Australian geology. The extraordinary prevalence of *Nubecularia* in the rock—a form which hitherto has been considered more a modern than ancient type of Protozoa—is a notable fact. Moreover, in the Upper Palæozoic rocks of Australia, judging from the Tasmanian evidence, there is an apparent absence of the arenaceous and sub-arenaceous types, which are the characteristic forms of the Carboniferous foraminifera of the Northern Hemisphere, and their places are taken by genera which construct calcareous and hyaline tests, types that are more characteristic of related faunæ of Secondary and Tertiary age. It must, however, be remembered that the data at present are extremely slender on which to base any broad generalisations, and a more extended examination of rocks of this age may bring to light a closer affinity between the foraminiferal fauna of the Upper Palæozoics of the two hemispheres than appears at present.

DESCRIPTION OF PLATES.

The Plates exhibit portions of the transparent sections of the foraminiferal rock magnified twenty-six diameters.

Plate X.

a. Eight of the more conspicuous sections of *Nubecularia lucifuga*, var. *Stephensi*, var. nov., are marked *a*. The example in the upper left-hand corner is a flat parasitic form, the rest are investing.

b. Longitudinal section of *Nodosaria (?) radicula*, Linné.

c. Transverse section of *Spiroloculina (?) planulata*, Lamk, passing nearly through the centre of the test.

Plate XI.

a. Nine of the more conspicuous sections of *N. lucifuga*, var. *Stephensi*, cut at various angles, are marked *a*.

4.—A CENSUS OF THE FOSSIL FORAMINIFERA OF AUSTRALIA.

By WALTER HOWCHIN, F.G.S.

It is intended by the present paper to tabulate a complete list of the fossil foraminifera of Australia so far as known at present.

Many years ago small samples of material from the Lower Tertiaries were examined for foraminifera by the Rev. Tenison Woods. Messrs. Parker and Jones, and Dr. H. B. Brady, particulars of which will be found in the sequel. About ten years ago the author commenced a systematic examination of the microzoal rocks of this continent, with the result that the list of known species of foraminifera in the fossil condition has been greatly increased and many interesting facts bearing upon the distribution of this order in relation to space and time have been collated.

The field of investigation in this department of research is a very wide one, and the methods of observation, demanded by the minuteness of the objects, necessarily slow and tedious. Added to these difficulties is the serious disadvantage of being widely separated from co-workers in the same departments of study and the inaccessibility to works of reference, which is one of the greatest drawbacks to original workers in these colonies. I have to express my grateful acknowledgments to the late Dr. H. B. Brady, F.R.S., Monsieur C. Schlumberger (of Paris), C. D. Sherborn, Esq., F.G.S., F. Chapman, Esq., and others for valuable assistance given in the determination of new and doubtful forms; also to Professor R. Tate, F.G S., Jas. W. Jones, Esq. (Conservator of Water), John Dennant, Esq., F.G.S., R. Etheridge, jun., Esq. (Government Palæontologist, New South Wales), H. P. Woodward, Esq., F.G.S. (Government Geologist, Western Australia), and many others who have placed geological material at my disposal.

The classification and nomenclature adopted in the present paper are in the main the same as those laid down by Dr. H. B. Brady, in his descriptions of "The Reticularian Rhizopoda of the Challenger Expedition," modified only in a few instances where later researches demand it.

The letters in the columns indicate the relative number of individuals observed whilst searching the material, and have the following values:—V R, very rare; R, rare; R S, rather scarce; M C, moderately common; C, common; V C, very common; X, indicates occurrences when the relative numbers of the species is unknown.

POST-TERTIARY.

Material obtained from elevated sea bed bordering the coast. The Post-Tertiary beds at Port Adelaide are divided into two strongly-marked divisions—an upper bed of bluish sandy clay with shells, and a lower bed of white calcareous sand very full of organic remains. The foraminifera specified below were obtained from the upper bed exposed in the banks of creeks on the Port Adelaide flats. The lower bed has not yet been examined for foraminifera, but large numbers of *Orbitolites complanata*, Lamk., can be easily distinguished in it by the naked eye.

TABLE I.

Miliolidæ.

Nubecularia lucifuga, Defr.	V C
Miliolina Boueana, d'Orb.	R
circularis, Bornem.	R S
Ferussacii, d'Orb.	R
labiosa, d'Orb.	R
oblonga, Montag.	V C
subrotunda, Montag.	V C
seminulum, Linn.	M C
(Tri.) insignis, Brady	M C
" tricarinata, d'Orb.	V C
" trigonula, Lamk.	R
Spiroloculina excavata, d'Orb.	R
grata, Terq.	M C
Vertebralina striata, d'Orb.	C
Peneroplis pertusus, Forskal	R
planatus, F. & M.	R S

Textularidæ.

Textularia conica, d'Orb.	R
Valvulina pupa, MS. Howchin	R
Virgulina pauciloculata, Brady	R
Bolivina punctata, d'Orb.	M C
textilarioides, Rss.	R S
tortuosa, Br.	R

Lagenidæ.

Lagena clavata, d'Orb.	R
globosa, Montag.	R
gracillima, Seg.	M C
semistriata, Will.	M C
Polymorphina lactea, W. & J.	R

Rotalidæ.

Discorbina globularis, d'Orb.	R
rosacea, d'orb.	R
turbo, d'Orb.	C

ROTALIDÆ—*continued.*

Discorbina valvulata, d'Orb.	R
vesicularis, Lamk.	V C
Planorbulina Mediterranensis, d'Orb.	R S
Truncatulina lobatula, W. & J.	R
Rotalia Beccarii, Linn.	R S

NUMMULINIDÆ.

Polystomella crispa, Linn.	V C
macella, F. & M.	R
striato-punctata, F. & M.	V C

The above list contains thirty-eight species, all of which are more or less common in the neighboring Gulf St. Vincent at the present day. Some changes in local distribution are apparent in a few species, particularly those contained in the calcareous bed of the lower division. In the latter bed *Orbitolites complanata* is the prevailing foraminifer. This species is still living on some portions of the Australian coast, but has apparently become extinct in the adjoining waters within recent times.

PLIOCENE.

A bore put down by the Dry Creek Smelting Company about six miles north of Adelaide yielded artesian water at a depth of 320ft. The water stratum proved to be a white quartzose sand of marine origin and very fossiliferous. On the determination of Professor Ralph Tate the mollusca have a facies that can be most appropriately referred to the Pliocene—a marine formation of this age being unique for Australia. On examination, the following species of foraminifera were noted:—

TABLE II.

MILIOLIDÆ.

Biloculina bulloides, d'Orb.	V R
Miliolina Ferussacii, d'Orb.	R
oblonga, Montag.	R
(Tri) tricarinata, d'Orb.	R

LAGENIDÆ.

Polymorphina oblonga, d'Orb.	R
Sagrina (?) columellaris, Brady	V R

ROTALIDÆ.

Discorbina vesicularis, Lamk. ..... R S
turbo, d'Orb. ..... R
Rotalia Beccarii, Linn ..... V C

NUMMULINIDÆ.

Polystomella crispa, Linn ..... V C

Only ten species have been recorded at this horizon. The material is of a character not particularly favorable for the presence of foraminifera. *Rotalia Beccarii* and *Polystomella crispa* are the prevailing forms, both of which are characteristic of shallow water conditions.

MIOCENE.

LOCALITIES.

No. 1.—From material collected by Professor Tate from the Murray Cliffs, near the North-West Bend Station. It is a fine sand with a small proportion of argillaceous matter with it. Foraminifera scarce.

No. 2.—A fine reddish sand (similar to No. 1) gathered from beds exposed when cutting foundations for new engine-sheds near the west end of Torrens Lake, Adelaide. The foraminifera are somewhat sparingly distributed through the bed, but as there is little or no infiltration of mineral matter in the chambers they can be easily separated from the material by water.

No. 3.—The upper bed of the Muddy Creek section, near Hamilton, Western Victoria. Material supplied by Mr. J. Dennant.

TABLE III.

Genera and Species.	1 N.W. Bend.	2 Adelaide.	3 Muddy Creek.
MILIOLIDÆ.			
Nubecularia lucifuga, Defr.	—	M C	—
Biloculina bulloides, d'Orb.	—	—	R
depressa, d'Orb.	—	—	R S
elongata, d'Orb.	—	—	R
ringens, Lamk.	—	—	R S
Miliolina agglutinans, d'Orb.	—	—	R S
bicornis, W. & J.	—	—	V R
insignis, Brady	—	R	V R

Table III.—continued.

Genera and Species.	1 N.W. Bend.	2 Adelaide.	3 Muddy Creek.
MILIOLIDÆ—*continued.*			
Miliolina Linneana, d'Orb.	—	—	R S
oblonga, Montag.	—	—	C
secans, d'Orb.	—	—	R S
seminulum, Linn	—	R	V C
(Tri) tricarinata d'Orb	—	R	R
" trigonula, Lamk.	—	R	R S
Spiroloculina grata, Terq	—	—	V R
limbata, d'Orb.	—	—	R S
Hauerina intermedia, Howchin	—	—	M C
Vertebralina insignis, Brady	—	—	R
Fabularia Howchini, Schlumb.	—	—	R
Sigmoilina sigmoidea, Brady (sp.)	—	—	R
LITUOLIDÆ.			
Lituola nautiloidea, Lamk.	—	—	V R
Placopsilina cenomana, d'Orb	—	—	V R
TEXTULARIDÆ.			
Textularia agglutinans, d'Orb	—	V R	—
var. porrecta, Brady	—	—	R S
sagittula, Def.	—	—	C
Verneuilina pygmæa, Egger.	—	—	V R
triquetra, Münst.	—	—	R
Clavulina angularis, d'Orb.	—	—	V R
communis, d'Orb.	—	—	V R
Bulimina elegantissima, d'Orb.	—	—	V R
Cassidulina subglobosa, Brady	—	—	V R
LAGENIDÆ.			
Lagena lineata, Will.	—	V R	—
melo, d'Orb	—	—	V R
sulcata, W. & J.	—	—	V R
Nodosaria (Gland.) æqualis, Rss	—	—	R
consobrina, d'Orb.	—	—	V R
filiformis, d'Orb.	—	V R	—
(Gland.) lævigata, d'Orb.	—	—	V R
pauperata, d'Orb.	—	—	R
raphanus, Linné	—	—	R
Frondicularia complanata, Def.	—	—	V R
Rhabdogonium exsculptum, Howchin	—	—	R
Polymorphina augusta, Egger	—	M C	—
communis, d'Orb	—	M C	R S
compressa, d'Orb.	—	—	M C
elegantissima, P. & J.	—	M C	C
elongata, Howchin, M.S.	—	V C	—

Table III. – continued.

Genera and Species.	1 N.W. Bend.	2 Adelaide.	3 Muddy Creek.
LAGENIDÆ—*continued.*			
Polymorphina gibba, d'Orb.	—	—	R S
lactea, W. & J.	—	R S	R
oblonga, d'Orb.	—	R S	R S
rotundata, Born.	—	—	R
problema, d'Orb.	—	R	—
Uvigerina pygmæa, d'Orb.	—	—	V R
GLOBIGERINIDÆ.			
Globigerina bulloides, d'Orb.	—	—	R
Orbulina universa, d'Orb	—	—	R S
ROTALIDÆ.			
Spirillina tuberculata, Brady	—	—	V R
Discorbina biconcava, P. & J.	—	M C	R S
globularis, d'Orb.	—	—	R
opercularis, d'Orb.	—	—	R
pileolus, d'Orb.	—	—	R S
rarescens, Brady	—	—	R
rosacea, d'Orb.	—	R	R S
polystomelloides, P. & J.	—	—	R S
turbo, d'Orb.	—	—	V C
vesicularis, Lamk.	—	R S	R
Vilardeboana, d'Orb.	—	R S	M C
Planorbulina Mediterranensis, d'Orb.	—	R	—
Truncatulina echinata, var. lævigata, Howchin	—	—	R
Haidingerii, d'Orb.	—	—	R
lobatula, W. & J.	—	R	—
reticulata, Czjzek	—	—	R
Ungeriana, d'Orb.	—	—	R S
Anomalina ammonoides, Rss.	—	—	R
Polytrema miniaceum, var. alba, Carter	—	—	V R
Gypsina globulus, Rss.	—	—	R S
vesicularis, P. & J.	—	—	R S
Pulvinulina repanda, F. & M.	—	—	R S
Rotalia Beccarii, Linn.	M C	M C	C
clathrata, Brady	—	—	V C
papillosa, var. compressiuscula, Brady	R	—	—
Calcarina rarispina, d'Orb.	—	—	M C
NUMMULINIDÆ.			
Nonionina depressula, W. & J.	—	R S	R
Polystomella, crispa, Linn.	R	V C	R S
craticulata, F. & M.	—	—	R
macella, F. & M.	—	R S	R S
imperatrix, Brady	—	—	C
striato-punctata, F. & M.	—	R S	R
subnodosa, Munster	—	—	C
Amphistegina, Lessonii	—	—	R S

The Miocenes of South Australia are not particularly rich in foraminifera. They are, for the most part, either closely compacted oyster beds or fine variegated sands that are sparsely fossiliferous. In the Muddy Creek section, however, there is a rich assemblage of forms. Altogether there are eighty-nine species recorded from these localities, including one new species from the Adelaide beds and several from the Muddy Creek upper bed, some of which are of great interest.

[In the course of discussion at the close of the reading of the present paper, in Section C, Mr. Dennant remarked he has since discovered that the material supplied by him (and from which the determinations have been made) had inadvertently got mixed with material from the lower bed (Eocene). In consequence of this fact the above list may require some revision. I had suspected the presence of foreign forms, and rejected a few as "derived" when searching the material.—W. H.]

EOCENE.

LOCALITIES.

1. *Muddy Creek, No.* 1.—The occurrences noted in No. 1 column have been taken from a short list of species published by the late Rev. Julian E. T. Woods "On Some Tertiary Deposits in the Colony of Victoria (Muddy Creek)." (See Quar. Jour. Geo. Soc., 1865, vol. XXI., p. 391.) In this article the author states:—"The foraminifera are large and numerous; indeed one species (*Amphistegina vulgaris*, d'Orb.) is so common that the clay is principally composed of it. Its large lenticular form can be traced in almost every pinch of the *debris*, and what makes the individuals more conspicuous is that they have all received the ferruginous glaze, which makes them look like little coins. From their numbers the strata may in truth be called an *Amphistegina* bed, similar to that in Vienna, and probably of the same age." Mr. Woods is evidently mistaken in his determination of *Amphistegina* as the leading feature of the foraminiferal fauna at Muddy Creek. *Amphistegina* exists in the Muddy Creek material, but is not nearly so large or numerous as another species, viz., *Nummulites variolaria*, which answers in all respects to Mr. Woods's descriptions, and is evidently the form intended. It is, therefore, really a *Nummulitic* rather than an *Amphistegine* bed. I have taken the liberty of making this correction in Mr. Woods's list.

2. *Muddy Creek, No.* 2.—This list of 164 species was determined by the present author from the very rich material gathered by Mr. Dennant. A goodly number of the species in this list are more or less rare, and were compiled as the result of a careful microscopic examination of the material extending over a period of two years. For further particulars see "The Foraminifera of the Older Tertiary of Australia (No. 1, Muddy Creek, Victoria),"

Trans. Roy. Soc. S.A., 1889, vol. XII., p. 1. A few alterations in the nomenclature have been made in the list as now published, to bring it up to date, and also includes two additional species —*Trillina Howchini*, Sch.—through the industry of Mons. Schlumberger, of Paris, who discovered this new species in a sample of the material sent him,* and *Fabularia Howchini*, Sch., descriptions of which will be found in Trans. Roy. Soc., S.A., vol. XIV., p. 346. Pl. XIII., Figs. 5-8.

3. In January, 1885, Mr. H. Watts, of Melbourne, sent me a few slides of mounted foraminifera for identification, selected by himself from the Lower Tertiary beds of Waurn Ponds, near Geelong. Column 3 in the subjoined table gives the results of the determination. For a note on the occurrence of *Astrorhiza angulosa*, Br., in this series, see Trans. Roy. Soc. S.A., 1885, vol. VIII., p. 160.

4. For the species indicated in the fourth column I am indebted to Mr. R. M. Johnstone, F.L.S., who published a list of the foraminifera of the Eocene beds of Table Cape, Tasmania, in his "Observations with respect to the Nature and Classification of the Rocks of Australia," and the same has been reproduced in his work on "The Geology of Tasmania." In addition to the species indicated in the column below, Mr. Johnstone has noted the presence of the following genera, of which he was unable to determine the specific relationships, viz., *Biloculina*, *Miliolina*, *Cassidulina*, *Polymorphina*, *Orbulina*, *Nonionina*, and *Nummulites*.

5. The Mount Gambier determinations in column 5 were made by Messrs. W. K. Parker and T. Rupert Jones, F.G.S. (See "Foraminifera from the Bryozoan Limestone near Mount Gambier, South Australia," Quar. Jour. Geol. Soc., 1860, vol. XVI., p. 261.)

6. In a letter to the "Geological Magazine," 1876, p. 324, Mr. R. Etheridge, jun., includes a list of foraminifera determined by the late Dr. H. B. Brady, F.R.S., from material secured "in sinking a Government well in the Murray River flats, on the road from the Burra Burra mines to the great bend on the Murray River, about half-way (thirty miles) between the two points named." In this letter the beds are erroneously said to be of Post-Tertiary age. Dr. Brady's list is given in column 6.

7. The material which supplied the forms indicated in this column was obtained from the Government bore put down in the waterworks yard, Kent Town, Adelaide, in 1881. The lithological characteristics of these beds differ considerably from those known on the eastern side of the Mount Lofty Ranges, consisting of brown and greenish argillaceous sands, and are underlain by a series of freshwater beds. Fuller notes on the foraminifera of this section will be found in an article on "The Foraminifera of the Older Tertiary of Australia (No. 2), Kent Town Bore, Adelaide," Trans. Roy. Soc. S.A., 1891, vol. XIV., p. 350.

---

* "Note sur les Genres *Trillina et Linderina*." Bulletin de la Société Géologique de France, 3 série, tome XXI., p. 118, année, 1893.

TABLE IV.

Genera and Species.	1 Muddy Creek.	2 Muddy Creek.	3 Waurn Ponds.	4 Table Cape.	5 Mount Gambier.	6 Murray Flats.	7 Adelaide.
MILIOLIDÆ.							
Biloculina depressa, d'Orb.	—	R S	—	—	—	X	—
elongata, d'Orb.	—	R	—	—	—	X	—
irregularis, d'Orb.	—	R S	—	—	—	—	—
ringens, Lamk.	—	R S	—	—	—	X	R
Miliolina agglutinans, d'Orb.	—	V C	—	—	—	X	—
Brongniartii, d'Orb.	—	R	—	—	—	—	—
Cuvieriana, d'Orb.	—	R S	—	—	—	—	—
Ferussacii, d'Orb.	—	M C	—	—	—	—	R S
Linneana, d'Orb.	—	R S	—	—	—	—	—
oblonga, Montag.	—	M C	—	—	—	X	R S
prisca, Terq.	—	M C	—	—	—	—	—
pygmæa, Rss.	—	M C	—	—	—	—	—
scrobiculata, Brady	—	R	—	—	—	—	—
seminulum, Linn	X	M C	X	—	—	X	R S
secans, d'Orb.	—	—	—	—	—	X	—
subrotunda, Mont.	—	—	—	—	—	X	—
(Triloc) tricarinata, d'Orb.	—	R S	—	—	—	X	—
trigonula, Lamk.	X	R S	—	—	—	—	R
undosa, Kar.	—	C	—	—	—	—	—
valvularis, Rss.	—	V R	—	—	—	—	—
Pentellina saxorum, d'Orb.	—	M C	—	—	—	—	—
Trillina, Howchini, Schlumb.	—	R S	—	—	—	—	—
Spiroloculina asperula, Kar.	—	R	—	—	—	—	—
affixa, Terq.	—	R S	—	—	—	—	—
canaliculata, d'Orb.	—	—	—	—	—	X	—
grata, Terq.	—	R S	—	—	—	—	—
Cornuspira crassisepta, Brady	—	R	—	—	—	—	—
foliacea, Phil.	—	R S	—	—	—	X	—
involvens, Rss.	—	R S	X	—	—	X	R S
Hauerina compressa, d'Orb.	—	—	—	—	—	X	—
Orbiculina adunca, F.& M.	—	—	X	—	—	—	—
Orbitolites complanata, Lamk.	—	R	—	—	—	X	—
Vertebralina insignis, Brady	—	R	—	—	—	—	—
Articulina sagra, d'Orb.	—	R	—	—	—	—	—
sulcata, Rss.	—	R	—	—	—	—	—
Sigmoilina sigmoidea, Brady, sp.	—	M C	—	—	—	—	—
Tateana, Howchin, sp.	—	M C	—	—	—	—	—
Planispirina exigua, Brady	—	R	—	—	—	—	—
contraria, d'Orb.	—	—	—	—	—	X	—
ASTRORHIZIDÆ.							
Astrorhiza angulosa, Brady	—	—	X	—	—	—	—

Table IV.—continued.

Genera and Species.	1 Muddy Creek.	2 Muddy Creek.	3 Waurn Ponds.	4 Table Cape.	5 Mount Gambier.	6 Murray Flats.	7 Adelaide.
Lituolidæ.							
Reophax fusiformis, Will.	—	R S	—	—	—	—	—
scorpiurus, Mont.....	—	R	—	—	—	—	—
Haplophragmium agglutinans, d'Orb. ..	—	V R	—	—	—	—	R
pseudospirale, Will.	—	R S	—	—	—	—	—
sphæroidiniformis, Br., MS.	—	C	—	—	—	—	—
Bdelloidina aggregata, Carter	—	R	—	—	—	—	—
Textularidæ.							
Textularia aspera, Brady	—	C	—	—	—	—	—
agglutinans, d'Orb.	—	R S	—	X	M C	—	M C
var. porrecta, Br.	—	R S	—	—	—	—	—
carinata, d'Orb.....	—	V R	—	—	—	—	—
gibbosa, d'Orb.	—	M C	X	—	—	—	R
gramen, d'Orb.	—	R S	—	—	—	—	—
pygmæa	—	—	—	X	M C	—	—
rugosa, Rss.	—	R	—	—	—	—	—
sagittula, Def.	X	V C	X	—	—	—	—
var. fistulosa, Brady	—	R	—	—	—	—	—
Pavonina flabelliformis, d'Orb.	—	V R	—	—	—	—	
Verneuilina polystropha, Rss.	—	R	—	—	—	—	—
tricarinata, d'Orb.	—	R	—	—	—	—	—
triquetra, Munst.	—	C	—	—	—	—	—
Gaudryina rugosa, d'Orb.	—	R S	—	—	—	—	R
Clavulina angularis, d'Orb.....	—	V R	—	—		—	—
communis, d'Orb.	—	V R	—	—	—	—	—
Bulimina elegantissima, d'Orb.	—	V R	—	—	—	—	—
obtusa, d'Orb.	—	V R	—	—	—	—	—
pupoides, d'Orb.	—	—	—	—	—	—	R S
pyrula, d'Orb.....	—	—	—	—	—	—	M C
Bolivina dilatata, Rss.....	—	R	—	—	—	—	—
limbata, Brady	—	R	—	—		—	—
punctata, d'Orb.	—	R S	—	—	—	—	R
Cassidulina lævigata, d'Orb.	—	R	—	—	—	—	—
crassa, d'Orb. (oblonga, Rss.)	—	—	—	X	M C	—	—
subglobosa, Brady	—	C	—	—	—	—	R S
Ehrenbergina serrata, Rss.	—	R S	—	—	—	—	—
Lagenidæ.							
Lagena globosa, Mont.	—	R	—	—	—	—	—
hexagona, Will.	—	V R	—	—	—	—	R
lævis, Mont.	—	—	—	—	—	—	R
lineata, Will.	—	V R	—	—	—	—	—

Table IV.—continued.

Genera and Species.	1 Muddy Creek.	2 Muddy Creek.	3 Waurn Ponds.	4 Table Cape.	5 Mount Gambier.	6 Murray Flats.	7 Adelaide.
LAGENIDÆ—*continued.*							
Lagena marginata, W. and B.	—	R	—	—	—	—	R
squamosa, Mont.	—	—	—	—	—	—	R
sulcata, W. & J.	—	R		—	—	—	R
Nodosaria affinis, d'Orb.	—	R	—	—	—	—	—
costulata, Rss.	—	V R	—	—	—	—	—
lævigata, d'Orb.	—	R	—	—	—	X	—
multilineata, Borne	—	R S	—	—	—	—	—
obliqua, Linne	—	R	—	—	—	—	R
pauperata, d'Orb.	—	R	—	—	—	—	—
plebia, Rss.	—	V R	—	—	—	—	—
raphanus, Linne	—	R S	—	—	—	—	—
scalaris, Batsch	—	R S	—	—	—	—	R
soluta, Rss.	—	R	—	—	—	—	R S
verruculosa, Neugel.	—	—	—	—	—	—	V R
Lingulina carinata, var. seminuda, Batsch	—	V R	—	—	—	—	—
Marginulina costata, Batsch	—	R S	—	—	—	—	—
Frondicularia complanata, Def.	—	R	—	—	—	—	—
Vaginulina legumen, Linne	—	—	—	—	—	—	R
linearis, Mont.	—	V R	—	—	—	—	—
Cristellaria articulata, Rss.	—	R S	—	—	—	—	—
convergens, Borne	—	V R	—	—	—	—	—
cultrata, Mont.	—	R	—	—	—	—	R
rotulata, Lamk.	—	R	—	—	—	X	—
tricarinella, Rss.	—	R	—	—	—	—	—
Polymorphina communis, d'Orb.	—	R S	—	—	—	—	R
dispar, Stache	—	M C	—	—	—	—	—
elegantissima, P. & J.	—	C	X	—	—	—	M C
gibba, d'Orb.	—	M C	—	—	—	—	C
lactea, W. & J.	X	R	—	—	M C	—	R
var. oblonga, Will.	—	V R	—	—	—	—	—
oblonga, d'Orb.	—	V R	—	—	—	—	—
ovata, d'Orb.	—	R	—	—	—	—	—
regina, Br., P. & J.	—	R S	—	—	—	—	R
Uvigerina Canariensis, d'Orb.	—	R S	—	—	—	—	—
angulosa, Will.	—	—	—	—	—	—	R S
Sagrina limbata, Brady	—	V R	—	—	—	—	—
GLOBIGERINIDÆ.							
Globigerina bulloides, d'Orb.	—	V C	X	—	C	—	—
var. triloba, Rss.	—	R S	—	—	—	—	—
helicina, d'Orb.	—	R	—	—	—	—	—
inflata, d'Orb.	—	R S	—	—	—	—	—
Orbulina universa, d'Orb.	—	V C	—	—	—	—	—

Table IV.—continued.

Genera and Species.	1 Muddy Creek.	2 Muddy Creek.	3 Waurn Ponds.	4 Table Cape.	5 Mount Gambier.	6 Murray Flats.	7 Adelaide.
GLOBIGERINIDÆ—*continued.*							
Pullenia quinqueloba, Rss.	—	—	—	—	—	—	R
sphœroides, d'Orb.	—	—	—	—	—	—	R
Sphœroidina bulloides, d'Orb	—	M C	—	—	—	—	—
ROTALIDÆ.							
Spirillina decorata, Brady	—	R	—	—	—	—	M C
inæqualis, Brady	—	R S	—	—	—	—	—
limbata, Brady	—	R	—	—	—	—	—
tuberculata, Brady	—	R S	—	—	—	—	M C
Discorbina araucana, d'Orb.	—	R	—	—	—	—	—
Bertheloti, d'Orb.	—	R		X	M C	—	—
biconcava, P. & J.	—	R	—	—	—	—	R
cruciformis, Howchin	—	M C	—	—	—	—	—
globularis, d'Orb.	—	R S	—	—	—	—	R
orbicularis, Terq.	—	R	—	—	—	—	—
patelliformis, Brady	—	R S	—	—	—	—	—
polystomelloides, P. & J.	—	V R	—	—	—	—	—
rosacea, d'Orb.	—	R S	—	—	—	—	—
(?) tabernacularis, Brady	—	R	—		—	—	—
turbo, d'Orb.	X	R S	—	X	—	—	—
Planorbulina acervalis, Brady	—	V R	—	—	—	—	? V R
larvata, P. & J.	—	M C	—	—	—	—	—
Mediterranensis, d'Orb.	—	R	—	—	—	—	
Truncatulina echinata, Brady	—	R S	—	—	—	—	—
var. lævigata, Howchin	—	M C	—	—	—	—	—
Haidingerii, d'Orb.	X	R S	—	—	M C	—	—
lobatula, W. & J.	—	R S	—	—	—	X	R S
margaritifera, var. Adelaidensis, Howchin	—	—	—	—	—	—	M C
reticulata, Czjzek	—	M C	—	—	M C	X	—
Ungeriana, d'Orb.	—	C	—	—	V C	X	C
variabilis, d'Orb.	—	R	—	—	—	—	—
Anomalina ammonoides, Rss.	—	M C	—	—	—	—	R
polymorpha, Costa	—	R	—	—	—	—	—
rotula, d'Orb.	—	R	—	—	R	—	—
Carpenteria proteiformis, Goës	—	M C	—	—	—	—	—
Polytrema miniaceum, var alba, Carter	—	M C	—	—	—	—	—
Gypsina globulus, Rss.	—	C	—	—		—	—
inherens, Schultze	—	R	—	—	—	—	—
vesicularis, P. & J.	—	C	—	—	—	—	—
Pulvinulina auricula, F. & M.	—	R	—		—	—	—
Berthelotiana, d'Orb.	—	R S	—	—	—	—	—
elegans, d Orb.	—	—	—	—	—	X	—

Table IV.—continued.

Genera and Species.	1 Muddy Creek.	2 Muddy Creek.	3 Waurn Ponds.	4 Table Cape.	5 Mount Gambier.	6 Murray Flats.	7 Adelaide.
ROTALIDÆ—*continued.*							
Pulvinulina Hauerii, d'Orb.	—	R	—	—	—	—	R
oblonga, Will.	—	R	—	—	—	—	—
Patagonica, d'Orb.	—	R	—	—	—	—	—
Partschiana, d'Orb.	—	R S	—	—	—	—	—
pulchella, d'Orb.	X	C	—	—	—	—	—
repanda, F. & M.	—	V C	—	—	—	—	R
Schreibersii, d'Orb.	—	R S	—	—	—	—	—
semiornata, Howchin	—	R S	—	—	—	—	—
Rotalia Beccarii, Linn.	—	—	X	—	—	—	—
calcar, d'Orb.	—	R	—	—	—	—	—
clathrata, Brady	—	M C	—	—	—	—	—
orbicularis, d'Orb.	—	—	X	—	—	—	—
papillosa, Brady	—	R	—	—	—	—	—
var. compressiuscula, Brady	—	R	—	—	—	—	—
Soldanii, d'Orb.	—	—	—	—	—	X	R
NUMMULINIDÆ.							
Nonionina depressula, W. & J.	—	R	—	—	—	—	—
stelligera, d'Orb.	—	R S	—	—	—	—	—
umbilicatula, Mont.	—	R S	—	—	—	—	—
Polystomella craticulata, F. & M.	—	R	—	—	—	X	—
macella, F. & M.	—	V C	—	—	—	X	—
verriculata, Brady	—	R	—	—	—	—	—
Amphistegina Lessonii, d'Orb.	—	M C	—	—	—	—	—
Orbitoides, dispansus, Sow.	—	R S	—	—	—	—	—
Manteili, Morton	—	C	—	—	—	—	—
stellata, d'Arch	—	C	—	—	—	—	—
Operculina complanata, Def.	X	V C	—	—	—	—	—
var. granulosa, Leymerie	—	C	—	—	—	—	—
Nummulites variolaria, Sow.	X*	V C	—	—	—	—	—

The Lower Tertiaries, which have yielded such a profusion of mollusca under the zealous researches of Professor Ralph Tate, have proved relatively quite as rich in their foraminiferal fauna. Of the 187 species in the above Table, no less than 164 species are recorded from the extremely rich beds of Muddy Creek. It is somewhat remarkable that a considerable number of the new species of the *Challenger* expedition are found fossil in the Lower Tertiaries of Australia. So far as the foraminifera can be taken as indicative of bathymetrical and climatic conditions in

* See observations under Muddy Creek, No. 1.

geological times, the present Tables point to a gradual elevation of the sea-bottom in southern Australia, dating from Eocene times, and coincidently with this shallowing of the sea there was apparently a slow lowering of temperature. Taking the Muddy Creek formations for analysis in these particulars, we find the lower bed (Eocene) contains 49 per cent. of shallow water species, and 28 per cent. of those which have a moderately deep, to deep, habitat, whilst in the upper bed (Miocene) the shallow water species reach 58 per cent., and the moderately deep, to deep, forms are reduced to 16 per cent.—a decided change in the fauna in the direction of shallowing conditions. Again, by comparing the lists with regard to climatic distribution, the Eocene beds contain 26 per cent. characteristic of tropical and 33 per cent. of warmer temperate zones, whilst in the Miocene beds the tropical forms are reduced to 18 per cent., and the warmer temperate increased to 35 per cent. In the later Pliocenes and Post-Tertiaries the same tendencies are not only continued but accentuated. It is interesting, as bearing upon this subject, to observe that the author has found several sub-arctic species living in the Port Creek.*

CRETACEOUS.

The Cretaceous beds of central Australia have yielded in various places a remarkable supply of artesian water. For the purpose of tapping these subterranean supplies many bores have been sunk, and it has been chiefly from the cores of the diamond drill thus used that the following species of foraminifera have been obtained.

LOCALITIES.

1. *Hergott, No.* 1 *Bore.*—The results given in this column were obtained from the examination of material at nine different horizons, ranging from 15ft. from the surface down to 309ft., at which depth the bed-rock was touched. For fuller particulars of this bore, see Roy. Soc. Trans., S. Aus., vol. VIII., 1885, p. 79.

2. *Hergott, No.* 2 *Bore.*—This bore was put down about 150 yards from the preceding. A very complete series of samples at regular distances of 10ft. have been placed at my disposal by Mr. Jones, the Conservator of Water, and, so far as searched, have yielded the forms now indicated. My examination of the core is incomplete. The occurrences noted were observed at the following depths from the surface in feet, viz., 50ft., 100ft., 120ft., 130ft., 140ft., 150ft., and 210ft.

3. *Tarkaninna Bore.*—This bore is situated on The Clayton, about thirty miles north-east of Hergott. Twenty samples of material were examined, ranging in depth from near the surface down to 1,226ft. The quantities available for examination were,

* "The Estuarine Foraminifera of the Port Adelaide River"—Trans. Roy. Soc. S.A., vol. XIII., 1890, p. 161.

in most instances, very limited. Had the material at command been greater no doubt a much longer list of foraminifera would have been obtained. *Ref.* Roy. Soc. Trans. S.A., vol. XVII., 1893, p. 346.

4. *Mirrabuckinna Bore* is situated about twenty miles north of the head of Lake Torrens, and forty-three miles in a straight line south-west of Hergott. Six samples were examined, included within the geological horizons of 40ft. and 153ft. The foraminifera noted in the Table below were limited in their occurrence to the first 50ft. of the section. Below this level the beds proved to be gypseous and unfossiliferous. *Ref.* Trans. Roy. Soc. S.A., vol. XVII., 1893, p. 346.

5. *William Creek* is situated on the Northern railway, about 125 miles north-west of Hergott. The few foraminifera mentioned in No. 5 column were observed in searching a very small supply of material taken from the heap at mouth of bore that was put down in this locality.

6. *Wilcannia.*—I am indebted to Mr. Dombraine for a small sample from the Wilcannia bore, which on searching yielded a few fragments of *Bigenerina nodosaria*, one of the most characteristic of the Australian Cretaceous foraminifera.

7. *Wollumbilla, Queensland.*—From gatherings made by the late Rev. W. B. Clarke, F.G.S., and published in "Australian Mesozoic Geology and Palæontology," by Mr. Charles Moore, F.G.S., Qy. Jour. Geo. Soc., 1870, xxvi., p. 239; also "Geology and Palæontology of Queensland," by Mr. R. L. Jack, F.G.S., and Mr. R. Etheridge, jun., p. 435. Mr. Moore *(loc. cit.*, p. 231) gives the occurrence of *Cristellaria cultrata*, Mont., in the Mesozoic rocks of Western Australia, but without locality.

TABLE V.

Genera and Species.	1	2	3	4	5	6	7
	Hergott.						
	No. 1 Bore.	No. 2 Bore.	Tarkaninna.	Mirrabuckinna.	William Creek.	Wilcannia, N.S.W.	Wollumbilla, Queensland.
ASTRORHIZIDÆ.							
Hyperammina vagans, Brady	R	—	?	—	—	—	—
LITUOLIDÆ.							
Reophax ampullacea, Brady	R	R S	—	—	—	—	—
difflugiformis, Brady	—	V R	—	—	—	—	—
fusiformis, Will.....	C	C	R	C	—	—	—
scorpiurus, Montf.	R	R	—	C	—	—	—

Table V.—continued.

Genera and Species.	Hergott. No. 1 Bore.	Hergott. No 2 Bore.	Tarkaninna.	Mirrabuckinna.	William Creek.	Wilcannia. N.S.W.	Wollumbilla. Queensland.
1	1	2	3	4	5	6	7
LITUOLIDÆ—*continued.*							
Haplophragmium agglutinans, d'Orb. ..	R S	R S	R	R	—	—	—
æquale, Römer	—	M C	—	—	—	—	—
glomeratum, Brady ..	—	R	—	—	—	—	—
Canariense, d'Orb.	R S	M C	R	C	V R	—	—
Australis, Howchin, MS.	R	R S	R	—	—	—	—
Placopsilina cenomana, d'Orb.	R	—	—	—	—	—	—
Thurammina compressa, Brady	R	R	R	—	—	—	—
Ammodiscus incertus, d'Orb.....	—	M C	—	—	—	—	—
Sigmoilina celata, Costa, sp.	—	—	?	M C	—	—	—
TEXTULARIDÆ.							
Bigenerina digitata, d'Orb.....	R	R	R	—	—	—	—
nodosaria, d'Orb.....	M C	C	R	—	—	R	—
Verneuilina polystropha, Rss.	V R	V R	R	—	—	—	—
Gaudryina pupoides, d'Orb.	R S	R S	R	—	—	—	—
scabra, Brady	?	—	V R	—	—	—	—
siphonella, Rss.	R S	—	R	—	V R	—	—
LAGENIDÆ.							
Lagena lævis, Montf.	—	V R	—	—	—	—	—
Nodosaria communis, d'Orb.	—	V R	—	—	—	—	X
farcimen, Sold.	—	R	—	—	—	—	—
pauperata, d'Orb.	—	V R	—	—	—	—	—
radicula, Linne	R	R	—	—	—	—	—
soluta, Rss.	—	R	—	—	—	—	—
subtertenuata, Schwag.	—	V R	—	—	—	—	—
Lingulina carinata, d'Orb.	V R	—	—	—	—	—	—
Frondicularia complanata, Defr.	—	R	—	—	—	—	—
species	—	V R	—	—	—	—	—
Vaginulina legumen, Linn.....	R	R S	R	—	R S	—	—
linearis, Mont.....	—	V R	—	—	—	—	—
striata, d'Orb.	—	—	—	—	—	—	X
Marginulina costata, Batsch	—	R S	V R	—	—	—	—
glabra, d'Orb.	R	M C	R	—	R S	—	—
Cristellaria acutiauricularis, F. & M. ..		R	—	—	—	—	X
var. longicostata, Moore..	—	—	—	—	—	—	X
cassis, F. & M.	—	R	—	—		—	—
crepidula, F. & M.	—	C	R	—	—	—	—
cultrata, Mont., var. radiata, Moore	—	—	—	—	—	—	X
gibba, d'Orb.	R	C	R	—	M C	—	—
rotulata, Lamk	?	V R	—	—	—	—	—
Schloenbachi, Rss.	—	R S	—	—	—	—	—

Table V.—continued.

Genera and Species.	1 Hergott. No. 1 Bore.	2 Hergott. No. 2 Bore.	3 Tarkanimna.	4 Mirrabuckima.	5 William Creek.	6 Wilcannia, N.S.W.	7 Wollumbilla, Queensland.
LAGENIDÆ—*continued.*							
Polymorphina angusta, Egger	—	R S	—	—	—	—	—
lactea, W. & J.	R	R S	—	—	—	—	X
rotundata, Bornem	—	R	—	—	—	—	—
gibba, d'Orb.	—	—	—	—	—	—	X
ROTALIDÆ.							
Spirillina (?) vivipara, Ehrenb.	—	V R	—	—	—	—	—
margaritifera, Will.	—	V R	—	—	—	—	—
Patellina Jonesii, Howchin, MS.	—	R S	—	—	—	—	—
Discorbina Vilardeboana, d'Orb.	—	C	—	—	—	—	—
Anomalina, ammonoides, Rss.	—	R S	R	—	—	—	—
Truncatulina lobatula, W. & J.	—	V R	—	—	—	—	X
Ungeriana, d'Orb.	—	—	—	—	—	—	X
Pulvinulina elegans, d'Orb.	V R	—	R	—	—	—	—
(?) Amphistegina Lessonii, d'Orb	—	V R	—	—	—	—	

The marine beds of Secondary age have an immense development throughout the central regions of Australia. The lithological features of this formation are very uniform both in section and in area, and so far as these researches have gone the distribution of the foraminifera in the Australian Cretaceous sea was equally general and uniform. The most remarkable feature in the Table is the unusual proportion of foraminifera with arenaceous tests, there being no less than twenty species belonging to this class out of a total of fifty-six.

UPPER PALÆOZOIC.

Permo-Carboniferous.

Australian foraminiferal material of Palæozoic age, so far as obtained, is of the most scanty description. Only two localities have hitherto yielded examples of these minute forms, and under circumstances not the most favorable for their elucidation. The results, so far as can be determined at present, are contained in the subjoined Table.

LOCALITIES.

No. 1.—The few species indicated in the first column have been determined with some reservation from two transparent rock sections

made by Mr. R. Etheridge, jun., Government Palæontologist of New South Wales, from chippings sent by Mr. Thos. Stephens, F.G.S., of Hobart. Mr. Stephens obtained the foraminiferal rock from an outcrop of Permo-Carboniferous limestone, on the River Piper, in the north-east of Tasmania. *Nubecularia* is the prevailing form, and occurs in the rock in very great numbers. *Ref.* See p. 344 *ante*.

No. 2.—The foraminifera mentioned in the second column of the table, together with some other indeterminate and doubtful forms, were obtained by washing the clayey material out of a few small shells of *Productus* and *Spirifera*, kindly sent me by Mr. H. P. Woodward, Government Geologist of Western Australia. The fossils had been collected by him from the Carboniferous beds on the Irwin River, Western Australia. This bed would doubtless yield a much greater number of species if a larger quantity of material could be treated :—

TABLE VI.

Genera and Species.	1 Tasmania.	2 Irwin River.
Nubecularia lucifuga, var. Stephensi, Howchin.....	X	—
Spiroloculina (?) planulata, Lamk.....	X	—
Cornuspira involvens, Reuss.....	X	—
" Schlumbergi, Howchin, MS.....	—	X
Nodosaria (?) radicula, Linné.....	X	—
species	—	X
Frondicularia, species	—	X

This first list of the Palæozoic foraminifera of Australia is of special interest as the oldest fauna of this class of organisms observed in the Southern Hemisphere. The facies of the Australian species differs widely from the foraminifera of the Carboniferous limestone of the opposite hemisphere, in which this group is essentially an arenaceous or sub-arenaceous one, whilst those observed in rocks of this age in Australia are characterised by porcellaneous or hyaline tests. The Australian Palæozoic forms show a closer affinity with the Permian, and more particularly with the Liassic faunæ of the Northern Hemisphere, than they do with the Palæozoic. The Irwin River material contains several new species, which will be described in due course.

VII.—COMPARATIVE TABLE.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. MILIOLIDÆ.						
	Sub-Fam. Miliolinæ.						
1	Nubecularia lucifuga, Defr.	X	—	X	—	—	—
2	var. Stephen-i, Howchin	—	—	—	—	—	X
3	Biloculina bulloides, d'Orb.	—	X	X	—	—	—
4	depressa, d'Orb.	—	—	X	X	—	—
5	elongata, d'Orb.	—	—	X	X	—	—
6	irregularis, d'Orb.	—	—	—	X	—	—
7	ringens, Lamk.	—	—	X	X	—	—
8	Miliolina agglutinans, d'Orb.	—	—	X	X	—	—
9	Boueana, d'Orb	X	—	—	—	—	—
10	bicornis, W. & J.	—	—	X	—	—	—
11	Brongniartii, d'Orb.	—	—	—	X	—	—
12	circularis, Bornem.	X	—	—	—	—	—
13	Cuvieriana, d'Orb.	—	—	—	X	—	—
14	Ferussacii, d'Orb.	X	X	—	X	—	—
15	insignis, Brady	X	—	X	—	—	—
16	labiosa, d'Orb.	X	—	—	—	—	—
17	Linneana, d'Orb.	—	—	X	X	—	—
18	oblonga, Montag.	X	X	X	X	—	—
19	prisca, Terq.	—	—	—	X	—	—
20	pygmæa, Rss.	—	—	—	X	—	—
21	scrobiculata, Brady	—	—	—	X	—	—
22	secans, d'Orb.	—	—	X	X	—	—
23	seminulum, Linn.	X	—	X	X	—	—
24	subrotunda, Montag.	X	—	—	X	—	—
25	(Tri) tricarinata, d'Orb.	X	X	X	X	—	—
26	trigonula, Lamk.	X	—	X	X	—	—
27	undosa, Kar.	—	—	—	X	—	—
28	valvularis, Rss.	—	—	—	X	—	—
29	Spiroloculina affixa, Terq.	—	—	—	X	—	—
30	asperula, Kar.	—	—	—	X	—	—
31	canaliculata, d'Orb.	—	—	—	X	—	—
32	excavata, d'Orb.	X	—	—	—	—	—
33	grata, Terq.	X	—	X	X	—	—
34	limbata, d'Orb.	—	—	X	—	—	—
35	(?) planulata, Lamk.	—	—	—	—	—	X
36	Pentellina saxorum, d'Orb.	—	—	—	X	—	—
37	Trillina Howchini, Schlumb.	—	—	—	X	—	—
38	Cornuspira crassisepta, Brady	—	—	—	X	—	—
39	foliacea, Phil.	—	—	—	X	—	—
40	involvens, Rss.	—	—	—	X	—	X
41	Schlumbergi, Howchin, MS.	—	—	—	—	—	X
42	Hauerina compressa, d'Orb.	—	—	—	X	—	—
43	intermedia, Howchin	—	—	X	—	—	—
44	Vertebralina insignis, Brady	—	—	X	X	—	—

VII.—Comparative Table—continued.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. MILIOLIDÆ—*continued.*						
	Sub-Fam. Miliolininæ—continued.						
45	Vertebralina striata, d'Orb.....	X	—	—	—	—	—
46	Articulina sagra, d'Orb.	—	—	—	X	—	—
47	sulcata, Rss.	—	—	—	X	—	—
48	Fabularia Howchini, Schlumb.	—	—	—	X	—	—
49	Sigmoilina sigmoidea, Brady sp.	—	—	X	X	—	—
50	Tateana, Howchin sp.	—	—	—	X	—	—
51	celata, Costa, sp.	—	—	—	—	X	—
52	Planispirina contraria, d'Orb.	—	—	—	X	—	—
53	exigua, Brady	—	—	—	X	—	—
	Sub-Fam. Orbitolitinæ.						
54	Peneroplis pertusus, Forskal	X	—	—	—	—	—
55	planatus, F. & M.....	X	—	—	—	—	—
56	Orbiculina adunca, F. & M.	—	—	—	X	—	—
57	Orbitolites complanata, Lamk.....	X	—	—	X	—	—
	FAM. ASTRORHIZIDÆ.						
58	Astrorhiza angulosa, Brady	—	—	—	X	—	—
59	Hyperammina vagans, Brady.....	—	—	—	—	X	—
	FAM. LITUOLIDÆ.						
60	Reophax ampullacea, Brady	—	—	—	—	X	—
61	difflugiformis, Brady	—	—	—	—	X	—
62	fusiformis, Will.	—	—	—	X	X	—
63	scorpiurus, Montg.	—	—	—	X	X	—
64	Placopsilina cenomana, d'Orb.	—	—	X	—	X	—
65	Thurammina compressa, Brady	—	—	—	—	X	—
66	Ammodiscus incertus, d'Orb.....	—	—	—	—	X	—
67	Haplophragmium agglutinans, d'Orb. ..	—	—	—	X	X	—
68	æquale, Römer	—	—	—	—	X	—
69	Australis, Howchin MS.	—	—	—	—	X	—
70	pseudospirale, Will. ..	—	—	—	X	—	—
71	Canariense, d'Orb.....	—	—	—	—	X	—
72	glomeratum, Brady....	—	—	—	—	X	—
73	sphæroidiniformis, Br. MS.	—	—	—	X	—	—
74	Lituola nautiloidea, Lamk.....	—	—	X	—	—	—
75	Bdelloidina, aggregata, Carter	—	—	—	X	—	—
	FAM. TEXTULARIDÆ.						
	Sub-Fam. Textularinæ.						
76	Textularia agglutinans, d'Orb.	—	—	X	X	—	—
77	var. porrecta, Brady.....	—	—	X	X	—	—

VII.—Comparative Table—continued.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. TEXTULARIDÆ—*continued.*						
	Sub-Fam. Textularinæ—continued.						
78	Textularia aspera, Brady	—	—	—	X	—	—
79	carinata, d'Orb.....	—	—	—	X	—	—
80	conica, d'Orb.	X	—	—	—	—	—
81	gibbosa, d'Orb.....	—	—	—	X	—	—
82	gramen, d'Orb.....	—	—	—	X	—	—
83	pygmæa	—	—	—	X	—	—
84	rugosa, Rss.	—	—	—	X	—	—
85	sagittula, Def.	—	—	X	X	—	—
86	var. fistulosa, Brady	—	—	—	X	—	—
87	Bigenerina digitata, d'Orb.....	—	—	—	—	X	—
88	nodosaria, d'Orb.	—	—	—	—	X	—
89	Pavonina flabelliformis d'Orb.	—	—	—	X	—	—
90	Verneuilina polystropha, Rss.....	—	—	—	X	X	—
91	pygmæa, Egger	—	—	X	—	—	—
92	tricarinata, d'Orb.	—	—	—	X	—	—
93	triquetra, Münster	—	—	X	X	—	—
94	Gaudryina pupoides, d'Orb.	—	—	—	—	X	—
95	rugosa, d'Orb.	—	—	—	X	—	—
96	scabra, Brady	—	—	—	—	X	—
97	siphonella, Rss.....	—	—	—	—	X	—
98	Valvulina pupa, Howchin, MS.....	X	—	—	—	—	—
99	Clavulina angularis, d'Orb.....	—	—	X	X	—	—
100	communis, d'Orb.	—	—	X	X	—	—
	Sub-Fam. Buliminæ.						
101	Bulimina elegantissima, d'Orb.	—	—	X	X	—	—
102	obtusa, d'Orb.	—	—	—	X	—	—
103	pupoides, d'Orb.....	—	—	—	X	—	—
104	pyrula, d'Orb.....	—	—	—	X	—	—
105	Virgulina, pauciloculata, Brady	X	—	—	—	—	—
106	Bolivina dilatata, Rss.....	—	—	—	X	—	—
107	limbata, Brady	—	—	—	X	—	—
108	punctata, d'Orb.	X	—	—	X	—	—
109	textilarioides, Rss.	X	—	—	—	—	—
110	tortuosa, Brady.....	X	—	—	—	—	—
	Sub-Fam. Cassidulininæ.						
111	Cassidulina lævigata, d'Orb.	—	—	—	X	—	—
112	crassa, d'Orb.	—	—	—	X	—	—
113	subglobosa, Brady	—	—	X	X	—	—
114	Ehrenbergina serrata, Rss.....	—	—	—	X	—	—

VII.—Comparative Table—continued.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. LAGENIDÆ.						
	Sub-Fam. Lageninæ.						
115	Lagena clavata, d'Orb.	X	—	—	—	—	—
116	globosa, Mont.	X	—	—	X	—	—
117	gracillima, Seg.	X	—	—	—	—	—
118	hexagona, Will.	—	—	—	X	—	—
119	lævis, Mont.	—	—	—	X	X	—
120	lineata, Will.	—	—	X	X	—	—
121	marginata, W. & B.	—	—	—	X	—	—
122	melo, d'Orb.	—	—	X	—	—	—
123	semistriata, Will.	X	—	—	—	—	—
124	squamosa, Mont	—	—	—	X	—	—
125	sulcata, W. & J.	—	—	X	X	—	—
126	Nodosaria affinis, d'Orb.	—	—	—	X	—	—
127	(Gl) æqualis, Rss.	—	—	X	—	—	—
128	communis, d'Orb.	—	—	—	—	X	—
129	consobrina, d'Orb.	—	—	X	—	—	—
130	costulata, Rss.	—	—	—	X	—	—
131	farcimen (Sold)	—	—	—	—	X	—
132	filiformis, d'Orb.	—	—	X	—	—	—
133	(Gl) lævigata, d'Orb.	—	—	X	X	—	—
134	multilineata, Borne	—	—	—	X	—	—
135	obliqua, Linné	—	—	—	X	—	—
136	pauperata, d'Orb.	—	—	X	X	X	—
137	plebia, Rss	—	—	—	X	—	—
138	radicula, Linné	—	—	—	—	X	X
139	raphanus, Linné	—	—	X	X	—	—
140	scalaris, Batsch	—	—	—	X	—	—
141	soluta, Rss.	—	—	—	X	X	—
142	subtertenuata, Schwag.	—	—	—	—	X	—
143	verruculosa, Neugeb.	—	—	—	X	—	—
144	species	—	—	—	—	—	X
145	Lingulina carinata, d'Orb.	—	—	—	—	X	—
146	var. seminuda, Batsch	—	—	—	X	—	—
147	Frondicularia complanata, Def.	—	—	X	—	X	—
148	species	—	—	—	—	X	—
149	species	—	—	—	—	—	X
150	Vaginulina legumen, Linné	—	—	—	X	X	—
151	linearis, Mont.	—	—	—	X	X	—
152	striata, d'Orb.	—	—	—	—	X	—
153	Rhabdogonium exsculptum, Howchin ..	—	—	X	—	—	—
154	Marginulina costata, Batsch	—	—	—	X	X	—
155	glabra, d'Orb.	—	—	—	—	X	—
156	Cristellaria acutiauricularis, F. & M. ..	—	—	—	—	X	—
157	var. longicostata, Moore	—	—	—	—	X	—
158	articulata, Rss.	—	—	—	X	—	—
159	cassis, F. & M.	—	—	—	—	X	—

VII.—Comparative Table—continued.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. LAGENIDÆ—*continued.*						
	Sub-Fam. Lagenina—continued.						
160	Cristellaria convergens, Borne	—	—	—	X	—	—
161	crepidula, F. & M.	—	—	—	—	X	—
162	cultrata, Mont.....	—	—	—	X	—	—
163	var radiata, Moore	—	—	—	—	X	—
164	gibba, d'Orb.....	—	—	—	—	X	—
165	rotulata, Lamk	—	—	—	X	X	—
166	Schloenbachi, Rss.	—	—	—	—	X	—
167	tricarinella, Rss.	—	—	—	X	—	—
	Sub. Fam. Polymorphinina.						
168	Polymorphina angusta, Egger.....	—	—	X	—	X	—
169	communis, d'Orb.	—	—	X	X	—	—
170	compressa, d'Orb	—	—	X	—	—	—
171	dispar, Stache.	—	—	—	X	—	—
172	elegantissima, P. & J.	—	—	X	X	—	—
173	elongata, Howchin, M.S.	—	—	X	—	—	—
174	gibba, d'Orb.	—	—	X	X	X	—
175	lactea, W. & J.....	X	—	X	X	X	—
176	var. oblonga, Will.	—	—	—	X	—	—
177	oblonga, d'Orb.....	—	X	X	X	—	—
178	ovata, d'Orb.....	—	—	—	X	—	—
179	regina, Br. P. & J.	—	—	—	X	—	—
180	rotundata, Borne	—	—	X	—	X	—
181	problema, d'Orb.	—	—	X	—	—	—
182	Uvigerina angulosa, Will	—	—	—	X	—	—
183	Canariensis, d'Orb.....	—	—	—	X	—	—
184	pygmæa. d'Orb.	—	—	X	—	—	—
185	Sagrina (?) columellaris, Brady	—	X	—	—	—	—
186	limbata, Brady	—	—	—	X	—	—
	FAM. GLOBIGERINIDÆ.						
187	Globigerina bulloides, d'Orb.	—	—	X	X	—	—
188	var. triloba, Rss..	—	—	—	X	—	—
189	helicina, d'Orb.	—	—	—	X	—	—
190	inflata, d'Orb.	—	—	—	X	—	—
191	Orbulina universa, d'Orb.	—	—	X	X	—	—
192	Pullenia quinqueloba, Rss.	—	—	—	X	—	—
193	sphæroides, d'Orb.	—	—	—	X	—	—
194	Sphæroidina bulloides, d'Orb.	—	—	—	X	—	—
	FAM. ROTALIDÆ.						
195	Spirillina decorata, Brady	—	—	—	X	—	—
196	inæqualis, Brady.....	—	—	—	X	—	—
197	limbata, Brady.....	—	—	—	X	—	—
198	margaritifera, Will.	—	—	—	—	X	—

VII.—Comparative Table—continued.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. ROTALIDÆ—*continued.*						
199	Spirillina tuberculata, Brady	—	—	X	X	—	—
200	(?) vivipara, Ehrenb.	—	—	—	—	X	—
201	Patellina Jonesii, Howchin, MS.	—	—	—	—	X	—
202	Discorbina Araucana, d'Orb.	—	—	—	X	—	—
203	Bertheloti, d'Orb.	—	—	—	X	—	—
204	biconcava, P. & J.....	—	—	X	X	—	—
205	cruciformis, Howchin	—	—	—	X	—	—
206	globularis, d'Orb.	X	—	X	X	—	—
207	opercularis, d'Orb.....	—	—	X	—	—	—
208	orbicularis, Terq.	—	—	—	X	—	—
209	patelliformis, Brady	—	—	—	X	—	—
210	pileolus, d'Orb.	—	—	X	—	—	—
211	polystomelloides, P. & J.....	—	—	X	X	—	—
212	rarescens, Brady	—	—	X	—	—	—
213	rosacea, d'Orb.	X	—	X	X	—	—
214	(?) tabernacularis, Brady	—	—	—	X	—	—
215	turbo, d'Orb.	X	X	X	X	—	—
216	valvulata, d'Orb.	X	—	—	—	—	—
217	vesicularis, P. & J.	X	X	X	—	—	—
218	Vilardeboana, d'Orb.	—	—	X	—	X	—
219	Planorbulina acervalis, Brady	—	—	—	X	—	—
220	larvata, P. & J.....	—	—	—	X	—	—
221	Mediterranensis, d'Orb. ..	X	—	X	X	—	—
222	Truncatulina echinata, Brady	—	—	—	X	—	—
223	var. lævigata, Howchin.	—	—	X	X	—	—
224	Haidingerii, d'Orb.	—	—	X	X	—	—
225	lobatula, W. & J.	X	—	X	X	X	—
226	margaritifera, var. Adelaidensis, Howchin	—	—	—	X	—	—
227	recticulata, Czjzek	—	—	X	X	—	—
228	Ungeriana, d'Orb.....	—	—	X	X	X	—
229	variabilis, d'Orb.	—	—	—	X	—	—
230	Anomalina ammonoides, Rss.	—	—	X	X	X	—
231	polymorpha, Costa.....	—	—	—	X	—	—
232	rotula, d'Orb.....	—	—	—	X	—	—
233	Carpenteria proteiformis, Goës	—	—	—	X	—	—
234	Polytrema miniaceum, var. alba., Carter	—	—	X	X	—	—
235	Gypsina globulus Rss.	—	—	X	X	—	—
236	inherens, Schultze	—	—	—	X	—	—
237	vesicularis, P. & J.	—	—	X	X	—	—
238	Pulvinulina auricula, F. & M.	—	—	—	X	—	—
239	Berthelotiana, d'Orb.	—	—	—	X	—	—
240	elegans, d'Orb	—	—	—	X	X	—
241	Hauerii, d'Orb.....	—	—	—	X	—	—
242	oblonga, Will.	—	—	—	X	—	—
243	Patagonica d'Orb.....	—	—	—	X	—	—
244	Partschiana, d'Orb.....	—	—	—	X	—	—

VII.—Comparative Table—continued.

No.	Genera and Species.	Post Tertiary.	Pliocene.	Miocene.	Eocene.	Cretaceous.	Upper Palæozoic.
	FAM. ROTALIDÆ—*continued.*						
245	Pulvinulina pulchella, d'Orb	—	—	—	X	—	—
246	repanda, F. & M.....	—	—	X	X	—	—
247	Schreibersii, d'Orb	—	—	—	X	—	—
248	semiornata, Howchin	—	—	—	X	—	—
249	Rotalia Beccarii, Linn.....	X	X	X	X	—	—
250	calcar, d'Orb.	—	—	—	X	—	—
251	clathrata, Brady	—	—	X	X	—	—
252	orbicularis, d'Orb	—	—	—	X	—	—
253	papillosa, Brady	—	—	—	X	—	—
254	var. compressiuscula, Brady ..	—	—	X	X	—	—
255	Soldanii, d'Orb	—	—	—	X	—	—
256	Calcarina rarispina, d'Orb	—	—	X	—	—	—
	FAM. NUMMULINIDÆ.						
	Sub. Fam. Polystomellinæ.						
257	Nonionina depressula, W. & J.	—	—	X	X	—	—
258	stelligera, d'Orb.....	—	—	—	X	—	—
259	umbilicatula, Mont.	—	—	—	X	—	—
260	Polystomella crispa, Linn	X	X	X	—	—	—
261	craticulata, F. & M.....	—	—	X	X	—	—
262	macella, F. & M.	X	—	X	X	—	—
263	imperatrix, Brady.....	—	—	X	—	—	—
264	striato-punctata, F. & M..	X	—	X	—	—	—
265	subnodosa, Münster	—	—	X	—	—	—
266	verriculata, Brady	—	—	—	X	—	—
	Sub. Fam. Nummulitinæ.						
267	Amphistegina Lessonii, d'Orb	—	—	X	X	?	—
268	Orbitoides dispansus, Sow.	—	—	—	X	—	—
269	Mantelli, Morton	—	—	—	X	—	—
270	stellata, d'Arch	—	—	—	X	—	—
271	Operculina complanata, Def.	—	—	—	X	—	—
272	var. granulosa, Leymerie..	—	—	—	X	—	—
273	Nummulites variolaria, Sow.	—	—	—	X	—	—

REPORT

OF THE

FIFTH MEETING

OF THE

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,

HELD AT

ADELAIDE, SOUTH AUSTRALIA, SEPTEMBER, 1893.

EDITED BY :

RALPH TATE, F.G.S., F.L.S.
E. H. RENNIE, M.A., D.Sc.
W. H. BRAGG, M.A.

PUBLISHED BY THE ASSOCIATION.

PERMANENT OFFICE OF THE ASSOCIATION :

THE UNIVERSITY, GLEBE, SYDNEY, N.S.W.

SOUTH AUSTRALIA:
C. E. BRISTOW, GOVERNMENT PRINTER,
NORTH-TERRACE, ADELAIDE.

1894.