BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1984/19

RECORD

A palynological review of the Jurassic below the Injune Creek Group
in the Eromanga Basin, Queensland

BY

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and Energy

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10 April 1985

To: All recipients of BMR Record 1984/19 by D. Burger, entitled: "A palynological review of the Jurassic below the Injune Creek Group in the Eromanga Basin, Queensland."

The author's attention has been drawn to a number of errors in text and figures of BMR Record 1984/19, which are to be corrected as follows.

PAGE 7: Line 19 from top to read - "record which accentuate this level and seem to be of"

PAGE 9: Depths of various horizons in several deep wells to be changed as follows:

	Corfield 1	Brookwood 1	Boree 1	Bury 1	Balfour 1
base Injune Ck Grp	879.3	845.8	747.9	931.4	652.3
base member C	1002.8	910.7	898.8	1114.8	847.9
base member B	1085.1	--	978.2	1142.9	951.3
base member A	--	--	1022.8	1218.6	1035.6

All hundred meter markings in these wells have to be disregarded.

PAGE 9: Depths of various horizons in Dawson River Dr 12 to be changed as follows:

for	22.6	m	read	21.0	m
,	40.1	m	,	37.3	m
,	149.3	m	,	138.7	m
,	213.7	m	,	198.5	m

The 100m and 200m indicators in DRD 12 must be deleted.

PAGE 11: Depths of various horizons in several deep wells to be changed as follows:

	Gumbardo 1	Bury 1	Boree 1
base Injune Ck. Group	1283.1	931.4	747.9
base member C	1417.8	1114.8	898.8
base member B	1439.5	1142.9	978.2
base member A	--	1218.6	1022.8

Total depth of BMR Tambo 2 to be read as 68.3 m.

All hundred meter markings in these three deep wells to be deleted.

PAGE 12: Line 16 from bottom to read - "suggest a change at about 1003 m depth from a quartzose sandstone with"

PAGES 21-22: The column "DEPTH OF SAMPLE (metres)" in Table 2 to be amended as follows:

depth	corresponds with sample	
1176.8	MFP4061	(erroneously listed as 4601)
1213.5	MFP4017	
983.9	MFP3103	
917.4	MFP3095	
1139.9	MFP4060	
1073.5	MFP4059	
1033.0	MFP1167	
1366.7	MFP4141	
1914.8	MFP3881	
891.5	MFP2255	
1000.0	MFP4058	
64.0	MFP3987	
26.6	MFP3986	
1826.1	MFP3880	
62.8	MFP4344	

PAGE 23: Depths of samples from several deep wells in Table 3 to be changed as follows:

BALFOUR 1	swc	859.5
	swc	895.2
	swc	942.7
GUMBARDO 1	swc	1395.4
	swc	1436.8
CUMBROO 1	core	1942.5
BUDGERYGAR 1	swc	1469.2
	core	1507.2
GILMORE 1	core	1703.5
LEOPARDWOOD 1	swc	1647.7
QUILBERRY 1	core	1020.4
STAFFORD 1	core	1383.7

Most of these errors stem from use of an incorrect feet/metres conversion formula, and inexcusably remained undetected at various stages of text revision. Regrettably you have not been notified earlier as I have been away from office for three months. Please accept my sincere apologies for the confusion created and the inconvenience done to you personally.

Sincerely yours,

Dennis Burger

Record 1984/19

A palynological review of the Jurassic below the Injune Creek Group in the Eromanga Basin, Queensland

BY

D. BURGER

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ABSTRACT

As part of an ongoing analysis of the Early Jurassic depositional and environmental history of the Eromanga Basin, palynological evidence for the oil-bearing sequence below the Injune Creek Group in that basin is reviewed. In many drillholes in the eastern part of the basin this sequence includes three lithological intervals or "members". From their associations with Early and Middle Jurassic palynological intervals or units J1 to J4 it is suggested that lower arenaceous member A is Sinemurian?-Pliensbachian to Toarcian, intermediate argillaceous member B Toarcian, and upper arenaceous member C Toarcian to Bajocian in age.

Member A is palynologically correlated with the Precipice Sandstone and lower Evergreen Formation, member B with the Evergreen Formation, and member C with the upper Evergreen Formation and the Hutton Sandstone in the Surat Basin. In the northern part of the area of study only member C is identified as such, and locally may rest on strata which are of similar age as members A or B but have accumulated in a different environment.

INTRODUCTION

The Jurassic sequence of sandstone, siltstone, and mudstone below the Injune Creek Group in the Eromanga Basin has been referred to as the Hutton Sandstone by the BMR, the Geological Survey of Queensland, and petroleum exploration companies drilling in the basin, ever since this name was formally proposed by Reeves (1947) for the sandstone sequence between the Evergreen Formation and the Injune Creek Group in the northern Surat Basin (GSQ, 1960; Vine & others, 1965; Gregory & others, 1967; Senior & others, 1968, 1969, 1978; Exon & others, 1972; Exon, 1976; see also various references in Table 1).

Interest in the nomenclature of this sequence has been revived in recent years by oil strikes in South Australia (Poolowanna and Strzelecki fields in 1977, Merrimelia field in 1981) and Queensland (Jackson field in 1981), and during a special symposium on the Eromanga Basin (Adelaide, November 1982) under the joint sponsorship of the Petroleum Exploration Society of Australia and the Geological Society of Australia several authors referred to the existence of discrete rock units below the Injune Creek Group in the central and south-western portions of the basin (Gravestock, 1982; Armstrong & Barr, 1982; Wiltshire, 1982; Senior, 1982). During her work in the

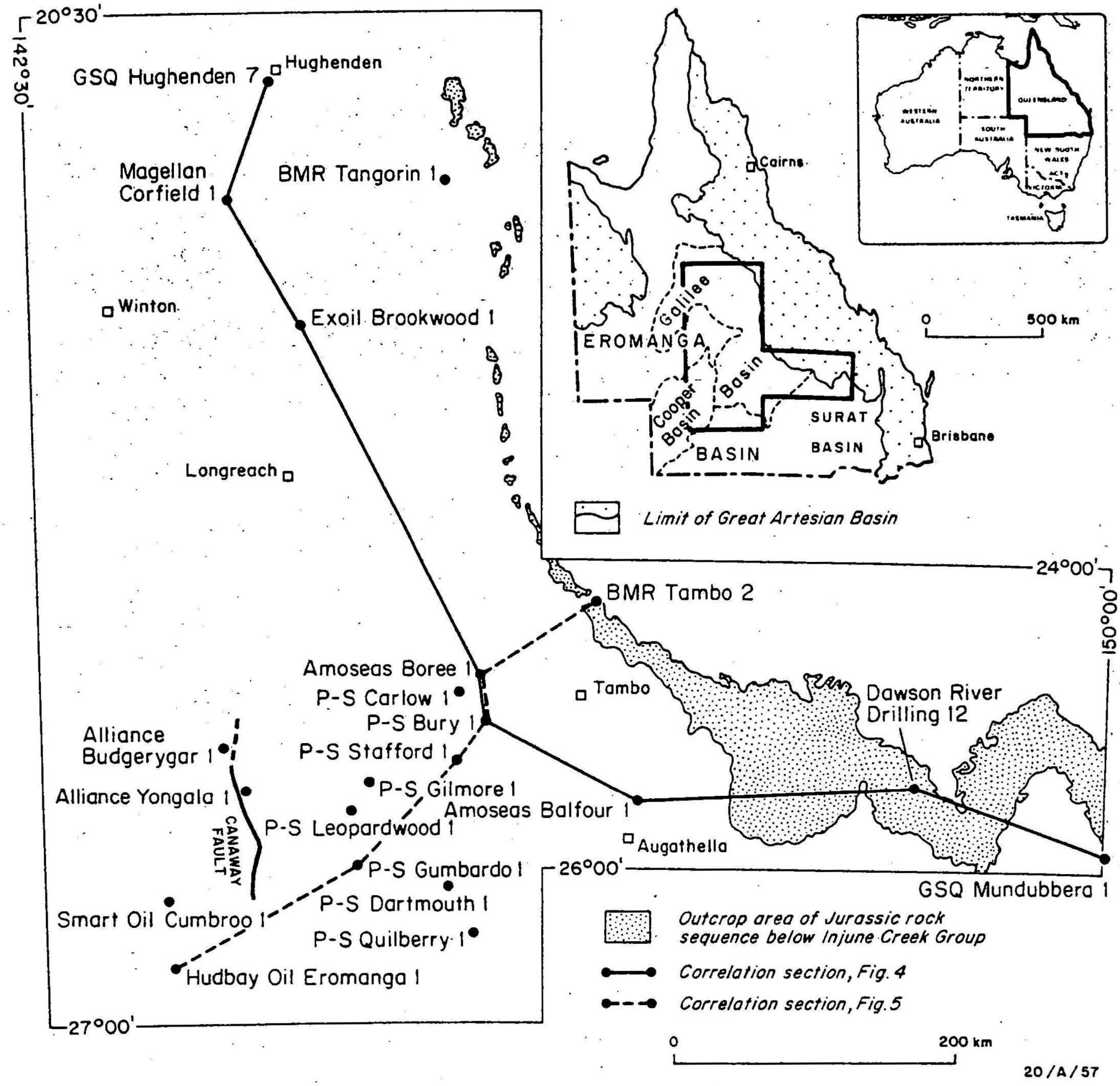

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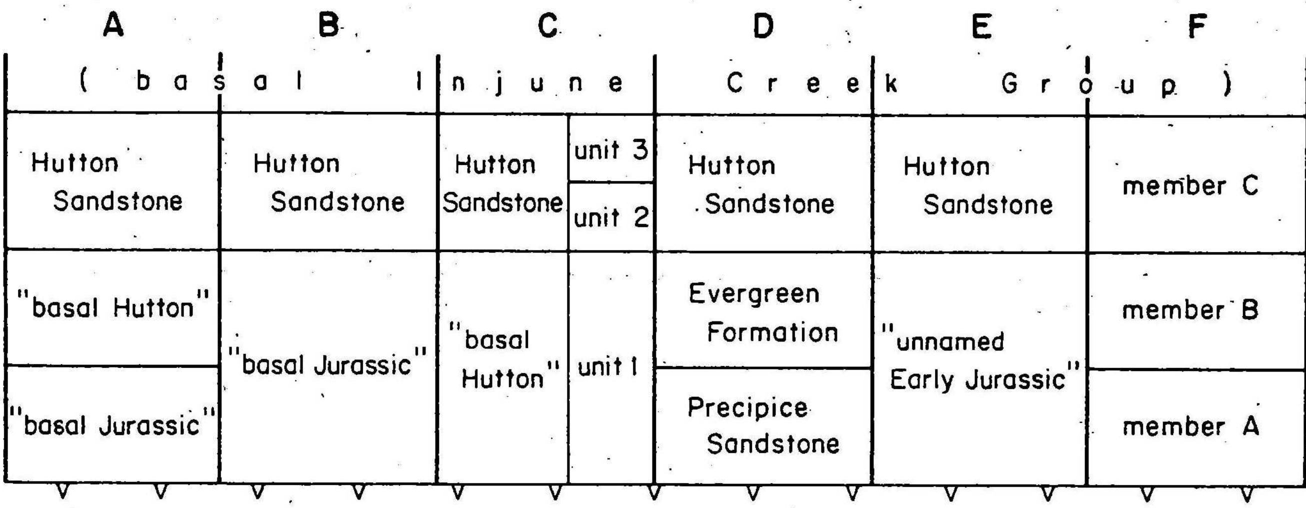
Figure 1. Eastern Eromanga Basin: outcrop of Lower to Middle Jurassic sedimentary formations. Locations of drillholes reviewed in study area



A. southwestern Eromanga Basin (Armstrong & Barr, 1982; Wiltshire, 1982)

B. southwestern & central Eromanga Basin (Ambrose & others, 1982)

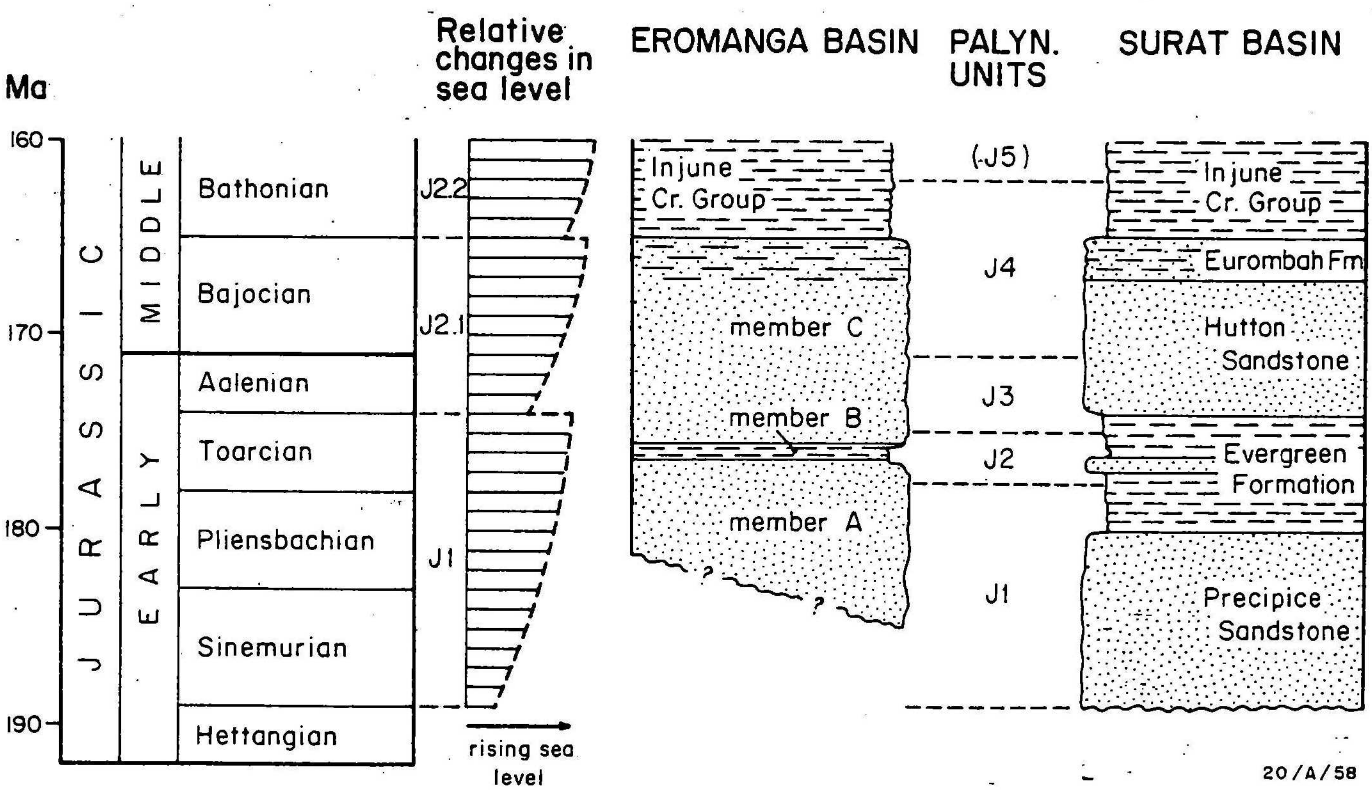
C. southwestern Eromanga Basin (Gravestock, 1982)

D. central Eromanga Basin (Senior, 1982)

E. GSQ Eromanga 1 corehole (Almond, 1983)

F. eastern Eromanga Basin (this report)

Figure 2. Lithological intervals identified below the Injune Creek Group (no correlations are implied)



Record 84/19 Figure 3. Palynological correlation of Jurassic rock intervals and their suggested link with global sea level movements

Jurassic of the central and eastern Eromanga Basin (Fig. 1) Virginia Passmore of the BMR came to the same conclusion, and recent drilling in the same area confirmed this (Almond, 1983).

Various informal nomenclature schemes currently in use appear to define consistently three lithological intervals within the sequence in question, both in South Australia and Queensland (Fig. 2), and thus seem to imply that certain Early Jurassic events took place on a basin-wide scale. Lithological and palynological evidence now under review in the BMR also points to a certain degree of uniformity in the geological history of the eastern Eromanga Basin overlying the southern Galilee Basin, and palynological correlations with sequences in South Australia may verify whether this is true or not for the entire Eromanga Basin.

This report summarises the spore and pollen evidence to date from the area of study depicted in Figure 1, as a contribution to a joint study of the sequence below the Injune Creek Group in the basin by Virginia Passmore and the author, and is an expansion of a discussion of the Early Jurassic in a recent paper on the Eromanga Basin (Burger, in press).

STUDY MATERIAL

The palynological information reviewed in this paper is based on examination of petroleum exploration wells and other drill-holes in the Eromanga Basin, east of approximately longitude 143^{o} east. Locations of various drill-holes are plotted in Figure 1, and relevant well data are specified in Table 1. Selected material includes cores and sidewall cores - cuttings have been rejected in view of the high risk of contamination. Much of the material is deposited in the BMR and has been re-examined for this study (Table 2). Much valuable information has been communicated elsewhere by other workers, based on material not available in the BMR and not examined by the author. A selection of that information is reassessed and tentative identification of palynological zonal intervals (units J1 to J4) is made on the basis of helpful discussions and distribution lists of fossil species provided by the workers involved (Table 3).

LITHOLOGICAL UNITS

The Hutton Sandstone in the eastern Eromanga Basin has been described in essence as a poorly to well-sorted quartzose to occasionally sublabile sandstone, at intervals clayey or calcareous, with scattered conglomerate horizons and siltstone and mudstone near the top (Exon & others, 1972; Senior & others, 1978; Wiltshire, 1982). The formation crops out along the eastern basin margin (Vine & others, 1965; Burger & Senior, 1979), and in the Tambo and Augathella areas it reportedly rests conformably on the Evergreen Formation (Exon & others, 1972).

Elsewhere in the basin, the sequence below the Injune Creek Group and overlying the Permo-Triassic sequences of the Galilee and Cooper Basins, and crystalline and metamorphic basement, has been logged in the subsurface of many drillholes as the Hutton Sandstone. Within this sequence, mainly east of the Canaway Fault, Passmore distinguished a lower and upper arenaceous interval, separated by a silty to argillaceous interval, from descriptions of cores, sidewall cores, cuttings, and analysis of gamma-ray and electrical logs in many deep wells. These discrete rock intervals are here referred to informally as a lower member A, an intermediate member B, and an upper member C (Figs 2,3). Lithological characteristics, stratigraphic relationships, formal status, and nomenclature of the members will be fully discussed at a later date.

PREVIOUS PALYNOLOGICAL DOCUMENTATION

By the absence of any evidence from marine fossils the study of spores and pollen grains has provided the only means of estimating the age of the abovementioned members and correlating them with the corresponding sequence in the Surat Basin. Palynological studies in Western Australia, in particular the Perth Basin (Balme, 1957; Filatoff, 1975), the Leigh Creek Coal Measures in South Australia (Playford & Dettmann, 1965), and the Surat Basin have provided a solid taxonomic and biostratigraphic basis for the data presented here. De Jersey & Paten (1964) drew attention to the correlative significance of several palynological horizons in the Early and Middle Jurassic of the Surat Basin, such as the oldest stratigraphic appearance of *Inaperturopollenites turbatus* (Balme) and *Callialasporites dampieri* (Balme) in the Evergreen Formation, and *Contignisporites cooksonii* (Balme) in the basal Injune Creek Group. The significance of these species was acknowledged by Evans (1966), whose Jurassic bio -

stratigraphic scheme (which includes six intervals, coded units J1 to J6) has gained wide acceptance in Queensland. Study of spores and pollen grains from the Precipice Sandstone and Evergreen Formation in the northern Surat Basin by Reiser & Williams (1969) confirmed Evans' views. McKellar (1974) described the rapidly changing fossil sequence associated with the upper Evergreen Formation and the Hutton Sandstone, and redefined geological ranges of many spore and pollen species in that interval.

PALYNOLOGICAL ZONAL INTERVALS

Evans' (1966) palynostratigraphic scheme serves here with slight modifications to correlate rock sequences below the Injune Creek Group of many wells in the study area. Four successive palynological zonal intervals, units J1 to J4, are identified (Fig. 3). Some of these units have never been sharply defined before, as in several instances new information tended to reject current ideas and offered seemingly workable alternatives. A brief summary of the units follows, whereby the unit symbols, as an interim device, are expected to be replaced eventually by a formal nomenclature by J.L. McKellar of the Geological Survey of Queensland.

Palynological Unit J1

Evans (1966) initially defined unit J1 as the interval characterised by a great abundance of the pollen genus *Classopollis*, together with a suite of distinctive pteridophyte spores, including the genus *Cadargasporites*. An abundance of *Classopollis* (50% or more of total assemblages) is also characteristic of Early Jurassic palynofloras from the Clarence-Moreton Basin (De Jersey, 1971), the youngest assemblages from the Leigh Creek Coal Measures (Playford & Dettmann, 1965), and the Cockleshell Gully Formation in the Perth Basin (Filatoff, 1975).

From detailed study of the occurrence of *Classopollis* and related forms in southeastern Queensland De Jersey (1973) concluded that the most common form within that group, namely *Classopollis chateaunovi* Reyre, first appeared *en masse* in Rhaeto-Liassic times. Reiser & Williams (1969) and McKellar (1974, 1978) reported spore-pollen assemblages with abundant *Classopollis* spp. from the Precipice Sandstone and lower Evergreen Formation in the Taroom, Mundubbera, and Eddystone areas in the northern Surat Basin. They regarded these assemblages as Rhaeto-Liassic, and possibly older than Toarcian in age.

Reiser & Williams' (1969) subdivision of unit J1 (the equivalent of their Classopollis classoides Zone) by means of a horizon representing the oldest stratigraphic appearance of Nevesisporites vallatus De Jersey & Paten may not operate in the eastern Eromanga Basin, where in the author's experience this species is a very rare element in basal Jurassic spore and pollen assemblages (see Table 2).

Palynological unit J2

Balme (1957) described and reported Callialasporites (Zonalapollenites) dampieri from the Middle and Late Jurassic of Western Australia, and Filatoff (1975) reported the oldest specimens of the species from the Lower Jurassic Cockleshell Gully Formation in the Perth Basin. Evans (1966) took the first appearance of the species as the lower limit of his unit J2. Reiser & Williams (1969) reported the oldest occurrence of the species from slightly below the Boxvale Sandstone Member of the Evergreen Formation in the Taroom area. These authors, and McKellar (1974) referred to reported occurrences of Callialasporites dampiere in the Early Jurassic (Toarcian) of north-western Europe and Argentina.

Several more or less simultaneous changes take place in the palynological record which accentuate the importance this level and seem to be of more than local stratigraphic importance. Callialasporites trilobatus (Balme), Tsugaepollenites segmentatus (Balme), and several species of Duplexisporites are newly introduced, and Inaperturopollenites turbatus Balme may first appear somewhat earlier, in the upper part of unit J1. The group of Classopollis, although still common, is no longer a dominant element in the majority of assemblages, either in Queensland or in Western Australia (Filatoff, 1975).

Palynological unit J3

Unit J3 is the beginning of an era of rapid changes in the palynological record. The genus Classopollis dwindles to minor proportions in spore-pollen assemblages, and several groups of spores, among which Cadargasporites, disappear from the record. Several other species are newly introduced, and Evans (1966) suggested that species of Lycopodiumsporites might be assigned to subdivide units J3-4, which he was then unable to split up on the information at his disposal. McKellar (1974) drew attention to a trilete spore, Camarozonosporites ramosus (De Jersey) as a possible Early Jurassic zone marker species. The present author found this species to be relatively rare in the Eromanga Basin, and indicated (*in* Jensen & others, 1976) the lower limit of a redefined unit J3 by the oldest stratigraphic appearance of *Antulsporites saevus* (Balme), a distinctive species in the Jurassic of both eastern and Western Australia. Other potentially useful indicator species for unit J3 may be *Ceratosporites equalis* Cookson & Dettmann, *Lycopodiumsporites circolumenus* Cookson & Dettmann, and *Podocarpidites multesimus* (Bolchovitina).

Indications for the age of unit J3 are somewhat contradictory. In the Canning Basin in Western Australia *Antulsporites saevus* first appears in the Oxfordian Jarlemai Siltstone (Balme, 1957), and in the Perth Basin in the upper part of the Cockleshell Gully Formation, which may be basal Middle Jurassic in age (Filatoff, 1975). According to McKellar (1974), in the Surat Basin in Queensland the species first appears slightly above the Westgrove Ironstone Member of the Evergreen Formation, which De Jersey & Paten (1964) regarded as not younger than Lower Jurassic. McKellar cited palynological evidence from overseas which also suggests that the upper part of the Evergreen Formation is of late Toarcian age.

Palynological unit J4

Burger (1968) first proposed a new unit J4 on the basis of the oldest stratigraphic appearance of a distinctive spore species which he initially identified as *Leptolepidites verrucatus* Couper. McKellar (1974) recognised it to be a different species and first described it (p. 22) from the Surat Basin as *Camarozonosporites clivosus* Williams & McKellar sp. nov. It first appears in the upper part of the Hutton Sandstone in the Surat Basin (Burger, 1968, *in* Jensen & others, 1976; McKellar, 1974), and appears to be commonly present below the Injune Creek Group in the Eromanga Basin as well (Burger, 1977; McKellar, 1979; Burger & Senior, 1979).

Unit J4 assemblages commonly include large proportions of gymnosperm coniferous pollen and only minor quantities of *Classopollis* spp. Several spore species first appear within the unit, of which *Klukisporites scaberis* (Cookson & Dettmann) and *Sestrosporites pseudoalveolatus* (Couper) warrant attention as potential secondary zonal indicators. Unit J4 extends into the basal Injune Creek Group and ends with the first stratigraphic appearance of the trilete spore *Contignisporites cooksonii* (Balme) of Evans' (1966) unit J5, which will be discussed in a forthcoming paper.

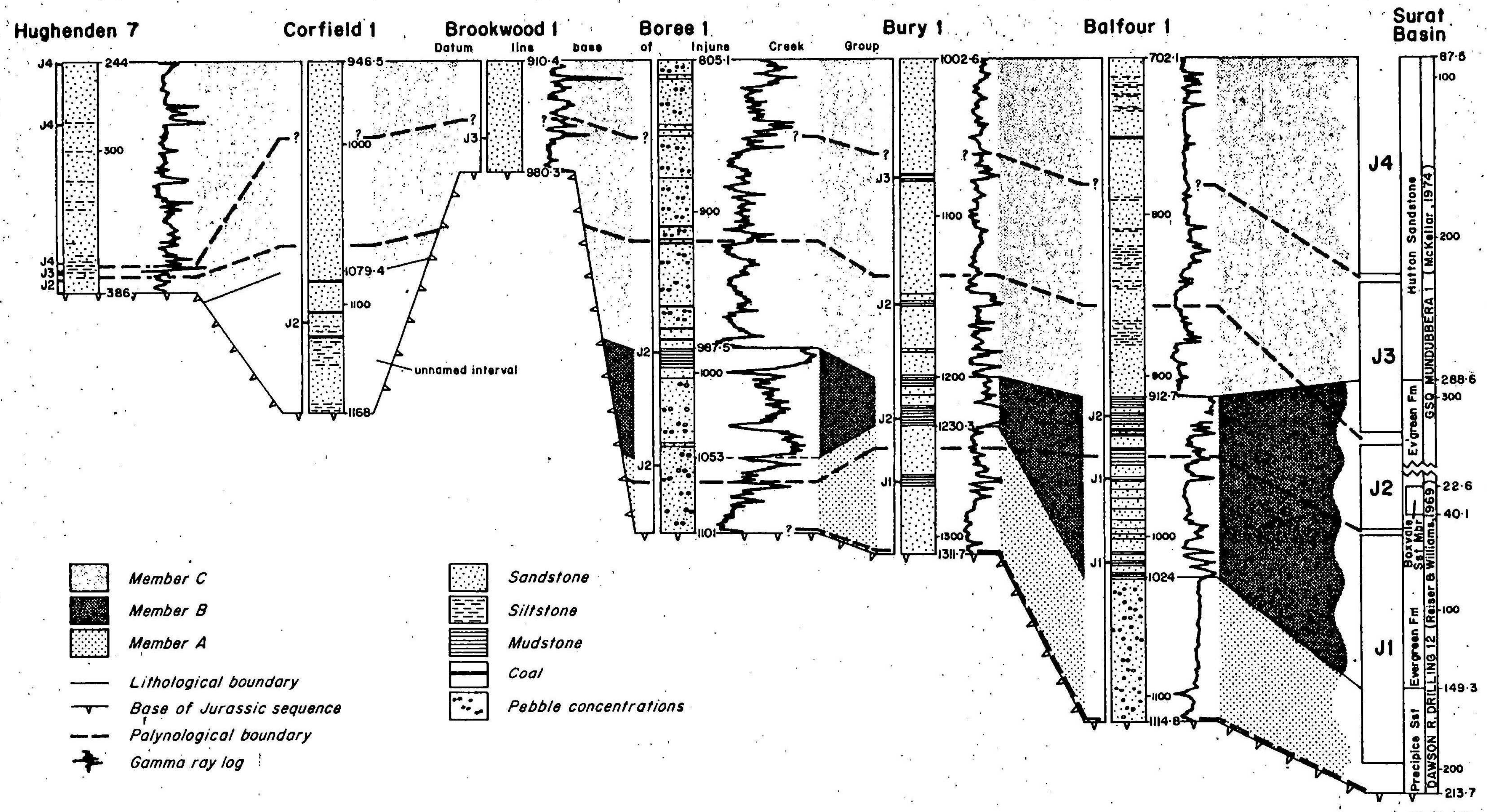


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Figure 4. Association of palynological units J1 to J4 with Jurassic sedimentary formations in the Eromanga and Surat Basins

The age of unit J4 is uncertain. Balme (1957) recorded the oldest known occurrence of Contignisporites cooksonii from lower Callovian (middle Jurassic) beds in the Carnarvon Basin in Western Australia. De Jersey & Paten (1964) and Evans (1966) accepted a similar age for the oldest stratigraphic appearance of that species in the basal Injune Creek Group in the Surat Basin. Unit J4 cannot be recognised as such in the Perth Basin, where according to Filatoff (1975) Contignisporites cooksonii first appears together with Camarozonosporites clivosus in the Middle to Upper Jurassic Yarragadee Formation. Klukisporites scaberis, however, appears earlier in the same formation, and this is a faint indication that unit J4 may be of Middle Jurassic age. But McKellar (1974) discussed palynological evidence from Europe and South America, indicating that the Hutton Sandstone in the Surat Basin may be not younger than Lower Jurassic (Toarcian to Aalenian).

CORRELATIONS AND AGE

Suggested spore and pollen correlations of designated members A, B, and C in the study area with the Precipice Sandstone, Evergreen Formation, and Hutton Sandstone in the Surat Basin are set out schematically in Figure 3. Associations of units J1 to J4 with individual rock intervals are shown in the correlation diagrams of Figures 4 and 5. Basal member A may have been restricted to lowland areas; it apparently wedges out against the Nebine Arch in the east, and the Longreach basement high in the north, and is absent in Phillips-Sunray Gumbardo 1 well on the Cheepie Shelf. A probable equivalent of the member may reappear in Hudbay Oil Eromanga 1 well in the southwest (Fig. 5), and will be discussed within the context of the geology of the western Eromanga Basin. Information communicated by Playford (see Table 3) suggests that the member is restricted to unit J1 in Amoses Balfour 1 (Fig. 4), and as such it may be the correlative interval of the Precipice Sandstone. Some distance away from the Nebine Arch it also includes part of unit J2 (Amoseas Boree 1, Phillips-Sunray Leopardwood 1), and thus correlates with the Precipice Sandstone and lower Evergreen Formation (possibly up to and including the Boxvale Sandstone Member).

Member B is a persistent horizon in many drillholes, and within the area of study is restricted to unit J2 except in Amoseas Balfour 1 (Fig. 4), where according to information communicated by Playford (Table 3) it may include part of unit J1 as well. On the whole, therefore, the member may be correlated with the upper part of the Evergreen Formation

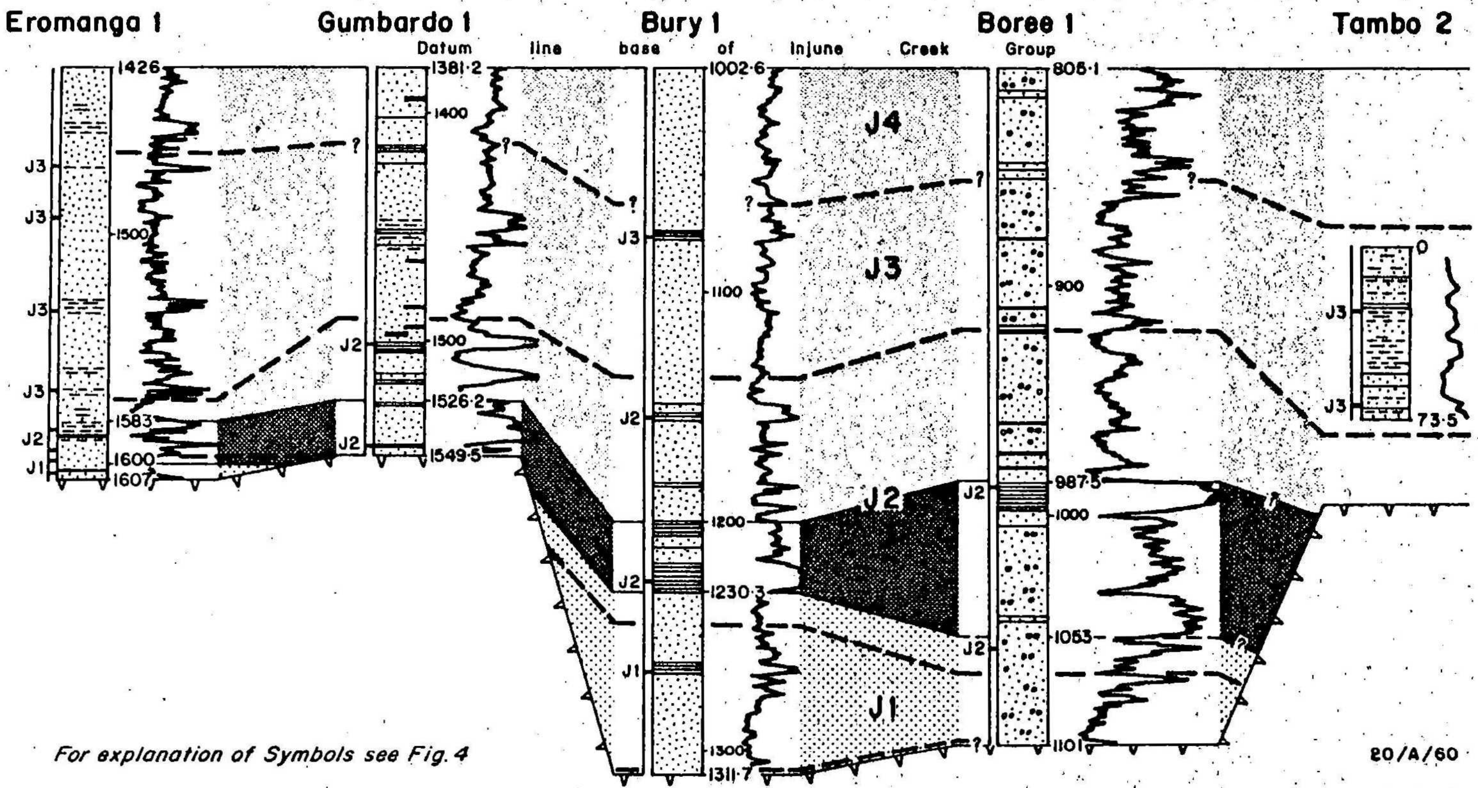

Figure 5. Relationships of members A, B, and C to palynological units J1 to J3

(including the Westgrove Ironstone Member). It seems to extend outside the study area to the southwest, overlapping the Cheepie Shelf in Phillips-Sunray Gumbardo 1 well (Fig. 5). It wedges out against the Longreach basement high, and the recovery of unit J2 from a coarse quartzose sandstone with carbonaceous siltstone and lignite bands in Magellan Corfield 1 (Fig. 4) suggests contemporary deposition in a different environment further north.

Member C appears to be the most widespread rock interval in the study area. Its lower part lies within unit J2 in Phillips-Sunray Bury 1, and apparently also in Phillips-Sunray Gumbardo 1, Phillips-Sunray Quilberry 1, and GSQ Hughenden 7 (Table 3). Unit J2 was identified in the member of Bury 1, Exoil Brookwood 1, and is thought to be present also in the member of AOD Budgerygar 1 and Hudbay Oil Eromanga 1 (Table 3). The thinness of the interval representing unit J3 in GSQ Hughenden 7 may indicate that deposition of the basal Hutton Sandstone/member C was locally interrupted at times. BMR Tambo 2 (Fig. 5) has been described as intersecting the basal Hutton Sandstone, the Boxvale Sandstone Member of the Evergreen Formation, and the uppermost Precipice Sandstone (Exon & others, 1972, Fig. 9). Revised palynological determinations now associate the section with unit J3 and thus establish it as the time (if not lithological) equivalent interval of member C. Unit J4 may be present in the Hutton Sandstone/member C of GSQ Hughenden 7 (Fig. 4), and a probable unit J4 assemblage was recovered from the lower Ronlow Beds in BMR Tangorin 1, so that the two rock formations may be in part contemporary developments (Burger & Senior, 1979). Rock descriptions and electrical log characteristics of Magellan Corfield 1 (Fig. 4) suggest a change at about 1079 m depth from a quartzose sandstone with siltstone and lignite to a quartz sandstone with angular to subrounded grains, and this level is tentatively taken as the base of member C in that well. The member is correlated with the upper part of the Evergreen Formation and the Hutton Sandstone (plus Eurombah Formation) in the Surat Basin.

Exon & Burger (1981) and Burger (in press) reviewed the age of rock formations in the Surat and Eromanga Basins by means of linking recurrent patterns of sedimentation in the two basins to world-wide cyclic movements of the sea level during the Jurassic and Early Cretaceous. Burger (in press) associated the interval including members A and B ("lower Hutton Sandstone") with Sinemurian-Toarcian eustatic cycle J1 of Vail & others (1977), and member C ("upper Hutton Sandstone") and the basal Injune Creek Group with Aalenian-Bajocian eustatic cycle J2.1 and Bathonian eustatic cycle J2.2 (Fig. 3). The maximum age of member A may vary depending on locality but is unlikely to exceed the Sinemurian

(Burger, in press). Member B indicates a brief episode of quiet sedimentation and slow drainage in the area of study which may coincide with a phase of high eustatic sea level during the Toarcian. Member C is here regarded as probably uppermost Toarcian to Bajocian in age.

McKellar (1974) suggested that the base of the Injune Creek Group in the Surat Basin may be early Bajocian, whereas the abovementioned correlations suggest the Group in the Surat and Eromanga Basins to be not older than Bathonian. The author feels that the base of the Group is unlikely to be diachronous to the degree suggested by this apparent discrepancy, and that better palaeontological evidence must be awaited for a more accurate age determination of the Group.

CONCLUDING REMARKS

From the lithological associations of units J1 and J2 the boundaries of members A and B in the Augathella area and further east appear to be slightly diachronous (Fig. 4). No obvious diachronous trend seems indicated for member C, but better documentation of unit J4 in the study area may suggest otherwise.

Brief marginally marine conditions to the east are indicated by the presence of spinose acritarchs of the genera Micrhystridium Deflandre and Veryhachium Deunff in the Evergreen Formation (including the Westgrove Ironstone Member, see Evans, 1966), but cannot be confirmed in the eastern Eromanga Basin. The recovery of rare smooth-walled acritarchs of the genus Leiosphaeridia Eisenack from member B in Amoseas Boree 1 (Table 2) is in itself no indication of increased salinity of the environment (see Burger, 1980). During eustatic cycle J1 the sea briefly entered the Surat Basin via an eastern corridor (Exon & Burger, 1981) but apparently lacked momentum to extend into the eastern Eromanga Basin across the Nebine Arch.

In part of the study area overlying the northern Galilee Basin different environments prevailed, at least prior to deposition of member C. Isopachs of member A to C combined indicate that this area drained off to the south via a narrow channel situated east of the Longreach basement high (Burger, in press). Isopachs of separate members are being drawn up and may illustrate more clearly the Early Jurassic palaeogeography of the region.

ACKNOWLEDGEMENTS

Hudbay Oil (Australia) Pty Ltd in Perth kindly permitted relevant information from its Eromanga No. 1 well to be used in this report.

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well/borehole	latitude south	longitude east	1:250 000 sheet area		reference
Amoseas BALFOUR 1	25°32'13''	146°42'40''	Augathella	SG 55-6	Gerrard, 1966
Amoseas BOREE 1	24°45'32''	145°34'36''	Tambo	SG 55-2	Gerrard, 1964
Exoil BROOKWOOD 1	22°28'55''	144°19'58''	Muttaburra	SF 55-9	Pemberton, 1963
Alliance Oil Dev. BUDGERYGAR 1	25°14'19''	143°48'28''	Windorah	SG 54-8	Cadart, 1969
Phillips-Sunray BURY 1	25°02'40''	145°36'20''	Augathella	SG 55-6	Patterson, 1966
Phillips-Sunray CARLOW 1	24°50'27''	145°25'48''	Blackall	SG 55-1	Kyranis, 1966
Magellan CORFIELD 1	21°42'46''	143°22'30''	Manuka	SF 54-8	Harris, 1960
Smart Oil CUMBROO 1	26°13'40''	143°22'47''	Eromanga	SG 54-12	Campe, 1969
Phillips-Sunray DARTMOUTH 1	26°08'39''	145°20'34''	Quilpie	SG 55-9	Knuth, 1967
Hudbay Oil EROMANGA 1	26°40'28''	143°36'25''	Eromanga	SG 54-12	Lane & Putnam, 1982
Phillips-Sunray GILMORE 1	25°21'33''	144°48'38''	Adavale	SG 55-5	Lewis & Kyranis, 1965
Phillips-Sunray GUMBARDO 1	25°58'52''	144°41'41''	Adavale	SG 55-5	Phillips Sunray, 1963
GSQ HUGHENDEN 7	20°57'	144°11'	Hughenden	SF 55-1	Balfe, 1979
Phillips-Sunray LEOPARDWOOD 1	25°37'10''	144°40'13''	Adavale	SG 55-5	McDonagh & others, 1966
Phillips-Sunray QUILBERRY 1	26°25'03''	145°30'07''	Charleville	SG 55-10	Cundill, Meyers & Associates, 1965
Phillips-Sunray STAFFORD 1	25°17'33''	145°26'03''	Adavale	SG 55-5	Netzel, 1967
BMR TAMBO 2	24°17'34''	146°23'21''	Tambo	SG 55-2	Exon & others, 1966, 1972
BMR TANGORIN 1	21°32'42''	145°22'46''	Tangorin	SF 55-5	-----
Alliance Oil Dev. YONGALA 1	25°30'19''	143°55'48''	Windorah	SG 54-8	Laing, 1966

TABLE 1: SPECIFICATIONS OF WELLS AND BOREHOLES PLOTTED IN FIG. 1

TABLE 2: DISTRIBUTION OF JURASSIC SPORE AND POLLEN SPECIES IN THE EROMANGA BASIN

WELL/BOREHOLE	Bury 1	Carlow 1	Boree 1	Boree 1	Bury 1	Bury 1	Corfield 1	Dartmouth 1	Yongala 1	Brookwood 1	Bury 1	Tambo 2	Tambo 2	Yongala 1	Tangorin 1
PALYNOLOGICAL SAMPLE NUMBER	MFP4601	MFP4017	MFP3103	MFP3095	MFP4060	MFP4059	MFP1167	MFP4141	MFP3881	MFP2255	MFP4058	MFP3987	MFP3986	MFP3880	MFP4344
DEPTH OF SAMPLE (metres)	1266.7	1306.2	1059.1	987.5	1227.0	1155.5	1111.9	1471.1	2061.0	959.6	1076.4	68.9	28.6	1965.6	67.6
CORE/SIDEWALL CORE	swc	c. 2	swc	c. 4	swc	swc	c. 2	swc	c. 6	c. 7	swc	c. 3	c. 1	c. 5	c. 4
DESIGNATED MEMBER (see Fig. 3)	A	A	A	B	B	C	A+B	C	B	C	C	C	C	C	
PALYNOLOGICAL UNIT	J1		J2							J3					J4
Alisporites australis		x			x	x						?	x		
Alisporites grandis	?			x	x		x				?	x	?		x
Alisporites lowoodensis												x	?		
Alisporites similis		?	?	x	x	x	x		?	x	x	x	x	x	x
Anapiculatisporites dawsonensis				x										x	
Anapiculatisporites pristidentatus	?	x			?						x			x	x
Annulispora folliculosa	x	x		x		x	x	x							
Antulsporites saevus				?						x	x	x	x	x	x
Antulsporites sp. A					x								x		
Apiculatisporis globosus		x	x		x	x		?							
Araucariacites australis	x	x		x	x	x	x	x	x		x		x	x	
Araucariacites fissus	x	x	x	x	x			x			x		x	x	x
Baculatisporites comaumensis	x	x	x	x	x	x		x		x	x	x	x	x	x
Biretisporites sp.	x		x												
Cadargasporites baculatus		x							?						
Cadargasporites reticulatus		x		x							x				
Callialasporites dampieri			x		x	x	x	x	x	x	x	x	x	x	
Callialasporites trilobatus			x	?	x						?			x	
Camarozonosporites ramosus	?					?		x			x			x	
Camarozonosporites rudis	x	?										x	x		
Ceratosporites equalis											x				
Classopollis chateaunovi	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Classopollis meyeriana-simplex group	x	x	?	x	x		x		x		x		x	x	
Concentrisporites hallei	x	x	x	x	x	x		x	x	x	x	x	x	x	
Contignisporites sp.					x				x					x	
Cyathidites australis		?				x		x			x				x
Cyathidites minor	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Dictyophyllidites mortonii				?	x	x	x			x					
Duplexisporites gyratus				?		?			x		x			x	
Exesipollenites sp.			x	x											x
Foraminisporis tribulosus	x			x		?								x	
Gleicheniidites circinidites					x	x	x	x	x	x	x			x	x
Granulatisporites sp.				x											
Inaperturopollenites turbatus		x	x	x	x	x	x	x	x		x	x		x	x
Ischyosporites marburgensis	x			x	x	x				x		x	x	x	x

TABLE 2: DISTRIBUTION OF JURASSIC SPORES (CONT.)

WELL/BOREHOLE	Bury 1	Carlow 1	Boree 1	Boree 1	Bury 1	Bury 1	Corfield 1	Dartmouth 1	Yongala 1	Brookwood 1	Bury 1	Tambo 2	Tambo 2	Yongala 1	Tangorin 1
PALYNOLOGICAL SAMPLE NUMBER	MFP4601	MFP4017	MFP3103	MFP3095	MFP4060	MFP4059	MFP1167	MFP4141	MFP3881	MFP2255	MFP4058	MFP3987	MFP3986	MFP3880	MFP4344
DEPTH OF SAMPLE (metres)	1266.7	1306.2	1059.1	987.5	1227.0	1155.5	1111.9	1471.1	2061.0	959.6	1076.4	68.9	28.6	1965.6	67.6
CORE/SIDEWALL CORE	swc	c. 2	swc	c. 4	swc	swc	c. 2	swc	c. 6	c. 7	swc	c. 3	c. 1	c. 5	c. 4
DESIGNATED MEMBER (see Fig. 3)	A	A	A	B	B	C	A+B	C	B	C	C	C	C	C	
PALYNOLOGICAL UNIT	J1		J2							J3					J4
Klukisporites scaberis											?				
Laevigatosporites sp.			x												
Lycopodiumsporites austroclavatidites	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lycopodiumsporites circolumenus							?				x		?	?	
Lycopodiumsporites huttonensis			x			x								x	
Lycopodiumsporites nodosus				?										?	
Lycopodiumsporites rosewoodensis	x			x	?	x	x	x		?	x		x	x	x
Lycopodiumsporites semimurus	x			x	?	x				x	x		x		
Matonisporites sp.					x							x			
Monosulcites minimus				x										x	x
Monosulcites nitidus				x						x					
Neoraistrickia elongata	x	x	x	x		x					x		?	x	
Neoraistrickia suratensis		x	?			x					?		x		
Neoraistrickia truncata		?		?		?				x	?		?		
Nevesisporites vallatus						x			x					x	
Osmundacidites wellmanii	x	x	x	x	x	x	x	x	x		x	x	x	x	x
Podocarpidites ellipticus			x		?	x	?			?		?	x		
Podocarpidites multesimus										?	x	x	x	x	
Polycingulatisporites crenulatus		?													
Polycingulatisporites densatus								x					x		
Polycingulatisporites mooniensis		x													
Punctatosporites scabratus				x	x	x			x					x	
Punctatisporites microtumulosus					x	x					x			?	
Rogalskaisporites cicatricosus	x	x		x			x			x	x	x	x	x	x
Sestrosporites pseudoalveolatus															x
Staplinisporites caminus				x		x	x				x			x	x
Staplinisporites manifestus							x								
Stereisporites antiquasporites	x	x	x	x	x	x	x	x	x		x		x		
Trilobosporites antiquus	x	x		x	x		x	?	x			?			
Tsugaepollenites segmentatus			?	?			x		x	?		x		?	?
Vitreisporites pallidus	x	?	x	x	x		x	x	x		x	x	x		x
smooth-walled spherical acritarchs				x							x				

well/corehole	sample and depth (m)	member	inferred palyn. unit	reference
BALFOUR 1	swc 925.2 swc 963.6 swc 1014.8	B B B	J2 J1 J1	Playford, in Gerrard, 1966
EROMANGA 1	swc 1471.1 swc 1493 swc 1533 swc 1569 swc 1585 swc 1594 swc 1598 swc 1604	C C C C B B B A	J3 J3 J3 J3 J2 J2 J1 J1	Dettmann & Price, in Lane & Putnam, 1982
GUMBARDO 1	swc 1502.0 swc 1546.6	C B	J2 J2	De Jersey, in Phillips Sunray, 1963
HUGHENDEN 7	core 246 core 283.8 core 371.5 core 375.9 core 377.8 core 380.4 core 385.4	C C C C C C C	J4 J4 J4 J3 J3 J2 J2	McKellar, 1979
CUMBROO 1	core 2090.9	A-B	J2	Paten, in Campe, 1969
BUDGERYGAR 1	swc 1581.5 core 1622.4	C B	J3 J2	Paten, in Cadart, 1969
GILMORE 1	core 1833.7	B	J2	De Jersey, in Lewis & Kyranis, 1965
LEOPARDWOOD 1	swc 1773.6	A	J2	De Jersey, in McDonagh & others, 1966
QUILBERRY 1	core 1098.4	C	J2	De Jersey, in Cundill, Meyers & Associates, 1965
STAFFORD 1	core 1489.5	B	J2	De Jersey, in Netzel, 1967

TABLE 3: RELATIONSHIPS OF MEMBERS A, B, AND C TO UNITS J1 TO J4, AS INTERPRETED FROM PALYNOLOGICAL INFORMATION IN OUTSIDE COMMUNICATIONS (FOR DETAILS SEE TEXT)