DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 82/21
IDENTIFICATION OF MORGAN
LIMESTONE IN CSIRO COREHOLE
R8, HD. MURBKO, MURRAY BASIN

GEOLOGICAL SURVEY

by

J.M. LINDSAY

BIOSTRATIGRAPHY SECTION

MARCH, 1982

DME.No.71/82
Biostrat.No.3/82

CONTENTS | PAGE

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 82/21
DME No. 71/82
Biost. No. 3/82
Disk No. 99

IDENTIFICATION OF MORGAN LIMESTONE IN CSIRO COREHOLE R8, HD. MURBKO, MURRAY BASIN

(Client: CSIRO Soils Division, Urrbrae)

ABSTRACT

A set of cores of Murray Group limestones spanning a stratigraphic thickness of 15 m contains the large foraminifer Lepidocyclina howchini Chapman and Crespin in the bottom-most core (28.6-28.9 m), indicating that the hole bottomed low in Morgan Limestone. Furthermore, other foraminifera (particularly the occurrence of Astrononion obesum Carter at a depth of 15.2-15.85 m) indicate that all the cores supplied are from Morgan Limestone. It may now be possible to recognise within the Murbko study area, clayey equivalents of the Cadell Marl Lens within Morgan Limestone, and of the Finniss Clay beneath Morgan Limestone. The sequence in corehole R8 is related to the nearest exposures of Murray Group in the River Murray cliffs 6 km west.

INTRODUCTION

A request was received from CSIRO, Division of Soils (Dr. G.B. Allison, Dr. W.J. Stone) to identify the stratigraphic formation(s) and age of drill cores recovered during the CSIRO Murbko Recharge Study as part of investigations into groundwater contributions to the salinity of the River Murray.

WELL LOCATION

RENMARK 1:250 000 Sheet (SI 54-10),

Morgan 1:100 000 Sheet (6829-IV),

Morgan 1:50 000 Sheet,

1:100 000 Grid Reference 818160,

6 km E.S.E. of Murbko,

County Albert, Hundred Murbko, Section 9.

DESCRIPTIONS OF SAMPLES

Hollow-auger core, with wireline retrieval.

Core 13.9-14.35 m (sample 9)

Fossiliferous limestone, brownish-cream, calcarenitic; silty, clayey; moderately cemented; partly leached of carbonate fossils; minor glauconite; frequent bryozoal and echinoid fragments; regressive facies, stratigraphically distinctive foraminifera lacking; benthonic species include miliolids (*Quinqueloculina*, *Triloculina*, *Pyrgo*), arenaceous species (*Dorothia parri*, *Textularia*), and common *Cibicidoides pseudoungerianus*.

Core 14.35-15.1 m (sample 10)

Glauconitic calcarenitic limestone, yellow-brown; partly leached, moderately cemented; frequent echinoid fragments, mollusc fragments moulds and casts; rare ostracods and *Ditrupa* tubes; the foraminiferal fauna has rather low diversity (regressive facies) but includes the planktonic species *Praeorbulina transitoria*, and benthonics *Pararotalia* cf. *verriculata*, *Elphidium chapmani*, *Parrellina howchini*, *Marginopora vertebralis* (one fragment), together with common *Cibicidoides pseudoungerianus* and fragmentary miliolids.

Core 15.2-15.85 m (sample 11)

Hard calcarenitic limestone, mostly well cemented; pale brown; occasional glauconite grains; poor disaggregation; rare bryozoal, echinoid, and *Ditrupa* fragments; benthonic foraminifera include rare *Astrononion obesum*, *Gypsina howchini*, and *Pararotalia* cf. *verriculata*, together with common fragmentary miliolids and abundant *C. pseudoungerianus*.

Core 16.6-17.35 m (sample 13)

Calcarenitic limestone, mottled pale and darker brown, friable; silty, clayey; minor glauconite; common *Ditrupa* fragments, less common echinoid and bryozoal remains; foraminifera benthonic and mostly small; *Gypsina howchini* is rare and small; a fragment of ?*Operculina*.

Core 21.85-22.6 m (sample 20)

Limestone, bryozoal, foraminiferal, echinoidal, moderately friable, pale grey; silty; minor glauconite as grains or fossil fillings; large *Operculina victoriensis* and *Amphistegina lessoni* occur frequently; *Parrellina craticulatiformis*, large *Gypsina howchini*, and *Sphaerogypsina globula* are rare.

Core 26.35-27.10 m (sample 25)

As above; pale brownish-grey; benthonic foraminifera as above, together with frequent *Tritaxia victoriensis*.

Core 27.1-27.85 m (sample 26)

As above, but cream; benthonic foraminifera include large *Operculina*, *Parrellina*, *Gypsina*, *Sphaerogypsina*, and occasional *Bdelloidina aggregata*; planktonic species include rare *Praeorbulina transitoria* and *Globigerinoides sicanus*.

Core 28.6-28.9 m (total depth) (sample 28)

As above, with *Lepidocyclina howchini* (3 specimens), rare *Crespinella parri*, and large *Operculina*, *Amphistegina*, together with a specimen of the planktonic species *Praeorbulina transitoria*.

DISCUSSION OF RESULTS

1. The presence of *Lepidocyclina howchini* in the lowest sample (associated with a characteristic microfauna) indicates that the hole bottomed within the *L. howchini* zone, and thus within the Morgan Limestone, since in the western Murray Basin this zone only occurs a few metres above the base of Morgan Limestone (Lindsay and Giles, 1973). With ground level at R8 estimated to be R.L. 40 m, the top of the *L. howchini* zone in the bore is thus about R.L. 11.4 m.

2. The thin zone of *Astrononion obesum* is encountered consistently within Morgan Limestone in the western Murray Basin, the base of the zone occurring at between 11 and 14 m above the *Lepidocyclina howchini* zone, in the Cadell Marl and its equivalents (Lindsay and Bonnett, 1973, p. 13; Lindsay and Giles, 1973, p. 5). In the cores provided from bore R8, *A. obesum* only occurs at 15.2-15.85 m,i.e. 12.75 m above the *L. howchini* zone, consistent with other records. This also suggests that soft, clayey bands at about this depth in bore R8 would correlate with the Cadell Marl Lens.

3. *Pararotalia verriculata* (Howchin and Parr) has a somewhat irregular range-top within Morgan Limestone in the western Murray Basin, between the *Lepidocyclina howchini* zone and the Cadell Marl Lens (Ludbrook, 1961,

table 7; Lindsay and Bonnett, 1973, p. 14; Lindsay and Giles, 1973, p. 4). The range-top of P. cf. verriculata at 14.35-15.1 m in the series of cores from bore R8 suggests (as does the presence of Astrononion obesum immediately below) that this is stratigraphically no higher than the Cadell Marl.

4. The uppermost core sample supplied, No. 9, from 13.9-14.35 m, although lacking definitive foraminifera, is similar lithologically to core sample 10 at 14.35-15.1 m, and is also identified as Morgan Limestone. The exposed thickness (above normal river level) of the type section of Morgan Limestone, 12 km N.N.W. of bore R8, is 28 m (Ludbrook, 1961, p. 54). Of this thickness, 25 m is above the Lepidocyclina howchini zone (Lindsay and Giles, 1973), so core sample 9 which is only at most 14.7 m above the L. howchini zone is well within the expected thickness of Morgan Limestone hereabouts.

5. If Finniss Clay is present in the vicinity of bore R8, its top and the base of Morgan Limestone might be expected at about 6 to 9 m below the top of the Lepidocyclina howchini zone, i.e. at about 5.7 to 8.7 m below the bottom of bore R8 (see Lindsay and Giles, 1973; Lindsay and Bonnett, 1973). This is estimated to represent a Reduced Level (A.H.D.) of between 5.4 and 2.4 m. Only 2 km N.N.W. of bore R8, in SADME observation bore 6829-00245, a distinct bed of Finniss Clay, 1.8 m thick, underlies Morgan Limestone, the contact being at a depth of 28.7 m (R.L. 6.5 m). In this bore, Finniss Clay is logged as moderately soft marl, pale yellow-brown, with an estimated 25% content

of calcarenite. Alternating thin bands of marl and limestone continue from 30.5 m to total depth of 39.6 m, gradational from Finniss Clay to Mannum Formation.

6. The presence of the significant planktonic species Praeorbulina transitoria (Blow) at 14.35 m down to 28.9 m in hole R8, closely dates the whole section as late Early Miocene to early Middle Miocene, mid Zone N.8 - basal Zone N.9 (Blow, 1969).

ADDENDUM

In order to compare the borehole sequence with the nearest exposures, the River Murray cliff section at the old 'Amber Hill' ruin, 6 km west of bore R8, was subsequently examined with Dr. W.J. Stone on 3rd March, 1982. The Lepidocyclina howchini zone was identified by inspection, with an apparent top at 11.8 m above pool level, or R.L. 15.0 m (A.H.D.).

A soft marly band two or three metres above pool level is considered to be a Finniss Clay equivalent underlying Morgan Limestone. Equivalents of the Cadell Marl Lens are not present in the section, the Morgan Limestone being truncated below the stratigraphic level of the Cadell Marl by the Pliocene erosional unconformity at about 21.6 m above pool level (i.e. R.L. 24.8 m).

J.M. Lindsay.

JML/GU

J. Murray Lindsay,
Biostratigraphy Section

REFERENCES

Blow, W.H., 1969. Late Middle Eocene to Recent planktonic foraminiferal biostratigraphy. _In:_ Bronnimann, P. and Renz, H.H. (Eds), _Proceedings of the First International Conference on Planktonic Microfossils, Geneva, 1967_. E.J. Brill, Leiden, Vol. 1, pp. 199-422.

Lindsay, J.M. and Bonnett, J.E., 1973. Tertiary stratigraphy of three deep bores in the Waikerie area of the Murray Basin. _Rep. Invest., geol. Surv. S. Aust._, 38.

Lindsay, J.M. and Giles, S.D., 1973. Notes on the _Lepidocyclina_ Zone in Morgan Limestone along the Murray River, South Australia. _Q. geol. Notes, geol. Surv. S. Aust._, 45: 1-7.

Ludbrook, N.H., 1961. Stratigraphy of the Murray Basin in South Australia. _Bull. geol. Surv. S. Aust._, 36.