982)

Extent of Toolebuc Formation facies and lateral equivalents

Urisino beds



Outflowing fresher (less dense) water

Inflowing saline (denser) water

Fig.1 Distribution of Toolebuc Formation facies and lateral equivalents; cross-section showing hypothetical conditions in the basin during kerogenous shale deposition.

- favoured preservation of organic matter in the northern and central parts of the basin, and

- effectively prevented the growth and preservation of organic matter in the southern and southwestern parts of the Toolebuc sea where, along the shelf and shelf margins shallow higher energy and mostly oxidizing conditions prevailed.

The areal distribution of the Toolebuc Formation and its lateral equivalents reflects the interplay of basin geometry, water circulation, and sedimentary processes. The conditions which favoured oil shale deposition were apparently terminated with the return of normal marine enviroment, probably the result of increase in saltwater inflow arising from rising sea level and possible variations in conditions limiting the productivity in the euphotic zone.

Acknowledgements

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