DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

THE TYPE SECTION OF THE MORGAN LIMESTONE AND CADELL MARL LENS, 4 MILES SOUTH OF MORGAN

by

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PALAEONTOLOGIST

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ABSTRACT:

The Section described by Tate in 1885 is selected as type section for the Morgan Limestone and Cadell Marl Lens. The formation is of Lower Miocene (Batesfordian) age.

1. INTRODUCTION:

In 1885 Tate published a description of a section measured in the cliffs of the Murray River at a point 4 miles downstream from Morgan. This section is of particular importance as the type locality from which many of Tate's molluscan species were collected. It was recorded by Tate as follows:

		ft.	in.
	Lacustrine		
1.	Reddish coloured calciferous clays	54	0
	Upper Murrarian		
2.	Oyster bank	12	0
	Middle Murravian		
3.	Hard, lumpy, yellow sandstone	10	0
4.	Yellowish-grey limestone with clayey sand layers	10	10
5.	Yellowish-brown clayey sand with *Cellepona gambierensis*	5	4
6.	Id. with hard lumps and imperfectly stony bands. Very fossiliferous, particularly rich in gastropods	16	5
7.	Shell sand with streak of stiff blue clay	0	3
8.	As No.6	5	0
9.	Yellow soft calciferous sandstone	43	6
	Total to river level	157	4

The section was remeasured and sampled by the writer in March, 1956. It is located about 4 miles downstream from Morgan on the east bank of the River Murray on Section G, Hundred of Cadell. It is readily accessible from the Morgan - Blanchetown road by driving off the road to the head of a small gully which cuts through the cliffs at this point. The section measured in the gully confirmed Tate's measurements and description.

2. SAMPLING:

Samples were taken at every five feet from the base of the section at river level or at changes in lithology, corresponding to Tate's numbered beds as follows:-

Tate's Bed		
9	F76/56	5 feet above river level
	F77/56	10 feet " " "
	F78/56	1st Cellepora band
	F79/56	1st marly band
	F80/56	2nd Cellepora band
	F81/56	2nd marly band
	F82/56	3rd Cellepora band
	F83/56	3rd marly band
	F84/56	Hard band at top of lower member
8	F85/56	5" from base of marl
7	3" shell sand not observed	
6	F86/56	10" from base of marl
	F87/56	15" from base of marl
	F88/56	Top of marl
5	F89/56	On south side of gully
	F90/56	On north side of gully
4	F91/56	Bottom of 10 feet limestone bed
	F92/56	Top of limestone
3	F93/56	Sample with Panopea sp.

3. MORGAN LIMESTONE

From river level upwards for 91 feet the cliffs consist of a light creamy yellow bryozoal limestone named the Morgan Limestone, with a marly lens from 21 feet thick and 300 yards long named the Cadell Marl Lens in the upper half commencing at 43'6" from the base of the Section.

The lower member 45 feet thick (Tate's bed9) is a fairly uniform soft bryozoal limestone, cavernous near the river and becoming banded in the upper 30 feet. The hard bands each about 5 feet thick consist of masses of Cellepora and alternate into soft somewhat marly bands. The upper member (Tate's beds 5,4,3) above the Cadell Marl Lens is a hard yellow limestone with Cellepora.

The Morgan Limestone carries rich microfauna similar to that of the Batesford Limestone in Victoria, although Lepidocyclina has not so far been discovered at or near Morgan. The typical assemblage of the lower member is dominated by Operculina victoriensis. Amphistegina lessonii. Gypsina howchini. Parellina craticulatiformis. Globigerinoides bisphaerica and Globigerinoides triloba.

The upper member is weathered and probably regressive, with a relatively sparse fauna.

4. CADELL MARL LENS

Within the Morgan Limestone at the type section a marl lens occurs over a length of 300 feet, with a maximum thickness of 22 feet (Tate's beds 8, 7,6). The marl carries a rich fauna of well preserved mollusca which readily weather out on the surface.

These include the following species of Tate, the nomenclature of which is unrevised for the purposes of this paper. For most of them the Cadell Marl Lens type section is the type locality.

Pelecypoda

Nucula morundiana, Leda obolella, Leda woodsii, Cucullaea corioensis, Dimya dissimilis, Myadora tenuilirata, Carditella polita, Lucina fabuloides, Antigona dimorphophylla, Verticordia rhomboidea, Zenatiopsis angustata, Capistrocardia fragilis, Solecurtus ellipticus, Corbula ephamilla.

Scaphopoda

Dentalium aratum, Entalis subfissura.

Gastropoda

Turritella murrayana, Turritella acricula, Triton radialis, Triton tortirostris, Murex basicinctus, Murex pachystirus, Trophon mangelioides, Nassa tatei, Fasciolaria exilis, Fasciolaria decipiens, Fusus dictyotis, Fusus simulans, Fusus styliformis, Fusus spiniferus, Peristernia murrayana, Peristernia morundiana.

The Cadell Marl Lens or its equivalents is represented in borings in County Albert by blue clays or marls rich in Turritella murrayana overlying the Morgan Limestone (Barnes, 1951). Austrotrillina howchini commonly occurs also.

5. OVERLYING STRATA

The Morgan Limestone is overlain disconformably by a thick

oyster bed of the Norwest Bend Formation, succeeded by 54 feet of Pleistocene clays. The Loxton Sands are discontinuous in the area. They occur to the north on Section 131 Hundred of Cadell where they are quarried in a very small way as freestone and to the south in the cliffs about 6 miles south of Morgan overlying Morgan Limestone and overlain by Norwest Bend Formation oyster bed, but are missing at the type section.

6. REFERENCES

Barnes, T. A. 1951. Underground Water Survey of Portion of the Murray Basin (Counties Albert and Alfred). Geol. Surv. S. Aust. Bulletin 25.

Tate, R. 1885. Notes on the Physical and Geological Features of the Basin of the Lower Murray River. Trans. Roy. Soc. S. Aust. 7 pp. 24 - 46.

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NHL:JAH.
14/8/58.

MICROPALAEONTOLOGICAL LOG

MORGAN TYPE SECTION IN UPWARD SEQUENCE

	Morgan Limestone Lower Member.						Cadell Marl Lens				Morgan Limestone Upper Member.			
	F76/56	F77/56	F78/56	F79/56	F81/56	F83/56	F85/56	F86/56	F87/56	F88/56	F89/56	F91/56	F92/56	F93/56
Textularia pseudogramen C & P	x	-	-	-	-	x	-	x	x	-	-	-	-	x
Textularia corrugata H. A. & E.	x	x	-	x	-	-	-	-	-	-	x	-	-	-
Textularia spp.	x	-	-	-	x	x	x	-	x	-	-	-	-	-
Dorothia parri Cushman	x	x	-	x	x	x	x	-	-	-	-	-	-	x
Dorothia spp.	x	-	-	-	-	-	-	x	x	x	x	-	x	-
Clavulinoides victoriensis Cushman	x	x	-	-	x	x	x	-	-	-	-	-	-	-
Sigmoilina sp.	x	-	-	-	-	-	-	-	-	-	-	-	-	-
Lagenonodosaria scalaris (Batsch)	x	-	-	x	-	-	x	-	-	-	-	x	-	-
Tubulogenerina moorabooleensis (H. A. & E.)	x	-	-	x	-	-	-	-	-	-	-	-	-	-
Uvigerina spp.	x	-	-	-	-	-	-	-	-	-	x	x	x	-
Ehrenbergina sp.	x	-	-	-	x	-	-	-	-	-	-	-	-	-
Eponides praecinctus (Karrer)	x	-	-	-	x	x	-	x	-	-	-	-	-	-
Caneris evatus Cushman & Todd	x	-	-	-	-	-	x	-	-	-	-	x	-	-
Cibicides lobatulus (Walker & Jacob)	x	-	-	-	-	x	x	-	-	-	-	-	-	-
Cibicides pseudoungerianus (Cushman)	x	-	x	x	x	x	x	x	-	x	x	x	x	x
Globigerina bulloides d'Orbigny	x	-	-	x	x	x	x	-	x	-	-	x	x	-
Globigerina sp.	x	-	-	x	-	-	-	-	-	-	-	-	-	-
Globigerinoides bisphaerica Todd	x	-	-	x	x	x	-	x	-	-	-	x	-	-
Planorbulinella plana (H. A. & E.)	x	-	-	-	-	-	-	-	-	-	-	-	-	-
Gypsina globulus (Reuss)	x	x	-	-	x	x	x	-	-	-	-	-	-	-
Gypsina howchini Chapman	x	x	-	x	x	x	x	x	x	x	-	-	x	-
Nonion victoriense Cushman	x	-	-	-	-	-	-	x	-	-	x	x	x	-
Parellina cribriculatiformis Wade	x	x	-	-	-	-	x	-	-	-	-	-	-	-
Amphistegina lessonii d'Orbigny	x	x	-	-	-	-	x	-	-	-	-	-	-	-
Operculina victoriensis Chapman & Parr	x	x	x	-	x	x	x	x	-	-	x	-	-	-
Gaudryina (Pseudogaudryina) crespinae Cushman		x	-	-	-	-	-	-	-	-	-	-	-	-
Globulina gibba d'Orbigny		x	-	-	-	-	-	-	-	-	-	-	-	-
Carpenteria proteiformis Goës		x	-	-	-	x	-	-	-	-	-	-	-	-
Quinqueloculina vulgaris d'Orbigny			x	-	x	x	x	x	x	x	-	-	-	-
Sigmoilina cf. flintii Cushman			x	-	x	-	-	-	-	-	-	-	-	-

	Morgan Limestone Lower Member						Cadell Marl Lens				Morgan Limestone Upper Member.			
	F76/56	F77/56	F78/56	F79/56	F81/56	F83/56	F85/56	F86/56	F87/56	F88/56	F89/56	F91/56	F92/56	F93/56
Austrotrillina howchini (Schlumberger)			x	-	-	-	-	-	-	-	-	-	-	-
Cibicides subhaidingerii Parr			x	-	-	-	-	-	x	-	cf.	-	-	-
Siphonina australis Cushman			x	x	x	x	x	x	x	-	x	-	x	x
Anomalina colligera Chapman & Parr			x	-	-	x	-	-	-	-	-	-	-	-
Anomalina sp.			x	x	-	-	-	-	-	-	-	-	-	-
Uvigerina cf. tenuistriata Reuss				x	-	-	-	-	-	-	-	-	-	-
Bolivina spp.				x	-	-	x	-	-	-	x	x	-	-
Sphaeroidina bulleides d'Orbigny				x	x	-	-	x	x	-	-	x	-	-
Reussella decorata H. A. & E.				x	-	-	-	-	-	-	-	-	-	-
Cibicides refulgens Montfort				x	x	-	-	-	-	-	-	x	x	x
Glabratella glebigeriniformis (H. A. & E.)				x	-	-	-	-	-	-	-	-	-	-
Eponides repandus (F. & M.)				cf.	-	-	-	-	-	-	-	-	-	-
Globigerinoides triloba (Reuss)				x	-	x	x	x	x	-	-	x	-	-
Elphidium howchini Cushman				x	-	-	-	-	-	-	-	-	-	x
Elphidium parri Cushman				x	-	-	-	-	-	-	-	-	x	-
Ammosphaeroidina sphaeroidiniformis (Brady)					x	x	x	x	-	-	-	-	-	-
Gaudryina sp. cf. collinsi Cushman					x	x	-	-	-	-	-	-	-	-
Triloculina trigonula (Lamarck)					x	x	x	x	x	x	x	-	-	-
Quinqueloculina cuvieriana d'Orbigny					x	-	x	x	-	-	-	-	-	-
Pyrgo sarsi (Schlumberger)					x	-	-	-	-	-	-	-	-	-
Cornuspira involvens Reuss?					x	x	-	-	x	-	-	-	-	-
Cornuspira tasmanica Parr					x	-	x	x	x	-	-	-	-	-
Pyrulina cylindroides (Roemer)					x	-	-	x	-	-	-	-	-	-
Sigmoidella kagaensis Cush. & Ozawa					x	-	-	-	-	-	-	-	-	-
Cassidulina spp.					x	-	-	-	-	-	x	-	-	-
Reussella spinulosa (Reuss)					x	-	x	-	-	-	x	x	x	-
Pullenia quinqueloba (Reuss)					x	-	-	-	-	-	-	-	-	-
Cibicides concentricus (Cushman)					x	-	-	-	-	-	x	x	x	-
Cibicidella variabilis (d'Orbigny)					x	-	-	-	-	-	-	-	-	-
Liebusella rudis (Costa)						x	-	-	-	-	-	-	-	-
Schenckiella howchini (Cushman)						x	-	-	-	-	-	-	-	-
Pyrgo sp.						x	-	x	x	x	-	-	-	-

	Morgan Limestone Lower Member						Cadell Marl Lens				Morgan Limestone Upper Member			
	F76/56	F77/56	F78/56	F79/56	F81/56	F83/56	F85/56	F86/56	F87/56	F88/56	F89/56	F91/56	F92/56	F93/56
Sigmoilina sp.						x	x	-	x	-	-	-	-	-
Quinqueloculina sp.						x	x	x	-	-	-	-	-	-
Articulina victoriana Cushman						x	x	x	-	-	-	-	-	-
Triloculina tricarinata d'Orbigny						x	-	x	-	-	-	-	-	-
Cornuspira sp.						x	x	-	-	-	-	-	-	-
Cornuspiroides expansus (Chapman)						x	-	-	x	-	-	-	-	-
Dyocibicides biserialis Cushman & Valentine						x	x	-	-	-	-	-	-	-
Textularia cf. sagittula Defrance							x	-	-	-	-	-	-	-
Siphotextularia sp.							x	-	-	-	-	-	-	-
Quinqueloculina polygona d'Orbigny							x	-	-	-	-	-	-	-
Quinqueloculina berthelotiana d'Orbigny							x	-	-	-	-	-	-	-
Spiroloculina sp.							x	-	-	-	-	-	-	-
Biloculinella globula (Bornemann)							x	-	-	-	-	-	-	-
Miliolinella circularis (Bornemann)							x	-	-	-	-	-	-	-
Dentalina sp.							x	-	x	-	-	-	-	-
Fissurina spp.							x	-	-	-	-	-	-	-
Fissurina sp.							x	-	-	-	-	-	-	-
Parafissurina sp.							x	-	-	-	-	-	-	-
Sigmomorphina subregularis Howchin & Parr							x	-	-	-	-	-	-	-
Bolivina sublobata Cushman							x	x	-	-	x	-	x	-
Planorbulina sp.							x	-	-	-	-	-	-	-
Elphidium chapmani Cushman							x	-	-	-	-	-	-	-
Parellina sp.							x	-	-	-	-	-	-	-
Martinotiella bradyana Cushman								x	x	-	-	-	-	-
Triloculina sp.								x	-	-	-	-	-	-
Massilina cf. australis Cushman								x	-	-	-	-	-	-
Spiroloculina antillarum d'Orbigny								x	x	-	-	-	-	-
Massilina sp.								x	x	-	-	-	-	-
Nodobacullariella sp.								x	x	-	-	-	-	-
Marginopora vertebralis Blainville								x	x	-	-	-	-	x
Plectofrondicularia sp.								x	-	-	-	-	-	-
Guttulina problema d'Orbigny								x	-	-	-	-	-	-
Ramulina globulifera Brady								x	-	-	-	-	-	-

	Morgan Limestone . Lower Member						Cadell Marl Lens				Morgan Limestone Upper Member			
	F76/56	F77/56	F78/56	F79/56	F81/56	F83/56	F85/56	F86/56	F87/56	F88/56	F89/56	F91/56	F92/56	F93/56
Cancris intermedius Cushman & Todd								x	x	-	x	x	x	-
Calcarina verriculata (Howchin & Parr)								x	-	-	-	-	-	-
Guttulina regina (B. P. & J.)									x	-	x	-	-	-
Virgulina sp.									x	-	-	-	-	-
Astrononion sp.									x	-	-	-	-	-
Textularia vertebraiis Cushman										x	-	-	-	-
Anomalina glabrata Cushman											x	x	x	-
Elphidium advenum Cushman											x	-	-	-
Pullenia bulloides d'Orbigny											x	-	-	-
Cassidulina subglobosa Brady											x	x	x	x
Pyrulina fusiformis (Roemer)											x	-	-	-
Marginulina sp.												x	-	-
Lagena spp.												x	-	-
Trifarina bradyi Cushman												x	-	-
Guttulina irregularis (dIOrbigny)												x	-	-
Discorbis cf. floridana Cushman												x	-	-

Springs, soaks and seepages leading into the River

	Location	Length	Height above present river level	Volume	Permanence	A.T.
Spring 1	Co. Albert Hd. Forster Sec. 1	15'	10'	300g.p.h.	All year	129g.p.
Spring 2	Co. Sturt Hd. Finniss Sec. 615	200' from a stratum around hillside	60'	?	All year	890 "
Spring 3	Co. Russell Hd. Seymour Sec. 1095	6'	4'	50g.p.h.	All year	480 "
Spring 4	Co. Russell Hd. Seymour Sec. 1095	?	Below present river level	?	All year	-
Spring 5	Co. Sturt Hd. Ridley Sec. 18	?	Below present river level (lagoon)	?	All year	159 "
Soak A	Co. Albert	50'	Marsh grasses 10' growing above present river level.			-
Soak B	Co. Albert	-	Water drained back into river for several months after flood - now damp patches.			-
Soak C	Co. Albert Hd. Paisley Sec. C WL	-	Marsh grasses up to 6' above present river level			-
Soak D	Co. Albert Hd. Paisley Sec. 33	-	Damp patch and marsh grasses 10' above present river level.			-
Soak E	Co. Albert Hd. Nildottie Sec. 167.	100'	Damp patches along foot of cliffs.			-
Soak F	Co. Buccleuch Hd. Bowhill Secs. 54 & 2 NE	-	Damp patches along foot of cliffs			-
Soak G	Co. Russell Hd. Younghusband Sec. 621	-	Damp patches along foot of cliffs with one small spring			-
Soak H	Co. Sturt Hd. Ridley Sec. 23	10'	2'-4'	Series of jets of water draining from cliffs back into river after flood (now dry)		-
Soak I	Co. Russell Hd. Seymour Sec. 1097	50'	2'-4'	Minor fresh soaks along foot of cliffs		-
	Co. Sturt Hd. Ridley	Black Hill	-	Fresh spring reported - not seen		
		Caloote	-	Small seepages after high river - not seen.		
		Pampoota) Mypolonga)		Fresh springs reported - below present river level.		

	Location	Remarks	Volume	A.T.S.
Seepage (a)	Co. Albert Hd. Cadell Cadell Lagoon	Seepage from lagoon into river	?	790 g.p.g.
Seepage (b)	Co. Albert Hd. Cadell Cadell Lagoon	Seepage from blocks into lagoon	1600g.p.h.	348 "
Seepage (c)	Co. Albert Hd. Waikerie Sec. 76	Seepage from blocks - natural drainage stratum 30' above present river level - ½mile long.	?	-
Seepage (d)	Co. Albert Hd. Holder Sec. 49 ^{D} Block 10	Back drainage after flood 4' above R.L. 10' wide	100 g.p.h.	450 g.p.g.
Seepage (e)	Co. Albert Hd. Morook Secs. 1^{A}, 1^{B}, 1C	Seepage from blocks into river	up to 1000 g.p.h.	63 "
Seepage (f)	Co. Russell Hd. Seymour Sec. 1097	Seepage from pastures into river	3000 g.p.h.	87 "