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THE GEOLOGY OF THE OFFICER BASIN

by

Graham Walter Krieg[1] & Michael James Jackson[2]

1 Assistant Senior Geologist, Regional Mapping Section, Department of Mines, South Australia.
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INTRODUCTION

Parts of the Officer Basin have been mapped recently: the Western Australian portion by a combined Geological Survey of Western Australia - Bureau of Mineral Resources party; and the South Australian portion by a South Australian Mines Department team. The preliminary results indicate significant differences in the geological history of the 'basin' in the two states; so the two parts are described separately. In fact, it now appears evident that a more meaningful redefinition, subdivision, or restriction of the vaguely used term 'Officer Basin' will be warranted in the near future; though this is beyond the scope of this paper.

The rock units are currently being defined in accordance with the Australian Code of Stratigraphic Nomenclature (Geol.Soc.Aust., 1964). An attempt is made (Fig. 2) to combine for the first time all these names on a correlation diagram.

THE OFFICER BASIN IN SOUTH AUSTRALIA (GWK)

GENERAL

The South Australian part of the Officer Basin is a large intracratonic depression with a thick Adelaidean (Upper Proterozoic) to Palaeozoic sediment fill, which underlies the Great Victoria Desert in the northwest of South Australia. To the north the basin is sharply bounded by the Musgrave Block, to the northeast it is overlapped by the Great Artesian Basin, to the south by the Tertiary Eucla Basin, and to the southeast, where the basin sediments lap onto the Gawler Block, by the Great Artesian Basin and possibly the Permian Arckaringa Basin. It is approximately 500 km long and 200 km wide. It reaches a maximum depth to magnetic basement of 5000m, possibly more, along the keel. The main trough of the basin is arcuate in plan, trending from WNW in the west to ENE in the east (Fig. 1b).

Structurally, the basin, on present geophysical evidence, is interpreted as a graben or half-graben, deepest near its faulted northern margin and shallowing southeast towards the Gawler Block. Recent unpublished seismic work together with a reinterpretation of magnetic/gravity data strongly suggests that part, at least, of the northern margin, near the eastern end of the basin, is a low-angle overthrust (Milton, South Australian Mines Dep., pers. comm.). A northeast-trending hinge zone has been recorded along the southeastern flank of the basin (Wopfner, 1969b), where gradient of the magnetic basement changes at about the 1000 m contour (e.g., Thomson, 1970).

The general basin configuration is similar in many ways to that of the Amadeus Basin, which flanks the Musgrave Block to the north (Wells et al., 1970); and the two are probably related in a general geotectonic sense, crustal instabilities having had similar effects in each area.

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EXPLORATION HISTORY AND IMPORTANT LITERATURE

Exploration in the Officer Basin of South Australia may be viewed in three parts: the pioneer and reconnaissance work up to 1964, more detailed company exploration between 1960 and 1969, and systematic regional mapping at 1:250 000 scale, and related work, by the Geological Survey of South Australia, which began in 1966 and is continuing.

Brown (1905) and Jack (1915) first suggested an Ordovician age for the sandstones at the eastern end of the basin and presented a regional geology of the area. Apparently there were no further geological reports until Wilson (1952) discussed and named the Chambers Bluff Tillite. Sprigg, Wilson, & Coats carried out a brief mapping program in 1953 which resulted in the publication of <u>Indulkana</u> 1:63 360 (1955), <u>Chandler</u> 1:63 360 (1956) and ALBERGA 1:253 440 (1959) geological sheets.

An airborne magnetometer survey in 1954 (Quilty & Goodeve, 1958) and a gravity and magnetic survey in 1960 (Mumme, 1963) established the presence of a deep sedimentary basin beneath the Great Victoria Desert, and thereafter petroleum exploration expanded. Sprigg & Wilson (1958) discussed the tectonics of the 'Musgrave Mountain Belt' with a 'trough of marine sediments' along the southern margin and compared this trough with the 'Amadeus Trough' to the north. Other relevant work is recorded by Wopfner (1961), Johnson (1963), Coats (1963), Thouvenin (1964), and Webb (1964, 1965).

Exoil began a major petroleum exploration program in 1960 and Continental Oil Company (Australia) continued this work after 1966. Their activities included further studies of surface geology (e.g., Shiels, 1960; Harrison, 1966), but the subsurface exploration yielded the most significant information. A seismic traverse demonstrated an east to west deepening of the more southerly part of the basin (Bowman & Harkey, 1962), and Emu No. 1 (Grasso, 1963), interpreted at the time as having penetrated an Adelaidean (Upper Proterozoic) sequence, was the first stratigraphic well in the Officer Basin. A major advance in the understanding of the general basin configuration resulted from an aeromagnetic survey

(Steenland, 1965) from which a magnetic basement contour plan was produced. Subsequent seismic surveys (Moorcroft, 1969; Shorey, 1966; Raitt & Bowman, 1967) confirmed the broad magnetic basement trends and located drilling targets for the only two deep stratigraphic wells in the area - Birksgate No. 1 (Tauer, 1967) and Munyarai No. 1 (Continental Oil Company, 1969). The Birksgate No. 1 section was interpreted as mainly Adelaidean, but Munyarai No. 1 bottomed in probable Devonian shales. Meanwhile the shallow stratigraphic well Officer No. 1 (Krieg, 1967; Lindsay, 1967) provided further useful subsurface information.

A report for Murumba Oil N.L. (Packham & Webby, 1969) argued a Silurian or younger age for the eastern Officer Basin and a helicopter gravity survey for the same company suggested possible overthrusting of the basement along the northern margin of the basin (Nettleton, 1970).

Since 1966 the Geological Survey of South Australia has maintained a regional mapping program which has resulted in the publication of BIRKSGATE 1:250 000 Geological Sheet (Major, 1971) and the compilation of map sheets for the remainder of the area. EVERARD and LINDSAY Sheets are to be published soon. Other relevant work by the GSSA includes a detailed description of the probable Middle Cambrian Observatory Hill Beds (Wopfner, 1969a), a summary of the depositional history and tectonics of South Australian sedimentary basins (Wopfner, 1969b), a synthesis of all eastern Officer Basin data (Krieg, 1969), a report on a 'dense Lower to Middle Palaeozoic dolomite' along the southeastern flank of the basin (Milton & Thornton, 1970), and explanatory Notes for the EVERARD 1:250 000 Sheet area (Krieg, 1972). Seismic work at the eastern end of the basin is continuing.

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STRATIGRAPHY

Proterozoic (Adelaidean)

The oldest part of the basin fill is an Adelaidean (Upper Proterozoic) succession of sandstone, siltstone, tillite, basic volcanics, and carbonate rock, which is exposed intermittently along the northern margin of the basin (Fig. 1a). Where exposed these rocks are strongly folded or infolded with the crystalline basement, but whether the folding in confined to the margin or general throughout the basin is unknown, as these rocks have not been penetrated in the stratigraphic wells drilled so far. Seismic evidence from the Birksgate No. 1 locality suggests an almost flat-lying sequence.

Palaeozoic (east of 131°E)

Unconformably overlying the Adelaidean rocks is a thick Palaeozoic succession, gently folded into a broad syncline with some strong local deformation near crystalline basement. Although the ages of the various Palaeozoic units have not been established with certainty the following interpretation (after Wopfner, 1969a) seems the most likely when the available data are viewed in regional context.

Palaeozoic deposition began in Middle Cambrian time under generally unstable tectonic conditions and led to the formation of greywacke sandstones and siltstones with interbedded carbonate and chert (Observatory Hill Beds - Wopfner, 1969) overlain disconformably by red, feldspathic and micaceous sandstones and siltstones (Trainor Hill Sandstone - Krieg, 1972). These two units intertongue with the Mount Johns Conglomerate (Krieg, 1972) at the northeastern extremity of the syncline. The Observatory Hill Beds disappear to the south beneath younger cover and so the nature of the southern margin of the unit is unknown.

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After a minor regression, sedimentation resumed during Early Ordovician time in a different depositional environment. Four conformable units overlap the older units to the north. The lowermost, the Mount Chandler Sandstone, is a mature quartz arenite with a characteristic 'piperock' structure in its upper part produced by an abundance of <u>Scolithus</u> and <u>Rhizocorallium</u>-type burrow casts; the second, the Indulkana Shale, is a thin red and green shale of limited extent; the third, the Blue Hills Sandstone, is a slightly clayey quartz arenite characterized by very large-scale current bedding; and the uppermost, the Cartu Beds, consists of Kaolinitic sandstone and green biotitic sandstone and siltstone. The Cartu Beds are very tentatively thought of as Middle or Upper Ordovician.

The final phase of Palaeozoic deposition began in Devonian time following a period of gentle folding that affected Ordovician and older sediments. This phase is marked by a return to unstable conditions that culminated in rapid subsidence during Early Carboniferous time. The Devonian sediments are characteristically arkosic and micaceous, rather poorly sorted sandstones and siltstones or dark grey micaceous dolomitic shales in the distal basin areas as intersected in Munyarai No. 1 stratigraphic well (Continental Oil Company of Australia Ltd, 1969). The overlying Carboniferous deposits are synorogenic conglomeratic feldspathic greywackes composed of fresh, rapidly buried debris from the Musgrave Block as intersected in Officer No. 1 (Krieg, 1967).

<u>Palaeozoic</u> (west of 131°E)

To the west, in the Birksgate area, the Palaeozoic sequence is somewhat different. The oldest exposed unit, the Wirrildar Beds (Major, 1967), is a folded sequence of arkosic and micaceous clastics with dolomites, inferred as Lower Cambrian from field relationships. Whether the folding is restricted to the basin margin or is more widespread is unknown. The next unit, the Kulyong Volcanics (Major & Teluk, 1967), is a tholeiitic basalt, cropping out as a thin, flat-lying sheet over a small area, but very widespread and much thicker to the west in Western Australia where the unit is known as the Officer and Table Hill Volcanics. An inferred unconformity separates the Kulyong Volcanics from the Wirrildar Beds below. A Rb/Sr age of 550 m.y. (i.e. Lower Cambrian) has been obtained on them. A third unit, the Boongar Sandstone, a mature, friable quartz arenite with characteristic ?solution tubes, is exposed as low, flat-lying, isolated outcrops scattered over a wide area. It may be tentatively correlated with the Mount Chandler Sandstone (?Lower Ordovician) on the basis of lithology and regional distribution. However, Major (1971) considers the Boongar Sandstone to be the youngest of the Palaeozoic to Mesozoic rocks in the LINDSAY 1:250 000 Sheet area. Finally, the Wanna Beds are exposed along the Serpentine Lakes as somewhat clayey quartz arenite featuring large-scale current bedding. In the subsurface, the Birksgate No. 1 stratigraphic well (Tauer, 1967) successively penetrated a clayey sandstone (Wanna Beds), a red micaceous, feldspathic sandstone known as the Lennis Sandstone in Western Australia which may be correlated with the ?Upper Cambrian Trainor Hill Sandstone, and finally an oolitic limestone - grey shale - arkosic sandstone sequence which may possibly be correlated with either the Lower Cambrian Wirrildar Beds or the ?Upper Adelaidean Babbagoola Beds.

PETROLEUM POTENTIAL

The petroleum potential of the Officer Basin in South Australia cannot yet be reliably assessed. The stratigraphy and detailed structure are inadequately understood: there is little exposed section or stratigraphic drilling, few diagnostic fossils, and mainly only reconnaissance geophysics - altogether making any basin synthesis uncertain at best.

The Ordovician deposits are of special interest in petroleum exploration because their correlatives in the Amadeus Basin, notably the Pacoota Sandstone, bear hydrocarbons. In the Officer Basin, however, these rocks have not been penetrated in the stratigraphic drilling, so their hydrocarbon potential has yet to be tested.

Perhaps the most encouraging exploration work to date comes from Munyarai No. 1, sited on a seismically defined anticline previously located by reconnaissance aeromagnetic and seismic surveys. The well intersected 2900 m of Devonian sandstone and shale, fairly reliably dated by fossils, without reaching the base of this sequence. Detailed gravity/magnetic surveys followed up by seismic profiling are now required to locate further drilling targets, and deep stratigraphic drilling penetrating the complete Palaeozoic section is needed to make a proper basin study. The possibility of stratigraphic as well as structural traps and the physical characteristics of the basin may then be examined.

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THE OFFICER BASIN IN WESTERN AUSTRALIA (MJJ)

GENERAL

The Western Australian part of the Officer Basin underlies about 250 000 km^2 of the sparsely populated area known as the Gibson and Great Victoria Deserts (Fig. 1a). It is a poorly delineated, northwesterly trending structural depression, containing a little-known sequence of essentially undisturbed Proterozoic and Phanerozoic rocks that lies between the Yilgarn Block to the southwest and the Musgrave Block to the northeast (Fig. 1b). Although the margins are seldom seen on the surface the basin is slightly arcuate in plan and is some 800 km long by 200 km wide. Its trend is easterly to northeasterly as it continues eastward into South Australia. Its northwest margin towards the Canning and Bangemall Basins is hidden by younger deposits.

A Bureau of Mineral Resources party in 1972 recorded a series of combined reflection and refraction profiles along a line from Cosmo Newberry towards Warburton Mission (Fig. 1b, line AB). Preliminary interpretation indicates that the sedimentary sequence in the basin is about 5000 m thicker than suggested from previous work. The sequence of sediments, probably largely Proterozoic, is about 10 000 m thick near the centre of the basin, but may thin significantly near Lake Throssell. Throughout most of the basin the older rocks are completely concealed by the overlying Phanerozoic rocks and recent soil, so very little is known of this thick Proterozoic section.

BASIN DEFINITION

The following mainly arbitrary boundaries for the Officer Basin in Western Australia are used here (from Lowry, Jackson, van de Graaff, & Kennewell, 1972).

1. The Warri Gravity Ridge in the north, separating the Officer from the Canning and Amadeus Basins.
2. The base of the Townsend Quartzite in the northeast.
3. The northern limit of the Tertiary deposits of the Eucla Basin, as these sediments conceal the southern boundary.
4. The extent of the continuously preserved Permian deposits in the west and southwest, separating the Officer Basin from the Yilgarn Block and Bangemall Basin.

These boundaries are genetically and structurally inconsistent. However in the absence of more reliable information the adopted boundaries broadly delineate an area of thick sedimentation. BMR seismic and detailed gravity survey results are currently being processed and may provide more reliable information on the southwestern limit of the basin. The results from an aeromagnetic survey planned by BMR for 1973 may also provide data on the basin margins.

EXPLORATION HISTORY AND IMPORTANT LITERATURE

The earliest recorded geological investigation of the Officer Basin is that by Talbot & Clarke in 1916, who made a traverse from Laverton northeast across the desert to the South Australian border. They produced a comprehensive report containing information on the physiography, geology, geography, and water supplies (Talbot & Clarke, 1917) which, until 1972, represented the only publication dealing with the whole area in some detail. Parts of this desert area were mapped in the 1950's as part of a general increase in oil-search activity. Utting (1955) and Leslie (1961) mapped parts of the area but did not publish their results.

The first major geophysical surveys were done by BMR between 1960 and 1962 in the Gibson Desert. Aeromagnetic, seismic, and regional gravity surveys confirmed the existence of a thick sedimentary sequence west of the Musgrave Block. Turpie (1967) reviewed these results. Wells (1963) worked with the regional gravity party in the Gibson Desert and produced a geological map of the area and an unpublished report.

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The Hunt Oil - Placid Oil - Exoil Consortium undertook a major program of petroleum exploration between 1961 and 1966. They concentrated their effort in the area southwest of Warburton, which they considered was the deepest part of the basin. Reconnaissance aeromagnetics in 1961 was followed by a major gravity survey and detailed seismic surveys between 1963 and 1965, culminating in stratigraphic drilling in 1965 and 1966. The interpretation of the drilling results led to the suspension of operations. Four shallow test wells (maximum depth 614 m) and one stratigraphic well (990 m deep) were drilled. Minor traces of oil and gas were encountered in the Proterozoic Browne Beds in Browne Nos 1 and 2; no other oil or gas shows were observed in either surface or subsurface rocks. P. Jackson (1966) wrote a comprehensive unpublished review of the exploration program and synthesized the known geology and geophysics on several small-scale maps in the report.

Additional aeromagnetic and geological surveys were done in the northern part of the basin as part of other petroleum exploration programs (Mack & Herrmann, 1965; Lynch, 1965; Wilson, 1967), but none of the reports were published.

Systematic mapping, stratigraphic drilling, seismic, regional gravity, and detailed gravity surveys were done by BMR in conjunction with the Geological Survey of Western Australia between 1970 and 1972. The results of this work will be recorded on twenty geological maps at 1:250 000 scale with accompanying explanatory Notes, and in a Bulletin synthesizing the geology of the basin. The results of the 1971 geological mapping program were published (Lowry et al., 1972).

STRATIGRAPHY

General

The widespread mantle of Holocene superficial deposits, the horizontal attitude of the extensive Mesozoic and Palaeozoic cover, and a lack of reliable age dating renders knowledge of the stratigraphy very fragmentary. Basically, however, the sediment fill of the basin can be conveniently grouped into three ages - (1) Proterozoic, (2) Lower Palaeozoic, and (3) Upper Palaeozoic and younger.

Proterozoic

Rocks of Proterozoic age constitute the bulk of the sedimentary pile throughout the basin in Western Australia. Between Cosmo Newberry and Warburton Mission, where recent seismic and gravity information is available, the basement in the main trough appears to be about 10 000 m deep. This contrasts with previous geophysical information (Jackson, 1966), which indicated that the main trough was about 5000 m deep (see section on Basin Structure). Hunt Oil wells Browne 1, 2, Yowalga 2, BMR wells Talbot 1 to 5, outcrops along the southern margin of the Musgrave Block, and diapiric intrusions provide the only geological information on the 8000 to 9000 m sequence that fills this deep depression. Yowalga No. 2 penetrated 143 m of sandstone, siltstone, shale, and dolomite (Babbagoola Beds) underlying the Lower Cambrian Table Hill Volcanics. Primitive microfossils suggest a Proterozoic to Early Cambrian age. Browne Nos 1 and 2 were drilled on diapiric structures and intersected interbedded dolomitic limestone, calcareous shale, anhydrite, and gypsum (Browne Beds). Minor oil and gas shows were found in cores from both holes. The stratigraphic level of the Babbagoola Beds and Browne Beds within the Proterozoic section and their inter-relationships are unknown.

Along the southern margin of the Musgrave Block, stretching from Warburton Mission to the South Australian border (Fig. 1a), is a poorly exposed strike belt of shallow south-dipping sediments, possibly Adelaidean in age, that collectively are about 5000 m thick. Neritic to fluviatile sandstone and siltstone (Townsend Quartzite and Lefroy Beds) overlain by fluvioglacial rocks (Lupton Beds) constitute the lower 800 m. These are overlain by an unknown thickness of claystone, siltstone, and sandstone (intersected by BMR Talbot 3, 4, and 5), which in turn is overlain, about 2000 m higher up in the sequence, by arkosic and feldspathic sandstone. Except for the glacial beds these rocks are broadly correlatable with similar units exposed in South Australia, in an equivalent stratigraphic position.

The Woolnough Hills and Madley diapirs, in the northwest of the basin (Fig. 1a), contain evaporitic core material flanked by stromatolitic dolomite, siltstone, and sandstone of unknown age. At the surface the diapirs intrude Permian and younger sediments. The evaporitic core material may be stratigraphically related to the evaporite-bearing, Lower Palaeozoic, Carribuddy Formation of the Canning Basin or to the Proterozoic Browne Beds 220 km to the southeast.

East-striking sediments intruded by basic sills and dykes (minimum age of 1050 m.y.), forming part of the Bangemall Basin sequence, crop out extensively to the west of the Officer Basin in the area between Lake Carnegie and Lake Disappointment (Fig. 1). The thickness and easterly extent of these rocks beneath the western part of the Officer Basin and their stratigraphic and structural relationships to the Proterozoic units described above are largely unknown at present. However, it seems likely that these slightly folded, shallow marine deposits could constitute a large proportion of the basin in this western area at least.

Lower Palaeozoic

Three Lower Palaeozoic units with a combined thickness of about 1000 m crop out in the southeastern part of the basin both in Western Australia and South Australia (Fig. 1a). The oldest unit, variously termed the Officer, Table Hill, or Kulyong Volcanics, is a widespread tholeiitic basalt about 100 m thick, that crops out intermittently, and can be traced seismically, throughout much of the basin in Western Australia. It crops out in South Australia only on the western part of the Birksgate 1:250 000 Sheet area. It is the only known lithologically and seismically distinct isochronic marker horizon in the basin. Recent isotopic dating (Compston, 1973, in prep.), indicates a minimum age of 550 m.y. (Early Cambrian) which contrasts with the 1000 m.y. assigned to it by P. Jackson (1966). Both in outcrop and seismic sections the volcanic layer is separated from the underlying rocks by an angular unconformity; it therefore effectively delineates the Phanerozoic fill of the Officer Basin from the underlying Proterozoic fill. As the volcanics have not been recorded deeper than about 1500 m, the Western Australian Palaeozoic section is much thinner than its equivalent in South Australia.

The basalts are unconformably overlain by shallow-marine subtidal to littoral sandstone and siltstone about 500 m thick (Lennis Sandstone and Wanna Beds). The sandstones are moderately to well sorted and porous; they would be a suitable reservoir rock. Their age is unknown, but they fall within the range Cambrian to Carboniferous. These two formations were penetrated by Continental Oil Birksgate No. 1 well between 34 and 501 m.

Upper Palaeozoic and Younger

A complex suite of fluvial, glacial, and lacustrine deposits of Sakmarian age (Paterson Formation) and fossiliferous Aptian shallow marine rocks (Samuel Formation and Bejah Claystone) form a flat-lying cover, up to about 600 m thick, over much of the area. These rocks are continuous and identical with similar units in the southern Canning Basin. Lateritic and siliceous profiles have developed on them since the Cretaceous. Cainozoic aeolian, alluvial, and colluvial material forms a thin layer over about 80 percent of the whole area of the Officer Basin.

STRUCTURE

Basin Structure

P. Jackson (1966, figs. 16 to 20), combining aeromagnetic, gravity, and seismic interpretations, concluded that the basin was 'an asymmetrical graben basin aligned NW-SE with the deeper portion along the northeast flank' (idem, p. 54). He delineated and named a number of infra-basinal structural divisions based primarily on the inferred amount of sediment present, e.g., Talbot Deep, Westwood Platform, and these have been adopted on the Tectonic Map of Australia and New Guinea (Geological Society of Australia, 1971). The recent BMR seismic survey and geological mapping throw doubt on the credibility of this interpretation, in at least two areas. The basement profile between the Yilgarn Block and Musgrave Block, as indicated by the recent seismic results, contrasts markedly with that given by Jackson. Along this line the basin is a wide, relatively symmetrical trough with basement at about 10 000 m. The northeastern margin (near Warburton) is steeper than the southern, but there is now no evidence for a 5-km trough close to the Musgrave Block which gradually shallows towards the Yilgarn Block. Also, detailed geological mapping in the southwest corner of the Neale Sheet area established the presence of metamorphic and igneous rocks in outcrop, in the centre of Jackson's 2000 m deep Rason Basin (compare Figs. 1a & 1b). Figure 1b is a structural map of the basin based on the Tectonic Map of Australia and New Guinea. The depth to basement contours have not been modified to accord with this recent BMR information, as an aeromagnetic survey by BMR of the Western Australian part of the basin is planned for 1973, and it is expected that the results of this together with the recent gravity and seismic interpretation will cause substantial revision of the depth to basement contours throughout much of the basin in Western Australia.

Folds

Seismic interpretation indicates that the Proterozoic rocks are flat-lying to slightly folded except along the northeast margin of the basin, along the edge of the Musgrave Block, where the Townsend Quartzite outcrop pattern suggests tighter folding. The Phanerozoic rocks are flat-lying and unfolded, but updoming of beds and piercement folds occur at Woolnough Hills, in the northeast of the Madley Sheet area (Madley diapirs), and in the southeast of the Browne Sheet area (Browne diapir). Evaporites form the cores of these structures

PETROLEUM POTENTIAL

The petroleum potential of the Officer Basin in Western Australia is thought to be small. Although suitable hydrocarbon traps are present (e.g., diapiric folds, broad anticlinal flexures), and likely reservoir beds occur (e.g. Lennis Sandstone), no suitable source rocks have been found and only minor oil and gas shows have been encountered during drilling. About 80 percent of the basin fill is probably Precambrian, but only a minute proportion of this is known from outcrop or drill core. Recent geophysical and geological work has cast considerable doubt on the previously accepted ideas concerning the structure of the basin. Hence, knowledge of the structure and history of the basin is still so inadequate that a reliable assessment of petroleum potential is not possible. Large unexplored areas containing Phanerozoic rocks occur in the basin, especially towards the South Australian border.

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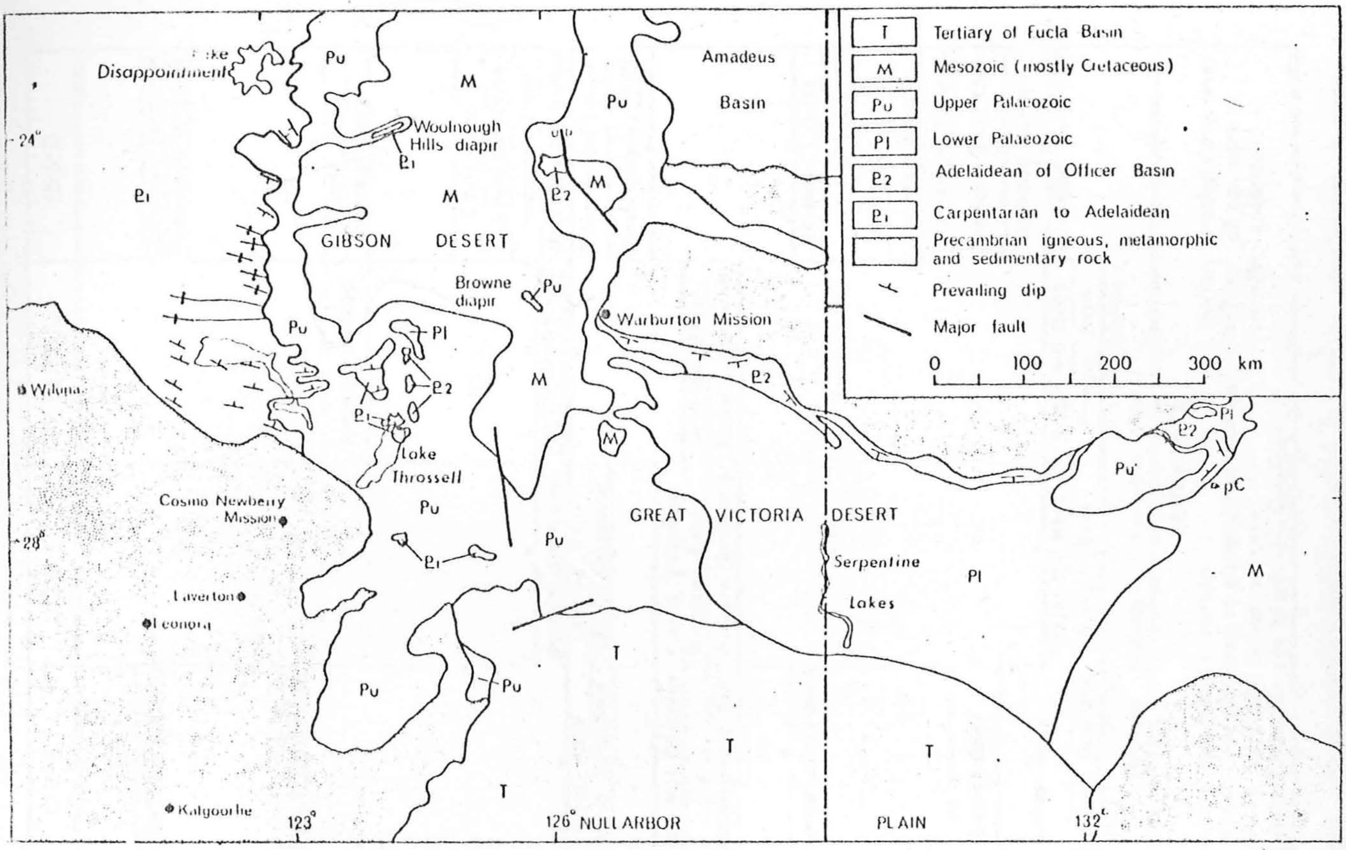

Fig 1a: Solid geology map of Officer Basin

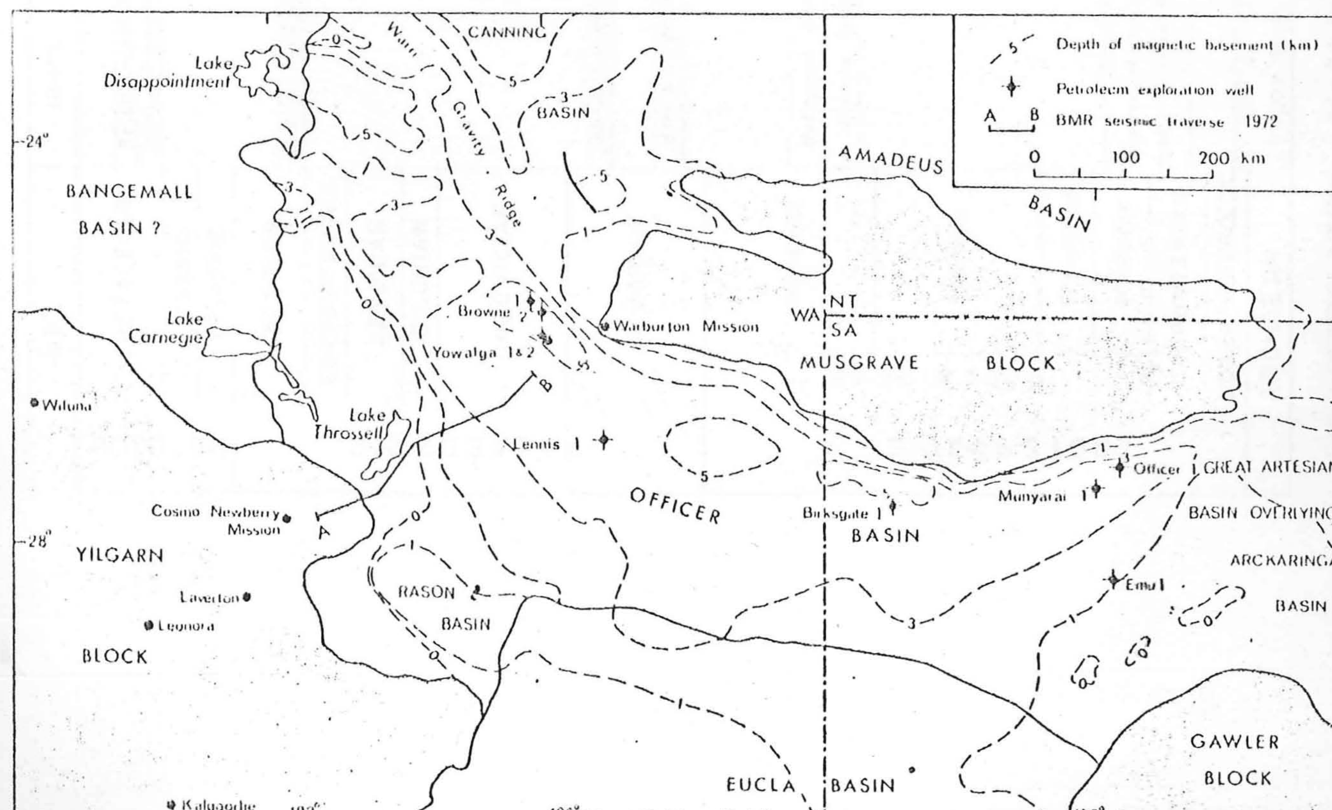

Fig 1b: Regional tectonic setting of Officer Basin (after Tectonic Map of Australia and New Guinea)

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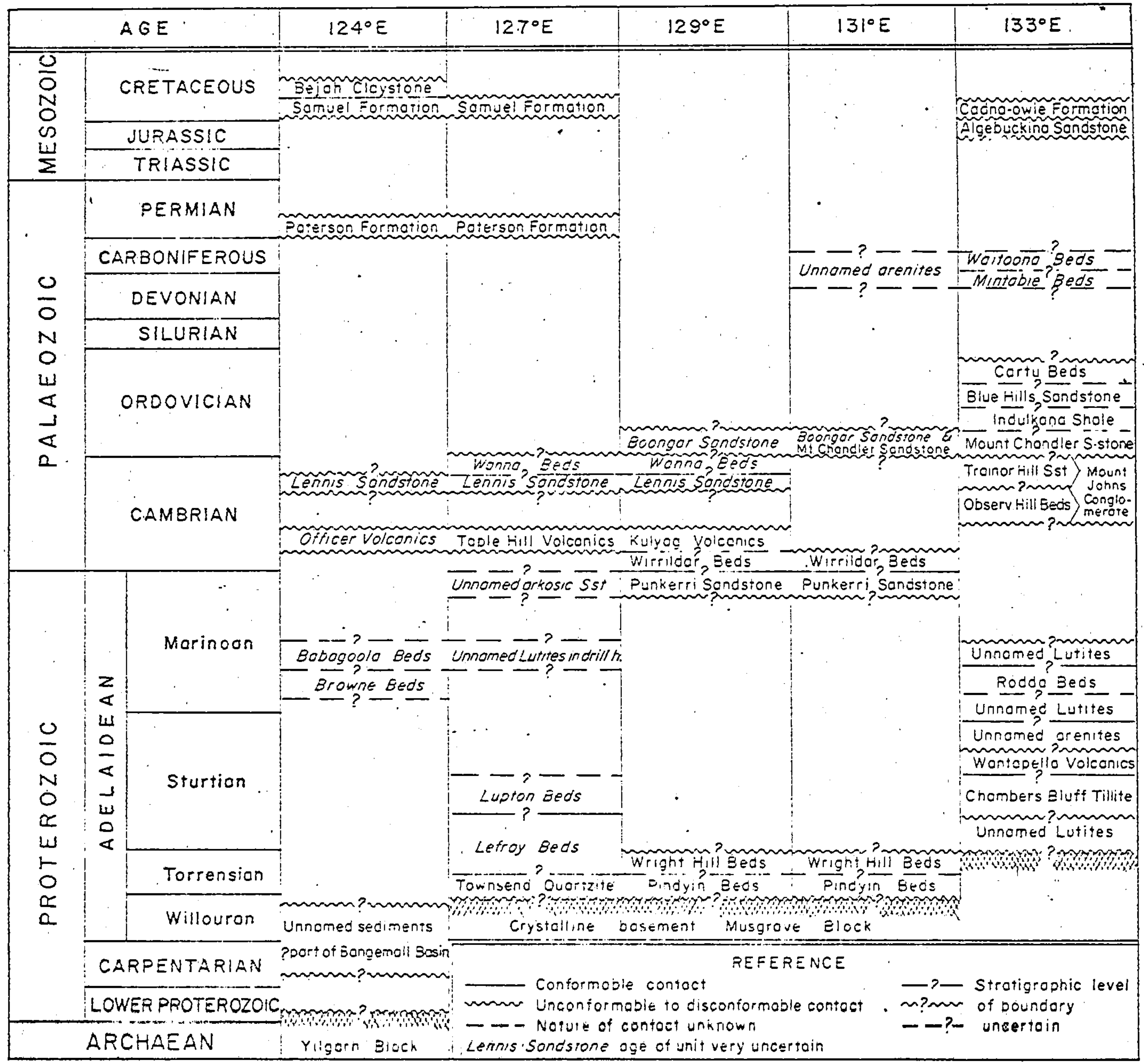

FIG 2-CORRELATION DIAGRAM OF STRATIGRAPHIC UNITS IN THE OFFICER BASIN

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