THE SIGNIFICANCE OF GAMMA-RAY ANOMALY IN THE CRETACEOUS TOOLEBUC FORMATION FACIES AND IN THEIR LATERAL EQUIVALENTS EROMANGA AND CARPENTARIA BASINS

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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 Francais Du Petrole (Mission in Australia). While employed by BMR and IFP he was closely associated 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.

ABSTRACT

In boreholes, the presence of the Toolebuc Formation has in the past been suspected from a marked isolated peak or set of peaks on gamma-ray logs.

The anomaly is easily recognised, and correlates with the Toolebuc Formation kerogenous facies throughout the central and northern Eromanga Basin, and onshore Carpentaria Basin. In the southern part of the Eromanga Basin in BMR Urisino-1 stratigraphic hole an anomaly occurs in the upper part of the Coreena Member equivalent, but not in the overlying Toolebuc Formation equivalent 'Urisino beds' (Ozimic, 1982). Palynological dating found the age of sediments giving the gamma-ray anomaly in BMR Urisino-1 to be slightly older than the Toolebuc Formation in central and northern parts of the Eromanga Basin (Burger, 1981).

Examination of the gamma-ray logs of a number of petroleum exploration wells, stratigraphic holes and water bores in South Australia, New South Wales, Northern Territory and Queensland shows:

- that the gamma-ray anomaly possibly rises in the succession from the southern to the northern parts of the Eromanga Basin, from the upper part of the Coreena Member equivalent to the upper beds of the Toolebuc Formation kerogenous facies (Fig. 1).

- that the character of the anomaly changes from weak, broad and serrated, along the central and northern basin margins to intensive, narrow, single or double peaked in the centre of the basin;

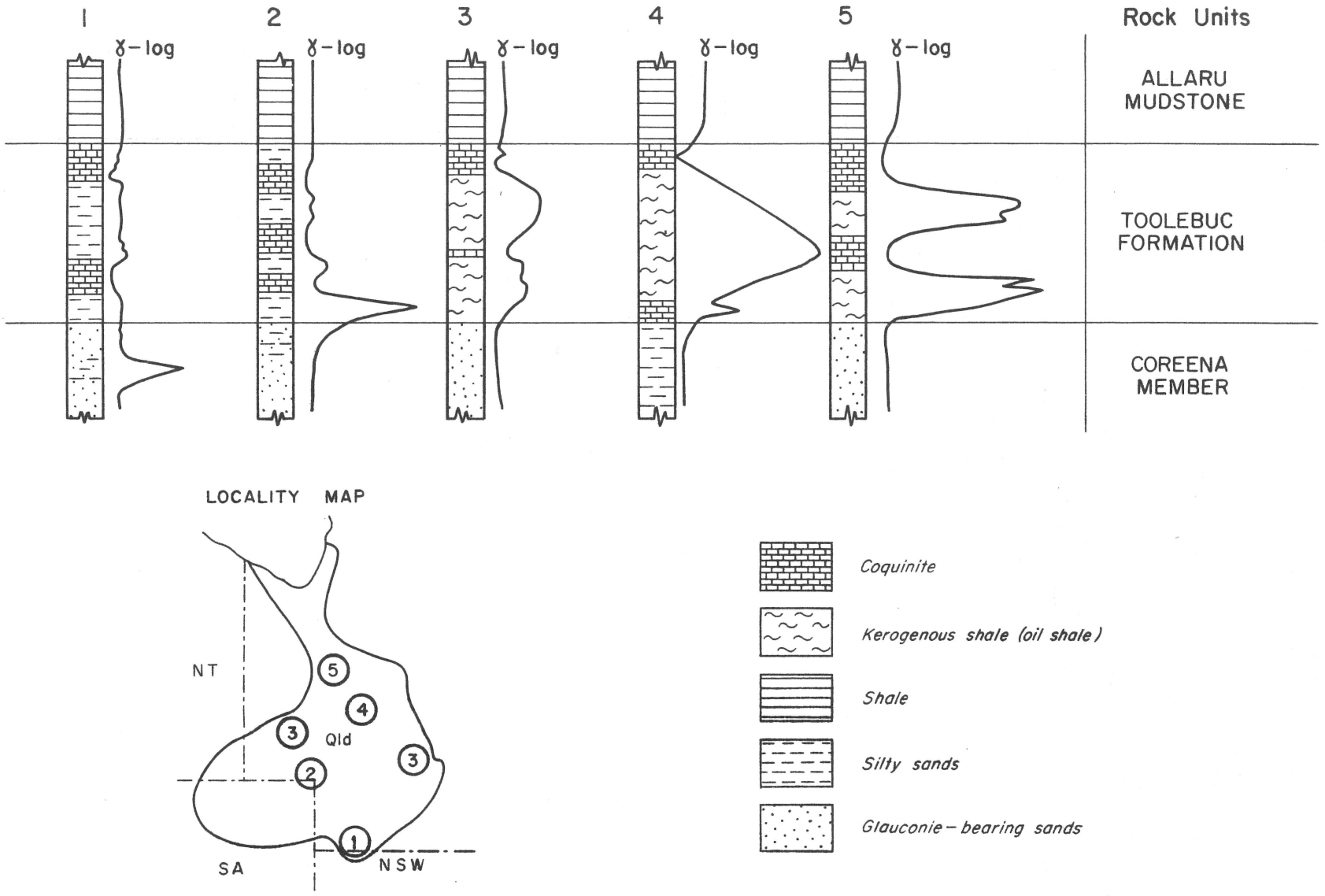

Fig. 1 Eromanga Basin, Gamma-ray anomaly correlation.

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- that where kerogenous shales (oil shales) have been proven they are associated with a gamma-ray anomaly; the reverse proposition is not true for the whole basin, as the anomaly below the Toolebuc Formation equivalent "Urisino beds" in the southern part of the basin demonstrates (Fig. 1), and

- that the intensity of the gamma-ray opposite kerogenous shales (oil shales) does not bear a simple relationship to oil-shale grade.

The great areal extent of the gamma-ray anomaly is thought to be evidence for widespread partial and intensive reducing conditions (during the deposition of upper Coreena Member equivalent in the south; the Wooldridge Limestone Member in the southwest and the Toolebuc Formation in the north) suitable for fixation of soluble radioactive matter into insoluble minerals as well as for preservation of organic matter constituting the bulk of the oil shale component of the Toolebuc Formation.

Acknowledgements

This abstract is published with permission of the Director, Bureau of Mineral Resources, Geology & Geophysics, Canberra. Support of this research was provided under the National Energy Research Development and Demonstration Programme administered by the Commonwealth Department of National Development and Energy.

References

BURGER, D., 1980 - Palynology of three N.E.R.D.D.C. stratigraphic bores in the Eromanga Basin (Preliminary Report). Bur. Miner. Resour. Aust. Rec. 1981/32.

OZIMIC, S., 1982 - Depositional environment of the oil shale-bearing Cretaceous Toolebuc Formation and its equivalents, Eromanga Basin, Australia: Proceedings, 15th Oil Shale Symposium, Golden, Colorado, U.S.A. Colorado School and Mines (in press).