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ART. XIII.—*Description of New and Rare Fossils obtained by Deep Boring in the Mallee.*

PART I.—PLANTAE; AND RHIZOPODA TO BRACHIOPODA.

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(With Plates XVI.-XIX).

[Read 10th July, 1913].

Introductory Note.

In this and the two succeeding parts are embodied the palaeontological results of a somewhat exhaustive study of the material brought up by borings in the Mallee near Ouyen, numbered 1-11. The actual boring was carried out between August, 1908, and August, 1909. The borings are all in the County of Weeah, and commence at about six miles east of the South Australian boundary, and fifty miles north of the 36th parallel at Pinaroo. The bores are situated at distances of two to four miles apart.

The second part of this report will comprise the mollusca, written in conjunction with Mr. C. J. Gabriel, and the third part, by myself, will comprise the groups of the Ostracoda and Fishes.

The report containing the general results will subsequently appear in the publications of the Geological Survey of Victoria.

Plantae.

Boring fungi, indet.

In one instance, Bore 9, 315-325 feet, the remains of a boring fungus are seen in the outer, aragonitic layer of a (?) *Dosinea* valve. The thallus forms stellate groups, measuring about 3 mm. across. The tubes average about .115 mm. in diameter. A microscope section did not reveal any recognisable structure.

In Bore 1, 154-190 feet, the rolled shells of mollusca are freely riddled with a similar form of perforating plant, but showing less regularity in outline.

Genus LITHOTHAMNION, Philippi, 1837, Foslie, emend. 1900.

LITHOTHAMNION RAMOSISSIMUM, Reuss sp. (Plate XVI., Figs. 1*a-c*, 2, 3).

Nullipora ramosissima, Reuss, 1848, Haidinger's Naturw. Abhandl., vol. ii., pt. ii., p. 29, pl. iii., figs. 10, 11. Unger, 1857, Denkschr. K. Akad. Wiss. Wien, vol. xiv., pp. 23, 38, pl. v., figs. 18-22.

Lithothamnium ramosissimum, Reuss sp., Gümbel, 1871, Abhandl. k. bayer. Akad. Wiss., vol. xi., pt. i., p. 34, pl. i., figs. 1*a-d*.

Cumulipora rosenbergi, Martin, 1881, Samml. Reichsmus. Leiden, vol. i., pt. i., pp. 12-14, 64, pl. iii., figs. 6, 7.

Lithothamnium rosenbergi, Martin sp., Martin, 1881, Ibid. vol. i., pt. ii., pp. 70, 79. Ibid, 1882, vol. i., pt. iii. pp. 153, 155.

L. ramosissimum, Rss. sp. Rothpletz, 1891, Zeitschr. deutsch. geol. Gesellsch., vol. xliii., p. 320. Nishiwada, 1894, Journ. Coll. Sci. Imp. Univ. Tokyo, vol. vii., pt. iii., p. 233, pl. xxix., figs. 1-3.

L. (*Cumulipora*) *rosenbergi*, Martin, Newton and Holland, 1900, Journ. Geol. Soc. Tokyo, vol. vii., No. 81, p. 1.

L. rosenbergi, Martin, sp. Yoshiwara, 1900, Journ. Geol. Soc. Tokyo, vol. vii., No. 81, p. 22.

Lithothamnion ramosissimum, Reuss sp., Foslie, 1900, "Revised Systematical Survey of the Melobesidae." Kongl. Norske Vidensk. Selsk. Skr. No. 5, p. 12 (No. 14).

Lithothamnium ramosissimum, Rss. sp., Newton and Holland, 1902, Journ. Coll. Sci. Imp. Univ. Tokyo, vol. xvii., Art. 6, p. 17, pl. i., fig. 8.

Observations.—From Jurassic times the branching Lithothamnia have played an important rôle in the formation of limestones, especially those associated with reef-making corals. The distinguishing characters of this plant, apart from the fruiting organs, are not easily defined, the form of the thallus being very variable. Solms Laubach[1] cuts the gordian knot in that he says, "We shall do well to follow Unger in this matter, and put them all together as *Lithothamnium ramosissimum.*"

My own conviction is, that when the cell structure is well preserved, and the mode of frutification shown, the fossil specimens are as good as living examples for diagnostic purposes. It has

1. Fossil Botany, Oxford, 1891. English translation by H. E. F. Garnsey, p. 45.

hitherto been the usage amongst palaeobotanists[1] to separate the encrusting forms of *Lithothamnion* as *Lithophyllum;* but as Foslie (whose untimely death we have recently had to deplore), showed,[2] that, having regard to the reproductive organs of the plants, that method was based on insufficient ground. From a study of the recent forms of the group, Foslie included nearly all the species of *Lithophyllum* in *Lithothamnion*, the latter genus being defined by the downward growth of the conceptacles into the frond (subgen. *Eulithothamnion*, sect. Innatae) or by their superficial character (sect. Evanidae). The present species falls into the first section of the subgenus mentioned.

The conceptacles with tetraspores can be found in the fossil examples by slicing, almost as easily as in the recent forms. In these specimens from the polyzoal rock of the Mallee bores, it is found that the conceptacles are immersed in the thallus, the surface of which is sometimes overarched above the conceptacles. The conceptacles here examined were slightly broken during slicing, so that the true outline of the cavity was not seen. It has already been stated[3] that the tetraspores "could be but imperfectly fossilised," since they contain very little carbonate of lime. It is, therefore, particularly interesting to note that the tetraspores are here present, and preserved as glauconite pseudomorphs of a pale green tint. The example figured shows two of the tetraspores clinging to the inner wall of one of the conceptacles, whilst another is seen in an adjoining cavity. These tetraspores are ovoid, and pointed at the base of attachment. The pseudomorphic change into glauconite shown by these fossil bodies is more easily understood when we compare them with the sarcode bodies of Foraminifera replaced by the same substance, for I am inclined to believe that the glauconitisation of foraminifera takes place as a reactionary product of the protoplasm, and not as a mere infilling of the dead shells, in which case we should most probably get a concentric structure developed in the glauconite. This assumption can, of course, only be proved by detailed observation and chemical experiment.

In *Lithothamnion nummuliticum*[4] the cell structure is quadrate and smaller than in *L. ramosissimum*, to which we refer nearly all the present examples. The specific standing of the latter is further

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1. Seward. Fossil Plants, vol. i., Cambridge, 1898, p 186.
2. Foslie. Op. supra cit., p. 5, et seq.
3. See Waters, A.W., on "Fossil Lithothamnia". Mem. Lit. and Phil. Soc. Manchester, vol. v., 1874, p. 248. This paper gives a useful resumé of the occurrences of the fossil Lithothamnia as rock-forming agents (pp. 244-250).
4. *Lithothamnium nummuliticum*, Gümbel. Abhandl. k. bayer, Ak. Wiss., vol. xi. (1), 1871 p. 37, pl. i, fig. 2*a-e*.

supported by the external form of the specimens, which is in general agreement with other Miocene examples, of which some of the synonymy is given above.

Rothpletz[1] gives the cell measurement of his examples of *L. ramosissimum* as $20 \times 14\text{-}16\mu$, whilst the specimens from the Mallee vary from about that proportion to $30 \times 17\mu$. This amount of variation in the cell measurement can be found in a single branch in our specimens, so that the dimensional character must be taken with other factors, viz., the habit of the branches and the form and position on the thallus of the conceptacles, whether immersed, sub-immersed, or prominent.

There is little doubt that the encrusting layers of calcareous algae found on some of the pebbles in the present borings are merely the early stage of the above, or a closely allied species, as the cells agree in form, and spread out fan-wise over the surface as in the basal parts of a branching specimen.

The above species is a peculiarly Miocene form. It constitutes the bulk of the Leithakalk (Tortonian) of the Vienna Basin. In Eastern Asia it accompanies Miocene forms of *Lepidocyclina*, such as have been recorded from Japan, Timor, New Guinea, Amboina, Batu Island, Formosa and Riu Kiu.

Distribution.—Bore 3, 201-220 feet and 226 feet. Bore 4, 163-170 feet. Bore 5, 163-175 feet (figd.), and 175-189 feet. Bore 10, 310-320 feet. Bore 11, 438-440 feet, and 457-458 feet.

[In working out the above details I have been assisted with literature, and specimens of recent material, through the kindness of Mr. C. J. Gabriel.]

LITHOTHMANION aff. LICHENOIDES, Ellis and Solander.

Millepora lichenoides, Ellis and Solander, 1786, Nat. Hist. Zoophytes, p. 131, pl. xxiii., fig. 9.

Lithothamnion lichenoides, Ell. and Sol. sp., Foslie, 1900, Kongl. Norske Vidensk. Selsk. Skr. (No. 5), p. 14, No. 55.

In this form the branches are flattened or frondose, with the conceptacles superficial.

Distribution.—Bore 11, 457-458 feet.

LITHOTHAMNION spp, indet.

Specimen *a.*—Bore No. 3, about 226 feet, yielded two pebbles partly formed of an encrusting *Lithothamnion*.

1. Op. cit., p. 303.

Specimen *b*.—This is an encrusting thallus, very thin, one cell layer in thickness, spread over the surface of a phosphatic pebble from Bore 3, 206 feet. The elongate-rectangular cells are like those of *Lithothamnion ramosissimum*, but much larger. They spread far-wise over the surface, and the limiting plane of each successive growth is undulate or convex. In some respects it is allied to *Lithothamnion lichenoides*, Ellis and Sol. sp., which Foslie places in his second section (Evanidae) of the subgenus *Eulithothamnion*. The question here arises whether a form like *L. ramosissimum*, when attached to a rolling pebble, does not conform to its surroundings and show a varietal mutation on account of the abnormal conditions of its existence.

Genus LITHOPHYLLUM, Philippi.

(?) LITHOPHYLLUM sp.

This is a comparatively large fragment, subcylindrical, measuring 11×5.5 mm. It cannot be referred to a branchlet of *L. ramosissimum*, since the successive concentric layers of the growing thallus are separated by narrow spaces, which show it to be persistently encrusting; and what is more important, there are circular depressions over the surface on the summits of low monticules, pointing to superficial conceptacles.

Bore 1, 212-215 feet.

Animalia.

FORAMINIFERA.

Fam. MILIOLIDAE.

Genus TRILLINA, Schlumberger.

TRILLINA HOWCHINI, Schlumberger. (Plate XVI., Fig. 4).

Trillina howchini, Schlumberger, 1893, Bull. Soc. Géol. France, ser. 3, vol. xxi., p. 119, woodcut fig. 1, and pl. iii., fig. 6. Chapman, 1908, Proc. Linn. Soc. New South Wales, vol. xxxii., p. 753, pl. xxxix., figs. 7-9.

Observations.—This remarkable and easily indentifiable species was figured and described by M. Schlumberger from the lower beds at Muddy Creek, near Hamilton, where the Rev. W. Howchin found it to be moderately common. It also occurs in Miocene strata in the New Hebrides. It was only occasionally found in the present bores, in strata identified as Janjukian by the general characters of its facies. It here evidently persists into a higher horizon than that represented by the Muddy Creek lower beds (Balcombian), for it is associated in Bore 4 with some undoubted Kalimnan forms, as *Bathyactis beaumariensis*, although the remainder of the fauna at 163-170 feet is essentially Janjukian.

The example figured above resembles *M. vulgaris* in contour, whilst others are nearer *M. tricarinata* in outline, the species being much subject to variation.

Distribution.—Bore 2, 211-240 feet, very common. Bore 3, about 260 feet. Bore 4, 163-170 feet. Bore 11, 267-270 feet.

Genus ORBITOLITES.

Orbitolites complanatus, Lamarck.

Orbitolites complanatus, Lamarck, 1801, Syst. Anim. sans Vert., p. 376. Carpenter, 1856, Phil. Trans., p. 224, pls. iv-ix.

Observations.—As a fossil this species has been previously recorded from Victoria by Mr. Howchin, as rare at Muddy Creek (lower beds; Balcombian); it has also occurred in the Govt. well-boring in the Murray Flats, South Australia. *O. complanata*, as remarked by Mr. Howchin, was living on the South Australian coast to within Pleistocene times, but is now extinct in that area.

Distribution.—In the present borings this species is of common occurrence, and seems mainly confined to the greensand and phosphatic deposits of the Janjukian and Kalimnan series.

Fam. LITUOLIDAE.

Genus AMMODISCUS, Reuss.

Ammodiscus ovalis, sp. nov. (Plate XVI., Figs. 5*a*, *b*).

(?) *Ammodiscus* sp., Chapman and Howchin, 1905, Mem. Geol. Surv. New South Wales, Palaeont. No. 4. Foram. Permo-Carb. Limestones of New South Wales, p. 11, pl. i., figs. 12*a-c*.

Description.—Test composed of fine arenaceous mud, consisting of a depressed, sparsely-coiled shell, elongated in one direction to form an irregular oval. Thinner in the centre than at the periphery.

Dimensions.—Longer diameter, .692 mm.; shorter diameter, 384 mm. Thickness, cir., .077 mm.

Observations.—The examples doubtfully referred to the genus *Ammodiscus* by Mr. Howchin and myself, from the Carbopermian of New South Wales, is of the same type of shell as the above, and may be regarded as a depauperated and sparsely coiled form of the *Ammodiscus* type. The nearest allied examples to the above are the *Ammodiscus robertsoni*, Brady sp.,[1] and *A. auricula*, Chapman.[2]

Distribution.—Bore 10, 160-186 feet.

Fam. LAGENIDAE.

Genus FRONDICULARIA, Defrance.

FRONDICULARIA LORIFERA[3], sp. nov. (Plate XVI., Fig. 6).

Description.—Test, compressed ovate, with pointed extremities, more acute at aboral end. Edges of test, blunt. Chambers numerous, about fifteen. The surface of each acute V-shaped chamber thickened with redundant shell-growth, especially towards the oral area of each segment.

Dimensions.—Length of type specimen, 4 mm.; greatest width, 1.615 mm.; thickness, .3 mm.

Affinities.—In outline somewhat like the associated species of *Frondicularia* in these borings, viz., *F. inaequalis.* It is distinguished from that form, however, by the wide angle of divergence made by the two upper edges of each segment, and the exceptionally heavy shell with thick, strap-like layers of redundant growth on the lateral surfaces of the test.

Distribution.—Bore 4, 163-170 feet. Bore 11, 438-440 feet.

Fam. ROTALIIDAE.

Genus CARPENTERIA, Gray.

CARPENTERIA PROTEIFORMIS, Goës. (Plate XVI., Fig. 7).

Carpenteria balaniformis, Gray, var. *proteiformis*, Goës, 1882, K. Svenska Vet.-Akad. Handl., vol. xix., No. 4, p. 94, pl. vi., figs. 208-214; pl. vii., figs. 215-219.

Observations.—This species is found both in the Balcombian and Janjukian faunas; in the former at Muddy Creek (lower beds), and in the latter at Batesford.

1. *Trochammina robertsoni*, H. B. Brady, 1876. Mon. Carb. and Perm. Foram. (Pal. Soc.), p. 80, pl. iii., fig. 6. *Ammodiscus robertsoni*, Brady sp. Chapman, Ann. Mag. Nat. Hist., ser. 6, vol. xvi., p. 318, pl. xi., figs. 15-17.
2. Chapman, loc. supra cit., 1895, p. 319, pl. xi., fig. 18.
3. Deriv. *Lorus*, a strap; *fero*, I bear.

The specimens from the polyzoal rock of the Mallee borings are invariably arrested in growth, showing only the first tier of segments above the primordial group.

Distribution.—Bore 11, 540-542 feet; 544-546 feet; 560-562 feet.

Genus PULVINULINA, Parker and Jones.

PULVINULINA SCABRICULA, Chapman.

Pulvinulina scabricular, Chapman, 1910, Proc. Roy. Soc. Vict., vol. xxii. (N.S.), pt. ii., p. 288, pl. ii., figs. 2a, b.

Observations.—This distinct little species was hitherto known only from the Batesford limestone. It is here moderately common, and restricted to the polyzoal rock of the Mallee bores.

Distribution.—Bore 11, 540-542 feet; 554-556 feet.

PULVINULINA CALABRA, Costa sp. (Plate XVI., Figs. 8*a*, *b*).

Rosalina calabra, Costa, 1856, Pal. del Regno di Napoli, pt. ii., pl. xiv., figs. 6*a*-*c*.

R. thiara, Stache, 1864, Novara Exped., Geol. Theil, vol. i., p. 279, pl. xxiv., figs. 29*a*-*c*, 30*a*-*c*.

Observations.—This remarkable and distinct species was figured by O. G. Costa from the Italian Tertiaries, but not described. There is no doubt about its identity with our Mallee bore specimen.

The *Rosalina thiara* of Stache is synonymous with Costa's species. It was described from the Tertiary marl of Whaingaroa Harbour, N.Z., which yields a microzoal fauna closely resembling that of the deeper parts of the Mallee bores.

The test of our specimen is slightly rough, and is in the form of a depressed nautiloid spiral, flatter on the superior face. which shows a many-chambered, short, segmented whorl with constricted sutures, closely and densely coiled on the central axis. Underside somewhat concave, showing the outer whorl. Septal face where fractured shows the shell-wall to be thick.

Dimensions.—Diameter of test, 3.84 mm.; thickness, 1.25 mm.

Distribution.—Bore 5, 163-175 feet.

Genus GYPSINA, Carter.

GYPSINA HOWCHINI, Chapman.

Gypsina howchini, Chapman, 1910, Proc. R. Soc. Vict., vol. xxii. (N.S.), pt. ii., p. 291, pl. ii., figs. 4*a*, *b*., pl. iii., figs. 3-5.

Observations.—This species was hitherto only known from the Batesford Limestone. Typical specimens were found in the present bores as follows:—

Bore 3, 226 feet. Bore 5, 162-163 feet. Bore 11, 440-442 feet.

Fam. NUMMULINIDAE.

Genus POLYSTOMELLA, Lamarck.

POLYSTOMELLA STRIATOPUNCTATA, F. v. M. sp, var. EVOLUTA, nov. (Plate XVI., Fig. 9).

Description.—This variety is very distinct from the type-form in having the earlier whorls exposed on the umbilical area. The latter is depressed and wide, compared with that of the specific form. The retral processes in this variety are strongly developed, and the interspaces, especially on the last whorl, are circular and deep towards the inner boundary of the whorl.

Diameter of test in figured specimen, .466 mm.

Observations.—Typical examples of the species itself are also found in these bores; as, for instance, in Bore 11, 170-175 feet, and in the later deposits, but more sparingly than the variety above described.

An evolute variety of the above species has lately been described by Messrs. Heron-Allen and Earland, from Selsey and Bognor in Sussex, under the varietal name of *selseyensis*.[1] That variety was recorded as "both recent and fossil" (probably pleistocene). It differs from the present evolute variety in having an encrustation of redundant shell-growth over the umbilicus, which is, moreover, not so wide nor so deep as in our variety.

Distribution.—Bore 9, 263-273 feet. Bore 10, 160-186 feet; 195-225 feet; 296-306 feet.

Genus OPERCULINA, d'Orbigny.

OPERCULINA VENOSA, Fichtel and Moll sp.

Nautilus venosus, Fichtel and Moll, 1798, Test Micr., p. 59 pl. viii., figs. *e-h*.

Amphistegina cumingii, Carpenter. 1859, Phil. Trans., p. 32, pl. v., figs. 13-17.

Nummulites cumingii, Carp., H. B. Brady, 1884, Rep. Chall., vol. ix., p. 749, pl. cxii., figs. 11-13, woodcut, fig. 22.

1. Journ. R. Micr. Soc., 1909, p. 695, pl. xxi., figs. 2a-c (var. of *P. striatopunctata*); name given as *P. striatopunctata*, var. *selseyensis*, Iidem, ibid, 1911, p. 448.

Nummulina venosa, F. and M. sp., Chapman, 1895, Proc. Zool. Soc. Lond., p. 47.

Observations.—This interesting species occurs twice in these bores. It was accepted as a nummulite by Dr. H. B. Brady in his work on the "Challenger" foraminifera (loc. supra cit.), but he did not seem quite convinced that it belonged to that genus, for he says,[1] "On the whole I am inclined to agree in this latter determination" [as a nummulite by Carpenter] "notwithstanding the fact that in any large collection of specimens there are invariably a certain number in which the segments of the final convolution spread out radially, so as to impart an *Operculina*-like aspect to the shell."

In my own cabinet there is a series of tests of this form from the East Indian Archipelago, which shows extreme modification, ending with the typical *Operculina*.

Operculina venosa is found on parts of the Australian coast at the present day, in the neighbourhood of the Great Barrier Reef.

Distribution.—Bore 1, 215-244 feet. Bore 11, 566-568 feet.

SPONGIAE.

CALCISPONGIAE.

Spicules, indet.

The spicules of calcareous sponges enumerated in the lists of fossils from the borings are all of the tri-radiate type, and conform to figures 4, 5 and 6 of plate iii. in Dr. Hinde's description of *Plectroninia halli* in their outline, but are more than twice the size.[2] No precise identification is, however, attempted here.

ANTHOZOA.

HEXACORALLA.

Fam. TURBINOLIIDAE.

Holcotrochus crenulatus, Dennant. (Plate XVII., Fig. 10.)

Holcotrochus crenulatus, Dennant, 1904, Trans. R. Soc. S. Austr., vol. xxviii., p. 3, pl. ii., figs. 4*a-c*.

Observations.—This neat little coral is not easily confused with the only other known form of the genus, *H. scriptus*, for the latter differs in its more broadly-ovate transverse section, and in the horozontal scribing of the costae; whilst the surface of the thecal wall in *H. crenulatus* is granulate.

1. Loc. supra cit., p. 742.
2. Quart. Journ. Geol. Soc., vol. lvi. 1900, pp. 50-69, plts. iii.-v.

This is the first recorded occurrence of *H. crenulatus* as a fossil. Except for a slight weathering of the external surface, the two specimens found here are in every way comparable with the recent examples in the Dennant collection, from South Australia. These were obtained by Dr. Verco at Cape Borda (15 fms.); St. Vincent's Gulf; and Backstairs Passage (22 fms.).

The related *H. scriptus*, also found recently in Backstairs Passage, S.A., at 22 fathoms, was originally described by Mr. Dennant from the Tertiary of Muddy Creek, and supposed by that author to come from the lower beds. The pink, ferruginous appearance of the type specimen now in the National Museum collection suggests, however, that it came from the red limestone between the Balcombian and the Kalimnan series at Muddy Creek, and about which there is now evidence for believing it to be of Janjukian age. The rolled examples of *H. scriptus* found by Dr. T. S. Hall, came from the Kalimnan of Forsyth's Grange Burn, Hamilton.

Distribution.—*H. crenulatus* occurs in Bore 11 of this present series at 197-199 feet, associated with Kalimnan fossils.

OCTOCORALLA.

PSEUDAXONIA.

Fam. ISIDAE.

Genus MOPSEA, Lamaroux.

MOPSEA TENISONI, sp. nov. (Plate XVII., Figs. 11*a*, *b*, 12*a*, *b*, 13 and 15*a-c*; Pl. XIX., Fig. 39).

Isis sp., Tenison Woods, 1862, Geol. Observations in S. Australia, plate facing, p. 73, fig. 6.

(?) *Isis dactyla*, Id., palaeont. New Zealand, pt. iv., 1880, p. 7, pl. i., fig. 1.

cf. *Isis* sp., Duncan, 1875, Quart. Journ. Geol. Soc., vol. xxxi., p. 674, pl. xxxviiiA, figs. 1-4.

Isis sp., Id., 1875, ibid., p. 675, pl. xxxviiiB., fig. 4.

Preliminary Note.—Tenison Woods in 1880 figured and described some fossil remains possibly identical with the above species under the name of *Isis dactyla*, from Hutchinson's Quarry, Oamaru, but they were so badly preserved as to preclude an exact comparison. It seems better, therefore, to give a distinctive name, in honour of T. Woods, who actually figured this form in 1862 from the Mt. Gambier deposits. In his description of the fossils, he states, amongst other points, that " The condyles are convex or sub-conical, concentrically striate," but he does not mention the radial striae seen in our form. Judging from an examination of several hundred examples of the calcareous internodal joints of *Mopsea* from the Mallee bores, Tenison Woods' specimens may have been abraded, so that the fine, salient radii were cleared away, leaving only the more deeply-marked concentric growth stages of the calcareous part of the axis. Specimens in the present collection show both conditions.

Description.—Calcareous joints forming the internodes, circular to elliptical in transverse section; short and wide when from the base of the coral; longer, to extremely slender and circular in section where forming the middle and distal joints. Sides straight to incurved, and slightly dilated at the ends, especially in the terminal joints; with numerous, fine linear ridges or striae. Articular facets flat to conical, with strong concentric rings of growth and numerous fine radii. The concentric rings are undulate, and outwardly concave to meet the axial radii at the cusps. The radii are in systems of eight, and these, with the concentric lines, produce a very ornate effect on the articular surface in well preserved specimens. The striae of the cylinder correspond with the radial lines of the condyles.

Microscopic Structure of the Calcareous Internodes.—A transverse section of the joints shows that the axis is built on a system of eight rays which send off secondary and tertiary branches; and these consist of thin calcareous plates with a slight upward curvature, giving a tegulate appearance to the rays, in section. The inter-radial areas appear to be formed of fused, spicular bodies. Compared with the structure of the calcareous axis in a living *Mopsea* (*M.* cf. *encrinula*, Lamarck sp.), the fossil species here described (*M. tenisoni*) shows fundamentally similar structure, though on a coarser scale. This is probably owing to the rays not having advanced beyond the primitive eight. The tegulate appearance is seen in both the living and fossil species.

Dimensions of Calcareous Joints.—Three typical specimens were selected.

A.—Specimen of a basal joint; 9 x 8 mm. in diameter, 4 mm. high.

B.—A median joint; that is, from the middle branches of the corallum; 2.5 mm. in diameter, 5 mm. high.

C.—A terminal joint; .75 mm. in diameter, 2.25 mm. high.

Distribution.—Bore 1, 215-244 feet. Bore 3, 201-220 feet; 226 feet. Bore 4, 163-170 feet. Bore 8, 210-219 feet. Bore 9, 315-325 feet. Bore 10, 310-320 feet. Bore 11, 267-590 feet.

Spicules Associated in the Deposits with Mopsea.—Alcyonarian spicules are not uncommon in the finest washings of the polyzoal rock of the Mallee bores. They appear to be all of one general type, and without much doubt may be referred to the same organisms as these here described. They agree with certain species of *Mopsea* found round the Australian coast at the present day, and closely resemble those figured under the name of *Mopsea whiteleggei* by Thomson and Mackinnon,[1] a delicate and graceful plume-like form from Broken Bay, New South Wales. The fossil spicules here recorded are fusiform, twisted to a long S-shape, or V-shape, and sparsely covered with short rounded, blunt or square-ended tubercles. They measure from .375 to .4 mm. in length.

MOPSEA HAMILTONI, Thomson sp. (Plate XVII., Fig. 16).

Isis sp., Duncan, 1875, Quart. Journ. Geol. Soc., vol. xxxi., p. 674, pl. xxxviii.a, figs. 5 and (?) 6, 7, 7*a*.

Isis sp., 1, Id., 1880, Palaeontologia Indica (Sind Fossil Corals and Alcyonaria) ser. xiv., vol. i., pt. 1, p. 109, pl. xxviii., figs. 8, 9.

Isis hamiltoni, Thomson, 1908, Trans. and Proc. N.Z. Inst., for 1907, vol. xl., p. 99, pl. xiv., fig. 1.

Mopsea hamiltoni, Thomson sp., Chapman, 1912, Mem. Nat. Mus., Melbourne, No. 4, p. 43, pl. vi., figs. 3*a*, *b*; 4.

Observations.—The calcareous joints of this species are scarce in the present collection, as compared with those of the foregoing *Mopsea tenisoni*. Their differential characters are well defined in most examples, as seen in specimens now figured, in which the radial lines on the condyles are very pronounced and distinctly crenulate.

Duncan's Indian specimens referred to above were from the Gáj Series (Burdigalian); Naigh-Nai Valley, S.W. of Sehwan. Duncan compares these fossils with his previously figured examples from C. Otway, Victoria; and there is no doubt of their close relationship if not identity.

Mopsea hamiltoni is now known from the Cape Otway Series, from King Island, and from the greensands of Kakanui, New Zealand, as well as from three of the borings in the Mallee; whilst a practically identical form occurs in the Gáj Series of India.

Distribution.—Bore 3, 226 feet. Bore 4, 163-170 feet. Bore 11, 342-510 feet.

1. Mem. Austr. Mus. Mem. iv., pt. 13, Alcyonaria, 1911, p. 678, pl. lxvi., figs. 2, 3; pl. lxiii.

Genus ISIS, Linnaeus.

ISIS COMPRESSA, Duncan. (Plate XVII., Figs. 17*a*, *b*; Pl. XIX., Fig. 41).

Isis compressa, Duncan, 1880, Palaeon tologia Indica (Sind Fossil Corals and Alcyonaria), ser. xiv., vol. i., pt. 1, p. 109, pl. xxviii., figs. 4, 5.

Observations.—Two fragments of the stony axis of the alcyonarian occur in the Mallee bores, which are comparable to the above form. The largest fragment measures 12 mm. in length, and its greatest transverse diameters are 6.25×4 mm. In shape it is a flattened cylinder, and is superficially grooved with coarse longitudinal striae. The fractured surface of one of the fragments is, in the central area, discoloured to a bluish black, as if by residual organic staining. The articular surface is nearly flat, and has all the characters of Duncan's figured specimen.

A transverse section of this fossil under the microscope shows it to consist of undulose concentric laminae, with a sub-circular central portion having numerous short radial extensions; and these layers, by accelerated growth along one axis, cause the stem to finally assume an elliptical outline. The cusps of the concentric layers form the costae on the external surface of the calcareous axis.

Duncan's specimens were from the Gáj beds of Tandra Ráhim Khán.

Occurrence.—Bore 3, 226 feet. Bore 11, 495-500 feet.

NOTE ON THE GENERIC AFFINITIES OF THE ABOVE ALCYONARIAN FOSSILS.

Calcareous joints of Alcyonarians have long been known from the Tertiary beds of Southern Australia and New Zealand. These fossils have hitherto been referred to *Isis*. Tenison Woods in 1862 figured a basal joint from the Mount Gambier limestones which he referred to that genus.[1] Subsequently Duncan provisionally referred to *Isis* and *Mopsea* the collection of alcyonarian remains sent to him from Australia (Cape Otway beds), accordingly as the calcareous joints are branched or unbranched.[2] That is to say, if branched, they belong to *Isis*, if not they may belong to *Mopsea*, or are unbranched joints of *Isis*. This view now appears to be erroneous, for in *Mopsea encrinula* branching invariably takes

1. Geol. Obs. in S. Australia: plate facing p. 73, fig. 6.
2. Quart. J. Geol. Soc., vol. xxxi., p. 673.

place on the calcareous internodes.[1] The spicules (sclerodermites) of *Mopsea* are stated to be club-shaped,[2] but the majority of those figured in the "Challenger" report and from the "Thetis" expedition are spindle-shaped, though sometimes approaching the clavate type.

In *Melitodes* the internodes are calcareous with a horny matrix. In the present examples referred to *Mopsea*, the microscopic structure of the joints excludes that genus from consideration, since they are seen to be solidly and originally calcified.

There is, however, at least one species in the present collection which agrees with *Isis*, as seen in the long, and coarsely-grooved joints, and the dense lamellated structure of the axis.

CRINOIDEA.

Fam. COMATULIDAE.

Genus ANTEDON, de Fréminville.

ANTEDON PROTOMACRONEMA, sp. nov. (Plate XVII., Figs. 18*a*, *b*).

Description.—Isolated centrodorsal nearly hemispherical seen from the side; with more than 30 cirrus sockets, arranged in threes and fours vertically, alternate; borders of sockets prominent, with indications of a crenulated surface to the rim. Ventral aspect subcircular, showing the grooves of the radial pentagon, which increase in width near the periphery. Dorsal aspect subpentagonal at base, with a central depression apparently not perforate or permanently open.

Dimensions.—Type: Height of centrodorsal, 1.154 mm; width ventrally, 1.7 mm.

Observations.—Another specimen, probably of this species, and twice the dimensions, occurs in the same sample, viz., Bore 11, 430-432 feet. It is, however, not so well preserved, and consequently is not figured.

Separate brachial ossicles, which may be referable to this or an allied species, are common in the Mallee borings, in the Janjukian series, having a Mount Gambier facies; and also at Batesford, Geelong.[3]

There is still another species of Antedon in the southern Australian Tertiaries, which is found at Torquay, Victoria, and at Mount Gambier. This will be described later, from specimens in the

1. Wright and Studer, Rep. Chall., Zool., vol. xxxi., 1889, Alcyonaria, p. 43.
2. Cambridge Natural History, Coelenterata, 1906, p. 353.
3. See Proc. Roy. Soc. Victoria, vol. xxii. (N.S.), pt. ii., 1910, pl. 305, p. lii., figs. 8*a*-*b*.

National Museum. It is a comparatively large form, with few cirrus sockets and a low centrodorsal.

Affinities.—One of the nearest allied forms to the above species appears to be *Antedon macronema*, Miller sp.,[1] a Feather-star which has been recorded by the "Challenger" from Port Jackson at 30-35 fathoms; and is also found in King George's Sound and Port Stephens.

Occurrence.—Centrodorsals (2 examples). Bore 11, 430-432 feet. Brachials (probably of this species). Bore 3, 226 feet. Bore 4, 163-170 feet. Bore 11, 430-432 feet; 438-440 feet; 440-442 feet; 442-446 feet; 446-448 feet; 457-458 feet; 540-542 feet; 546-548 feet; 558-560 feet; 560-562 feet; 562-564 feet.

ANTEDON, sp. (Plate XVIII., Fig. 19).

Observations.—A cirrus joint of a larger species than that described above as *A. protomacronema* occurs in the polyzoal limestone of the Mallee. It may be referable to the Mount Gambier and Torquay species before noticed.

Occurrence.—Bore 11, 560-562 feet.

ASTEROIDEA.

PHANEROZONIA.

Genus PENTAGONASTER, Linck.

PENTAGONASTER sp. (Plate XVIII, Figs. 20, 21).

Observations.—Marginal plates of a large species of Shield-star have already been recorded by Dr. T. S. Hall[2] from the Lower and Upper beds of Muddy Creek; and also from Spring Creek, Waurn Ponds and Batesford.

In the Mallee borings the genus *Pentagonaster* is well distributed through the polyzoal rock series, and represented both by subtriangular plates from the margin, and subpolygonal to rounded plates of the abactinal area. A few of the plates met with are covered with minute tubercles, as in those of the common living *Pentagonaster aurata*.

Occurrence.—Bore 3, 226 feet. Bore 11, 197-590 feet.

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1. See P. H. Carpenter. Report on the Comatulae, Chall. Rep. Zool., vol. xxvi., pt. lx., 1888, p. 212.
2. Proc. Roy. Soc., Victoria, vol. xv. (N.S.), pt. i., 1902, p. 81, pl. xi., figs. 4, 5.

ECHINOIDEA.

CIDAROIDA.

Fam. CIDARIDAE.

Genus GONIOCIDARIS, Desor.

GONOICIDARIS sp. (Plate XVII., Fig. 22).

Observations.—Amongst other cidaroid spines occurring here there is a small spine differing from those of the living *G. tubaria*, Lam. sp.[1] in having the shaft hour-glass shaped, smooth, with blunt apical tubercles; whereas those in *G. turbaria* are always more or less flattened, and tubercular along the shaft, excepting in the case of the secondary spines, which are longitudinally serially granulate. From *Leiocidaris* it differs in the clavate form of the spine.

Goniocidaris (misprinted "Gomocidaris") is recorded by Tate in his "Census of the Older Tertiary Fauna of Australia."[2]

Dimensions.—Length, 8 mm.; greatest width at about one-third from the base, 3.1 mm.

Occurrence.—Bore 11, 530-535 feet.

CLYPEASTROIDA.

Fam. FIBULARIIDAE.

Genus ECHINOCYAMUS, van Phels.

Subgenus SCUTELLINA, Agassiz.

ECHINOCYAMUS (SCUTELLINA) PATELLA, Tate sp. (Plate XVIII., Fig. 23).

Observations.—In 1907 Dr. T. S. Hall[3] described a *Scutellina* tentatively referred to the above species, having a definite marsupium or brood pouch. This structure was new for this order of echinoids, the Clypeastroida.[4] The figured example came from the polyzoal rock near the mouth of the Glenelg River, Victoria, and Dr. Hall also recorded other specimens obtained by him from Mount Gambier in a similar rock. Amongst the score or two tests of the above species in the Mallee bores collection one very fine example with a brood pouch

1. See McCoy Prod. Zool. Vict., dec. 10, 1883, p. 33, pl. c.
2. Journ. Roy. Soc. N.S. Wales, vol. xxii., 1889, p. 251.
3. Proc. Roy. Soc. Victoria, vol. xx. (N.S.), pt. ii., 1907, p. 140, woodcut.
4. H. L. Clark in his description of *Fibularia nutriens* obtained by the "Thetis," off the coast of N.S. Wales (Mem. Austr. Mus., No. iv., 1909, p. 557, pl. lviii., figs. 1-11) refers to that species as "the only clypeastroid known" with a marsupium, he probably not having seen the report quoted.

occurs. In outline it is of an elongate or ovate type, but comes within the limit of variation in the ambital outline assumed by this species. This example measures 8.5 mm. × 7 mm., and was found in Bore 11 at 500-505 feet in white polyzoal rock of the Mount Gambier type.

In one instance (Bore 8, 165-180 feet) an example of this species was found with the periproct inframarginal, but this need not be considered as more than an exceptional character, as such variation is characteristic of the genus as a whole, but not of the species under present notice.

ANNELIDA.

POLYCHAETA TUBICOLA.

Fam. SERPULIDAE.

Genus SERPULA, Linné.

(SERPULA OUYENENSIS, sp. nov. (Plate XVIII., Figs. 24, 25; Pl. XIX., Fig. 42).

Description.—Tube free, stout, hexagonal in section, gently tapering and slightly curved; the cusps formed by the six longitudinal irregular ridges. Exterior of shell annulated by variably spaced rings of growth, producing a roughened appearance on the edges of the ridges. Interior of tube round and polished.

Dimensions.—Figured specimens (co-types). Spec. A.—Length, 5 mm.; width, 2 mm. Spec. B.—Length, 6.5 mm.; greatest width, 1.75 mm.

Observations.—Several forms of worm tubes ascribed to *Serpula* approach the present species, but none seems to exactly match it in its hexagonal and fluted cross section. The specimens are very constant in character. From the shells of *Dentalium* they are typical shell-structure under the microscope (pl. xix., fig. 42).

Occurrence.—Bore 3, 210 feet. Bore 11, 562-590 feet. Fairly common.

Genus DITRUPA, Berkley.

DITRUPA CORNEA, Linné sp., var. WORMBETIENSIS, McCoy. (Plate XVIII., Figs. 26-28).

Ditrupa wormbetiensis, McCoy, 1874, Prog. Rep. Geol. Surv. Vict., pt. 1, p. 22, fig. 4. Chapman, 1905, Vict. Nat., vol. xxi., No. 12, p. 180.

Description.—Tube rather small, slender and tapering; swollen near the apex and truncated from the shoulder of the swelling to the orifice, the edge of which is thin and sharp. Surface smooth, but for indistinct rings of growth. Occasionally these rings are very thick, and resemble collars.[1] Lengths of two typical examples, 8 mm. and 9.5 mm., respectively; breadths, 1.5 mm. and 1.5 mm. at the apical end.

Observations.—The type species has been described under many names.[2] As a fossil it ranges in Europe from the Middle Eocene to the Pleistocene, and is also found living.

The present variety is more regularly tapering than Brocchi's "*Dentalium*" *coarctatum*.[3] It is closer to Sowerby's "*Dentalium*" *incrassatum*,[4] from which it differs in its more irregular surface and generally smaller size. The latter species is synonymous with *Ditrupa cornea*.

The original specimen referred to by McCoy, from the Janjukian ironstone of Stawell, Victoria, is merely a mould, and the figure given in the Progress Report (loc. supra cit.) hardly coincides with a squeeze which I have taken from the type specimen, and now figured (see pl. xviii., fig. 26). Since McCoy connects this specimen with those from Wormbete Creek, Barwon Valley, there leaves no room for doubt as to its identity. This variety is, so far as known, quite restricted to the Janjukian series in Victoria.

Occurrence.—Bore 3, 201-220 feet; 226 feet. Bore 4, 163-170 feet; 180-190 feet. Bore 5, 163-175 feet; 175-189 feet; 189-190 feet. Bore 6, 150-154 feet; 158-161 feet. Bore 9, 315-325 feet. Bore 10, 254-296 feet; 310-320 feet. Bore 11, 272-315 feet; 331-342 feet; 342-349 feet; 353-370 feet; 448-450 feet.

DITRUPA, CORNEA, L. sp., var. CONSTRICTA, var. nov. (Plate XVIII. Figs. 29, 30).

Description.—Tube tapering, only slightly curved, broken up into nodosities by constrictions at intervals along the tube. The nodose swellings are generally found at or towards the apical end, thus showing the varietal character to be partly attributable to senility. Tube larger and stouter than in var. *wormbetiensis*.

Occurrence.—Bore 1, 215-244 feet. Bore 3, 226 feet. Bore 4, 163-170 feet; 180-190 feet. Bore 5, 163-175 feet. Bore 10, 310-320 feet.

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1. In this character it resembles *Ditrupa strangulata*, Deshayes. See Monographie, 1826, p. 372, pl. xvi., fig. 28. Also Rovereto, Pal. Ital., vol iv, 1898, p. 73, pl. vii. (ii.), fig. 15, 15*a-e*. This species or variety is recorded living from the Mediterranean, Southern Ocean, and Atlantic.

2. See Rovereto, G. Palæontographia Italica, vol. iv., 1898, p. 71; and vol x., 1904, p. 29.

3. Conchiologia, vol. ii., pl. i, fig. 4.

4. Min. Conch., vol. i., 1812, pl. lxxix., figs. 3, 4.

Genus SPIRORBIS, Lamarck.

SPIRORBIS HELICIFORMIS, Eichwald. (Plate XVIII., Fig. 31).

Spirorbis heliciformis, Eichwald, 1853, Lethaea Rossica, vol. iii., p. 52, pl. iii., fig. 11. Rovereto, 1904, Pal. Ital., vol. x., p. 59.

Observations.—Several specimens, agreeing in all details of shape and ornament, were found in the present series. Some of them are attached to the interior of bivalved shells.

A similarly ornamented (?) *Spirorbis*, but of much larger dimensions, is figured by Goldfuss[1] from the Oolite and Lias of Germany, under the name of *Serpula convoluta*. Eichwald's species came from the Tertiary (probably Miocene) of several Russian localities, as Zukowie, Zalisce and the districts of Volhynia and Podolia. Rovereto found this species in the Miocene of Ritzing and Neulerchenfeld in Austria.

The fossil recorded as *Spirorbis* sp. from the polyzoal rock (Janjukian) of Seal River, King Island[2] evidently belongs to the above species.

Occurrence.—Bore 8, 160-165 feet. Bore 11, 564-566 feet.

Class POLYZOA.

Suborder CHEILOSTOMATA.

Fam. CATENICELLIDAE.

Genus CLAVIPORELLA, MacGillivray.

CLAVIPORELLA sp. (Plate XVIII., Fig. 32).

Observations.—A zooeium of *Claviporella* was picked out of the material from Bore 5 at 163-175 feet, in the present series. The specimen is important from the fact that it corresponds with the peculiar little iron-stained bodies occasionally found in the Janjukian calcareous sands of Waurn Ponds, and which have been referred to the foraminifer, *Astrorhiza angulosa*.[3]

Fam. MEMBRANIPORIDAE.

Genus SELENARIA, Busk.

SELENARIA MARGINATA, Tenison Woods, var. SPIRALIS, var. nov. (Plate XVIII., Fig. 33).

Description.—The type species, *S. marginata*, is very common throughout the strata in the bores referable to the Kalimnan and

1. Petrefacta Germaniae, vol. i., 1837, p. 228, pl. lxvii., figs. 14*a-f*.
2. Mem. Nat. Mus., Melbourne, No. 4, 1912, p. 45.
3. Trans. Roy. Soc. S. Aust., vol. viii, 1886, p. 160.

Janjukian series. Some of the forms, however, nearest the little variety *lucens*, MacGillivray,[1] with the polished dorsal surface have a distinct spiral arrangement of the zooecia viewed from the lower or ventral aspect of the zoarium. Another feature invariably accompanying this varietal character, and which is sometimes met with in other species of the genus, is the inclusion of a little glauconite pebble in the centre of the zoarium on its lower side. This probably formed a point of attachment for the initial zooecium.

Dimensions of figured specimen (type): 1.87 mm. in diameter.

Occurrence.—Found in strata referable to the base of the Kalimnan and the top of the Janjukian.

Bore 5, 155-159 feet. Bore 8, 165-180 feet; 180-199 feet; 210-219 feet. Bore 9, 254-256 feet; 263-273 feet; 315-325 feet. Bore 10, 230-254 feet; 254-296 feet. Bore 11, 199-209 feet.

Fam. LEPRALIIDAE.

Genus LEPRALIA, Johnston.

LEPRALIA GIPPSLANDII, Waters. (Plate XIX., Fig. 43).

Lepralia gippslandii, Waters, 1882, Quart. Journ. Geol. Soc., vol. xxxviii., p. 509. MacGillivray, 1895. Trans. R. Soc. Vict., vol. iv., p. 77, pl. x., fig 21.

Observations.—Four typical examples of this species were found in a sample from Bore 5, at 175-189 feet. They form an encrusting layer upon a species of *Cellepora*.

The species appears to have been hitherto confined to the locality of Bairnsdale.

Fam. SMITTIIDAE.

Genus PORINA, d'Orbigny.

PORINA GRACILIS, M. Edwards sp.

Porina gracilis, M. Edwards sp., MacGillivray, 1885, Trans. R. Soc. Vict., vol. iv., p. 103, pl. xiv., figs. 21-24.

Observations.—The usual form of the zoarium in these deposits (polyzoal rock) is the lobed, bilaminate variation. In connection with this it is interesting to note that MacGillivray (loc. supra cit.) says, "The lobate form is that usually found recent, while the great majority of the fossil specimens are cylindrical."

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1. Trans. Roy. Soc., Vict., vol, iv., 1895, p. 48.

Class BRACHIOPODA.

Fam. TEREBRATULIDAE.

Genus TEREBRATULINA, d'Orbigny.

TEREBRATULINA FLINDERSI, sp. nov. (Plate XVIII., Fig. 34*a-c*).

Description.—Shell small, elongate ovate, with tapering beak. Both valves convex, the pedicle valve deeper than the brachial; the latter depressed towards the anterior margin. Beak stout, prominent, with large foramen.

Shell surface ornamented with about 12 strong, ridge-like costae, bifurcated at or near the anterior margin, and beset with squamose scales; costae becoming spinose at lateral margins of shell. Intercostal spaces deep. Concentric lines of growth inconspicuous.

Dimensions.—Length, 4.75 mm.; greatest width, 3 mm.; thickness, 2 mm.

Observations.—This species is well represented in the Dennant collection by specimens from Flinders, from the Mitchell River, and from the Muddy Creek older beds.

T. flindersi differs from *T. triangularis*, Tate,[1] in its more elongate shape and ovate outline, and in the convexity of the brachial valve.

Occurrence.—Two specimens (one of which is the selected holotype), found in Bore 10, 310-320 feet.

Fam. TEREBRATELLIDAE.

Genus TEREBRATELLA, d'Orbigny.

TEREBRATELLA ACUTIROSTRA, sp. nov. (Plate XVIII., Fig. 35*a-c*).

Description.—Shell small, subcircular, compressed, with a prominent beak. Pedicle valve convex in the umbonal area, with slightly concave shoulders, flattened posteriorly. Brachial valve more depressed and only slightly convex in the posterior region. Surface nearly smooth, but under a low power seen to be finely, radially striate.

Dimensions.—Length, 2.23 mm.; breadth, 1.84 mm.; thickness, .75 mm.

Observations.—This species bears some resemblance to the evenly contoured variations of *T. woodsi*, Tate,[2] but is easily separated by

1. Trans. Roy. Soc. S. Aust., vol. iii., 1880, p. 159, pl. viii., figs. 7*a-d*. Ibid., vol. xxiii., 1899 p. 254.

2. Op. supra cit., vol. iii., 1880, p. 161, pl. ix., figs. 10*a-c*.

the prominent beak and the absence of a mesial fold on the brachial valve.

Occurrence.—Bore 11, 430-432 feet.

TEREBRATELLA PORTLANDICA, sp. nov. (Plate XVIII., Figs. 36*a-c*, 37, 38).

Description.—Shell small, roundly oval; outline subangulate. Valves plano-convex. Beak small, pointed, foramen conspicuous; surface of pedicle valve strongly arched dorsally; brachial valve with a shallow, broad sinus, not extensive, turned down to meet the arched fold of the pedicle valve. Shell surface finely punctate, and showing a few faint concentric lines tending to become laminate.

Dimensions.—Length of holotype, 5.75 mm.; width, 5 mm.; thickness, 2.25 mm.

Observations.—This interesting little *Terebratella* is not infrequent in the bores, but never abundant. In only two cases were perfect examples secured, on account of the liability of the valves to easily separate. By its well-developed median septum it is seen to be a typical member of this genus. The above species is of the *Terebratella woodsi* type,[1] but that shell is much heavier, having a larger foramen and comparatively gigantic beak, and with a deeper and more convex brachial valve. At first sight *T. portlandica* might be confused with Tate's *Magasella lunata*,[2] which also occurs in these bores, but may be distinguished by the latter having a typical acute beak with smaller foramen, characteristic of that genus, and a rounder outline to the shell.

In the Dennant collection there is a typical example of the above species from Portland, which was doubtfully referred to *Terebratella woodsi*, and in the same tube are numerous shells of a similar form from Beaumaris. My attention was first directed to this particular species some years ago in the National Museum collection, when sorting over material from the white polyzoal limestone of Portland, at which locality it is a typical fossil.

Occurrence.—Bore 6, 114-150 feet; 154-158 feet. Bore 9, 263-273 feet. Bore 10, 254-296 feet; 310-320 feet. Bore 11, 505-510 feet; 515-520 feet; 525-530 feet; 545-550 feet.

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1. Loc supra cit.
2. Trans. R. Soc., S. Aust., vol. xxiii., 1899, p. 256, pl. viii., figs. 3-3*a*.

Genus MAGASELLA, Dall.

MAGASELLA LUNATA, Tate.

Magasella lunata, Tate, 1899. Trans. R. Soc. E. Austr., vol. xxiii., p. 256, pl. viii., figs. 3, 3*a*.

It is interesting to note the occurrence of this rare form in the present series, especially as it was previously found in some South Australian bores, viz., Croydon Bore, near Adelaide, at 400 to 1230 feet, and Murgurdawa Bore, near Wellington, at 213 feet. Tate also records the species from Belmont, near Geelong, and from the Murray River Cliffs at Mannum.

Occurrence.—Bore 9, 315-325 feet; 11, 560-565 feet.

EXPLANATION OF PLATES.

PLATE XVI.

Fig. 1 *a*, *b*, *c*.—*Lithothamnion ramosissimum*, Reuss. Three examples of branchlets. Mallee Bore No. 5, 163-175 feet. × 4.

2.—*L. ramosissimum*, Reuss. Vertical section of a branchlet, showing variable cell-dimensions. Mallee Bore No. 3, 226 feet. × 26.

3.—*L. ramosissimum*, Reuss. Portion of same branchlet in section, showing two conceptacles with included tetraspores (T), the latter transforming into pale green glauconite. × 52.

4.—*Trillina howchini*, Schlumberger. Lateral aspect of test. Mallee Bore No. 4, 163-170 feet. × 13.

5 *a*, *b*.—*Ammodiscus ovalis*, sp. nov.: *a*, lateral aspect of test; *b*, edge view. Mallee Bore No. 10, 160-186 feet. × 26.

6.—*Frondicularia lorifera*, sp. nov. Lateral aspect of test. Mallee Bore, No. 11, 438-440 feet. × 13.

7.—*Carpenteria proteiformis*, Goës. A young example, consisting of the rotaline basal series of chambers. Mallee Bore No. 11, 540-542 feet. × 26.

8 *a*, *b*.—*Pulvinulina calabra*, Costa sp.: *a*, superior aspect; *b*, inferior aspect. Mallee Bore No. 5, 163-175 feet. × 13.

9.—*Polystomella striatopunctata*, F. and M. sp., var. *evoluta*, var. nov. Lateral aspect of test. Mallee bore No. 9, 263-273 feet. × 56.


1
a
b
c
4/1
2
26/1
5
a
b
26/1
3
T
52/1
8 a
13/1
6
13/1
4
13/1
8 b
13/1
9
56/1
7
26/1


10
26/1
12
b
a
8/1
16
8/1
11a
8/1
11b
8/1
14
26/1
13
52/1
17
a
b
2/1
15
a
b
c
52/1
18 b
26/1
18 a
26/1

F.C., ad. nat. del.


19
26/1
20
4/1
21
4/1
23
2/1
22
5/1
24
a
b
25
4/1
26
2/1
27
2/1
28
2/1
29
2/1
30
2/1
31
26/1
32
52/1
33
16/1
34
a
b
c
4/1
37
2/1
38
2/1
35
a
b
c
8/1
36
a
c
b
2/1

F.C., ad. nat. del.

40
14/1
41
14/1
43
7/1
42
39
36/1
14/1

PLATE XVII.

Fig. 10.—*Holcotrochus crenulatus*, Dennant. Lateral aspect. Mallee Bore, No. 11, 197-199 feet. × 26.

11 *a*, *b*.—*Mopsea tenisoni*, sp. nov.: *a*, articular face of joint; *b*, lateral surface of joint. Mallee Bore No. 11, 555-560 feet. × 8.

12 *a*, *b*.—*M. tenisoni*, sp. nov.: *a*, articular face of joint near distal end of corallum; *b*, lateral aspect. Mallee Bore No. 11, 544-546 feet. × 8.

13.—*M. tenisoni*, sp. nov. Thin slice of a sector of a joint, magnified to show structure. Mallee Bore No. 11, 495-500 feet. × 52.

14.—*Mopsea* cf. *encrinula*, Lam. sp. (Living). A thin slice of a sector of a joint of the corallum, to show similarity of structure with that of the preceding species. × 26.

15.—*a-c*.—*Mopsea* sp., cf. *tenisoni*, sp. nov.: *a-c*., spicules or sclerodermites. Mallee Bore No. 11, 546-548 feet. × 52.

16.—*M. hamiltoni*, Thomson sp., Articular face of joint. Mallee Bore No. 11, 505-510 feet. × 8.

17 *a*, *b*.—*Isis compressa*, Duncan: *a*, lateral aspect; *b*, articular face. Mallee Bore No. 11, 495-500 feet. × 2.

18 *a*, *b*.—*Antedon protomacronema*, sp. nov.: *a*, centro-dorsal seen from the side; *b*, ventral aspect. Mallee Bore No. 11, 430-432 feet. × 26.

PLATE XVIII.

Fig. 19.—*Antedon* sp. Cirrus joint. Mallee Bore No. 11, 560-562 feet. × 26.

20.—*Pentagonaster* sp. Marginal plate. Mallee Bore No. 11, 575-580 feet. × 4.

21.—*Pentagonaster* sp. Rounded plate of the abactinal area. Mallee Bore No. 11, 575-580 feet. × 4.

22.—*Goniocidaris* sp. Hour-glass shaped spine. Mallee Bore No. 11, 530-535 feet. × 5.

23.—*Echinocyamus* (*Scutellina*) *patella*, Tate sp. Actinal surface showing marsupium. Mallee Bore No. 11, 500-505 feet. × 2.

24 *a*, *b*.—*Serpula ouyenensis*, sp. nov.: *a*, side view of large tube (spec. A); *b*, aperture. Mallee Bore No. 11, 585-590 feet. × 4.

Fig. 25.—*S. ouyenensis*, sp. nov. A large tube (spec. B). Mallee Bore No. 11, 585-599 feet. × 4.

26.—*Ditrupa cornea*, Linné sp., var. *wormbetiensis*, McCoy. Type of "*D. wormbetiensis*," McCoy. Cast from mould in ironstone near Stawell. × 2.

27.—*D. cornea*, L. sp., var. *wormbetiensis*, McCoy. Specimen showing annular nodosities. Mallee Bore No. 5, 163-175 feet. × 2.

28.—*D. cornea*, L. sp., var. *wormbetiensis*, McCoy. Typical smooth specimen. Mallee Bore No. 5, 163-175 feet. × 2.

29.—*D. cornea*, L. sp. var. *constricta*, var. nov. Irregularly constricted form. Mallee Bore No. 5, 163-175 feet. × 2.

30.—*D. cornea*, L. sp., var. *constricta*, var. nov. Regularly constricted form. Mallee Bore No. 5, 163-175 feet. × 2.

31.—*Spirorbis heliciformis*, Eichwald. Free or upper surface. Mallee Bore No. 11, 564-566 feet. × 26.

32.—*Claviporella* sp. Zooecium. Mallee Bore No. 5, 163-175 feet. × 52.

33.—*Selenaria marginata*, T. Woods, var. *spiralis*, var. nov. Inferior aspect of zoarium, showing spirally arranged zooecia. Mallee Bore No. 9, 315-325 feet. × 16.

34.—*Terebratulina flindersi*, sp. nov.: *a*, brachial valve; *b*, pedicle valve; *c*, lateral aspect. Mallee Bore No. 11, 310-320 feet. × 4.

35.—*Terebratella acutirostra*, sp. nov.: *a*, brachial valve; *b*, pedicle valve; *c*, lateral aspect. Mallee Bore No. 11, 430-432 feet. × 8.

36.—*Terebratella portlandica*, sp. nov.: *a*, brachial valve; *b*, pedicle valve; *c*, lateral aspect. Mallee Bore No. 11, 525-530 feet. × 2.

37.—*T. portlandica*, sp. nov. Interior of a brachial valve. Mallee Bore No. 6, 154-156 feet. × 2.

38.—*T. portlandica*, sp. nov. Interior of a pedicle valve. Mallee Bore No. 6, 114-150 feet. × 2.

Plate XIX.

Fig. 39.—*Mopsea tenisoni*, Chapman. Transverse section of sclerobasic axis, showing finely tegulate structure of the successive curved layers, and secondary radial arrangement. Mallee Bore No. 11, 585-590 feet. × 14.

Fig. 40.—*Mopsea* cf. *encrinula*, Lam. Transverse section showing coarsely tegulate structure. × 14.

41.—*Isis compressa*, Duncan. Transverse section of axis, showing highly ornate tegulate structure. Mallee Bore No. 11, 495-500 feet. × 14.

42.—*Serpula ouyenensis*, sp. nov. Transverse section of tube, showing laminated inner layer and tubulated outer layer. Mallee Bore No. 11, 585-590 feet. × 36.

43.—*Lepralia gippslandii*, Waters. Mallee Bore No. 5, 175-189 feet. × 7.

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