

PART SEC 17. Hd NOARLUNGA

(HACKHAM)

58/68

RB 58/68

DEPARTMENT OF MINES
SOUTH AUSTRALIA

REPORT ON

PALAEONTOLOGICAL EXAMINATION OF ANGER SAMPLES FROM HACKHAM,

PART SECTION 17, HUNDRED OF HEARLUNGA, COUNTY ADELAIDE.

by

J.M. Lindsay

SUMMARY:

46 anger samples were examined from 5 bores at Hackham, 18 miles south of Adelaide, in the Hearlunga Basin. An Upper Eocene sequence of South Australian Sande - Tortachilla Limestone - Blanche Point Marie is recognized on the basis of distinct lithologies and faunally rich layers, closely comparable with the type section in the Willunga Basin. Quaternary alluvium occurs as valley-fill.

INTRODUCTION:

In search for non-marine clay beds, ten scout holes were drilled at Hackham 18 miles south of Adelaide between 29/1/64 and 1/2/64 with a Department of Mines Geoscience auger machine. Fifteen samples from bores 1, 3, 5, 6 and 8, were submitted for palaeontological examination to determine formation and stratigraphic position. As the investigation proceeded twenty-five additional samples from bores 4, 5, 7, 8 and 10, were examined and one hundred sludge samples were logged. Tertiary formations encountered in the bores are the Blanche Point Marie and Blanche Point Transitional Marie, Tortachilla Limestone, and South Australian Sande.

FORMATIONS ENCOUNTERED:

1. Quaternary alluvium:

At least 30 feet of brown poorly-sorted pebbly, gritty, clayey quartz sand, probably fluvial and alluvial were cut in Bore 10, sited low in the present valley. This material, which is apparently unfossiliferous, is in its upper part laminated, as indeed are the Blanche Point Marie where they are within about 100 ft. of the present land surface.

2. Blanche Point Marie (Upper Eocene)

This is the youngest of the Tertiary formations encountered in the bore. Including the Blanche Point Transitional Marie, a minimum thickness of at least 45 feet is cut in Bore 1. The Blanche Point Marie in this area are typically cream, light brown or light grey, speckled with green glauconite, more or less sandy, siliceous (opicular chert or flint) marls or mudstones becoming increasingly fossiliferous downwards. Entry into Transitional Marie Member is marked by a change to a khaki colour, more glauconite and limonite, light pink brown and green calcite recrystallization, larger and more common mollusc fragments, and an abundant and varied fauna including such foraminifera as Cyroidina sp., Cornuclia sp., Nautilina chassani, Asterionaria adalaidensis and Cheloniculites rugosa. The thickness of this Transitional Marie Member is about 10ft.

3. Tortachilla Limestone (Upper Eocene)

This is a distinctively green and brown (overall khaki brown) glauconitic and limonitic, sandy and clayey, somewhat siliceous (cherty) abundantly fossiliferous shelly limestone, marl and calcarenite, about 10ft. thick in this area. Glauconite impregnated calcitic fragments and honey-brown limonite-stained sub-rounded and polished quartz sand, are typically common. Most of the abundant originally-glauconitic voids and aggregates have been more or less oxidized to limonite. The limestone matrix is variously light greenish-grey, light pink, light brown and cream. A prolific foraminiferal fauna includes a very rare but distinctive Paratropidoceras sp. which seems to be restricted to the Tortachilla Limestone. Other species although better developed and more abundant in the Tortachilla Limestone, persist into the Blanche Point Transitional Marie.

4. South Maclin Sands (Upper to Middle Mesozoic)

Under the Tertachilla Limestone occur dark brown slightly glauconitic very limonitic calcareous silty and clayey quartz sand referred to the South Maclin sands. Limonite (oxidized glauconite) ovoids and aggregates are abundant, the quartz grains are generally stained or coated with limonite, and the rare to frequent bryozoan echinoid mollusk and foraminiferal fossils are often limonitized. Cibicides wuhenifer dominates the foraminiferal fauna. Bore 5 penetrates the South Maclin Sands most deeply, and here, under about 22 ft. of the above lithology occurs at least 1 ft. of a light gray (streaked and mottled with limonitic-brown) micaceous sandy and silty clay. Cibicides wuhenifer occurs frequently, same at least within this matrix as them. An amphibian tooth was also recovered. This interval is regarded as a clayey phase of the South Maclin Sands. No formation older than the Upper Mesozoic South Maclin Sands was encountered in any of the bores examined.

DESCRIPTIONS OF CUTTINGS:

Bore 1

(a) 6 - 9 ft.

Cream to very light brown glauconitic cherty and sandy marl with common sponge spicules, spicular moulds, and light grey or brown translucent chalcodonic spicular flints. Mollusk moulds and casts, bryozoan fragments and very rare non-diagnostic foraminifera are also present. Light olive-green glauconite ovoids and aggregates are abundant. The sample is assigned to the Blanche Point Marl in view of its lithology and spiculiferous nature.

(b) 2 - 12 ft.

Cream to white, speckled green, very similar to the previous interval. Very rare foraminifera, rare echinoid spines, bryozoan fragments and mollusk moulds

and casts, abundant sponge spicules. Blanche Point
Maria.

(c) 35 - 45 ft.

Light greenish khaki-coloured glauconitic sandy
cherty marl with abundant sponge spicules, common
mollusc, echinoid and bryozoan fragments, and abundant
foraminifera. Very light pink calcitic recrystallization
of the carbonate fossils is common. The glauconite is
a darker olive-green. Foraminifera include: large
Lenticulina sp. (R), Cibicides subaerifer (A), Cibicides
near pseudosubaerifer (R), Cibicides cf. vorax (F),
Globigerina lincolni (VR), Chilostomulites rufus (F),
Pullenia quinqueloba (C), Uvulinerina subglobosa (F),
Rosalina sp. (R), and many other small species. The
sample is from the Blanche Point Transitional Maria.

Bore 2

(a) 6 - 9 ft.

Green-speckled, cream to light grey, glauconitic
sandy cherty marl and mudstone with many fossil casts
and moulds, mostly of molluscs. Sponge spicules and
chalcedonic spicular filaments are common. Foraminifera
are rare. The sample is mostly Blanche Point Maria.
However there are frequent fragments of light green,
light pink and light brown glauconitic slightly limonitic
sandy and chelly limestone with polished honey-brown
limonite-stained quartz grains. Frequent moderately
large pelecypod fragments occur in this matrix as do
light pink recrystallized bryozoan fragments and frequent
glauconitic-impregnated fragments, particularly of echinoids.
Limonite ovoids and aggregates occur frequently. A
foraminiferal fauna distinctively coloured a very light

* (VR) = very rare, (R) = rare, (F) = frequent, (C) = common,
(A) = abundant.

green (glauconitic impregnation) includes Panoplia polymorpha sp. (VR), Asterigerina edwardsensis (VR), a moderately large Lentaculina sp. (VR), Cyrtocina sp. (VR), Cibicides pseudocarinatus (N), Cibicides subquadratus (C), Buccella sp. (VR), "Eponides repandus" (F) and Meretrix sp. (N). The above lithology and fauna is typical of the Tortachilla Limestone. Since the sample representing 9-12ft. is also mostly Blanche Point Marl with only a very small amount of Tortachilla Limestone, the Tortachilla contribution in the sample 6-9ft. is regarded as either reworked material (romantic fossils) or contamination during drilling or sampling.

(b) 9 - 12ft.

This is mostly very light grey, speckled green, glauconitic sandy cherty marl and slightly calcareous cherty fossiliferous mudstone of the Blanche Point Marl. Glauconite ovoids and aggregates are abundant. Loose sponge spicules in light-colored matrix are common in washed material. Foraminifera are rare and include Cibicides subquadratus. A small amount of glauconitic shelly limestone, similar to that in the 6-9ft. sample, is likewise regarded as Tortachilla Limestone introduced by reworking or contamination.

(c) 42 - 45ft.

Khaki green and brown, glauconitic, ferruginous, sandy and clayey, slightly cherty, shelly limestone and marl, typical of the Tortachilla Limestone, with abundant mollusk fragments (some large), bryozoa, echinoids, and foraminifera, rare ostracods and frequent sponge spicules. There is much glauconite impregnation especially of porous echinoid fragments. Honey-brown, limonite-stained, polished quartz grains are common. Most glauconite ovoids and aggregates have been more or less limonitized (oxidized). A distinctive and prolific foraminiferal

assemblage generally tinted by glauconite or limonite includes Nautilella chermakii (VR), Asterigerina adelaigensis (R), large Lenticulina sp. (R), Pseudo- polymorphina sp. (VR), and several other species of Polymeridinae, Gibbicoides pseudocurvatus (F), Gibbicoides subenifera (A), Gibbicoides spp. (C), Rosalina sp. (F), Gyrogonia sp. (F), "Goniatites rooseae" (F), Eponides sp. (C), Ammonia sp. (F), Globigerina lineolata (R), Globigerina spp. (C), Cheloniculina rugosa (F), Cassidulina spp. (F), Palaeoniscus subquadratus (R), species of Ammonitina, Uvuloceras, and Trifarina; Ceratomyria sp. (F), Lagena hexagona (F), Serolis sp. (R), Textularia sp. (R), Fissurina sp. (F), and Statalina soluta (R)

(d) 51 - 52ft.

Tortoschella lineolata, very similar to 42-45ft.

Core 4.

(a) 6 - 9ft.

Light grey and brown, slightly greenish, with minor light brown ferruginous patches, somewhat laminated, glauconitic spicular cherty sand and cherty mudstone. Light green glauconite ovoids are quite abundant. Light grey chalcedonic spicule-rich flints are common in washed material. A small amount of angular to rounded clear quartz sand is present. Foraminifera are very rare. The sample is from the Blanche Point Marls.

(b) 12 - 15ft.

Light grey, light brown, light olive-green (overall light khaki), glauconitic spicular cherty sand and mudstone with more sand than at 6-9ft. Glauconite ovoids and aggregates are more abundant; loose sponge spicules are abundant in addition to spicular flints. Frequent mollusc casts and moulds include Turritella sp. Foraminifera are very rare. Blanche Point Marls.

(c) 18 - 21ft.

Rather similar to 13-15ft. Blanche Point Marie.
Dark olive-green glauconite is abundant, as are fragments of spicular chert. Mollusc casts and molds are common in glauconite and chert. Quartz sand is only minor. Foraminifera are very rare.

(d) 22 - 27ft.

Light grey, light brown, speckled olive-green (overall unwashed colour is greenish light khaki) sandy, glauconitic cherty marl with abundant loose sponge spicules and light grey chalcidonic spicular glauconitic flints. Foraminifera are common, dominated by Cibicides lobatulus (C), and Assiculina subglobosa (F). A moderately large Lenticulina sp. occurs very rarely. Lagena hexagona (R), and rare Polymerphinites and Medusarites are present. Blanche Point Marie.

(e) 28 - 33ft.

Speckled greenish light khaki sandy glauconitic cherty marl rather similar to 24-27ft. Mollusc fragments (mostly polycypids) are common, generally, like the foraminifera, in very light pink recrystallised calcite. Foraminifera are common and include Spirulina sp. (R), Cibicides lobatulus (C), Cibicides sp. (F) and Assulina sp. (R). Probably Blanche Point Transitional Marie.

(f) 34 - 40ft.

Speckled brownish-khaki limonitic and glauconitic sandy cherty marl, with a more abundant and varied fauna of mollusca (fragments abundant), sponges (spicules common), echinoids (fragments frequent), bryozoa (fragments rare) and foraminifera (abundant). Frequent light pink, light brown and light green calcitic fragments contribute to a more calcareous lithology. Foraminifera include Assiculina shannoni (VA), Paranartax sp. (VA), "Assiculina shannoni" (R), large Lenticulina sp.

(A). Sismatobina sp. (VR), and Cibicides sp. in addition to previously listed forms which are also more abundant. Blanche Point Transitional Series.

(G) 42 - 45ft.

Predominantly a brownish-khaki limonitic and glauconitic sandy cherty marl, still with many fragments of light grey glauconitic chert. Entry into the Tortachilla Limestone (at, say, 44ft.) is marked by the appearance of frequent fragments of green-brown, glauconite-impregnated, limonitic fossiliferous sandy limestone with large mollusk fragments, bryozoa, and glauconite-impregnated echinoid fragments. Asterigerina adelaidensis (VR), Cibicides near pseudocorymbus (VR), Pseudopolymerobina sp. (VR), and Gastropoda sp. (VR) are present.

(H) 45 - 48ft.

Darker greenish-khaki (grey-green and brown when washed) glauconitic limonitic abundantly fossiliferous sandy clayey and shelly limestone, with abundant limonitized glauconite ovoids and many fragments of light green, light pink, light brown, or cream limestone. A Tortachilla fauna similar to that recorded from Bore 3, 42-45ft. confirms Tortachilla Limestone.

BORE 5.

(a) 9 - 12ft.

The washed sample is very light brown to grey with speckling of ferruginous brown and glauconitic green (unwashed: brownish-green). A sandy glauconitic and ferruginous somewhat limonitized marl, in which blue-green glauconite and limonitized glauconite both occur frequently, and light green calcitic fragments are abundant as are fine to coarse subrounded quartz grains.

Bryozoal fragments are rare, echinoid and mollusk fragments very rare. Rare and small foraminifera include

Chelonicrinella curvata (VR), Triferina bradyi (R),
Heliolites sp. (VR), Cibicides cf. venter (R), Cibicides
sp. (VR), Moselyella sp. (VR), Cassidulinella sp. (VR),
Asterigerina sp. (VR) and Lacuna sp. (VR). A fragment
of a light green larger polymorphinid, small opinesse
spheroids, and siliceous ovoids and discs are also
present. The interval is assigned to the Blanche
Point Transitional Series.

(D) 12 - 15 ft.

Speckled light brown and greenish-gray glauconitic
limonitic sandy cherty fossiliferous limestone, somewhat
knackerized. The limestone which is in part hard,
recrystallized, and siliceous, varies in colour from
white, cream, and pink, to very light green and brown.
Honey-brown limonite-stained polished quartz grains are
common, as are limonitized ovoids and aggregates. Large
mollusc fragments are frequent, but generally the common
bryozoan, echinoid, and mollusc fragments are broken
small. Glauconite-impregnated fragments, especially
of echinoids, are present as are limonitized bryozoan
fragments. Foraminifera are quite rare, recrystallized,
and coloured light green, brown or pink. Cibicides
umbonifer is the most common; others include Moselyella
chapmani (VR), Asterigerina aculeata (VR), large
Lenticulina sp. (VR), Gyrogonia sp. (VR), Cibicides near
pseudocurvatus (VR), "Echinoides repandus" (VR), Carpenteria
sp. (R), Dentalina soluta (VR), Pisidium sp. (VR),
Orthis sp. (VR), and several other species of Poly-
morphinidae. One fragment may be Pseudomorphinella sp.
Lithology and fauna suggest Katachilla Limestone, at
least for part of the interval.

(c) 15 - 27ft.

Greenish-brown and grey (unwashed colour a light khaki-brown) more ferruginous glauconitic sandy and clayey cherty liststone and marl, with a Tertashilian fauna and abundantly fossiliferous. Mostly Tertashilia liststone.

(d) 27 - 42ft.

Darker brown glauconitic very limonitic calcareous clay, silt, and sand, with abundant limonitized ovoids, limonite stained or coated quartz, and rare to frequent mostly limonitized bryozoal and echinoid fragments. Foraminifera are rare and mostly small, dominated by Gibicides umbonifer, Gibicides parvobuccatus, Gibicides sp., Neolina sp., and a few Polysorphaeidae, are all very rare. "Uvulites repanda" is rare. The interval is assigned to the South Maslin Sands.

(e) 42 - 54ft.

As above passing down to light grey (streaked and mottled with limonitic-brown) micaceous sandy and silty clay. Frequent Gibicides umbonifer occurs, some at least in this matrix. An ophiurid tooth and a few other foraminifera were also recovered. The sample is probably from the South Maslin Sands.

Bore 6.

(a) 6 - 10ft.

This is a composite sample which seems anomalous in some respects, since Bore 6 is sited between Bore 5 and Bore 7 on much the same level, and should be comparable. The unwashed sludge is brown, slightly ferruginous, calcareous gritty quartz sand and clay with abundant buff to cream sandy bunker fragments and frequent fragments of white, light greenish-grey and light brown glauconitic apicular chert and cherty marl. The washed material is mostly quartz sand, some of it iron-stained. The glauconitic

slightly limonitic chert fragments are fossiliferous, with gastropod and polycyped moulds and casts. This lithology is typical of the Blanche Point Marls. Very rare glauconite-limonite green and brown fragments are reminiscent of Tortachilla Limestone lithology. Polished limonite ovoids and aggregates are frequent. Glauconite-impregnated echinoid fragments occur rarely. Echinoid spines, bryozoan fragments, foraminifera and ostracoda are very rare, generally in recrystallized brown calcite. Foraminifera include Cibicides vertex (VR), Syringidina sp. (VR), Cibicides subaenifer (VR) and Cassidulina subglobosa (VR). Loose sponge spicules and spicular grey flints are rare. Small spinose spheres are frequent, siliceous milky ovoids are very rare. Black, glossy carbonaceous fragments are rare. In all there is evidence for predominant Blanche Point Marls, with some contribution from Tortachilla Limestone and South Marls Sands.

(b) 90 - 43ft.

The unwashed sledge is very similar to that of 6-30ft. being brown clayey and sandy with many light-coloured fragments of cherty more or less calcareous lithology, and both glauconite and limonitic. The washed sample is largely gritty quartz sand with abundant fragments of white, crisp and light brown sandy glauconitic chert and cherty limestone. Heliozoan coats and moulds are frequent. Sponge spicules are frequent. Rare foraminifera include Folliaquin quinqueloba (VR), Cassidulina subglobosa (VR), Frago sp. (VR), Cibicides subaenifer (VR), Cibicides sp. (VR), and Elphidium spp. (VR). Small spinose spheres, and siliceous ovoids are rare. This sample again seems largely Blanche Point Marls, but like 6-30ft. is composite, saccharous, and perhaps contaminated or reworked.

(a) 6 - 9ft.

Light brown sandy limestonitic glauconitic slightly limonitic cherty marl. Common light grey glauconitic apiculate cherty fragments, with mollusc casts and moulds, and sometimes with dendritic black (manganese-dioxide) staining. Foraminifera are very rare. Limestonitic Blanche Point Marl.

(b) 12 - 15ft.

Light brown sandy limestonitic cherty marl rather similar to 6-9ft. but more fossiliferous. Echinoid and bryozoan fragments, and foraminifera are frequent. Rare loose mollusc fragments are present, some fairly large. Ostreoids are very rare. Glauconite-impregnated light grey-green echinoid and other calcitic fragments occur rarely, as do fragments of bright green and brown glauconitic limonitic sandy and cherty shelly limestone. Foraminifera include Sibicidina subquadrata (F), Sibicidina quadrangulata (VR), moderately large Lepticalina sp. (VR), Cyrtocina sp. (F), Entellina sp. (VR), Gammonella sub-elliptica (F), Epistominella quadrata (VR), Globulinerina sp. (F), Trifarina bradyi (F), Ammonia sp. (VR), Ammonia sp. (VR), Trifarina sp. (VR), Laguncula sp. (F), Laguncula sp. (F), Dentalina soluta (VR) and Foraminifera sp. (VR). Small spinose spheroids and siliceous cysts are rare. The lithology and fauna show entry into the Blanche Point Transitional Marl.

(c) 18 - 21ft.

Khaki-coloured (grey-green and brown speckled when washed) limonitic glauconitic sandy cherty and clayey limestone, abundantly fossiliferous and shelly, with abundant fragments of light green, light brown, and cream cherty limestone. The lithology and fauna is typical of the Tartachilla Limestone as previously described. Paenodactylina sp. occurs very rarely.

(d) 24-27ft.

Khaki-brown (when washed - brown, light grey, green) moderately glauconitic more limonitic and sandier than 18-21ft. The fauna is less abundant but still predominantly Tortachillian. Most of the interval is Tortachilla Limestone but South Maslin Sands may be entered.

(e) 28 - 33ft.

Dark brown very limonitic slightly glauconitic calcareous silty and clayey quartz sand, of the South Maslin Sands, with abundant limonite ovoids, aggregates, coatings and stainings. Bryozoa, echinoid, and mollusc fragments are frequent and often limonitized. Sibicoides subovifer is common. One specimen each of Pseudopoly-morphina sp., Asterigerina adelaidensis and Masilinella chapmani may be Tortachillian contaminants.

(f) 34 - 39ft.

Very similar to 30-33ft. Much limonitization. South Maslin Sands.

(g) 39 - 42ft.

Very similar to 30-33ft. South Maslin Sands.

UNIT 3

(a) 6 - 9ft.

Green, partly limestonized glauconitic sandy shelly cherty marl. Loose sponge spicules are frequent, as are spicular chert fragments. Polycysted fragments are common, echinoid fragments (occasionally glauconite-impregnated) are frequent, and bryozoan fragments rare. Ostracods are rare. Foraminifera are common and include Sibicoides subovifer (G), Masilina sp. (R), Cassidinella subglobosa (R), Lagena hexagona (VR), and a medium-sized Loxostoma sp. Blanche Point Marls.

(b) 12 - 15ft.

Green, slightly green and light brown partly laminarized glauconitic cherty sandy and shelly marl with frequent chalcedonic opicular flints which are greenish-grey and sometimes glauconitic. Mollusc fragments are common, sometimes large; echinoid fragments and loose sponge spicules are common, bryozoan fragments rare, and foraminifera common and more varied than 6-9ft. Estracods are frequent. Limonite ovoids, aggregates, quartz-stainings etc. occur frequently. Foraminifera include Asterigerina adalensis (VR), moderately large Lenticulina sp. (VR), Nautilina sp. (R), Sibicidina cf. vorax sp. (R), Sibicidina subanifer (A), Sibicidina sp. (C), Cassidulina subglobosa (P), at least eight species of Polyamorphinidae, all very rare. Puzosia sp. (VR), small Uvigerininae (R), Rafinesquina sp. (R), Loganella (R), and Gentulina sp. (R). Small milky siliceous ovoids are rare. Blanche Point Transitional Marie.

(c) 15 - 21ft.

Green-grey, dark olive-green and brown glauconitic limonitic sandy shelly and cherty marl tending in part to light brown, green and cream abundantly fossiliferous limestone. A full benthonic Tertachillian foraminiferal fauna is present, similar to that described earlier. The sample thus involved Blanche Point Transitional Marie passing down into Tertachillian limestone.

(d) 24 - 27ft.

Khaki (green, grey, brown) abundantly fossiliferous glauconitic limonitic sandy cherty shelly impure limestone of the Tertachillian limestone.

(e) 27 - 30ft.

Khaki brown (speckled brown and greenish-grey) notably limonitic, glauconitic sandy impure limestone or calcarenite with an abundant Tertachillian fauna as above.

On long-lasting reaction with dilute hydrochloric acid considerable brown ferruginous clay is released and much siliceous spicular meshwork is revealed, together with frequent green-grey chert fragments. Tentaculites linearis

(f) At 30ft.

Very similar to the above in every way. Tentaculites linearis.

Para 10.

(a) 6 - 9ft.

Bankarised brown gritty silty and clayey ferruginous quartz sand. Washed material is almost entirely a poorly sorted limonite-stained gritty quartz sand with frequent more or less rounded fragments of brown phyllitic siltstone. Common in the washed sample are light brown to brown-grey sandy bankar fragments which dissolve in dilute hydrochloric acid to leave brown clay, quartz silt and sand. Apparently unfossiliferous.

(b) 12 - 15ft.

Very similar to above. Apparently unfossiliferous.

(c) 18 - 21ft.

As above with common subangular to rounded lithic fragments of brown, red-brown, and grey phyllitic siltstone. Apparently unfossiliferous.

(d) 24 - 27ft.

As for 18-21ft. Abundant lithic fragments in gritty sand. Apparently unfossiliferous.

(e) At 30ft.

Washed material is brown pebbly gritty sand, apparently unfossiliferous, with abundant fragments of phyllitic siltstone as above.

J. M. Lindsay

J. M. LINDSAY
GEOLOGIST
PALAEONTOLOGY