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BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

Record 1980/5

MCARTHUR BASIN RESEARCH

DECEMBER QUARTER, 1979

K.A. Plumb (Coordinator)

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PRINCIPAL RESULTS

- (1) Sulphide mineralisation in DDH BMR 4 postdates vadose alteration and later silicification.
- (2) Pseudomorphs after trona and shortite have been provisionally identified in the Lynott Formation and Balbirini Dolomite.
- (3) Despite adverse weather conditions, all sites planned for the 1979 magneto-telluric survey were occupied.

PUBLICATIONS

The following manuscripts were submitted for publication during the quarter:

JACKSON, M.J., 1980. Shallow-water and evaporitic carbonates of the Proterozoic McArthur Basin, N.T. 4th Australian Geological Convention, Geological Society of Australia, Hobart, Abstracts.

MUIR, M.D., in prep. Palaeontological evidence for the early Cambrian age of the Bukalara Sandstone, McArthur Basin, N.T. BMR Journal of Australian Geology & Geophysics.

GEOLOGY

M.J. Jackson (Task Leader), K.J. Armstrong, M.D. Muir.

Samples from the 1979 field season were sorted, slabbed, and despatched for petrological preparation and for mineralogical and chemical analysis.

Studies of drillcore material

EMR Bauhinia Downs 4 was re-examined and sampled.

Textures show considerable evidence for early vadose alteration of the carbonates, which has produced a considerable amount of vuggy porosity. Later silicification of the Looking Glass Formation has created additional porosity and permeability and the sulphide mineralisation postdates this porosity and permeability. Hydrocarbons have wept from many of the bitumen-filled vugs during storage, indicating the presence of a mobile phase (MDM).

Australian Geophysical drillholes MA1 and MA2, drilled in the Mountain Home area during 1966, were inspected at the Department of Mines, Darwin. Although shown as intersecting only Amelia Dolomite in the company report, the sequence includes Amelia Dolomite (0-95 m), Mallapunyah Formation (95-170 m), and the upper part of the Masterton Formation (170-224 m total depth). The Amelia Dolomite contains several beds of chertified Conophyton overlain by intraclast dolarenite. It is therefore similar in thickness and character to the Amelia Dolomite in the Mallapunyah area, 60 km to the southwest. Although the underlying Mallapunyah Formation is similar in lithology to outcrops in the Mallapunyah area, it is much thinner (80 m versus 140m); this was suspected during mapping of the poorly exposed sequences in the Mountain Home area during 1979 (MJJ).

Evaporite minerals

Pseudomorphs after trona (hydrous sodium carbonate) and shortite (sodium calcium carbonate) have been provisionally identified in the Lynott Formation and Balbirini Dolomite.

During a visit to the South Australian Mines Department during October, Jackson and Muir inspected DDH Byilkaoora No. 1, which penetrated a thick sequence of Cambrian carbonates with abundant pseudomorphs after trona and shortite, in the Officer Basin of South Australia.

Pseudomorphs of acicular crystals 2 mm thick, and forming rosettes up to 2 cm in diameter, were collected from the Lynott Formation during 1978 by K. Plumb; these appear to be identical to the trona pseudomorphs of the South Australian Cambrian carbonates. Slightly irregular elongate rhombic pseudomorphs are present in pink mudstone in the lower part of the Balbirini Dolomite, and had been tentatively identified as polyhalite. However, they are morphologically identical to the shortite moulds seen in the South Australian Cambrian carbonates.

These new findings are of significance in environmental reconstructions because trona and shortite are restricted, in modern environments, to non-marine lacustrine sequences. The most famous of these is the Green River Formation of U.S.A., where trona and shortite occur in lacustrine evaporitic cycles associated with thick euxinic oil shales. The Lynott Formation contains abundant euxinic black shale sequences, below the supposed trona occurrence. These provisional identifications will be confirmed by appropriate laboratory measurements.

GEOPHYSICS

MAGNETO-TELLURICS (A.G. Spence (Task Leader), J.P. Cull, B. Liu,
J. Whatman.

All 17 sites which had been planned for the 1979 season were occupied during October and November. These were in two main areas:

- (1) Relatively closely-spaced sites along the detailed gravity line measured during 1979, extending westwards from Bauhinia Downs homestead and then southwest, to the Carpentaria Highway near Tanumbirini homestead (see Fig. 2, September Quarterly Report, Record 1979/82);
- (2) Widely spaced sites along the Carpentaria Highway, as far west as Daly Waters.

The first line is designed to supplement gravity in determining the deep structure of the Bauhinia Shelf, and the second line will supplement the crustal seismic survey.

The quality of data was generally acceptable, despite extreme weather conditions, although three of the sites were affected by thunderstorms.

No results are available yet. No inversions or interpretation will be carried out until the data has been screened on the office computer. This processing will commence in early 1980.

GRAVITY (W. Anfiloff)

The 1979 field season added a further 750 readings to the detailed profile across the McArthur Basin (Fig. 2; September Quarterly Report, Record 1979/82). Computer processing of this new data is in progress and the gravity profiles should be available by February, 1980, when geological interpretation of these and the 1978 profiles will commence.