

Tertiary Foraminifera of Victoria, Australia.—The Balcombian Deposits of Port Phillip: Part I. By FREDERICK CHAPMAN, A.L.S., F.R.M.S., Palæontologist, National Museum, Melbourne.

(PLATES 1-4.)

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Introduction.

MANY of the clays and limestones of the Victorian Tertiary strata are so rich in Foraminifera that they offer a wide field of research to the rhizopodist. In the gigantic size and redundant growth of many of the species we see the result of congenial life-conditions; and in this respect the foraminiferal fauna affords a parallel instance with that of the Tertiaries of the Sub-apennines, the Oligocene and Miocene deposits of the West Indies, and the Miocene of the Vienna Basin.

The Tertiary foraminiferal rocks of Victoria have been by no means neglected, for some valuable descriptive work on the Foraminifera of the Muddy Creek beds has been already published by the Rev. Walter Howchin, F.G.S., of Adelaide *, in which both the lower (Balcombian) and the upper (Kalimnan) series are dealt with. The same author has also contributed a paper on the Foraminifera obtained from the Kent Town Bore, Adelaide †, which passed through somewhat similar Tertiary strata. A complete list of the Tertiary Foraminifera of Muddy Creek (lower and upper beds), including a species of *Fabularia* described by the late M. C. Schlumberger ‡, was given by Mr. Howchin in his census of the fossil Foraminifera of Australia §.

A note with lists of Foraminifera, Tertiary and recent, has also been published by H. Watts ||, who has recorded 13 species of Foraminifera from "Mt. Martha," which is equivalent to our locality of Balcombe's Bay.

There is yet another paper dealing with the Foraminifera of the Port Phillip area, by G. R. Vine, Jun. ¶. Mr. Vine recorded 67 species, and stated that his first lot of material came from Mount Martha (*i. e.* Balcombe's Bay); whilst a second supply, yielding smaller and more numerous Foraminifera, came from a "similar deposit at Yarra Yarra, Victoria." Since there is no locality of that name for Tertiary fossils, it may be assumed that "beyond the

* Trans. R. Soc. S. Australia, vol. xii. 1889, pp. 1-20, pl. i.

† *Ibid.* 1891, pp. 350-354, pl. xiii. figs. 11-13.

‡ The comparatively sudden decease of this most successful and earnest worker in microzoology is deplored by all students of Rhizopoda.

§ Report Adelaide Meeting Austr. Assoc. Adv. Sci. (1893).

|| "Foraminifera of Victoria." Southern Science Record, vol. iii. 1883, No. 3, p. 76.

¶ "On some Miocene Foraminifera from Australia." Trans. & Ann. Rep. Sheffield Microscopical Soc., Session 1897-98, pp. 6-9.

mouth of the Yarra" was intended; and from Vine's description of the material it probably came from Grice's Creek. In this interpretation I am supported by Mr. T. S. Hall, M.A., to whom I am also indebted for a copy of Vine's paper.

Notwithstanding the work which has already been done by the authors just mentioned, there are many other localities in Victoria which require to be worked systematically for their Foraminifera before sufficient data are collected to show adequately their distribution in the Tertiaries both vertically and topographically. I therefore venture to offer a contribution to the study of Victorian species, based on collections made by myself during the past four years from other places in the State besides that of Muddy Creek. The list of species here enumerated is by no means exhaustive, as additional forms are found at each examination of fresh material.

The foraminiferal rocks of Victoria represent, in their lithological structure, deposits laid down under all the varied conditions between clear water and turbid, both deep and shallow, which would result from intermittent or continuous movements of a shore-line. Thus it will be apparent that by a change of environment, along with a varying food-supply, the facies of the foraminiferal fauna would vary.

Sources of the present Collection.

For the Balcombe's Bay deposit I am under great obligations to Mr. T. S. Hall, who has supplied me with a large quantity of the washings from this, as well as many other localities, especially along the coastal areas of Victoria.

The Grice's Creek material was also furnished me by Mr. Hall, and I have supplemented this by collecting samples from both the brown and the blue clays of the same place. There is nothing distinctive in these two layers, however, the brown colour being the result of an alteration of the iron sulphide into the hydrous peroxide, as similarly recorded in the case of the London Clay of Piccadilly*.

The third locality herein dealt with is Kackeraboite Creek (of Selwyn) †, or Dennant Creek (of Kitson) ‡. The clay exposed in this section, although close to Grice's Creek, seems to differ somewhat in its molluscan contents and in the smallness and delicacy of most of the Foraminifera. Samples from this bed were collected by myself.

The fourth locality is situated near Altona Bay, where the blue clay was

* Journ. R. Micro. Soc. ser. 2, vol. vi. 1886, p. 739.

† Report on the Geological Structure of the Basin of the River Yarra. Papers presented to Legislative Council, Victoria, 1856.

‡ Report on the Coast-line and adjacent Country between Frankston, Mornington, and Dromana. Monthly Progr. Rep. Geol. Surv. Vict. 1900, No. 12, p. 3.

thrown out during the boring operations for brown coal. A heap of fossiliferous clay remained until lately at the head of the shaft, and a plentiful harvest of both large and small fossils might have been secured by picking over the clay, or by washing and sifting. My first acquaintance with this rich material was through a sample given me by Mr. E. O. Thiele, who, in conjunction with Mr. F. E. Grant, wrote a short paper on the deposit, giving a list of the fossils, chiefly mollusca *. Since then I have visited the locality several times, and collected and washed a considerable quantity of the clay, thereby securing a fine collection of both Foraminifera and Ostracoda †.

Microscopic Characters of the Washings.

The residues of the clays yielding the Foraminifera treated of in this paper have all the same general character. The majority of the particles point to an organic origin, but there is also present a fair proportion of terrigenous material, consisting mainly of quartz-grains, with an occasional felspar or other mineral fragment. The finer quartz sand is angular, and the coarser grains are usually well-rounded; whilst here and there a wind-worn grain may be easily detected on account of its highly polished surface. The deposit containing the largest and most numerous quartz-grains is that from the Altona Bay Coal-Shaft; and one bed in the series passed through by boring is a coarse quartz-grit.

The organisms seen in these washings, and common to all the localities unless otherwise stated, are the following:—

FORAMINIFERA. Generally abundant.

SPONGES. Fragments of hexactinellid skeletal mesh; 4-rayed and slender, curved needle-shaped spicules, pointed at both ends; calcisponge spicules (*Plectroninia Halli*), 4-rayed. Found only at Altona Bay Coal-Shaft and Balcombe's Bay.

GORGONID spicules, two kinds.

Leptoclinum spicules; stellate, calcareous.

ECHINOID spines; belonging to Spatangoids and Echinids.

POLYZOA. Numerous.

MOLLUSCA, including *Styliola rangiana* and *Limacina tertiaria* (Pteropods).

OSTRACODA. Fairly common; valves occasionally united.

FISH; otoliths. Occasional.

Some fragments of a species of *Corallina* were also found in the washings from the Altona Bay Coal-Shaft.

* "On the Fossil Contents of the Eocene Clays of the Altona Bay Coal-Shaft." Proc. Roy. Soc. Vict. n. s. vol. xiv. pt. 2, 1902, p. 145.

† I have already done a portion of the work on this group, and hope to shortly publish some results.

*Description of the Species.*Order **FORAMINIFERA.**Family **MILIOLIDÆ.**Subfamily **MILIOLININÆ.**Genus **BILOCULINA**, *d'Orbigny*.**BILOCULINA BULLOIDES**, *d'Orbigny*. (Plate 1. figs. 3, 4.)

Biloculina bulloides, *d'Orbigny*, 1826, Ann. Sci. Nat. vol. vii. p. 297, No. 1, pl. 16. figs. 1-4; Schlumberger, 1887, Bull. Soc. Géol. France, sér. III. vol. xv. p. 120, pl. 15. figs. 10-13, woodcuts figs. 1-5; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 1.

Fairly typical specimens showing the slender **T**-shaped epistoma are not rare. The shells are generally undersized, and have a tendency to become pyriform in a slight degree, thus linking the species with *B. ringens*. Howchin recorded this species from Muddy Creek, but only from the Upper Bed (Kalimnan).

Occurrence.—Grice's Creek, common; Balcombe's Bay, very rare.

BILOCULINA RINGENS, *Lamarck* sp. (Plate 1. figs. 9, 10.)

Miliolites ringens, Lamarck, 1804, Ann. du Muséum, vol. v. p. 351; vol. ix. pl. 17. fig. 1. *Biloculina ringens*, Lam. sp., Schlumberger, 1887, Bull. Soc. Géol. France, sér. III. vol. xv. p. 126, pl. 15. figs. 14-18, woodcuts figs. 6-9; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 1.

The specimens in the present collection are medium-sized. They have a sub-elliptical test, seen from the front, and the face of the penultimate chamber is somewhat pyriform. The epistoma is bifid with the tips more or less recurved. A moderately large specimen (not figured) closely resembles the form common in the English "Coralline" (polyzoan) Crag*. Howchin has noted this species both from the Upper and Lower Beds of Muddy Creek, and Vine from the Port Phillip Tertiaries.

Occurrence.—In the present series *B. ringens* is somewhat frequent; from Grice's Creek, Balcombe's Bay, Kackeraboite Creek, and Altona Bay Coal-Shaft.

BILOCULINA BRADII, *Schlumberger*. (Plate 1. figs. 7, 8.)

Biloculina ringens, Brady (non Lamarck), 1884, Rep. Chall. vol. ix. p. 142, pl. 2. fig. 7. *B. Bradyi*, Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv. p. 557, pl. 10. figs. 63-71, woodcuts figs. 15-19.

The above species has been clearly diagnosed by Schlumberger, who has

* Jones, Parker, and Brady, Mon. Foram. Crag, 1866, pl. 3. figs. 26, 27.

shown its identity with Brady's figure referred to above, by the external form, the shape of the aperture, the thickness of the shell-wall, and especially in the internal arrangement of the chambers so well illustrated by the median slices of the test. Our specimens agree with the above species both in external form and internal plan. Schlumberger's specimens were obtained from the Gulf of Gascony at a depth of 1850 metres.

Occurrence.—Grice's Creek, somewhat rare.

BILOCULINA SARSI, Schlumberger. (Plate 1. figs. 1, 2.)

Biloculina Sarsi, Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv. p. 553, pl. 9. figs. 55–59, woodcuts figs. 10–12.

At first sight this form might be confused with *B. depressa*. It differs, however, from that species in the relatively thicker test and less salient carina. Internally, the form A in *B. Sarsi* possesses a thick-walled canal-like chamber following the megalosphere or large initial cell; whilst in form B the quinqueloculine chambers of the initial portion are not so strongly carinate as in *B. depressa*. The specimens examined at present from the Australian localities appear all to belong to form A.

Schlumberger recorded the above species from the *Biloculina*-Clay of the North Sea at 2000 fathoms.

There is very little doubt that d'Orbigny's *B. lunula* from the Vienna Basin is closely related to, if not identical with, the above species.

Occurrence.—This species is fairly common in the present collection. It occurs at Grice's Creek, Balcombe's Bay, and Altona Bay Coal-Shaft.

BILOCULINA DEPRESSA, d'Orbigny. (Plate 1. fig. 16.)

Biloculina depressa, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 298, No. 7; Brady, 1884, Rep. Chall. vol. ix. p. 145, pl. 2. figs. 12, 16, 17, pl. 3. figs. 1, 2; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 1; Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv. p. 547, pl. 9. figs. 48, 49, woodcuts figs. 1–5.

The majority of the specimens show a tendency to develop an aboral prolongation of the peripheral flange, as noticed also by Howchin, who recorded this species from both the Lower and Upper beds of Muddy Creek.

Occurrence.—*B. depressa* is not at all common in our samples and is perhaps below the average in point of size. It occurs at Grice's Creek, Kackeraboite Creek, and Altona Bay Coal-Shaft.

BILOCULINA LÆVIS, DeFrance sp. (Plate 1. fig. 15.)

Pyrgo lævis, DeFrance, 1824, Dict. Sci. Nat. vol. xxxii. p. 273, Atlas, pl. 80. fig. 2.

Biloculina lævis, DeFrance sp., Goës, 1894, Kongl. Svenska Vetenskaps-Akad. Handlingar, vol. xxv. p. 119, pl. 24. figs. 914–918.

This species is somewhat similar to *B. depressa* in its general shape, but is distinguished by its bicarinate periphery. It inhabits deep and shallow water

alike in the living condition. Defrance's original specimens came from the Paris Tertiaries. Vine records this species from the Port Phillip Tertiaries.

Occurrence.—*B. lævis* seems to be rare in Victorian strata. In this series it was found only in washings from the Altona Bay Coal-Shaft.

BILOCULINA ELONGATA, d'Orbigny. (Plate 1. fig. 14.)

Biloculina elongata, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 298, No. 4; Brady, 1884, Rep. Chall. vol. ix. p. 144, pl. 2. figs. 9 *a*, *b*; Howchin, 1899, Trans. R. Soc. S. Australia, vol. xii. p. 1; Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv. p. 571, pls. 11 & 12. figs. 87–89, woodcuts figs. 35, 36.

Our specimens are small but typical. Howchin recorded the species from Muddy Creek, both Lower and Upper Beds; and Vine, from the Port Phillip Tertiaries.

Occurrence.—In the present collection it occurred sparingly at Grice's Creek, Balcombe's Bay, and Kackeraboite Creek.

BILOCULINA ANGUSTA, sp. nov. (Plate 1. figs. 11–13.)

Specific characters.—Test narrow, elliptical, with a narrow and somewhat concave peripheral flange. Aperture normally closed by a semicircular flange, but sometimes this is absent.

Length .36 mm.; width .17 mm.; depth .13 mm.

This form seems intermediate in character between *B. labiata*, Schlumberger* and *B. elongata*, d'Orbigny, with stronger affinities towards the former.

B. labiata has a much broader test and the oral flange is more pronounced.

Occurrence.—Grice's Creek, frequent; Kackeraboite Creek, frequent.

BILOCULINA IRREGULARIS, d'Orbigny. (Plate 1. figs. 5, 6.)

Biloculina irregularis, d'Orbigny, 1839, Foram. Amér. Mérid. p. 67, pl. 8. figs. 22–24; Brady, 1884, Rep. Chall. vol. ix. p. 140, pl. 1. figs. 17, 18; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 1.

The aperture of this form is sometimes labyrinthic (see figure), as noted also by Howchin in the Muddy Creek specimens. Normally, however, it has a small partition in the aperture. Previously recorded from the Lower Beds of Muddy Creek.

Occurrence.—*B. irregularis* is common at Grice's Creek, Balcombe's Bay, and Kackeraboite Creek.

BILOCULINA GLOBULUS, Bornemann. (Plate 1. figs. 17, 18.)

Biloculina globulus, Bornemann, 1855, Zeitschr. d. deutsch. Geol. Gesellsch. vol. vii. p. 349, pl. 19. fig. 3; Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv. p. 575, pl. 12. figs. 97–100, woodcuts figs. 42–44.

Schlumberger has shown (*loc. cit.*) that this species is distinct from the

* Mém. Soc. Zool. France, 1891, vol. iv. p. 556, pl. 9. figs. 60–62, woodcuts figs. 13, 14.

so-called *Biloculina sphaera* of d'Orbigny, although Brady united the two forms in his synonymy of the latter species, which is in reality a *Planispirina*.

Occurrence.—Grice's Creek, frequent; Altona Bay Coal-Shaft, rare.

Genus SPIROLOCULINA, d'Orbigny.

SPIROLOCULINA ACUTIMARGO, Brady. (Plate 1. fig. 19.)

Spiroloculina acutimargo, Brady, 1884, Rep. Chall. vol. ix. p. 154, pl. 10. figs. 12-15.

This species is found, in the living condition, from the littoral zone down to moderately deep water areas. It is distinguished from other *Spiroloculinae* of the same compressed type by its sharp peripheral margin.

Occurrence.—Grice's Creek, rare; Kackeraboite Creek, rare.

SPIROLOCULINA AFFIXA, Terquem. (Plate 1. figs. 23-25.)

Spiroloculina affixa, Terquem, 1878, Mém. Soc. Géol. France, sér. III. vol. i. p. 55, pl. 5 (10) figs. 13 a-c.

Spiroloculina inaequilateralis, Schlumberger, 1887, Bull. Soc. Zool. France, vol. xii. p. 202, pl. 4. figs. 84-86, woodcut fig. 3.

Spiroloculina affixa, Terq., Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

This delicate and thin-walled foraminifer has one face almost flat whilst the opposite surface rapidly increases in thickness from the centre to the margin, appearing as if deeply incised by a V-shaped groove along the median line of the shell. *S. affixa* has been recorded from the Lower Beds of Muddy Creek (Howchin).

Occurrence.—Grice's Creek, rare.

SPIROLOCULINA CANALICULATA, d'Orbigny. (Plate 1. figs. 20, 21.)

Spiroloculina canaliculata, d'Orbigny, 1846, Foram. Foss. Vienne, p. 269, pl. 16. figs. 10-12; Jones, 1895, Foram. Crag, pt. ii. p. 108, pl. 3. figs. 39, 40, woodcuts figs. 3 a, 3 b.

Our specimen figured is small but otherwise quite typical. It is readily distinguished by its grooved margin.

Occurrence.—Kackeraboite Creek, very rare.

SPIROLOCULINA ASPERULA, Karrer. (Plate 1. fig. 22.)

Spiroloculina asperula, Karrer, 1868, Sitzungsab. d. K. Ak. Wiss. Wien, vol. lvii. p. 136, pl. 1. fig. 10; Brady, 1884, Rep. Chall. vol. ix. p. 152, pl. 8. figs. 13, 14; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 3.

The majority of our specimens have the suture-lines on the face of the test obscured by the arenaceous covering. Howchin notes the same feature in the specimens from Muddy Creek, where he records it from the Lower Beds. Karrer's original figure is that of a more elongate shell, the sutures being very distinct; the Balcombian specimens more nearly resemble the recent

specimens figured by Brady from comparatively shallow water in the Pacific and elsewhere, in their generally greater breadth.

Occurrence.—Grice's Creek, frequent; Balcombe's Bay, very rare; Kackeraboite Creek, frequent; Altona Bay Coal-Shaft, rare.

Genus MILIOLINA, *Williamson*.

MILIOLINA OBLONGA, *Montagu* sp. (Plate 2. fig. 26.)

Vermiculum oblongum, Montagu, 1803, Test. Brit. p. 522, pl. 14. fig. 9.

Miliolina oblonga, Mont. sp., Brady, 1884, Rep. Chall. vol. ix. p. 160, pl. 5. figs. 4*a*, *b*; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

The specimens in the present series are exceptionally small, but otherwise typical. Howchin found this species in both the Upper and Lower Series at Muddy Creek; Vine records it from the Port Phillip Tertiaries.

Occurrence.—Balcombe's Bay, very rare; Altona Bay Coal-Shaft, frequent.

MILIOLINA CIRCULARIS, *Bornemann* sp. (Plate 2. fig. 27.)

Triloculina circularis, Bornemann, 1855, Zeitschr. d. deutsch. Gesellsch. vol. vii. p. 349, pl. 19. fig. 4.

Miliolina circularis, Born. sp., Brady, 1884, Rep. Chall. vol. ix. p. 169, pl. 5. figs. 13, 14; Sherborn & Chapman, 1886, Journ. R. Micr. Soc. ser. II. vol. vi. p. 742, pl. 14. figs. 2*a*, *b*; Millett, 1898, Journ. R. Micr. Soc. p. 499, pl. 11. figs. 1-3.

Our figured specimen is typical in outline, but the oral aperture is dentate. Vine records this species from the Port Phillip Tertiaries.

Occurrence.—Balcombe's Bay, very rare.

MILIOLINA SCHREIBERIANA, *d'Orbigny* sp. (Plate 2. fig. 28.)

Triloculina schreiberiana, d'Orbigny, 1839, Foram. Cuba, p. 174, pl. 9. figs. 20-22.

Triloculina austriaca, d'Orbigny, 1846, Foram. Foss. Vienne, p. 275, pl. 16. figs. 25-27.

Triloculina schreiberiana, d'Orbigny, Schlumberger, 1893, Mém. Soc. Géol. France, vol. vi. p. 204, pl. 1. figs. 42-44, woodcuts figs. 5, 6; Fornasini, 1900, Mem. R. Accad. Sci. Ist. Bologna, ser. V. vol. viii. p. 361, fig. 5.

The triloculine forms of *Biloculina lucernula*, Schwager*, are strongly suggestive of affinity with this species; their distinctness, however, is clearly seen on making thin slices of the test. Our specimens agree with the normal triloculine species referred to above, both as to internal arrangement and external form. *M. schreiberiana* may be separated from *B. lucernula*, however, without having recourse to the slicing of the shell, by the form of the oral extremity, which is not prolonged as in the latter species. *M. schreiberiana* is again distinguished from *M. trigonula*, Lam. sp., by the accentuated inflation of the chambers visible on the exterior.

Occurrence.—Grice's Creek, common; Kackeraboite Creek, frequent; Altona Bay Coal-Shaft, frequent.

* Novara-Exped., Geol. Theil (2) 1866, p. 202, pl. 4. figs. 14*a-c*, 17*a, b*.

MILIOLINA POLYGONA, *d'Orbigny* sp. (Plate 2. fig. 29.)

Quinqueloculina polygona, *d'Orbigny*, 1839, *Foram. Cuba*, p. 198, pl. 12. figs. 21-23.

Miliolina polygona, *d'Orbigny* sp., *Goës*, 1896, *Bull. Mus. Comp. Zool. Harvard*, vol. xxi. No. 1 (xx), p. 83, pl. 8. figs. 11-18.

M. polygona is a neat, short, multicarinate form, which appears to be new to Australian Tertiary lists. In the living condition it is of fairly deep-water habit.

Occurrence.—Grice's Creek, very rare.

MILIOLINA TRIGONULA, *Lamarck* sp. (Plate 2. fig. 30.)

Miliolites trigonula, *Lam.*, 1804, *Ann. du Mus.* vol. v. p. 351, No. 3; *id.*, 1822, *Anim. s. Vert.* vol. vii. p. 612, No. 3.

Miliolina trigonula, *Lam.* sp., *Howchin*, 1889, *Trans. R. Soc. S. Australia*, vol. xii. p. 2.

The affinity of this species with the succeeding one, *M. tricarinata*, is somewhat close; *M. trigonula* being distinguished by the less regular carination of the margins, and the comparatively strong inflation of the penultimate and earlier chambers.

Howchin records this species from both series at Muddy Creek; *Vine* notes it from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, frequent; Balcombe's Bay, frequent.

MILIOLINA TRICARINATA, *d'Orbigny* sp. (Plate 2. fig. 31.)

Triloculina tricarinata, *d'Orbigny*, 1826, *Ann. Sci. Nat.* vol. vii. p. 299, No. 7; *Modèle*, No. 94.

Miliolina tricarinata, *d'Orbigny* sp., *Brady*, 1884, *Rep. Chall.* vol. ix. p. 165, pl. 2. figs. 17 *a, b*; *Howchin*, 1889, *Trans. R. Soc. S. Australia*, vol. xii. p. 2.

The Australian Tertiary examples of the above species are exceedingly large; and although they are generally typical of the species, they have the peripheral margins of the trihedral test less acute than the recent and fossil specimens from the Northern hemisphere.

Howchin records this species from both beds at Muddy Creek. *Vine* mentions its occurrence in the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, common; Balcombe's Bay, frequent; Kackeraboite Creek, very rare; Altona Bay Coal-Shaft, very common.

MILIOLINA VULGARIS, *d'Orbigny* sp. (Plate 2. fig. 32.)

Quinqueloculina vulgaris, *d'Orbigny*, 1826, *Ann. Sci. Nat.* vol. vii. p. 302, No. 33.

Q. triangularis, *d'Orbigny*, 1826, *ibid.*, p. 302, No. 34.

Q. auberiana, *d'Orbigny*, 1839, *Foram. Cuba*, p. 193, pl. 12. figs. 1-3.

Q. vulgaris, *d'Orbigny*, *Schlumberger*, 1893, *Mém. Soc. Géol. France*, vol. vi. p. 207, pl. 2. figs. 65, 66, woodcuts figs. 13, 14.

Of the several species grouped around *M. seminulum* as a central type, this is perhaps one of the best defined forms. It is a constant and characteristic species in the present series. The varieties with a sharp peripheral edge agree with the published figures of *M. auberiana*. This form, under

the last-mentioned name, was recorded by Vine from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, frequent ; Balcombe's Bay, frequent ; Kackeraboite Creek, common ; Altona Bay Coal-Shaft, very common.

MILIOLINA CUVIERIANA, d'Orbigny sp. (Plate 2. fig. 33.)

Quinqueloculina cuvieriana, d'Orbigny, 1839, Foram. Cuba, p. 190, pl. 11. figs. 19-21.

Miliolina cuvieriana, d'Orbigny sp., Brady, 1884, Rep. Chall. vol. ix. p. 162, pl. 5. figs. 12 a-c ; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

This is one of the more ubiquitous Miliolines in these Tertiary beds. It is easily recognized by its prolonged oral extremity, the keeled edge of the test, and sharply ridged median chamber. This form belongs to the *M. vulgaris* type, but differs from that species in the above-mentioned particulars. In the living condition it is found ranging from shallow water down to 95 fathoms. Howchin records it from the Lower Beds of Muddy Creek.

Occurrence.—Grice's Creek, common ; Balcombe's Bay, common ; Kackeraboite Creek, frequent ; Altona Bay Coal-Shaft, common.

MILIOLINA SEMINULUM, Linné sp. (Plate 2. fig. 34.)

Serpula seminulum, Linné, 1767, Syst. Nat. 12th ed. p. 1264, No. 791 ; id., 1788, 13th (Gmelin's) ed. p. 3739, No. 2.

Miliolina seminulum Linné sp., Brady, 1884, Rep. Chall. vol. ix. p. 157, pl. 5. figs. 6 a-c ; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

Our specimens are somewhat large and solidly built ; otherwise they are quite typical. Howchin records it from both beds at Muddy Creek, and Vine and Watts obtained it from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, very rare ; Kackeraboite Creek, very rare.

MILIOLINA CONTORTA, d'Orbigny sp. (Plate 2. fig. 35.)

Quinqueloculina contorta, d'Orbigny, 1846, Foram. Tert. Vienne, p. 298, pl. 20. figs. 4-6.

Miliolina contorta, d'Orb. sp., Göes, 1894, Arctic and Scand. Foram., Svenska Vetenskaps Akad. Handlingar, vol. xxv. No. 9, p. 111, pl. 20. figs. 851, 852.

This is a species seldom recorded. Our specimens are exactly comparable with d'Orbigny's figured example from the Miocene of the Vienna Basin. It may perhaps be regarded as a weak form of *Miliolina Ferussacii*, d'Orb. sp., and related to *M. nudosa*, Karrer sp.

Vine has already recorded *M. contorta* from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, very rare ; Balcombe's Bay, very rare.

MILIOLINA FERUSSACII, d'Orbigny sp. (Plate 2. fig. 39.)

Quinqueloculina Ferussacii, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 301, No. 18 Modèle, No. 32.

Miliolina Ferussacii, d'Orb. sp., Brady, 1884, Rep. Chall. vol. ix. p. 175, pl. 113. figs. 17 a, b ; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

This species, as a fossil, dates from the Cretaceous, and it is found in nearly

all foraminiferal deposits of Tertiary age. As a recent form it occurs as far north as Baffin's Bay, and has been also recorded from several places off the coast of Australia.

Howchin records this species from the Lower Bed of Muddy Creek.

Occurrence.—Grice's Creek, frequent.

MILIOLINA AGGLUTINANS, d'Orbigny sp. (Plate 2. fig. 36.)

Quinqueloculina agglutinans, d'Orbigny, 1839, Foram. Cuba, p. 168, pl. 12. figs. 11-13.

Miliolina agglutinans, d'Orb. sp., Brady, 1884, Rep. Chall. vol. ix. p. 180, pl. 8. figs. 6, 7; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

This is a variable species in the present series, some of the specimens being more elongate than others; this peculiarity was also remarked upon by Howchin, who recorded it from Muddy Creek, where in the Lower Bed it is very common, and in the Upper Bed rare. Vine also notes this species from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, common; Balcombe's Bay, common; Kackeraboite Creek, frequent; Altona Bay Coal-Shaft, frequent.

MILIOLINA LINNÆANA, d'Orbigny sp. (Plate 2. fig. 37.)

Triloculina linnæana, d'Orbigny, 1839, Foram. Cuba, p. 153, pl. 9. figs. 11-13.

Miliolina linnæana, d'Orb. sp., Brady, 1884, Rep. Chall. vol. ix. p. 174, pl. 6. figs. 15-20; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 2.

The present examples are typical in having an elliptical test, sculptured with coarse and fairly deep longitudinal furrows.

The fossils hitherto recorded are from the Tertiaries of the Vienna Basin and the Island of Ischia, and it was also found by Howchin in both Lower and Upper Beds at Muddy Creek. *M. linnæana* is found in the recent condition in fairly shallow-water areas, chiefly within the tropical zone.

Occurrence.—Grice's Creek, frequent.

MILIOLINA VENUSTA, Karrer sp. (Plate 2. fig. 38.)

Quinqueloculina venusta, Karrer, 1868, Sitzungsab. d. K. Ak. Wiss. Wien, vol. lviii. Abth. i. p. 147, pl. 2. fig. 6.

Miliolina venusta, Karrer sp., Brady, 1884, Rep. Chall. vol. ix. p. 162, pl. 5. figs. 5, 7.

This species dates from the Cretaceous (Gault of England). Karrer's specimens came from the Miocene of Kostej, Banat. As a living form it is essentially of deep-water habit.

Occurrence.—Grice's Creek, rare.

Genus SIGMOİLINA, Schlumberger.

SIGMOİLINA SIGMOIDEA, Brady sp. (Plate 2. fig. 40.)

Planispirina sigmoidea, Brady, 1884, Rep. Chall. vol. ix. p. 197, pl. 2. figs. 1-3, woodcut fig. 5 c.

SigmoİLina sigmoidea, Brady sp., Schlumberger, 1887, Bull. Soc. Zool. France, vol. xii. p. 118.

Planispirina sigmoidea, Brady, Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 5.

In the recent condition this form has a restricted geographical range. It has been recorded from two localities off S. America out of a total of five. As a fossil form Howchin recorded it from both beds at Muddy Creek, where in the Lower Series it is common.

Occurrence.—Grice's Creek, frequent; Balcombe's Bay, frequent; Altona Bay Coal-Shaft, frequent.

SIGMOİLINA CELATA, *Costa* sp. (Plate 2. fig. 41.)

Spiroloculina celata, Costa, 1856, Atti Acc. Pontaniana, vol. vii. pt. 1a, pl. 26. fig. 5.

Planispirina celata, Costa sp., Fornasini, 1885, Boll. Soc. Geol. Ital. vol. iv. p. 108; Terrigi, 1891, Mem. R. Comit. Geol. Ital. vol. iv. pt. 1a, p. 67, pl. 1. figs. 5, 6.

Costa's original specimens differ from the recent form named by Dr. Silvestri *S. Schlumbergeri*, in having an angular contour and conspicuously marked sutures; whilst internally they show in transverse section that the chambers are subcircular or subangular in outline, and these are arranged in a more extended sigmoidal curve than those seen in *S. Schlumbergeri*.

Our specimens are not so broad as the typical examples from the Italian Tertiaries, but they, in all probability, belong to the same species.

Occurrence.—Grice's Creek, frequent; Kackeraboite Creek, rare.

SIGMOİLINA SCHLUMBERGERI, *Silvestri*. (Plate 2. fig. 42.)

Planispirina celata (non Costa sp.), Brady, 1884, Rep. Chall. vol. ix. p. 197, pl. 8. figs. 1-4; Flint, 1899, Rep. U.S. Nat. Mus. (1897) p. 303, pl. 47. fig. 5.

Sigmoilina Schlumbergeri, Silvestri, 1904, Mem. dell. Pontif. Acc. Romana d. Nuovi Lincei, vol. xxii. p. 267.

In the last mentioned work Dr. A. Silvestri has pointed out the previous confusion of two forms under the one name, and further shows that the original specimens of Costa are not referable to the species usually found in recent deposits. Silvestri separates this latter form under the name of *S. Schlumbergeri*. The distinguishing characters of this species are the even contour and inconspicuous sutures; whilst internally the differences between this and the preceding species are still more apparent in the rounded form of the chambers and the strong sigmoidal curvature of the series.

Occurrence.—Grice's Creek, frequent.

Subfamily HAUERININÆ.

Genus PLANISPIRINA, *Sequenza*.

PLANISPIRINA EXIGUA, *Brady* sp. (Plate 2. fig. 43.)

Hauerina exigua, Brady, 1879, Quart. Journ. Micr. Sci. vol. xix. n. s. p. 53.

Planispirina exigua, Brady, 1884, Rep. Chall. vol. ix. p. 196, pl. 12. figs. 1-4, and woodcut fig. 5b; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 5; Millett, 1898, Journ. R. Micr. Soc. p. 611, pl. 13. fig. 13.

It is interesting to add this record to Howchin's previous one for the

Muddy Creek Lower Beds, since it was from that deposit that this shallow-water tropical species was first recorded as a fossil.

Our figured specimen is most like that depicted by Millett from the Malay Archipelago.

Occurrence.—Grice's Creek, very rare; Altona Bay Coal-Shaft, very rare.

Genus ARTICULINA, *d'Orbigny*.

ARTICULINA FUNALIS, *Brady*. (Plate 2. fig. 44.)

Articulina funalis, Brady, 1884, Rep. Chall. vol. ix. p. 185, pl. 13. figs. 6-11; Egger, 1893, Abhandl. k.-bayer. Ak. Wiss., math.-nat. Cl. II. vol. xviii. p. 242, pl. 3. fig. 1; Millett, 1898, Journ. R. Micr. Soc. p. 513.

As in the majority of the recent forms hitherto found, our specimen has lost its initial milioline series of chambers.

This is probably the first occurrence of the species as a fossil. It is found living off Kerguelen Island, the coast of New Guinea and the Malay Archipelago.

Occurrence.—Grice's Creek, very rare.

Subfamily PENEROPLIDINÆ.

Genus CORNUSPIRA, *Schultze*.

CORNUSPIRA CRASSISEPTA, *Brady*. (Plate 2. fig. 45.)

Cornuspira crassisepta, Brady, 1882, Proc. Roy. Soc. Edin. vol. xi. p. 714; id., 1884, Rep. Chall. vol. ix. p. 202, pl. 113. fig. 20; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 4.

The geographical distribution of this species is peculiar. It is the most abundant of the *Cornuspiræ* in the Tertiaries of South-eastern Australia, and in the living condition has only been recorded from one locality, namely the Faroe Channel, "warm area," 530 fathoms. Flint* figures two examples of a similar shell in the same group with *C. involvens*. They may possibly belong to this species, but their peripheral aspect is not shown. Flint's specimens came from soundings in the Caribbean Sea, Straits of Yucatan and coast of Georgia, from 276 to 463 fathoms.

C. crassisepta was found by Howchin in the Lower Bed at Muddy Creek.

Occurrence.—Grice's Creek, very common; Balcombe's Bay, very common; Kackeraboite Creek, common; Altona Bay Coal-Shaft, very common.

CORNUSPIRA INVOLVENS, *Reuss* sp. (Plate 2. fig. 46.)

Operculina involvens, Reuss, 1850, Denkschr. d. Akad. Wiss. Wien, vol. i. p. 370, pl. 46. fig. 20.

* Rep. U. S. Nat. Mus. for 1897, p. 303, pl. 48. fig. 3.

Cornuspira involvens, Reuss sp., Brady, 1884, Rep. Chall. vol. ix. p. 200, pl. 111. figs. 1-3; Rupert Jones, 1895, Pal. Soc. Mon. Foram. Crag, p. 128, pl. 3. figs. 52-54, woodcuts figs. 11 *a*, *b*; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 4; Millett, 1898, Journ. R. Micr. Soc. p. 612.

Of the two forms of this species usually found associated in the same deposit, that which has the most numerous convolutions is figured here. It probably represents the microspheric stage of this species; whilst the other, with a conspicuous, spherical initial chamber, as Millett remarks respecting the recent examples from the Malay Archipelago, represents the megalospheric form. The microspheric (B) form is twice as abundant as the megalospheric (A) form in the present series.

Howchin records this species from the Lower Bed at Muddy Creek, and Watts from Balcombe's Bay.

Occurrence.—Grice's Creek, very common; Kackeraboite Creek, common.

CORNUSPIRA STRIOLATA, Brady. (Plate 3. fig. 47.)

Cornuspira striolata, Brady, 1882, Proc. Roy. Soc. Edin. vol. xi. p. 713; id., 1884, Rep. Chall. vol. ix. p. 202, pl. 113. figs. 18, 19.

C. foliacea, Philippi sp. (*pars*), Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii p. 4 [immature examples].

C. striolata, Brady, Goës, 1894, Kongl. Svenska Vetensk. Ak. Handlingar, vol. xxv No. 9, p. 107, pl. 48. fig. 835.

C. involvens, Reuss sp., "striated var.", Vine, 1898, Trans. & Ann. Rep. Sheffield Micr. Soc. p. 9.

The majority of the specimens referred to the above species are not fully developed; that is to say, they do not exhibit the peripheral expansion and reflexure of the last-formed whorl seen in the recent examples. It was only by the fortunate discovery of a few examples out of many hundreds examined that the doubts relating to their specific identification were removed. In his description of *C. foliacea*, Howchin remarked as follows:—"It is worthy of note that all the specimens, which are more or less weathered, show a fine surface ornamentation resembling *C. striolata*, Brady." The mature forms found in the present series show the striated surface to be due not to weathering, but that they are actual markings on the original surface of the test. Other specimens in our series show an initial stage of the peripheral reflexion by the formation of a compressed trumpet-shaped mouth; and in fact, a graduated series might be arranged from one end to the other.

C. striolata is remarkable for its strictly northern distribution in the living condition, as far as its geographical range is at present known; the localities being, Faroe Channel, "cold area," 540 fathoms, and the Siberian Sea, 150 metres. As a fossil this species has been found by Howchin in the Lower beds of Muddy Creek (as *C. foliacea* in part), and by Vine in the Port Phillip Tertiary deposit (as *C. involvens* striated var.).

Occurrence.—Grice's Creek, frequent; Balcombe's Bay, common; Kackeraboite Creek, rare; Altona Bay Coal-Shaft, very common.

CORNUSPIRA FOLIACEA, *Philippi* sp. (Plate 3. fig. 48.)

Orbis foliaceus, Philippi, 1844, Enum. Moll. Sicil. vol. ii. p. 147, pl. 24. fig. 26.

Cornuspira foliacea, Phil. sp., Brady, 1884, Rep. Chall. vol. ix. p. 199, pl. 11. figs. 5-9 ; Howchin (*pars*), 1889, Trans. R. Soc. S. Australia, vol. xii. p. 4.

The above is distinguished from *C. involvens* by the stronger compression of the test, and the rapid increase in the diameter of the last whorl. From *C. striolata* it is separated by the much slighter structure and absence of the crowded undulose striæ so conspicuous on the latter species.

C. foliacea has been recorded by Howchin from the Lower Bed of Muddy Creek, and by Vine from the Tertiaries of Port Phillip.

Occurrence.—Grice's Creek, frequent; Kackeraboite Creek, rare; Altona Bay Coal-Shaft, common.

Family ASTRORHIZIDÆ.

Subfamily RHABDAMMININÆ.

Genus JACULELLA, *Brady*.

? JACULELLA OBTUSA, *Brady*. (Plate 3. fig. 49.)

Jaculella obtusa, Brady, 1882, Proc. Roy. Soc. Edin. vol. xi. p. 714 ; id., 1884, Rep. Chall. vol. ix. p. 256, pl. 22. figs. 19-22.

There is very little doubt that our specimens belong to the above genus and species. They consist of fairly straight tubes of firmly cemented sand-grains, amongst which are also included minute tests of other, calcareous, foraminifera. The tube is slightly wider at one end than the other. The examples found seem to have lost the bulbous extremity, which is present in the living examples.

This appears to be the first recorded occurrence of the genus in the fossil condition.

As a recent organism *J. obtusa* occurred in the "warm area" of the Faroe Channel at depths of 350 and 542 fathoms.

Occurrence.—Grice's Creek, rare.

Family LITUOLIDÆ.

Subfamily LITUOLINÆ.

Genus HAPLOPHRAGMIUM, *Reuss*.

HAPLOPHRAGMIUM SPHÆROIDINIFORME, *Brady*. (Plate 3. figs. 50, 51.)

Haplophragmium sphæroidiniforme, Brady, 1884, Rep. Chall. vol. ix. p. 313.

H. sphæroidiniformis, Brady, Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 6.

Dr. Brady briefly but clearly described this species in the 'Challenger' Report, and stated that his specimens were dredged in the Mediterranean,

70–120 fathoms. Mr. Howchin, in his report on the Muddy Creek foraminifera, referred to this species as a MS. species of Brady's, being unaware of the fact that Brady himself had briefly described the species previously.

The earlier record for this form is the Lower Bed of Muddy Creek.

Occurrence.—Grice's Creek, frequent; Balcombe's Bay, common; Altona Bay Coal-Shaft, frequent.

Genus LITUOLA, *Lamarek*.

LITUOLA SIMPLEX, *Chapman*. (Plate 3. fig. 52.)

Lituola simplex, Chapman, 1904, Rec. Geol. Survey Vict. vol. i. pt. 3, p. 228, pl. 22. figs. 3, 4.

The Balcombian specimen figured appears to be in every way comparable with the above form, which was found in the Jan Jukian clays of Brown's Creek, Otway Coast, Victoria.

Occurrence.—Altona Bay Coal-Shaft, very rare.

Family TEXTULARIIDÆ.

Subfamily TEXTULARIINÆ.

Genus TEXTULARIA, *DeFrance*.

TEXTULARIA GRAMEN, *d'Orbigny*. (Plate 3. fig. 53.)

Textularia gramen, d'Orbigny, 1846, Foram. Foss. Vienne, p. 248, pl. 15. figs. 4-6; Fornasini, 1887, Boll. Soc. Geol. Ital. vol. vi. p. 399, pl. 11. figs. 4 *a*, *b*; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 7.

This species is well-known as a Tertiary fossil. Besides being of short habit, the test has no spiral commencement as in *Spiroplecta sagittula*, which in some respects it resembles.

T. gramen was recorded by Howchin from the Lower Bed of Muddy Creek, and it has also been found by Vine in the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, frequent; Balcombe's Bay, frequent; Kackera-boite Creek, rare.

TEXTULARIA GIBBOSA, *d'Orbigny*. (Plate 3. fig. 54.)

Textularia gibbosa, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 262, No. 6, Modèle No. 28; Fornasini, 1903, Mem. Accad. Sci. Ist. Bologna, ser. V. vol. x. p. 300, pl. O. fig. 1.

This species and the following variety are undoubtedly closely allied. Specimens which belong to the type form *T. gibbosa* are essentially conoidal. They resemble *T. agglutinans* but with a short aborally pointed test, and the chambers are nearly flush with the shell-surface.

T. gibbosa is of frequent occurrence in the Tertiaries (Pliocene), and the shore-sand, of the Adriatic region. It has been recorded by Howchin from the Lower Bed of Muddy Creek, and by Vine from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, very rare; Balcombe's Bay, common; Kackeraboite Creek, rare; Altona Bay Coal-Shaft, frequent.

TEXTULARIA GIBBOSA, var. TUBEROSA (*d'Orbigny*). (Plate 4. fig. 76.)

Textularia tuberosa, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 263, No. 26.

T. aspera, Brady, 1882, Proc. R. Soc. Edin. vol. xi. p. 715; id., 1884, Rep. Chall. vol. ix. p. 367, pl. 44. figs. 9-13; Howchin, 1887, Trans. R. Soc. S. Australia, vol. xii. p. 6.

T. tuberosa, d'Orb., Fornasini, 1889, Boll. Soc. Geol. Ital. vol. vi. p. 161, pl. 2. figs. 2 a, b.

T. gibbosa, forma *tuberosa*, d'Orb., Fornasini, 1903, Mem. Acc. Sci. Ist. Bologna, ser. V. vol. x. p. 300, pl. O. fig. 2.

This variety differs from the type form in having an ovoid or sub-cylindrical test. It is essentially a Tertiary species, and is frequent in the Neogene strata of the Italian Sub-apennine area. There is little doubt that Brady's *T. aspera* is referable to this variety, and it is Brady's species to which Howchin referred the Muddy Creek specimens. Since the specific name, *aspera*, drops into synonymy it relieves nomenclature of one preoccupied name, two other forms having been similarly named by Ehrenberg and Terquem respectively*.

Occurrence.—Grice's Creek, very rare; Balcombe's Bay, very rare; Kackeraboite Creek, common; Altona Bay Coal-Shaft, frequent.

TEXTULARIA ABBREVIATA, *d'Orbigny*. (Plate 3. fig. 55.)

Textularia abbreviata, d'Orbigny, 1846, Foram. Foss. Vienne, p. 249, pl. 15. figs. 7-12; Brady, Parker, & Jones, 1888, Trans. Zool. Soc. Lond., vol. xii. p. 219, pl. 42. figs. 4, 5.

This short and broad form is a characteristic species in the Vienna and Italian Tertiaries, and has been found living on the Abrolhos Bank off the coast of S. America. Vine records it from the Port Phillip Tertiaries. Our specimens are typical in outline, but the chambers are higher and fewer than in d'Orbigny's original specimens.

Occurrence.—Grice's Creek, rare; Balcombe's Bay, frequent; Kackeraboite Creek, rare.

TEXTULARIA SIPHONIFERA, *Brady*. (Plate 3. fig. 56.)

Textularia siphonifera, Brady, 1881, Quart. Journ. Micr. Sci. vol. xxi. p. 53; id., 1884, Rep. Chall. vol. ix. p. 362, pl. 42. figs. 25-29.

The localities which have yielded the above species in the recent condition are almost exclusively those of coral-reef areas in the Pacific. It has also occurred in the Gulf of Suez at a depth of 30 fathoms. At Funafuti it occurred at various depths on the outer-reef slope of the atoll down to 150 fathoms, at which depth, at Funamanu, the writer found it to be most abundant.

Occurrence.—Grice's Creek, rare; Balcombe's Bay, very rare.

* See Sherborn's 'Index to the Genera and Species of the Foraminifera,' 1896.

TEXTULARIA RUGOSA, *Reuss* sp. (Plate 3. fig. 57.)

Plecanium rugosum, Reuss, 1869, Sitzungsab. d. K. Ak. Wiss. Wien, vol. lix. Abth. i. p. 453, pl. 1. figs. 3 a, b.

Textularia rugosa, Reuss sp., Brady, 1884, Rep. Chall. vol. ix. p. 363, pl. 42. figs. 23, 24; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 7.

This species has also been found at Muddy Creek (Lower Beds). The short varieties bear some resemblance to *T. gramen*, but may be distinguished by the strongly excavated sutures of the chambers.

Occurrence.—Grice's Creek, very rare.

Genus SPIROPLECTA, *Ehrenberg*.SPIROPLECTA SAGITTULA, *Defrance* sp. (Plate 3. figs. 58, 59.)

Textularia sagittula, Defrance, 1824, Dict. Sci. Nat. vol. xxxii. p. 177; 1828, vol. liii. p. 344, Atlas Conch. pl. 13. fig. 5; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 7.

Spiroplecta sagittula, Defr. sp., Wright, 1891, Proc. R. Irish Acad. p. 471; id., 1902, Irish Naturalist, p. 211, pl. 3.

The above species was first shown by J. Wright to belong to the genus *Spiroplecta* on account of the spiral arrangement of the initial series of chambers.

S. sagittula has been recorded by Howchin from Muddy Creek (both Lower and Upper Beds), and by Vine and Watts from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, very common; Balcombe's Bay, very common; Kackeraboite Creek, very common; Altona Bay Coal-Shaft, very common.

SPIROPLECTA SAGITTULA, *Defrance* sp., var. FISTULOSA, *Brady*. (Plate 3. fig. 60.)

Textularia sagittula, Defrance, var. *fistulosa*, Brady, 1884, Rep. Chall. vol. ix. p. 362, pl. 42. figs. 19–22; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 7.

In the Lower Bed at Muddy Creek this variety seems to be comparatively rare. It is, however, nearly as common as the specific form in the present series. Brady regarded the fistulosity as a redundant growth peculiar to examples occurring in tropical or sub-tropical areas.

Occurrence.—Grice's Creek, common; Balcombe's Bay, common; Altona Bay Coal-Shaft, frequent.

SPIROPLECTA CARINATA, *d'Orbigny* sp. (Plate 3. fig. 61.)

Textularia carinata, d'Orbigny, 1826, Ann. Sci. Nat. p. 263, No. 13; id., 1846, Foram. Foss. Vienne, p. 247, pl. 14. figs. 32–34.

T. carinata, d'Orb., var. *maorica* [var. *antipodum* in text], Stache, 1864, Novara-Exped., Geol. Theil, vol. i. p. 271, pl. 24. figs. 21 a–c.

T. carinata, d'Orb., Hantken, 1875 (1881) Mitth. a. d. Jahrb. k.-ungar. geol. Anstalt, vol. iv. p. 66, pl. 7. fig. 8; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 7.

Spiroplecta carinata, d'Orb. sp., Spandel, 1901, Abhandl. Naturhist. Gesellsch. Nürnberg, 1901, pp. 1–12; Fornasini, 1902, Mem. Accad. Sci. Ist. Bologna, ser. V. vol. x. p. 11, woodcut fig. 10.

Although this species is common at one of our localities it is rare to find a

thoroughly typical specimen, and this peculiarity was noticed by Howchin, who found it at Muddy Creek (Lower Bed). *S. carinata* and its minor varieties were found by Stache in the late Tertiary marls of Whaingaroa Harbour, Auckland, New Zealand.

Occurrence.—Grice's Creek, common ; Balcombe's Bay, rare.

SPIROPLECTA NUSSDORFENSIS, d'Orbigny sp. (Plate 3. fig. 62.)

Textularia nussdorfensis, d'Orbigny, 1846, Foram. Foss. Vienne, p. 243, pl. 14, figs. 17-19.

Our figured specimen agrees very closely with d'Orbigny's original example, with the exception that it has the spiral commencement of a *Spiroplecta*. This feature is not seen in the figure alluded to above, but its general irregularity of build makes it highly probable that d'Orbigny's example was a true *Spiroplecta*.

Occurrence.—Grice's Creek, very rare.

Genus GAUDRYINA, d'Orbigny.

GAUDRYINA PUPOIDES, d'Orbigny. (Plate 3. fig. 63.)

Gaudryina pupoides, d'Orbigny, 1840, Mém. Soc. Géol. France, sér. I. vol. iv. p. 44, pl. 4, figs. 22-24.

This rather variable form appears to be extremely rare in the Victorian foraminiferal deposits, so far as I have examined them. The figured specimen is unusually protuberant at the aboral extremity.

Occurrence.—Grice's Creek, very rare.

GAUDRYINA RUGOSA, d'Orbigny. (Plate 3. fig. 64.)

Gaudryina rugosa, d'Orbigny, 1840, Mém. Soc. Géol. France, sér. I. vol. iv. p. 44, pl. 4, figs. 20, 21 ; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 8.

The specimens which are identifiable with the above are exemplified in our series in every stage of their development. The initial portion of the test, with its tricarinate form, is fairly common, and at this stage is closely comparable with *Verneuilina triquetra*, Münster sp. A point of distinction in the young of *G. rugosa*, however, is the brevity of the initial, tricarinate portion ; in other words, a typical specimen of *Verneuilina triquetra* has a normally longer test than that of *G. rugosa* in its earlier stage.

Howchin recorded this species from Muddy Creek (Lower Bed) ; and Vine from the Tertiaries of Port Phillip.

Occurrence.—Grice's Creek, common ; Balcombe's Bay, common ; Kackera-boite Creek, common ; Altona Bay Coal-Shaft, common.

GAUDRYINA SIPHONELLA, Reuss. (Plate 3. fig. 65.)

Gaudryina siphonella, Reuss, 1851, Zeitschr. deutsch. geol. Gesellsch. vol. iii. p. 78, pl. 5, figs. 40-42 ; Hantken, 1875 (1881), Mitth. d. Jahrb. k.-ungar. geol. Anstalt, vol. iv. p. 14, pl. 1. fig. 3.

This neat little *Gaudryina* is a well distributed Tertiary and recent species.

Its earliest occurrence seems to have been in the Upper Chalk of Rügen. It has been found as a recent form in both the Atlantic and Pacific Oceans, and appears to prefer deep water.

Occurrence.—Grice's Creek, very common.

GAUDRYINA OXYCONA, Reuss. (Plate 3. fig. 67.)

Gaudryina oxycona, Reuss, 1860, Sitzungsab. d. K. Ak. Wiss. Wien, vol. xl. p. 229, pl. 12. figs. 3 a-c.

G. Reussi, Hantken, 1875 (1881), [non Stache 1864], Mitth. a. d. Jahrb. k.-ungar. geol. Anstalt, vol. iv. p. 14, pl. 1. fig. 5.

G. oxycona, Reuss, Chapman, 1892, Journ. R. Micr. Soc. p. 753, pl. 12. figs. 1 a, b.

It is interesting to meet with the above species in the Tertiary of Grice's Creek, since it is more characteristic of the Cretaceous in other parts of the world. It has, however, been found in the Older Tertiary (Szabói-schichten) of Hungary.

Vine also recorded this form ('*Gaudryina Reussi*') from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, very rare.

Genus *CLAVULINA*, d'Orbigny.

CLAVULINA COMMUNIS, d'Orbigny. (Plate 3. fig. 66.)

Clavulina communis, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 268, No. 4; Brady, 1884, Rep. Chall. vol. ix. p. 394, pl. 48. figs. 1-13.

The geological range of this species extends through the whole of the Tertiary deposits, and it also occurs in the recent condition. Our specimens are quite typical in every respect, and comparable with those found in the Northern hemisphere.

Howchin found this species in both the Lower and Upper Beds of Muddy Creek, and Vine recorded it from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, very common; Balcombe's Bay, common; Kackeraboite Creek, very common.

CLAVULINA ANGULARIS, d'Orbigny. (Plate 4. figs. 68-73.)

Clavulina angularis, d'Orbigny, 1826, Ann. Sci. Nat. vol. vii. p. 268, No. 2, pl. 12. fig. 7; Brady, 1884, Rep. Chall. vol. ix. p. 396, pl. 48. figs. 22-24.

There are two distinct forms of the tricarinate *Clavulinæ* in the present series, one of which is parallel-sided and only bluntly keeled, the other being elongately pyramidal in shape and with sharp salient edges. Upon slicing the tests, the former of these is seen to have a comparatively large initial chamber with only a single group of three chambers in the triserial portion of the test, and this to be followed by an irregularly shaped quasi-textularian series, leading to the uniserial portion, which in the figured specimen shows five superposed chambers.

The larger, pyramidal form, when sliced medially, shows the existence of a comparatively small initial chamber, followed by at least three complete triserial sets of chambers; these are succeeded by three sets of quasi-textularian segments, and terminated by five in the uniserial part of the test.

The former variety, with its large initial chamber and comparatively few segments, may be regarded as the megalospheric condition (form A) of *C. angularis*; and the latter, with its small initial chamber and succeeding, numerous chambers, as the microspheric condition (form B) of the same species.

Hantken figured some specimens almost identical with our form B * from the Older Tertiary of Hungary, which he named *Clavulina Szabói*.

It is noteworthy that the recent specimens hitherto recorded all seem to belong to form A.

Howchin recorded *C. angularis* from the Lower and Upper Beds of Muddy Creek. Vine recorded '*Tritaxia tricarinata*' from the Port Phillip Tertiaries; this is evidently the above species, of form B, which *T. tricarinata* very closely resembles. The distinctive character of the valvuline aperture in *C. angularis* clearly separates it from the genus *Tritaxia*, which has a simple, circular orifice.

Occurrence.—Form A: Grice's Creek, very common; Altona Bay Coal-Shaft, very common. Form B: Grice's Creek, very rare; Altona Bay Coal-Shaft, frequent.

CLAVULINA TEXTULARIOIDEA, Goës. (Plate 4. figs. 74, 75.)

Clavulina parisiensis, d'Orbigny, forma *textularioidea*, Goës, 1892, Arctic and Scand. Rhizop., Svenska Vet.-Akad. Handl. vol. xxv. No. 9, p. 42, pl. 8. figs. 387-399.

Clavulina textularioidea, Goës, 1896, Bull. Mus. Comp. Zool. vol. xxix. No. 1, pt. 20. p. 37, pl. 4. figs. 26-38.

The Australian Tertiary specimens of *Clavulina*, which have a cuneate aboral end and nodosariform chambers in the terminal series, belong to the above species rather than to *C. parisiensis*, which is the only form much resembling it yet recorded from these or similar beds. The chief difference between the two forms lies in the arrangement of the earlier series of chambers, which in *C. textularioidea* are very nearly comparable with those of *Bigenerina nodosaria* d'Orb., but more compressed and carinate (Goës).

The compression of the earlier portion of the test is often so marked as to cause the shell to resemble *Haplophragmium agglutinans*, but that the chambers are arranged as in *Textularia*.

Vine recorded, under the name of *C. parisiensis*, what is probably the above form, from the Port Phillip Tertiaries.

* Mitth. d. Jahrb. k.-ungar. Geol. Anstalt, vol. iv. p. 15, pl. 1. figs. 9 a-d.

The recent specimens were obtained by Goës from the Caribbean Sea, 150–300 fathoms.

Occurrence.—Grice's Creek, common ; Kackeraboite Creek, common.

Subfamily BULIMININÆ.

Genus BULIMINA, *d'Orbigny*.

BULIMINA ELEGANTISSIMA, *d'Orbigny*, var. APICULATA, *nov.* (Plate 4. fig. 77.)

The specimens in our series all possess a terminal spine like that often seen in *B. elegans* ; the test of this form is comparable with *B. elegantissima* *, although these Victorian fossil examples are remarkably regular in shape. This latter feature and the presence of the aboral spine serves to distinguish the new variety.

The type species dates from the Upper Eocene (Barton Beds) of England, and is found living as far north as the west coast of Novaia Zemlya ; and also at the Falkland Islands, the western coast of S. America, S. Pacific, and the east coast of Australia.

Howchin recorded the type species from each of the beds of the Muddy Creek section.

Occurrence.—Grice's Creek, rare ; Balcombe's Bay, frequent ; Kackeraboite Creek, frequent ; Altona Bay Coal-Shaft, rare.

Genus VIRGULINA, *d'Orbigny*.

VIRGULINA SUBDEPRESSA, *Brady*. (Plate 4. fig. 78.)

Virgulina subdepressa, Brady, 1884, Rep. Chall. vol. ix. p. 416, pl. 52. figs. 14–17.

This species seems to be entirely a Southern hemisphere form, since it occurs in recent deposits only in the South Pacific and South Atlantic.

The specimen now figured is considerably smaller than the recent examples.

Occurrence.—Altona Bay Coal-Shaft, very rare.

Genus BOLIVINA, *d'Orbigny*.

BOLIVINA TEXTULARIOIDES, *Reuss*. (Plate 4. fig. 79.)

Bolivina textularioides, Reuss, 1862, Sitzungsab. d. K. Ak. Wiss. Wien, vol. xvi. p. 81, pl. 10. fig. 1.

As a fossil this species dates from the Cretaceous. It is also a well-known Tertiary form, and in recent deposits its geographical distribution is wide.

* *d'Orbigny*, 1839, Voy. Amér. Mérid. ser. 5, vol. v. 'Foraminifères,' p. 51, pl. 7. figs. 13, 14.

It affects fairly deep-water areas. Recorded by G. R. Vine, Junr., from the Port Phillip Tertiaries.

Occurrence.—Grice's Creek, frequent; Altona Bay Coal-Shaft, frequent.

BOLIVINA PUNCTATA, *d'Orbigny*. (Plate 4. fig. 80.)

Bolivina punctata, d'Orbigny, 1839, Foram. Amér. Mérid. p. 61, pl. 8. figs. 10-12; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 8.

This well-known Tertiary species is widely distributed, and it occurs in soundings from almost every sea.

It has been recorded from the Lower Bed of Muddy Creek (Howchin).

Occurrence.—Grice's Creek, common; Altona Bay Coal-Shaft, frequent.

BOLIVINA NOBILIS, *Hantken*. (Plate 4. fig. 81.)

Bolivina nobilis, Hantken, 1875, Mitth. Jahrb. d. k.-ung. Geol. Anstalt, vol. iv. p. 65, pl. 15. figs. 4 *a*, *b*; Chapman, 1892, Quart. Journ. Geol. Soc. vol. xlviii. p. 516, pl. 15. fig. 11; Millett, 1900, Journ. R. Micr. Soc. p. 541, pl. 4. fig. 4.

This elegant species was first found as a fossil in the *Clavulina Szabói* beds of Ofen, Hungary; and the writer found it in the Upper Chalk of Taplow, England. The 'Challenger' dredgings brought it to light as a recent species, apparently restricted to the South Pacific. It has since been found off the West Coast of Africa (Egger), and Millett records it as abundant in the Malay Archipelago.

Occurrence.—Grice's Creek, common; Balcombe's Bay, rare; Kackera-boite Creek, very rare.

BOLIVINA ROBUSTA, *Brady*. (Plate 4. fig. 82.)

Bolivina robusta, Brady, 1881, Quart. Journ. Micr. Sci. vol. xxi. n. s. p. 57; id., 1884, Rep. Chall. vol. ix. p. 421, pl. 53. figs. 7-9; Millett, 1900, Journ. R. Micr. Soc. p. 543.

As a recent species this form is well distributed. It is occasional in certain Tertiary beds, and is abundant in the L. Pliocene clay of St. Erth, Cornwall, England. Vine records the species from the Port Phillip Tertiaries.

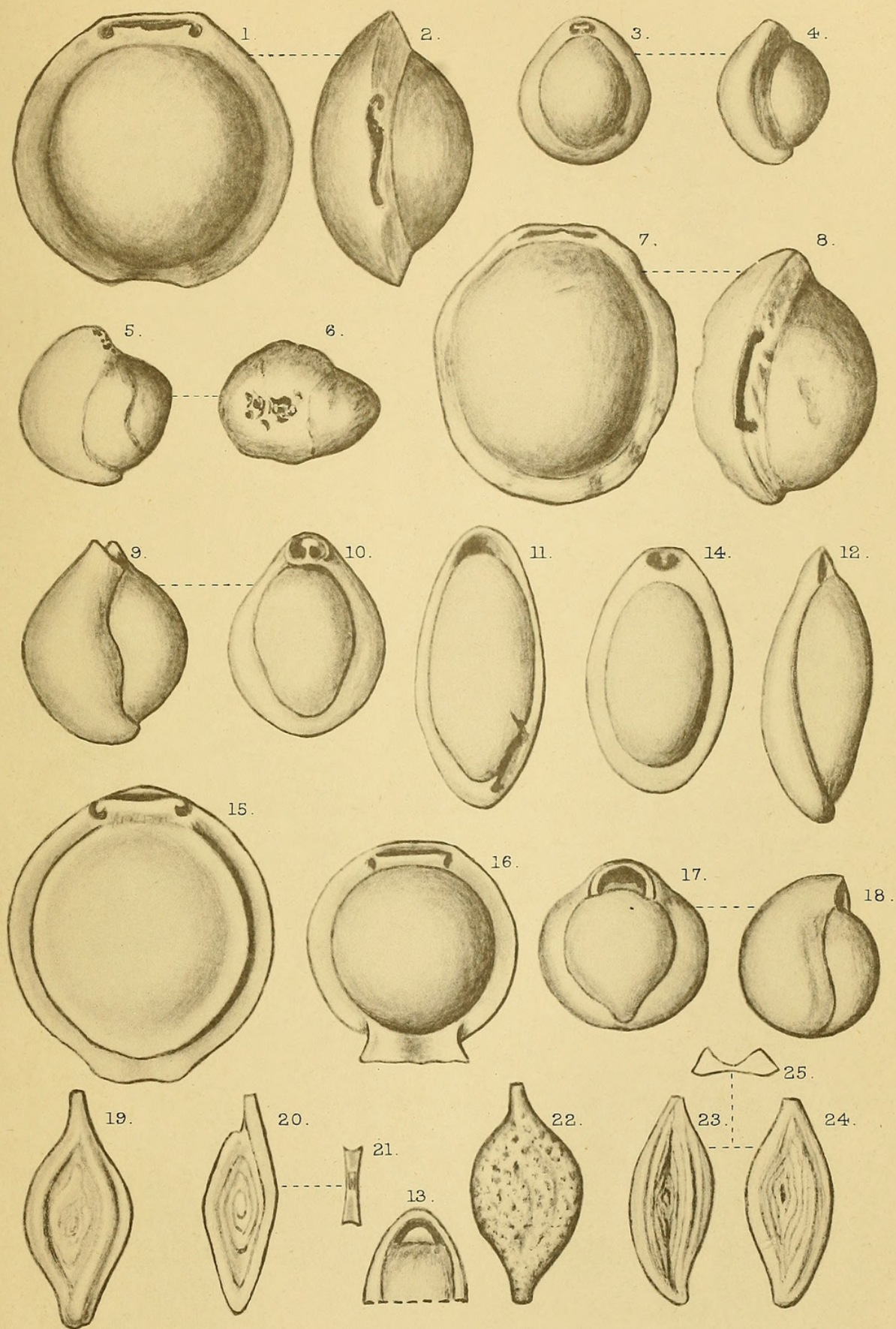
Occurrence.—Altona Bay Coal-Shaft, rare.

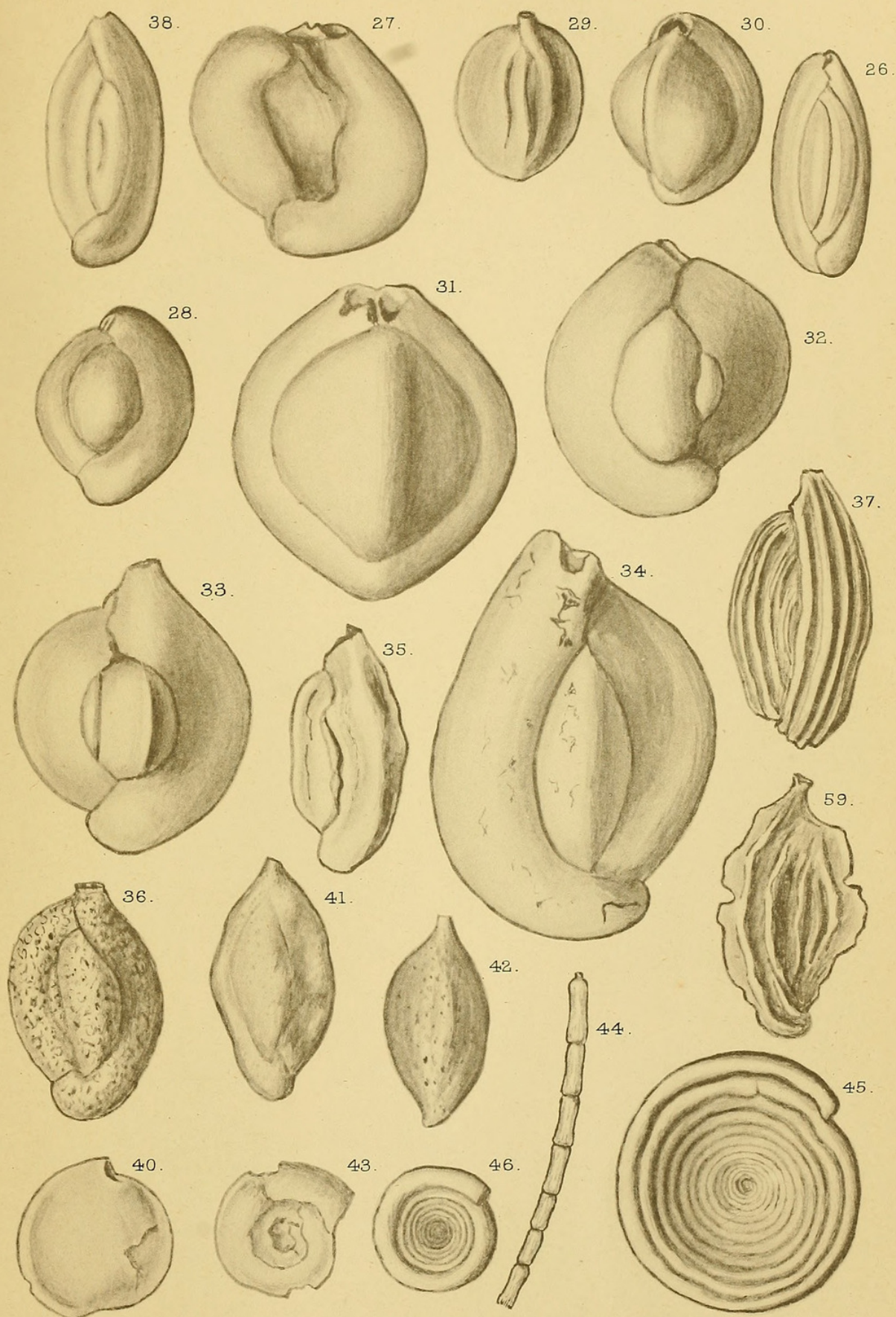
BOLIVINA LIMBATA, *Brady*. (Plate 4. fig. 83.)

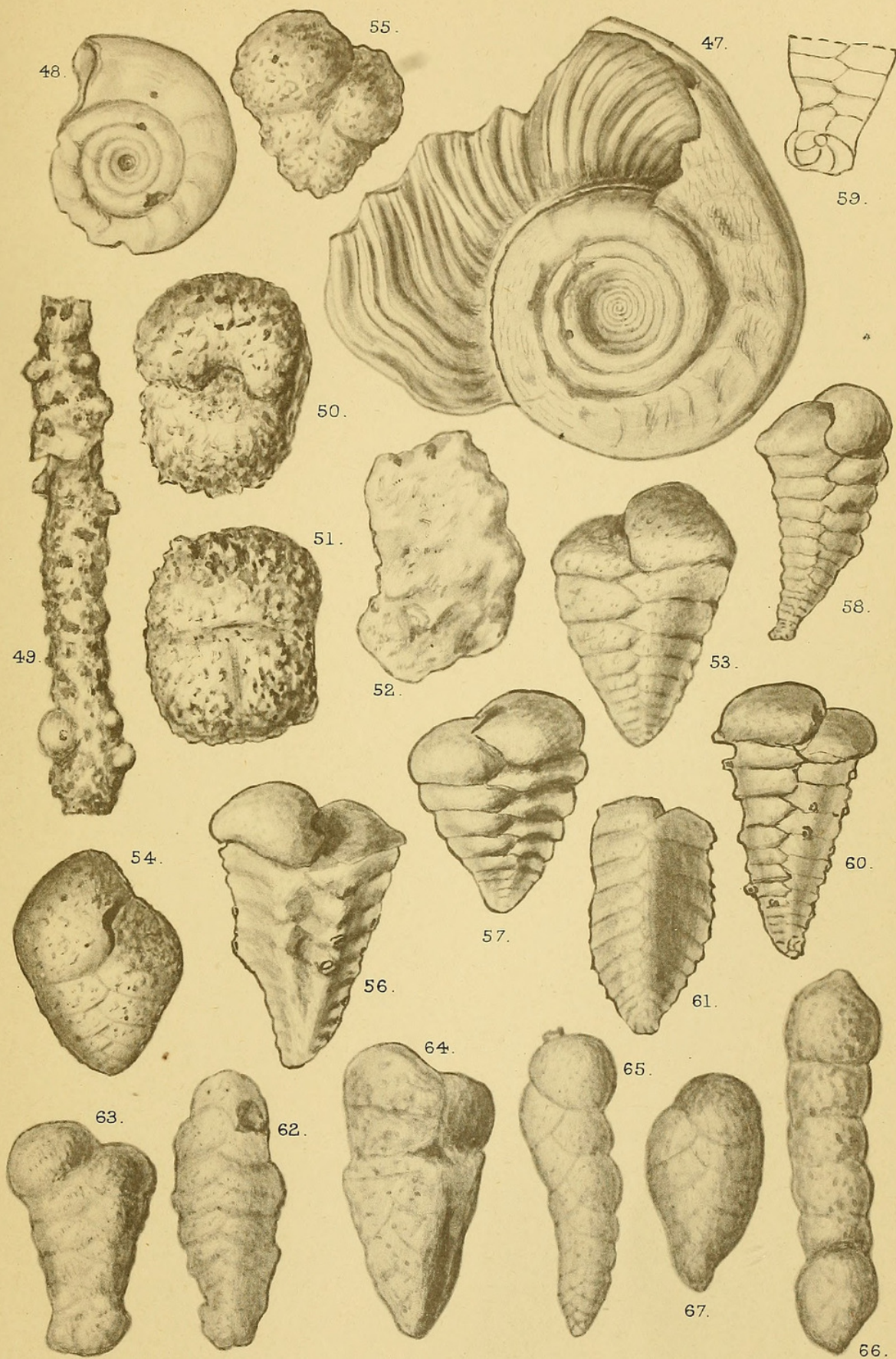
Bolivina limbata, Brady, 1881, Quart. Journ. Micr. Sci. vol. xxi. n. s. p. 57; id., 1884, Rep. Chall. vol. ix. p. 419, pl. 52. figs. 26-28; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 8; Egger, 1893, Abhandl. k.-bayer. Akad. Wiss., math.-nat. Cl. II. vol. xviii. p. 300, pl. 8. figs. 10-12.

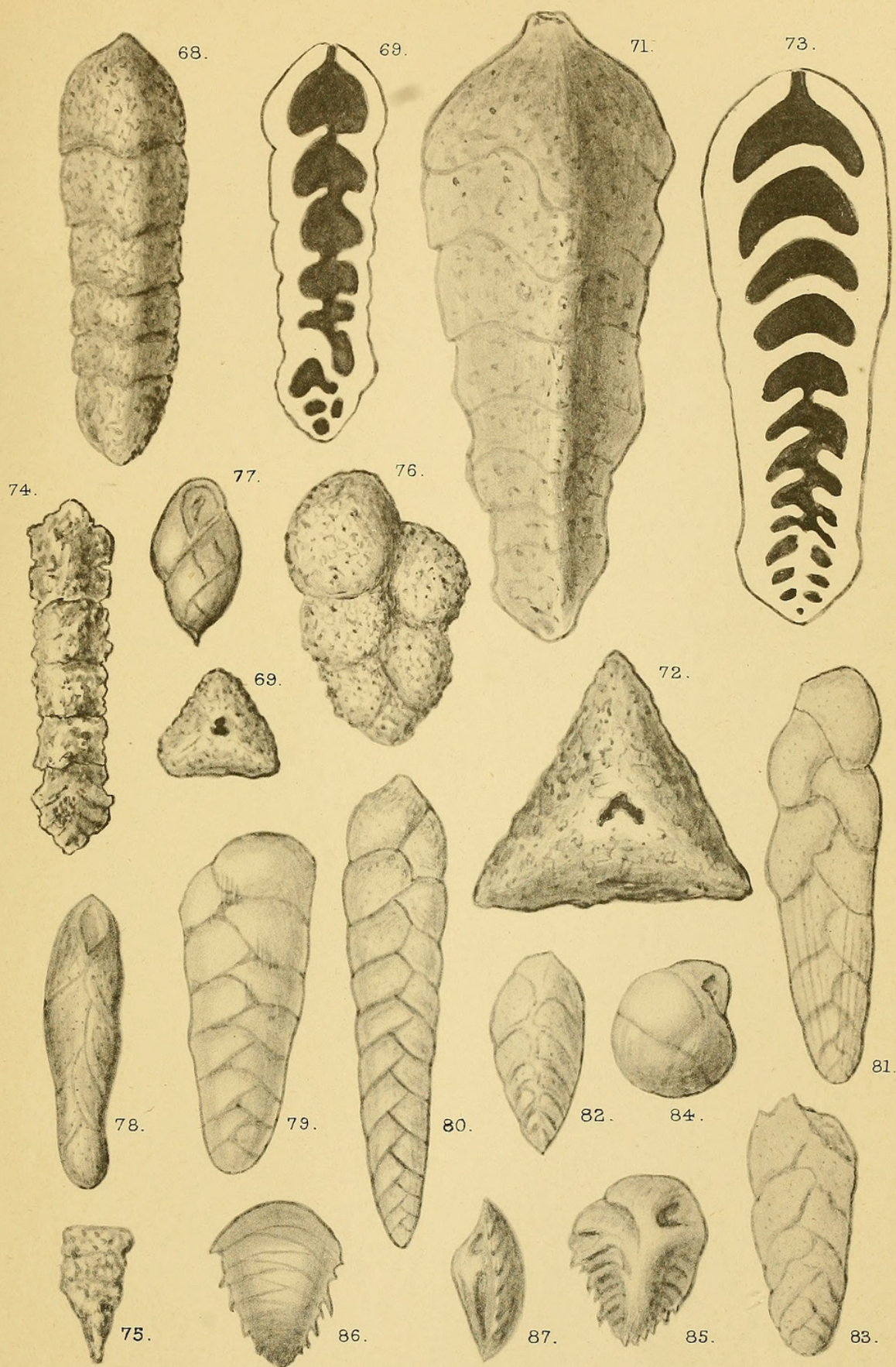
Our figured specimen is a very minute form. It is referable to the above species, which is commonly found in the neighbourhood of coral reefs at the present day. The bifarine form, with later uniserial chambers, is more often met with in recent dredgings. Howchin records this species from the Lower Bed of Muddy Creek.

Occurrence.—Balcombe's Bay, very rare.









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VICTORIAN TERTIARY FORAMINIFERA.

Subfamily CASSIDULININÆ.

Genus CASSIDULINA, *d'Orbigny*.CASSIDULINA SUBGLOBOSA, *Brady*. (Plate 4. fig. 84.)

Cassidulina subglobosa, Brady, 1881, Quart. Journ. Micr. Sci. vol. xxi. n. s. p. 60; id., 1884, Rep. Chall. vol. ix. p. 430, pl. 54. figs. 17 *a-c*; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 8.

This form appears to be, generally speaking, a deep-water species, and has a wide distribution as a recent form.

It has been recorded by Howchin from the Lower and Upper Beds at Muddy Creek, where, as in common with our examples, the test is very small.

Occurrence.—Altona Bay Coal-Shaft, frequent.

Genus EHRENBURGIA, *Reuss*.EHRENBURGIA SERRATA, *Reuss*. (Plate 4. figs. 85–87.)

Ehrenburgina serrata, Reuss, 1849, Denkschr. d. k. Ak. Wiss. Wien, vol. i. p. 377, pl. 48. figs. 7 *a-c*; Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii. p. 8.

This ornate little form is well-known as a Miocene fossil (Reuss and Karrer), and it has been found in various West Indian Tertiary deposits, as the *Globigerina*-Marls of Barbados (Chapman).

Howchin records this species from the Lower Bed at Muddy Creek.

Occurrence.—Grice's Creek, frequent; Altona Bay Coal-Shaft, very rare.

EXPLANATION OF THE PLATES.

PLATE 1.

- Fig. 1. *Biloculina Sarsi*, Schlumb. Grice's Creek. Front aspect. $\times 25$.
 2. *B. Sarsi*, Schlumb. Oral aspect of same. $\times 25$.
 3. *B. bulloides*, d'Orb. Grice's Creek. Front aspect. $\times 50$.
 4. *B. bulloides*, d'Orb. Lateral aspect of same. $\times 50$.
 5. *B. irregularis*, d'Orb. Grice's Creek. Lateral aspect. $\times 50$.
 6. *B. irregularis*, d'Orb. Oral aspect of same. $\times 50$.
 7. *B. Bradii*, Schlumb. Grice's Creek. Front aspect. $\times 25$.
 8. *B. Bradii*, Schlumb. Oral aspect of same. $\times 25$.
 9. *B. ringens*, Lam. sp. Grice's Creek. Lateral aspect. $\times 50$.
 10. *B. ringens*, Lam. sp. Front aspect of same. $\times 50$.
 11. *B. angusta*, sp. nov. Grice's Creek. Front aspect. $\times 110$.
 12. *B. angusta*, sp. nov. Lateral aspect of same. $\times 110$.
 13. *B. angusta*, sp. nov. Kackeraboite Creek. Oral extremity of test. $\times 110$.
 14. *B. elongata*, d'Orb. Grice's Creek. Front aspect. $\times 110$.
 15. *B. lævis*, Defr. sp. Altona Bay Coal-Shaft. Front aspect. $\times 50$.
 16. *B. depressa*, d'Orb. Grice's Creek. Front aspect. $\times 50$.
 17. *B. globulus*, Born. Grice's Creek. Front aspect. $\times 50$.
 18. *B. globulus*, Born. Lateral aspect of same. $\times 50$.

- Fig. 19. *Spiroloculina acutimargo*, Brady. Kackeraboite Creek. Lateral aspect. $\times 80$.
 20. *S. canaliculata*, d'Orb. Kackeraboite Creek. Lateral aspect. $\times 50$.
 21. *S. canaliculata*, d'Orb. Oral aspect of same. $\times 50$.
 22. *S. asperula*, Karrer. Grice's Creek. Lateral aspect. $\times 25$.
 23. *S. affixa*, Terquem. Grice's Creek. Lateral aspect. $\times 50$.
 24. *S. affixa*, Terquem. Opposite face of same. $\times 50$.
 25. *S. affixa*, Terquem. Sectional view. $\times 50$.

PLATE 2.

- Fig. 26. *Miliolina oblonga*, Montagu sp. Altona P'ay Coal-Shaft. $\times 88$.
 27. *M. circularis*, Born. sp. Balcombe's Bay. $\times 50$.
 28. *M. schreiberiana*, d'Orb. sp. Grice's Creek. $\times 37$.
 29. *M. polygona*, d'Orb. sp. Grice's Creek. $\times 50$.
 30. *M. trigonula*, Lam. sp. Balcombe's Bay. $\times 37$.
 31. *M. tricarinata*, d'Orb. sp. Grice's Creek. $\times 25$.
 32. *M. vulgaris*, d'Orb. sp. Altona Bay Coal-Shaft. $\times 37$.
 33. *M. cuvieriana*, d'Orb. sp. Altona Bay Coal-Shaft. $\times 25$.
 34. *M. seminulum*, Linn. sp. Kackeraboite Creek. $\times 25$.
 35. *M. contorta*, d'Orb. sp. Balcombe's Bay. $\times 50$.
 36. *M. agglutinans*, d'Orb. sp. Grice's Creek. $\times 25$.
 37. *M. linæana*, d'Orb. sp. Grice's Creek. $\times 25$.
 38. *M. venusta*, Karrer sp. Altona Bay Coal-Shaft. $\times 110$.
 39. *M. Ferussacii*, d'Orb. sp. Grice's Creek. $\times 37$.
 40. *Sigmoilina sigmoidea*, Brady sp. Balcombe's Bay. $\times 25$.
 41. *S. celata*, Costa sp. Kackeraboite Creek. $\times 50$.
 42. *S. Schlumbergeri*, Silvestri. Grice's Creek. $\times 50$.
 43. *Planispirina exigua*, Brady. Grice's Creek. $\times 50$.
 44. *Articulina funalis*, Brady. Grice's Creek. $\times 25$.
 45. *Cornuspira crassisepta*, Brady. Grice's Creek. $\times 37$.
 46. *C. involvens*, Reuss. Kackeraboite Creek. $\times 25$.

(All figures on this Plate show the lateral aspect of the test.)

PLATE 3.

- Fig. 47. *Cornuspira striolata*, Brady. Lateral aspect. Kackeraboite Creek. $\times 25$.
 48. *C. foliacea*, Philippi sp. Lateral aspect. Kackeraboite Creek. $\times 25$.
 49. ? *Jaculella obtusa*, Brady. Lateral aspect. Grice's Creek. $\times 50$.
 50. *Haplophragmium sphaeroidiniforme*, Brady. Oral aspect. Balcombe's Bay. $\times 37$.
 51. *H. sphaeroidiniforme*, Brady. Lateral aspect. Balcombe's Bay. $\times 37$.
 52. *Lituola simplex*, Chapman. Lateral aspect. Altona Bay Coal-Shaft. $\times 37$.
 53. *Textularia gramen*, d'Orb. Lateral aspect. Balcombe's Bay. $\times 37$.
 54. *T. gibbosa*, d'Orb. Lateral aspect. Kackeraboite Creek. $\times 25$.
 55. *T. abbreviata*, d'Orb. Lateral aspect. Grice's Creek. $\times 25$.
 56. *T. siphonifera*, Brady. Lateral aspect. Balcombe's Bay. $\times 37$.
 57. *T. rugosa*, Reuss sp. Lateral aspect. Grice's Creek. $\times 37$.
 58. *Spiroplecta sagittula*, Defr. sp. Lateral aspect. Kackeraboite Creek. $\times 25$.
 59. *S. sagittula*, Defr. Spiral, aboral end of test. Kackeraboite Creek. $\times 100$.
 60. *S. sagittula*, Defr. sp., var. *fistulosa*, Brady. Lateral aspect. Altona Bay Coal-Shaft. $\times 37$.
 61. *S. carinata*, d'Orb. sp. Lateral aspect. Grice's Creek. $\times 37$.
 62. *S. nussdorffensis*, d'Orb. sp. Lateral aspect. Grice's Creek. $\times 50$.

- Fig. 63. *Gaudryina pupoides*, d'Orb. Lateral aspect. Grice's Creek. $\times 37$.
 64. *G. rugosa*, d'Orb. Lateral aspect. Grice's Creek. $\times 37$.
 65. *G. siphonella*, Reuss. Lateral aspect. Grice's Creek. $\times 37$.
 66. *Clavulina communis*, d'Orb. Lateral aspect. Grice's Creek. $\times 37$.
 67. *Gaudryina oxycona*, Reuss. Lateral aspect. Grice's Creek. $\times 50$.

PLATE 4.

- Fig. 68. *Clavulina angularis*, d'Orb. Form A, lateral aspect. 69. Oral aspect. Grice's Creek. $\times 37$.
 70. *C. angularis*, d'Orb. Form A, vertical half-section. Altona Bay Coal-Shaft. $\times 37$.
 71. *C. angularis*, d'Orb. Form B, lateral aspect. 72. Oral aspect. Altona Bay Coal-Shaft. $\times 25$.
 73. *C. angularis*, d'Orb. Form B, vertical half-section. Altona Bay Coal-Shaft. $\times 25$.
 74. *C. textularioides*, Goës. Lateral aspect. 75. Edge view of aboral end. Grice's Creek. $\times 50$.
 76. *Textularia gibbosa*, var. *tuberosa*, d'Orb. Lateral aspect. Kackeraboite Creek. $\times 37$.
 77. *Bulimina elegantissima*, d'Orb., var. *apiculata*, nov. Lateral aspect. Grice's Creek. $\times 50$.
 78. *Virgulina subdepressa*, Brady. Lateral aspect. Grice's Creek. $\times 100$.
 79. *Bolivina textularioides*, Reuss. Lateral aspect. Grice's Creek. $\times 80$.
 80. *B. punctata*, d'Orb. Lateral aspect. Grice's Creek. $\times 80$.
 81. *B. nobilis*, Hantken. Lateral aspect. Grice's Creek. $\times 80$.
 82. *B. robusta*, Brady. Lateral aspect. Altona Bay Coal-Shaft. $\times 50$.
 83. *B. limbata*, Brady. Lateral aspect. Balcombe's Bay. $\times 100$.
 84. *Cassidulina subglobosa*, Brady. Lateral aspect. Altona Bay Coal-Shaft. $\times 100$.
 85. *Ehrenbergina serrata*, Reuss. Ventral aspect. 86. Dorsal aspect. 87. Edge view. Grice's Creek. $\times 50$.

Note on a new South African Tick, *Rhipicephalus phthirioides*, sp. n.
 By W. F. COOPER, B.A., F.L.S., and L. E. ROBINSON, A.R.C.Sc. Lond.

(PLATE 5 and 4 text-figures.)

[Read 20th December, 1906.]

IN the late autumn of last year Dr. S. Williamson, of Berkhamsted, forwarded two dried ticks to us for the purpose of identification. These specimens, a male and a female, had been given to him in Cape Town by Mr. Colin Storey, who had taken them from a horse in Rhodesia, and who remarked at the time that they were unlike any tick which he had previously examined.

Both specimens were much mutilated by a lengthy sojourn in a pocket-book, most of the legs being broken; fortunately these still remained enclosed with the rest, and the specimens were sufficiently serviceable for the purpose



Chapman, Frederick. 1907. "Tertiary Foraminifera of Victoria, Australia.-The Balcombian Deposits of Port Phillip: Part I." *The Journal of the Linnean Society of London. Zoology* 30(195), 10-35.

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