



The Pliocene Mollusca of Great Britain, Being Supplementary to S. V. Wood's Monograph of the Crag Mollusca. VOL. II, PART III. Pages 705–856; Plates LVII–LXIV

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THE
PLIOCENE MOLLUSCA
OF
GREAT BRITAIN,

BEING SUPPLEMENTARY TO

S. V. WOOD'S MONOGRAPH OF THE
CRAG MOLLUSCA.

BY

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Specific Characters.—Shell minute, depressed; whorls 3, convex, the last inflated, much the largest; ornamented by numerous fine curvilinear ribs which extend to the umbilicus, but do not entirely cover the base; spire very short; suture deep; mouth orbicular, expanded, with a continuous peristome, large in proportion to the size of the shell; umbilicus circular; operculum strong, calcareous; inside lip double.

Dimensions.—H. 2 mm. B. 2 mm.

Distribution.—*Recent*: Irish coast. Finmark, Iceland, Spitzbergen, Greenland, Canada, New England coast. Bay of Biscay (Travailleur Exped.). West Indies, St. Thomas (Verkrüzen).

Fossil: Bridlington, Shetland (Jeffreys), Turbot-bank, Antrim, Renfrew, Paisley, Fort William, Shewalton. Uddevala, Christiania fiord—Upper *Mya*-banks, *Tapes*-banks. Montreal, New England coast.

Remarks.—This minute shell, by no means an abundant form, has a wide range as recent, principally, however, northern and circumpolar. As a fossil it seems to be confined to the Pleistocene deposits. It has been known for some time from certain localities in the west of Scotland as well as from Scandinavia and from Canada, but Mr. Bell has recently discovered a specimen, which is interesting and deserves to be figured, in the clayey matrix of an *Astarte* from Bridlington.

It is allied to *Cyclostrema*, but may be distinguished from it by having a double inside lip to receive the operculum.

Our specimen, being worn, has lost most of the characteristic sculpture. Traces of it, however, are clearly shown, but the artist has not done justice to what is left of it.

THE EEMIEN ZONE (PLEISTOCENE) OF DENMARK AND HOLLAND.

Among the Mollusca recorded hitherto in this work, the following are given by Dr. Nordmann and Dr. Lorié from the Eemien deposits of Denmark and Holland:

<i>Succinea elegans</i> , Risso.	<i>Pyrgolina interstincta</i> , Montagu.
<i>Bithynia tentaculata</i> , Linné.	„ <i>spiralis</i> , Montagu.
<i>Valvata piscinalis</i> , Müller.	<i>Onoba aculeus</i> , Gould.
<i>Pisidium amnicum</i> , Müller.	„ <i>striata</i> , J. Adams.
<i>Nassa pygmaea</i> , Lamarck.	<i>Rissoa inconspicua</i> , Alder.
„ <i>reticulata</i> , Linné.	„ <i>membranacea</i> , A. Adams.
<i>Bittium reticulatum</i> , Da Costa.	„ <i>parva</i> , Da Costa.
<i>Triforis perversu</i> , Linné.	„ „ var. <i>interrupta</i> , A. Adams.
<i>Aporrhais pes-pellicani</i> , Linné.	<i>Littorina littorea</i> , Linné.
<i>Turritella communis</i> , Risso.	„ <i>obtusata</i> , Linné.
<i>Scala communis</i> , Lamarck.	„ <i>rudis</i> , Maton.
<i>Turbonilla lactea</i> , Linné.	<i>Lacuna divaricata</i> , Fabricius.
„ (<i>Pyrgostelis</i>) <i>densicostata</i> , Montagu.	<i>Cardium edule</i> , Linné.
	<i>Tellina (Macoma) balthica</i> , Linné.

Genus **TURBO**, Linné, 1758.

Sub-genus **SENECTUS**, Humphrey, 1797.

Turbo (Senectus) Newtoni (Etheridge and Bell, MS.). Plate LIX, fig. 23.

1893—98. *Clanculus newtoni*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 630, 1893; *Turbo (Senectus) Newtoni*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 155, pl. ii, fig. 17, 1898.

Specific Characters.—Shell small; whorls marked with horizontal cords at top, middle and base, with thin vertical plates between them; shell strongly turreted, with strong, angulated shoulders; suture well marked; umbilicus moderate, deep; mouth square (A. Bell).

Dimensions.—H. 5 mm. B. 10 mm.

Distribution.—Not recorded living.

Fossil: St. Erth.

Remarks.—This remarkable shell was discovered by Mr. E. T. Newton, but named and described by Mr. A. Bell, as given above. It belongs to an exotic group which, as far as I know, is not otherwise represented in the European region either as recent or fossil. The specimen now figured belongs to the Jermyn Street Collection and is Mr. Bell's type.

Genus **TROCHUS**, Linné, 1758.

Sub-genus **CALLIOSTOMA**, Leach in Gray, 1840.

Trochus (Calliostoma) conuloides (Lamarck). Plate LVII, figs 7—9.

1822—43. *Trochus conuloides*, Lamarck, Hist. Nat. Anim. s. Vert., vol. vii, p. 24, no. 47, 1822; ed. Deshayes, vol. ix, p. 142, no. 47, 1843.

1846. *Trochus zizyphinus* (non Linné), Philippi in Chemnitz, Conch. Cab., ed. 2, p. 62, pl. xiii, fig. 6.

1848. *Trochus zizyphinus*, var. *conuloides*, S. V. Wood, Mon. Crag Moll., pt. i, p. 124, pl. xiii, figs. 9f, 9g.

1853. *Trochus zizyphinus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 491, pl. lxxvii, figs. 1—3.

1859. *Trochus zizyphinus*, G. B. Sowerby, Ill. Index Brit. Shells, pl. xi, fig. 8.

1865—71. *Trochus zizyphinus*, var. *cingulata*, Jeffreys, Brit. Conch., vol. iii, p. 330, 1865; vol. v, p. 204, pl. lxxiii, fig. 6, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 492, 1871.

1878. *Trochus zizyphinus*, G. O. Sars, Moll. Reg. Arct. Norv., p. 141.

1880. *Trochus conuloides*, Fischer in Kiener, Coq. viv., p. 81, pl. xviii, fig. 3.

1884. *Trochus (Zizyphinus) conuloides*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 347, pl. xli, figs. 9—11.

1892. *Zizyphinus conuloides*, Locard, Coq. mar. Côtes de France, p. 204, fig. 180.

1901. *Calliostoma zizyphinus*, Conch. Soc. List Brit. Mar. Moll., Journ. of Conch., vol. x, p. 17.

1907. *Calliostoma conuloide*, Scalia, Att. Accad. Gioen. Sci. Nat. Catania [4], vol. xx, p. 30.

1912. *Calliostoma conuloide*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, pp. 15, 48, pl. iii, figs. 21—23.

Specific Characters.—Shell solid and strong, regularly conical; whorls flattened, ornamented by well-marked spiral ridges, the lowest, just above the suture, being larger and broader than the others, forming a slightly angulated and prominent margin to the whorls, together with oblique and inconspicuous lines of growth; spire regularly diminishing in size; apex acute; suture slight, defined by the basal ridge of each whorl; base of the shell flattened, imperforate, with concentric striæ; mouth rhomboidal; outer lip thin; inner lip reflected on the pillar; pillar thickened.

Dimensions.—H. 25—28 mm. B. 25—30 mm.

Distribution.—*Recent*: British seas. North Atlantic from the Canaries to the Faroe Islands. Norway, Sweden, Denmark.

Fossil: Waltonian Crag: Walton-on-Naze, Little Oakley. Newbournian: Waldringfield, Foxhall, Newbourn, Sutton. Butleyan: Hollesley, Butley. Icenian: Bramerton.

Scaldisien: Belgium.

Pleistocene: Sicily—Salustro, Nizetti, San Paulo (Scalia).

Remarks.—Two distinct forms, now characteristic of different areas, have been grouped together under the common name of *Trochus zizyphinus*, the one a slightly sculptured or nearly smooth shell with an enlarged base, represented by the *T. zizyphinus* of Linné, having been described by the latter authority as "*testa imperforata, lævis, anfractibus marginatis*," the other, the whorls of which are covered with well-marked spiral striæ, agreeing with the *T. conuloides* of Lamarck.

MM. Bucquoy, Dautzenberg and Dollfus remark (following Fischer) that the first is characteristic of the Mediterranean, the second of the Atlantic coasts and of those of Great Britain and of Scandinavia.

Specimens of the typical *T. zizyphinus* from the Crag are usually more or less fragile and difficult to obtain in perfect condition, whereas those of *T. conuloides*, though often broken, are solid and strong, retaining their spiral sculpture uninjured. Jeffreys, dealing with the characteristic British shell, says that it is solid.

Of the specimens I have figured as *T. conuloides*, one, a recent shell (Pl. LXVII, fig. 7), I received from M. Dollfus as typical of the northern and Atlantic form; two others, which I identify with it, though the spiral sculpture is finer, belong to the Sedgwick Museum at Cambridge, having been obtained from the Crag of Sutton and Butley.

I have collected a number of examples of *T. conuloides* from the English Crag but none of them are of an intermediate character between that species and the typical *T. zizyphinus*, tending to show that in Pliocene times they had become differentiated, supporting the view that they should be regarded as specifically distinct.

Dr. Scalia reports that *T. conuloides* (which has not been recognised from the

Mediterranean region as a recent shell) occurs in the late Pleistocene deposits on the flanks of Mount Etna.

Both the present form and the *T. zizyphinus* of Linné have been referred generically to *Zizyphinus* by Locard and others, and to the same term as a subgenus by the authors of the 'Marine Mollusca of Roussillon,' but it has been more generally grouped with the *Calliostoma* of Leach, as in the Conchological Society's list of 1901.

The Mediterranean *T. zizyphinus* of Linné has been called *T. Linnæi* by Monterosato, Carus and Locard, and *Trochus (Zizyphinus) zizyphinus* by M. Bucquoy and his colleagues.

***Trochus (Calliostoma) zizyphinus* (Linné).** Plate LVII, figs. 1, 2, 5.

1758. *Trochus zizyphinus*, Linné, Syst. Nat., ed. x, p. 759, no. 520.
 1822. *Trochus zizyphinus*, Lamarck, Anim. s. Vert., vol. vii, p. 23, no. 46.
 1836—44. *Trochus conulus*, var. β , Philippi, Enum. Moll. Sic., vol. i, p. 175, 1836; vol. ii, p. 149, 1844.
 1848. *Trochus zizyphinus*, S. V. Wood, Mon. Crag Moll., pt. i, p. 124, pl. xiii, figs. 9a, 9b.
 1871. *Trochus zizyphinus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 492.
 1872. *Trochus zizyphinus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1874—6. *Trochus zizyphinus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 437; p. 332, no. 148, 1874; *Trochus (Zizyphinus) conulus*, var. *zizyphinus*, vol. vii, p. 182, no. 727, 1876.
 1874—92. *Trochus zizyphinus*, Van den Broeck, Ann. Soc. Malac. Belg., vol. ix, pp. 187, 273, 356; vol. xiv, p. 74, 1879; vol. xvii, p. 204, 1882; vol. xix, p. 19, 1884; Bull. Soc. Belg. Géol., vol. vi (Mémoires), pp. 123, 134, 1892.
 1884. *Zizyphinus Linnæi*, Monterosato, Nom. Gen. e Spec. Conch. Medit., p. 44.
 1885. *Trochus (Zizyphinus) zizyphinus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 345, pl. xli, figs. 1, 2, 4, 5.
 1887. *Calliostoma zizyphinus*, Fischer, Man. Conch., p. 826, fig. 585.
 1889. *Zizyphinus Linnæi*, Carus, Prod. Faun. Medit., vol. ii, p. 256.
 1892. *Zizyphinus Linnæi*, Locard, Coq. mar. Côtes de France, p. 204.
 1896. *Trochus zizyphinus*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), p. 129.

Specific Characters.—Shell regularly conical, base wider in proportion to the height than in *T. conuloides*; whorls flat or nearly so with a narrow raised band just above the suture, the first three or four ornamented with fine granular ridges, the lower ones without or with inconspicuous sculpture; base imperforate, slightly convex, with a few striæ near the umbilical region; mouth oblique, subquadrangular; columella and inner lip covered by a nacreous glaze.

Dimensions.—H. 25—35 mm. B. 25—35 mm.

Distribution.—*Recent*: Anglesey, Loch Carron (Jeffreys). West French coast (rare). Mediterranean—Ægean.

Fossil: St. Erth. Coralline Crag: Orford, Ramsholt, Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Casterlien, Scaldisien, Poederlien: Belgium.

Upper Pliocene : Messina. *Zone à Isocardia cor* : Antwerp.

Pleistocene : Italy—Livorno, Reggio, Monteleone. Sicily—Messina, Monte Pellegrino.

Remarks.—The typical *T. zizyphinus* is a comparatively southern species. It is common in the Coralline and Waltonian horizons of the Crag, young examples being specially abundant at Oakley. It has been recorded also from the later zones of the Red Crag and from the Icenian of Bramerton, but whether such specimens should be referred to the present form or to *T. conuloides* I do not know. Although fossils belonging perhaps to the same group are said to occur in the Miocene deposits of Touraine and the Vienna basin, the Crag *T. zizyphinus* is hardly one of the representative forms of the Italian Pliocene. Seguenza has reported it from one or two localities in the Upper Pliocene of Calabria, and from Livorno, as well as from the Pleistocene of Messina and Palermo. Some of my Oakley fossils are smaller than the type, but whether they are immature or a dwarf variety of *T. zizyphinus* I am unable to say.

Dr. Odhner agrees that the true *T. zizyphinus* is a Mediterranean form, occurring rarely on the Atlantic coast of France. He does not know of it from Scandinavian seas.

Var. *lævigata* (J. Sowerby). Plate LVII, fig. 6.

1818. *Trochus lævigatus*, J. Sowerby, Min. Conch., vol. ii, p. 179, pl. clxxxi, fig. 1.
 1822. *Trochus lævigatus*, Conybeare and Phillips, Outl. Geol. Engl. and Wales, pt. i, chap. ii, p. 1.
 1843—81. *Trochus lævigatus*, Nyst, Coq. foss. Terr. tert. Belg., p. 379, pl. xxxvi, fig. 11, 1843;
T. zizyphinus, var., Conch. Terr. tert. Belg., p. 99, pl. vi, fig. 25, 1881.
 1848—79. *Trochus zizyphinus*, var. *lævigatus*, S. V. Wood, Mon. Crag Moll., pt. i, p. 124, pl. xiii,
 fig. 9d, 1848; 2nd Suppl., p. 34, pl. iv, fig. 20, 1879.
 1853. *Trochus zizyphinus*, var. *lævis*, Forbes and Hanley, Brit. Moll., vol. ii, p. 492, pl. lxvii, figs. 5, 6.
 1856. *Trochus conulus*, Hörnes, Foss. Moll. Tert. Wien, vol. i, p. 453, pl. xlv, fig. 8.
 1865. *Trochus zizyphinus*, var. *lævigata*, Jeffreys, Brit. Conch., vol. iii, p. 331.
 1885. *Trochus conuloides*, var. *strangulata* (?), Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss.,
 vol. i, p. 349, pl. xli, figs. 6, 7.
 1901. *Calliostoma zizyphinus*, var. *lævigata*, Conch. Soc. List Brit. Mar. Moll., Journ. of Conch.,
 vol. x, p. 17, no. 305.

Varietal Characters.—Shell strong and solid, resembling *T. conuloides*, but either without or with finer transverse sculpture, usually with a distinctly marked sutural ridge.

Dimensions.—H. 25—30 mm. B. 25—30 mm.

Distribution.—Recent : Anglesea, Loch Carron.

Fossil : Coralline Crag : Ramsholt. Waltonian : Walton-on-Naze, Little Oakley. Newbournian : Holywell. Probably elsewhere in the Red Crag.

Scaldisien : Belgium.

Miocene : Vienna basin.

Remarks.—In his original description of *T. lævigatus* Sowerby remarks that the sides of the cone are almost straight or very slightly convex, and that although a few lines may be traced around the spire, they are obscure and irregular; also that though it resembles *T. zizyphinus*, it may be distinguished from it by its obtuse margin and plain surface. In the figures given by Nyst and Hörnes of what seems to be the same shell, the surface is without sculpture. One of Wood's figures of 1848 (*op. cit.*, pl. xiii, fig. 9c) is similarly devoid of ornament, but, as he points out, it may have been drawn from a smooth or decorticated specimen. Imperfect examples allied to the present variety are not very rare at Oakley, some of them with fine spiral ridges and others without, and I have collected them from the Scaldisien deposits of Antwerp. Wood's fig. 20 in pl. iv of his 2nd Supplement fairly represents the shell here referred to the present variety.

It is a stronger shell than the typical *T. zizyphinus*, but in its general character seems to correspond more nearly with that species, with which it is here grouped.

It may be pointed out that although Sowerby describes *T. lævigatus* as nearly smooth, his figure shows it to be ridged or striated, and this is also the case with most of my imperfect specimens of the present form from Oakley, as well as with some perfect shells from Antwerp. It is true that the figures given by Hörnes and Nyst show no sign of such ridges, but I have found by experience that it is very difficult for an artist who is not a conchologist to realise the importance of showing the minute details of sculpture upon which the correct identification of allied species so often depends.

Wood's figures of the present variety, moreover, show the whorls to be ornamented with fine spiral ridges (*op. cit.*, pl. xiii, figs. 9d, 9e).

Var. dilatata (Monterosato), *vide* B., D. & D. Plate LVII, fig. 3.

1885. *Trochus (Zizyphinus) zizyphinus*, var. *dilatata*, Monterosato, in Bucquoy, Dautzenberg et Dollfus, *Moll. mar. Rouss.*, vol. i, p. 348, pl. xli, fig. 3.

Varietal Characters.—Differs from the type form of *Trochus zizyphinus* in the absence of a sutural ridge and in its expanded and tumid body-whorl, the base of which is obtusely rounded and not angulate.

Dimensions: H. 35 mm. B. 35 mm.

Distribution.—*Recent*: Mediterranean.

Fossil: Coralline Crag. Waltonian: Walton-on-Naze, Little Oakley, possibly elsewhere in the Red Crag.

Remarks.—This distinct variety of *T. zizyphinus* is fairly common in the Waltonian Crag of Walton and Little Oakley. Our fossils agree with the figure from Roussillon given under the present name by the authors of the Monograph of its Mollusca, except that they are occasionally somewhat larger. A number of specimens, however, are much smaller. These M. Dautzenberg thinks may be immature examples.

Var. **strangulata**, Bucquoy, Dautzenberg et Dollfus. Plate LVII, fig 4.

1885. *Trochus zizyphinus*, var. *strangulata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 348, pl. xli, figs. 6, 7.

Varietal Characters.—*Tours déprimés et un peu concaves, à leur partie moyenne* (B, D., D., *op. cit.*).

Dimensions.—L. 20 mm. B. 18 mm.

Distribution.—*Recent*: Mediterranean.

Fossil: Waltonian Crag: Little Oakley. Newbournian: probably elsewhere.

Remarks.—I have found several imperfect specimens at Oakley belonging to the present group which seem to correspond with a recent shell figured by M. Bucquoy and his colleagues. The whorls are slightly concave, without sculpture, except that they are narrowly but distinctly ridged near the suture. They are also angulate at the base and the outer lip. As the authors named regard it as a distinct variety differing from the varieties *lævigata* and *dilatata*, the latter of which is specially common at the Waltonian horizon, it seems desirable to notice it in the present work.

Trochus (Calliostoma) granulatus (Born). Plate LVII, figs. 10–12.

1778–80. *Trochus granulatus*, Born, Ind. Mus. Cæsar. Vindob., p. 343, 1778; Test. Mus. Cæsar. Vindob., pl. xii, figs. 9, 10, 1780.

1779. *Trochus papillosus*, Da Costa, Brit. Conch., p. 38, pl. iii, figs. 5, 6.

1836–44. *Trochus granulatus*, Philippi, Enum. Moll. Sic., vol. i, p. 174, pl. x, fig. 22, 1836; vol. ii, p. 149, 1844.

1853. *Trochus granulatus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 499, pl. lxvii, fig. 7, pl. lxviii, fig. 3.

1859. *Trochus granulatus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 12.

1865–71. *Trochus granulatus*, Jeffreys, Brit. Conch., vol. iii, p. 327, 1865; vol. v, p. 204, pl. lxiii, fig. 5, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 491, 1871.

1870. *Trochus granulatus*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 216.

1872. *Trochus granulatus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 210, 214.

1872. *Trochus granulatus*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 82, pl. v, fig. 14.

1874–76. *Trochus (Zizyphinus) granulatus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 445, 1874; vol. vii, p. 182, no. 728, 1876.

1878. *Zizyphinus granulatus*, De Stefani e Pantinelli, Bull. Soc. Malac. Ital., vol. iv, p. 76.

1885. *Trochus (Zizyphinus) granulatus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 359, pl. xlvi, figs. 1–5.

1889. *Zizyphinus granulatus*, Carus, Prod. Faun. Medit., vol. ii, p. 261.

1889–96. *Trochus papillosus*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 350, no. 1811, 1889; *Ampullo-trochus (?) granulatus* and vars., Moll. Terr. Terz. Piem., pt. xxi, p. 42, pl. iv, figs. 34–37, 1896.

1892. *Zizyphinus granulatus*, Locard, Coq. mar. Côtes de France, p. 204.

1913. *Trochus (Zizyphinus) granulatus*, Gignoux, Form. mar. Plioc. Quat. Ital. e Sic., p. 577.

Specific Characters.—Shell not very solid, subconical; whorls slightly convex, the last dilated, much the largest, with an angulate and rounded base; ornamented by delicate spiral ridges, 6 or 8 on the body-whorl generally granulate, with still finer ones between them; the latter tend to disappear towards the apex and the stronger ones to become less numerous; spire regularly diminishing in size towards a fine apex; suture slight, defined by an imbricated sutural ridge; mouth oblique, subquadrangular; outer lip thin, inner lip reflected on the pillar; base of the shell imperforate, with fine concentric, non-tuberculate ridges.

Dimensions.—H. 33 mm. B. 33 mm.

Distribution.—*Recent*: British seas, coralline zone, on the south-west coast, Channel Islands, Isle of Man, south and east of Ireland, Mull of Galloway. West European, Mediterranean, Adriatic, Morea, Madeira, Canary Islands.

Fossil.—Waltonian Crag: Walton-on-Naze, Little Oakley. Newbournian: Waldringfield (A. Bell), Felixstow.

Lower Pliocene: Siena.

Upper Pliocene: Astiano, Livorno, Orciano, Gerace.

Pleistocene: Livorno, Ficarazzi, Rhodes.

Remarks.—The present species, *Trochus granulatus*, a Mediterranean shell, with a range extending to Madeira and the Canaries, is only known from the western and southern coasts of the British Isles. It is one of those southern forms which lingered on in the Crag basin until Waltonian times, and apparently, but rarely, somewhat later. In the 'British Conchology' Jeffreys expressed the opinion (*op. cit.*, p. 329) that it was not found in the Crag, but in his list of 1871 (p. 491) he gives it from various Red Crag localities and, following S. P. Woodward, from the Icenian of Bramerton and Thorpe. As to the latter, however, the shell referred to was evidently the *T. similis* of Sowerby, as Woodward himself suggested. There is a specimen of the true *T. granulatus* from Walton in the Norwich Museum,¹ which is here figured together with a recent one from the Mediterranean for comparison, and I have several others in my own collection, not quite perfect, from Walton and Oakley (figs. 11, 12).

T. granulatus belongs to the subgenus *Calliostoma*, but is generally regarded as distinct from other forms of that group. It seems specially characterised by its very fine granular sculpture and its delicately ridged base.

***Trochus (Calliostoma) subexcavatus* (S. V. Wood). Plate LVII, figs. 13—15.**

1842—48. *Trochus subexcavatus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 531, 1842; Mon. Crag Moll., pt. i, p. 126, pl. xiii, fig. 8, 1848.

1871. *Trochus papillosus*, var. (Wood, non Da Costa), Jeffreys, in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 492.

¹ This specimen has been unfortunately broken, so that only the lower part of it remains.

1872. *Trochus subexcavatus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 210.
 1881. *Trochus subexcavatus*, Nyst, Conch. Terr. tert. Belg., p. 103, pl. vi, fig. 28.
 1890. *Trochus subexcavatus*, C. Reid, Plioc. Dep. Brit., p. 258.

Specific Characters.—Shell imperforate, strong and solid; whorls convex below, concave and excavated above; ornamented by strongly granulated ridges, those immediately above the well-marked suture forming a prominent and well-marked supra-sutural band; spire more elongate than in the other members of this group; base rounded, not angulate, the whole of it concentrically ridged; mouth oblique, subrhomboidal; outer lip thin; inner lip folded upon the pillar.

Dimensions.—H. 25—32 mm. B. 20—28 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Sutton, Foxhall, Waldringfield, Newbourn, Ramsholt, Bentley. Butleyan: Butley.

Scaldisien: Belgium.

Remarks.—This very distinct and easily recognisable species, belonging to the granulate and imperforate group, is not uncommon in the Waltonian division of the Red Crag, from which I have many specimens in my collection, all maintaining the same general character. It is only known from the Boytonian zone of the Coralline Crag, which, as before stated, seems to form a connecting link between the Gedgravian horizon of the latter and the Waltonian. It is a strong, rather coarse shell with well-marked sculpture, the upper part of the whorls being excavated and more or less concave; the spire is elevated, and the base covered with numerous strong and closely-set concentric ridges.

Trochus (Calliostoma) similis (J. Sowerby). Plate LVII, fig. 16.

1818. *Trochus similis*, J. Sowerby, Min. Conch., vol. ii, p. 179, pl. clxxxi, fig. 2.
 1822. *Trochus similis*, Conybeare and Phillips, Outl. Geol. Engl. and Wales, pt. i, chap. ii, p. 1.
 1843—81. *Trochus similis*, Nyst, Coq. foss. Terr. tert. Belg., p. 377, pl. xxxv, fig. 19, 1843; Conch. Terr. tert. Belg., p. 102, pl. vi, fig. 27b, 1881.
 1848. *Trochus papillosus*, var. *similis*, S. V. Wood, Mon. Crag Moll., pt. i, p. 126, pl. xiii, fig. 6c.

Specific Characters.—Shell fairly large, distinctly conical, imperforate; whorls 8, flat, regularly diminishing in size towards a pointed apex, the last whorls rather more than half the total length, the two first without sculpture, ornamented by fine spiral ridges, those on the upper whorls being generally granulate, and only the first ridge on the lower ones; suture slight and inconspicuous; base obtusely angulate, ridged only in the centre; supra-sutural band slight and narrow; mouth subrhomboidal; outer lip thin.

Dimensions.—H. 18—22 mm. B. 18—22 mm.

Distribution.—Not known living.

Fossil : Waltonian Crag : Walton-on-Naze, Little Oakley. Newbournian : Holywell.

Scaldisien : Belgium.

Remarks.—This shell, originally described by Sowerby and then by Nyst in 1843 as a distinct species under the name here adopted, was afterwards regarded by Wood as a variety of *T. noduliferens*. It differs so materially, however, from what I regard as the type form of that species that I am inclined to revive Sowerby's name and consider it specifically distinct. The difficulty, in this case also, is to decide where to place it. In form it resembles *T. conuloides* rather than *T. noduliferens*, but its granulated sculpture suggests a relation to the *T. noduliferens* group. It is by no means the first time we have met with Crag shells which appear to claim a possible alliance with more than one prototype.

It may be interesting to remark that *Trochus similis* and *T. lævigatus* are mentioned as worthy of notice as Crag shells by Conybeare and Phillips in their 'Outlines of the Geology of England and Wales,' published in 1822.

Trochus similis seems distinguished by its flattened whorls, its conical form and its slight suture. The Walton specimen here figured comes from the Wood Collection at the Norwich Museum, where it bears this name in Wood's own writing. It corresponds exactly with those given by Sowerby, Nyst and himself.

Trochus (Calliostoma) bullatus (Philippi). Plate LVIII, figs. 1—3.

1844. *Trochus bullatus*, Philippi, Enum. Moll. Sic., vol. ii, p. 226, pl. xxviii, fig. 8.
 1848—72. *Trochus zizyphinus*, var. *monstrosa*, S. V. Wood, Mon. Crag Moll., pt. i, pl. xiii, fig. 4, 1848; *T. bullatus*, 1st Suppl., pt. i, p. 82, pl. vii, fig. 20, 1872.
 1871. *Trochus bullatus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 146.
 1871—98. *Trochus bullatus*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 360, 1871; *T. (Calliostoma) bullatus*, Trans. R. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.
 1872. *Trochus bullatus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1874—76. *Trochus (Zizyphinus) bullatus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 332, no. 151, 1874; vol. vii, p. 184, no. 738, 1876.

Specific Characters.—Shell conical, fairly large, imperforate; whorls 6, slightly convex, the last obtusely rounded at the base, not strongly angulate; ornamented by fine spiral ridges more or less granulated, not very prominently, sometimes only partially; suture well marked, but not deep; mouth obliquely expanded; spire regularly diminishing in size to a blunt point; base smooth, except near the columella.

Dimensions.—H. 20—25 mm. B. 20—25 mm.

Distribution.—Not known living.

Fossil : St. Erth. Coralline Crag : Gedgrave, Sutton, Boyton.

Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Bentley, Waldringfield. Upper Pliocene: Caltabiano, Messina.

Remarks.—Wood figured two specimens of what he considered the true *T. bullatus*, with which both of those from the Crag here represented more or less nearly agree. One of Wood's shells was somewhat decorticated, the other perfect, showing the original granulated sculpture. Mr. Bell states (*loc. cit.*, p. 360) he had received from Prof. Seguenza a series of what the latter authority considered the typical Sicilian form of this species, a close examination of which enabled both Wood and himself to correlate the Italian and Crag shells.

By what seems to have been an unfortunate mistake a somewhat different or incorrectly drawn shell was published in Philippi's work which does not altogether agree with the *T. bullatus* of Seguenza, Wood and Bell.

Trochus (Calliostoma) cingulatus (Brocchi). Plate LVIII, fig. 4.

1814. *Trochus cingulatus*, Brocchi, *Conch. foss. subap.*, vol. ii, p. 351, pl. v, fig. 15.
 1836—48. *Trochus cingulatus*, Philippi, *Enum. Moll. Sic.*, vol. i, p. 175, 1836; vol. ii, p. 149, 1844; in Martini und Chemnitz, *Conch. Cab.*, ed. 2 (*Trochus*), p. 67, no. 64, pl. xiii, fig. 12, 1848.
 1874—76. *Trochus (Zizyphinus) cingulatus*, Seguenza, *Boll. R. Com. Geol. Ital.*, vol. v, p. 8, no. 439, 1874; vol. vii, p. 182, no. 726, 1876.
 1889. *Calliostoma zizyphinum*, var. *cingulata*, Tryon, *Man. Conch.*, vol. xii, p. 389, pl. xiii, fig. 12.
 1889. *Zizyphinus cingulatus*, Carus, *Prod. Faun. Medit.*, vol. ii, p. 257.
 1889—96. *Trochus cingulatus*, Sacco, *Boll. Soc. Geol. Ital.*, vol. viii, p. 349, no. 1797, 1889; *Calliostoma (Ampullotrochus?) cingulatus*, *Moll. Terr. Terz. Piem.*, pt. xxi, p. 45, pl. iv, fig. 46, 1896.
 1916. *Calliostoma cingulatum*, Cerulli-Irelli, *Palaeont. Ital.*, vol. xxii, p. 193, pl. xxii, figs. 1—5.

Specific Characters.—Shell conical, imperforate, whorls flat or slightly concave, ornamented by fine, but clearly cut concentric ridges, those nearest the suture being stronger and obscurely granulate; base flattened, striated, acutely marginate; mouth oblique, rhomboidal, angulated by the basal keel; inner lip reflected obliquely on the pillar.

Dimensions.—H. 14—20 mm. B. 12—15 mm.

Distribution.—*Recent*: Sicily, Adriatic.

Fossil: St. Erth? Coralline Crag: Gedgrave, Sutton, Ramsholt.

Waltonian: Walton-on-Naze, Little Oakley. Butleyan: Butley.

Miocene: Italy—Elveziano, Tortoniano.

Pliocene: Piacenziano, Astiano (abundant).

Pleistocene: Livorno, Valle Biaia, Gravina, Monte Pellegrino.

Remarks.—Imperfect specimens of *T. cingulatus* are not uncommon at Oakley, and there is another one, perfect, in Major Moore's collection from the Coralline Crag of Ramsholt which nearly corresponds with Brocchi's figure of that species. The one here figured is from Butley and belongs to the Sedgwick Museum. The

spiral ridges are finer in *T. cingulatus* than in *T. conuloides*, and the spire is longer in proportion to the length of the shell.

It does not seem to be a common Mediterranean species but it is reported as recent by Philippi and Dr. Carus from Sicily and the Adriatic. Prof. Sacco says it is very abundant as a fossil in the Astian deposits of Piacenza, and Seguenza gives it from several Pleistocene localities in Italy and Sicily. It is a stronger shell than *T. conulus*, with coarser ridges continuous from base to summit, whereas in the latter species the sculpture is confined to the upper whorls.

Trochus (Calliostoma) conulus (Linné). Plate LVIII, figs. 5, 6.

1758. *Trochus conulus*, Linné, Syst. Nat., ed. x, p. 759, no. 519.
 1836—44. *Trochus conulus*, Philippi, Enum. Moll. Sic., vol. i, p. 175, 1836; vol. ii, p. 149, pl. xxviii, fig. 6, 1844.
 1848. *Trochus conulus*, S. V. Wood, Mon. Crag Moll., pt. i, p. 125, pl. xiii, fig. 5.
 1853. *Trochus conulus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 495, pl. lxxiii, figs. 1, 2.
 1871. *Trochus zizyphinus*, var., Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 146.
 1872. *Trochus conulus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1874—76. *Trochus (Zizyphinus) conulus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 438; p. 332, no. 149, 1874; vol. vii, p. 182, no. 727, 1876.
 1874—79. *Trochus conulus*, Van den Broeck, Ann. Soc. malac. Belg., vol. ix, p. 356, 1874; vol. xiv, p. 71, 1879.
 1884. *Zizyphinus conulus*, Monterosato, En. Nom. Gen. e Spec. Conch. Medit., p. 44.
 1885. *Trochus (Zizyphinus) conulus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 349, pl. xlii, figs. 1—3.
 1889. *Zizyphinus conulus*, Carus, Prod. Faun. Medit., vol. ii, p. 256.
 1889—96. *Trochus conulus*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 349, no. 1798, 1889; *Calliostoma conulum*, Moll. Terr. Terz. Piem., pt. xxi, p. 41, pl. iv, fig. 30, 1896.
 1892. *Zizyphinus conulus*, Locard, Coq. mar. Côtes de France, p. 205, fig. 181.
 1896. *Trochus conulus*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), p. 129.
 1901—7. *Calliostoma conulum*, Scalia, Att. Accad. Gioen. Sc. Nat. Catania [4], vol. xiv, p. 12, no. 109, 1901; vol. xx, p. 30, no. 171, 1907.
 1916. *Calliostoma conulum*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 190, pl. xxi, figs. 30—32.

Specific Characters.—Shell smooth and polished, elongato-conical, less solid than *T. conuloides*; whorls about 10, flat, the upper ones ornamented by exceedingly fine granulate ridges, the lower ones without sculpture or by obsolete and inconspicuous spiral lines, with a raised ridge at the base of the whorls; base flat, obtusely carinated, imperforate, obscurely and concentrically ridged, especially at the centre; mouth subquadrangular, oblique, angulated by the keel; columella flexuous, with a swelling at the base.

Dimensions.—H. 20—24 mm. B. 15—18 mm.

Distribution.—*Recent*: Mediterranean, Adriatic, west European coasts to the Azores, Madeira and the Canaries.

Fossil: Coralline Crag: Gedgrave, Ramsholt. Waltonian: Walton-on-Naze, Little Oakley.

Lower Pliocene: Piacenziano, Piedmont.

Upper Pliocene: Belgium—Casterlien, Scaldisien. Italy—Asti, Livorno, Orciano, Altavilla, Messina, Castroreale.

Pleistocene: Monte Pellegrino, Ficarazzi, Messina, Catania, Reggio, Sciacci, San Giovanni, Monteleone, Taranto, Gravina, Livorno.

Remarks.—This Mediterranean and southern shell was reported from the Coralline Crag of Ramsholt by Wood, from Walton by Prof. Kendall, and I have found some imperfect specimens at Oakley which seem to be the same; one of them shows the fine and granulated transverse ridges which are characteristic of this species but are generally confined to the upper whorls. In Wood's drawing the artist has not shown the special sculpture very clearly. I have therefore figured a recent specimen received from the Stazione Zoologica at Naples for comparison with a fossil from Antwerp and as a guide for future collectors.

The shell described and figured by Hörnes from the Miocene deposits of Vienna under the present name¹ is stronger and shorter in the spire than the recent *T. conulus* or than that from the Italian Pleistocene, resembling more nearly in form but not in size the Crag *T. conuloides*, var. *lævigata*.

The typical *T. conulus* is a rather small, polished and delicately sculptured shell, with an acute spire, the lower whorls being generally without or with inconspicuous sculpture, the upper ones only being covered with closely set and excessively fine granulate ridges.

Jeffreys considered that the specimen figured by Wood under the present name was a ridged variety of *T. zizyphinus*.

Var. **subangulata**, Bucquoy, Dautzenberg et Dollfus. Plate LVIII, fig. 7.

1885. *Trochus (Calliostoma) conulus*, var. *subangulata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 351, pl. xlii, fig. 4.

1916. *Calliostoma conulus*, var. *subangulata*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 191, pl. xxi, figs. 33—36.

Varietal Characters.—Shell somewhat smaller than the type, the marginal ridges being less prominent, in consequence of which the base of the last whorl and the periphery are rounded or subangulate rather than distinctly keeled.

Dimensions.—H. 16 mm. B. 12 mm.

Distribution.—Recent: Roussillon.

Fossil: Coralline Crag: Orford.

Remarks.—The present specimen, obtained from one of the Coralline Crag pits near Orford, belongs to the Sedgwick Museum. It presents the characteristic features of the typical *T. conulus*, but the base of the last whorl is rounded or subangulate and not keeled, owing to the sutural ridges being less prominent.

¹ 'Foss. Moll. Tert. Wien,' vol. i, p. 453, pl. xlv, fig. 8.

Trochus (Calliostoma) noduliferens (S. V. Wood). Plate LVIII, figs. 8, 9.

- 1842—74. *Trochus granosus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 531, 1842; *T. papillosus*, Mon. Crag Moll., pt. i, p. 126, pl. xiii, fig. 6 a, 1848; *T. noduliferens*, 1st Suppl., pt. i, p. 81, 1872; pt. ii, p. 210, 1874.
1871. *Trochus papillosus* (Wood, not Da Costa), Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 492.
1872. *Trochus granosus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 210.
1881. *Trochus noduliferens*, Nyst, Conch. Terr. tert. Belg., p. 102, pl. vi, fig. 27 a.
1886. *Trochus noduliferens*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
1890. *Trochus noduliferens*, C. Reid, Plioc. Dep. Brit., p. 258.
1892. *Trochus noduliferens*, Van den Broeck, Bull. Soc. Belg. Géol., vol. vi (Mémoires), pp. 123, 147.
1896. *Trochus noduliferens*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), p. 131.
1898. *Trochus (Calliostoma) noduliferens*, A. Bell, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 256.

Specific Characters.—Shell of moderate size, imperforate, subconical, fairly solid; whorls 7 or 8, convex, regularly diminishing in size towards a blunt apex, the last expanded, about half the total length; ornamented by four or five principal spiral ridges, all of them distinctly granulate, with some smaller ones in the interspaces; suture well marked, without a distinct supra-sutural ridge; base striated, obtusely angulate, not so much rounded as in *T. bullatus*; mouth oblique, sub-rhomboidal; outer lip thin; inner lip reflected on the columella, which is flexuous; there is a slight depression behind the latter, with a rudimentary umbilicus.

Dimensions.—H. 16—20 mm. B. 18—24 mm.

Distribution.—Not known living.

Fossil: St. Erth. Waltonian Crag: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Sutton, Waldringfield, Foxhall, Newbourn, Rams-holt, Felixstow. Butleyan: Bawdsey, Hollesley, Butley.

Scaldisien, Poederlien: Belgium.

Remarks.—Some amount of difficulty exists as to the correct nomenclature of the different forms of a group of fossils specially characteristic of the Red Crag and the Scaldisien of Belgium, of which those figured under the present name may be taken as examples. They are abundant in the Waltonian Crag of Walton and Oakley; most of the specimens from those localities in my collection maintain throughout a similar character in form and sculpture.

Recognising that it was neither the *T. granosus* of Linné, nor the *T. papillosus* of Da Costa, the latter being the equivalent of *T. granulatus*, Born, Wood described it in 1872 as a new species, *T. noduliferens*. It may be distinguished by the absence of any strong supra-sutural ridge, as in some other forms of this group, by its wide and granulated base, its somewhat convex whorls, and the distinct and continuous granulation of its transverse sculpture. My Oakley specimens agree with that figured by Wood in 1848 (*op. cit.*, pl. xiii, fig. 6 a) as *T. papillosus*. One of Nyst's figures of *T. noduliferens* (1881) is not satisfactory, but the artist may have failed to grasp the special characteristics of the shell

submitted to him. I have given, however, an example from my own collection (Pl. LVIII, fig. 9) obtained some years ago which may more accurately represent the Belgian type of this species.

Trochus (Calliostoma) millegranus (Philippi). Plate LVIII, figs. 10, 11.

- 1836—44. *Trochus millegranus*, Philippi, Enum. Moll. Sic., vol. i, p. 183, pl. x, fig. 25, 1836; vol. ii, p. 154, 1844.
1848. *Trochus millegranus*, S. V. Wood, Mon. Crag Moll., pt. i, p. 127, pl. xiii, fig. 1.
1853. *Trochus millegranus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 502, pl. lxvi, figs. 9, 10.
- 1867—71. *Trochus millegranus*, Jeffreys, Brit. Conch., vol. iii, p. 325, 1867; vol. v, p. 204, pl. lxiii, fig. 4, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 146, 491, 1871.
- 1870—71. *Trochus millegranus*, A. Bell, Journ. de Conch., vol. xviii, p. 352, no. 408, 1870; Ann. Mag. Nat. Hist. [4], vol. viii, p. 360, 1871.
1872. *Trochus millegranus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210.
1874. *Trochus millegranus*, Van den Broeck, Ann. Soc. malac. Belg., vol. ix, p. 119.
- 1874—76. *Trochus (Zizyphinus) millegranus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 447; p. 332, no. 152, 1874; *T. (Zizyphinus) miliaris*, vol. vii, p. 182, no. 730, 1876.
1878. *Conulus millegranus*, G. O. Sars, Moll. Reg. arct. Norv., pp. 143, 358.
1886. *Trochus miliaris*, var. *precedens*, Dollfus et Dautzenberg, Feuille des Jeunes Natur., vol. xvi, p. 141.
1889. *Trochus millegranus*, Carus, Prod. Faun. Medit., vol. ii, p. 260.
1890. *Trochus millegranus*, C. Reid, Plioc. Dep. Brit., p. 258.
1892. *Trochus millegranus*, Præger, Proc. R. Irish Acad. [3], vol. ii, p. 260.
1896. *Trochus miliaris*, var. *millegranus*, Sacco, Moll. Terr. Terz. Piem., pt. xxi, p. 44, pl. iv, fig. 42.

Specific Characters.—Shell small, conical, imperforate, somewhat flattened at the base, regularly tapering to a fine point; whorls nearly flat, ornamented by exceedingly fine granulated ridges, with rather stronger ones at the suture, obliquely striated near the apex on the lines of growth; suture slight; mouth oblique, subquadrangular. Sculpture much more delicate than that of *T. multi-granus*.

Dimensions.—H. 8—10 mm. B. 8—10.

Distribution.—*Recent*: coasts of Great Britain including Scotland and Ireland. Sweden, Norway from the Christiania Fiord to the Lofoten Islands. Mediterranean, Ægean, Atlantic, coasts of France, Spain and Portugal.

Fossil: Coralline Crag: Sutton. Waltonian: Walton-on-Naze, Beaumont. Ireland: estuarine clays.

Miocene: Belgium, Touraine, Italy.

Pliocene: Biot, Italy, Sicily.

Pleistocene: Sicily, Calabria, Christiania Fiord—*Tapes*-banks.

Remarks.—This shell, having rather an extended range as a recent form in British, west European and Mediterranean waters, reported also as a fossil from certain Miocene, Pliocene and Pleistocene deposits of the Continent, is not very

abundant in the English Crag. I have only one specimen in my collection, which I obtained from the Waltonian of Beaumont and is here figured.¹ *T. millegranus* may be distinguished from *T. multigranus* by its size and its more delicate sculpture, well shown in Philippi's type figure (*op. cit.*). The recent shell *Trochus miliaris*, though allied to the Crag forms, is, I consider, a different species.

Trochus (Calliostoma) multigranus (S. V. Wood). Plate LVIII, figs. 12, 13.

- 1842—48. *Trochus asperulus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 531, 1842; *T. multigranus*, Mon. Crag Moll., pt. i, p. 127, pl. xiii, fig. 3, 1848.
 1871. *Trochus multigranus*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 360.
 1871. *Trochus Dekini*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 492.
 1872. *Trochus multigranus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210.
 1874. *Trochus multigranus*, Van den Broeck, Ann. Soc. malac. Belg., vol. ix (Mémoires), p. 260.
 1881. *Trochus multigranus*, Nyst, Conch. Terr. tert. Belg., p. 105, pl. vi, fig. 30 (*T. millegranus* in plate).
 1890. *Trochus multigranus*, C. Reid, Plioc. Dep. Brit., p. 258.

Specific Characters.—Shell somewhat larger than *T. millegranus*, imperforate, conical; whorls slightly convex, ornamented by concentric ridges, strongly and continuously granulated, the granulations extending to the base, which is obtusely angulated and covered with transverse lines; columella oblique with an obsolete tooth.

Dimensions.—H. 8—12 mm. B. 8—10 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Boyton, Orford. Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Waldringfield, Sutton. Butleyan: Butley. Scaldisien: Antwerp.

Remarks.—This shell, which was regarded as a distinct species by Wood, Nyst and the brothers Bell, was identified by Jeffreys with the Belgian *Dekini* (*Dekinii* of Nyst), a form without the strongly granulate sculpture generally accepted as a characteristic feature of *T. multigranus*; Jeffreys' view, moreover, has not been accepted by any other British or Belgian authority. One of the specimens of the latter here represented is from the Coralline Crag of Boyton (Jermyn Street Collection). The other, from the York Museum, was obtained at Waldringfield. Both these I take to be typical, as are those figured by Wood (*op. cit.*, pl. xiii, fig. 3), and by Nyst in 1881 (pl. vi, fig. 30), named by mistake *T. millegranus*. In his text, p. 105, the latter, however, gives this specimen correctly as *T. multigranus*.

¹ There are several, however, from Sutton in the Norwich Museum.

Trochus (Calliostoma) occidentalis (Mighels and Adams). Plate LVIII, figs. 14, 15.

1842. *Trochus occidentalis*, Mighels and Adams, Bost. Journ. Nat. Hist., vol. iv, p. 47, pl. iv, fig. 16.
 1842—48. *Trochus quadricinctus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 531, 1842;
T. formosus, Mon. Crag Moll., pt. i, p. 125, pl. xiii, fig. 2, 1848.
 1847. *Trochus formosus*, E. Forbes, Ann. Mag. Nat. Hist. [1], vol. xix, p. 96, pl. ix, fig. 1.
 1853. *Trochus alabastrum*, Forbes and Hanley, Brit. Moll., vol. ii, p. 497, pl. lxvi, figs. 7, 8 (*T. formosus* in Plate).
 1865—71. *Trochus occidentalis*, Jeffreys, Brit. Conch., vol. iii, p. 333, 1865; vol. v, p. 204, pl. lxii, fig. 7, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 146, 491, 1871.
 1870. *Trochus occidentalis*, Gould and Binney, Rep. Inv. Mass., vol. ii, p. 286, fig. 548.
 1872. *Trochus occidentalis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210, 214.
 1878. *Trochus occidentalis*, G. O. Sars, Moll. Reg. arct. Norv., pp. 142, 358, pl. ix, fig. 7.
 1879. *Trochus occidentalis*, Van den Broeck, Ann. Soc. malac. Belg., vol. xiv, p. 47.
 1881. *Trochus occidentalis*, Nyst, Conch. Terr. tert. Belg., p. 104, pl. vii, fig. 5.
 1890. *Trochus formosus*, C. Reid, Plioc. Dep. Brit., p. 258.
 1896. *Trochus occidentalis*, Bernays, Bull. Soc. Belge Géol., vol. x (Mémoires), p. 129.
 1901. *Trochus occidentalis*, Friele og Grieg, Norske Nordh. Exped., vol. iii, p. 65.
 1912. *Calliostoma occidentale*, Odhner, K. Svensk. Vet.-Akad. Handl. Stockholm, vol. xlvi, p. 49, pl. iii, figs. 24, 25.
 1915. *Calliostoma occidentale*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii; Faun. New Engl., no. 13, p. 90.

Specific Characters.—Shell of medium size, imperforate, pyramidal, solid; whorls about 7, somewhat convex; ornamented by well-marked spiral ridges, the upper one on each whorl being more or less distinctly granulate; the ridges on the body whorl are further apart than the others and are smooth or indistinctly lineated in the intervening spaces; spire regularly conical, ending in a sharp point; suture slightly channelled; base rounded, obtusely angulate, generally with fine lines immediately below the periphery and, separated from them, 3 or 4 stronger ones on the umbilical area; mouth subcircular, angulated above, expanded below; outer lip thin, indented by the spiral ridges; inner lip reflected on the pillar.

Dimension.—H. 10—15 mm. B. 10—15 mm.

Distribution.—*Recent*: Aberdeenshire, Shetland, Orkneys, the Hebrides, Dogger Bank, Norwegian coast from Finmark to the Christiania Fiord, Lofoten Islands, The Minch, Murman coast, Kola, Greenland, Canadian and New England coasts.

Fossil: Coralline Crag: Sutton, Gedgrave, Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Sutton, Waldringfield. Butleyan: Hollesley, Butley. Icenian: Bramerton.

Casterlien, Scaldisien: Antwerp. Pliocene: Calabria, San Giovanni.

Remarks.—In 1847 Prof. Ed. Forbes described and figured under the name of *Trochus formosus* a recent and very distinct shell, which was afterwards identified by Jeffreys with the northern and American species *T. occidentalis*, Mighels and Adams—an earlier name than the latter. Through the kindness of Dr. W. H. Dall,

of the Smithsonian Institution, who has sent me a recent and typical specimen of the American variety for comparison, I am able to discuss Jeffreys' determination, which has been largely adopted by English and continental authorities. The species is reported as a fossil, though not an abundant one, at many Crag localities, from the Coralline to the Icenian and occasionally from Belgium, Italy and elsewhere.

The recent form is easily recognised by its glossy and semitransparent texture. Usually the spiral granulation of the ridges is confined to the upper one or two on each whorl, those on the last being polished, smooth and rather distant. By some of the writers quoted above this granulation is not clearly shown, but it seems to be a feature which, although not always present, should be noted.

I ought to state that Dr. Dall doubts whether the American and European forms are the same species. They are at least closely allied.

Trochus (Calliostoma) Laugieri (Payraudeau). Plate LVIII, figs. 16, 17.

1826. *Trochus Laugieri*, Payraudeau, Moll. Corse, p. 125, pl. vi, figs. 3, 4.
 1826. *Trochus violaceus*, Risso, Hist. nat. Europ.-merid., vol. iv, p. 127, pl. viii, fig. 111.
 1836—48. *Trochus Laugieri*, Philippi, Enum. Moll. Sic., vol. i, p. 175, 1836; vol. ii, p. 150, 1844; Conch. Cab., ed. 2 (*Trochus*), p. 68, no. 66, pl. xiii, fig. 14, 1848.
 1874. *Trochus (Zizyphinus) Laugieri*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 440.
 1878. *Trochus (Zizyphinus) Laugieri*, Monterosato, Giorn. Soc. Sci. Nat. Palermo, vol. xiii, p. 81.
 1880. *Trochus conulus*, var. *Laugieri*, Fischer, in Kiener, Icon. Coq. viv., vol. ii (*Trochus*), p. 123, pl. xlix, fig. 4.
 1885. *Trochus (Zizyphinus) Laugieri*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 353, pl. xlii, figs. 10—14.
 1889. *Calliostoma Laugieri*, Tryon and Pilsbury, Man. Conch., vol. xi, p. 392, pl. lxx, figs. 80—90.
 1889. *Zizyphinus Laugieri*, Carus, Prod. Faun. Medit., vol. ii, p. 257.
 1892. *Zizyphinus Laugieri*, Locard, Coq. mar. Côtes de France, p. 206.
 1901—7. *Calliostoma Laugieri*, Scalia, Atti Accad. Gioen. Sci. Nat. Catania [4], vol. xiv, p. v, 1901; vol. xx, p. 30, 1907.

Specific Characters.—Shell conical, imperforate, smaller than *T. conulus*, with a less prominent sutural ridge; whorls 6 or 7, 2 or 3 of the upper ones usually ornamented by exceedingly fine transverse lines, the lower ones smooth and polished; base very slightly convex, obscurely striated, angulate; mouth oblique, subquadrangular; outer lip thin; columella flexuous, tubercular at the base.

Dimensions.—H. 8—10 mm. B. 7—9 mm.

Distribution.—*Recent*: Mediterranean, Adriatic, Ægean. Atlantic coast—Vigo to the Azores.

Fossil: Coralline Crag: Sutton.

Pleistocene: Ficarazzi, Catania, San Giovanni (Calabria).

Remarks.—This small shell, allied to *T. conulus* but much smaller, has generally been regarded as a distinct species. Its sculpture is variable, but it may be

usually distinguished by its size and sutural ridge, which is more delicate than that of *T. conulus*. Dr. Fischer considers it equivalent to *T. dubius*, but this is also a larger form, intermediate in size between the two.

Dr. Scalia reports it from the sub-Etnaen deposits of Catira, Nizzeti and San Paulo near Catania.

One of the specimens now figured is from the Coralline Crag of Sutton. I noticed it when examining the Wood Collection in the Castle Museum at Norwich, where it had been labelled *T. conulus*. The other (fig. 17), for which I have to thank the Marchese di Monterosato, is a recent one. As far as I know, this species had not been found before in our Crag deposits. A search for it should be made in the Coralline Crag, especially in seams of small shells like that at Sutton.

Trochus (Calliostoma) exasperatus (Pennant). Plate LVIII, fig. 18.

1777. *Trochus exasperatus*, Pennant, Brit. Zool., vol. iv, p. 126.
 1846. *Trochus exasperatus*, E. Forbes, Mem. Geol. Surv., vol. i, p. 96.
 1853. *Trochus exiguus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 505, pl. lxvi, figs. 11, 12.
 1865—83. *Trochus exasperatus*, Jeffreys, Brit. Conch., vol. iii, p. 324, 1865; vol. v, p. 203, pl. lxiii, fig. 3, 1869; *T. zizyphinus exasperatus*, Proc. Zool. Soc., p. 105, 1883.
 1874—76. *Trochus exasperatus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 442, 1874; vol. vii, p. 184, no. 736, 1876.
 1878—84. *Trochus (Zizyphinus) Matoni*, Monterosato, Enum. e Sinon., p. 22, 1878; *Zizyphinus (Jujubinus) Matonii*, Nom. Gen. e Spec. Conch. Medit., p. 46.
 1889. *Zizyphinus exiguus*, Carus, Prod. Faun. Medit., vol. ii, p. 259.
 1892. *Zizyphinus exasperatus*, Locard, Coq. mar. Côtes de France, p. 207.
 1892. *Trochus exasperatus*, A. Bell, Rep. Yorks. Phil. Soc., p. 63.
 1896. *Trochus (Jujubinus) exasperatus*, Sacco, Moll. Terr. Terz. Piem., pt. xxi, p. 47, pl. iv, fig. 51.
 1901. *Calliostoma exasperatum*, Conch. Soc. List, Journ. of Conch., vol. x, p. 17, no. 302.
 1916. *Calliostoma (Jujubinus) exasperatum*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 198, pl. xxii, figs. 21—25.

Specific Characters.—Shell small, slender, imperforate, solid, pyramidal, elongato-conical, resembling *T. striatus* in general shape, but the sculpture is granulate and especially strong at the base of each whorl, where the intersecting lines are oblique; base flattened, angulate, concentrically ridged.

Dimensions.—L. 9 mm. B. 6 mm.

Distribution.—*Recent*: British coasts—southern and western. France, Portugal, Spain, Mediterranean, Ægean, Madeira, Canaries, Azores, Black Sea.

Fossil: Wexford, Selsey.

Miocene: Italy, Tortonian.

Pliocene: Monte Mario, Biot, Caltabiano, Reggio, Messina, Piacenziano, Astiano.

Pleistocene: Ficarazzi, Monte Pellegrino, San Giovanni, Reggio.

Remarks.—The specimen of this charming little shell belongs to the York

Museum, having been found at Selsey. It is nearly allied to *T. striatus* and might almost be regarded as a variety of that form. It differs from the latter in its sculpture, however, and is more generally regarded as specifically distinct. It is very rare as a British fossil.

Trochus (Calliostoma) Montagu (W. Wood). Plate LIX, figs. 1, 2.

1828. *Trochus Montagu*, W. Wood, Ind. Test., Suppl., pl. vi, fig. 43.
 1853. *Trochus Montagu*, Forbes and Hanley, Brit. Moll., vol. ii, p. 511, pl. lxxv, figs. 10, 11.
 1865. *Trochus Montacuti*, Jeffreys, Brit. Conch., vol. iii, p. 320, pl. lxxiii, fig. 1.
 1874. *Trochus (Zizyphinus) Montacuti*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 449.
 1881. *Trochus Montacuti*, Nyst, Conch. Terr. tert. Belg., p. 109, pl. vii, fig. 3.
 1889. *Zizyphinus Montagu*, Carus, Prod. Faun. Medit., vol. ii, p. 260.
 1892. *Zizyphinus Montagu*, Locard, Coq. mar. Côtes de France, p. 207.
 1901. *Calliostoma montagu*, Conch. Soc. List, Journ. of Conch., vol. x, p. 17, no. 300.
 1916. *Calliostoma (Jujubinus) Montagu*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 201, pl. xxii, fig. 39.

Specific Characters.—Shell small, conical, solid, imperforate; whorls 6 or 7, flattened, with a slight angularity below the suture, gradually enlarging, the last obtusely keeled; spire elongated, ornamented by well-marked spiral ridges, indistinctly crossed by oblique and delicate striæ, specially shown in the interstices between the spiral rows, similar sculpture being continuous to the base of the shell; mouth subquadrate, about one-third the total length.

Dimensions.—H. 8 mm. B. 6 mm.

Distribution.—*Recent*: British coasts, rather common in Guernsey and the west of Scotland. Belgium, Atlantic coasts of France, Spain and Portugal. Gibraltar. Mediterranean—Gulf of Lyons, Ajaccio, Malta, Sicily, Algiers, Tunis, Crete.

Fossil: Pliocene: Belgium (Scaldisien). Italy—Monte Mario, Farnesina.

Pleistocene: Scotland, Garvel Park. Italy—Livorno, Taranto, Reggio. Sicily—Monte Pellegrino.

Remarks.—One of the specimens figured under this name (Plate LIX, fig. 2) was noticed by Mr. A. Bell in a consignment of small stuff from Garvel Park sent to him by Mr. Kennard. The other (fig. 1), with which it closely corresponds, I received from M. Dautzenberg as a typical example of the recent shell *T. Montagu* of W. Wood. It should be pointed out, however, that both these differ widely from the one figured by his namesake, S. V. Wood, as *T. Montacuti* (*op. cit.*, pl. xiv, fig. 1), for which on p. 736 I am proposing the name *T. Woodii*. Indeed, in Prestwich's paper of 1871 ('Quart. Journ. Geol. Soc.,' vol. xxvii, pp. 146, 491), Jeffreys had expressed the opinion that Wood's identification was a doubtful one, while the latter author, in his original description, points out that the form in question bears a great resemblance to some varieties of *T. Adansoni*.

Trochus (Calliostoma) elenchoides (Issel). Plate LIX, fig. 3.

1878. *Trochus striatus*, var. *elenchoides*, Issel, *Croc. del Violante*, p. 436, figs. 6, 7.
 1883. *Trochus elenchoides*, Dautzenberg, *Journ. de Conch.*, vol. xxxi, p. 307.
 1884. *Jujubinus elenchoides*, Monterosato, *Nom. Gen. e Spec. Conch. Medit.*, p. 47.
 1885. *Trochus striatus*, var. *elenchoides*, Bucquoy, Dautzenberg et Dollfus, *Moll. mar. Rouss.*, vol. i, p. 368, pl. xliii, figs. 20, 25.
 1889. *Trochus elenchoides*, Carus, *Prod. Faun. Medit.*, vol. ii, p. 259.
 1898. *Trochus (Calliostoma) elenchoides*, A. Bell, *Trans. Roy. Geol. Soc. Cornwall*, vol. xii, p. 155.
 1916. *Calliostoma (Jujubinus) elenchoides*, Cerulli-Irelli, *Palaeont. Ital.*, vol. xxii, p. 200, pl. xxii, fig. 38.

Specific Characters.—Shell of medium size, slender, conical, imperforate; whorls nearly flat, compressed towards the apex, slightly rounded at the periphery, with a metallic lustre, apparently smooth but showing under a lens very fine spiral striæ with numerous diagonal lines of growth; spire slender; base spirally ridged.

Dimensions.—L. 12 mm. B. 8 mm.

Distribution.—*Recent*: coasts of Barbary.

Fossil: St. Erth. Monte Mario.

Remarks.—This shell, rare as recent, has been found at St. Erth, from which place two imperfect specimens, now in the Sedgwick Museum, have been obtained. It is specially characterised by the metallic lustre of the whorls, similar to that to be observed in the genus *Elenchus*, with which sometimes it has been grouped. It may be important to notice that few of the species of *Trochus* characteristic of and abundant in the Red Crag, have been reported from St. Erth.

Trochus (Calliostoma) striatus (Linné). Plate LIX, figs. 4, 5.

1766. *Trochus striatus*, Linné, *Syst. Nat.*, ed. xii, p. 1230.
 1853. *Trochus striatus*, Forbes and Hanley, *Brit. Moll.*, vol. ii, p. 508, pl. lxvi, figs. 5, 6.
 1859. *Trochus striatus*, G. B. Sowerby, *Ill. Ind. Brit. Shells*, pl. xi, fig. 13.
 1865—69. *Trochus striatus*, Jeffreys, *Brit. Conch.*, vol. iii, p. 322, 1865; vol. v, p. 203, pl. lxiii, fig. 2, 1869.
 1870—92. *Trochus striatus*, A. Bell, *Journ. de Conch.*, vol. xviii, p. 352, no. 413, 1870; *Rep. Yorks. Phil. Soc.*, p. 63, 1892.
 1874—76. *Trochus (Zizyphinus) striatus*, Seguenza, *Boll. R. Com. Geol. Ital.*, vol. v, p. 8, no. 444, 1874; vol. vii, p. 184, no. 734, 1876.
 1878. *Trochus (Zizyphinus) striatus*, Monterosato, *Enum. et Sinon. Conch. Medit.*, p. 22.
 1885. *Trochus striatus*, Bucquoy, Dautzenberg et Dollfus, *Moll. mar. Rouss.*, vol. i, p. 365, pl. xliii, figs. 8—15.
 1886. *Trochus striatus*, Dollfus et Dautzenberg, *Feuille des Jeunes Natur.*, vol. xvi, p. 141.
 1889. *Zizyphinus striatus*, Carus, *Prod. Faun. Medit.*, vol. ii, p. 258.
 1892. *Zizyphinus striatus*, Locard, *Coq. mar. Côtes de France*, p. 206, fig. 182.
 1896. *Trochus (Jujubinus) striatus*, Sacco, *Moll. Terr. Terz. Piem.*, pt. xxi, p. 48, pl. iv, fig. 55.
 1901. *Calliostoma striatum*, *Conch. Soc. List, Journ. of Conch.*, vol. x, p. 17, no. 301.
 1916. *Calliostoma (Jujubinus) striatus*, Cerulli-Irelli, *Palaeont. Ital.*, vol. xxii, p. 198, pl. xxii, figs. 26—37.

Specific Characters.—Shell small, conical, solid, more or less flattened below; whorls 7, also flattened, the lower ones ornamented by 8 or 9 fine spiral ridges, the last being prominent, decreasing in number towards the apex; spire slender, elevated; suture inconspicuous but increasing in size downwards towards the periphery, where the last ridge forms a basal keel; they are crossed obliquely by delicately imbricated striæ; mouth oblique, squarish, outer lip rather thin; inner lip short, broad and thick, reflected above, notched below by a small tubercular tooth, thickened by an indistinct angulated rib.

Dimensions.—L. 9 mm. B. 6 mm.

Distribution.—*Recent*: British coasts, laminarian zone, from low-water mark to 15 fathoms—Channel islands, Dorset, Devon, Cornwall. Cork, Bantry, Dublin Bay. France, Portugal, Spain, Italy, Algeria, Adriatic, Madeira, the Canaries.

Fossil: Waltonian Crag: Oakley.

Miocene: Touraine. Pliocene: Sicily, Italy, Cotentin, Biot. Pleistocene: Selsey, Sicily.

Remarks.—I have a worn specimen from Oakley which seems to correspond with a recent one (fig. 4) which I have received from one of my foreign correspondents as typical of the present species. *T. striatus* is a southern form which has a wide distribution, both in space and time.

Trochus (Calliostoma) incertus, sp. nov. Plate LIX, fig. 6.

1893—98. *Trochus granosus*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.

Specific Characters.—Shell small, conical, solid; whorls convex, ornamented by 5 rows of fine, closely set and rounded ridges, distinctly granulate; suture well marked; base obtusely angulate, covered by fine crenulated spiral lines.

Dimensions.—H. 9 mm. B. 9 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—The imperfect specimen here figured is from the Warburton St. Erth collection at the British Museum (no. 18049), where it is called *Trochus granosus*, a form described but not figured by Lamarck¹ for what was evidently something different. Wood carried on the latter name in his 'Catalogue' of 1842 for a Walton and Mediterranean shell which in his 1st Suppl. of 1872 (*op. cit.*, p. 81, pl. v, fig. 14) he identified with the Crag *T. noduliferens*. To none of these can our St. Erth fossil be satisfactorily referred, and I therefore propose for it the name given above.

¹ 'Hist. Nat. Auim. s. Vert.,' 2nd Ed., vol. xix, p. 137, 1843.

Trochus (Calliostoma) multistriatus (S. V. Wood). Plate LIX, fig. 7.

1886. *Trochus multistriatus*, S. V. Wood in Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.

1898. *Trochus multistriatus*, A. Bell, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 155.

Specific Characters.—Shell having a general resemblance to *T. patulus*, Brocchi, but wanting its deep sutures; whorls 6 or 7, flattened, impressed with delicately incised lines; a slight projection on the inner lip; base striated; no umbilicus (A. Bell).

Dimensions.—H. 5—8 mm. B. 8—10 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—The shell here figured, from the British Museum (no. 18040), has been identified by Mr. A. Bell with that named but not described by Wood. It has a short and flattened spire with exceedingly delicate transverse sculpture reaching to and covering the base, which is obtusely angulated. It has been recorded only from St. Erth, where I am informed it is not very rare.

Sub-genus **GIBBULA**, Leach in Risso, 1826.**Trochus (Gibbula) octosulcatus** (Nyst). Plate LVIII, figs. 19, 20.

1835—81. *Trochus octosulcatus*, Nyst, Rech. Coq. foss. d'Anvers, p. 26, no. 18, pl. iv, fig. 18, 1835; Coq. foss. Terr. tert. Belg., p. 381, no. 325, pl. xxxviii, fig. 1, 1843; Conch. Terr. tert. Belg., p. 107, no. 94, pl. vii, fig. 1, 1881.

1892. *Trochus octosulcatus*, Van den Broeck, Bull. Soc. Belge Géol., vol. vi (Mémoires), pp. 123, 134.

1896. *Trochus octosulcatus*, Bernays, Bull. Soc. Belge Géol., vol. x (Mémoires), p. 131.

Specific Characters.—Shell small, fairly thick and solid, obscurely umbilicate; obtusely conical; whorls 5 or 6, convex, the last much the largest, rapidly diminishing towards a blunt and sometimes flattened apex; ornamented by strong and conspicuous concentric ridges, some of them smaller than the others, which extend continuously over the base to the umbilical region and are more or less distinctly and obliquely granulated and decussated by the lines of growth; suture distinct; base obtusely angulate, flattened; marked by strong prominent ridges which are similarly crenulated; mouth subcircular, angulated above; umbilicus nearly closed, columella flexuous, incurved, with a single tooth.

Dimensions.—H. 10 mm. B. 10 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Little Oakley. Scaldisien, Poederlien; Antwerp.

Remarks.—This species has not been recorded hitherto from the English Crag. Some years ago I found a perfect example at Oakley which at the time I identified as *T. octosulcatus*. Unfortunately it was lost, but I give an imperfect one from that place, figuring with it a specimen of a typical Belgian shell which M. Van de Wouwer kindly sent me for comparison.

Nyst identified the present species with the specimens figured by Wood as *T. Adansoni*,¹ but not with the shell originally described by Payraudeau under that name, pointing out that the spire of the Belgian fossil is more obtuse than that of Payraudeau's shell. I agree that, granting Nyst's figure is correctly drawn, it is not Payraudeau's species. The sculpture of the base and whorls of the typical *T. octosulcatus*, moreover, is strong, prominent and distinctly granulate, the granulation sometimes extending over the whole shell.

MM. Van den Broeck and Bernays give this form under the present name from the Scaldisien of Belgium. I presume they consider it distinct from the recent *T. Adansoni*.

My Oakley fossil, although imperfect, is, I think, the same as the one I received from Antwerp.

Although these shells have an inconspicuous umbilicus they are decidedly of the *Gibbula* type.

Trochus (Gibbula) umbilicaris (Linné). Plate LVIII, figs. 21, 22.

1766. *Trochus umbilicaris*, Linné, Syst. Nat., ed. xii, p. 1229.

1836—44. *Trochus umbilicaris*, Philippi, Enum. Moll. Sic., vol. i, p. 181, 1836; vol. ii, p. 153, 1844.

1874—76. *Trochus umbilicaris*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 452, 1874; vol. vii, p. 184, no. 748, 1876.

1880. *Trochus umbilicaris*, Fischer in Kiener, Coq. viv. (*Trochus*), p. 143, pl. xlvi, fig. 2.

1885. *Trochus (Gibbula) umbilicaris*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 376, pl. xlv, figs. 1—8.

1889. *Gibbula umbilicaris*, Carus, Prod. Faun. Medit., vol. ii, p. 251.

1892. *Gibbula umbilicaris*, Locard, Coq. mar. Côtes de France, p. 209, fig. 185.

1901—7. *Gibbula umbilicaris*, Scalia, Att. Accad. Gioen. Sci. Nat. Catania [4], vol. xiv, p. 6, no. 74, 1901; vol. xx, p. 31, no. 194, 1907.

Specific Characters.—Shell conical, depressed; spire short, rapidly diminishing towards an acute apex; whorls 6 or 7, the last much the largest, slightly convex, suture well marked; base rounded, subangulate, ornamented by fine unequal spiral ridges which extend to the base; umbilicus large, open, deep, angulated; mouth subcircular; outer lip oblique, angulated by the basal keel; columella nearly perpendicular.

Dimensions.—H. 8—12 mm. B. 11—15 mm.

¹ 'Conch. Terr. tert. Belg.', p. 107, 1881.

Distribution.—Recent : Mediterranean.

Fossil : Waltonian Crag : Little Oakley.

Upper Pliocene : Altavilla.

Pleistocene : Messina, Monte Pellegrino, Reggio, Livorno ; sub-Etnaen beds—Nizzeti, Salustro, San Paulo.

Remarks.—This unique and perfect specimen from Oakley is new to our Crag lists. As a Pliocene fossil it has been reported from Altavilla, but it has been found also at several localities in the Italian and Sicilian Pleistocene, including the comparatively recent deposits on the flanks of Mount Etna. It suggests to students of the Crag that the fauna of our deposits is as yet not nearly worked out.¹

Trochus (Gibbula) magus (Linné). Plate LVIII, fig. 23.

1758. *Trochus magus*, Linné, Syst. Nat., ed. x, p. 757.
 1803. *Trochus magus*, Montagu, Brit. Test., pt. i, p. 283.
 1814. *Trochus magus*, Brocchi, Conch. foss. sub-ap., vol. ii, p. 355, no. 404.
 1853. *Trochus magus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 522, pl. lxx, figs. 6, 7.
 1859. *Trochus magus*, Chenu, Man. Conch., vol. i, p. 362, fig. 2688.
 1865—83. *Trochus magus*, Jeffreys, Brit. Conch., vol. iii, p. 305, 1865 ; vol. v, p. 203, pl. lxii, fig. 1, 1869 ; Proc. Zool. Soc., p. 100, 1883.
 1870—92. *Trochus magus*, A. Bell, Journ. de Conch., vol. xviii, p. 352, 1870 ; Ann. Mag. Nat. Hist. [4], vol. viii, p. 49, 1871 ; Rep. Brit. Assoc. (Leeds), p. 417, 1890 ; Rep. Yorks. Phil. Soc., p. 63, 1892.
 1874—76. *Gibbula magus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 470 ; p. 332, no. 159, 1874 ; vol. vii, p. 184, no. 755, 1876.
 1879. *Gibbula magus*, Fontannes, Moll. Plioc. Vallé du Rhone, vol. i, p. 221, pl. xi, fig. 25.
 1885. *Gibbula magus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 373, pl. lxiv, figs. 1—11.
 1889. *Gibbula magus*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 349, no. 1803 ; Moll. Terr. Terz. Piem., pt. xxi, p. 30, pl. iii, fig. 32.
 1889. *Gibbula magus*, Carus, Prod. Faun. Medit., vol. ii, p. 250.
 1892. *Trochus magus*, Praeger, Proc. R. Irish Acad. [3], vol. ii, p. 30.
 1916. *Trochus magus*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 178, pl. xx, fig. 3.

Specific Characters.—Shell solid, opaque, rough, irregularly conical ; ornamented by numerous, irregular, spiral ridges, crossed obliquely by minute closely-set striæ, laminar or imbricated in the interstices, with a stronger ridge on the upper part of the lower whorl ; spire scalariform, rapidly diminishing to an acute point ; whorls 8, convex, the last angulated, expanded, much the largest, with a row of strong rounded tubercular foldings round the upper part of each whorl ; suture strongly marked, deep and channelled ; base rounded, spirally striated ; umbilicus large, deep, grooved internally ; mouth subquadrangular.

¹ The shell figured by Forbes and Hanley as *Trochus umbilicaris*, 'Brit. Moll.' plate lxvi, figs. 1—4, is a different form. In their text, vol. ii, p. 519, moreover, it is described as *T. umbilicatus*, a species which does not occur in the Crag.

Dimensions.—H. 21 mm. B. 26 mm.

Distribution.—*Recent*: British coasts, southern and western. Ireland, west of Scotland, Shetland and the Orkneys, Anglesey, Isle of Man. Coasts of France, Spain, Portugal, Italy, Greece, North Africa, Madeira, Canaries and the Azores. Mediterranean. Adriatic—Dalmatia. S.W. Sweden.

Fossil: Pleistocene: Selsey, Scotland—widely distributed; Dublin, Belfast—estuarine clays. Holocene: Sandwich, Portrush.

Miocene: Italy—Tortoniano.

Pliocene: Biot, Piedmont—Astiano, Piacenziano, Monte Mario, Bologna, Rhone Valley, Altavilla and elsewhere in Italy and Sicily. Pleistocene: widely distributed in Sicily and Calabria.

Remarks.—This widely spread and variable shell, having a range mainly southern, has not been reported hitherto either from St. Erth or the English Crag, though it is rather abundant locally in some of our Pleistocene and Holocene deposits.

I have to thank Dr. Trechmann for the loan of the specimen now figured, which was obtained from the estuarine clays of Belfast.

Trochus (Gibbula) cineroides (S. V. Wood). Plate LVIII, fig. 24.

1842—48. *Trochus cineroides*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 531, 1842; Mon. Crag Moll., pt. i, p. 131, pl. xiv, fig. 8, 1848.

1871. *Trochus cinerarius*, var. (*T. solarium*), Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 491.

1872. *Trochus cineroides*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 210, 214.

1890. *Trochus cinerarius* var., C. Reid, Plioc. Dep. Brit., p. 258.

Specific Characters.—Shell strong, sub-conical; whorls ornamented by fine spiral lines which extend to the base, and are crenulated and slightly convex; spire generally depressed; suture slight; base obtusely angulated; umbilicus large, deep, open; mouth subquadrangular; outer lip thin; inner lip reflected on the pillar with an obsolete projection.

Dimensions.—H. 13—18 mm. B. 15—20 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Foxhall, Sutton, Waldringfield, Newbourn. Butleyan: Butley.

Remarks.—This well-marked form, allied to the recent *T. cinerarius*, but considered by Wood to be a distinct and extinct species, seems to be confined to the Red Crag, being very common at Oakley, where it may be obtained by the hundred, both in the young and the mature state. Jeffreys regarded it as a variety of *T. cinerarius*, identifying it with the *T. solarium* of Nyst—a view I am

unable to accept. It differs from the first-named in its smaller size, its uniformly crenulated sculpture, and its deep and open umbilicus. My figure (Pl. LVIII, fig. 24) of this form closely agrees with that given by Wood in his 'Mon. Crag Moll.' of 1848, pl. xiv, fig. 8 *b*.

Some of my specimens are rather longer in the spire than the typical Oakley variety, as is one of those figured by Wood, *op. cit.*, fig. 8 *a*. I have seen none, however, in the Crag so coarsely granulate as are the latter.

Trochus (Gibbula) cinerarius (Linné). Plate LVIII, figs. 25, 26.

1758. *Trochus cinerarius*, Linné, Syst. Nat., ed. x, p. 758, no. 512.
 1803. *Trochus cinerarius*, Montagu, Test. Brit., pt. i, p. 284.
 1846. *Trochus cinerarius*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 92.
 1848—72. *Trochus cinerarius*, S. V. Wood, Mon. Crag Moll., pt. i, p. 131, pl. xiv, fig. 7, 1848; 1st Suppl., p. 81, 1872.
 1853. *Trochus cinerarius*, Forbes and Hanley, Brit. Moll., vol. ii, p. 516, pl. lxxv, figs. 1, 2, 3.
 1859. *Trochus cinereus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 17.
 1865—84. *Trochus cinerarius*, Jeffreys, Brit. Conch., vol. iii, p. 309, 1865; vol. v, p. 203, pl. lxxii, fig. 3, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 491, 1871; vol. xl, p. 319, 1884.
 1872. *Trochus cinerarius*, F. W. Harmer, Proc. Norf. Norw. Nat. Soc., vol. i, pt. iii, p. 42.
 1872. *Trochus cinerarius*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 210, 214.
 1878. *Gibbula cineraria*, G. O. Sars, Moll. Reg. arct. Norv., p. 140.
 1887. *Trochus cinerarius*, Loricé, Arch. Mus. Teyler [2], vol. iii, p. 122, pl. vi, fig. 24.
 1890. *Trochus cinerarius*, C. Reid, Plioc. Dep. Brit., p. 258.
 1890—2. *Trochus cinerarius*, A. Bell., Proc. Roy. Phys. Soc. Edinb., p. 292, 1890; Rep. Yorks. Phil. Soc., p. 63, 1892.
 1892. *Gibbula cineraria*, Locard, Coq. mar. Côtes de France, p. 212, fig. 186.
 1901. *Gibbula cinerarius*, Brøgger, Norges geol. Undersøgelse, no. xxxi, p. 657, pl. ix, fig. 11.
 1908. *Trochus cinerarius*, Nordmann, Danm. geol. Undersøgelse, vol. ii, pp. 220, 257.
 1912. *Gibbula cineraria*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 43, pl. iii, figs. 4—7.

Specific Characters.—Shell solid, umbilicate, bluntly conical, varying in height; whorls 6 or 7, flattened or but slightly convex; ornamented by numerous fine irregular ridges, which extend to the base, and by oblique lines of growth; base rounded and obtuse; suture generally slight, sometimes channelled; apex blunt; mouth rather large, subcircular; outer lip thin; inner lip thick, reflected on the pillar, slightly thickened in the middle.

Dimensions.—H. 15 mm. B. 15 mm.

Distribution.—*Recent*: British seas, generally diffused. West European—Heligoland. Scandinavian coasts, Finmark, Lofoten Islands, Iceland.

Fossil: Coralline Crag: Boyton. Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Sutton, Waldringfield. Butleyan: Butley.

Pleistocene: Middle Glacial sands—Hopton Cliff, Bridlington, Selsey, March, Kelsey Hill and elsewhere. Scotland—raised beaches, Clyde beds. Ireland—Belfast, etc. Holocene: Portrush.

Flandrien: Ostend. Eemien: Holland. *Tapes*-banks: Christiania, Trondhjem.

Remarks.—This common British shell, belonging to the *Gibbula* group, having a northern range but found also in the west European region, is rare in the earlier horizons of the Crag, being more characteristic of the English Pleistocene than of our Pliocene deposits. I have found but 2 or 3 specimens at Oakley during the work of many years at that prolific locality. The experience of Wood, the brothers Bell and Prof. Kendall elsewhere seems to have been of a similar character. I cannot find any mention of *T. cinerarius* as a Pliocene species in the published lists of Belgian conchologists, but on the other hand it has been reported by Prof. Brøgger and Drs. Nordmann, Øyen and Lorié from the Pleistocene of Ostend, the Vallée gueldroise and the Christiania and Trondhjem fiords.

Jeffreys gives it as a Mediterranean shell, but this view has not been generally accepted, Messrs. Bucquoy, Dautzenberg and Dollfus expressing the opinion that the oceanic form which he associated with it as *T. cinerarius* was different. The *T. cinerarius* of Brocchi and the Italian geologists is also considered another species.

The Oakley *T. cinerarius* is not by any means a handsome shell. It has not the delicate form or sculpture of some other members of this group, and is occasionally misshapen, possibly owing to the conditions under which it lived. The spire of the type varies a good deal in length.

Trochus (Gibbula) Adansoni (Payraudeau). Plate LIX, figs. 8, 9.

1826. *Trochus Adansonii*, Payraudeau, Moll. Corse, p. 127, pl. vi, figs. 7, 8.
 1832. *Trochus varians*, Deshayes, Expéd. scient. Morée, p. 142, pl. xviii, figs. 31—33.
 1835—48. *Trochus Adansonii*, Philippi, Enum. Moll. Sic., vol. i, p. 182, 1836; vol. ii, p. 153, 1844; Martini und Chemnitz, Conch. Cab., ed. 2, *Trochus*, p. 192, no. 233, pl. xxix, figs. 14, 15, 1848.
 1848. *Trochus Adansoni*, S. V. Wood, Mon. Crag Moll., pt. i, p. 129, pl. xiv, fig. 3.
 1871. *Trochus Adansoni* (?), Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 146, 491.
 1872. *Trochus Adansonii*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 214.
 1874—76. *Trochus (Gibbula) Adansonii*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 464, 1874; vol. vii, p. 184, no. 753, 1876.
 1880. *Trochus Adansoni*, Fischer in Kiener, Icon. Coq. viv. (*Trochus*), p. 343, pl. cvii, figs. 1—4.
 1885. *Trochus (Gibbula) Adansoni*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rousa., vol. i, p. 394, pl. xvii, figs. 1—5.
 1888. *Trochus Adansoni*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
 1889. *Gibbula Adansoni*, Carus, Prod. Faun. Medit., vol. ii, p. 249.
 1890. *Trochus Adansoni*, C. Reid, Plioc. Dep. Brit., p. 257, pl. iii, fig. 1.
 1892. *Gibbula Adansoni*, Locard, Coq. mar. Côtes de France, p. 210.
 1897. *Trochus (Gibbula) Adansoni* (?), A. Bell, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 155.
 1900—7. *Gibbula Adansoni*, Scalia, Atti Accad. Gioen. Sci. Nat. Catania [4], vol. xiii, p. 18, no. 152, 1900; vol. xx, p. 31, no. 192, 1907.
 1916. *Gibbula Adansoni*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 183, pl. xxi, figs. 9—11.

Specific Characters.—Shell of medium size, conical, umbilicate, fairly solid; whorls about 6, slightly convex, the last much the largest, obtusely subangular

at the periphery, rounded at the base, ornamented by very fine spiral ridges, generally granulate in the upper whorls, which extend to and cover the base, and by the lines of growth; spire ending in a rather blunt point; suture slightly channelled; mouth subquadrangular; columella somewhat curved, thickened below.

Dimensions.—H. 10—12 mm. B. 10—12 mm.

Distribution.—*Recent*: Mediterranean, Adriatic, Ægean, Black Sea (B.D.D., *op. cit.*).

Fossil: St. Erth. Coralline Crag: Gedgrave, Sutton, Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Waldringfield, Sutton, Newbourn. Butleyan: Butley. Scaldisien: Antwerp.

Lower Pliocene: Monte Mario.

Upper Pliocene: Livorno.

Pleistocene: Messina, Catania, Reggio, Livorno, Vallé Biaia.

Remarks.—The sub-genus *Gibbula*, of which *Trochus (Gibbula) magus* is taken as the type, includes a large conoidal group of the Trochidæ, umbilicate, with whorls more or less convex, the last subangulate, a comparatively short spire, and an oblique and sub-rhomboidal mouth.

Wood's figure of a fossil from the Coralline Crag of Sutton ('Mon. Crag Moll.,' pt. i, pl. xiv, fig. 3), a form he says is common at that locality, seems to correspond sufficiently with an example of the recent *T. Adansonii* I have received from one of my foreign correspondents as typical of that species, especially in its fine and characteristic spiral sculpture, to justify its reference to that species. I have a number of specimens in my possession from Oakley which resemble this recent shell referred to, in form, but for the most part they do not show any spiral markings; possibly these have been removed by erosion. I figure one, however, from Mr. Van de Wouwer's collection found in the Scaldisien of Antwerp, in which this delicate sculpture is clearly shown. The Belgian fossil and the recent shell referred to are figured in my Pl. LIX, figs. 8, 9.

T. Adansonii is reported by Seguenza from a number of Pleistocene and Pliocene localities in Sicily and southern Italy, and by Dr. Scalia from the comparatively recent deposits on the flanks of Mount Etna. Its presence or absence from certain localities of the English Crag may need further investigation.

***Trochus (Gibbula) tumidus* (Montagu).** Plate LIX, figs. 10, 11.

1803. *Trochus tumidus*, Montagu, Test. Brit., pt. i, p. 280, pl. x, fig. 4.

1833. *Trochus nitens*, S. Woodward, Geol. Norf., p. 44, pl. iii, fig. 10.

1842—72. *Trochus tumidus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 532, 1842; Mon. Crag Moll., pt. i, p. 130, pl. xiv, fig. 2, 1848; 1st Suppl., pt. i, p. 81, 1872.

1853. *Trochus tumidus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 513, pl. lxxv, figs. 8, 9.

1859. *Trochus tumidus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 16.

1867—71. *Trochus tumidus*, Jeffreys, Brit. Conch., vol. iii, p. 307, 1867; vol. v, p. 203, pl. lxxii, fig. 2, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 492, 1871.

1872. *Trochus tumidus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 210, 214.
 1874. *Gibbula tumida*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 463.
 1878. *Gibbula tumida*, G. O. Sars, Moll. Reg. arct. Norv., pp. 141, 358.
 1885. *Trochus (Gibbula) tumidus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 387, pl. xlvii, figs. 14—18.
 1890. *Trochus tumidus*, C. Reid, Plioc. Dep. Brit., p. 259.
 1890—1911. *Trochus tumidus*, A. Bell, Proc. Roy. Phys. Soc. Edinb., vol. x, p. 296, 1890; Ipswich Field Club, vol. iii, p. 16, 1911.
 1892. *Gibbula tumida*, Locard, Coq. mar. Côtes de France, p. 210.
 1901. *Gibbula tumida*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 657, pl. ix, fig. 10.
 1912. *Gibbula tumida*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlviii, p. 45, pl. iii, figs. 8—15.
 1912. *Gibbula (Sterromphalus) tumida*, Dautzenberg et Fischer, Camp. Scient. Prince de Monaco, vol. xxvii (Mollusques), p. 266.

Specific Characters.—Shell solid, distinctly turreted; whorls 6 or 7, more or less convex, obtusely angulate above; ornamented by numerous fine and irregular spiral ridges and by excessively fine and oblique transverse lines; spire short, with a blunt apex; suture not deep but well marked by the angulation of the whorls; periphery obtusely keeled; base rounded and ridged; mouth sub-rhomboidal; outer lip thin and curved; inner lip folded back towards the umbilicus with a thickened tooth in the middle; umbilicus fairly large but not wide, obliquely excavated, exposing a part of the spire.

Dimensions.—H. 9 mm. B. 10 mm.

Distribution.—*Recent*: British seas, *passim*. Norwegian coast from the Christiania fiord to Finmark, Lofoten Islands, Iceland, Greenland, Atlantic coasts of France, Portugal and Spain to the Straits of Gibraltar.

Fossil: Waltonian Crag: Walton-on-Naze, Little Oakley. Newbournian: Waldringfield, Foxhall, Newbourn, Sutton, Ramsholt, Felixstow. Butleyan: Butley, Hollesley. Icenian: Thorpe near Aldeburgh, Beccles, Yarn Hill, Aldeby, Bramerton, Thorpe (Norwich), Brundall.

Pleistocene: Selsey, west coast of Scotland, Largo Bay. Belfast. Holocene: Portrush.

Pleistocene: Livorno. Christiania fiord (Brøgger), Trondhjem (Øyen).

Remarks.—This species, common locally as a recent shell on the coast of Great Britain and Ireland, ranges northwards to Iceland, Finmark and the Lofoten Islands and southwards though not abundantly through the West European region to the Straits of Gibraltar. It has been identified by Forbes and Hanley, Jeffreys and some others with a smaller Mediterranean form, *Trochus (Gibbula) Racketti*, but this view is not accepted by other authorities, as by MM. Dollfus and Dautzenberg. Comparing our Crag fossils with some specimens of the latter in my collection received from the Marchese di Monterosato, I am disposed to agree with them. Where *T. tumidus* is spoken of as now living in the Mediterranean, it is not the present shell which is meant. It seems to be essentially a northern form.

This species seems to have been comparatively late in establishing itself in the

Crag Sea. It is unknown from the Coralline, rare in the Waltonian and not very abundant below the Icenian, in which it occurs at most localities.

Similarly Messrs. Bucquoy, Dautzenberg and Dollfus remark that *T. tumidus* is more abundant in the north of Europe than on the coasts of France and Spain, and that specimens from the former region and from Iceland are sometimes larger than the type.

Trochus (Gibbula) brevispira, sp. nov. Plate LIX, fig. 12.

1848. *Trochus Kicksii*, S. V. Wood, Mon. Crag Moll., pt. i, p. 130, pl. xiv, fig. 5 a.

Specific Characters.—Shell small, depressed; whorls 5, the last expanded, much the largest, base rounded, not angulated; spire short, rapidly diminishing to a blunt point; mouth large in proportion, nearly one-half the total length; spiral sculpture hardly or not at all visible.

Dimensions.—H. 7 mm. B. 9 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Sutton. Waltonian: Little Oakley, abundant, otherwise not worked out.

Remarks.—I have obtained at Oakley at least 50 specimens of this small *Trochus*, varying in size but agreeing in general character, which is considerably flattened, with an expanded, rounded base and a short spire. They seem the same as one of those represented by Wood in 1848 (pl. xiv, fig. 5 a) as *T. Kicksii*, but resemble neither the form figured by Nyst under that name nor the *T. Robynsii* of the same author. Out of a handful of the small shells of this group there is little difficulty in separating those for which I have adopted the above name. As stated below, Wood figured two forms as *T. Kicksii*, the present one and his fig. 5 b of the same plate having an elevated spire; the latter may be identified, I think, with Nyst's *T. Robynsii*.

Trochus (Gibbula) adriaticus (Philippi). Plate LIX, fig. 13.

1844—48. *Trochus Adansonii*, var., Philippi, Enum. Moll. Sic., vol. ii, p. 153, pl. xxv, fig. 10, 1844;

T. adriaticus, Martini und Chemnitz, Conch. (*Trochus*), p. 194, no. 236, pl. xxix, fig. 18, 1848.

1868. *Trochus Adansonii*, var., Weinkauff, Conch. Mittelm., vol. ii, p. 372.

1874. *Gibbula Adansonii*, var. *adriaticus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 464.

1885. *Trochus Adansonii*, var. *adriatica*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 395.

1886. *Trochus adriaticus*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.

1889. *Gibbula adriatica*, Carus, Prod. Faun. Medit., vol. ii, p. 249.

1890. *Trochus adriaticus*, C. Reid, Plioc. Dep. Brit., p. 257.

1892. *Gibbula adriatica*, Locard, Coq. mar. Côtes de France, p. 210.

1900—7. *Gibbula adriatica*, Scalia, Atti Accad. Gioen. Sci. Nat. Catania [4], vol. xiii, p. 18, no. 149, 1900; vol. xx, p. 31, no. 189, 1907.

Specific Characters.—Larger, stronger and more solid than the type of *T. Adansoni*, with flatter whorls, subangulate at the base, coarser sculpture and an indistinct tooth on the columella. Suture slightly channelled.

Dimensions.—H. 12 mm. B. 10 mm.

Distribution.—Recent: Algiers, Corsica, Adriatic.

Fossil: St. Erth. Waltonian Crag: Little Oakley, probably at other localities.

Pleistocene: Messina, Catania, Reggio, Livorno, Vallé Biaia, Nizzeti.

Remarks.—This shell, sometimes regarded as a variety of *T. Adansoni*, but considered by Drs. Carus, Scalia and others as deserving specific rank, is characterised by its more solid character and stronger sculpture. I have obtained one or two somewhat doubtful specimens of it from Oakley; they may be found probably at other Crag localities if specially looked for.¹ Seguenza records it from the Pleistocene deposits of Sicily and Catania, and Dr. Scalia from those of Nizzeti on the flanks of Etna. It was reported also by Messrs. Kendall and R. G. Bell as having been obtained at St. Erth.

The authors of "The Mollusca of Roussillon," who regard the present form as a variety of *T. Adansoni*, remark that its spire is less elevated, more expanded and angulate at the periphery, and that its spiral sculpture is more distinct and is rough to the touch.

Trochus (Gibbula) Woodii, sp. nov. Plate LIX, fig. 14.

1848. *Trochus Montacuti*, S. V. Wood, Mon. Crag Moll., pt. i, p. 129, pl. xiv, fig. 1.

Specific Characters.—Shell conical, elevated, thick and strong; whorls 5, nearly flat, transversely striated; base of volution obtusely angulate; umbilicus inconspicuous; aperture subquadrate; columella with an obsolete tooth; outer lip sharp and oblique; lines of growth visible, slightly raised.

Dimensions.—H. 8 mm. B. 6 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Orford, Sutton. Newbournian: Sutton. Not fully worked out.

Remarks.—I am sorry to have to differ with Wood's reference of this shell to *T. Montacuti*, but M. Dautzenberg considers with me that it does not altogether agree with that species. The description of it given by the first-named author coincides accurately with my Crag specimens. Wood states that it is by no means a rare shell in the Coralline, but that he had met with only a single specimen in the Red Crag. Out of the hundreds of these small *Trochi* in my collection from Oakley I have seen nothing with which I can satisfactorily identify it. The

¹ As I am unable to obtain a thoroughly satisfactory fossil specimen, I figure a recent example of it, received from the Marchese di Monterosato.

specimen I now figure comes from the Coralline Crag and belongs to the Sedgwick Museum at Cambridge.

Trochus (Gibbula) Kickxii (Nyst). Plate LIX, fig. 15.

1835—81. *Trochus Kickxii*, Nyst, Rech. Coq. foss. d'Anvers, p. 26, no. 19, pl. iv, fig. 19, 1835; Coq. foss. Terr. tert. Belg., p. 381, no. 324, pl. xxxviii, fig. 2, 1843; Conch. Terr. tert. Belg., p. 108, no. 95, pl. vi, fig. 31, 1881.

1871. *Trochus Adansoni*, var., Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 146, 491.

1872. *Trochus Kickxii*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210.

1890. *Trochus Kicksii*, C. Reid, Plioc. Dep. Brit., p. 258.

Specific Characters.—Shell small, umbilicate, distinctly conical, whorls but slightly convex, smooth or obscurely striated; spire regularly diminishing to an acute point; base rounded, not so distinctly angulated as in *T. Robynsii*; mouth semicircular, rounded below.

Dimensions.—H. 8 mm. B. 8 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton, Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley, probably elsewhere in the Red Crag. Scaldisien: Antwerp.

Remarks.—Two shells were figured by Wood under the present name, but I venture to think that neither of them has any close resemblance to the *T. Kickxii* of Nyst. The one represented by fig. 12 of my Plate LIX I have described above, p. 735, as *T. brevispira*, the other, fig. 16, I refer to *T. Robynsii*. As to *T. Kickxii*, Nyst states it is closely allied to the latter, but that the base is always distinctly rounded and not angulate. I have obtained specimens of each of these forms from Oakley. *T. Kickxii* was considered by Jeffreys a variety of *T. Adansoni*—a view which Wood seemed at first to entertain. The examination of some hundreds of these various fossils has led me, however, to think that Nyst's classification, here adopted, most satisfactorily explains the facts of the case.

Trochus (Gibbula) Robynsii (Nyst). Plate LIX, fig. 16.

1835—81. *Trochus Robynsii*, Nyst, Rech. Coq. foss. d'Anvers, p. 26, no. 19, pl. iv, fig. 20, 1835; Coq. foss. Terr. tert. Belg., p. 382, no. 325, pl. xxxviii, fig. 3, 1844; Conch. Terr. tert. Belg., p. 108, no. 96, pl. vii, fig. 2, 1881.

1848. *Trochus Kicksii*, S. V. Wood, Mon. Crag Moll., pt. i, p. 130, pl. xvi, fig. 5 b.

Specific Characters.—Shell small, umbilicate, fairly solid, distinctly conical; whorls flattened, generally without sculpture; spire short, with an acute point; base somewhat expanded, sharply angulated; suture slight; mouth subtetragonate, angulated below by the keel.

Dimensions.—L. 8 mm. B. 8 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Little Oakley (abundant), not otherwise worked out.

Remarks.—Nyst states that this species may be always and easily distinguished by its sharply angulated base. The specimen now figured shows this feature distinctly, especially when compared with that of *T. Kickxii*, as do its regularly conical form, its flattened whorls, and its acutely pointed apex. Although my specimens of this group of shells generally show no signs of spiral sculpture, Wood says that traces of the latter may be occasionally observed in it.

As suggested before, the absence of sculpture in these small *Trochi* may be due to erosion. In a parcel of them received from Mons. Van de Wouwer from the Belgian Crag, nearly all are ornamented clearly by spiral lines.

***Trochus (Gibbula) Reevei*, sp. nov. Plate LIX, fig. 17.**

Specific Characters.—Shell conical, smaller than *T. Adansoni*, with a slight but distinct shelf below the suture; the spiral ridges are clearly marked, and less numerous than in those described above; base obtusely angulate.

Dimensions.—H. 7—8 mm. B. 7—8 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Gedgrave.

Remarks.—There are one or two specimens from Gedgrave in the Norwich Museum allied to *T. Adansoni* which have been separated from that species under the name of *T. Montacuti*—an identification which I cannot accept. For reasons given above I prefer to give them provisionally a distinctive name.

***Trochus (Gibbula) tricariniferus* (S. V. Wood). Plate LIX, fig. 18.**

1842—48. *Trochus tricariniferus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 532, 1842; Mon. Crag Moll., pt. i, p. 132, pl. xiv, fig. 6, 1848.

1871—83. *Trochus tricariniferus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 146, 495, 496, 1871; *T. tricarinifer*, Proc. Zool. Soc. London, p. 103, 1883.

1872. *Trochus tricariniferus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.

1890. *Trochus tricariniferus*, C. Reid, Plioc. Dep. Brit., p. 258.

Specific Characters.—Shell small, thick and solid, ovato-conical; whorls 5, ornamented by 3 strong, prominent and distant spiral ridges, the last angulating the base, and forming the margin to a sloping shelf below the suture, crenulated also by numerous closely-set and very fine lines of growth; spire short, elevated, with an acute apex; suture deep, base flattened and ridged, slightly projecting;

mouth sub-quadrangular; columella with an obsolete tooth; umbilicus very small, nearly covered.

Dimensions.—H. 6 mm. B. 6 mm.

Distribution.—*Recent*: Swedish Expedition, 340—430 fathoms, 1869 (Jeffreys).

Fossil: Coralline Crag: Sutton. Waltonian: Little Oakley.

Remarks.—This charming and distinct species, belonging to the *obconicus* group, was known to Wood from but one locality in the Coralline Crag—the bed of small shells at Sutton often referred to. I have obtained a single and nearly perfect specimen, however, at Oakley, that equally prolific deposit, where such a large proportion of the Coralline Crag mollusca are to be found, many of them, however, being represented by unique examples only.

Trochus (Gibbula) Philberti (Récluz). Plate LIX, figs. 19, 20.

1843. *Trochus Philberti*, Récluz, Rév. Zool., vol. vi, p. 11.
 1844—46. *Trochus villicus*, Philippi, Enum. Moll. Sic., vol. ii, p. 152, pl. xxv, fig. 14, 1844; Martini und Chemnitz, Conch. Cab., ed. 2, *Trochus*, p. 194, pl. xxix, fig. 17, 1846.
 1848. *Trochus villicus*, S. V. Wood, Mon. Crag Moll., pt. i, p. 128, pl. xiv, fig. 4.
 1871. *Trochus Adansoni*, var., Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 146, 492.
 1872. *Trochus villicus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 210, 214.
 1874. *Gibbula villica*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 451.
 1878—84. *Trochus (Gibbula) villicus*, Monterosato, Giorn. Sci. nat. ed Econ., vol. xiii, p. 21, 1878; *G. Philberti*, Conch. Litt. Medit., p. 8, 1884.
 1880. *Trochus villicus*, Fischer in Kiener, Coq. viv. (*Trochus*), p. 258, pl. lxxxvii, fig. 1.
 1885. *Trochus (Gibbula) Philberti*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 383, pl. xlvi, figs. 1—5.
 1889. *Gibbula Philberti*, Carus, Prod. Faun. Medit., vol. ii, p. 252.
 1890. *Trochus Adansoni*, var., C. Reid, Plioc. Dep. Brit., p. 259.
 1892. *Gibbula Philberti*, Locard, Coq. mar. Côtes France, p. 211.
 1916. *Gibbula Philberti*, Cerulli-Irelli, Palaeont. Ital., vol. xxii, p. 184, pl. xxi, figs. 12, 13.

Specific Characters.—Shell small, fairly solid, forming a short cone; whorls 5 or 6, slightly convex, depressed and angulate above; ornamented by irregularly spaced concentric ridges, 3 or 4 being stronger than the others, narrower than the spaces intervening between them, and by oblique, fine but fairly conspicuous lines of growth; spire short; suture depressed; base obtusely angulate, covered by strong concentric ridges; mouth sub-quadrangular; outer lip angulated in the middle.

Dimensions.—H. 6—10 mm. B. 6—8 mm.

Distribution.—*Recent*: Mediterranean.

Fossil: Coralline Crag: Sutton. Waltonian: Little Oakley.
 Newbournian: Sutton.

Pliocene: Monte Mario. Pleistocene: Selsey.

Remarks.—A shell was described by Wood in 1848 as *Trochus villicus*, although

with a “?” Since then that species has been identified by the authors of ‘The Mollusca of Roussillon,’ the Marchese di Monterosato and others with *Trochus Philberti*, Récluz, which name I adopt for our Crag fossils. The latter are rare, however, having been reported only from the earlier horizons and not at all from Belgium.

Jeffreys regarded the *T. Philberti* of Récluz as a variety of *T. cinerarius*—a view which has not been otherwise accepted. As the representation of *T. villicus* given by Wood’s artist is not very convincing, I have figured a recent specimen of *T. Philberti* from Palermo, received from the Marchese di Monterosato, for the guidance of future collectors.

Since the above paragraph was in print Mr. Bell has discovered in the British Museum a perfect specimen (no. 68015), found many years ago at Selsey, which now bears the name of *Eumargarita undulata*. A careful re-examination of it, however, has shown him that both in form and sculpture it agrees exactly with *Trochus Philberti*, a view with which I entirely agree. Such a characteristic Mediterranean shell seems quite in place in a comparatively southern fauna like that of Selsey.

***Trochus (Gibbula) pulcherrimus*, sp. nov.** Plate LIX, fig. 21.

Specific Characters.—Shell minute, conical; whorls 5, angulated, with a sloping shelf above, the last, rounded below, being much the largest; ornamented by two or three prominent spiral ridges and by numerous fine oblique lines, producing granulation where they intersect; spire short, rapidly increasing in size downwards, with an acute apex, suture well marked; base flattened, without sculpture; umbilicus small; mouth subquadrangular; outer and inner lips thin, the last projecting.

Dimensions.—L. 3 mm. B. 3 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Boyton?

Remarks.—The shell figured under this name was found by Mr. A. Bell when sifting some fine material from the Coralline Crag, probably of Boyton. It is beautifully sculptured, quite perfect, and seems to be new and unique.

***Trochus (Gibbula) obconicus* (S. V. Wood).** Plate LIX, fig. 22.

1842—48. *Trochus obconicus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 532, 1842; Mon. Crag Moll., pt. i, p. 133, pl. xiv, fig. 10, 1848.

1871. *Trochus obconicus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 146.

1872. *Trochus obconicus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.

1881. *Trochus obconicus* (?), Nyst, Conch. Terr. tert. Belg., p. 110, pl. vii, fig. 4.

1890. *Trochus obconicus*, C. Reid, Plioc. Dep. Brit., p. 258, pl. ii, fig. 8.
 1892. *Trochus obconicus*, Van den Broeck, Bull. Soc. Belg. Géol., vol. ix (Mémoires), p. 123.
 1896. *Trochus obconicus*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), p. 131.

Specific Characters.—Shell minute, solid, obconical; whorls somewhat convex, flattened above; spire short; apex blunt; base rounded, obtusely angulate, covered with fine ridges; suture sub-canalicate; ornamented by rather strong, well-marked spiral ridges and by oblique striæ which cause crenulation where they intersect; mouth sub-circular; umbilicus small and inconspicuous, nearly covered by the inner lip.

Dimensions.—H. 2—3 mm. B. 1·5—2 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Gedgrave, Sutton. Waltonian: Little Oakley. Scaldisien: Antwerp.

Remarks.—This minute shell is only known from the Coralline and Waltonian Craggs and from the approximate equivalent of the latter, the Scaldisien of Antwerp.

It has not been identified, even as a variety, with any of the numerous small Trochidæ of the Mediterranean, either recent or fossil. Wood obtained it abundantly in the bed of small shells in the Coralline Crag at Sutton, and I have found four specimens at Oakley; Mons. Bernays says it occurs in the Belgian Crag, and I noticed several in M. Van de Wouwer's collection which were less worn, showing the crenulated sculpture more clearly than do those of the English Crag.

In Wood's Monograph the spiral ridges of this species are shown to be a variable feature. My Crag specimen most nearly agrees with his fig. 10*d*.

Genus **TROCHOCOCHLEA**, Klein, 1753.

Trochocochlea turbinata (Born). Plate LIX, fig. 24.

1780. *Trochus turbinatus*, Born, Test. Mus. Coes. Vind., p. 335; *T. tessellatus*, p. 332, pl. xii, figs. 5, 6.
 1822. *Monodonta tessellata*, Risso, Eur. mérid., vol. iv, p. 132, pl. iv, fig. 51.
 1846. *Trochus fragaroides*, Philippi in Chemnitz, Conch. Cab., ed. 2, p. 162, pl. xxvi, figs. 7—11.
 1870. *Trochus fragaroides*, Hidalgo, Mol. mar., pl. lxi, fig. 2; pl. lxii, figs. 9—11.
 1875. *Trochus (Trochocochlea) turbinata*, Seguenza, Boll. R. Com. Geol. Ital., vol. vii, p. 184, no. 741.
 1878—84. *Trochus (Trochocochlea) turbinatus*, Monterosato, Enum. e Sinon., p. 21, 1878; *Trochocochlea turbinata*, Conch. litt. Med., p. 11; *Curagolus turbinatus*, Nom. Gen. e Spec., p. 43, 1884.
 1885. *Trochus (Trochocochlea) turbinatus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 402, pl. xlviii, figs. 6—11.
 1892. *Trochocochlea turbinata*, Locard, Coq. mar. Côtes de France, p. 214, fig. 189.

1896. *Trochocochlea turbinata*, Sacco, Moll. Terr. Tert. Pied., pt. xxi, p. 24.

1898. *Trochocochlea (Osolinus) turbinata*, A. Bell, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 155.

Specific Characters.—Shell fairly large, subvoid, thick and solid; whorls 6, slightly convex, regularly increasing to a rounded base, ornamented by distinctly marked spiral ridges, equidistant and continuous over the periphery; suture inconspicuous; mouth rhomboidal, angulate above, squarely rounded below, outer lip projecting; base imperforate; columella with an inconspicuous and thickened excrescence.

Dimensions.—H. 18—25 mm. B. 15—22 mm.

Distribution.—*Recent*: Mediterranean, Adriatic, Portuguese coast, Canaries.

Fossil: St. Erth. Sicily—Altavilla.

Remarks.—The generic name *Trochocochlea* has been adopted for a small group of imperforate shells with a rhomboidal aperture, a thickened columella, and a more or less prominent tubercle on the inner lip. As far as British deposits are concerned they have been reported only from St. Erth. It is not easy to arrive at a thoroughly satisfactory identification of the three or four fossil specimens that are known to us. The specific names here adopted, more or less provisionally, are those in use at the British Museum. The use of the term *Trochocochlea* as generic is not universal. Messrs. Bucquoy, Dautzenberg and Dollfus employ it as a subgenus of *Trochus*.

***Trochocochlea littoralis*, Etheridge and Bell. Plate LIX, fig. 25.**

1893—98. *Trochocochlea littoralis*, Etheridge and Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; *T. (Osolinus) St. Erthensis*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 155, pl. ii, fig. 19, 1898.

Specific Characters.—Shell conical; whorls 6 to 7, flatly convex, delicately sculptured with spiral ridges extending to the base, where they are of unequal size; base rounded, not acutely angulated; mouth quadrate; pillar slightly swollen in the centre, with a shallow depression behind.

Dimensions.—H. 18 mm. B. 15 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—It may be suggestive as well as interesting to notice as bearing on the stratigraphical position of the St. Erth fauna, that of this Mio-Pliocene and southern genus, unknown as a fossil from any other British horizon, no less than four distinct forms have been found at the locality named, although one of them, *T. turbinata*, occurs recent in the Mediterranean and elsewhere, and another as fossil in the Astien of Calabria (Seguenza). The absence of this genus from Lenham, the Coralline Crag and from any other part of the Anglo-Belgian Pliocene, seems

a rather important piece of evidence in support of the view that the St. Erth fauna is older than that of any part of the East Anglian deposits.

The sculpture of the present species is somewhat finer than that of *T. turbinata*.

Trochocochlea erthensis, Etheridge and Bell. Plate LIX, fig. 26.

1893—98. *Trochocochlea St. Erthensis*, Etheridge and Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; *T. (Osolinus) St. Erthensis*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 154, 1898.

Specific Characters.—Differs from *T. turbinata* in its deeper suture and in its sculpture, which is partly granulated, the transverse ridges of the body whorl being crossed obliquely by rows of well-marked nodules; the last whorl is sharply angulate, forming a projecting ridge on the keel, which with the base is also distinctly granulate.

Dimensions.—H. 14 mm. B. 12 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—A single and imperfect specimen of this shell is reported from St. Erth. It may be distinguished from *T. turbinata* by its coarser and muricated sculpture, which is confined to the body whorl. The spiral ridges of the base are not so distinctly granulate.

Trochocochlea turbinoides (Deshayes). Plate LIX, fig. 27.

1832. *Trochus turbinoides*, Deshayes, Expéd. scient. de Morée, p. 143, pl. xviii, figs. 28, 29, 30.

1878—79. *Trochus turbinoides*, Monterosato, Enum. e Sinon., p. 21, 1878; Boll. Soc. Mal. Ital., vol. v, p. 218, 1879.

1885. *Trochus (Gibbula) turbinoides*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 396, pl. xlvii, figs. 26—28.

Specific Characters.—Shell smaller and less solid than *T. turbinata*; spire short, conical; whorls 5, slightly convex, regularly decreasing upwards to a blunt point; ornamented by fine spiral lines, rather stronger on the last, forming a basal keel at the periphery; mouth rounded.

Dimensions.—H. 8 mm. B. 8 mm.

Distribution.—Recent: Mediterranean, Adriatic.

Fossil: St. Erth. Sicily—Altavilla.

Remarks.—This shell, which corresponds with the recent specimens described by the authors of 'The Mollusca of Roussillon' in form and sculpture, is much smaller than any other of the *Trochocochleæ* reported from St. Erth, approaching most nearly the variety *cincta* of Dautzenberg, who says that form presents an aspect *bicaréné*. The St. Erth fossil now figured belongs to the Warburton St. Erth Collection at the British Museum (no. 18054).

Genus **SOLARIELLA**, S. V. Wood, 1842.

Solariella maculata, S. V. Wood. Plate LX, fig. 1.

- 1842—72. *Solariella maculata*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 531, pl. v, figs. 7—10, 1842; *Margarita maculata*, Mon. Crag Moll., pt. i, p. 135, pl. xv, fig. 3, 1848; 1st Suppl., pt. i, p. 83, 1872.
- 1843—81. *Solarium turbinoides*, Nyst, Coq. foss. Terr. tert. Belge, p. 370, pl. xxxvi, fig. 7, 1843; *Trochus turbinoides* and var. *maculata*, p. 98, pl. v, fig. 24, 1881.
1845. *Solarium* (allied to *Solariella maculata*), Lyell, Quart. Journ. Geol. Soc., vol. xix, p. 555.
1871. *Solarium turbinoides*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 144.
1872. *Margarita maculata*, A and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.
- 1874—79. *Margarita monilifera*, Van den Broeck, Ann. Soc. Malac. Belge, vol. ix, pp. 134, 187, 356, 1874; *Trochus turbinoides*, vol. xiv, p. 71, 1879.
1890. *Margarita maculata*, C. Reid, Plioc. Dep. Brit., p. 246.
1896. *Trochus turbinoides*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), p. 129.

Specific Characters.—Shell minute, conical, depressed, scalariform; whorls 4—5, rugose, subcircular, carinated; carinæ three, placed at unequal distances, differing in size, the upper one the most prominent, crenulated by the oblique lines of growth, rugose; base rounded, flattened, ridged; umbilicus large, crenulated, with a depressed furrow at the suture; spire short; apex pointed, obtuse; suture deep, channelled.

Dimensions.—H. 2 mm. B. 3 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Sutton, Gomer. Waltonian: Walton-on-Naze, Little Oakley.

Miocene, Casterlien, Scaldisien: Belgium.

Remarks.—The generic term *Solariella* was proposed in 1842 by Wood for this species, as in his opinion its subcylindrical whorls differed from the subquadrangular opening of *Solarium*, regarding it as intermediate between *Trochus* and *Margarita*. This name has been adopted since by H. and A. Adams,¹ Dr. P. Fischer² and others for a small group of subtrochiform shells of which *S. obscura* and *S. varicosa* were taken as types.

The present species is the only one that has been reported from the Pliocene of the Anglo-Belgian area under the generic name of *Solariella*; it is unknown from St. Erth but occurs at Selsey. Three of the other specimens here referred to this genus are northern. They belong to the Headley Collection of Bridlington fossils, and are given under the specific names proposed by Mr. Bell.

¹ 'Gen. Rec. Moll.,' vol. i, p. 431, 1858.

² 'Man. Conch.,' p. 126, 1887.

Solariella obscura (Couthouy). Plate LX, fig. 2.

1838. *Turbo obscurus*, Couthouy, Bost. Journ. Nat. Hist., vol. ii, p. 100, pl. iii, fig. 12.
 1841—70. *Margarita obscura*, Gould, Inv. Mass., ed. 1, p. 253, fig. 171, 1841; ed. 2, p. 283, fig. 545, 1870.
 1878. *Machæroplax obscura*, G. O. Sars, Moll. Reg. arct. Norv., pp. 137, 357, pl. ix, fig. 5.
 1878. *Margarita obscura*, Leche, K. Svensk. Vet.-Akad. Handl., vol. xvi, p. 44.
 1883. *Trochus obscurus*, Jeffreys, Proc. Zool. Soc., p. 97.
 1889. *Solariella obscura*, Tryon, Man. Conch., vol. xi, p. 308, pl. lvii, figs. 44, 45.
 1912. *Solariella obscura*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 70, pl. v, figs. 15, 16.
 1915. *Solariella obscura*, Johnson, Bost. Soc. Nat. Hist., vol. vii, Occ. papers (13), p. 89.
 1917. *Solariella obscura*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell minute, conical, depressed; whorls 5, convex, flattened below the suture, the last much the largest; ornamented by rather distant spiral ridges, not very prominent, and by indistinct lines of growth; suture deep; umbilicus large and deep; base generally striated but sometimes nearly smooth; mouth subangulate, expanded.

Dimensions.—H. 5 mm. B. 5 mm.

Distribution.—Recent: Norwegian coast, Finmark, Lofoten Islands, Kara Sea, Bear Island, Barent Sea, Siberian coast, Spitzbergen, Jan Mayen, Behring Sea, Valentian Islands, Banks of Newfoundland, New England coast.

Fossil: Bridlington.

Remarks.—The specimen figured under this name was discovered by my colleague, Mr. A. Bell, when examining Mr. Headley's collection of Bridlington fossils, which, as stated above, includes a small group hitherto unrecorded from any Pleistocene beds in the British Isles, predominantly of a northern character but containing also forms which now live in American but not in our own seas. *S. obscura* is a circumpolar species with a wide range as a recent shell, but, as far as I know, it has been definitely reported as a British fossil from Bridlington only, Mr. Bell's list of mollusca from the latter locality containing the names of 180 species.¹ The specimen here represented was identified by Dr. Gwyn Jeffreys, the base being more distinctly ridged spirally than in that figured by Sars.

Solariella varicosa (Mighels and Adams). Plate LX, fig. 3.

1842. *Margarita varicosa*, Mighels and Adams, Bost. Journ. Nat. Hist., vol. iv, p. 46, pl. iv, fig. 14.
 1848. *Margarita elegantissima*, S. V. Wood, Mon. Crag Moll., pt. i, p. 134, pl. xv, fig. 1.
 1869—84. *Trochus (Margarita) elegantissimus*, Jeffreys, Brit. Conch., vol. v, p. 203, 1869; *T. varicosus*, in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 319, 1884.
 1870. *Margarita varicosa*, Gould and Binney, Inv. Mass., ed. 2, p. 285, fig. 547.
 1878. *Margarita elegantissima*, Leche, K. Svensk. Vet.-Akad. Handl., vol. xvi, p. 43.
 1878. *Machæroplax varicosa*, G. O. Sars, Moll. Reg. arct. Norv., pp. 139, 357, pl. ix, fig. 2.

¹ A. Bell, 'Yorks. Nat.', no. 723, p. 96, 1917.

1912—15. *Solariella varicosa*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 69, pl. v, figs. 6—14, 1912; vol. liv, p. 151, 1915.

1917. *Solariella varicosa*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell small, conoidal; whorls 5—7, convex, the last much the largest; spire not much elevated; suture well-marked; ornamented with numerous rather inconspicuous and oblique plications which are continuous across the base to the umbilicus, and by excessively fine spiral lines; base subcarinate, flattened; outer lip oblique, expanded, angulate below; inner lip angulate at the base; umbilicus large and deep, bounded by two varices which are notched transversely by the longitudinal plications.

Dimensions.—H. 6—10 mm. B. 6—8 mm.

Distribution.—Recent: Finmark, Spitzbergen, Chaleur Bay, New Brunswick, Banks of Newfoundland.

Fossil: Bridlington.

Remarks.—The specimen from Bridlington figured under the present name seems to be identical with that described by Wood in 1848 from the same locality as *Margarita elegantissima*. It has been identified by Drs. Leche and Odhner with the *M. varicosa* of Mighels and Adams (1842), by which specific name, according to the law of priority, it should be known. Mr. Bell informs me there are several examples of it in Mr. Headley's collection. The one figured by Prof. G. O. Sars is considerably larger than that given by Gould or than the Bridlington shells, but otherwise they seem to agree. As far as our present information serves, it appears to be a rare form, whether as recent or fossil. It may be recognised by its oblique sculpture and the prominent granular ridges surrounding the umbilicus.

Solariella bella (Verkrüzen). Plate LX, fig. 4.

1875. *Margarita bella*, Verkrüzen, Jahrb. Deutsch. Mal. Gesell., vol. ii, p. 236.

1878. *Machæroplax bella*, G. O. Sars, Moll. Reg. arct. Norv., pp. 137, 357, pl. ix, fig. 4.

1889. *Solariella bella*, Tryon, Man. Conch., vol. xi, p. 310, pl. lxiv, figs. 57, 58.

1899. *Margarita (Machæroplax) bella*, Posselt, Medd. om Grønl., vol. xxiii, p. 132.

1911. *Machæroplax bella*, Dautzenberg and H. Fischer, Journ. de Conch., vol. ix, p. 30.

1912. *Solariella obscura*, var. *bella*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 70, pl. v, figs. 25—27, 31, 34.

1915. *Solariella obscura bella*, Johnson, Bost. Soc. Nat. Hist., vol. vii, Occ. papers (13), p. 89.

1917. *Solariella obscura* var. *bella*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Differing from *S. obscura* in its stronger sculpture, one of the spiral ridges giving the whorls an angulated appearance; the lines of growth are more prominent and regular, producing with the spiral ridges distinct clathration; our shells are generally rather smaller than the recent type form.

Dimensions.—H. 4 mm. B. 4 mm.

Distribution.—*Recent*: Similar to that of the type, circumpolar and wide-spread (Greenland, Posselt).

Fossil: Bridlington.

Remarks.—This very charming shell was regarded by Verkrüzen and G. O. Sars as specifically distinct, but it has been sometimes considered as a variety of *S. obscura*. The difference between the two seems to be mainly one of sculpture.

Solariella acutangula, A. Bell. Plate LX, fig. 5.

1892. *Solariella acutangula*, A. Bell, Rep. Yorks. Phil. Soc., p. 74, pl. i, fig. 27.

Specific Characters.—Shell minute, compressed above and below; spire but slightly elevated, apex immersed; whorls 4—5, enlarging rapidly, with 6 to 7 angulated concentric ridges above the periphery and 5 below it; umbilicus large and open; suture deep, channelled; mouth sharply angulated by the peripheral ridge; pillar forming an acute angle at its junction with the outer lip; inter-ridgial spaces covered by lamellar lines of growth (A. B.).

Dimensions.—H. 2 mm. B. 4 mm.

Distribution.—Not recorded living.

Fossil: Selsey.

Remarks.—This small but beautiful shell, allied to but differing, according to Mr. Bell, from the *S. maculata* of Wood, is represented by three specimens from Selsey in the York Museum, only one of which seems to be full grown; they were obtained, described and figured by the former, to whom we are so largely indebted for our knowledge of the Selsey fauna, of which, except for his careful and painstaking investigations, we should know but little. The subject has not been by any means worked out, and well deserves the further attention of our younger geologists.

Solariella approximata, A. Bell. Plate LX, fig. 6.

1892. *Solariella approximata*, A. Bell, Rep. Yorks. Phil. Soc., p. 75, pl. i, fig. 28.

Specific Characters.—Shell minute; spire depressed; whorls 3—4, sides rounded, flattened above with 3 to 4 sharply moulded circular ridges, the peripheral one the strongest of those below; the two lower ones are granulated by well-marked lines of growth; suture distinct; umbilicus deep and open; base of outer lip obtusely angulated (A. B.).

Dimensions.—H. 1.25 mm. B. 2 mm.

Distribution.—Not recorded living.

Fossil: Selsey.

Remarks.—Allied to *S. acutangula*, but somewhat smaller and more coarsely ridged. It was obtained at Selsey by Mr. Bell, who found it to be very rare at that place. The specimen here given belongs to the York Museum, and is copied from the same shell as that from which his original figure was drawn.

Genus **EUMARGARITA**, Fischer, 1885.

Eumargarita cinerea (Couthouy). Plate LX, fig. 7.

1838. *Turbo cinereus*, Couthouy, Bost. Journ. Nat. Hist., vol. ii, p. 99, pl. iii, fig. 9.
 1841—70. *Margarita cinerea*, Gould, Inv. Mass., ed. 1, p. 252, 1841; ed. 2, p. 279, fig. 539; 1870.
 1863. *Margarita cinerea*, var. *striata*, Jeffreys, Rep. Brit. Assoc. (Trans.), Newcastle-on-Tyne, p. 78.
 1869—84. *Trochus cinereus*, Jeffreys, Brit. Conch., vol. v, p. 304, 1869; in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 319, 1884.
 1878. *Margarita cinerea*, G. O. Sars, Moll. Reg. arct. Norv., pp. 134, 357, pl. ix, fig. 1.
 1901. *Margarita cinerea*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 653, pl. ix, fig. 22.
 1901. *Eumargarita cinerea*, Conch. Soc. List., Journ. of Conch., vol. x, p. 16, no. 293.
 1910—15. *Margarita cinerea*, Odhner, Arkiv för Zool., vol. vii, p. 23, 1910; K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 62, pl. iv, figs. 28—37; pl. v, figs. 1—5, 1911; vol. liv, p. 150, 1915.
 1915. *Margarites cinerea*, Johnson, Bost. Soc. Nat. Hist., vol. vii, Occ. papers (13), p. 87.
 1917. *Solariella cinerea*, A. Bell, Yorks. Naturalist, no. 723, p. 96.
 1919. *Margarita cinerea*, Baker, Bull. Amer. Mus. Nat. Hist., vol. xli, p. 505.

Specific Characters.—Shell small, thin, conoidal; whorls 5—7, convex, the last angulated at the base; ornamented by well-marked spiral ridges with very fine lines intervening and by the lines of growth; suture fairly deep; base flattened; spirally ridged; mouth subquadrangular; outer lip regularly curved, angulated where it meets the inner lip; umbilicus broad and deep.

Dimensions.—H. 9 mm. B. 9 mm.

Distribution.—*Recent*: Norwegian coast, Finmark, Lofoten Islands, Iceland, Murman coast, Kola peninsula, Nova Zembla, Kara Sea, Spitzbergen, Greenland, Newfoundland, New England coasts, Siberian coast, Behring Sea.

Fossil: Bridlington. Glacial and post-glacial deposits of Christiania region, Uddevalla.

Remarks.—This species, a circumpolar and North American form, was recognised by Jeffreys as a Bridlington fossil in 1884, and is given by Prof. Brøgger among the arctic fossils of the Norwegian glacial deposits (*Mya*-banks) and from the post-glacial *Isocardia* clays of the Christiania Fiord.

It has been usually referred to the genus *Margarita*, but Messrs. Dautzenberg and H. Fischer have adopted for it the generic name *Eumargarita* of Paul Fischer,¹ as has the Conchological Society in its list of British Marine Mollusca (*op. cit.*).

¹ *Man. de Conch.*, p. 325, 1885.

Eumargarita crassistriata (R. G. Bell). Plate LX, fig. 8.

1882. *Margarita crassistriata*, R. G. Bell in S. V. Wood, Mon. Crag Moll., 3rd Suppl., p. 10, pl. i, fig. 15.

Specific Characters.—Shell small, solid, conical; whorls 5, ornamented by 4 or 5 thickened spiral ridges with traces of fine intermediate ones, crossed by the lines of growth, giving it a crenulated appearance; base rounded, strongly ridged; suture deep; mouth rounded with an obscure fold near the base of the inner lip; umbilicus very small.

Dimensions.—L. 6 mm. B. 6 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Boyton. Waltonian: Little Oakley.

Remarks.—The fossil upon which this species was founded was obtained by the late R. G. Bell at Boyton. Its distinguishing feature seems to be the small tooth or fold on the columella. Another was found by myself and Mr. Alfred Bell at Oakley. As soon as it turned up the latter recognised it at once as an example of his brother's species. The specimen here figured is copied from Wood (*op. cit.*).

Eumargarita grœnlandica (Chemnitz). Plate LX, fig. 9.

1781. *Turbo grœnlandicus*, Martini und Chemnitz, Conch. Cab., vol. v, p. 108, pl. clxxi, fig. 1671.

1790. *Trochus grœnlandicus*, Gmelin, Syst. Nat., ed. 13, p. 3574.

1841—70. *Margarita undulata*, Gould, Inv. Mass., ed. 1, p. 254, fig. 172, 1841; ed. 2, p. 280, fig. 541, 1870.

1851—72. *Margarita undulata*, S. V. Wood, Mon. Crag Moll., pt. ii, p. 321, 1851; *M. grœnlandica* 1st Suppl., pt. i, p. 83, pl. v, fig. 11, 1872.

1853. *Trochus undulatus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 528, pl. lxxviii, figs. 1, 2.

1859. *Margarita undulata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 21.

1863—84. *Margarita grœnlandica*, Jeffreys, Rep. Brit. Assoc. (Newcastle-on-Tyne), p. 73, 1863; *Trochus grœnlandicus*, Brit. Conch., vol. iii, p. 298, 1865; vol. v, p. 202, pl. lxi, fig. 5, 1869; *T. grœnlandicus*, Proc. Zool. Soc., p. 97, 1883; in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 319, 1884.

1864. *Margarita undulata*, S. P. Woodward, in White's Hist. of Norfolk, ed. 3, p. 119.

1870. *Margarita grœnlandica*, S. V. Wood, Jr., and F. W. Harmer, Rep. Brit. Assoc. (Liverpool), p. 99.

1872. *Margarita grœnlandica*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 214.

1878. *Margarita grœnlandica*, G. O. Sars, Moll. Reg. arct. Norv., pp. 133, 357.

1890. *Margarita grœnlandica*, C. Reid, Plioc. Dep. Brit., p. 246.

1890—1917. *Margarita grœnlandica*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 415, 1890; *Trochus (Margarita) grœnlandicus*, Proc. R. Irish Acad. [3], vol. ii, p. 635, 1893; Yorks. Naturalist, no. 723, p. 96, 1917.

1900. *Margarita grœnlandica*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 653, pl. xii, fig. 17; pl. xvii, fig. 2.

1901. *Eumargarita grœnlandica*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 291.

1911—12. *Eumargarita (Valvatella) grænlandica*, Dautzenberg et Fischer, Journ. de Conch., vol. lix, p. 28, 1911; Camp. scient. Prince de Monaco, vol. xxxvii (Mollusques), p. 277, 1912.

1915. *Margarites grænlandica*, Johnson, Boston Soc. Nat. Hist., Occ. papers (13), p. 88.

Specific Characters.—Shell small, ovato-conical; whorls 6, rather tumid, gradually increasing in size, ornamented by numerous thread-like spiral lines and below the suture by short folds or wrinkles; base flattened, finely striated; suture rather deep; spire moderately elevated; mouth oblique, expanded below, angulated above; umbilicus broad, funnel-shaped, bounded by a spiral line.

Dimensions.—H. 6 mm. B. 10 mm.

Distribution.—*Recent*: Scotland, west coast, Orkneys, Shetland. Arctic seas—Finmark, Lofoten Islands, Faroes, Norway, White Sea, Iceland, Spitzbergen, Nova Zembla, Jan Mayen, Greenland. Canada, Maine, Massachusetts.

Fossil: Middle glacial sands: Hopton. Bridlington. Scotland—in Pleistocene deposit in many places but not very common. Ireland—Belfast clays, Turbot bank. Uddevalla.

This decidedly northern shell has been reported from time to time from our Pliocene beds, but it is doubtful whether the type form occurs there. The specimens found at Bramerton were no doubt the variety *lævior* of Möller as stated by Wood. By the kindness of my friend M. Dautzenberg I am able to figure a recent specimen of each to show the difference between them, together with a fossil example of the latter from Garvel Park.

Var. *lævior* (Möller). Plate LX, figs. 10, 11.

1842. *Margarita undulata*, var. *lævior*, Möller, Ind. Moll. Grænl., p. 8.

1865—69. *Trochus grænlandicus*, var. *lævior*, Jeffreys, Brit. Conch., vol. iii, p. 299, 1865; vol. v, p. 202, 1869.

1874. *Margarita grænlandica*, var. *lævior*, S. V. Wood, Mon. Crag Moll., 1st Suppl., p. 83, pl. v, fig. 11, 1872.

1882. *Trochus (Margarita) grænlandicus*, var. *lævior*, Cooke, Journ. of Conch., vol. iii, p. 363.

1898. *Trochus grænlandicus*, var. *lævior*, Marshall, Journ. of Conch., vol. ix, p. 69.

1901. *Eumargarita grænlandica*, var. *lævior*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 291.

1912. *Margarita grænlandica*, var. *lævior*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlviii, p. 17, pl. iv, fig. 26.

1912. *Eumargarita (Valvatella) grænlandica*, var. *lævior*, Dautzenberg et H. Fischer, Camp. scient. Prince de Monaco, vol. xxxvii (Mollusques), p. 279.

Varietal Characters.—Smaller than the type form, solid and glossy, conical, smooth except for one or two inconspicuous spiral ribs on the uppermost whorls.

Dimensions.—H. 5 mm. B. 8 mm.

Distribution.—*Recent*: Greenland to Skye.

Fossil: Bramerton, Garvel Park.

Remarks.—The specimen here figured under this name comes from the Pleistocene of Garvel Park. It occurs recent also, according to Dr. Odhner, at Bergen.

Eumargarita Bellii, spec. nov. Plate LX, fig. 12.

Specific Characters.—Shell resembling *E. trochoidea* in form, but larger; whorls 5, decidedly convex, the last expanded, rounded, not angulated at the base, rapidly and regularly increasing in size, flattened below the suture; ornamented by excessively fine and numerous spiral striæ, inconspicuous except under a microscope; spire short, pointed; suture well-marked; mouth subcircular; umbilicus large and deep.

Dimensions.—H. 5 mm. B. 8 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Boyton.

Remarks.—This beautifully perfect specimen is reported from the Coralline Crag, probably from Boyton, and was found in his own collection of Crag shells by Mr. A. Bell. It seems to be unique and unlike anything hitherto met with either in the Crag or elsewhere. Its delicate spiral sculpture seems its distinguishing feature.

Eumargarita helicina (Fabricius). Plate LX, fig. 13.

1780. *Trochus helycinus*, Fabricius, Faun. Grœnl., p. 393.

1841—70. *Margarita arctica*, Gould, Inv. Mass., ed. 1, p. 255, fig. 163, 1841; *M. helicina*, ed. 2, p. 281, fig. 522, 1870.

1851. *Margarita arctica*, Middendorff, Reis. Nord. Ost. Siber., p. 203, pl. xvii, figs. 13—16.

1853. *Trochus helycinus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 531, pl. lxxviii, figs. 4, 5.

1865—69. *Trochus helycinus*, Jeffreys, Brit. Conch., vol. iii, p. 295, 1865; vol. v, p. 201, pl. lxi, fig. 4, 1869.

1877. *Margarita helicina*, Mörch in Rink, Dan. Grœnl., p. 439.

1878. *Margarita helicina*, G. O. Sars, Moll. Reg. arct. Norv., pp. 132, 357, pl. xxi, fig. 3.

1889. *Margarita helicina*, Tryon, Man. Conch., vol. xi, p. 285, pl. lxiv, figs. 45—47; pl. xxxix, fig. 63.

1898. *Margarita helicina*, Posselt, Medd. om Grœnl., vol. xxiii, p. 122.

1901. *Eumargarita helicina*, Conch. Soc. List, Journ. of Conch., p. 16, no. 290.

1901. *Margarita helicina*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 653, pl. xviii, fig. 1.

1901. *Margarita helicina*, Friele, Norske Nordhav. Exped., pt. iii (Mollusca), p. 62.

1911. *Eumargarita helicina*, Dautzenberg et H. Fischer, Journ. de Conch., vol. lix, p. 27.

1915. *Margarita helicina*, Johnson, Bost. Soc. Nat. Hist., Occ. papers (13), p. 87.

Specific Characters.—Shell minute, umbilicate, somewhat globular; whorls 5, convex, ornamented by fine spiral ridges and by a few puckers near the suture; suture distinct; mouth angular above, outer lip plain, inner lip folded on the umbilical cavity.

Dimensions.—L. 2 mm. B. 2 mm.

Distribution.—Recent: British coasts, northern; Shetland, Orkneys, Scotland, Northumberland, Yorkshire, Belfast, Dublin, Connemara.

Norwegian coast, Finmark to Christiania fiord. Iceland, Spitzbergen, Green-

land, White Sea, North America—New England, Labrador and Canada to Behring Sea.

Fossil: Pleistocene: Portland (abundant), Fort William, Oban, Clyde beds, estuarine clays of Belfast. Uddevalla. Dutch Pliocene: Oploo.

Remarks.—This distinctly northern and circumpolar form has been reported to be abundant and generally present as a fossil in many Scottish Pleistocene localities, but not from any English deposit except Portland. There is, however, a specimen from the Pliocene of Oploo in the Wood Collection at the Norwich Museum which was identified by him under the present name.

Eumargarita trochoidea (S. V. Wood). Plate LX, fig. 14.

1842—72. *Margarita trochoidea*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 530, 1842; Mon.

Crag Moll., pt. i, p. 136, pl. xv, fig. 2, 1848; 1st Suppl., pt. i, p. 84, 1872.

1871. *Margarita trochoidea*, S. P. Woodward, in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 124, Jeffreys, p. 144; *Adeorbis pulchralis*, p. 495.

1872. *Margarita trochoidea*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.

1890. *Margarita trochoidea*, C. Reid, Plioc. Dep. Brit., p. 246.

Specific Characters.—Shell trochoid, depressed, thin; whorls 4, convex, the last wide, expanded, obtusely angulate at the base, flattened below the suture, rounded beneath, ornamented by very fine, inconspicuous spiral lines; mouth subcircular; umbilicus large, wide and deep.

Dimensions.—L. 4 mm. B. 6 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton (not rare).

Remarks.—The shell figured under this name was considered by Jeffreys to be identical with the *Adeorbis pulchralis* of Wood (*op. cit.*). In 1872 (*op. cit.*) the latter stated that having re-examined his specimens he still believed them to be distinct.

Genus **CYCLOSTREMA**, Marryatt, 1818.

Cyclostrema spherioideum (S. V. Wood). Plate LX, fig. 15.

1842—72. *Turbo spherioidea*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 533, 1842; Mon. Crag Moll., pt. i, p. 122, pl. xv, fig. 9, 1848; 1st Suppl., pt. i, p. 86, 1872.

1871—83. *Cyclostrema spherioideum*, Jeffreys, Quart. Journ. Geol. Soc., vol. xxvii, p. 146, 1871; Ann. Mag. Nat. Hist. [5], vol. vi, p. 317, 1880; *C. spherioides*, Proc. Zool. Soc., p. 93, 1883.

1872. *Cyclostrema spherioidea*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.

1888. *Cyclostrema spherioides*, Locard, Expéd. scient. Trav. et Talism., p. 7.

1893—98. *Cyclostrema spherioidea*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; (*Turbo*) Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.

Specific Characters.—Shell minute, spheroidal, nacreous; spire slightly elevated; whorls 3, convex, rounded, rapidly enlarging; ornamented by about half a dozen spiral striæ or ridges, the lower one forming a kind of keel, encircling the umbilicus which is broad and naked, the ridges being continued to the base of the shell; suture deep; mouth ovate, angulate above.

Dimensions.—L. 2 mm. B. 2 mm.

Distribution.—*Recent*: Bay of Biscay ("Travailleur" Exped.). Atlantic, Tangier ("Porcupine" Exped.).

Fossil: St. Erth. Coralline Crag: Gedgrave, Sutton.

Remarks.—A rare form, both as recent or fossil. There are three specimens of it from St. Erth in the British Museum, while Wood reported one from the Coralline Crag. It seems to be a comparatively deep sea form, derived possibly in Pliocene times from a deep portion of the Atlantic which then lay at no great distance from the British coasts.

Cyclostrema læve (Philippi). Plate LX, fig. 16.

1844. *Delphinula lævis*, Philippi, Enum. Moll. Sic., vol. ii, p. 146, pl. xxv, fig. 2

1853. *Skeneia lævis*, Forbes and Hanley, Brit. Moll., vol. iii, p. 165, pl. lxxxviii, figs. 5, 6.

1859. *Skeneia lævis*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xiv, fig. 22.

1872—74. *Cyclostrema lævis*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. 1, p. 86, pl. v, fig. 13, 1872; pt. 2, p. 186, 1874.

1890. *Cyclostrema lævis*, C. Reid, Plioc. Dep. Brit., p. 243.

1893—98. *Cyclostrema lævis*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.

1901. *Delphinoidea nitens*, var. *lævis*, Conch. Soc. List, Journ. of Conch., vol. x, p. 17, no. 312.

Specific Characters.—Shell minute, smooth, orbicular; whorls 3, subcylindrical, the last wide, expanded, much the largest, rapidly diminishing to a very short and depressed spire; suture deep; umbilicus comparatively large and deep, internally striated; mouth large, subcircular, two-thirds the total length, one half the basal diameter of the shell.

Dimensions.—Diam. 1 mm. H. 0·5 mm.

Distribution.—*Recent*: Coast of north-eastern England. Sicily.

Fossil: St. Erth. Calabria—Reggio.

Remarks.—Of this minute and very rare shell there are two specimens from St. Erth in the Warburton Collection at the British Museum of Natural History under the above name, one of which is here rather unsatisfactorily figured; the umbilicus is internally striated.

Cyclostrema basistriatum, Jeffreys, MS. Plate LX, fig. 17.

1873. *Cyclostrema basistriatum*, Jeffreys in Weinkauff, Cat. europ. Meeresconch., p. 38, no. 739.

1876. *Cyclostrema (Molleria) basistriatum*, Brugnone, Miscell. Malac., pt. ii, p. 17, fig. 24

- 1877—83. *Cyclostrema basistriatum*, Jeffreys, Ann. Mag. Nat. Hist. [4], vol. xix, p. 234, 1877; Proc. Zool. Soc., p. 90, 1883.
1878. *Cyclostrema basistriatum*, G. O. Sars, Moll. Reg. arct. Norv., pp. 128, 357, pl. viii, fig. 8.
- 1893—98. *Cyclostrema basistriata*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.
1901. *Delphinoidea basistriata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 17, no. 314.
1901. *Cyclostrema basistriatum*, Friele og Grieg, Norske Nordhav. Exped., pt. iii (Mollusca), p. 60.
1912. *Cyclostrema basistriatum*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 19, pl. v, figs. 40, 42.

Specific Characters.—Shell minute, conical, depressed; spire short, narrow; apex obtuse; whorls 4, tumid; the last much the largest, three-fourths the total length; suture deep; mouth large, subcircular, expanded; outer lip rounded; umbilicus circular, distinct; surface generally smooth, except at the base, which is spirally striated.

Dimensions.—L. 2 mm. B. 2.5 mm.

Distribution.—*Recent*: Norwegian coast from the Lofoten Islands to the Christiania fiord, Spitzbergen; North Atlantic expeditions, 40 to 1333 fathoms, east coast of N. America as *C. affinis* (Friele).

Fossil: Pliocene: St. Erth. Pleistocene: Ficarazzi.

Remarks.—This minute form is described in MS. by Jeffreys under the present name, which was adopted by Weinkauff some years before the appearance of Brugnone's work. It is another deep sea and Atlantic species only known as an English fossil from St. Erth. Brugnone reports it from the Pleistocene of Ficarazzi.

In the Warburton Collection of St. Erth fossils at the British Museum there are several specimens named respectively *C. lævis* (no. 18060) and *C. basistriatum* (no. 18061). They seem to be very much the same, but most nearly to represent that figured by Wood as *C. lævis*, the difference being in the basal sculpture. Wood's figure (*op. cit.*) shows the umbilical cavity to be margined by a distinctly raised spiral ridge, of which there is no trace in Philippi's type ('Enum. Moll. Sic.,' pl. xxv, fig. 2). In his supplement of 1874 (p. 186), Wood appears inclined to agree with Jeffreys that the Crag shell is not Philippi's *C. lævis* but a new species, suggesting it should be called *C. basistriatum*, which view I adopt as the best way out of the difficulty. Unfortunately so many of our authorities do not figure their specimens, and when they do so their non-photographic drawings cannot always be relied on.

***Cyclostrema elegantulum* (Philippi).** Plate LX, fig. 18.

1844. *Delphinula? elegantula*, Philippi, Enum. Moll. Sic., vol. ii, p. 146, pl. xxv, fig. 3.
1873. *Cyclostrema elegantula*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 10, no. 480.
1892. *Cyclostrema elegantulum*, A. Bell, Rep. Yorks. Phil. Soc., pp. 63, 74, pl. i, fig. 16.

Specific Characters.—Shell minute, conoid, umbilicate; whorls rounded, flattened; spire very short; base slightly striated, the upper part and side of the whorls being ornamented by delicate spiral ridges; mouth large, circular, obliquely expanded, about half the total length; umbilicus large, deep; peristome continuous.

Dimensions.—H. 0.75 mm. B. 1 mm.

Distribution.—Not recorded living.

Fossil: Selsey. Calabria—Pezzo, near Reggio.

Remarks.—Thirty years ago Mr. Bell discovered at Selsey the specimen now in the York Museum, here figured under the above name, which he considered to be identical with a unique example from the Pleistocene deposits of Calabria described by Philippi 50 years before. With the exception of these two, this form is unknown either as recent or fossil.

Cyclostrema nitens (Philippi). Plate LX, fig. 19.

1844. *Delphinula nitens*, Philippi, Enum. Moll. Sic., vol. ii, p. 146, pl. xxv, fig. 4.
 1853. *Trochus pusillus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 534, pl. lxxiii, figs. 3, 4.
 1867—83. *Cyclostrema nitens*, Jeffreys, Brit. Moll., vol. iii, p. 289, 1867; vol. v, p. 201, pl. lxi, fig. 2, 1869; Proc. Zool. Soc., p. 91, 1883.
 1876. *Cyclostrema nitens*, Seguenza, Boll. R. Com. Geol. Ital., vol. vii, p. 188, no. 777.
 1886. *Cyclostrema nitens*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
 1889. *Cyclostrema nitens*, Carus, Prod. Faun. Medit., vol. ii, p. 262.
 1890. *Cyclostrema nitens*, C. Reid, Plioc. Dep. Brit., p. 243.
 1892. *Cyclostrema nitens*, Locard, Coq. mar. Côtes de France, p. 198.
 1892—98. *Cyclostrema nitens*, A. Bell, Rep. Yorks. Phil. Soc., p. 63, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.
 1901. *Delphinoides nitens*, Conch. Soc. List, Journ. of Conch., vol. x, p. 17, no. 312.

Specific Characters.—Shell minute, depressed above and below; whorls 3, convex, rapidly enlarging; surface smooth and polished except for a few indistinct grooves on the upper part of the umbilicus; spire short, blunt; suture rather deep; mouth slightly angular above; umbilicus narrow, oblique.

Dimensions.—B. 1 mm. H. 0.75 mm.

Distribution.—*Recent:* Guernsey, Devon, Cornwall; Ireland, Scotland—Skye, Hebrides, Moray Firth, Shetland.

Mediterranean.

Fossil: St. Erth. Calabria—Reggio. Isle of Man. Selsey. Irish estuarine clays (abundant). Upper Pliocene: Messina.

Remarks.—This minute shell, unknown from the Crag, has been recorded as a Pliocene fossil by Prof. Kendall and the late R. G. Bell from St. Erth, and from Sicily by Seguenza. A. Bell has found it in the Pleistocene of Selsey and in the estuarine clays of Belfast, in the latter locality, he informs me, in great abundance.

A single specimen was found by Philippi in Calabria. Being a minute form it may have been otherwise overlooked by collectors.

Genus **ADEORBIS**, S. V. Wood, 1842.

Adeorbis subcarinatus (Montagu). Plate LX, fig. 20.

1803. *Helix subcarinata*, Montagu, Test. Brit., pt. ii, p. 438, pl. vii, fig. 9.
 1842—48. *Adeorbis subcarinata*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 530, 1842; Mon. Crag Moll., pt. i, p. 139, pl. xv, fig. 8, 1848.
 1844. *Natica subcarinata*, Philippi, Enum. Moll. Sic., vol. ii, p. 143, pl. xxiv, fig. 13.
 1844—81. *Trochus trigonostomus*, Nyst, Coq. foss. Terr. tert. Belge, p. 385, pl. xxxv, fig. 23, 1844; *Adeorbis subcarinatus*, Conch. Terr. tert. Belg., p. 110, pl. vii, fig. 6, 1881.
 1853. *Adeorbis subcarinatus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 541, pl. lxxviii, figs. 6—8.
 1859. *Adeorbis subcarinatus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 25.
 1867—85. *Adeorbis subcarinatus*, Jeffreys, Brit. Conch., vol. iv, p. 231, 1867; vol. v, p. 216, pl. lxxix, fig. 1, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 142, 486, 1871; Proc. Zool. Soc., p. 40, 1885.
 1872. *Adeorbis subcarinatus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209.
 1873. *Adeorbis subcarinatus*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 352, no. 249.
 1874—92. *Adeorbis subcarinatus*, Van den Broeck, Ann. Soc. malac. Belg., vol. ix, p. 187, 1874; Bull. Soc. Belge Géol. (Mémoires), vol. vi, pp. 123, 134, 1892.
 1882. *Adeorbis subcarinatus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 424, pl. li, figs. 4, 5, 6.
 1890. *Adeorbis subcarinatus*, Carus, Prod. Faun. Medit., vol. ii, p. 299.
 1890. *Adeorbis subcarinatus*, C. Reid, Plioc. Dep. Brit., p. 237.
 1890—93. *Adeorbis subcarinatus*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 420, 1890; Proc. Roy. Phys. Soc. Edin., vol. x, p. 296, 1890; vol. xii, p. 25, 1892; Rep. Yorks. Phil. Soc., p. 63, 1893.
 1901. *Adeorbis subcarinatus*, Conch. Soc. List, Journ. of Conch., vol. x, p. 18, no. 365.
 1912. *Adeorbis subcarinatus*, Tesch., Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 62, no. 134.

Specific Characters.—Shell minute, solid, subcircular; whorls compressed, rapidly enlarging, the last tumid, much the largest, angulated, ornamented by strong, narrow, but prominent spiral ridges, 6 on the body whorl, 2 on the next, none on the two upper ones and 2 on the base, the inter-striæ being crossed by numerous longitudinal striæ, oblique and flexuous; spire extremely short, suture well-defined but not deep; mouth large, oblique, expanded, indented by the ridges; umbilicus large, striated obliquely, sloping inwards.

Dimensions.—Diam. 2—3 mm. H. 1—2 mm.

Distribution.—*Recent*: British seas—south and west, Irish, Scottish—Bute, Aberdeenshire. Atlantic coasts—France, Portugal, Morocco, Belgium. Mediterranean, Adriatic, Ægean.

Fossil: Coralline Crag: Sutton, Gedgrave, Ramsholt, Boyton. Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Sutton. Pleistocene: Selsey, Torbay, Fillyside. Holocene: Portrush.

Miocene: Bordeaux, Touraine, Belgium, Italy. Pliocene: France, Cotentin. Scaldisien: Belgium, Holland. Poederlien: Belgium.

Remarks.—This minute shell, known to Wood principally from the Coralline Crag, has since been reported from the Waltonian of Walton and Oakley. The specimen now figured was found by Mr. Bell at Portrush, where he says it is not uncommon. It has also been recorded by the same authority from the Pleistocene and Holocene of some other localities. A careful examination of the detritus, which is too often thrown away, would certainly add to our lists of such forms from those deposits.

Adeorbis naticoides, S. V. Wood. Plate LX, fig. 21.

1879. *Adeorbis (?) naticoides*, S. V. Wood, Mon. Crag Moll., 2nd Suppl., p. 34, pl. iii, fig. 13.
 1890. *Adeorbis naticoides*, C. Reid, Plioc. Dep. Brit., p. 237.
 1893—98. *Adeorbis naticoides*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 630, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 144, 1898.

Specific Characters.—Shell minute, smooth, obliquely ovate; whorls convex, regularly coiled round the apex, the last ventricose much the largest; spire very short, depressed; mouth large, five-sixths the total length, much expanded; peristome continuous; umbilicus large and deep, surrounded by a distinct ridge, with another crossing it internally and obliquely.

Dimensions.—H. 1·5—2·5 mm. B. 2·5 mm.

Distribution.—Not known living.

Fossil: St. Erth. Coralline Crag: Sutton.

Remarks.—This very distinct shell, as to the generic affinities of which Wood was in doubt, was known to him from a unique specimen he had found in the prolific bed of Coralline Crag at Sutton. It seems too interesting to be passed over without notice, if only to draw the attention of collectors to it. Such minute forms deserve a closer examination than they have generally received. The specimen here figured belongs to the St. Erth Warburton Collection of the British Museum (no. 18063), where it bears the name given above.

Adeorbis supranitidus, S. V. Wood. Plate LX, fig. 22.

- 1842—72. *Adeorbis supranitidus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 530, 1842; Mon. Crag Moll., pt. i, p. 137, pl. xv, fig. 5, 1848; 1st Suppl., pt. i, p. 84, 1872.
 1857. *Adeorbis Orbigny*, Fischer, Journ. de Conch., vol. vi, pp. 173, 286.
 1865—85. *Trochus Duminyi*, var., Jeffreys, Brit. Conch., vol. iii, p. 315, 1865; vol. v, p. 203, pl. lxx, fig. 5, 1869; *Adeorbis supranitidus*, in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 144, 1871; Proc. Zool. Soc., p. 40, 1885.
 1871. *Adeorbis supranitidus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.
 1878. *Omalaxis supranitidus*, G. O. Sars, Moll. Reg. arct. Norv., pp. 214, 360, pl. xxii, fig. 20.

1882. *Omalaxis lirata*, Verrill, Trans. Conn. Acad., vol. v, p. 529.
 1893. *Adeorbis supranitida*, A. Bell, Rep. Yorks. Phil. Soc., p. 63.
 1915. *Adeorbis supranitidus orbigny*, Johnson, Bost. Soc. Nat. Hist., Occ. papers (13), p. 120.

Specific Characters.—Shell minute, smooth, depressed, with one to three sharp carinæ, the upper one small, sometimes absent; whorls 3—4, the last ventricose, subcanaliculate near the suture; umbilicus large, open, coarsely striated.

Dimensions.—Diam. 2—3 mm. H. 1 mm.

Distribution.—*Recent*: Lofoten Islands. Tangier Bay. New England Coasts.

Fossil: Coralline Crag: Sutton, Gedgrave. Waltonian: Little Oakley. Pleistocene: Selsey.

Remarks.—This is another of the minute shells that Wood obtained from the Coralline Crag of Sutton. I found a specimen of it at Oakley, and Mr. Bell has reported it from Selsey.

***Adeorbis pulchralis*, S. V. Wood. Plate LX, fig. 23.**

- 1842—72. *Margarita helicina*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 530, 1842; *Adeorbis pulchralis*, Mon. Crag Moll., pt. i, p. 139, pl. xv, fig. 4, 1848; 1st Suppl., pt. i, p. 84, 1872.
 1871. *Adeorbis pulchralis*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142.
 1872. *Adeorbis pulchralis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.
 1873. *Adeorbis pulchralis*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 352, no. 251.
 1890. *Adeorbis pulchralis (Margarita trochoidea)*, C. Reid, Plioc. Dep. Brit., p. 237.

Specific Characters.—Shell minute, depressed, suborbicular, heliciform; whorls 3, rapidly increasing, the last expanded, convex above, flat beneath, obtusely angulate; suture deep; spiral sculpture very fine; mouth large and wide, with a deep umbilicus, outer lip projecting.

Dimensions.—Diam. 2 mm. H. 1 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton, Gomer. Waltonian: Little Oakley. Pleistocene: Livorno.

Remarks.—This minute shell is at present known as an English fossil only from the Coralline Crag of Sutton, the now inaccessible Gomer pit, and from the Waltonian of Little Oakley. Seguenza reports it from the Pleistocene deposits of Livorno.

***Adeorbis obliquata*, A. Bell.**

- 1893—98. *Adeorbis obliquata*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 630, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 144, 1898.

Specific Characters.—Shell small, flat, smooth; mouth wide; umbilicus large (A. Bell).

Distribution.—Not recorded living.

Fossil: St. Erth.

Remarks.—I cannot ascertain what has become of the specimen upon which this species was founded. Unless it should turn up hereafter I fear the rather vague description of it given by Mr. A. Bell will hardly enable future students of the St. Erth fossils satisfactorily to identify it.

Adeorbis tricarinatus, S. V. Wood. Plate LX, fig. 24.

1842—72. *Adeorbis tricarinatus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 530, 1842; Mon. Crag Moll., pt. i, p. 138, pl. xv, fig. 6, 1848; 1st Suppl., pt. i, p. 34, 1872.

1865—85. *Trochus Duminyi*, var. *tricarinata*, Jeffreys, Brit. Conch., vol. iii, p. 317, 1865; *Adeorbis supranitidus*, var., in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871; var. *tricarinatus*, Proc. Zool. Soc., p. 40, 1885.

1872. *Adeorbis tricarinatus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.

1890. *Adeorbis supranitidus*, var. *tricarinatus*, C. Reid, Plioc. Dep. Brit., p. 237.

Specific Characters.—Shell minute, depressed, flat above and beneath; whorls 3, subcylindrical, ornamented by 3 subequidistant carinæ, with a large open umbilicus, corrugated by the lines of growth.

Dimensions.—Diam. 2 mm. H. 1 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton.

Remarks.—This minute shell was referred by Jeffreys at one time to the var. *tricarinata* of *Adeorbis supranitidus*, and at another to *Trochus Duminyi*. In his latest notice of the subject Wood retained his original view, however, that it should be regarded as specifically distinct, in which the Messrs. Bell have followed him. It is only known from one spot, the bed of small shells in the grit of Coralline Crag at Sutton. Wood has obtained there about half a dozen specimens only, but they all possessed what he considered the distinguishing features of this species.

Genus **CIRCULUS**, Jeffreys, 1865.

Circulus striatus (Philippi). Plate LX, fig. 25.

1836—44. *Valvata* (?) *striatus*, Philippi, Enum. Moll. Sic., vol. i, p. 147, pl. ix, fig. 3, 1836; vol. ii, p. 122, 1844.

1842—48. *Adeorbis striatus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 530, pl. v, figs. 4, 6, 1842; Mon. Crag Moll., pt. i, p. 137, pl. xv, fig. 7, 1848.

1865—83. *Trochus Duminyi*, Jeffreys, Brit. Conch., vol. iii, p. 315, 1865; vol. v, p. 203, pl. lxii, fig. 5, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871; *Circulus striatus*, Proc. Zool. Soc., p. 95, 1883.

1870. *Trochus Duminyi*, A. Bell, Journ. de Conch., vol. xviii, p. 352, no. 406.
 1871. *Adeorbis striatus*, S. P. Woodward, in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 124.
 1874—76. *Circulus striatus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 8, no. 474, 1874; vol. vii, p. 188, no. 774, 1876.
 1886. *Circulus striatus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 420, pl. li, figs. 1—3.
 1889. *Circulus striatus*, Carus, Prod. Faun. Medit., vol. ii, p. 255.
 1889. *Delphinula striata*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 349, no. 1788.
 1890. *Adeorbis striatus*, C. Reid, Plioc. Dep. Brit., p. 237.
 1892. *Circulus striatus*, Locard, Coq. mar. Côtes de France, p. 200, fig. 175.

Specific Characters.—Shell minute, smooth, depressed, striated, not carinated; whorls 3 or 4, the last convex, expanded, much the largest, flattened above; spire very short, scarcely elevated; suture deep and distinct; umbilicus large and wide; mouth subcircular, projecting.

Dimensions.—Diam. 3—4 mm. H. 2 mm.

Distribution.—*Recent*: Donegal Bay (very rare); Atlantic Coast as far south as Morocco; Mediterranean, Adriatic.

Fossil: Coralline Crag: Gedgrave, Sutton.

Miocene: Calabria.

Pliocene: Altavilla, Modena, Calabria, Biot.

Pleistocene: Catania, Reggio.

Remarks.—This minute shell has been rarely reported either as recent or fossil; as fossil 4 or 5 specimens only were known to Wood in 1842—8, from two localities in the Coralline Crag, and although a distinct form it has been rarely noticed since—possibly it has been overlooked by collectors.

Genus **VELUTINA**, Fleming, 1820.

Velutina lævigata (Pennant). Plate LX, fig. 26.

1777. *Helix lævigatum*, Pennant, Brit. Zool., vol. iv, p. 140, pl. lxxxvi, fig. 139.
 1841—70. *Velutina lævigata*, Gould, Inv. Mass., ed. 1, p. 241, fig. 159, 1841; ed. 2, *V. haliotoides*, p. 334, fig. 605, 1870.
 1842—74. *Velutina lævigata*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 528, 1842; Mon. Crag Moll., pt. i, p. 152, pl. xix, fig. 8, 1848; 1st Suppl., pt. ii, p. 210, 1874.
 1853. *Velutina lævigata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 347, pl. xcix, figs. 4, 5.
 1858. *Velutina lævigata*, H. and A. Adams, Gen. Rec. Moll., vol. i, p. 199, pl. xxi, fig. 2.
 1859. *Velutina lævigata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvi, fig. 21.
 1863—69. *Velutina lævigata*, Jeffreys, Rep. Brit. Assoc. (Newcastle-on-Tyne), p. 73, 1863; Brit. Conch., vol. iv, p. 240, 1867; vol. v, p. 216, pl. lxxix, fig. 4, 1869.
 1872. *Velutina lævigata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 214.
 1878. *Velutina lævigata*, G. O. Sars, Moll. Reg. arct. Norv., pp. 146, 358.
 1879. *Velutina lævigata*, Jas. Reeve, Proc. Norwich Geol. Soc., vol. i, p. 71.

1890. *Velutina lævigata*, Carus, Prod. Faun. Medit., vol. ii, p. 307.
 1890. *Velutina lævigata*, C. Reid, Plioc. Dep. Brit., p. 261.
 1892. *Velutina lævigata*, Locard, Coq. mar. Côtes de France, p. 185, fig. 161.
 1898. *Velutina lævigata*, Posselt, Medd. om Grönl., vol. xxiii, p. 133.
 1901. *Velutina lævigata*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 430, 560, pl. ix, fig. 16.
 1901. *Velutina lævigata*, Kobelt, Icon. europ. schalentrag. Meeresconch., vol. ii, p. 112, pl. xlv, figs. 6, 7.
 1902. *Velutina lævigata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 29, no. 389.
 1905. *Velutina lævigata*, F. W. Harmer, Bull. Soc. Belge Géol., vol. xix, p. 326.
 1910—11. *Velutina lævigata*, Odhner, Arkiv. f. Zool., vol. vii, p. 6, 1910; K. Svensk. Vet.-Akad. Handl., vol. xlviii, p. 60, pl. i, figs. 17—26, 1911.
 1912. *Velutina velutina*, Dautzenberg et Fischer, Camp. scient. Prince de Monaco, vol. xxxvii (Mollusques), p. 220.
 1915. *Velutina lævigata*, Johnson, Bost. Soc. Nat. Hist., Occ. papers (13), p. 108.

Specific Characters.—Shell oval, thin, fragile; whorls $3\frac{1}{2}$, the last ventricose, occupying nearly the whole of the shell, expanding outwards; ornamented by oblique curved lines of growth and by delicate transverse lines; suture deep and channelled; spire twisted upwards; mouth very large, subcircular, slightly angulate above, rounded below, equalling in length seven-eighths of the shell; outer lip almost forming an arc of a circle; outer lip very thin; inner lip broadly reflected on the pillar with a small umbilical chink behind it.

Dimensions (of Crag specimen).—H. 8 mm. B. 8—10 mm.

Distribution.—*Recent*: Widely distributed on hard ground beyond tide-marks in British seas. Baltic Sea, North Atlantic from Finmark and the Lofoten Islands to Vigo. Circumpolar: Spitzbergen, Iceland, Greenland, Siberia, Lapland, Nova Zembla, Kara Sea to Behring Sea and Kamschatka. Newfoundland and New England coast. Mediterranean.

Fossil: Icenian Crag: Bramerton, Thorpe, Postwick, W. Runton. Pleistocene: Scotland—Garvel Park, Paisley, and elsewhere.

Uddevalla, Christiania fiord—*Cyprina*-beds to *Tapes*-banks.

Remarks.—This widely spread species, ranging as a recent shell from the arctic circle to the Mediterranean, has been reported as a fossil from the Norwich and Weybourne zones of the Icenian, but not abundantly, and from no other part of the Crag. Mr. Bell informs me, however, that it is fairly common at certain localities in the Pleistocene of Scotland, as at Garvel Park. Jeffreys records it from Uddevalla and Prof. Brøgger from the Christiania-fiord beds. Possibly its fragility is one reason why it has not been more commonly found as a fossil. The specimen here figured is from the Reeve Collection at the Norwich Museum.

Velutina virgata, S. V. Wood. Plate LX, fig. 27.

- 1848—74. *Velutina virgata*, S. V. Wood, Mon. Crag Moll., pt. i, p. 153, pl. xix, fig. 9, 1848; 1st Suppl., pt. ii, p. 210, 1874.

1871. *Velutina undata*, Jeffreys, in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 146.
 1872. *Velutina undata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1890. *Velutina virgata*, C. Reid, Plioc. Dep. Brit., p. 261.

Specific Characters.—Shell small, ear-shaped, thin and fragile; spire slightly elevated, with two or three inflated volutions covered with spiral striæ; suture deep; mouth ovate, narrowed at the base; left lip reflected; columella flattened.

Dimensions.—L. 6 mm. B. 6 mm.

Distribution.—*Recent*: Not known living.

Fossil: Coralline Crag: Sutton.

Remarks.—This is the only form of *Velutina* known from the Coralline Crag, the others being found exclusively at a later horizon, that of the Icenian. As I cannot discover any recorded species to which it can be satisfactorily referred, I have adhered to Wood's name, and have had the specimen figured by him copied for the present work.

Jeffreys identified it with the *V. undata* of Smith, in which he was followed by A. and R. Bell, but I think that was a mistake.

***Velutina undata*, Brown. Plate LX, fig. 28.**

1839. *Velutina undata*, Brown, in Smith, Mem. Wernerian Soc., vol. viii, p. 102, pl. i, fig. 15.
 1841—70. *Velutina zonata*, Gould, Inv. Mass., ed. 1, p. 242, fig. 160, 1841; ed. 2, p. 335, fig. 606, 1870.
 1848—74. *Velutina undata*, S. V. Wood, Mon. Crag Moll., pt. i, p. 153, pl. xix, fig. 10, 1848; 1st Suppl., pt. ii, p. 210, 1874.
 1858. *Limneria zonata*, H. and A. Adams, Gen. Rec. Moll., vol. i, p. 201; *Murvillia zonata*, vol. ii, p. 645.
 1863—71. *Velutina undata*, Jeffreys (*Galericulum undatum*), Rep. Brit. Assoc. (Newcastle-on-Tyne), p. 79, 1863; Brit. Conch., vol. iv, p. 242, 1867; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 146, 1871.
 1872. *Velutina zonata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 214.
 1872. *Velutina undata*, Dawson, Canad. Natur. [N.S.], vol. vi, p. 90.
 1877. *Velutina undata*, Etheridge in J. Geikie, Gt. Ice Age, ed. 2, p. 600.
 1878. *Morvillia undata*, G. O. Sars, Moll. Reg. arct. Norv., pp. 147, 358, pl. xxi, fig. 7.
 1890. *Velutina undata*, C. Reid, Plioc. Dep. Brit., p. 261.
 1890. *Velutina zonata*, Posselt, Medd. om Grønland, vol. xxiii, p. 135.
 1901. *Morvillia undata* (?), Brøgger, Norges geol. Undersøgelse, no. 31, pp. 560, 653.
 1913. *Velutina undata*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. l, p. 55, pl. i, figs. 10—15.
 1915. *Velutina undata*, Johnson, Bost. Soc. Nat. Hist., vol. vii, Occ. papers (13), p. 108.
 1921. *Velutina zonata*, Dall, U.S. Nat. Mus., Bull. 112, p. 167.

Specific Characters.—Shell ovate, very thin and fragile; spire exceedingly small and short, placed laterally behind the expansion of the outer lip; apex depressed; whorls 3, obsoletely striated; mouth very large, suborbicular, expanded; inner lip reflected on the columella.

Dimensions.—L. 6 mm. B. 5 mm.

Distribution.—*Recent*: Circumpolar—White Sea, Kara Sea, Spitzbergen, Nova Zembla, Siberian coast, Behring Sea, Greenland. Norwegian coast, Finmark to Christiansund. Eastern coast of North America—Maine, Massachusetts. North-West Coast—California.

Fossil: Icenian Crag: Bramerton. Pleistocene: Scotland—Dalmuir, Ayrshire, Gourock, Girvan.

Montreal, Uddevalla.

Remarks.—The shell here figured comes from the Wood Collection at the Norwich Museum, where it bears in his own writing the words "*Velutina undatum*, Bramerton." It is no doubt one of the three specimens he mentions as having been found at that place which he identified with the *V. zonata* of Gould, with whose drawing in the Invertebrata of Massachusetts it satisfactorily agrees.

As a recent shell it seems to have an extended range, including the Pacific coast of North America. It has been lately reported by Dr. Dall from California.

Genus **CAPULUS**, Montfort, 1810.

Capulus ungaricus (Linné). Plate LXI, figs. 1, 2.

1766. *Patella ungaricus*, Linné, Syst. Nat., ed. xii, p. 1259.
 1814. *Patella hungaricus*, Brocchi, Conch. foss. subap., vol. i, p. 257.
 1836—44. *Pileopsis ungarica*, Philippi, Enum. Moll. Sic., vol. i, p. 118, 1836; vol. ii, p. 91, 1844.
 1842—72. *Capulus ungaricus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 527, 1842; with varieties, Mon. Crag Moll., pt. i, p. 155, pl. xvii, fig. 2, 1848; 1st Suppl., pt. i, p. 88, 1872.
 1844—81. *Pileopsis ungaricus*, Nyst, Coq. foss. Belg., p. 355, pl. xxxv, fig. 8, 1844; Conch. Terr. tert. Belg., p. 116, pl. vii, figs. 11 a, b, c, 1881.
 1853. *Pileopsis hungaricus*, Forbes and Hanley, Brit. Moll., vol. ii, p. 459, pl. lx, figs. 1, 2.
 1856. *Capulus ungaricus*, Hörnes, Foss. Moll. Tert. Wien, vol. i, p. 636, pl. 1, fig. 19.
 1865—72. *Capulus hungaricus*, Jeffreys, Brit. Conch., vol. iii, p. 269, 1865; vol. v, p. 201, pl. lix, fig. 6, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 142, 489, 1872.
 1870. *Capulus Hungaricus*, S. V. Wood, Jr., and F. W. Harmer, Rep. Brit. Assoc. (Liverpool), p. 90.
 1870—1911. *Capulus hungaricus*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 427, 1870; Geol. Mag., vol. viii, p. 454, 1871; Rep. Brit. Assoc. (Leeds), p. 417, 1890; Proc. R. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. R. Geol. Soc. Cornwall, vol. xii, p. 156, 1898; Journ. Ipswich Field Club, vol. iii, p. 15, 1911.
 1872. *Capulus hungaricus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209, 213, 215.
 1874—76. *Capulus hungaricus*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 10, no. 488; p. 334, no. 162, 1874; vol. vii, p. 260, no. 795, 1876.
 1886. *Capulus hungaricus*, with varieties, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 464, pl. lvi, figs. 1—6.
 1892. *Capulus hungaricus*, Locard, Coq. mar. Côtes de France, p. 218, fig. 194.
 1892. *Capulus (Pileopsis) Ungaricus*, Van den Broeck, Bull. Soc. Belge Géol., vol. vi (Mémoires), pp. 124, 134.
 1896. *Pileopsis Ungaricus*, Bernays, Bull. Soc. Belge Géol., vol. x (Mémoires), pp. 129, 132.
 1896. *Capulus ungaricus*, F. W. Harmer, Quart. Journ. Geol. Soc., vol. lii, p. 780.
 1901—7. *Capulus ungaricus*, Scalia, Atti Accad. Gioen. Sci. Nat. Catania [4], vol. xiv, p. 6, no. 8, 1901; vol. xx, p. 32, no. 209, 1907.

1912. *Capulus ungaricus*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 64, no. 139.
 1915. *Capulus ungaricus*, R. B. Newton, Journ. of Conch., vol. xv, p. 69.
 1915. *Capulus ungaricus*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii, Faun. of New England, no. 13 (Mollusca), p. 110.
 1919. *Capulus hungaricus*, Schlesch, Yorks. Naturalist, p. 342.

Specific Characters.—Shell fairly solid, subconical, vertex inclining to the posterior side, overhanging it and gradually becoming spiral; surface, often disfigured by irregular indentations and wrinkles of growth, is marked with fine raised costellæ, the rapidly attenuated whorls being loosely coiled and separated from the shell by a distinct and deep suture; inside smooth, more or less circular or oval and expanded in outline; aperture large, wide and open, concentrically and microscopically lineated from the middle to within a short distance of the margin; muscular mark deeply impressed, with large obtuse terminations, equidistant and converging.

Dimensions.—L. 50—60 mm. B. 35—40 mm. H. 25—30 mm.

Distribution.—*Recent*: British coasts, generally but locally diffused from 7 to 85 fathoms (Jeffreys) on oyster banks.

From the Lofoten islands, Iceland and the Norwegian coast to the Straits of Gibraltar, Mediterranean, Adriatic, Ægean. New England—Massachusetts.

Fossil: Lenham, St. Erth. Coralline Crag: Gedgrave, Sutton, Ramsholt, Boyton. Red Crag—Waltonian, Newbournian, Butleyan (*passim*). Icenian: Bramerton, Aldeby. Pleistocene: Billockby, Gorleston, Caithness, Wexford gravels, Irish estuarine clays.

Miocene, Casterlien, Scaldisien: Belgium. Scaldisien: Holland.

Miocene: Italy, Vienna basin, Touraine. Pliocene: Biot, Bologna, Piacenziano, Astiano, Sicily. Pleistocene: Tuscany, Calabria, Sicily, sub-Etnaen beds—Catania. *Tapes*-banks—Christiania fiord.

Remarks.—The Fools-cap Limpet, as it is sometimes called, is not a very rare shell in the Anglo-Belgian Crag. It is a variable species, the typical form, in which the sides are laterally extended, being that figured by Wood (*op. cit.*, pl. xvii, fig. 2), Nyst and other authors, and in the present work (Pl. LXI, fig. 2), in which the base is much expanded, other varieties being var. *regularis*, described below, and Wood's var. *elata* (fig. 2*f*), possibly a smaller specimen of the latter. The type is widely distributed as a fossil from the Miocene deposits to the post-glacial *Tapes*-banks of the Christiania fiord, while as recent it ranges from Norway to the Ægean and North America.

Var. **regularis**, S. V. Wood. Plate LXI, figs. 3, 4.

1884. *Capulus ungaricus*, var. *regularis*, S. V. Wood, Mon. Crag Moll., pt. i, p. 155, pl. xvii, fig. 2*a*.
 1886. *Capulus hungaricus*, var. *regularis*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 467.

Varietal Characters.—A regularly conical form, obscurely striated, with a circular base and a small pointed apex, nearly central, not laterally expanded as in the type.

Dimensions.—L. 20—30 mm. B. 25—40 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Ramsholt. Waltonian: Oakley, Beaumont, not otherwise worked out.

Capulus obliquus, S. V. Wood. Plate LXI, figs. 5, 6.

1842—48. *Capulus obliquus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 527, 1842; Mon. Crag Moll., pt. i, p. 156, pl. xvii, figs. 1 a, 1 b, 1848.

1868—81. *Pileopsis obliquus*, Nyst in d'Hallo, Précis élém. de Géol., p. 613, 1868; *Pileopsis ungarica*, var. *obliqua*, Nyst, Conch. Terr. tert. Belg., pp. 118, pl. vii, figs. 11 f, g, h, i, j, 1881.

1870. *Capulus obliquus*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 216.

1871. *Capulus ungaricus*, var., Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 487.

1890. *Capulus ungaricus*, var., C. Reid, Plioc. Dep. Brit., p. 240.

1896. *Pileopsis Ungaricus*, var. *obliquus*, Bernays, Bull. Soc. Belge Géol., vol. x (Mémoires), p. 129.

Specific Characters.—Shell elongato-ovate, thin and fragile, inequilateral and oblique, externally smooth and glossy, the outer side truncate; apex depressed, overhanging the posterior margin; obtusely and obliquely angulate.

Dimensions.—L. 25—32 mm. B. 15—25 mm. H. 10—15 mm.

Distribution.—Not known living.

Fossil: Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Waldringfield, Newbourn, Sutton, Felixstow. Butleyan: Butley (probably elsewhere in the Red Crag).

Scaldisien: Belgium.

Remarks.—Although this shell has been regarded by Jeffreys and others as a variety of *C. ungaricus*, I follow Wood and A. Bell in considering it specifically distinct. It is usually more fragile than the latter, is smooth, and generally without sculpture (see Wood, *op. cit.*, p. 156), differing from it materially in form. It may be distinguished by being decidedly inequilateral, by the obtuse, straight angulation, which runs from the apex to the basal and rounded limit of the shell. Wood calls attention to the persistence of its oblique outline and the absence of any intermediate varieties of *C. ungaricus* in the direction of *C. obliquus*. Whether the difference between the two should be regarded as varietal or specific, they are not the same. I adopt the latter opinion. *C. obliquus* is not uncommon at Oakley.

Capulus unguis (J. Sowerby). Plate LXI, fig. 7.

1818. *Patella unguis*, J. Sowerby, Min. Conch., vol. ii, pl. cxxxix, fig. 7.

1848. *Capulus ungaricus*, var. *unguis*, S. V. Wood, Mon. Crag Moll., pt. i, p. 155, pl. xvii, figs. 2 b, 2 c.

1871. *Capulus unguis*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 360.

1896. *Capulus hungaricus*, var. *unguis*, Sacco, Moll. Terr. Terz. Piem., pt. xx, p. 38.

Specific Characters.—Differs from *C. ungaricus* in size, its narrower base, and from *C. obliquus* in the subcentral and not one-sided position of the beak; it is somewhat stronger than the former, and shows clearly the lines of growth; occasionally it is obtusely angulated.

Dimensions.—L. 30—35 mm. B. 24—27 mm. H. 10—20 mm.

Distribution.—Not recorded living.

Fossil: Coralline and Red Crag (not worked out).

Remarks.—This shell is not uncommon in the Crag. Wood gives it as a variety of *C. ungaricus* from the Coralline horizon at Sutton, and I have found it at Oakley. There is also a specimen from Waldringfield, here figured, which comes from the Howes Collection at the Norwich Museum.

Capulus venustus, sp. nov. Plate LXI, fig. 8.

Specific Characters.—Differs from the type of *C. ungaricus* in size, in its shorter and more symmetrical form, and in its distinct and delicate sculpture.

Dimensions.—L. 15 mm. B. 12 mm. H. 7 mm.

Distribution.—Not reported living.

Fossil: Coralline Crag: Boyton.

Remarks.—The specimen here figured is no doubt a Boyton form, though it is stated to have been obtained from the Coralline Crag of Butley, at which place the latter does not exist. It belongs to the Jermyn Street Collection, where it bears the number 25525.

Capulus fallax, S. V. Wood. Plate LXI, fig. 9.

1842—48. *Capulus fallax*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 528, 1842; Mon. Crag Moll., pt. i, p. 157, pl. xvii, fig. 4, 1848.

1871. *Piliscus commodus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142.

1872. *Piliscus commodus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.

1890. *Capulus fallax*, C. Reid, Plioc. Dep. Brit., p. 240.

1896. *Capulus fallax*, Bernays, Bull. Soc. Belge Géol., vol. x (Mémoires), p. 129, pl. i, fig. 3.

Specific Characters.—Shell suborbicular, -depressed, smooth, thin and fragile, with an involute and oblique vertex, spirally twisted, the upper part of the shell expanded, the lower compressed, obtusely angular and rounded, bending in the opposite direction to the involution of the beak.

Dimensions.—L. 12—15 mm. B. 8—10 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Sutton. Waltonian: Beaumont, Oakley. Casterlien: Antwerp.

Remarks.—This very distinct form, known to Wood from the Coralline Crag of Sutton, and to M. Bernays from the contemporary deposits (zone à *Isocardia cor* of Antwerp = Casterlien only) was unfortunately identified by Jeffreys with a circumpolar and, as I think, a different species, the *Piliscus commodus* of Middendorff (*Pilidium radiatum*), in which he was followed by the brothers Bell. It is clear, however, that both the latter writers (*op. cit.*) were referring to Wood's southern and Sutton shell, and not to the northern one of the Scandinavian authors, which has been also reported from Uddevalla, Bridlington and Japan. Unfortunately but few authorities have figured the last-named species, but it might be instructive to compare the figure of *Pilidium radiatum* of G. O. Sars ('Moll. Reg. Arct. Norv.,' pl. viii, fig. 6) with those of Wood and Bernays, with which it closely corresponds, especially in the curved longitudinal keel crossing those shells obtusely, and the involution of the beak, which bends in the opposite direction.

Capulus recurvatus, S. V. Wood. Plate LXI, fig. 15.

1804. *Patella militaris*, Montagu, Test. Brit., pt. ii, p. 488, pl. xiii, fig. 11.
 1842—72. *Capulus recurvatus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 527, 1842; *C. militaris*, Mon. Crag Moll., pt. i, p. 156, pl. xvii, fig. 3f, 1848; *C. recurvatus*, 1st Suppl., pt. i, p. 88, 1872.
 1844. *Pileopsis (Patella) militaris*, Philippi, Enum. Moll. Sic., vol. ii, p. 92.
 1865—71. *Capulus Hungaricus*, juv., Jeffreys, Brit. Conch., vol. iii, p. 271, 1865; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 487, 1871.
 1872. *Capulus militaris*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 209, 213, 218.
 1890. *Capulus militaris*, Carus, Prod. Faun. Medit., vol. ii, p. 309.
 1890. *Capulus militaris*, C. Reid, Plioc. Dep. Brit., p. 240.
 1911. *Capulus recurvatus*, A. Bell, Journ. Ipswich Field Club, vol. iii, p. 15.
 1912. *Capulus recurvatus*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 64, no. 140.

Specific Characters.—Shell small, elongato-conical, with a distinctly recurved and reflected vertex, closely coiled, turning to one side, overhanging the base; ornamented by numerous fine and closely-set costæ and by distant lines of growth.

Dimensions of Aperture.—L. 18—25 mm. B. 12—18 mm.

Distribution.—Not reported living.

Fossil: Coralline Crag: Sutton, Orford. Waltonian: Walton-on-Naze, Little Oakley, Beaumont. Newbournian: Waldringfield, Newbourn, Sutton.

Remarks.—This species, which is fairly common at Oakley, was originally known to Wood as *C. recurvatus*. In 1848 he referred it to the *Patella militaris* of Montagu, but in 1872 reverted to his first name, as he found that the specific name *militaris* had been previously used by Linné for a different and West Indian shell.

Capulus pumila, sp. nov. Plate LXI, fig. 16.

1848. *Capulus militaris*, var., S. V. Wood, Mon. Crag Moll., pt. i, pl. xvii, fig. 3 e.

Specific Characters.—Shell minute, fragile, slender, rounded; apex incurved, coiled, inclined to the right; aperture oval, twice as long as wide; volution on the level of the base.

Dimensions.—L. 8 mm. B. 5 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: near Woodbridge, Sutton. Not otherwise worked out.

Remarks.—In his monograph of 1848 Wood figured a number of shells under the name of *Capulus militaris*, varying widely in size, form and sculpture. One of them agrees with three specimens in the Cambridge Museum, one of which is here figured; it seems to me it should be separated from the type of that species, deserving a distinct specific name. It is nowhere abundant, but is occasionally met with in other collections.

Genus **BROCCHIA**, Brown, 1827.**Brocchia sinuosa** (Brocchi). Plate LXI, fig. 10.

1814. *Patella sinuosa*, Brocchi, Conch. foss. subap., vol. ii, p. 257, pl. i, fig. 1.

1836—43. *Brocchia sinuosa*, Philippi, Enum. Moll. Sic., vol. i, p. 118, 1836; vol. ii, p. 92, 1843.

1860. *Brocchia sinuosa*, Chenu, Man. Conch., p. 329, no. 2384.

1868—81. *Pileopsis (Patella) sinuosa*, Nyst in Dewalque, Prod. Géol. Belg., p. 425, 1868; *Pileopsis ungarica*, var. *sinuosa*, Conch. Terr. tert. Belg., p. 118, pl. vii, fig. 11, 1881.

1871—1911. *Brocchia sinuosa*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 360, 1871; Journ. Ipswich Field Club, vol. iii, p. 15, 1911.

1872. *Brocchia sinuosa*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.

1872. *Capulus ungaricus*, var. *sinuosa*, S. V. Wood, Mon. Crag Moll., 1st Suppl., p. 88, pl. vii, fig. 26.

1874—75. *Brocchia (Patella) sinuosa*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 4, no. 496, 1874; vol. vi, p. 334, no. 165, 1875.

1884. *Patella sinuosa*, Jeffreys, in Prestwich, Quart. Journ. Geol. Soc., vol. xl, p. 29.

1889—96. *Capulus sinuosus*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 354, no. 1944, 1889; *Brocchia sinuosa*, Moll. Terr. Terz. Piem., pt. xx, p. 39, pl. v, figs. 13, 15.

1890. *Capulus sinuosus*, C. Reid, Plioc. Dep. Brit., p. 240.

1914. *Brocchia laevis*, var. *sinuosa*, Cerulli-Irelli, Palaeont. Ital., vol. xx, p. 208, pl. xvii, figs. 6—11.

Specific Characters.—Shell large, irregularly conical, inequilateral, convex, inflated; apex spirally incurved, overhanging; ornamented by strong, oblique, sinuous ribs or foldings; aperture wide, sub-circular or expanded laterally.

Dimensions.—L. 40 mm. B. 45 mm. H. 26 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Gedgrave. Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Waldringfield.

Pliocene: Italy—Astiano, Piacentino, Bordighera, Monte Mario. Sicily—Altavilla.

Scaldisien: Antwerp.

Remarks.—This very distinct form has been obtained from Walton by R. G. Bell, from Oakley by myself, and from Waldringfield and the Coralline Crag of Gedgrave by Alfred Bell. Sign. Cerulli-Irelli figures a number of specimens from Monte Mario (*op. cit.*), but to which of these our Crag fossils belong does not seem clear. Nyst gives it from the Scaldisien of Doel and Antwerp, and it has been reported also from a number of Italian and Sicilian localities by Profs. Sacco, Seguenza and others.

The specimen here figured is from the Coralline Crag of Gedgrave, and belongs to the Sedgwick Museum at Cambridge.

Brocchia plicata, sp. nov. Plate LXI, fig. 11.

Specific Characters.—Belongs to the genus *Brocchia*, but is smaller than the type, with a squarer and more depressed form, a number of irregular transverse plications extending from the beak to the margin, and narrower than the spaces separating them.

Dimensions.—L. 20 mm. B. 18 mm. H. 12 mm.

Distribution.—Not reported living.

Fossil: Coralline Crag: Gedgrave.

Remarks.—The shell figured under this name is from the Jermyn Street Collection, where it is regarded as a *Capulus*, and numbered 25526.

Brocchia partim-sinuosa (S. V. Wood). Plate LXI, fig. 12.

1848—74. *Capulus militaris*, var. β , *partim sinuosus*, S. V. Wood, Mon. Crag Moll., pt. i, p. 156, pl. xvii, figs. 3 a, 3 b, 1848; 1st Suppl., pt. i, p. 88, 1872; *Capulus (Brocchia)*, *partim sinuosus*, pt. ii, p. 211, 1874.

1872. *Brocchia partim-sinuosa*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 209.

1890. *Capulus partim-sinuosus*, C. Reid, Plioc. Dep. Brit., p. 240.

Specific Characters.—Shell of medium size, irregularly ovate, the left margin nearly straight, the right angulated below, side expanded, having a rounded outline, angulated above, and several strong and wide sinuosities with narrow intervals between on the upper part of it; ornamented also by five lines, both longitudinal and transverse; aperture very large in comparison to the length of the shell; apex small, incurved and coiled.

Dimensions.—L. 20 mm. B. 14 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Little Oakley. Newbournian: Waldringfield. Probably at other Crag localities.

Remarks.—The distribution of this interesting species has not been worked out. It deserves a careful search. Wood grouped several forms under the name of *Capulus militaris*, under the impression that the present one was an accidental variation, due possibly to its adherence to a *Pecten*, but later he gave up this view. I think it may be fairly regarded as specifically distinct.

Brocchia incerta (A. Bell). Plate LXI, figs. 13, 14.

1870. *Capulus* (?) *incertus*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 216.

1871. *Capulus incertus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 494.

1872. *Capulus incertus*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 88.

1872. *Brocchia incerta*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 209.

Specific Characters.—Shell forming a flattened cone with a depressed and overhanging apex nearly on a level with the margin. Volution twisted, inclining to the right. Opening truncated (with a slight inflexion) on the right side; left side expanded, sloping downwards from the top to the centre and thence contracting towards the base. Sculpture of strong ribs or flexures on the left side, curving lengthwise and downwards from the apex. Surface finely striated all over; lines of growth very distinct (A. B.).

Dimensions.—L. 28 mm. B. 24 mm.

Distribution.—Not known living.

Fossil: Newbournian Crag: Waldringfield. Scaldisien: Belgium.

Remarks.—The Red Crag specimen of this interesting shell was found by Mr. Bell at Waldringfield. The Belgian one I obtained myself from Antwerp.

Genus **FISSURELLA**, Bruguière, 1789.

Fissurella græca (Linné). Plate LXI, fig. 18.

1766. *Patella græca*, Linné, Syst. Nat., ed. xii, p. 1262.

1836—44. *Fissurella græca*, Philippi, Enum. Moll. Sic., vol. i, p. 116, 1836; vol. ii, p. 90, 1844.

1842—48. *Fissurella cancellata*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 528, 1842;

F. græca, Mon. Crag Moll., pt. i, p. 168, pl. xviii, fig. 4, 1848.

1843—81. *Fissurella græca*, Nyst, Coq. foss. Belg., p. 353, pl. xxxv, fig. 7, 1843; Conch. Terr. tert.

Belg., p. 122, pl. vii, fig. 7, 1881.

1853. *Fissurella reticulata*, Forbes and Hanley, Brit. Moll., vol. ii, p. 469, pl. xlvi, figs. 4, 5.

1865—82. *Fissurella græca*, Jeffreys, Brit. Conch., vol. iii, p. 266, 1865; vol. v, p. 200, pl. lix, fig. 5,

1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 144, 488, 1871; Proc. Zool. Soc., p. 677, 1882.

1870—1911. *Fissurella græca*, A. Bell, Journ. de Conch., vol. xviii, p. 352, no. 417, 1870; Proc. Roy.

Phys. Soc. Edinb., vol. x, p. 296, 1889; Rep. Brit. Assoc. (Leeds), p. 417, 1890; Rep. Yorks. Phil. Soc., p. 63, 1902; Journ. Ipswich Field Club, vol. iii, p. 15, 1911.

1872. *Fissurella græca*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209, 213.
 1874—76. *Fissurella græca*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 10, no. 498, 1874; vol. vii, p. 260, no. 799, 1876.
 1886. *Fissurella græca*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 440, pl. lxiii, figs. 4—10.
 1889. *Fissurella græca*, Carus, Prod. Faun. Medit., vol. ii, p. 239.
 1889—97. *Fissurella græca*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 348, no. 1954, 1889; (*Glyphis*), Moll. Terr. Terz. Piem., pt. xxii, p. 8, pl. i, figs. 16, 17, 1897.
 1892. *Fissurella græca*, Van den Broeck, Bull. Soc. Belge Géol., vol. vi (Mémoires), p. 124.
 1902. *Fissurella græca*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 286.
 1915. *Capiluna græca*, R. B. Newton, Journ. of Conch., vol. xv, p. 66, pl. iv, figs. 6, 7.

Specific Characters.—Shell forming an inequilateral cone, solid and opaque, perforated on the anterior side of the crown; ornamented by about 25 strong longitudinal ribs with finer ones between, and by imbricated concentric ridges causing nodulous decussation where they cross; aperture small, oval, thickened within; vertex truncated, sloping towards the anterior side; margin thickened and crenulated; mouth oval, slightly compressed towards the anterior end.

Dimensions.—L. 20—30 mm. B. 14—27 mm. H. 8—10 mm.

Distribution.—*Recent*: English coasts—south-east, south, west. Scotland—west. Ireland—all sides. Channel islands, Orkneys, Shetland, Atlantic coasts to Gibraltar, Mediterranean, Adriatic, Madeira, Canaries, Mogador, Egypt.

Fossil: Lenham. Coralline Crag: Sutton, Ramsholt. Red Crag: *passim*. Icenian: Aldeburgh (Suffolk). Selsey, Wexford. Irish estuarine clays—Portrush. Moel Tryfaen, Macclesfield.

Pliocene: Biot, Messina, Astiano. Scaldisien: Belgium.

Pleistocene: Messina, Ficarazzi, Monte Pellegrino, Taranto, Gravino, Livorno, Vallé Biaia.

Remarks.—This well-known southern species, ranging as recent from Shetland to Egypt and the Canaries, found abundantly in the Coralline, has been reported also from all parts of the Red Crag and from many Pleistocene deposits in Great Britain as well as on the continent, especially in Italy and Sicily. As a fossil it seems to be a comparatively modern form.

***Fissurella italica*, DeFrance. Plate LXI, fig. 17.**

1820. *Fissurella italica*, DeFrance, Dict. Sci. nat., vol. xvii, p. 79.
 1836—44. *Fissurella costaria*, Philippi, Enum. Moll. Sic., vol. i, p. 116, 1836; vol. ii, p. 90, 1844.
 1856. *Fissurella italica*, Hörnes, Foss. Moll. Tert. Wien, vol. i, p. 641, pl. l, fig. 28.
 1859. *Fissurella costaria*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 2.
 1870—92. *Fissurella costaria*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 216, 1870; Rep. Yorks. Phil. Soc., p. 63, 1892.
 1871. *Fissurella costaria*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 144.
 1872. *Fissurella costaria*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209.
 1872. *Fissurella costaria*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 90, pl. vii, fig. 19.

- 1874—76. *Fissurella costaria*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 10, no. 497, 1874;
F. neglecta, vol. vii, p. 260, no. 797, 1876.
1882. *Fissurella italica*, Fontannes, Moll. Plioc. Vall. du Rhone, p. 223, pl. xii, fig. 1.
1886. *Fissurella italica*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 446, pl. lxiii, figs. 1—3.
1889. *Fissurella italica*, Carus, Prod. Faun. Medit., vol. ii, p. 238.
- 1889—97. *Fissurella italica*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 348, no. 1756; *F. (Glyphis) italica*, Moll. Terr. Terz. Piem., pt. xxii, p. 8, pl. i, figs. 18—39, 1897.

Specific Characters.—Generally larger than *F. græca*, solid, ovate, inequilateral, compressed towards the anterior end; summit perforated, perforation larger and wider than in *F. græca* with strong and projecting callosities, external and internal; ornamented by well-marked and numerous radiating and unequal costæ to which the crenulated margins of the peristome correspond, the radiating lines of sculpture showing faintly on the interior of the shell.

Dimensions.—L. 45 mm. B. 30 mm. H. 12—14 mm.

Distribution.—*Recent*: Mediterranean, Adriatic.

Fossil: Coralline Crag: Gedgrave, Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Bentley, Waldringfield. Selsey.

Miocene: Gironde, Touraine, Rhone basin, Belgium, Switzerland, Turin, Austria, Bohemia (B. D. D., *op. cit.*, p. 449).

Pliocene: Pyrénées orientales, Rhone basin, Alpes maritimes, Belgium, Italy (B. D. D.)—Altavilla, Bologna, Biot, Caltabiano (Seguenza).

Pleistocene: Monte Pellegrino, Rhodes (B. D. D.), Ficarazzi, Calabria, Livorno, Valle Biaia (Seguenza).

Remarks.—This species is more decidedly southern than the one last described. It has been obtained from the Mediterranean and the Adriatic, but according to the authors of 'The Marine Mollusca of Roussillon' not from the Atlantic coast, some of the references to it in the works of various authorities being possibly varieties of *F. græca*; moreover it is not a recent British form. The specimen now figured is from Mr. Bell's collection of Boyton shells, an horizon, in his opinion, of intermediate age between the Gedgravian and Waltonian Crag.

It occurs in the Selsey fauna, which seems to represent a return to warmer conditions during a certain stage in the Pleistocene period.

Genus **CALYPTREA**, Lamarck, 1799.

Calyptra chinensis (Linné). Plate LXI, figs. 19, 20.

1766. *Patella chinensis*, Linné, Syst. Nat., ed. xii, p. 1257.
1792. *Patella sinensis*, Gmelin, Syst. Nat., ed. xiii, p. 3692.
1804. *Patella sinensis*, Montagu, Test. Brit., pt. ii, p. 489, pl. xiii, fig. 4.

1833. *Infundibulum clypeum*, S. Woodward, Geol. Norf., p. 44, pl. iii, fig. 2.
- 1836—44. *Calyptrea vulgaris*, Philippi, Enum. Moll. Sic., vol. i, p. 119, 1836; vol. ii, p. 93, 1844.
- 1842—72. *Infundibulum rotunda*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 462, 1842; *Calyptrea chinensis* and vars., Mon. Crag Moll., vol. i, p. 159, pl. xviii, fig. i, 1848; 1st Suppl., pt. i, p. 89, 1872.
1844. *Calyptrea sinensis*, Nyst, Coq. foss. Belg., p. 363, pl. xxxv, fig. 13.
1853. *Calyptrea sinensis*, Forbes and Hanley, Brit. Moll., vol. ii, p. 463, pl. lx, figs. 3—5.
- 1865—82. *Calyptrea chinensis*, Jeffreys, Brit. Conch., vol. iii, p. 273, 1865; vol. v, p. 201, pl. lx, fig. 1, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 142—487, 1871; Proc. Zool. Soc., p. 677, 1882.
1870. *Calyptrea sinensis*, S. V. Wood, Jr., and F. W. Harmer, Rep. Brit. Assoc. (Liverpool), p. 90.
- 1870—98. *Calyptrea chinensis*, A. Bell, Journ. de Conch., vol. viii, p. 353, 1870; Geol. Mag., vol. viii, p. 454, 1871; Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.
1872. *Calyptrea chinensis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209, 213, 215.
- 1874—76. *Calyptrea chinensis*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 10, no. 487; p. 332, no. 164, 1874; vol. vii, p. 260, no. 793, 1876.
1885. *Calyptrea sinensis*, Lorié, Arch. Mus. Teyler [2], vol. ii, p. 187, pl. v, fig. 7.
1886. *Calyptrea chinensis*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 456, pl. lv, figs. 1—4.
1886. *Calyptrea chinensis*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 212.
1902. *Calyptrea chinensis*, Conch. Soc. List, Journ. of Conch., vol. x, p. 19, no. 375.

Specific Characters.—Shell variable, more or less depressed, conical, with a wide base, thin, fragile, semitransparent; beak small, central, nearly erect; ornamented by numerous fine and minute striæ; marks of growth indistinctly spiral; suture slight; mouth greatly expanded; margin thin; diaphragm occupying nearly one half of the posterior side, obliquely triangular, concave.

Dimensions.—L. 20—28 mm. B. 15—25 mm. H. 6 mm. Icenian specimens are smaller, generally from 10 to 15 mm. only in length.

Distribution.—*Recent*: Local in shelly and pebbly ground on coasts of Devon and Cornwall and in the Channel Islands from low water mark to a few fathoms depth. Atlantic coast of France, Spain and Portugal. Mediterranean, Adriatic, Ægean, Tunis, Rhodes, Madeira, Canaries, Morocco.

Fossil: St. Erth. Coralline Crag: *passim*—Gedgrave to Boyton. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian, Butleyan, Icenian: generally diffused and sometimes abundant.

Pleistocene: Middle glacial sands, Hopton.

Diestien, Scaldisien, Poederlien: Belgium.

Diestien, Scaldisien, Amstelian: Holland.

Miocene: Austria, France, Italy, Switzerland.

Pliocene: France, Italy, Sicily. Pleistocene: Sicily.

Remarks.—The present species, mainly a southern form, is more or less common at all horizons of the English Crag, even as late as the Icenian, which there seems to indicate a lower temperature of the water of British seas than that of our own

times. I have myself obtained more than a hundred specimens from the typical locality of Bramerton near Norwich, all small, from 10 to 15 mm. in length, another variety, *depressa*, being flattened, while a third, var. *conica*, also small, has an elongated spire.

As far as specimens from the Crag are concerned, the small variety seems to be northern, characteristic of the later horizons of the Icenian deposits, while the large variety *muricata* is confined to the Coralline and Red horizons and appears to be a southern form. As to this see my remarks on *Cardium edule* in the first volume of the present work, p. 413.

Var. **muricata** (Brocchi). Plate LXI, figs. 21, 22.

1814. *Patella muricata*, Brocchi, Conch. foss. sub-ap., vol. ii, p. 254, pl. i, fig. 2.
 1844—81. *Calyptrea squamulata*, Nyst, Coq. foss. Belg., p. 363, pl. xxxv, fig. 13, 1844; *C. sinensis*, Conch. Terr. tert. Belg., p. 115, pl. vii, figs. 10 a, 10 b, 1881.
 1848. *Calyptrea chinensis*, var. *muricata*, S. V. Wood, Mon. Crag Moll., pt. i, p. 159, pl. xviii, figs. 1 a, 1 b.
 1856. *Calyptrea chinensis*, Hörnes, Foss. Moll. Tert. Wien, vol. i, p. 632, pl. 1, figs. 17, 18.
 1876. *Calyptrea muricata*, Seguenza, Boll. R. Com. Geol. Ital., vol. vii, p. 260, no. 792.
 1886. *Calyptrea chinensis*, Dollfus et Dautzenberg, Feuille des Jeunes Natur., vol. xvi, p. 142.
 1886. *Calyptrea chinensis*, var. *squamulata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 458, pl. liv, figs. 5, 6.
 1889—96. *Trochita muricata*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 354, no. 1929, 1889; *Calyptrea chinensis*, var. *muricata*, Moll. Terr. Terz. Piem., pt. xx, p. 30, pl. iv, fig. 8.
 1893—98. *Calyptrea chinensis*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 156, 1898.

Dimensions.—B. 32 mm. H. 13 mm.

Distribution.—*Fossil*: Waltonian Crag: Little Oakley.

Remarks.—Resembles the typical form of *C. chinensis*, but it is larger and the surface is covered by subconcentric rows of scales more or less distinct. It may be regarded, perhaps, as a well-marked southern variety, equivalent to the *C. squamulata* of Renieri and Nyst.

Genus **EMARGINULA**, Lamarck, 1801.

Emarginula crassa, J. Sowerby. Plate LXII, figs. 1, 2, 3.

1813. *Emarginula crassa*, J. Sowerby, Min. Conch., vol. i, p. 73, pl. xxxiii, figs. 1, 2.
 1844. *Emarginula crassa*, Nyst, Coq. foss. Belg., p. 352, pl. xxxvi, fig. 3.
 1846. *Emarginula crassa*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 92.
 1848—72. *Emarginula crassa*, S. V. Wood, Mon. Crag Moll., pt. i, p. 165, pl. xviii, figs. 2 a, 2 b, 1848; 1st Suppl., pt. i, p. 90, 1872.
 1859. *Emarginula crassa*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 6.

- 1871—82. *Emarginula crassa*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 143, 489, 1871; Proc. Zool. Soc., p. 678, 1882.
1872. *Emarginula crassa*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209.
- 1874—76. *Emarginula crassa*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 12, no. 503, 1874; vol. vii, p. 262, no. 814, 1876.
1878. *Emarginula crassa*, G. O. Sars, Moll. Reg. arct. Norv., pp. 125, 357.
1890. *Emarginula crassa*, C. Reid, Plioc. Dep. Brit., p. 243.
1901. *Emarginula crassa*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 657, pl. ix, fig. 14.

Specific Characters.—Shell large, strong and solid, ovate, moderately elevated; generally about twice as long as high, forming a more or less flattened cone; ornamented by numerous fine ridges, radiating from the apex, usually grouped by threes or fours, with narrow and shallow intervening depressions, decussated by delicate, wavy, closely set, concentric markings, and towards the margins by prominent lines of growth; base rounded at both ends and somewhat compressed at the sides, with crenulated edges; vertex acute and recurved nearer the posterior end, without sculpture; slit short.

Dimensions.—L. 40—60 mm. B. 25—45 mm. H. 20—30 mm.

Distribution.—*Recent*: British seas (rare). Scotland—Loch Fyne, Loch Long, Loch Carron, Skye, Oban. Ireland—Belfast Bay. Lofoten Islands to Christiania fiord, Scandinavian seas. Gulf of Gascony (400—500 m., Cooke).

Fossil: Coralline Crag: Sutton, Ramsholt. Waltonian: Little Oakley. Newbournian: Foxhall, Sutton, Newbourn, probably elsewhere in the Red Crag.

Pliocene: Antwerp, Messina. Pleistocene: *Tapes*-banks—Christiania fiord.

Remarks.—In his Monograph of 1848 Wood figured two shells as *E. crassa*, one of which, in his 1st Supplement of 1872 (p. 90), he considered to be a distinct though allied species, proposing for it the suggestive specific name of *E. crassalta*. The one to which I confine Sowerby's specific term (*crassa*), plate xviii, figs. 2 *a* and 2 *b* of Wood, is a large elongated form, comparatively narrow, more or less depressed, with the specially distinctive markings shown in Sowerby's figures. I have one variety from Oakley (Pl. LXII, fig. 3), with typically *crassa*-like sculpture but smaller, which, I think, might be called var. *complanata*.

The other, as its name (*crassalta*) suggests, has a comparatively elevated spire; the base is shorter in proportion to its height and the sculpture different. It is further described below.

***Emarginula crassalta*, S. V. Wood. Plate LXII, figs. 4, 5.**

1844. *Emarginula crassa*, E. Forbes, Ann. Mag. Nat. Hist. [1], vol. xiv, p. 410, pl. x, fig. 1.
- 1848—72. *Emarginula crassa*, var., S. V. Wood, Mon. Crag Moll., pt. i, p. 165, pl. xviii, fig. 2 *c*, 1848; *E. crassalta*, 1st Suppl., pt. i, p. 90, 1872.
1853. *Emarginula crassa*, Forbes and Hanley, Brit. Moll., vol. ii, p. 477, pl. lxiii, fig. 2 (pt.).

- 1865—69. *Emarginula crassa*, Jeffreys, Brit. Conch., vol. iii, p. 263, 1865; vol. v, p. 200, pl. lix, fig. 4, 1869.
 1881. *Emarginula crassa*, Nyst, Conch. Terr. tert. Belg., p. 113, pl. vii, fig. 8.
 1911. *Emarginula crassalta*, A. Bell, Journ. Ipswich Field Club, vol. iii, p. 15.

Specific Characters.—Shell thick, shorter and more strictly conical than the typical *E. crassa* with an elevated spire and stronger, sharper and closely-set ribs, more nearly resembling Wood's var. *conica*.

Dimensions.—L. 36—45 mm. B. 28—32 mm. H. 25 mm.

Distribution.—Recent: British coasts—Scotland, Ireland.

Fossil: Coralline Crag: Gedgrave, Sutton, Ramsholt, Boyton. Waltonian: Walton-on-Naze, Little Oakley. Probably elsewhere in Red Crag, not fully worked out.

Remarks.—The different and distinctive character and sculpture of the two shells described above are shown in the specimens now figured as they were by Wood, although they have not been generally recognised. I think the two shells should be regarded as specifically distinct.

Var. **conica** (S. V. Wood). Plate LXII, fig. 6.

1848. *Emarginula crassa*, var. *conica*, S. V. Wood, Mon. Crag Moll., pt. i, p. 165, pl. xviii, fig. 2 d.

Dimensions.—H. 20 mm. L. 26 mm. B. 18 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton, not otherwise worked out.

Remarks.—Smaller and more delicate than the type form with a spire more elevated and narrower in proportion to the size of the aperture.

Emarginula fissura, Linné. Plate LXII, fig. 7.

1766. *Emarginula fissura*, Linné, Syst. Nat., ed. 12, p. 1261.
 1812. *Emarginula reticulata*, J. Sowerby, Min. Conch., vol. i, p. 74, pl. xxxiii.
 1842—48. *Emarginula fissura*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 528, 1842; Mon. Crag Moll., pt. i, p. 164, pl. xviii, fig. 3 a, 1848.
 1843—81. *Emarginula fissura*, Nyst, Coq. foss. Belg., p. 350, pl. xxxv, fig. 6, 1843; Conch. Terr. tert. Belg., p. 114, pl. vii, fig. 9, 1881.
 1853. *Emarginula reticulata*, Forbes and Hanley, Brit. Moll., vol. ii, p. 477, pl. lxiii, fig. 1.
 1859. *Emarginula reticulata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 4.
 1865—82. *Emarginula fissura*, Jeffreys, Brit. Conch., vol. iii, p. 259, 1865; vol. v, p. 200, pl. lix, fig. 2, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 143, 488, 1871; Proc. Zool. Soc., p. 678, 1882.
 1872. *Emarginula fissura*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209, 213.
 1874—76. *Emarginula fissura*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 10, no. 501; p. 334, no. 169, 1874; vol. vii, p. 262, no. 811, 1876.

- 1874—92. *Emarginula fissura*, Van den Broeck, Ann. Soc. malac. Belg., vol. ix, p. 119, 280, 1874; Bull. Soc. Belg. Géol., vol. vi (Mémoires), p. 124, 1892.
1878. *Emarginula fissura*, G. O. Sars, Moll. Reg. arct. Norv., p. 125.
- 1889—97. *Emarginula fissura*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 341, no. 1760, 1889; Moll. Terr. Terz. Piem., pt. xxii, p. 13, pl. ii, fig. 1, 1897.
1892. *Emarginula fissurata*, Locard, Coq. mar. Côtes de France, p. 223.
1901. *Emarginula fissura*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 660, pl. xviii, fig. 26.
1911. *Emarginula fissura*, A. Bell, Journ. Ipswich Field Club, vol. iii, p. 15.
1916. *Emarginula fissura*, R. B. Newton, Journ. of Conch., vol. xv, p. 67, pl. iv, fig. 8.

Specific Characters.—Shell small, solid, opaque, elevato-conical; ornamented by numerous fine but distinct ribs, radiating from the beak to the margin, alternately somewhat more narrow, with many concentric ones crossing the interspaces, giving it a delicately punctured or cancellate appearance, with slight nodules at the points of junction; beak very small, ribless, incurved, slightly twisted, forming a spire of two whorls; slit of equal width, extending from the anterior margin about one-third to the apex; aperture subcircular, distinctly notched by the longitudinal ribs, inside finely lineated concentrically.

Dimensions.—L. 12—14 mm. B. 9—11 mm. H. 13—15.

Distribution.—*Recent*: Great Britain everywhere, on shells and stones. North Atlantic from the Lofoten Islands and Finmark to the Canaries. Mediterranean, Adriatic.

Fossil: Lenham. Coralline Crag: Gedgrave to Boyton (common). Red Crag—Waltonian to Butleyan: *passim*. Bolderien, Scaldisien: Antwerp.

Pleistocene: Gorleston, March, Shewalton, Cumbrae. Holocene: Portrush.

Pliocene: Italy—Piacenziano, Astiano, Biot. Sicily—Altavilla. France—Normandy.

Pleistocene: Sweden, Norway—Christiania fiord, *Cyprina*-beds to *Tapes*-banks. Sicily—Messina, Ficarazzi, Barcelona, Castoreale.

Remarks.—This common British species, ranging also from the Faroes to the Canaries in one direction and the Adriatic in another, occurs abundantly in the English Crag, as at Oakley, where I have found more than 100 specimens of it, as well as more occasionally in our Pleistocene and Holocene deposits. Abroad it is reported from the Miocene of Belgium to the post-glacial beds of the Christiania fiord.

Var. **depressa**, nov. Plate LXII, fig. 8.

Varietal Characters.—Shell thin, depressed; differing from the normal type of *E. fissura* in form and texture, in the regularity and delicacy of its sculpture, and in the number of its ribs.

Dimensions.—L. 9 mm. B. 6 mm. H. 5 mm.

Distribution.—*Recent*: Not reported living.

Fossil: Coralline Crag: Sutton (A. Bell). Waltonian: Little Oakley (unique).

Remarks.—At first sight this charming little shell seems allied to Mediterranean forms such as *E. elongata*, but neither the Marchese di Monterosato nor M. Dollfus, to whom I submitted my specimen, could refer it to any species known to them, the latter expressing the opinion that it might be regarded as an undescribed variety of *E. fissura*. As stated above, that species is very common at Oakley, but most of the specimens I have obtained from that place are of the same type; the height and length are about equal, they are fairly strong, with rather coarse and irregular sculpture. The spire of the present shell, on the other hand, is comparatively depressed and fragile, the longitudinal ribs being fewer in number.

Wood remarks of his specimens of *Emarginula fissura* from the Coralline Crag that the radiating lines and the cancellation, as well as the comparative height and position of the apex, vary considerably.

As far as my Oakley fossils are concerned the present shell stands by itself; in the Norwich Museum, however, there are two examples from the Coralline Crag of Sutton identical with it bearing the name, in Wood's writing, *E. fissura*, having prominent ridges and a depressed apex.

***Emarginula elongata*, O. G. Costa. Plate LXII, fig. 9.**

1829. *Emarginula elongata*, O. G. Costa, Oss. Zool. Isl. Pantelleria, p. 10, no. 17.
 1836—44. *Emarginula elongata*, Philippi, Enum. Moll. Sic., vol. i, p. 115, pl. vii, fig. 13, 1836; vol. ii, p. 89, 1844.
 1871. *Emarginula elongata*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 360.
 1871. *Emarginula elongata*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 143.
 1872. *Emarginula elongata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.
 1874—76. *Emarginula elongata*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 12, no. 506; p. 334, no. 174, 1874; *E. fissura*, var. *reticulata*, vol. vii, p. 262, no. 811, 1876.
 1878—84. *Emarginula elongata*, Monterosato, Enum. Sinon. Conch. Medit. (Giorn. Soc. Sci. Nat. Palermo, vol. xiii), p. 19, 1878; Nom. Gen. e Spec. Conch. Medit., p. 36, 1884.
 1886. *Emarginula elongata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 451, pl. liv, figs. 9—12.
 1889. *Emarginula elongata*, Carus, Prod. Faun. Medit., vol. ii, p. 241.
 1892. *Emarginula elongata*, Locard, Coq. mar. Côtes de France, p. 223.
 1900—1. *Emarginula elongata*, Scalia, Atti Accad. Gioen. Sci. Nat. Catania [4a], vol. xiii, p. 16, no. 117, 1900; vol. xiv, p. 12, no. 101, 1901.

Specific Characters.—Shell small, fairly solid, convex, elongate; ornamented by radiating costæ, rounded and equidistant, crossed by strong and raised ridges, producing a quadrangular reticulation; spire depressed; aperture oval; interior

showing nearly obsolete radial lines, corresponding with the external ribs; nucleus inequilateral, nearest to the posterior margin.

Dimensions.—L. 10 mm. B. 7 mm. H. 4 mm.

Distribution.—*Recent*: Atlantic coasts, France to the Canaries; Mediterranean—Balearic Islands, Corsica, Sardinia, Sicily, Adriatic, Ægean.

Fossil: Coralline Crag: Gedgrave, Sutton.

Pliocene: Altavilla, Messina.

Pleistocene: Monte Pellegrino, Messina, Trapani, Taranto, sub-Etnaen beds.

Remarks.—With the exception of Seguenza, who regarded this as a variety of *E. fissura*, our conchological authorities, both British and Continental, consider it to be a distinct species. It is a southern shell unrecorded as recent from British seas. As a fossil it is rare in the Coralline Crag, but is found at certain localities in the Sicilian Pleistocene, including the comparatively modern deposits on the flanks of Mt. Etna.

Emarginula rosea, T. Bell. Plate LXII, fig. 10.

1824. *Emarginula rosea*, T. Bell, Zool. Journ., vol. i, p. 52, pl. iv, fig. 1.

1848—72. *Emarginula fissura*, var. *punctura*, S. V. Wood, Mon. Crag Moll., pt. i, pl. xviii, fig. 3 b, 1848; *E. rosea*, 1st Suppl., pt. i, p. 89, 1872.

1853. *Emarginula rosea*, Forbes and Hanley, Brit. Moll., vol. ii, p. 479, pl. lxiii, fig. 3.

1858. *Emarginula rosea*, H. and A. Adams, Gen. Rec. Moll., vol. i, p. 452, pl. li, fig. 9.

1859. *Emarginula rosea*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xi, fig. 5.

1865—82. *Emarginula rosea*, Jeffreys, Brit. Conch., vol. iii, p. 261, 1865; vol. v, p. 200, pl. lix, fig. 3, 1869; Proc. Zool. Soc., p. 678, 1882.

1872. *Emarginula rosea*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.

1886. *Emarginula rosea*, Dollfus et Dautzenberg, Feuille des Jeunes Natur., vol. xvi, p. 142.

1889. *Emarginula conica*, Carus, Prod. Faun. Medit., vol. ii, p. 241.

1892. *Emarginula rosea*, Locard, Coq. mar. Côtes de France, p. 224, fig. 200.

1901. *Emarginula conica*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 284.

Specific Characters.—Shell smaller and narrower than *E. fissura*, the sides are compressed, the front being more convex and the back more concave; the longitudinal ribs are finer and more closely-set and equal-sized; the cancellation is smaller and shows round holes rather than square lattice work; the beak overhangs the margin and is more incurved.

Dimensions.—L. 6 mm. B. 3 mm. H. 4 mm.

Distribution.—*Recent*: British coasts—southern only. Channel and Scilly Isles. Coasts of France, Italy, Spain, Algeria and the Hellespont, from 8 to 95 fathoms. Adriatic, Ægean.

Fossil: Coralline Crag: Sutton. Waltonian: Oakley. Newbournian: Waldringfield.

Pliocene: N.W. Germany, Italy, Rhodes.

Remarks.—This small shell is found in the Coralline Crag at Sutton and is decidedly a southern form. It may be recognised by its size and shape, and the position of the beak which overhangs the margin. Jeffreys calls attention to its fine sculpture, which shows punctures between the ribs rather than the cancellation characteristic of *E. fissura*. Montagu considered it to be a variety of that species, but it is more often regarded as specifically distinct. It is not an abundant form, either as recent or fossil. Wood figures a minute variety (*punctura*) of *E. fissura* in his 1st Supplement (pl. vii, fig. 24); if correctly drawn, however, it is not the same as the true *E. rosea*, which has only one row of punctures between the ribs, whereas the former has four.

Genus **PATELLA**, Lister, 1688.

Patella vulgata, Linné. Plate LXII, fig. 11.

1766. *Patella vulgata*, Linné, Syst. Nat., ed. xii, p. 1258.
 1853. *Patella vulgata*, Forbes and Hanley, Brit. Moll., vol. ii, p. 421, pl. li, figs. 5, 6.
 1863—82. *Patella vulgata*, Jeffreys, Rep. Brit. Assoc. (Newcastle-on-Tyne), p. 78, 1863; Brit. Conch., vol. iii, p. 236, 1863; vol. v, p. 199, pl. lvii, figs. 1—4, 1869; Proc. Zool. Soc., p. 669, 1882.
 1876. *Patella vulgata*, Seguenza, Boll. R. Com. Geol. Ital., p. 264, no. 832.
 1878. *Patella vulgata*, G. O. Sars, Moll. Reg. arct. Norv., pp. 118, 357.
 1888—90. *Patella vulgata*, A. Bell, Rep. Brit. Assoc. (Bath), p. 133, 1888; (Leeds), p. 410, 1890.
 1892. *Patella vulgata*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, p. 258.
 1901. *Patella vulgata*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 429, 566, 721, fig. 57.

Specific Characters.—Shell solid, conical; ornamented by numerous radiating ribs which become stronger and broader near the margin, with fine ones in the intervals; apex blunt, sometimes nearly central; aperture roundish, oval, broader behind; margin bevelled, indented by the ribs; interior showing the external sculpture, annular scar large and broad.

Dimensions.—L. 45—55 mm. B. 35—45 mm. H. 30—35 mm.

Distribution.—*Recent*: British coasts—*passim*, abundant on rocks and stones. Abroad from the Lofoten Islands and Norway to the Mediterranean and the Ægean.

Fossil: Isle of Man, Wexford, Selsey, Kelsey Hill, Macclesfield (5—600 ft.), Moel Tryfan (13—1400 ft.), Caithness, Portrush, estuarine clays of Belfast district. *Isocardia*- and *Tapes*-banks, Christiania fiord. Uddevalla. Messina, Palermo.

Remarks.—The type form of this very common British shell is unknown from our Crag deposits, though one or two specimens of the variety *intermedia* (as stated in the next paragraph) have been met with.

It occurs abundantly, however, and sometimes of large size in our raised beaches.

Possibly the conditions necessary for its growth and development were more favourable during the Pleistocene period in the Anglo-Belgian Tertiary basin than they are at present.

Var. *intermedia*, Jeffreys. Plate LXII, fig. 12.

1842—48. *Patella vulgata*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 460, 1842; Mon. Crag Moll., pt. i, p. 183, pl. xx, fig. 8, 1848.

1865—69. *Patella vulgata*, var. *intermedia*, Jeffreys, Brit. Conch., vol. iii, p. 237, 1865; vol. v, pl. lvii, fig. 2, 1869.

1872. *Patella vulgata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 213.

1913. *Patella intermedia*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xlv, p. 45.

Varietal Characters.—Shell smaller, flatter, and more oval than the type, with finer ribs.

Dimensions.—L. 25 mm. B. 20 mm. H. 11 mm.

Distribution.—Recent: Channel Islands, Cork. St. Malo. Spain.

Fossil: Newbournian Crag: Sutton.

Pleistocene: Portland.

Remarks.—The specimen figured under this name is from Portland. It was regarded as a variety of *P. vulgata* by Jeffreys, but MM. Dautzenberg and Durouchoux have recently expressed the view that it is specifically distinct. The latter authorities say it has a more restricted range in depth than the type form, and that it is very common under conditions specially favourable to it. Wood reports it locally from the Red Crag, and A. Bell from the Pleistocene of Portland; possibly it might be found elsewhere if specially looked for. The shell figured by Wood as *P. vulgata*, and quoted by the brothers Bell, is of the var. *intermedia*.

Genus **ACTÆON**, Montfort, 1810.

Actæon Noë, J. Sowerby. Plate LXII, fig. 15.

1822. *Actæon Noë*, J. Sowerby, Min. Conch., vol. iv, p. 101, pl. cccclxxiv.

1842—1872. *Actæon Noë*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 537, 1842; Mon. Crag Moll., pt. i, p. 169, pl. xix, fig. 6, 1848; 1st Suppl., pt. i, p. 93, 1872.

1844—81. *Tornatella Noë*, Nyst, Coq. foss. Belg., p. 424, pl. xxxvii, fig. 22, 1844; Conch. Terr. tert. Belg., p. 129, pl. vii, fig. 18, 1881.

1871. *Actæon Noë*, Mörch, Geol. Mag., vol. viii, p. 395.

1871—85. *Actæon pusillus*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 486, 1871; *Actæon noë*, in J. Starkie Gardner, Quart. Journ. Geol. Soc., vol. xli, p. 96, 1885.

1872. *Actæon Noë*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 210.

1890. *Actæon Noë*, C. Reid, Plioc. Dep. Brit., p. 237.

1892. *Tornatella Noë*, Vau den Broeck, Bull. Soc. Belge Géol., vol. vi (Mémoires), pp. 124, 134.

Specific Characters.—Shell comparatively large, elongato-ovate, sub-cylindrical and barrel-shaped, angulated above; whorls 7, the last much the longest, five-sixths the total length, slightly convex, conical, compressed; spire rapidly diminishing to an acute point; suture deep, subcanaliculated; ornamented by delicate but well-marked spiral ridges which extend to the base; mouth long, narrowed above, rounded and projecting below; outer lip gently curved, sharp, with the outside sculpture showing faintly within; inner lip reflexed on the columella with a twisted and prominent plication where it joins the body-whorl.

Dimensions.—L. 20—24 mm. B. 14 mm.

Distribution.—Not recorded living.

Fossil: Waltonian Crag: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Sutton, Waldringfield, Brightwell, Newbourn, Shottisham. Butleyan: Butley. Icenian: Bulchamp, Yarn Hill.

Crag of Iceland. Scaldisien, Poederlien: Belgium.

Remarks.—This handsome shell, unknown either from St. Erth, the Coralline Crag or the Belgium equivalent of the latter, appears rather suddenly as a fossil in the Waltonian deposits of Great Britain and the Scaldisien of Belgium, being fairly common at Walton and Oakley, occurring also, though not so abundantly, at various localities in the later horizons of the Red Crag. It seems doubtful whether it survived to the Pleistocene period in England, nor is it known as a recent shell,¹ but Mörch states (*op. cit.*, p. 395) he had obtained two specimens from the Iceland Crag of Hallbjarnastadir.

Actæon tornatilis (Linné). Plate LXII, figs. 13, 14.

1766. *Voluta tornatilis*, Linné, Syst. Nat., ed. 12, p. 1187.

1824. *Actæon striatus*, J. Sowerby, Min. Conch., vol. v, p. 87, pl. cccclx, fig. 2.

1842—72. *Actæon tornatilis*, S. V. Wood, Ann. Mag. Nat. [1], vol. ix, p. 537, 1842; Mon. Crag Moll., pt. i, p. 170, pl. xix, fig. 5, 1848; 1st Suppl., pt. i, p. 93, 1872.

1844. *Actæon tornatilis*, Hörnes, Foss. Moll. Tert. Wien, vol. i, p. 508, pl. xlvi, fig. 24.

1844—81. *Tornatilla striata*, Nyst, Coq. foss. Belg., p. 426, pl. xxxvii, fig. 24, 1844; *T. tornatilis*, Conch. Terr. tert. Belge, p. 127, pl. vii, fig. 19, 1881.

1851. *Tornatella tornatilis*, S. P. Woodward, Man. Moll., p. 180, pl. xiv, fig. 1.

1853. *Tornatella fasciata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 523, pl. cxiv, fig. 3.

1867—71. *Actæon tornatilis*, Jeffreys, Brit. Conch., vol. iv, p. 433, 1867; vol. v, p. 224, pl. xcv, fig. 2, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 141, 486, 1871.

1870—90. *Actæon tornatilis*, A. Bell, Journ. de Conch., vol. viii, p. 353, no. 437, 1870; Geol. Mag., vol. viii, p. 454, 1871; Rep. Brit. Assoc. (Leeds), p. 417, 1890.

¹ Jeffreys, in his list of Crag shells published in Prestwich's paper, identified *A. Noæ* with a minute Ægean form, *A. pusillus*, Forbes, but this view has not been generally accepted.

1872. *Actæon tornatilis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210, 214.
- 1873—75. *Actæon tornatilis*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 294, no. 39, 1873; vol. vi, p. 151, no. 54, 1875.
1878. *Actæon tornatilis*, G. O. Sars, Moll. Reg. arct. Norv., pp. 280, 362, pl. xvii, fig. 11.
1886. *Actæon tornatilis*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 510, pl. lxvi, figs. 15, 16.
1889. *Actæon tornatilis*, Carus, Prod. Faun. Medit., vol. ii, p. 183.
- 1890—97. *Actæon tornatilis*, Sacco, Boll. Soc. Geol. Ital., vol. ix, p. 284, no. 4414, 1890; Moll. Terr. tert. Piem., pt. xxii, p. 31, pl. iii, figs. 3—6, 1897.
1892. *Actæon tornatilis*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, p. 267.
1901. *Actæon tornatilis*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 662, pl. xvii, fig. 21.
1901. *Actæon tornatilis*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 553.
1912. *Tornatella tornatilis*, Tesch, Med. v. d. Rijks. Delfstoffen, no. 4, p. 94, no. 242.
1915. *Actæon tornatilis*, R. B. Newton, Journ. of Conch., vol. xv, p. 78.

Specific Characters.—Shell ovate, sub-cylindrical, whorls 7 or 8, but slightly convex, the last much the longest, conical above, barrel-shaped in the centre, expanded and rounded below; ornamented by delicate spiral striæ, stronger at the base, suture slightly channelled; spire short, regularly diminishing; mouth long, narrow at the upper, wide at the lower part; inner lip forming a thin glaze on the part of the body whorl lying within the mouth, thicker and reflected over the pillar, which is short and flexuous, fold strong and tooth-like, winding obliquely, upper lip long, narrow and angulated.

Dimensions.—L. 20—25 mm. B. 8—10 mm.

Distribution.—*Recent*: British seas, not uncommon, widely distributed from Iceland and the Lofoten Islands to the Mediterranean, Adriatic and Ægean. Syria. Atlantic coasts from Norway to Morocco.

Fossil: Lenham. Coralline Crag: Sutton, Gedgrave. Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Waldringfield, Sutton, Ramsholt, Newbourn. Butleyan: Butley. Icenian: Bramerton, Postwick, Brundall, Horstead, Burgh, Aldeby, Yarn Hill, Easton Bavent, Bulchamp.

Pleistocene: Scotland—Caithness, Loch-gilp. Ireland—Belfast estuarine clays.

Miocene: France, Vienna, northern Italy.

Pliocene: Belgium—Scaldisien. Holland—Scaldisien. France—south. Italy—northern and central.

Pleistocene: Maritime Alps, Sicily, Ischia, Morea, Rhodes Christiania fiord—*Tapes*-banks. Denmark.

Remarks.—This species, widely distributed as recent and fossil, resembles *Actæon Noë* in form and general character, but it is smaller and the sculpture is more delicate. Although a Lenham shell it survived in Great Britain until Pleistocene times, as it has done to the present day, being found also in the Pleistocene deposits of Scandinavia and of southern Europe.

Actæon subulatus, S. V. Wood. Plate LXII, fig. 16.

1842—72. *Actæon subulatus*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 537, 1842; Mon. Crag Moll., pt. i, p. 170, pl. xix, fig. 7, 1848; 1st Suppl., pt. i, p. 94, pl. v, fig. 16, 1872.

1867—71. *Actæon tornatilis*, var. *subulata*, Jeffreys, Brit. Conch., vol. iv, p. 435, 1867; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 486, 1871.

1871. *Actæon subulatus*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 439; Geol. Mag., vol. viii, p. 454.

1872. *Actæon subulatus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 210, 214.

1890. *Actæon subulatus*, C. Reid, Plioc. Dep. Brit., p. 237.

1902. *Actæon tornatilis*, var. *subulata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 553.

Specific Characters.—Resembles *A. tornatilis* in general character and appearance, but it is smaller and narrower, the spire is longer and more attenuate, with an acuminate apex, and the whorls are somewhat more convex; the body whorl and mouth are comparatively short, while the plication on the columella is less prominent than in *A. Noæ* or *A. tornatilis*.

Dimensions.—L. 14 mm. B. 6 mm.

Distribution.—Recent: Fishguard and the Hebrides, rare (Jeffreys).

Fossil: Coralline Crag. Waltonian: Walton-on-Naze. Newbournian: Sutton, Newbourn. Butleyan: Hollesley, Butley.

Pliocene: Biot (A. Bell).

Remarks.—Jeffreys regarded this shell as a variety of *A. tornatilis*. I follow Wood, however, in considering it specifically distinct.

Actæon levidensis, S. V. Wood. Plate LXII, fig. 17.

1842—72. *Actæon levidensis*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 537, 1842; Mon. Crag Moll., pt. i, p. 171, pl. xix, fig. 4, 1848; 1st Suppl., pt. i, p. 94, 1872.

1871. *Tornatella elongata*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 141.

1872. *Actæon levidensis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.

1875. *Actæon levidensis?*, Seguenza, Boll. R. Com. Geol. Ital., vol. vi, p. 151, no. 53.

1881. *Tornatella levidensis*, Nyst, Conch. Terr. tert. Belg., p. 128.

1890. *Actæon levidensis*, C. Reid, Plioc. Dep. Brit., p. 237.

Specific Characters.—Shell minute, thick and strong, elevated, slender, turreted; whorls 5, but slightly convex, the last two-thirds the total length; spire regularly tapering to an obtuse apex; ornamented by distinct and regular spiral ridges which extend to the base, 12 or 14 on the body-whorl, decussated by inconspicuous lines of growth; suture well-marked, rather deep; mouth narrow and angulate above, rounded and expanded below; outer lip sharp, gently curved; inner lip with an obtuse and inconspicuous fold on the columella.

Dimensions.—L. 3·5 mm. B. 1·5 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton. Newbournian: Ipswich. Scaldisien: Antwerp. Upper Pliocene: Val d'Éra.

Remarks.—This species is only recorded as a British fossil from the Coralline Crag of Sutton, from whence Wood obtained fifty specimens, all of the same size. It has been doubtfully identified with *Tornatella elongata*, Nyst, *non* Sowerby, and with *Melania auricula*, Grateloup. Nyst reports it from the Upper Pliocene of Belgium, and Seguenza from that of Italy (Val d’Era).

Actæon Etheridgei, A. Bell. Plate LXII, fig. 18.

- 1870—72. *Actæon Etheridgei*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 216, 1870; Geol. Mag., vol. ix, p. 215, 1872.
 1871. *Actæon exilis*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 486, 494.
 1872. *Actæon Etheridgei*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 210.
 1872. *Actæon Etheridgei*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 94, pl. v, fig. 17.
 1890. *Actæon Etheridgei*, C. Reid, Plioc. Dep. Brit., p. 237.

Specific Characters.—Shell small, thin, slender, elongate; whorls 5—6, smooth, turreted, compressed or slightly convex, the lower one the longest, two-thirds the total length; inner lip with one strong fold.

Dimensions.—L. 5—8 mm. B. 1·5—2 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Walton-on-Naze, Little Oakley.

Remarks.—Of this minute form, smaller than most of the other recorded Crag species of *Actæon*, but three specimens have been found, all by Mr. A. Bell, the two first at Walton, fifty years ago, and the third much later, when working with me at Oakley.

Wood was rather doubtful whether his reference of it to *Actæon* was correct, as all the other species of that genus known to him were more or less covered with spiral striæ. Jeffreys, however, in his list, published in Prestwich’s Crag paper, accepts Bell’s generic name, while referring our fossil to a different and deep sea species, *A. exilis*.

Genus **MELAMPUS**, Montfort, 1810.

Melampus pyramidalis (J. Sowerby). Plate LXII, figs. 19, 20.

1822. *Auricula pyramidalis*, J. Sowerby, Min. Conch., vol. iv, p. 109, pl. cccclxxix, fig. 12.
 1842—74. *Conovulus pyramidalis*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 461, 1842; Mon. Crag Moll., pt. i, p. 11, pl. i, fig. 13, 1848; *Melampus pyramidalis*, 1st Suppl., p. 212, 1874.
 1844—81. *Auricula pyramidalis*, Nyst, Coq. foss. Belg., p. 473, pl. xxxix, fig. 12, 1844; *Conovulus pyramidalis*, Conch. Terr. tert. Belg., p. 125, pl. vii, fig. 17, 1881.
 1846. *Tornatella pyramidalis*, E. Forbes, Mem. Geol. Surv., vol. i, p. 428, no. 141.
 1871. *Conovulus pyramidalis*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 488.

- 1871—1915. *Melampus pyramidalis*, A. Bell, Geol. Mag., vol. viii, p. 453, 1871; Rep. Brit. Assoc. (Bath), p. 136, 1888; (Leeds), pp. 410, 423, 1890; Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 157, pl. iii, fig. 8, 1898; *Conovulus pyramidalis*, Geol. Mag. [6], vol. ii, p. 167, 1915.
1872. *Melampus pyramidalis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 209, 216.
1879. *Conovulus (Melampus) pyramidalis*, J. Reeve, Proc. Norw. Geol. Soc., vol. i, p. 70.
1879. *Melampus pyramidalis*, Crowfoot and Dowson, Proc. Norw. Geol. Soc., vol. i, p. 82.
1885. *Melampus pyramidalis*, S. V. Wood, Jr., Quart. Journ. Geol. Soc., vol. xli, p. 67.
1886. *Melampus pyramidalis*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, pp. 205, 212.
1892. *Conovulus pyramidalis*, Van den Broeck, Bull. Soc. Belg. Géol., vol. vi (Mémoires), p. 134.
1890. *Melampus pyramidalis*, C. Reid, Plioc. Dep. Brit., p. 246, pl. ii, fig. 6.
1900. *Conovulus pyramidalis*, F. W. Harmer, Quart. Journ. Geol. Soc., vol. lvi, p. 713.
1912. *Conovulus pyramidalis*, Tesch, Med. v. d. Rijks. Delfstoffen, no. 4, p. 94, no. 248.

Specific Characters.—Shell ovato-ventricose, varying in form, size, and the length of the spire; one variety, that figured by Wood and others, the most common in the Waltonian Crag, being thick and clumsily formed, with an ear-shaped mouth, angulate above, rounded below, compressed in the middle, inner lip reflected on the pillar, nearly covering the umbilicus, with a well-marked ridge below the suture and generally without sculpture.

Another variety (*conica*), common in the later horizons of the Crag, is more regular in form, usually symmetrically conical; a third variety (*striata*) is smaller, covered throughout by distinct fine spiral ridges; the latter occurs at St. Erth and may be a western form.

Dimensions.—L. 15—22 mm. B. 10—15 mm.

Distribution.—Not known living.

Fossil: (var. *striata*), Lenham, St. Erth. Coralline Crag: Boyton? Waltonian (type form): Walton-on-Naze, Beaumont, Little Oakley. Newbournian (generally var. *conica*): Sutton, Waldringfield, Newbourn, Ramsholt, Felixstow. Butleyan: Butley, Bawdsey. Icenian (Norwich horizon, var. *conica*): Aldeburgh, Bulchamp, Dunwich, Southwold, Yarn Hill, Easton Bavent, Bramerton, Thorpe, near Norwich, Postwick, Brundall. (Weybourne horizon): Belaugh, Rackheath, West Runton.

Scaldisien, Poederlien: Belgium. Poederlien: Holland.

Remarks.—This species, described by Sowerby 100 years ago, apparently extinct at present, has a wide distribution as a fossil, ranging from Lenham and St. Erth to Wexford and to the horizons of the Anglo-Belgian Crag. The distribution of the various varieties has not been systematically worked out, but judging from my own experience it seems to me that the coarse, misshapen form is specially characteristic of the Waltonian deposits, being very abundant, for example, at Little Oakley, from which locality I have obtained about a hundred specimens, while another, the var. *conica* (fig. 22), becomes smaller and more common in the upper zones of the Red and in the Icenian Crag. They are generally without sculpture, though vestiges of it may be rarely observed beneath the outer skin

of the shell. The Lenham specimens, however, var. *striata*, are clearly and regularly sculptured as shown in my fig. 21.

This species was described by Wood, Nyst and some others under the generic term *Conovulus*, but is now generally grouped with *Melampus*—a Miocene and southern form.

Var. **conica**, nov. Plate LXII, fig. 22.

Varietal Characters.—Smaller and more symmetrical and regularly conical than the type form (fig. 19) of the Waltonian Crag, generally showing no sign of transverse sculpture.

Dimensions.—L. 14—21 mm. B. 10—14 mm.

Distribution.—Not recorded living.

Fossil: Red Crag, Waltonian, Newbournian, Butleyan. Icenian: not fully worked out.

Remarks.—As stated above, this seems to be the characteristic form of the later horizons of the Red and Icenian deposits and of the Belgian Crag. It is said to occur also in the Coralline Crag of Boyton, and I have obtained it at Oakley (see fig. 22).

Var. **striata**, nov. Plate LXII, fig. 21.

Varietal Characters.—Smaller than the type form of Oakley and symmetrically conical. Clearly and regularly sculptured with fine transverse ridges.

Dimensions.—L. 14—15 mm. B. 9—10 mm.

Distribution.—Not recorded living.

Fossil: St. Erth, Lenham. Coralline Crag: Boyton? Wexford?

Remarks.—Examples of this shell from St. Erth and Lenham are covered uniformly with fine transverse sculpture. Mr. Bell informs me that an imperfect specimen he obtained from Wexford corresponded more nearly with the Lenham than with the Oakley type.

Genus **LEUCONIA**, Gray, 1840.

Leuconia bidentata (Montagu). Plate LXII, fig. 23.

1808. *Voluta bidentata*, Montagu, Test. Brit., Suppl., p. 100, pl. xxx, fig. 2.

1844. *Auricularia Bivonæ*, Philippi, Enum. Moll. Sic., vol. ii, p. 118.

1853. *Conovulus bidentatus*, Forbes and Hanley, Brit. Moll., vol. iv, p. 191, pl. cxxv, figs. 1, 2.

1859. *Conovulus bidentatus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xxii, fig. 4.

1869. *Melampus bidentatus*, Jeffreys, Brit. Couch., vol. v, p. 106, pl. xcvi, fig. 1.

1890. *Leuconia bidentata*, Carus, Prod. Faun. Medit., vol. ii, p. 436.
 1890—98. *Melampus bidentatus*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 417, 1890; Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; *M. (Leuconia) bidentatus*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 157, pl. iii, fig. 13, 1898.
 1892. *Melampus bidentatus*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 267, 281.
 1902. *Leuconia bidentata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 26, no. 702.
 1913. *Leuconia bidentata*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xliii, p. 8.

Specific Characters.—Shell spindle-shaped, rather solid and opaque; spire short with a blunt and obliquely twisted apex; whorls 6—7, slightly convex, compressed towards the suture, partly overlapping the latter, the last three-fourths the total length; suture slight; mouth contracted towards the top, expanded below; outer lip having a thin edge, flexuous at the upper end, smooth inside; inner lip broad, reflected below; pillar thick, with two folds, the lower one twisted, the larger one a little above it.

Dimensions.—L. 12 mm. B. 5 mm.

Distribution.—*Recent*: Great Britain and Ireland. Shetland to Sark. France—north and west coasts. Madeira. Mediterranean. Adriatic.

Fossil: St. Erth. Selsey, Portland.

Remarks.—The St. Erth shell here figured was identified, according to Mr. Alfred Bell, by his brother with the *Voluta bidentata* of Montagu, a species now referred to *Leuconia*; it does not appear in the list published by Prof. Kendall and the latter, but it forms part of the collection, now in the British Museum, which was handed to that Institution by the late Mrs. S. V. Wood at her husband's death. The resemblance between the three species of this group reported from St. Erth, and their dissimilarity to the *Melampus pyramidalis* of the Crag, deserve notice. It seems possible they may represent a type which existed in Pliocene and Pleistocene times in Europe and is still found living both there and in America. The generic names *Alexia* and *Leuconia* have been used in the Conchological Society's list of British Marine Mollusca and by other recent authorities, the first for *A. myosotis* and the second for *L. bidentatus*; they are adopted here provisionally. Judging from the figures given by those who have dealt with the subject, considerable difference of opinion has existed as to the correct identification of some of the various forms of these groups obtained from different localities. I can only content myself with using the names adopted at the British Museum and elsewhere. The subject is one requiring further investigation and the collection of a larger number of fossil specimens.

Var. alba (Turton), not *Voluta alba*, Montagu. Plate LXII, fig. 24.

1819. *Voluta alba*, Turton, Conch. Dict., p. 250.

1869. *Melampus bidentatus*, var. *alba*, Jeffreys, Brit. Conch., vol. v, p. 105.

1902. *Leuconia bidentata*, var. *alba*, Conch. Soc. List, Journ. of Conch., vol. x, p. 26, no. 702.

1913. *Leuconia bidentata*, var. *alba*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xliii, p. 8.

Varietal Characters.—Smaller, narrower and thinner than the type form (Jeffreys).

Dimensions.—L. 4 mm. B. 2 mm.

Distribution.—*Recent*: Irish coasts. British—Shetland to Sark. French—Bay of St. Malo, pointe de l'Enclos, Mordreux, Saint-Suliac, Saint-Elier.

Fossil: Selsey.

Remarks.—This minute shell was originally described by Turton as a distinct species under the name of *Voluta alba*, but afterwards it was regarded by Jeffreys, the Conchological Society and Messrs. Dautzenberg and Durouchoux as a variety of *Melampus* or *Leuconia*. It has been reported as a recent shell from the coasts of various parts of Great Britain, Ireland and France. As a fossil it is only known from the unique specimen here figured, which was obtained by Mr. A. Bell from Selsey. The *Voluta alba* of Montagu is considered to be a different shell and a tropical species of *Marginella*.

Leuconia fusiformis (A. Bell). Plate LXII, fig. 25.

1870. *Melampus fusiformis*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 213.

1872—79. *Melampus fusiformis*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 3, pl. i, fig. 1,

1872; *M. fusiformis*, var. *elongata* (?), 2nd Suppl., p. 38, pl. iii, fig. 15, 1879.

1890. *Melampus fusiformis*, C. Reid, Plioc. Dep. Brit., p. 246.

Specific Characters.—Shell of moderate size, solid, spindle-shaped; whorls 7, slightly convex, the last two-thirds the total length, compressed below; ornamented by oblique and inconspicuous lines of growth; suture well marked but not deep; spire gradually tapering; mouth oval, angulate above and below; inner lip reflected on the pillar with two folds; outer lip gently curved.

Dimensions.—L. 10—13 mm. B. 5—6 mm.

Distribution.—Not known living.

Fossil: Newbournian Crag: Sutton. Butleyan: Butley. Icenian—*Norwich zone*: Thorpe, Suffolk, Aldeby, Bramerton.

Remarks.—The shells figured under this name by Wood were regarded as distinct from the other forms of this group then known to him and as worthy of specific separation.

Leuconia incognita, sp. nov. Plate LXII, fig. 26.

Specific Characters.—Shell turreted, spindle-shaped; whorls 6, slightly convex, the last nearly two-thirds the total length; spire slender, elongate; regularly

diminishing to a blunt point; suture oblique, well-marked, with a slight ridge below it; mouth narrow, acutely angulate above, rounded and expanded below.

Dimensions.—L. 16 mm. B. 5 mm.

Distribution.—Not recorded living.

Fossil: Waltonian Crag: Little Oakley.

Remarks.—The shell here figured was found at Oakley by myself many years ago. Its lower part is somewhat broken, but it is clearly distinct from anything I know, either recent or fossil. I laid it on one side in the hope that another specimen might turn up. Perhaps this will be the case hereafter. It resembles *M. fusiformis*, var. *elongata*, S. V. Wood,¹ and some other forms in having an indistinct ridge below the suture.

Genus **ALEXIA**, Leach in Gray, 1847.

Alexia myosotis (Draparnaud). Plate LXII, fig. 27.

1805. *Auricula myosotis*, Draparnaud, Moll. terr. et fluv. France, p. 53, pl. iii, figs. 16, 17.
 1836—43. *Auricula myosotis*, Philippi, Enum. Moll. Sic., vol. i, p. 143, 1836; vol. ii, p. 118, 1843.
 1841—70. *Auricula denticulata*, Gould, Inv. Mass., ed. 1, p. 99, fig. 129, 1841; *Alexia myosotis*, ed. 2, p. 462, fig. 719, 1870.
 1842—48. *Conovulus myosotis*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 462, 1842; Mon. Crag Moll., pt. i, p. 12, pl. i, figs. 14, 15, 1848.
 1853. *Conovulus denticulatus*, var. *myosotis*, Forbes and Hanley, Brit. Moll., vol. iv, p. 195, pl. cxxv, figs. 4, 5.
 1858. *Alexia myosotis*, H. and A. Adams, Gen. Rec. Moll., vol. ii, p. 241.
 1859. *Conovulus myosotis*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xxii, fig. 5.
 1869—71. *Melampus myosotis*, Jeffreys, Brit. Conch., vol. v, p. 106, pl. xcvi, fig. 2, 1869; Quart. Journ. Geol. Soc., vol. xxvii, p. 488, 1871.
 1870—92. *Conovulus myosotis*, A. Bell, Journ. de Conch., vol. viii, p. 353, no. 441, 1870; Rep. Yorks. Phil. Soc., p. 64, 1892.
 1873. *Melampus myosotis*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 292, no. 20.
 1890. *Alexia myosotis*, Carus, Prod. Faun. Medit., vol. ii, p. 435.
 1900. *Alexia myosotis*, Scalia, Atti Accad. Gioen. Sci. nat. Catania [4], vol. xiii, p. 26, no. 310.
 1901. *Alexia denticulata*, var. *myosotis*, Conch. Soc. List, Journ. of Conch., vol. x, p. 26, no. 703.
 1913. *Alexia myosotis*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xliii, p. 8.
 1915. *Alexia myosotis*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii, Faun. New Engl., no. 13 (Mollusca), p. 178.

Specific Characters.—Shell comparatively small, symmetrically spindle-shaped, rather thin, glossy; whorls 6—7, slightly overlapping, gently rounded, the last five-eighths the total length; ornamented by minute longitudinal ridges and lines of growth with a narrow ridge below the suture; mouth acutely angulate above,

¹ 'Mon. Crag Moll.,' 2nd Suppl., pl. iii, fig. 15, 1879.

somewhat expanded below; spire short, regularly tapering to a blunt point; outer lip thin; inner lip reflected on the pillar with two folds.

Dimensions.—L. 10—12 mm. B. 5 mm.

Distribution.—*Recent*: On mud-flats and the salt marshes of estuaries, abundant (Jeffreys). Great Britain, European shores of the Atlantic, Madeira. Mediterranean, Adriatic. Jamaica, Nova Scotia, New England—Maine, Massachusetts, Connecticut.

Fossil: St. Erth. Waltonian Crag: Walton-on-Naze. Newbournian: Sutton. Icenian: Bramerton, Postwick. Pleistocene: Selsey, Barry Docks.

Pliocene: Biot. Pleistocene: Ficarazzi. Sub-Etnaen deposits.

Remarks.—The specimen here given has been identified at the British Museum with the *Auricula myosotis* of Draparnaud—a species now referred to the genus *Alexia*. It differs from the abundant and characteristic *M. pyramidalis* of the English Crag in size, texture and form, and is rare in our deposits, agreeing more nearly with the other members of this group recorded from St. Erth, especially with that given above (p. 787) as *Leuconia bidentata*.

Alexia myosotis is an American species which Dr. Scalia reports from the comparatively recent deposits of Cibali and Catira on the flanks of Mount Etna.

Alexia Reevei, sp. nov. Plate LXII, fig. 28.

Specific Characters.—Shell small, slender, whorls 7, the last rounded, nearly two-thirds the total length, spire short, regularly tapering to a blunt point; mouth oval, angulate above, rounded below; outer lip thickened, not distinctly toothed.

Dimensions.—L. 10 mm. B. 4 mm.

Distribution.—Not known living.

Fossil: Icenian Crag: Bramerton, *Scrobicularia* bed.

Remarks.—This small shell, unfortunately not quite perfect, was found by the late Jas. Reeve at Bramerton in the bed called by him by a special name owing to its containing specimens of *Scrobicularia*. It belongs to the Castle Museum at Norwich and bears the name *Melampus denticulatus*. It seems to belong to the *Alexia* group, however, and presents no sign of the denticulation on the outer lip which Forbes shows so distinctly in his figured specimen of the former species.

Genus **ACMÆA**, Eschscholtz, 1828.

Acmæa parvula (Saml. Woodward). Plate LXII, fig. 29.

1833. *Patella parvula*, S. Woodward, Geol. Norfolk, p. 44, pl. iii, fig. 1.

1842—72. *Lottia ? parvula*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 460, 1842; *Tectura ? parvula*, Mon. Crag Moll., pt. i, p. 162, pl. xviii, fig. 8, 1848; 1st Suppl., pt. i, p. 91, 1872.

1864. *Patella parvula*, S. P. Woodward in White's Hist. of Norfolk, 1st ed., p. 119.
 1872. *Tectura parvula*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 214.
 1879. *Patella vulgata*, J. Reeve, Proc. Norwich Geol. Soc., vol. i, pt. 3, p. 70.
 1890. *Tectura parvula*?, C. Reid, Plioc. Dep. Brit., p. 257.

Specific Characters.—Shell minute, thin, elongato-ovate, inequilateral; ornamented by very delicate radial costæ and by fine transverse striation; vertex close to the anterior end of the shell, margin crenulated.

Dimensions.—L. 8 mm. B. 5 mm. H. 3 mm.

Distribution.—Not known living.

Fossil: Icenian Crag: Bramerton.

Remarks.—The small fossil figured under this name is one of five found by Mr. Jas. Reeve, at Bramerton, alluded to by Wood and still in the Norwich Castle Museum, which are there regarded as immature specimens of *Patella vulgata*. Wood seemed inclined to think *T. parvula* a doubtful species, pointing out its resemblance to an American form, the *Lottia alvea* of Gould. On the whole, however, I am inclined to adopt the specific identification of S. Woodward in 1833, which was followed by his son, Dr. S. P. Woodward, and by the brothers Bell.

Acmæa rubella (Fabricius). Plate LXII, fig. 30.

1780. *Patella rubella*, Fabricius, Faun. Groenl., p. 386.
 1842. *Patella rubella*, Möller, Ind. Moll. Groenl., p. 16.
 1877. *Pilidium rubellum*, Mörch, in Rink, Dan. Groenl., p. 439.
 1877. *Tectura rubella*, Jeffreys, Ann. Mag. Nat. Hist. [4], vol. xix, p. 231.
 1878. *Tectura rubella*, G. O. Sars, Moll. Reg. arct. Norv., pp. 121, 357, pl. viii, fig. 5.
 1899. *Tectura rubella*, Posselt, Medd. om Grönl., vol. xxiii, p. 115.
 1901. *Tectura rubella* Brøgger, Norges geol. Undersøgelse, no. 31, p. 653, pl. xii, fig. 16.
 1901. *Acmæa rubella*, Friele, Norske Nordhav. Exped. (Mollusca, pt. iii), p. 57.
 1902. *Acmæa rubella*, Norman, Ann. Mag. Nat. Hist. [7], vol. x, p. 357.
 1912. *Acmæa rubella*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlviii, p. ii.
 1912. *Acmæa rubella*, Dautzenberg et Fischer, Camp. scient. Prince de Monaco, vol. xxxvii (Mollusques), p. 298.
 1919. *Tectura rubella*, Baker, Bull. Amer. Mus. Nat. Hist., vol. xli, p. 501.
 1919. *Tectura rubella*, Schlesch, Yorks. Natural., p. 342.

Specific Characters.—Shell small, thin, depressed, ovato-oblong, rather narrow in front, obliquely subconical; beak obtuse, nearer the anterior end of the shell; surface smooth, but showing the lines of growth.

Dimensions.—L. 6—15 mm. B. 4—14 mm. H. 3—5 mm.

Distribution.—Recent: Finmark, Nova Zembla, Spitzbergen, Greenland, Jan Mayen, Iceland, Newfoundland, Davis Strait, Barrow Strait, Perry's Island, Alaska.

Fossil: Waltonian Crag: Little Oakley. Uddevalla. Christiania fiord—*Arca*, *Cyprina*- and lower *Cardium*-beds. Port Kennedy and the North Russian Coast (Friele).

Remarks.—When examining my collection of mollusca from Oakley, Dr. Øyen noticed among the specimens of *Acmæa* several which he identified without hesitation as *A. rubella*. This species is allied to *A. virginæa*, but is generally regarded as distinct and not a variety of the latter, the spire being less elevated and the shell large in proportion. Prof. Sars describes it as minute, the shell he figures measuring only 5.5 mm. in length, that represented by Prof. Brøgger being 15 mm.

It does not seem probable that such distinctly northern forms should have existed in our seas during the Oakley stage only, especially in face of the evidence that the climate was gradually becoming colder as the "Great Ice Age" approached. In the present case specimens of *A. rubella* may have been overlooked, being taken for immature or abnormal examples of *A. virginæa*.

Genus **HELACION**, Montfort, 1810.

Helcion pellucidum (Linné). Plate LXII, fig. 31.

1766. *Patella pellucida*, Linné, Syst. Nat., ed. xii, p. 1260.
 1771. *Patella pellucida*, Pennant, Brit. Zool., vol. iv, p. 144, pl. xc, figs. 150, 151.
 1808. *Patella cærulea*, Montagu, Test. Brit., Suppl., p. 152.
 1853. *Patella pellucida*, Forbes and Hanley, Brit. Moll., vol. ii, p. 429, pl. lxi, figs. 3, 4.
 1859. *Patella pellucida*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. x, fig. 20.
 1865—69. *Helcion pellucidum*, Jeffreys, Brit. Conch., vol. ii, p. 242, 1865; vol. v, p. 199, pl. lviii, fig. 1, 1869.
 1878. *Nacella pellucida*, G. O. Sars, Moll. Reg. arct. Norv., pp. 119, 357.
 1889. *Helcion pellucidum*, Carus, Prod. Faun. Medit., vol. ii, p. 236.
 1890—1917. *Helcion pellucidum*, A. Bell, Proc. R. Phys. Soc. Edinb., vol. x, p. 296, 1890; vol. xii, p. 26, 1892; Rep. Yorks. Phil. Soc., pp. 63, 70, 1892; Yorks. Natur., no. 723, p. 96, 1917.
 1901. *Nacella pellucida*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 657, pl. xviii, fig. 27.
 1912. *Helcion pellucida*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xlvi, p. 12, pl. i, figs. 27—32.

Specific Characters.—Shell convex, depressed, semi-transparent; sometimes quite smooth, at others marked by indistinct and slight radial lines varying in number and regularity, and crossed by concentric striæ or raised lines of growth; beak obtuse; mouth oval; margin entire.

Dimensions.—L. 18—20 mm. B. 15—20 mm. H. 12—15 mm.

Distribution.—*Recent*: British coasts, generally from low water to 15 fathoms. Norway from Finmark to the Christiania fiord—Iceland. Mediterranean. Mogador.

Fossil: Selsey, Bridlington, Portland, Pleistocene of Scotland and Ireland. Estuarine clays, Portrush. *Tapes*-banks of the Christiania fiord.

Remarks.—Two rather distinct shells, the *Patella pellucida* of Linné and the *P. lævis* of Pennant, are now grouped as varieties of one and the same species; they are here referred to the Genus *Helcion*. The typical form is comparatively

solid, semi-transparent, and more regular in shape, with the apex more or less excentric. The variation may have been due to a difference in food and habitat. *H. pellucida* feeds on the leaves of *Fuci*, the variety *lævis* upon its root and stalks, in which it imbeds itself, being in shape much less regular and pinched up at the sides. *H. pellucida* seems to be a British species with a general range to the north. We have no evidence of its arrival in these latitudes until Pleistocene times, during which, however, it is not recorded by Seguenza or Dr. Scalia to have reached the Mediterranean. Prof. Brøgger reports it, however, from the post-glacial *Tapes*-banks of the Christiania Fiord.

Var. *lævis* (Pennant). Plate LXII, figs. 32, 33.

1777. *Patella lævis*, Pennant, Brit. Zool., vol. iv, p. 144, pl. xc, fig. 9.
 1853. *Patella pellucida*, var. *lævis*, Forbes and Hanley, Brit. Moll., vol. ii, pp. 430—31, pl. lxi, fig. 4.
 1859. *Patella pellucida*, var. *lævis*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. x, fig. 21.
 1865—69. *Helcion pellucidum*, var. *lævis*, Jeffreys, Brit. Conch., vol. iii, p. 243, 1865; vol. v, p. 199, pl. lviii, fig. 2, 1869.
 1889—91. *Helcion pellucidum*, var. *lævis*, A. Bell, Rep. Brit. Assoc. (Bath), p. 138, 1889; (Leeds), p. 420, 1891.
 1892. *Helcion pellucidum*, var. *lævis*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, p. 258.
 1892. *Helcion læve*, Locard, Coq. mar. Côtes de France, p. 230.
 1913. *Helcion (Patina) pellucidum*, var. *lævis*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xlv, p. 46.

Varietal Characters.—Stronger than the type form and less regular in shape, being pinched up at the sides, so that when placed on a level surface the margins alone touch the latter. Concentrically ridged externally at intervals, indicating the different stages of growth.

Dimensions.—L. 15 mm. B. 10—14 mm. H. 8 mm.

Distribution.—*Recent*: Not very common. British and French coasts, not worked out in detail.

Fossil: Portland, Portrush, Belfast, Estuarine clays, Lough Larne. Ballygeary, near Wexford.

Remarks.—In their paper quoted above, Messrs. Dautzenberg and Durouchoux give this shell from the Laminarian zone of a number of localities in the Bay of St. Malo.

Genus **UTRICULUS**, Brown, 1845.

Utriculus truncatulus (Bruguière). Plate LXIII, fig. 1.

1789. *Bulla truncatula*, Bruguière, Encycl. méthod., Vers, vol. vi, p. 377.
 1836—44. *Bulla truncatula*, Philippi, Enum. Moll. Sic., vol. i, p. 122, pl. vii, fig. 21, 1836; vol. ii, p. 96, 1844.

- 1839—48. *Bulla subtruncata*, S. V. Wood, Mag. Nat. Hist. [N.S.], vol. iii, p. 464, pl. vii, fig. 9, 1839 ; *B. truncata*, Ann. Mag. Nat. Hist. [1], vol. ix, p. 409, 1842 ; Mon. Crag Moll., pt. i, p. 176, pl. xxi, fig. 3, 1848.
1846. *Cylichna truncata*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 82.
1853. *Cylichna truncata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 510, pl. cxiv B, figs. 7—8.
1859. *Cylichna truncata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 7.
- 1867—71. *Utriculus truncatulus*, Jeffreys, Brit. Conch., vol. iv, p. 421, 1867 ; vol. v, p. 223, pl. xciv, fig. 2, 1869 ; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871.
- 1870—98. *Utriculus truncatus*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 452, 1870 ; *U. truncatulus*, Proc. Roy. Phys. Soc. Edinb., vol. x, p. 292, 1889 ; Rep. Brit. Assoc. (Leeds), p. 410, 1891 ; Proc. Roy. Phys. Soc. Edinb., vol. xii, p. 26, 1891 ; Rep. Yorks. Phil. Soc., p. 64, 1892 ; Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893 ; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 157, 1898.
1872. *Utriculus truncatulus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
- 1873—76. *Utriculus truncatulus*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 294, no. 42, 1873 ; vol. vi, p. 151, no. 58, 1876.
1878. *Utriculus truncatulus*, G. O. Sars, Moll. Reg. arct. Norv., pp. 285, 363, pl. xxvi, fig. 2.
- 1878—79. *Bulla truncata*, Crowfoot, Proc. Norwich Geol. Soc., vol. i, p. 26, 1878 ; *Utriculus truncatulus*, p. 79, 1879.
1886. *Cylichna truncatula*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 212.
1890. *Bulla truncata*, C. Reid, Plioc. Dep. Brit., p. 239.
1892. *Utriculus truncatulus*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 266, 281.
1901. *Utriculus truncatulus*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 662, pl. xvii, fig. 22.
1901. *Tornatina truncatula*, Conch. Soc. List, Journ. of Conch., vol. x, p. 26, no. 556.

Specific Characters.—Shell minute, smooth, opaque and glossy, cylindrical, contracted towards the middle, dilated on the lower portion ; spire involuted, abruptly truncated, encircled by a rim ; suture deep ; mouth very narrow above, wide and rounded near the base ; outer lip gently curved, projecting beyond the apex, outer corner rounded, inner corner obliquely incurved ; inner lip folded over the pillar with a small and narrow umbilical chink ; pillar short and thickened ; fold-like tooth rather strong.

Dimensions.—L. 3—4 mm. B. 1·5 mm.

Distribution.—*Recent* : British coasts, everywhere on muddy ground and at the base of seaweeds, from low-water mark to 15 fathoms.

Finmark to the Canary islands, Mediterranean, Adriatic, Ægean.

Fossil : St. Erth. Coralline Crag : Sutton. Icenian : Aldeby, Beccles, Yarn Hill. Pleistocene : Portland, Selsey, Portrush. Scotland, common.

Pleistocene : Christiania fiord, Messina, Monte Pellegrino. Pliocene : Altavilla, Bologna, Biot.

Remarks.—This minute shell, found by A. Bell at St. Erth and by Wood in the Coralline Crag, has not been recognised from the Red Crag, possibly because of its fragility or the different conditions under which it may have lived. It was obtained, however, by Messrs. Dowson and Crowfoot at various localities in the Icenian Crag, by A. Bell at Selsey and elsewhere, and is now a common recent British form. It has been recorded also by Prof. Brøgger from the post-glacial

deposits of the Christiania fiord, as well as by A. Bell from Biot and by Seguenza from the Upper Pliocene and Pleistocene of Italy or Sicily. The specimen here figured is from the Sedgwick Museum at Cambridge, where it has been identified with the specimen given above.

Utriculus crebristriatus (Jeffreys). Plate LXIII, fig. 2.

1884. *Bulla crebristriata*, Jeffreys in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 322, pl. xv, fig. 6.
1917. *Bulla crebristriata*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell ovato-cylindrical, thin, semi-transparent and glossy; ornamented by excessively fine inconspicuous spiral striæ and by irregular lines of growth; spire sunken and concealed; crown encircled by a distinct rim; mouth long and flexuous, narrow on the upper part, expanded below the pillar; outer lip slightly projecting above; inner lip rather thick, with a well-marked and rather deep sulcus behind the base.

Dimensions.—L. 5 mm. B. 3 mm.

Distribution.—Not known living.

Fossil: Bridlington.

Remarks.—The specimen here figured is from the Headley Collection of Bridlington fossils. It bears the inscription, in Jeffreys' writing, given above, differing from anything of the present group hitherto described in having a large excavated sulcus behind the base of the inner lip. I adopt Jeffreys' name provisionally, but possibly it should be regarded as belonging to a new genus.

Utriculus Lajonkaireanus (Basterot). Plate LXIII, fig. 3.

1825. *Bulla Lajonkaireana*, Basterot, Mém. Soc. géol. Bordeaux, p. 222, pl. i, fig. 25.
1839—74. *Bulla olivula*, S. V. Wood, Mag. Nat. Hist. [N.S.], vol. iii, p. 465, pl. vii, fig. 11, 1839; Ann. Mag. Nat. Hist. [1], vol. ix, p. 161, 1842; *B. Lajonkaireana*, Mon. Crag Moll., pt. i, p. 178, pl. xxi, fig. 5, 1848; 1st Suppl., pt. ii, p. 211, 1874.
1856. *Bulla Lajonkaireana*, Hörnes, Foss. Moll. Tert. Beck. Wien, vol. i, p. 624, pl. 1, fig. 9.
1859. *Cylichna Lajonkaireana*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, figs. 12, 13.
1867—71. *Utriculus obtusus*, var. *Lajonkaireana*, Jeffreys, Brit. Conch., vol. iv, p. 424, 1867; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871.
1872. *Utriculus Lajonkaireana*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
1889. *Tornatina obtusa*, var. *Lajonkaireana*, Carus, Prod. Faun. Medit., vol. ii, p. 184.
1889—92. *Utriculus Lajonkaireana*, A. Bell, Proc. Roy. Phys. Soc. Edin., vol. x, p. 292, 1889; Rep. Yorks. Phil. Soc., p. 64, 1892.
1890. *Bulla Lajonkaireana*, Leach, in C. Reid, Plioc. Dep. Brit., pp. 107, 239.
1892. *Utriculus obtusus*, var. *Lajonkaireana*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 266, 281.
1901. *Tornatina obtusa*, var. *lajonkaireana*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 557.

Specific Characters.—Shell minute, cylindrical, smooth; spire variable, sometimes inconspicuous, slightly striated, with a mammillated apex; suture distinct,

sub-canalculated; mouth linear, narrow, dilated below, with an obscure fold on the columella.

Dimensions.—L. 3 mm. B. 1 mm.

Distribution.—*Recent*: English Channel, west Atlantic, Shetland.

Fossil: Coralline Crag: Sutton. Waltonian: Little Oakley. Icenian: Bramerton, Yarn Hill. Pleistocene: Selsey, Largo. Ireland—Estuarine clays.

Remarks.—This minute, fragile and rare form, known as an English fossil to Wood from Sutton (Coralline Crag) only, has since been recognised from a few other British localities, Pliocene and Pleistocene, as stated above. It is given by Hörnes from the Miocene deposits of the Vienna basin, but the specimen figured by him does not correspond very closely with our Crag shell. It has also been recorded as a fossil under the present name by Basterot, Grateloup and other French authorities.

As the specimen of this form in the Norwich Museum is broken and the figure made from it not very satisfactory, I have had the one published by Wood in 1848 (*op. cit.*) reproduced.

Utriculus constrictus, Jeffreys. Plate LXIII, fig. 4.

1884. *Utriculus constrictus*, Jeffreys in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 321, pl. xv, fig. 5.

1917. *Utriculus constrictus*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell minute, thin, oval, deeply constricted above, broader below; spire produced but short and turreted; whorls 4, slightly convex with a ledge on the top of each; suture excavated, deep; mouth long, contracted on the upper part, expanded, rounded and oval towards the bottom; outer lip flexuous; inner lip thickened and spread on the pillar.

Dimensions.—L. 2 mm. B. 1.5 mm.

Distribution.—Not recorded living.

Fossil: Bridlington, Garvel Park.

Remarks.—The specimen here figured is from Mr. Headley's collection, and was described and named by Jeffreys as a new species. Mr. Lamplugh states that others were found with it, but that they have been lost. Mr. A. Bell has more recently found two examples in the Pleistocene deposits of Garvel Park.

Utriculus obtusus (Montagu). Plate LXIII, fig. 5.

1803. *Bulla obtusa*, Montagu, Test. Brit., pt. i, p. 223, pl. vii, fig. 3.

1833. *Bulla minuta*, S. Woodward, Geol. Norfolk, p. 44, pl. iii, fig. 3.

1839–72. *Bulla obtusa*, S. V. Wood, Mag. Nat. Hist. [n.s.], vol. iii, p. 464, pl. vii, fig. 10, 1839; *B. Regulbiensis*, Mon. Crag Moll., pt. i, p. 177, pl. xxi, fig. 4, 1848; 1st Suppl., pt. ii, p. 211, 1874.

1853. *Bulla obtusa*, Forbes and Hanley, Brit. Moll., vol. iii, p. 512, pl. cxiv c, figs. 2, 3.
 1859. *Cylichna obtusa*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 5.
 1867—71. *Utricularius obtusus*, Jeffreys, Brit. Conch., vol. iv, p. 423; vol. v, p. 223, pl. xciv, fig. 3, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 487, 1871.
 1872. *Utricularius obtusus*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 214, 216.
 1878. *Bulla Regulbiensis*, J. Reeve, Proc. Norwich Geol. Soc., vol. i, p. 69.
 1880. *Cylichna Regulbiensis*, Dollfus, Bull. Soc. géol. Norm., vol. vi, p. 517.
 1889. *Tornatina obtusa*, Carus, Prod. Faun. Medit., vol. ii, p. 184.
 1890—92. *Utricularius obtusus*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 417; Proc. R. Phys. Soc. Edinb., vol. x, p. 292, 1890; Rep. Yorks. Phil. Soc., p. 64, 1892.
 1892. *Utricularius obtusus*, Præger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 266, 281, fig. 23.
 1901. *Utricularius obtusus*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 658, pl. xvi, fig. 23.
 1901. *Tornatina obtusa*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 557.
 1915. *Retusa obtusa*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii, Faun. New England, no. 13 (Mollusca), p. 147.

Specific Characters.—Shell minute, subcylindrical, with a small but distinct and sometimes slightly elevated spire; whorls 4 or 5, the last generally contracted in the middle; suture deep; mouth dilated below; inner lip spread on the columella.

Dimensions.—L. 3 mm. B. 1 mm.

Distribution.—*Recent*: coasts of England, Scotland and Ireland in muddy estuaries and brackish water at many localities, from Jersey to Unst.

Iceland, Denmark, Holland to Bay of Biscay and Mediterranean. New England.

Fossil: Coralline Crag: Sutton (A. Bell). Icenian: Bramerton, Thorpe near Norwich, Yarn Hill, Aldeby.

Pleistocene: Selsey, Kelsey Hill, Irish Estuarine clays.

Pliocene: Gourbesville.

Pleistocene: *Tapes*-banks, Christiania fiord.

Remarks.—A. Bell reports this species from the Coralline Crag of Sutton, but I have no other notice of it from any other locality of that formation. As recent it seems to be a brackish-water shell, and it is therefore not surprising to find it in the Icenian beds at several places. In the Reeve collection at the Norwich Castle Museum there are forty specimens, obtained by that observer from the lower bed at the pit on Bramerton Common. *U. obtusus* has been known to several authors under the specific term of *Regulbiensis*, Adams, but I have followed Montagu's name of *obtusus* for these, which is now more generally adopted.

Utricularius pertenuis (Mighels). Plate LXIII, fig. 6.

1843. *Bulla pertenuis*, Mighels, Boston Journ. Nat. Hist., vol. iv, p. 346, pl. xvi, fig. 3.
 1870. *Utricularius pertenuis*, Gould, Rep. Inv. Mass., ed. 2, p. 218, fig. 509.
 1877. *Utricularius semen*, Mørch in Rink, Dan. Greenl., p. 436.
 1878. *Utricularius pertenuis*, G. O. Sars, Moll. Reg. arct. Norv., pp. 287, 363, pl. xvii, fig. 19.

1884. *Utriculus obtusus*, var. *pertenuis*, Jeffreys in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 320.
 1899. *Utriculus pertenuis*, Posselt, Medd. om. Grønl., vol. xxiii, p. 238.
 1907—15. *Retusa pertenuis*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 43, 1907; Arkiv f. Zool., vol. vii, p. 15, 1910; vol. liv, p. 224, 1915.
 1915. *Retusa pertenuis*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii, Faun. New Engl., no. 13 (Mollusca), p. 147.
 1917. *Utriculus obtusus*, var. *pertenuis*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell minute, thin, short, ovato-cylindrical, three-fourths the total length; spire exceedingly short, obtusely truncate; mouth somewhat compressed above, wider and rounded below.

Dimensions.—L. 2 mm. B. 1.5 mm.

Distribution.—*Recent*: Norway: west coast, Christiania fiord. Iceland, Spitzbergen, Siberia, Finmark, Greenland, Baffin's Bay, Newfoundland, New England coast: Maine, Massachusetts.

Fossil: Bridlington, Garvel Park.

Remarks.—The specimen here figured is from Mr. Headley's collection and was found at Bridlington. It bears the inscription, in Jeffreys' writing, *Utriculus obtusus*, var. *pertenuis*. It is a distinctly circumpolar shell, ranging as recent from Newfoundland to Spitzbergen and the Siberian coast. As a British fossil it is only known from the Pleistocene of Bridlington and of Garvel Park.

Genus **VOLVULA**, A. Adams, 1850.

Volvula acuminata (Bruguière). Plate LXIII, fig. 7.

1789. *Bulla acuminata*, Bruguière, Encycl. Meth., Vers., vol. i, p. 376.
 1836—44. *Bulla acuminata*, Philippi, Enum. Moll. Sic., vol. i, p. 122, pl. viii, fig. 18, 1836; vol. ii, p. 96, 1844.
 1837. *Bulla acuminata*, Grateloup, Not. Fam. Bulléens, pp. 27, 63, pl. iii, figs. 43, 44.
 1842—48. *Bulla acuminata*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 461, 1842; Mon. Crag Moll., pt. i, p. 174, pl. xxi, fig. 7, 1848.
 1843—81. *Bulla acuminata*, Nyst, Coq. foss. Belg., p. 457, pl. xxxix, fig. 11, 1843; Conch. Terr. tert. Belg., p. 135, pl. xxviii, fig. 5, 1881.
 1853. *Ovula? acuminata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 500, pl. cxiv B, fig. 3.
 1859. *Ovula acuminata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 3.
 1867—71. *Cylichna acuminata*, Jeffreys, Brit. Conch., vol. iv, p. 411, 1867; vol. v, p. 222, pl. xciii, fig. 4, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871.
 1872. *Volvula acuminata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1873. *Volvula acuminata*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 294, no. 50.
 1886. *Volvula acuminata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 534, pl. lxiv, figs. 4, 5.
 1889. *Volvula acuminata*, Carus, Prod. Faun. Medit., vol. ii, p. 186.
 1890. *Bulla acuminata*, C. Reid, Plioc. Dep. Brit., p. 238.

- 1890—97. *Bulla acuminata*, Sacco, Boll. Soc. Geol. Ital., vol. ix, p. 287, no. 4439, 1890; *Volvula acuminata*, Moll. Terr. Terz. Piem., pt. xxii, p. 42, pl. iii, pp. 91—93, 1897.
 1901. *Volvula acuminata*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 563, 662, pl. xvii, fig. 25.
 1901. *Volvutella acuminata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 568.
 1912. *Bulla acuminata*, Tesch, Med. v. Rijks. v. Delfstoffen, no. 4, p. 94, no. 245.

Specific Characters.—Shell minute, elongated, spindle-shaped, thin, translucent, pointed above, broader and rounded below; spire concealed; mouth very long, narrow and recurved at the top, expanded near the base; inner lip thickened and reflected so as to give the appearance of a short fold on the pillar, which is twisted and bends to the left.

Dimensions.—L. 3—5 mm. B. 1—2 mm.

Distribution.—*Recent*: coasts of Devon and Cornwall; Antrim, Arran islands, co. Galway. Scotland—Loch Fyne, Banff, Caithness, Wick, Shetland, Aberdeenshire.

Norwegian coast—Christiania fiord. Sweden. Gulf of Gascoigne. Gibraltar. Mediterranean. Adriatic, Ægean.

Fossil: Coralline Crag: Gomer pit Gedgrave, Sutton.

Miocene: Dax.

Pliocene: Scaldisien—Belgium, Holland. Italy—Piacenziano, Astiano.

Pleistocene: Italy—Livorno, Vallé Biaia, Reggio. Sicily—Ficarazzi, Monte Pellegrino. Norway—*Tapes*-banks, Christiania.

Remarks.—This minute form has only been recorded in England from two localities in the Coralline Crag, but as it occurs in the Scaldisien both of Belgium and Holland it seems not improbable that it may be found hereafter in the Waltonian, the British equivalent of that horizon.

Originally referred as a Pliocene shell to the genus *Bulla*, it was transferred to *Orula*, to which it has a superficial resemblance, by Forbes and Hanley and by G. B. Sowerby, and afterwards to the *Volvula* of A. Adams. Specimens from the Crag may be easily recognised, as it is the only species of this group known as recent or from the Pliocene or Pleistocene deposits. It seems to be a Miocene form which has nearly disappeared.

Genus **CYLICHNA**, Lovén, 1846.

Cylichna conuloidea (S. V. Wood). Plate LXIII, fig. 8.

- 1839—51. *Bulla conulus*, S. V. Wood, Mag. Nat. Hist. [N.S.], vol. iii, p. 463, pl. vii, fig. 6, 1839; Ann. Mag. Nat. Hist. [1], vol. ix, p. 464, 1842; Mou. Crag Moll., vol. i, p. 173, pl. xxi, fig. 2, 1848; *Bulla conuloidea*, vol. ii, Appendix, p. 322, 1851.
 1856. *Cylichna conulus*, Forbes and Hanley, Brit. Moll., vol. iii, p. 517, pl. cxiv c, fig. 7.
 1859. *Cylichna conulus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 9.

- 1867—80. *Cylichna umbilicata*, var. *conulus*, Jeffreys, Brit. Conch., vol. iv, p. 414, 1867; vol. v, p. 223, 1869; Quart. Journ. Geol. Soc., vol. xxvii, p. 142; *Cylichna ovata*, Proc. Roy. Soc., vol. xix, pp. 146, 221, 1871; Rep. Brit. Assoc. (Swansea), p. 387, 1880.
1870. *Cylichna conuloidea*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 449.
1872. *Cylichna conuloidea*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
- 1873—75. *Cylichna ovata*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 294, no. 49, 1873; vol. vi, p. 151, no. 71, 1875.
1878. *Utriculus conulus*, G. O. Sars, Moll. Reg. arct. Norv., pp. 287, 363, pl. xvii, fig. 17.
1886. *Cylichna ovata*, Watson, Chall. Rep., vol. xv, p. 664, pl. xlix, fig. 9.
- 1893—95. *Cylichna ovata*, Marshall, Journ. of Conch., vol. vii, p. 263, 1893; vol. viii, p. 59, 1895.
1897. *Cylichna ovata*, Locard, Exp. scient. Travailleux, vol. i, p. 69.
1901. *Tornatina conula*, Friele og Grieg, Norske Nordh. Exped., pt. iii, p. 111.
1901. *Tornatina ovata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 560.

Specific Characters.—Shell minute, solid, ovato-conical; ornamented by fine and distant transverse striæ (often abraded); spire truncated, hidden; mouth narrowed above, expanded below; upper lip projecting; inner lip reflected on the columella.

Dimensions.—L. 4 mm. B. 2 mm.

Distribution.—*Recent*: Shetland. Lofoten Islands. Algiers. Bay of Biscay, Azores, Mediterranean, east coast of North America, the Florida Channel, West Indies, Pernambuco.

Fossil: Coralline Crag: Sutton, Boyton.

Pliocene: Biot, Altavilla, Messina. Pleistocene: Ficarazzi.

Remarks.—This minute shell seems to be mainly a deep sea form. It has a very wide range, though it has not been reported anywhere as specially abundant in the Crag. Originally described by Wood as *Bulla conulus* under the impression that it was identical with an Eocene fossil of that name from the Paris basin, he changed *conulus* for *conuloidea* in 1851 (*op. cit.*) when he found it was not so. In 1871 Jeffreys, sharing Wood's later opinion that the two were different, but overlooking the fact that the latter writer had already suggested the specific name of *conuloidea* for the Crag fossil, proposed to call it *Cylichna ovata*, in which he was followed by Watson in the "Challenger" Report and by others. As Wood's name of *conuloidea* (1851) is older than Jeffreys' *ovata* (1871) it should be revived. Both Jeffreys and Nyst identify the present shell with *C. umbilicata*, but this was thought by Marshall to be a mistake.

Cylichna alba (Brown). Plate LXIII, fig. 9.

1838. *Bulla triticea*, Couthouy, Bost. Journ. Nat. Hist., vol. ii, p. 88, pl. ii, fig. 8.
- 1827—44. *Volvaria alba*, Brown, Ill. Rec. Conch. Gt. Brit., ed. 1, p. 38, pl. xxxviii, figs. 43, 44, 1827; ed. 2, p. 3, pl. xix, figs. 43, 44, 1844.
- 1841—70. *Cylichna alba*, Gould, Rep. Inv. Mass., vol. i, p. 165, fig. 98, 1841; vol. ii, p. 220, fig. 511, 1870.
- 1848—74. *Bulla cylindracea*, var. *monstrosa*, S. V. Wood, Mon. Crag Moll., pt. i, p. 174, pl. xxi, fig. 1 b, 1848; *B. alba*, 1st Suppl., pt. ii, p. 211, 1874.

- 1867—84. *Cylichna alba*, Jeffreys, Brit. Conch., vol. iv, p. 417, 1867; vol. v, p. 223, pl. xciii, fig. 6, 1869; in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 320, 1884.
1878. *Cylichna alba*, G. O. Sars, Moll. Reg. arct. Norv., pp. 283, 363, pl. xvii, fig. 15.
1890. *Bulla alba*, C. Reid, Plioc. Dep. Brit., pp. 107, 238.
1901. *Cylichna alba*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 563, 654.
1901. *Bullinella alba*, Conch. Soc. List, Journ. of Conch., vol. x, p. 24, no. 570.
- 1907—15. *Cylichna alba*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 48, 1907; Arkiv f. Zool., vol. vii, pp. 15, 25, 1910; vol. liv, p. 224, 1915.
1912. *Cylichna alba*, Dautzenberg et Fischer, Camp. Scient. Prince de Monaco, vol. xxxvii (Mollusques) p. 36.
1917. *Cylichna alba*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell short, oblong, sub-cylindrical, semi-transparent; mouth more open and the shell wider than in *C. cylindracea*; apex truncated, concave in the centre; outer lip gently curved, rather higher than the apex; pillar short and broad with an obscure plait.

Dimensions.—L. 4 mm. B. 2 mm.

Distribution.—*Recent*: 25 miles N.N.W. of Unst, otherwise northern and sub-polar: Lofoten islands, Finmark, Norwegian coast as far south as Bergen, Iceland, Spitzbergen, Greenland, North America eastern and western.

Fossil: Icenian Crag: Norwich horizon—Bramerton, Yarn Hill; Weybourne horizon—East Runton. Bridlington. Pleistocene of Scotland.

Remarks.—This distinctly northern shell has been found fossil at one or two places in the Icenian Crag. It is an exceedingly rare form.¹

Cylichna concinna (S. V. Wood). Plate LXIII, fig. 10.

- 1839—48. *Bulla concinna*, S. V. Wood, Mag. Nat. Hist. [N.S.], vol. iii, p. 463, pl. vii, fig. 7, 1839; Ann. Mag. Nat. Hist. [1], vol. ix, p. 461, pl. vii, fig. 7, 1842; Mon. Crag Moll., pt. i, p. 176, pl. xxi, fig. 6, 1848.

Specific Characters.—Shell minute, sub-cylindrical, thin, fragile, finely striated transversely, and decussated on the lines of growth; vertex umbilicated; spire hidden; inner lip slightly replicate, with an obsolete fold on the columella (S. V. W.).

Dimensions.—L. 2 mm. B. 1 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Gedgrave, Sutton.

Remarks.—This shell was known to Wood in 1848 by a single specimen only, obtained from the bed of Coralline Crag at Sutton. A few others have since been discovered at the same locality and at Gedgrave, one of them, from the Yorkshire

¹ In a paper of mine containing a list of the mollusca of the Weybournian Crag, published in the 'Bull. Soc. Belge Géol.,' vol. xix, p. 328, 1906, *Bulla alba* has been wrongly alluded to as a southern and Mediterranean instead of an arctic and circumpolar species.

Museum, being here figured. Wood suggests, though doubtfully, that his fossil may have been a young example of a Miocene species of *Bulla clathrata*, DeFrance = *B. Turbelliana*, Grateloup.

Cylichna scalpta (Reeve). Plate LXIII, fig. 11.

1845. *Bulla striata*, Brown, Rec. Conch. Gt. Brit., p. 57, pl. xix, figs. 41, 42.
 1855. *Bulla scalpta*, Reeve, in Belcher, Last of the Arct. Voy., vol. ii, p. 392, pl. xxxii, fig. 3.
 1867. *Cylichna striata*, Jeffreys, Brit. Conch., vol. iv, p. 419.
 1878. *Cylichna scalpta*, Leche; K. Svensk. Vet.-Akad. Handl., vol. xvi, p. 73, pl. i, fig. 22.
 1878. *Cylichna propinqua*, G. O. Sars, Moll. Reg. arct. Norw., pp. 284, 363, pl. xviii, fig. 5.
 1907—10. *Cylichna scalpta*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 51, 1907; Arkiv f. Zool., vol. vii, no. 4, p. 15, 1910.
 1910. *Cylichna scalpta*, Dautzenberg, Journ. de Conch., vol. lix, p. 297.
 1912. *Cylichna scalpta*, Dautzenberg et Fischer, Camp. Scient. Prince de Monaco, vol. xxxvii, p. 39.
 1915. *Cylichna occulta*, Johnson, Boston Soc. Nat. Hist., vol. vii, Occ. papers (13), p. 150.
 1917. *Cylichna scalpta*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell small, ovate, subcylindrical, abbreviated, rather solid; base rounded; mouth elongate, the upper half compressed, the lower expanded; spire minute, immersed; outer lip nearly straight, inner lip flexuous, rounded and projecting above; whorls more or less obscurely striated, often only visible by the aid of a lens.

Dimensions.—L. 4—7 mm. B. 3—4 mm.

Distribution.—Recent: Circumpolar—Spitzbergen, Kola, Nova Zembla, Siberia, Kara Sea, Greenland, north-east American coast, Behring Sea, Baffins Bay, Finmark, North Atlantic.

Fossil: Bridlington.

Remarks.—This rare but rather widespread northern shell is unknown from the East Anglian Pliocene, though it has been found occasionally in the Pleistocene of Bridlington, from which place there are several specimens of it in Mr. Headley's collection. It was first described under the present name by Lovell Reeve from material obtained by Sir Edward Belcher to the north of Becchey Island (*op. cit.*, p. 392), although the *Bulla striata* of Brown, *op. cit.*, with several similar forms as, e. g., *Cylichna proxima* and *C. occulta*, have been identified with it by Mons. Dautzenberg and some other authorities.

Cylichna cylindracea (Pennant). Plate LXIII, fig. 12.

1777. *Bulla cylindracea*, Pennant, Brit. Zool., vol. iv, p. 117, pl. lxx, fig. 85.
 1839—48. *Bulla cylindracea*, S. V. Wood, Mag. Nat. Hist. [N.S.], vol. iii, p. 463, pl. vii, fig. 8, 1839; Ann. Mag. Nat. Hist. [1], vol. ix, p. 460, 1842; Mon. Crag Moll., pt. i, p. 175, pl. xxi, fig. 1 a, 1848.

- 1844—81. *Bulla convoluta*, Nyst, Coq. foss. Belg., p. 454, pl. xxxix, fig. 6, 1844; *Cylichna cylindracea*, Conch. Terr. tert. Belg., p. 132, pl. vii, fig. 26, 1881.
1853. *Cylichna cylindracea*, Forbes and Hanley, Brit. Moll., vol. iii, p. 508, pl. cxiv b, fig. 6.
1859. *Cylichna cylindracea*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 4.
- 1867—71. *Cylichna cylindracea*, Jeffreys, Brit. Conch., vol. iv, p. 415, 1867; vol. v, pl. xciii, fig. 4, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 124, 145, 486, 1871.
- 1870—92. *Cylichna cylindracea*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 448, 1870; Geol. Mag., vol. viii, p. 455, 1871; Rep. Brit. Assoc. (Leeds), p. 417, 1891; Rep. Yorks. Phil. Soc., p. 70, 1892.
- 1873—5. *Cylichna cylindracea*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 294, no. 44, 1873; vol. v, p. 272, no. 21, 1874; vol. vi, p. 151, no. 69, 1875.
- 1874—92. *Bulla cylindracea*, Van den Broeck, Ann. Soc. Malac. Belg., vol. ix, pp. 121, 187, 1874; *Cylichna cylindracea*, vol. xiv, p. 71, 1879; vol. xix, p. 19, 1884; Bull. Soc. Belge Géol., vol. vi, pp. 124, 134, 1892.
1878. *Cylichna cylindracea*, G. O. Sars, Moll. Reg. arct. Norv., pp. 283, 363, pl. xvii, fig. 12.
1880. *Cylichna cylindracea*, Dollfus, Bull. Soc. géol. Normandie, vol. vi, p. 517.
1886. *Cylichna cylindracea*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 521, pl. xliii, figs. 8, 9.
1889. *Cylichna cylindracea*, Carus, Prod. Faun. Medit., vol. ii, p. 188.
1892. *Cylichna cylindracea*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 266, 281.
1896. *Cylichna cylindracea*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), pp. 129, 132.
1898. *Cylichna cylindracea*, Posselt, Medd. om Grønl., vol. xxiii, p. 242.
1901. *Bullinella cylindracea*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 569.
1907. *Cylichna cylindracea*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 47.
1912. *Cylichna cylindracea*, Tesch, Med. v. Rijks. v. Delfstoffen, no. 4, p. 94, no. 243.
1915. *Bullinella cylindracea*, R. B. Newton, Journ. of Conch., vol. xv, pp. 80, 111.

Specific Characters.—Shell elongato-cylindrical, fairly solid; ornamented by numerous inconspicuous spiral striæ which in fossil specimens are often obsolete; mouth narrow above, pear-shaped and wide at the base with a small obtuse fold on the columella; apex twisted and slightly contracted, truncated with a solid rim.

Dimensions.—L. 10—15 mm. B. 4—6 mm.

Distribution.—*Recent*: muddy sand in the Coralline zone on all our coasts and on the Atlantic from Finmark and the Lofoten Islands to Madeira and the Canaries. Mediterranean, Adriatic, Ægean.

Fossil: Lenham. Coralline Crag: Sutton, Gedgrave. Waltonian: Walton-on-Naze, Beaumont, Little Oakley. Newbournian: Waldringfield, Newbourn, Sutton, Felixstow. Butleyan: Butley. Icenian: Bramerton.

Pleistocene: Bridgewater, Torbay, Estuarine clays of Belfast.

Bolderien, Diestien, Casterlien, Scaldisien, Poederlien: Belgium.

Scaldisien, Poederlien: Holland.

Pliocene: Biot, Livorno, Altavilla, Messina, Caltabiano, Gourbesville.

Pleistocene: Ficarazzi, Monte Pellegrino, Livorno, Vallé Biaia, Rhodes.

Remarks.—This species is not uncommon in the earlier horizons of the English Pliocene, but specimens from the Coralline Crag are usually much smaller than those from the Waltonian, as will be seen by comparing a typical example from

Oakley with one from the Gedgravian. As a Belgian fossil our shell is recorded from all zones, from the Miocene of Antwerp to the Poederlien. As recent its range is boreal and southern.

(Genus **SCAPHANDER**, Montfort, 1810.

Scaphander puncto-striatus, Mighels and Adams. Plate LXIII, fig. 13.

1842. *Scaphander puncto-striatus*, Mighels and Adams, Bost. Journ. Nat. Hist., vol. iv, p. 43, pl. iv, fig. 10.
 1846. *Scaphander librarius*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 82,
 1867—69. *Scaphander librarius*, Jeffreys, Brit. Conch., vol. iv, p. 446, 1867; vol. v, p. 224, pl. cii, fig. 9, 1869.
 1870. *Scaphander puncto-striatus*, Gould, Inv. Mass., vol. ii, p. 215, fig. 505.
 1872. *Scaphander librarius*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1872. *Scaphander librarius*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 6, pl. v, fig. 18.
 1875. *Scaphander librarius*, Seguenza, Boll. R. Com. Geol. Ital., vol. vi, p. 151, no. 43.
 1878. *Scaphander puncto-striatus*, G. O. Sars, Moll. Reg. arct. Norv., pp. 292, 363, pl. xviii, fig. 6.
 1889. *Scaphander puncto-striatus*, Carus, Prod. Faun. Medit., vol. ii, p. 187.
 1890. *Scaphander librarius*, C. Reid, Plioc. Dep. Brit., p. 257.
 1893—98. *Scaphander puncto-striatus*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 157, pl. iii, fig. 8, 1898.
 1898. *Scaphander puncto-striatus*, Posselt, Medd. om Grøn., vol. xxiii, p. 235.
 1901. *Scaphander puncto-striatus*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 567.
 1907. *Scaphander punctostriatus*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 46.
 1915. *Scaphander punctostriatus*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii, Faun. New England, no. 13, Mollusca, p. 149.

Specific Characters.—Shell ovate, fairly solid, wider in the middle, rounded at the base; spire concealed, truncate; mouth very large, expanded below, contracted above; outer lip rising above the apex, sharp and gently arcuate; inner lip thin and broad, extending to the summit; ornamented by crowded and inequidistant rows of punctate striæ.

Dimensions.—(Of St. Erth specimen) L. 10 mm. B. 5 mm.

Distribution.—*Recent*: North of the Hebrides, west coast of Ireland. Lofoten Islands. Norwegian coast—Finmark to the Christiania fiord. Iceland, Greenland. New England coast—Casco Bay, Maine, Massachusetts. Gulf of Mexico, Bay of Biscay, Azores, Palermo.

Fossil: St. Erth. Coralline Crag: Sutton, Ramsholt.

Pliocene: Sicily—Caltabiano.

Remarks.—The beautiful St. Erth fossil here figured is from the Wood Collection at the British Museum. It belongs to a widely diffused but apparently rare and rather deep-sea species. The example figured by Prof. G. O. Sars is 34 mm. in length, three times longer than those from St. Erth or the Coralline Crag. *S. puncto-striatus* may be recognised by its punctated sculpture.

Scaphander lignarius (Linné). Plate LXIII, figs. 14, 15.

- 1758-66. *Bulla lignaria*, Linné, Syst. Nat., ed. 10, p. 727, 1758; ed. 12, p. 1184, 1766.
 1790. *Bulla lignaria*, Linné—Gmelin, Syst. Nat., ed. 13, p. 3425.
 1839-72. *Bulla lignaria*, S. V. Wood, Mag. Nat. Hist. [n.s.], vol. iii, p. 460, pl. vii, fig. 4, 1839; Ann. Mag. Nat. Hist. [1], vol. ix, p. 460, 1842; Mon. Crag Moll., pt. i, p. 173, pl. xxi, fig. 8, 1848; *Scaphander lignarius*, 1st Suppl., pt. i, p. 96, 1872.
 1843-81. *Bulla lignaria*, Nyst, Coq. foss. Belg., p. 452, pl. xxxix, fig. 5, 1843; *Scaphander lignarius*, Conch. Terr. tert. Belge, p. 137, pl. vii, fig. 23, 1881.
 1853. *Scaphander lignarius*, Forbes and Hanley, Brit. Moll., vol. iii, p. 536, pl. cxiv f, fig. 3.
 1859. *Scaphander lignarius*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 26.
 1867-71. *Scaphander lignarius*, Jeffreys, Brit. Conch., vol. iv, p. 443, 1867; vol. v, p. 224, pl. xcv, fig. 5, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 142, 486, 1871.
 1872. *Scaphander lignarius*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210.
 1873-75. *Scaphander lignarius*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 292, no. 32, 1873; vol. v, p. 274, no. 19, 1874; vol. vi, p. 151, no. 42, 1875.
 1878. *Scaphander lignarius*, G. O. Sars, Moll. Reg. arct. Norv., pp. 292, 363, pl. xviii, fig. 9; pl. xxvi, fig. 4.
 1880. *Scaphander lignarius*, Dollfus, Bull. Soc. géol. Normandie, vol. vi, p. 517.
 1889. *Scaphander lignarius*, Carus, Prod. Faun. Medit., vol. ii, p. 187.
 1890. *Scaphander lignarius*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 417.
 1890. *Scaphander lignarius*, Sacco, Boll. Soc. Geol. Ital., vol. ix, p. 287, no. 4436.
 1892. *Scaphander lignarius*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 267, 281.
 1896. *Scaphander lignarius*, Bernays, Bull. Soc. Belg. Géol., vol. x (Mémoires), pp. 129, 132.
 1901. *Scaphander lignarius*, Conch. Soc. List, Journ. of Conch., vol. x, p. 26, no. 566.
 1907. *Scaphander lignarius*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 46.
 1912. *Scaphander lignarius*, Tesch, Med. v. Rijks. v. Delfstoffen, no. 4, p. 94, no. 247.
 1915. *Scaphander lignarius*, R. B. Newton, Journ. of Conch., vol. xv, pp. 80, 111.

Specific Characters.—Shell large, ovate, thin, contracted towards the spire, with an expanded mouth, narrow above, rounded below: ornamented by distant and conspicuous striæ; spire truncated; outer lip projecting beyond the crown; inner lip broad and flexuous, consisting of a rather thick glaze.

Dimensions.—L. 30—40 mm. B 20—25 mm.

Distribution.—*Recent*: British coasts. Atlantic coast—from Finmark to Gibraltar. Mediterranean, Adriatic, Ægean.¹

Fossil: Lenham (R. B. N). Coralline Crag: Gomer, Ramsholt, Sutton. Newbournian: Sutton, Waldringfield.

Pleistocene: Fairlie, Greenock, Estuarine clays of Belfast.

Pliocene: Scaldisien—Belgium, Holland. France, Italy, Sicily. Pleistocene: Italy, Sicily.

Remarks.—This large and handsome shell has been recorded from several localities in the Coralline Crag, though not abundantly, but I have not found it in

¹ Several of my specimens of this fine Crag fossil have been broken in transit and I have no others. As the second Crag shell figured does not fairly represent the true character of this species, I have to replace it by a recent one from Dublin.

the Waltonian, either of Walton or Oakley, even as a fragment. Wood reports it, however, from the Newbournian of Sutton; A. Bell from Waldringfield and from some of our Pleistocene beds. It is nowhere abundant in our English deposits, possibly on account of its size and fragility and the conditions under which it originated.

Genus **HAMINEA**, Leach, 1847.

Haminea hydatis (Linné). Plate LXIII, fig. 16.

1766. *Bulla hydatis*, Linné, Syst. Nat., ed. 12, p. 1183.
 1790. *Bulla hydatis*, Linné—Gmelin, Syst. Nat., ed. 13, p. 3424.
 1853. *Bulla hydatis*, Forbes and Hanley, Brit. Moll., vol. iii, p. 530, pl. cxiv D, fig. 7.
 1859. *Bulla hydatis*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 19.
 1867—69. *Bulla hydatis*, Jeffreys, Brit. Conch., vol. iv, p. 437, 1867; vol. v, p. 224, pl. xciv, fig. 3, 1869.
 1871—92. *Bulla hydatis*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 51, 1871; Rep. Yorks. Phil. Soc., p. 64, 1892.
 1873. *Bulla (Haminea) hydatis*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 294, no. 37.
 1886. *Haminea hydatis*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 515, pl. lxxiii, figs. 8, 9.
 1889. *Haminea hydatis*, Carus, Prod. Faun. Medit., vol. ii, p. 190.
 1890. *Bulla hydatis*, Sacco, Boll. Soc. Geol. Ital., vol. ix, p. 287, no. 4446.
 1901. *Haminea hydatis*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 572.

Specific Characters.—Shell fragile, oval, semi-transparent, varying in size; ornamented by numerous inconspicuous striæ and by the lines of growth; spire concealed; apex obliquely indented; shape of mouth irregular, narrow above, expanded below; outer lip curved, not folding inwards; inner lip forming a broad and flexuous glaze; pillar short, smooth, curved.

Dimensions.—L. 25 mm. B. 18 mm.

Distribution.—*Recent*: English coasts—Hants, Dorset, Devon, Cornwall, Bristol Channel, Channel Islands, Scarborough and elsewhere. Irish—Galway, Bantry Bay, Cork, Dublin Bay, littoral and laminarian zones. Atlantic shores of France, Spain and Portugal; Mediterranean, Adriatic, Ægean, Canary Islands.

Fossil: Selsey, Southampton docks. Italian Pliocene: Astiano. Pleistocene: Ficarazzi, Monte Pellegrino, Livorno.

Remarks.—This southern and recent form was originally referred to the genus *Bulla*, Linné, but it has now and for many years been grouped by Seguenza and other Continental authorities, as well as by the Conchological Society of Great Britain, with the *Haminea* of Leach.

As a British fossil it has been recorded only from the Pleistocene of Selsey and one other southern locality. As the fragile Selsey specimen from the Jermyn Street Museum was accidentally broken in transit I have figured a recent form for the purpose of reference.

Genus **PHILINE**, Ascanias, 1772.

Philine aperta (Linné). Plate LXIII, fig. 17.

1766. *Bulla aperta*, Linné, Syst. Nat., ed. 12, p. 1183.
 1803—8. *Bulla aperta*, Montagu, Test. Brit., pt. i, p. 208, 1803; Appendix, p. 94, 1808.
 1853. *Philine aperta*, Forbes and Hanley, Brit. Moll., vol. iii, p. 539, pl. cxiv e, fig. 1.
 1859. *Philine aperta*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 20.
 1867—69. *Philine aperta*, Jeffreys, Brit. Conch., vol. iv, p. 457, 1867; vol. v, pl. xevi, fig. 8, 1869.
 1878. *Philine aperta*, G. O. Sars, Moll. Reg. arct. Norv., p. 363.
 1886. *Philine aperta*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 540, pl. lxiii, figs. 10—15.
 1886. *Philine aperta*, Watson, Rep. Voy. H.M.S. Challenger, vol. xv, p. 671.
 1889. *Philine aperta*, Carus, Prod. Faun. Medit., vol. ii, p. 193.
 1891—92. *Philine aperta*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 417, 1891; Proc. Roy. Phys. Soc. Edinb., vol. x, p. 26, 1892.
 1901. *Philine aperta*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 563, 662, pl. xvi, fig. 29.
 1901. *Philine aperta*, Conch. Soc. List, Journ. of Conch., vol. x, p. 24, no. 583.
 1902. *Philine aperta*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 267, 281.
 1907. *Philine aperta*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 55, pl. iii, fig. 1.

Specific Characters.—Shell rather large, squarish, oval, very thin and fragile, semi-transparent; spire loosely coiled with a small and inconspicuous apex; mouth oval, roundish, of great size compared with the size of the shell, seven-eighths the total length, obliquely truncated above, rounded below; outer lip dilated, with a thin edge, projecting beyond the spire; without umbilical groove or depression.

Dimensions.—L. 15—20 mm. B. 12—18 mm.

Distribution.—*Recent*: British coasts from the Firth of Forth to Jersey. Atlantic sea-board from Norway to Madeira and the Canaries. Mediterranean, Adriatic, Ægean, from 4 to 100 fathoms. Cape of Good Hope, Australia, New Zealand.

Fossil: Garvel Park, Fillyside; Irish Estuarine clays—Belfast. Christiania fiord—*Tapes*-banks.

Remarks.—This British and Mediterranean shell is only known as a fossil from the Christiania fiord and from a few of our Pleistocene deposits. It has been recorded as living, however, not only as far south as the Cape of Good Hope (the original locality of Linné's type), but also from Australia and New Zealand. Jeffreys considered that specimens from these sources were specifically identical with those from the north of Europe. It seems to vary considerably in size, the largest known to the observer named above having been found near Swansea, measuring nearly an inch and a quarter (32 mm.) in length.

Philine ventrosa (S. V. Wood). Plate LXIII, fig. 18.

- 1839—48. *Bulla ventrosa*, S. V. Wood, Mag. Nat. Hist. [N.S.], vol. iii, p. 462, pl. vii, fig. 5, 1839; Ann. Mag. Nat. Hist. [1], vol. ix, p. 460, 1842; *Bullæa ventrosa*, Mon. Crag Moll., pt. i, p. 182, pl. xxi, fig. 11, 1848.
 1872. *Philine ventrosa*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.

Specific Characters.—Shell small, short, thick, ovato-globose; spire concealed by the outer lip; whorls few, oblique, ornamented by punctured spiral striæ, the upper part contracted; mouth large, contracted above, expanded below; inner lip reflected; umbilicus small; muscular impression parallel with the outer lip.

Dimensions.—L. 2·5 mm. B. 2 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton.

Remarks.—Wood remarks that this shell, of which he had obtained only a few examples, resembles a minute (and shortened) specimen of *B. lignaria*, but that it has a distinct umbilicus. As I cannot find Wood's typical fossil I have had another figured from the York Museum. Jeffreys describes a shell as *Utriculus ventrosus* ('Brit. Conch.,' vol. iv, p. 425), but it seems to be different from the present form.

Philine elegans, sp. nov. Plate LXIII, fig. 19.

Specific Characters.—Shell small, oval, tumid, symmetrically elegant; spire short, truncated, expanded in the middle, regularly compressed at each end; whorls distinctly convex; apex obscure; mouth wide, gradually narrowing upwards, rounded and wider below.

Dimensions.—L. 5 mm. B. 4 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Sutton.

Remarks.—The unique specimen here figured was found by Mr. Bell in the Ipswich Museum, where it had been named first *Philine catena* and next *P. scabra*, but in both cases I think in error. It was originally obtained, as stated above, from the Coralline Crag of Sutton. Neither he nor I know of any other species to which it can be satisfactorily referred, and I have therefore described it provisionally as new, under the above name.

Philine scabra (Müller). Plate LXIII, fig. 20.

1776. *Bulla scabra*, Müller, Zool. Danm., p. 41, pl. lxxi, figs. 10—12.

1839—48. *Bulla dilatata*, S. V. Wood, Mag. Nat. Hist. [n.s.], vol. iii, p. 462, pl. vii, fig. 3, 1839;

B. catenata, Ann. Mag. Nat. Hist. [1], vol. ix, p. 460, 1842; *Bullæa scabra*, Mon. Crag Moll., pt. i, p. 181, pl. xxi, fig. 12, 1848.

1853. *Philine scabra*, Forbes and Hanley, Brit. Moll., vol. iii, p. 543, pl. cxiv e, figs. 4, 5.

1859. *Philine scabra*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 21.

1867—71. *Philine scabra*, Jeffreys, Brit. Conch., vol. iv, p. 447, 1867; vol. v, p. 224, pl. xcvi, fig. 1, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871.

1870—91. *Philine scabra*, A. Bell, Journ. de Conch., vol. xviii, p. 354, no. 457. 1870; Rep. Brit. Assoc. (Leeds), p. 417, 1891.

1872. *Philine scabra*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1873—75. *Philine scabra*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 292, no. 31, 1873; vol. v, p. 274, no. 18, 1874; vol. vi, p. 151, no. 40, 1875.
 1878. *Philine scabra*, G. O. Sars, Moll. Reg. arct. Norv., pp. 294, 363, pl. xviii, fig. 13.
 1889. *Philine scabra*, Carus, Prod. Faun. Medit., vol. ii, p. 195.
 1901. *Philine scabra*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 576.
 1902. *Philine scabra*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, p. 267.

Specific Characters.—Shell minute, resembling *Scaphander lignarius*, but much smaller and more slender, delicate and semi-transparent; ornamented by closely-set spiral rows of fine oval dots; whorls 3, the last large and voluminous; suture deep; spire very slightly prominent; mouth narrow above, much expanded and squarish below; outer lip gently curved, compressed above; inner lip forming a rather broad glaze.

Dimensions.—L. 5 mm. B. 2.5 mm.

Distribution.—*Recent*: British coasts—south-western. Scarborough, Northumberland, Berwick, Dogger Bank. Cork, Galway, Antrim. West of Scotland, Hebrides, Shetland, Moray Firth, Aberdeenshire.

Greenland, Iceland, Finmark, Lofoten Islands, Norwegian coast to Christiania fiord. Vigo bay, Gulf of Lyons, Mediterranean, Ægean, Sicily, Tunis.

Fossil: Coralline Crag: Sutton. Garvel Park.

Estuarine Clays: Belfast.

Pliocene: Biot, Monte Mario, Nice.

Pleistocene: Reggio, Vallé Biaia, Messina, Monte Pellegrino, Ficarazzi.

Remarks.—A number of species of the genus *Philine* have been recorded from the Pliocene and Pleistocene deposits of Great Britain, one group of them, to which the present form belongs, being specially characterised by numerous and delicate rows of punctate sculpture and by a somewhat conspicuous spire.

Genus **DIAPHANA**, Brown, 1833.

Diaphana hyalina (Turton). Plate LXIII, fig. 21.

1834. *Bulla hyalina*, Turton, Mag. Nat. Hist., vol. vii, p. 353.
 1853. *Amphispira hyalina*, Forbes and Hanley, Brit. Moll., vol. iii, p. 521, pl. cxiv d, fig. 2.
 1859. *Amphispira hyalina*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xx, fig. 14.
 1867—69. *Utriculus hyalinus*, Jeffreys, Brit. Conch., vol. iv, p. 427, 1867; vol. v, p. 223, pl. xciv, fig. 7, 1869.
 1878. *Diaphana hyalina*, G. O. Sars, Moll. Reg. arct. Norv., pp. 288, 363, pl. xviii, fig. 1.
 1886. *Amphispira hyalina*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 213.
 1891—98. *Amphispira hyalina*, A. Bell, Rep. Brit. Assoc. (Leeds), p. 419, 1891; Proc. Roy. Phys. Soc. Edinb., vol. xii, p. 26, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 157, 1898.

1892. *Utriculus hyalinus*, Præger, Proc. Roy. Irish Acad. [3], vol. ii, pp. 266, 280.
 1898. *Amphispira hyalina*, Posselt, Medd. om Grøn., vol. xxiii, p. 237.
 1899. *Amphispira hyalina*, Carus, Prod. Faun. Medit., vol. ii, p. 188.
 1901. *Diaphana hyalina*, Friele og Grieg, Norske Nordhav. Exped. (Mollusca), pt. iii, p. 111.
 1901. *Diaphana hyalina*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 431, 563, pl. xvi, fig. 25.
 1901. *Diaphana hyalina*, Conch. Soc. List, Journ. of Conch., vol. x, p. 23, no. 563.
 1907. *Diaphana hyalina*, Odhner, K. Svensk. Vet.-Akad. Handl., vol. xli, p. 52.

Specific Characters.—Shell small, fragile, ovate, semi-transparent, dilated in the middle, nearly equally broad at each end; spire abruptly truncated; whorls 3—4, angulated above; suture deep and channelled; mouth rather narrow on the upper part, very wide below; base expanding, equally rounded; outer lip flexuous, contracted and inflected above; outer corner bluntly angular; umbilicus small, distinct and deep.

Dimensions.—L. 5 mm. B. 4 mm.

Distribution.—*Recent*: British coasts, laminarian zone, mainly south and south-western, Channel Islands, Scarborough, Lynn Well, Shetland and north coast. Scotland—east and west. Ireland—Donegal, Galway, Cork, Dublin. Finmark, Atlantic coasts from Norway to Madeira and the Canary Islands, Mediterranean, Iceland and Greenland.

Fossil: St. Erth. Estuarine clays, Belfast. Scotland—Dalmuir, Garvel Park, Paisley and elsewhere.

Italian Pliocene: Astiano.

Pleistocene: Sicily, Monte Pellegrino, Ficarazzi. Norway—*Tapes*-banks, Christiania.

Remarks.—This species may be distinguished from others of the same group by its size, its large semi-circular and expanded mouth, and its conspicuous umbilicus. It has a wide range as a recent shell from circumpolar regions to the Canary Islands, but as a British Pliocene fossil it is only known from St. Erth, though it is found more frequently in the Pleistocene deposits of Scotland, the estuarine clays of Belfast, and in certain continental deposits, stated above.¹

Genus **RINGICULA**, Deshayes, 1838.

Ringicula buccinea (Brocchi). Plate LXIII, fig. 23.

1814—43. *Voluta buccinea*, Brocchi, Conch. foss. subap., vol. ii, p. 93, pl. iv, fig. 9, 1814; ed. 2, p. 319, 1843.

1825. *Auricula buccinea*, J. Sowerby, Min. Conch., vol. v, p. 100, pl. cccclxv, fig. 2.

1842—72. *Ringicula buccinea*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 539, 1842; Mon. Crag Moll., pt. i, p. 22, pl. iv, fig. 2, 1848; 1st Suppl., pt. i, p. 96, 1872.

¹ It was obtained many years ago by Captain Calver, of H.M.S. "Porcupine," when dredging in the Lynn Well, the deepest part of the East Anglian Wash.

- 1843—81. *Ringicula buccinea*, Nyst, Coq. foss. Belg., p. 604, pl. xlv, fig. 12, 1843; Conch. Terr. tert. Belg., p. 131, pl. vii, fig. 20 c, d, 1881.
1870. *Ringicula buccinea*, A. Bell, Journ. de Conch., vol. xviii, p. 346, no. 220.
1871. *Ringicula buccinea*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 145, 455, 490.
1872. *Ringicula auriculata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210.
- 1873—75. *Ringicula buccinea*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 296, no. 65, 1873; vol. vi, p. 153, no. 93 c, 1875.
- 1874—92. *Ringicula buccinea*, Van den Broeck, Ann. Soc. malac. Belge, vol. ix, pp. 120, 136, 187, 356, 1874; Bull. Soc. Belg. Géol., vol. vi (Mémoires), pp. 124, 134, 1892.
1878. *Ringicula buccinea*, Morlet, Journ. de Conch., vol. xxvi, p. 48, no. 33, pl. viii, fig. 6.
1889. *Ringicula buccinea*, Carus, Prod. Faun. Medit., p. 192.
1890. *Ringicula buccinea*, C. Reid, Plioc. Dep. Brit., p. 254.
- 1890—92. *Ringicula buccinea*, Sacco, Boll. Soc. Geol. Ital., vol. ix, p. 286, no. 4418, 1890; *R. auriculata*, var. *buccinea*, Moll. Terr. Terz. Piem., pt. xii, p. 20, pl. i, fig. 7, 1892.
1892. *Ringicula buccinea*, Locard, Coq. mar. Côtes de France, p. 32.
1912. *Ringicula buccinea*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. iv, p. 92, no. 240.

Specific Characters.—Shell strong, minute, subovate, inflated, smooth; spire short with an acute point; columella triplicate; outer lip much thickened outside and wider in the middle inside, but without a projecting tooth as in *R. ovata*.

Dimensions.—L. 5 mm. B. 4 mm.

Distribution.—*Recent*: west European. Mediterranean, Ægean.

Fossil: Coralline Crag: Sutton, Gedgrave. Waltonian: Walton-on-Naze, Little Oakley (fairly common). Newbournian: Waldringfield, Bentley, Newbourn, Sutton. Miocene: Vienna Basin, Belgium. Pliocene—Casterlien, Scaldisien. Casterlien, Scaldisien, Poederlien: Holland. Miocene—Elveziano, Tortonian, Italy. Pliocene: Piacenziano, widely diffused and abundant; Astiano—Biot, Bologna, Asti, Livorno. Pleistocene: Livorno, Vallé Biaia.

Remarks.—This well-known Crag fossil was reported by Wood from the Coralline and Red Crags of Sutton only, in the latter of which he believed it to have been derivative. Since that time it has been found in a number of Red Crag localities from Walton to Butley. At Oakley, for instance, I have obtained 50 or 60 specimens of it. In the Waltonian Crag of Walton and Oakley it was, I think, a genuine Crag species. In his 1st Supplement Wood states that its alleged discovery in the Icenian Crag had been proved to be an error, the specimen in question belonging to an allied species, *R. ventricosa*, characteristic of the upper beds of the English Crag, which is always striated. Abroad it is widely diffused, from the Miocene of Belgium to the Pleistocene of Livorno.

***Ringicula Searlesii*, Etheridge and Bell. Plate LXIII, fig. 22.**

1886. *Ringicula acuta*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
1890. *Ringicula acuta*, C. Reid, Plioc. Dep. Brit., p. 254.
- 1893—98. *Ringicula acuta*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; *R. Searlesii*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 158, 1898.

Specific Characters.—Shell small, thick and solid, ovate, slightly gibbous; whorls 5—6, smooth, inflated; mouth acutely angular and channelled above; outer lip thickened with a prominent tooth or swelling on the inside; enamel wide-spread over body-whorl; inner lip with two well-marked foldings.

Dimensions.—L. 5 mm. B. 3 mm.

Distribution.—Not recorded living.

Fossil: St. Erth.

Remarks.—This small fossil was originally identified by Messrs. Kendall and R. G. Bell with the *R. acuta* of Philippi, but on showing one of my St. Erth specimens to Prof. Issel he expressed the opinion that they were not the same, pointing out that *R. acuta* was a Red Sea species, unknown from the Mediterranean. In 1898 Messrs. Etheridge and A. Bell, recognising the difference, described it as a new species, *R. Searlesii* (*op. cit.*), which name I now adopt. Prof. Issel has kindly given me a specimen of what he considers the typical Red Sea form, figured below as such (fig. 26). It will be seen to differ materially not only from *R. Searlesii*, but from the two characteristic Crag forms, *R. buccinea* and *R. ventricosa*. Neither of these has the prominent tooth on the inner side of the lip.

Ringicula ventricosa (J. Sowerby). Plate LXIII, fig. 24.

1825. *Auricula ventricosa*, J. Sowerby, Min. Conch., vol. v, p. 99, pl. cccclxv, fig. 1.

1842—72. *Ringicula ventricosa*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 539, 1842; Mon. Crag Moll., pt. i, p. 22, pl. iv, fig. 1, 1848; 1st Suppl., pt. i, p. 97, 1872.

1871. *Ringicula ventricosa*, Jeffreys, in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 145, 455, 490.

1872. *Ringicula ventricosa*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210, 214.

1878. *Ringicula ventricosa*, Morlet, Journ. de Conch., vol. xxvi, p. 63.

1881. *Ringicula ventricosa*, Nyst, Conch. Terr. tert. Belg., p. 132, pl. vii, figs. 20 a, 20 b.

1890. *Ringicula ventricosa*, C. Reid, Plioc. Dep. Brit., p. 258.

1912. *Ringicula ventricosa*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 92, no. 241.

Specific Characters.—Shell small, ovate, ventricose, spirally striated; spire short; outer lip thickened outside, neither crenulated nor toothed inside; inner lid expanded, with two folds on the columella.

Dimensions.—L. 8 mm. B. 5 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Gedgrave, Sutton, Boyton. Waltonian: Walton-on-Naze. Newbournian: Sutton, Newbourn, Waldringfield. Butleyan: Butley. Icenian: Bramerton, Brundall, Beccles, Aldeby, Dunwich, Yarn Hill, Thorpe (Suffolk).

Scaldisien, Poederlien: Holland. Scaldisien: Belgium.

Remarks.—This form has been sometimes regarded as a variety of *R. buccinea*, but this view was not accepted by Wood, nor can I adopt it. It is larger than the

latter and distinctly striated, differing otherwise from it, as may be seen by a comparison of the figures of those species here given. Wood says he had never seen any specimens tending to connect the two, nor have I. Its distribution in the Crag is different. *R. buccinea* is common both at the Coralline and Waltonian horizons. I have many specimens in my collection from both. *R. ventricosa* is said to have been found but rarely in the first and at Walton, but I have never seen it during my many years' work at Oakley. In the Icenian Crag, on the contrary, from which no verified specimen of *R. buccinea* is known, *R. ventricosa* is generally though not abundantly represented.

Jeffreys states (*op. cit.*), but without giving his authority, that *R. ventricosa* is found living both in the Mediterranean and in the West European region, but I cannot find any confirmation of this statement elsewhere.

Ringicula striata, Philippi.

1843. *Ringicula striata*, Philippi, Beit. Test. Nord Deutsch., no. 116, pp. 28, 61, pl. iv, fig. 23.
 1853. *Ringicula striata*, Beyrich, Conch. Norddeutsch. Tert., p. 55, pl. ii, fig. 12.
 1859. *Ringicula striata*, Chenu, Man. Conch., vol. i, p. 222, fig. 1248.
 1862. *Ringicula striata*, Speyer, Conch. Cass. Tert., p. 17, pl. i, fig. 17 (Palæont., vol. xvi).
 1870—98. *Ringicula striata*, A. Bell, Journ. de Conch., vol. xviii, p. 346, no. 221, 1870; Proc. Roy. Irish Acad. [3], vol. ii, no. 4, p. 631, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 158, 1898.
 1878. *Ringicula striata*, Morlet, Journ. de Conch., vol. xxvi, p. 29, no. 12, pl. viii, fig. 10.
 1907. *Ringicula striata*, Ravn, K. Danske Vid. Selsk. Skrift., vol. iii, p. 365, pl. viii, fig. 11.

Specific Characters.—Shell minute, oval, finely and regularly striated; whorls 5, slightly convex, the last more than half the total length, rather obtuse at the base; spire longer in proportion and more slender than in *R. ventricosa*; outer lip nearly straight, somewhat thickened outside and in the middle, smooth inside; columella with three folds, the two lower ones pointing upwards.

Dimensions.—L. 3.5 mm. B. 2 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Pliocene: Biot.

Middle Miocene: Denmark.

Lower Miocene: North Germany.

Upper Oligocene: Denmark.

Remarks.—Several specimens of the present shell were obtained by Mr. A. Bell from the Pliocene of St. Erth, having been previously reported by him from Biot and by others from the Miocene and Oligocene of Denmark and North Germany. Unfortunately the fossils from the former locality have been mislaid, but it may be pointed out that this species, unknown from the Anglo-Belgian Crag, differs materially from the striated *R. ventricosa*, a characteristic form of the latter,

its absence from which and its presence at St. Erth having possibly some bearing on the relative age of these various formations. It is much smaller than any of the forms here described, from 3—5 to 5 mm. only in height and distinctly striated. Under the circumstances I must refer the student to the figures given by Chenu, Ravn and others, as I am unable to give one from my own collection.

Ringicula ovalis, A. Bell. Plate LXIII, fig. 25.

1893—98. *Ringicula ovalis*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 631, 1893; *R. ovata*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 158, pl. iii, fig. 11, 1898.

Specific Characters.—Shell minute, tumid; whorls 5, outer lip thickened inside, more so than in *R. buccinea*; spire short, conical; upper canal long and narrow.

Dimensions.—L. 5 mm. B. 3 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—But one specimen of this species has been found by Mr. Bell at St. Erth. He considers it to be a very distinct form, remarking, however, that it seems to bring *R. Searlesii* and *R. buccinea* together though it differs from both of them.

Ringicula acuta, Philippi. Plate LXIII, fig. 26.

1849. *Ringicula acuta*, Philippi, Zeitsch. für Malak., vol. vi, p. 33.

1869. *Ringicula acuta*, Issel, Malac. Mar. Rosso, p. 137.

1872. *Ringicula acuta*, var. *minuta*, H. Adams, Proc. Zool. Soc., p. 11, pl. iii, fig. 16.

1875. *Ringicula acuta*, Nevill, Journ. Asiat. Soc. Bengal, vol. xlv, pt. 2, p. 101.

1878. *Ringicula acuta*, Morlet, Journ. de Conch., vol. xxvi, p. 5.

Specific Characters.—Shell minute, ovato-oblong, acuminate, striated transversely; the last whorl about half the total length; mouth with a thickened lip.

Dimensions.—L. 4 mm. B. 3 mm.

Distribution.—*Recent*: Red Sea, Suez, Aden, Java, Persia, Bombay, Ceylon, Singapore. Not recorded to the north of Suez.

Remarks.—As stated on p. 813, the name of *R. acuta* occurs in several lists of St. Erth fossils, but that species is an entirely different shell, Asiatic rather than European, occurring from Aden to Singapore, but not recorded from the Mediterranean, or to the north of the isthmus of Suez. The variety *minuta* occurs only at the latter place.

Genus **DENTALIUM**, Linné, 1740.

Dentalium rectum, Gmelin. Plate LXIII, fig. 27.

1790. *Dentalium rectum*, Linné, Gmelin, Syst. Nat., ed. 13, p. 5738.
 1791. *Dentalium rectum*, Poli, Test. utriusque Sic., vol. iii, pl. lvi, fig. 28.
 1871—1911. *Dentalium rectum*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 361, 1871; Journ. Ipswich Field Club, vol. iii, p. 15, 1911.
 1872. *Dentalium rectum*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 210.
 1872. *Dentalium rectum*, S. V. Wood, Mon. Crag Moll., 1st Suppl., p. 92, pl. v, fig. 19.
 1889—97. *Dentalium rectum*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 347, no. 1735, 1889; *Entalis recta*, Moll. Terr. Terz. Piem., pt. xxii, p. 110, pl. x, figs. 1, 2, 1897.
 1890. *Dentalium rectum*, C. Reid, Plioc. Dep. Brit., p. 262.
 1910. *Dentalium (Fissidentalium) rectum*, Cerulli-Irelli, Palaeont. Ital., vol. xvi, p. 27, pl. iii, figs. 42—44.
 1913. *Dentalium rectum*, Gignoux, Form. mar. plioc. et quatern. Ital. du Sud., p. 468.

Specific Characters.—Shell large, strong, solid, tubular, elongate, straight, not curved, gradually but regularly diminishing in size towards a truncated apex; ornamented by from 12 to 16 well-marked longitudinal costæ, generally with finer ones in the interspaces, and by indistinct and distant lines of growth.

Dimensions.—Reaching 100 mm. in length and 15 mm. in width.

Distribution.—Not known living.

Fossil: Coralline Crag: Boyton. Waltonian: Walton-on-Naze, Little Oakley. Newbournian: Sutton, Waldringfield, Felixstowe. Butleyan: Butley.

Miocene: Italy—Elveziano, Tortoniano. Pliocene: Monte Mario, Tuscany.

Pleistocene: abundant in the Calabrian deposits of South Italy and somewhat less so in the Sicilian of Ficarazzi and elsewhere.

Remarks.—This fine and handsome species, larger than any other of the Crag *Dentalia*, was reported in 1872 by Wood from the Red Crag of Sutton, and in his opinion was probably derivative. It has since been recorded, however, from the Coralline Crag of Boyton and from other British localities, as well as from the Italian Pliocene and the Pleistocene of Sicily, so that the suggested derivative character of the Sutton fossil seems to be somewhat uncertain. At one time it was regarded as identical with a recent shell, *D. elephantinum*, but Prof. Sacco describes it as distinct from the latter, and that view has been generally held by later authorities. M. Gignoux regards *D. rectum*, while common in the Pliocene of central and southern Italy, as specially characteristic of the Calabrian and Sicilian horizons of the latter.

Wood remarks (*op. cit.*, p. 92) that there are three species described, viz. *D. elephantinum*, *D. arcuatum* and *D. rectum*, as to which it is difficult to say what character will satisfactorily separate them, but that the straight form of the latter

is the greatest, perhaps the only, distinction that can be relied on. The specimen here figured, which was found at Waldringfield, agrees specially with this last, though it has 14 costæ and the finer ones which may be usually observed in the interspaces are wanting—possibly this may be the result of abrasion.

Dentalium sexangulum, Schroeter. Plate LXIII, figs. 28, 29.

1784. *Dentalium sexangulum*, Schroeter, Einleit. Conchyl., vol. ii, p. 531, no. 12.
 1791. *Dentalium sexangulum*, Linné, Gmelin, Syst. Nat., ed. xiii, p. 3739.
 1818—38. *Dentalium sexangulare*, Lamarck, Hist. Nat. Anim. s. Vert., vol. v, p. 344, 1818; p. 592, 1838.
 1870. *Dentalium sexangulare*, A. Bell, Journ. de Conch., vol. xviii, p. 354, no. 431.
 1874—76. *Dentalium sexangulare*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 334, no. 180, 1874; vol. vii, p. 264, no. 846, 1876.
 1879. *Dentalium sexangulum*, Fontannes, Moll. Plioc. Val. du Rhone, vol. i, p. 226, pl. xii, fig. 2.
 1889—97. *Dentalium subsexangulare*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 347, no. 1736, 1889; *D. sexangulum*, Moll. Terr. Tert. Piem., pt. xxii, p. 92, pl. vii, figs. 48—54, 1897.
 1913. *Dentalium sexangulum*, Gignoux, Form. mar. plioc. et quatern. Ital. du Sud., p. 468.

Specific Characters.—Shell tubular, slightly curved, elongate, solid. Ornamented by well-marked conspicuous longitudinal ribs, variable in size and number, often with smaller ones intervening, the latter, however, sometimes wholly or nearly absent; lines of growth closely set but obscurely marked.

Dimensions.—L. 85 mm. B. 8 mm.

Distribution.—Not known living:

Fossil: Red Crag: Waldringfield.

France—Vallée du Rhone, Biot. Sicily—Girgenti. Italy—Tortoniano, Piacenziano (extraordinarily abundant), Astiano (frequentissimo).

Remarks.—I have one or two worn specimens of what I regard as the present species from the Red Crag, possibly derivative. It seems to be exceedingly variable in sculpture, Prof. Sacco figuring more than 20 varieties of it. It may be generally distinguished from *D. rectum* by its somewhat curved, not straight, form. My Crag shell has been submitted to the Marchese di Monterosato, who thinks it may be referred to *D. sexangulum*, of which he sends me an example for comparison (fig. 28).

Dentalium vulgare, Da Costa. Plate LXIII, figs. 30, 31.

1778. *Dentalium vulgare*, Da Costa, Brit. Conch., p. 22, pl. xi, fig. 10.
 1818. *Dentalium tarentinum*, Lamarck, Hist. Nat. Anim. sans Vert., vol. v, p. 345.
 1853. *Dentalium tarentinum*, Forbes and Hanley, Brit. Conch., vol. ii, p. 451, pl. lxxvii, fig. 12.
 1865—69. *Dentalium tarentinum*, Jeffreys, Brit. Conch., vol. iii, p. 195, 1865; vol. v, p. 197, pl. lv, fig. 2, 1869.
 1872. *Dentalium tarentinum*, S. V. Wood, Mou. Crag Moll., 1st Suppl., p. 92.
 1874—76. *Dentalium vulgare*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 12, no. 525; p. 334, no. 186, 1874; vol. vii, p. 266, no. 850, 1876.

1877. *Dentalium tarentinum*, Etheridge in J. Geikie, Great Ice Age, ed. 2, p. 594.
 1882. *Dentalium vulgare*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 558, pl. lxvi, figs. 1—6.
 1888—92. *Dentalium tarentinum*, A. Bell, Rep. Brit. Assoc. (Bath), p. 139, 1888; Rep. Yorks. Phil. Soc., p. 62, 1892; Yorks. Naturalist, no. 723, p. 96.
 1889. *Dentalium vulgare*, Cirus, Prod. Faun. Medit., vol. ii, p. 175.
 1892. *Dentalium vulgare*, Locard, Coq. mar. Côtes de France, p. 239, fig. 216.
 1901. *Dentalium vulgare*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 272.
 1912. *Dentalium vulgare*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 60, no. 126.
 1913. *Dentalium vulgare*, Dautzenberg et Durouchoux, Feuille des Jeunes Naturalistes, vol. xlv, p. 48.

Specific Characters.—Shell solid, opaque, tubular, slightly curved, narrowing regularly from base to summit; the upper part ornamented by numerous fine and inconspicuous longitudinal costæ with distant lines of growth, the anterior opening jagged, truncated and circular, with a distinct, rounded, thick and short straight pipe in the middle; it has no notch or groove.

Dimensions.—L. 40 mm. B. 5 mm.

Distribution—Recent: British coasts: south of England, Bristol Channel, Cardigan Bay. Channel Islands, Bantry Bay, Arran Isles, Co. Galway.

Atlantic coast from Belgium, France, Spain and Portugal to Gibraltar. Mediterranean. Adriatic.

Fossil: Waltonian Crag: Little Oakley, probably elsewhere in the Crag.

Pleistocene: Gamrie, King Edward, Cleongart, Ballybrack, Bridlington, Selsey.

Pliocene: Biot, Val d'Éra, Altavilla, Calabria, Messina.

Pleistocene: Sicily, Calabria, Tuscany.

Remarks.—This species has been probably often mistaken for *D. entalis*, a smooth form, owing to its characteristic sculpture having been obliterated by erosion, but I have some from the Waltonian of Oakley in which traces of the fine longitudinal costæ may be clearly observed. Possibly similar specimens may be found at other localities in the Crag if specially looked for. It seems to have been mistaken also for that shell, according to Jeffreys and others, in the sub-appenine Tertiaries of Sicily and of central and southern Italy. Formerly it was grouped with the *D. tarentinum* of Lamarck, but it has been more recently referred to the *D. vulgare* of Da Costa, whose name is considerably the older. One of the specimens here figured (fig. 31) was found by Mr. Bell at Selsey and belongs to the British Museum.

***Dentalium dentalis*, Linné. Plate LXIII, figs. 32, 33.**

- 1766—91. *Dentalium dentalis*, Linné, Syst. Nat., ed. xii, p. 1263, 1766; (Gmelin) ed. xiii, p. 3736, 1791.
 1814. *Dentalium dentalis*, Brocchi, Conch. foss. subap., vol. ii, p. 261.

- 1841—70. *Dentalium dentale*, Gould, Inv. Mass., ed. 1, p. 155, fig. 5, 1841; ed. 2, p. 266, 1870.
- 1865—82. *Dentalium dentalis*, Jeffreys, Brit. Conch., vol. iii, p. 196, 1865; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 141, 486, 1871; Proc. Zool. Soc., p. 656, 1882.
1870. *Dentalium dentalis*, S. V. Wood, jr., and F. W. Harmer, Rep. Brit. Assoc. (Liverpool), p. 90.
- 1870—92. *Dentalium dentalis*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 434, 1870; Geol. Mag., vol. viii, p. 454, 1871; Rep. Brit. Assoc. (Bath), p. 135, 1888; Rep. Yorks. Phil. Soc., p. 62, 1892.
1872. *Dentalium dentalis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 204, 210, 214.
- 1873—74. *Dentalium dentalis*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 12, no. 527, 1873; vol. v, p. 334, no. 184, 1874.
- 1874—92. *Dentalium costatum*, Van den Broeck, Ann. Soc. Malac. Belg., vol. ix, pp. 120, 136, 187, 1874; vol. xiv, p. 76, 1879; vol. xix, p. 19, 1884; Bull. Soc. Belge Géol., vol. vi (Mémoires), pp. 124, 356, 1892.
1882. *Dentalium dentalis*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 564, pl. lxvi, figs. 10, 11.
1884. *Dentalium dentalis*, Monterosato, Nom. Gen. e Spec. Conch. Medit., p. 31.
- 1889—97. *Dentalium dentale*, Sacco, Boll. Soc. Geol. Ital., vol. viii, p. 346, no. 1724, 1889; *Antale* (?) *dentale*, Moll. Terr. Terz. Piem., pt. xxii, p. 104, pl. viii, fig. 71, 1897.
1890. *Dentalium dentalis*, F. W. Harmer, Quart. Journ. Geol. Soc., vol. lxi, p. 122.
1890. *Dentalium dentalis*, C. Reid, Plioc. Dep. Brit., p. 261.
1892. *Dentalium dentale*, Locard, Coq. mar. Côtes de France, p. 238, fig. 215.

Specific Characters.—Shell slender, tubular, tapering, arched, smaller and more finely costated than the one figured below as *Dentalium costatum*; size moderate; margins thin; costæ less clearly marked.

Dimensions.—L. 30 mm. B. 3 mm.

Distribution.—*Recent*: Atlantic coasts, Mediterranean, Adriatic, Tunis, Tripoli, Sea of Marmora, Morocco, Canaries, Madeira, Cape of Good Hope.

Fossil: Coralline Crag: Gedgrave, Sutton, Boyton. Waltonian: Walton-on-Naze, Bentley, Beaumont, Little Oakley. Newbournian: Waldringfield, Foxhall, Sutton, Ramsholt, Newbourn, Felixstowe. Butleyan: Hollesley, Butley.

Pleistocene: Billockby, Selsey.

Remarks.—The present species, which has been recorded from all horizons of the English Crag from the Gedgravian to the Butleyan, as well as of the northern Pleistocene of Billockby and the southern of Selsey, is widely diffused both as *recent and fossil*.

Several allied and costated forms of *Dentalium* have been described by various authors under the name of the Mediterranean *D. dentalis* of Linné and its varieties, but there seems some difference of opinion as to which most nearly represents the typical form of that authority. There is one, however, published in the 'Moll. mar. du Roussillon' (pl. lxvi, figs. 10, 11), which Messrs. Bucquoy and his colleagues had received from the Marquis of Monterosato as having been obtained from Palermo under that name. It is not unlike the *D. costatum* of Sowerby, but is slender, delicate and distinctly bent, and is more finely costated than that species, as stated in the next paragraph. I have several imperfect specimens in my Oakley

collection which correspond to a considerable extent with this form, one of which I have here figured. I hope a more nearly complete one may turn up hereafter.

Dentalium costatum, J. Sowerby. Plate LXIII, fig. 34.

1823. *Dentalium costatum*, J. Sowerby, Min. Conch., vol. i, p. 162, pl. lxx, fig. 8.
 1842—1872 *Dentalium costatum*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 528, 1842; Mon. Crag Moll., pt. i, p. 188, pl. xx, fig. 1, 1848; *Dentalium dentalis*, 1st Suppl., p. 93, 1872.
 1843—1881. *Dentalium costatum*, Nyst, Coq. foss. Belg., p. 344, pl. xxv, fig. 2, 1843; Conch. Terr. tert. Belg., p. 121, pl. vii, fig. 15, 1881.
 1871. *Dentalium dentalis*, Jeffreys in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 141, 486.
 1892. *Dentalium costatum*, Van den Broeck, Bull. Soc. Belge Géol., vol. vi (Mémoires), p. 147.

Specific Characters.—Shell solid, tubular, tapering slightly, curved, longitudinally costated; costæ obtuse, rounded, well marked, varying in number, size and arrangement; anterior margin thin and sharp, slightly oblique; lines of growth more or less visible.

Dimensions.—L. about 20 mm. B. 5 mm.

Distribution.—Not recorded living.

Fossil: Coralline Crag: Sutton, Gomer.

Red Crag—Waltonian, Newbournian. Scaldisien, Poederlien: Antwerp.

Remarks.—This species, which Wood described under Sowerby's original specific name of *costatum*, afterwards following Jeffreys in considering it a variety of *D. dentalis*, but I think in error, has been reported by the former from the Red Crag of Sutton and by myself from the Waltonian of Beaumont, Bentley and Oakley. Jeffreys gives it also from Butley, but neither Mr. Bell nor I know it from that horizon and we believe this to be a mistake.

Dentalium panormitanum (Chenu). Plate LXIII, fig. 35.

1842. *Dentalium panormum*, Chenu, Ill. Conch., pl. vi, fig. 13.
 1858. *Dentalium panormum*, H. and A. Adams, Gen. Rec. Moll., vol. i, p. 456.
 1874—76. *Dentalium panormum*, Seguenza, Boll. R. Com. Geol. Ital., vol. v, p. 334, no. 183, 1874; *D. panormitanum*, vol. vii, p. 266, no. 849, 1876.
 1882. *Dentalium panormitanum*, Jeffreys, Proc. Zool. Soc., p. 657.
 1889. *Dentalium panormitanum*, Carus, Prod. Faun. Medit., vol. ii, p. 174.
 1892. *Dentalium panormitanum*, Locard, Coq. mar. Côtes de France, p. 239.
 1892. *Dentalium panormum*, A. Bell, Rep. Yorks. Phil. Soc., pp. 62, 74, pl. i, fig. 12.
 1901. *Dentalium panormitanum*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 267.

Specific Characters.—Differs from *D. dentalis* in its curved form and in the greater number, fineness and closeness of its ribs (A. Bell).

Dimensions.—Of the Selsey specimen, L. 9—12 mm. B. 2 mm.

Distribution.—*Recent*: Mediterranean—Marseilles to Palermo and Sciacca.

Fossil: Selsey.

Altavilla, Monte Mario, Messina.

Remarks.—But two small fossil examples of this shell have reached me, both from Mr. Bell, who found them at Selsey. I give them provisionally under the name adopted by him in 1892 (*op. cit.*). Carus, describing *D. panormitanum*, says it is sometimes 85 mm., and Jeffreys 3 to 4 inches in length. A recent specimen I have received from the Marchese di Monterosato measures 65 by 5 mm.

Dentalium striolatum (Stimpson). Plate LXIII, fig. 36.

- 1848—71. *Dentalium entale*, S. V. Wood, Mon. Crag Moll., pt. i, p. 189, pl. xx, fig. 26, 1848;
D. abyssorum, 1st Suppl., pt. i, p. 93, 1871.
1851. *Entalis striolata*, Stimpson, Proc. Bost. Soc. Nat. Hist., vol. iv, p. 114.
- 1865—84. *Dentalium abyssorum*, Jeffreys, Brit. Conch., vol. iii, p. 197, 1865; vol. v, p. 197, pl. ci,
 fig. 1, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 486, 1871; *D. striolatum*, Proc.
 Zool. Soc., p. 659, 1882; in Lamplugh, Quart. Journ. Geol. Soc., vol. xl, p. 319, 1884.
1870. *Entalis striolata*, Gould, Inv. Mass., ed. 2, p. 266, fig. 528.
1872. *Dentalium abyssorum*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 210.
1877. *Dentalium abyssorum*, Etheridge in J. Geikie, Gt. Ice Age, ed. 2, p. 594.
1878. *Antalis striolata*, G. O. Sars, Moll. Reg. arct. Norv., pp. 101, 356, pl. vii, fig. 1; pl. xx, fig. 10.
1878. *Dentalium striolatum*, Shone, Quart. Journ. Geol. Soc., vol. xxxiv, p. 394.
1886. *Dentalium entale*, var. *striolata*, Watson, Rep. Voy. Challenger, vol. xv, p. 5.
1892. *Dentalium abyssorum*, Nicholson, Quart. Journ. Geol. Soc., vol. xlvi, p. 91.
1901. *Antalis striolata*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 429, 560, pl. vi, fig. 11,
 pl. xvi, fig. 1.
1901. *Dentalium occidentale*, Friele og Grieg, Norske Nordhav. Exped., pt. iii, p. 49.
1901. *Dentalium striolatum*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 266.
- 1909—10. *Antalis striolata*, Øyen, Arkiv Math. og Natur., vol. xxx, pt. iii, pp. 32, 39, 1909; K. Norske
 Vid. Sels. Skrift., no. 9, pp. 130, 146, 153, 1910.
1915. *Dentalium entalis*, Johnson, Bost. Soc. Nat. Hist., Occ. papers, vol. vii, Faun. New England
 (Mollusca), pt. 13, p. 82.
1917. *Dentalium striolatum*, A. Bell, Yorks. Naturalist, no. 723, p. 96.

Specific Characters.—Shell elongated, attenuated, slightly curved towards the apex, ornamented by about 20 longitudinal striæ, stronger towards the latter, indistinct at the base, and by well-marked transverse lines of growth.

Dimensions.—L. 40—50 mm. B. 4—5 mm.

Distribution.—*Recent*: Shetland. From Spitzbergen, Finmark and the Faroe Islands to the Bay of Biscay and the Azores. Mediterranean. Greenland and the east coast of North America.

Fossil: Bridlington. Isle of Man, Worden, Cheshire, Moel Tryfaen, Gloppa, Caithness, and Scottish Pleistocene.

Remarks.—This form, more or less common in the British Pleistocene, has a

wide range as a recent shell, not only as a circumpolar and North American species, but extending also as far south as the Azores and the Mediterranean. It is the *D. abyssorum* of M. Sars, S. V. Wood, and others. The specimen here figured is from the Pleistocene of Gloppa; there is another in Mr. Headley's Bridlington Collection, where it bears the name in Jeffreys' writing of *D. striolatum*.

It was referred to the genus *Entalis* (*Antalis*) of Stimpson by Prof. G. O. Sars and by some other northern authorities, but has been more generally grouped with *Dentalium*, as in the list of the Conchological Society.

Dentalium entale, Linné. Plate LXIII, fig. 37.

- 1758—67. *Dentalis entalis*, Linné, Syst. Nat., ed. x, p. 785, 1758; ed. xii, p. 1263, 1767.
 1844—81. *Dentalium entalis*, Nyst, Coq. foss. Belg., p. 345, pl. xxxv, fig. 3, 1844; Conch. Terr. tert. Belg., p. 122, pl. vii, fig. 13, 1881.
 1853. *Dentalium entalis*, Forbes and Hanley, Brit. Moll., vol. ii, p. 449, pl. lvii, fig. 11.
 1865—82. *Dentalium entalis*, Jeffreys, Brit. Conch., vol. iii, p. 191, 1865; vol. v, p. 197, pl. lv, fig. 1, 1869; Proc. Zool. Soc., p. 659, 1882.
 1870—1917. *Dentalium entalis*, A. Bell, Journ. de Conch., vol. xviii, p. 353, no. 433, 1870; Rep. Brit. Assoc. (Bath), pp. 135, 139, 1888; (Leeds), p. 412, 1890; Proc. Roy. Phys. Soc. Edinb., vol. xii, p. 21, 1893; Yorks. Naturalist, no. 723, p. 96, 1917.
 1872. *Dentalium entalis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 218.
 1872. *Dentalium entalis*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 92, 1872.
 1874—92. *Dentalium entalis*, Van den Broeck, Ann. Soc. Malac. Belge, vol. ix, p. 356, 1874; Bull. Soc. Belg. Géol., vol. vi (Mémoires), p. 124, 1892.
 1877. *Dentalium entalis*, Etheridge in J. Geikie, Gt. Ice Age, ed. 2, p. 594
 1878. *Antalis entalis*, G. O. Sars, Moll. Reg. arct. Norv., pp. 100, 356.
 1878. *Dentalium entalis*, Shone, Quart. Journ. Geol. Soc., vol. xxxiv, p. 394.
 1885. *Dentalium entalis*, Lorient, Arch. Mus. Teyler [2], vol. ii, p. 73, pl. v, fig. 1.
 1886. *Dentalium entale*, Watson, Rep. Voy. Challenger, vol. xv, p. 5.
 1892. *Dentalium entale*, Nicholson, Quart. Journ. Geol. Soc., vol. xlviii, p. 92.
 1896. *Dentalium entale*, Bernays, Bull. Soc. Belge Géol., vol. x (Mémoires), p. 129.
 1897. *Dentalium entalis*, Reed, Geol. Cambs., p. 202.
 1901. *Dentalium entalis*, Conch. Soc. List, Journ. of Conch., vol. x, p. 16, no. 265.
 1901. *Antalis entalis*, Brøgger, Norske geol. Undersøgelse, no. 31, pp. 429, 656.
 1909—10. *Antalis entalis*, Øyen, Arkiv Math. og Natur., vol. xxx, pt. iii, pp. 32, 39, 1909; K. Norske Vid. Sels. Skrift., no. 9, pp. 141, 146, 1910.
 1916. *Dentalium entale*, R. B. Newton, Journ. of Conch., vol. xv, p. 111.

Specific Characters.—Shell solid, opaque, smooth, attenuated towards the apex, slightly curved; generally divided into segments by the lines of growth; margin of the broader end more or less jagged; posterior end usually truncate with a tubular and supplementary appendage and an occasional notch or groove on the convex side.

Dimensions.—L. 40 mm. B. 4 mm.

Distribution.—*Recent*: British coasts in sand, more common in the north than in the south.

Finmark and Lofoten Islands to the Christiania fiord. Iceland. Northern Russia, Maine, Vancouver.

Fossil: Lenham (R. B. Newton). Coralline Crag: Sutton, Orford. Red Crag: Oakley, Bentley. Wexford, Isle of Man.

Pleistocene: Billockby, Bridlington, Dimlington, Flamborough, March, Kelsey Hill. Worden, Severn Valley, Strethill, Moel Tryfaen, Gloppa, Macclesfield.

Remarks.—In his 'British Conchology' Jeffreys reported this species in 1865, on the authority of Olivi, from the Mediterranean and other southern localities, but in 1882, in his paper on the "Lightning" and "Porcupine" expeditions ('Proc. Zool. Soc.', p. 659, 1882) he states that he had never been able to identify it from either the Adriatic or Ægean, and further that, as to the recent British shell, it is more common in the north than in the south, where it seems to be replaced by *D. tarentinum*, although the name *D. entale* occurs in nearly every work on the shells of those seas. I have found it very difficult to separate the Crag specimens of these two forms, as they are generally so much worn as to obliterate the longitudinal sculpture of the first-named. The fact that *D. entale* seems to be a distinctly northern species seems to throw considerable doubt as to its occurrence in the earlier horizons of the Anglo-Belgian basins such as Lenham, the Coralline Crag of Suffolk, or the Miocene and Diestien of Belgium.

As the form which has been generally regarded as representing the Crag variety of *D. entale* does not altogether correspond with that of the British shell, I give a recent specimen of *D. tarentinum* for comparison (fig. 38), which I believe to be typical of the latter.

Dentalium longifissum, sp. nov. Plate LXIII, figs. 40, 41.

1872. *Dentalium entale*, S. V. Wood, Mon. Crag Moll., 1st Suppl., p. 92, pl. v, fig. 20; add. pl., p. 187, figs. 12 a, 12 b.

Specific Characters.—Shell tubular, slender, curved, jointed, without ornament, smooth and glossy, regularly diminishing to a fine point. Terminal slit long and narrow, nearly one-fourth the total length.¹

Dimensions.—L. 44 mm. B. 4 mm.

Distribution.—Not known living.

Fossil: Coralline Crag: Sutton, Gedgrave.

Remarks.—But two perfect specimens of this shell were known to Wood, both from the Coralline Crag, and no others have been found there or elsewhere since his time, having been regarded by him as an abnormal variety of *Dentalium entale*. The presence of the remarkable slit alluded to above, however, induces me to regard them as specifically distinct from that species.

¹ Fig. 41 represents the entire shell figured by Wood (*op. cit.*, fig. 20); fig. 40, a portion of the smaller end, enlarged twice and taken at a different angle so as to show the terminal slit.

Genus **DISCHIDES**, Jeffreys, 1867.

Dischides bifissus (S. V. Wood). Plate LXIII, fig. 39.

- 1842—48. *Ditrupa polita*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 459, pl. v, fig. 14, 1842 ;
Dentalium bifissus, Mon. Crag Moll., pt. i, p. 190, pl. xx, fig. 3, 1848.
 1869—82. *Dischides bifissus*, Jeffreys, Brit. Conch., vol. v, p. 194, 1869 ; *D. Olivi*, Scacchi, in
 Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 141, 1871 ; Proc. Zool. Soc., p. 663, 1882.
 1872. *Dischides Olivi*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 204.
 1873. *Dischides bifissus*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 14, no. 539.
 1889. *Dischides bifissus*, Carus, Prod. Faun. Medit., vol. ii, p. 177.
 1890. *Dentalium bifissum*, C. Reid, Plioc. Dep. Brit., p. 261.
 1892. *Dischides bifissus*, A. Bell, Rep. Yorks. Phil. Soc., p. 62.
 1892. *Dischides bifissus*, Locard, Coq. mar. Côtes de France, p. 240.
 1897. *Siphodontalium (Dischides) bifissus*, Sacco, Moll. Terr. Terz. Piem., pt. xxii, p. 115, pl. x,
 figs. 56—58.
 1910. *Siphodontalium (Dischides) bifissum*, Cerulli-Irelli, Palaeont. Ital., vol. xvi, p. 28, pl. iii,
 figs. 47—48.

Specific Characters.—Shell smooth, tubular, tapering, very slender, curved ; margin acute ; posterior termination bilaterally cleft ; dorsal margin projecting and rounded ; ventral portion short and truncate (S. V. W.).

Dimensions.—L. 8—12 mm. B. 1 mm.

Distribution.—*Recent* : west Atlantic, Mediterranean. Morocco, Canaries.

Fossil : Coralline Crag : Sutton, Boyton. Pleistocene : Selsey.

Pliocene : Monte Mario, Farnesina, Acquatraversa.

Pleistocene : Ficarazzi, Monte Pellegrino, Taranto, Vallé Biaia.

Remarks.—*Dischides bifissus* is said to be common in the Coralline Crag at Sutton, and Mr. Bell reports it from Selsey, but I am not aware that it has been recorded from any other locality as an English fossil. It has been reported, however, from Monte Mario by Signor Cerulli-Irelli and from the Italian Pleistocene by Seguenza. It was identified by Jeffreys in 1891 (*q. v.*) with the *D. Olivi* of Scacchi, but in 1882 the latter admitted this to be a mistake. It is a southern form, having been obtained recent by the "Porcupine" expedition as far south as Morocco and the Canaries in 5 to 180 fathoms.

A number of small specimens from the British Museum of Natural History and elsewhere, described under such generic names as *Odostomia*, *Chemnitziu* or *Rissoa*, have been placed in my hands for examination, and are now figured in Plate LXIV. Most of them were obtained at St. Erth, an horizon the exact geological position of which it is not easy but would be very important to ascertain.

Some of these shells are unrecorded as British fossils, some seem new to science, while the identification of others which has been adopted appears rather open to question. They are too interesting to be ignored, but in my eighty-eighth year, more or less unable to leave home, I am unable to give the subject the careful

attention it deserves, and must therefore leave its final determination in the hands of younger men. Under the circumstances it seems desirable, while giving new names to some of these specimens, to retain provisionally for others the names they now bear, giving also their Museum numbers for the purpose of further reference where desirable.

It should be borne in mind, however, that it would not be reasonable to expect to find in all cases that an organism now existing, possibly under very different conditions to those of its far-distant ancestors, should altogether preserve its original features.

Genus **ODOSTOMIA**, Fleming, 1828 (continued from p. 604).

Odostomia acuta, Jeffreys. Plate LXIV, fig. 1.

1846. *Odostomia producta*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 90.
 1848—84. *Odostomia acuta*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 338, 1848; Brit. Conch., vol. iv, p. 130, 1867; vol. v, p. 211, pl. lxxiii, fig. 8, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 144, 490, 1871; Proc. Zool. Soc. London, p. 347, 1884.
 1853. *Odostomia acuta*, Forbes and Hanley, Brit. Moll., vol. iii, p. 269, pl. xcvi, figs. 8, 9.
 1859. *Odostomia acuta*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, figs. 3, 4.
 1872. *Odostomia acuta*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209.
 1873—76. *Odostomia acuta*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 152, no. 282, 1873; vol. vii, p. 94, no. 567, 1876.
 1878. *Odostomia acuta*, G. O. Sars, Moll. Reg. arct. Norv., pp. 202, 360, 400, pl. xxii, fig. 11.
 1886. *Odostomia acuta*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
 1889. *Odostomia acuta*, Carus, Prod. Faun. Medit., vol. ii, p. 269.
 1892. *Odontostomia acuta* and vars., Sacco, Moll. Terr. Terz. Piem., pt. xi, p. 37.
 1892. *Ptychostomon acutum*, Locard, Coq. mar. Côtes de France, p. 150.
 1892—98. *Odostomia acuta*, A. Bell, Rep. Yorks. Phil. Soc., p. 63, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 146, 1898.
 1898. *Odostomia acuta*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. ii, p. 794.
 1901. *Odostomia acuta*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 425.
 1901. *Odostomia acuta*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 661, pl. xix, fig. 23.
 1901. *Odostomia acuta*, Friele og Grieg, Norske Nordh. Exped. Mollusca, iii, p. 81.
 1905. *Ptychostomon acutum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 80, pl. lxxvii, fig. 17.
 1914. *Odontostomia acuta*, Cerulli-Irelli, Palaeont. Ital., vol. xx, p. 254, pl. xxii, figs. 34—37.

Specific Characters.—Shell small, rather solid, acutely conical with a broad base and a very slight peripheral keel; whorls 6, rounded but compressed, the last about half the total length; spire regularly tapering to an acute point; ornamented by extremely fine and numerous microscopical spiral striæ and flexuous lines of growth; suture narrow and slightly excavated; mouth oval, angulated above, rounded below; umbilicus small.

Dimensions.—L. 3—5 mm. B. 1·5—2 mm.

Distribution.—*Recent*: British seas, principally southern and western, from the Channel islands and Devonshire to Ireland, west of Scotland and Aberdeenshire to Shetland, Dogger Bank, Norway, Lofoten islands, Sweden, Atlantic coasts of France and Spain, Teneriffe and Canary islands. Mediterranean, Adriatic.

Fossil: St. Erth. Coralline Crag: Sutton. Waltonian: Walton-on-Naze. Selsey. Irish estuarine clays.

Lower Pliocene (vars.): Piacenziano.

Upper Pliocene: Astiano, Monte Mario, Altavilla.

Pleistocene: Monte Pellegrino, Reggio, Livorno. *Isocardia*- and *Tapes*-banks, Christiania fiord.

Remarks.—The specimen here figured, which comes from the estuarine clays of Belfast, belongs to a recent species which, though not abundant, has a wide range, from Scandinavia to the Canaries, maintaining its specially conical and flattened character throughout. As a fossil it is but rare in the Crag, but has been reported from St. Erth and Selsey, occurring also in the Pleistocene beds (*Tapes*-banks) of Christiania and at various places in the Pliocene and Pleistocene of the Mediterranean. Prof. Sacco figures several forms allied to *O. acuta* from the Upper and Lower Pliocene deposits of Northern Italy as varieties of that species.

***Odostomia angularis*, sp. nov.** Plate LXIV, fig. 2.

1898. *Odostomia obeliscus*, A. Bell, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147.

Specific Characters.—Shell minute, fusiform, smooth, glossy, solid; spire elongate, tapering to an obtuse point; apex incurved; whorls 6—7, including a nucleus, flat, slightly compressed above; periphery strongly angulated; body-whorl occupying more than one-half of the entire shell; suture narrow; aperture a long oval; outer lip slightly expanded, contracting below; inner lip curved, forming a sharp angle at the base with the outer lip; tooth small, indistinct, placed in front of and just above the umbilical chink, which is deep and rather open. Under certain lights there appear to be numerous fine spiral striæ beneath the glaze (A. B.).

Dimensions.—L. 3.5 mm. B. 1 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—I give a copy of Mr. Bell's description of this shell, which seems to be new and distinct. There are four specimens of it in the British Museum, one of them (no. 18175) being here figured. As, however, the specific name *obeliscus* had been previously used by Jeffreys for a different species,¹ I have called it *O. angularis* from its angulated base.

¹ 'Ann. Mag. Nat. Hist.' [3], vol. i, p. 46, pl. ii, fig. 5, 1858; 'Brit. Conch.,' vol. iv, p. 171, 1867.

Odostomia turrita, Hanley. Plate LXIV, fig. 3.

1844. *Odostomia turrita*, Hanley, Proc. Zool. Soc. London, pl. xii, p. 18.
- 1848—84. *Odostomia turrita*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 339, 1848; Brit. Conch., vol. iv, p. 135, 1867; vol. v, p. 211, pl. lxxiv, fig. 2, 1869; Proc. Zool. Soc. London, p. 346, 1884.
1853. *Odostomia unidentata*, var. *turrita*, Forbes and Hanley, Brit. Moll., vol. iii, p. 267, pl. xcv, fig. 9.
1859. *Odostomia turrita*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 2.
1876. *Odostomia turrita*, Seguenza, Boll. R. Com. Geol. Ital., vol. vii, p. 94, no. 566.
1878. *Odostomia turrita*, G. O. Sars, Moll. Reg. arct. Norv., pp. 203, 360, 400, pl. xxii, fig. 10.
1878. *Odostomia turrita*, Monterosato, Enum. e Sinon. Conch. Medit. (Giorn. Soc. Sci. nat. Palermo, vol. xiii, p. 911).
- 1883—98. *Odostomia turrita*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 162, pl. xix, figs. 1, 2, 1883; vol. ii, p. 860, 1898.
1886. *Odostomia turrita*, Dollfus et Dautzenberg, Feuille des Jeunes Natur., vol. xvi, p. 140.
1889. *Odostomia turrita*, Carus, Prod. Faun. Medit., vol. ii, p. 272.
1892. *Ptychostomon turritum*, Locard, Coq. mar. Côtes de France, p. 149.
1892. *Odontostomia (Turritodostomia) turrita* and vars., Sacco, Moll. Terr. Terz. Piem., pt. xi, p. 42.
- 1892—98. *Odostomia turrita*, A. Bell, Rep. Yorks. Phil. Soc., p. 63, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147, 1898.
1901. *Odostomia turrita*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 431, 514, 661, pl. xvii, fig. 5.
1901. *Odostomia turrita*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 428.
1905. *Ptychostomon turritum*, Kobelt, Icon. schalentr. europ. Meeresconch., vol. iii, p. 83, pl. lxvi, figs. 18—22.
1912. *Odostomia turrita*, Dautzenberg et Fischer, Camp. scient. Pr. Monaco, vol. xxxvii (Mollusques), p. 257.
1913. *Auriculina turrita*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xlv, p. 37, pl. iii, fig. 18.
1914. *Odontostomia turrita*, Cerulli-Irelli, Palaeont. Ital., vol. xx, p. 255, pl. xxii, figs. 40—43.

Specific Characters.—Shell variable, minute, strong and solid, forming a sub-cylindrical cone; whorls 6, slightly convex, gradually enlarging, the last narrowed, nearly one-half the total length; spire slender, rather long, turreted, terminating abruptly; suture narrow but well defined; mouth small, not expanded; outer lip somewhat incurved; inner lip thin on the upper part, thickened below; umbilicus wanting.

Dimensions.—L. 3—4 mm. B. 1—1.5 mm.

Distribution.—*Recent*: British seas, widely distributed Atlantic coasts, Mediterranean, Adriatic, Ægean, Canaries. Lofoten islands. Norwegian coast to Finmark. Pernambuco ("Challenger" Exped.).

Fossil: St. Erth. Waltonian Crag: Little Oakley. Selsey. Lochgilphead, Largo Bay, Shewalton.

Miocene: Touraine.

Upper Pliocene: Astiano, Monte Mario, Altavilla.

Pleistocene: Christiania region—*Ostrea*-, *Isocardia*- and *Tapes*-banks.

Remarks.—As stated on p. 831, this species, which is allied to *O. unidentata*, may

be distinguished from it by its longer and more slender spire and its narrower and somewhat angulated base. The authors of the 'Mollusca of Roussillon' consider that the shell figured by Prof. G. O. Sars under the present name (*q. v.*) is a different species. It is new to the Crag, having been found by Mr. Bell and myself some years since during a visit to Oakley. The specimen here figured was obtained from St. Erth, and belongs to the British Museum, where it bears the name of *O. turrita*, no. 18164.

Odostomia conspicua, Alder. Plate LXIV, fig. 4.

- 1848—72. *Odostomia plicata*, S. V. Wood (?), Mon. Crag Moll., pt. i, p. 85, pl. ix, fig. 3, 1848;
O. conspicua, 1st Suppl., pt. i, p. 63, 1872.
1850. *Odostomia conspicua*, Alder, Trans. Tynes. Nat. Field Club, vol. i, p. 359.
1853. *Odostomia conspicua*, Forbes and Hanley, Brit. Moll., vol. iii, p. 263, pl. xcv, fig. 6.
1859. *Odostomia conspicua*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 9.
- 1867—69. *Odostomia conspicua*, Jeffreys, Brit. Conch., vol. iv, p. 132, 1867; vol. v, p. 211, pl. lxxiii, fig. 9, 1869.
1878. *Odostomia conspicua*, G. O. Sars, Moll. Reg. arct. Norv., p. 360.
1884. *Megastomia conspicua*, Monterosato, Nomen. Gen. e Spec. Couch. Medit., p. 94.
1889. *Odostomia (Megastomia) conspicua*, Carus, Prod. Faun. Medit., vol. ii, p. 271.
1892. *Ptychostomum conspicuum*, Locard, Coq. mar. Côtes de France, p. 150.
- 1893—1917. *Odostomia conspicua*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 146, 1898; Yorks. Naturalist. no. 723, p. 96, 1917.
1898. *Odostomia conspicua*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. ii, pp. 767, 794.
1901. *Odostomia conspicua*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 426.
1905. *Ptychostomon conspicuum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 83, pl. lxxvii, figs. 9, 10.
1912. *Odostomia conspicua*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 74, no. 176.

Specific Characters.—Shell solid, elongato-conical; whorls 8, flattened, the last about one-half the total length; ornamented by numerous and irregular microscopical spiral striæ and by minute closely-set lines of growth; periphery slightly but distinctly angulated; spire regularly tapering; suture narrow, excavated; mouth rhomboidal, contracted above, expanded below; outer lip obtusely angulate in the middle, incurved just below the periphery, finely grooved within; inner lip slight on the upper part, straight, with a distinct angle below; umbilicus extremely small, almost covered by the inner lip; tooth strong, prominent and conspicuous, forming a sharp ridge which winds internally round the pillar.

Dimensions.—L. 5—7 mm. B. 2—3 mm.

Distribution.—*Recent*: Guernsey (rare), Scilly Isles, Larnie, Aberdeenshire, Shetland, Scandinavia, West Atlantic coast to the Mediterranean and Adriatic.

Fossil: St. Erth. Coralline Crag: Sutton. Butleyan: Butley. Pleistocene: Bridlington.

Scaldisien: Dutch borings (Tesch).

Remarks.—The fossil here figured is from the St. Erth-Wood Collection at the British Museum, where it is named *O. conspicua*, no. 18171. It has been found rarely in the Crag, but Mr. Bell has recently reported it from the glacial beds of Holderness. Our specimen shows the conspicuous and prominent tooth, winding internally round the columella, characteristic of this species. Dr. Tesch gives it from the Scaldisien beds of one of the Dutch borings. M. Dautzenberg thinks that possibly our shell may be immature.

Odostomia albella (Lovén). Plate LXIV, fig. 5.

1846. *Turbonilla albella*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 91.
 1848—84. *Odostomia albella*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 338, 1848; Rep. Brit. Assoc. Newcastle-on-Tyne, p. 78, 1863; Brit. Conch., vol. iv, p. 121, 1867; vol. v, p. 211, pl. lxxiii, fig. 1, 1869; Proc. Zool. Soc. London, p. 348, 1884.
 1859. *Odostomia albella*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 21.
 1873. *Odontostomia albella*, Weinkauff, Cat. europ. Meeresconch., p. 24.
 1873. *Odostomia albella*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 352, no. 278.
 1874. *Odostomia albella*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. ii, p. 184, add. pl., fig. 15.
 1878. *Odostomia albella*, G. O. Sars, Moll. Reg. arct. Norv., p. 360.
 1889. *Odostomia albella*, Carus, Prod. Faun. Medit., vol. ii, p. 272.
 1890. *Odostomia albella*, C. Reid, Plioc. Dep. Brit., p. 249.
 1892. *Ptychostomon albellum*, Locard, Coq. mar. Côtes de France, p. 150.
 1892. *Odostomia albella*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, p. 263.
 1893—98. *Odostomia albella*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 146, 1898.
 1901. *Odostomia albella*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 661, pl. xviii, fig. 17.
 1905. *Ptychostomon albellum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 89, pl. lxxvii, figs. 15, 16.
 1913. *Odostomia albella*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xlv, p. 36, pl. iii, fig. 1.

Specific Characters.—Shell solid, short, conical; whorls 5—6, rounded but rather compressed, gradually enlarging, the last about three-fifths of the total length; spire tapering to a blunt point, apex reversed and inverted; ornamented by numerous microscopical striæ, spiral and in the lines of growth; suture shallow; mouth oval, contracted above, somewhat expanded below; outer lip curved, not distinctly expanded outwards as in *O. rissoides*; inner lip not much spread on the pillar, slightly reflected on the lower side; tooth small, retired and nearly hidden within the pillar; umbilicus slight or wanting.

Dimensions.—L. 3 mm. B. 1.5 mm.

Distribution.—*Recent*: British coasts from Guernsey to Shetland (not common), Norway, Sweden, Denmark, French coasts, Mediterranean, Adriatic.

Fossil: St. Erth. Coralline Crag: Sutton. Pleistocene: Caithness, estuarine clay of Belfast.

Uddevalla. *Isocardia*- and *Tapes*-banks, Christiania. Monte Pellegrino.

Remarks.—This species was only known to Wood from the Coralline Crag of Sutton, but it has been since reported from St. Erth as well as from other Pleistocene localities, as given above.

The specimen now figured is from the Wood Collection at the British Museum (no. 18169), which appears to agree with a recent shell in the Castle Museum at Norwich. It shows traces of the subsutural band, the indistinct lines of growth, and the reversed and inverted embryonic nucleus, which cannot be shown satisfactorily in the figure.

Odostomia unidentata (Montagu). Plate LXIV, figs. 6, 7.

1803. *Turbo unidentatus*, Montagu, Test. Brit., pt. ii, p. 324.
- 1848—84. *Odostomia unidentata*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 340, 1848; Brit. Conch., vol. iv, p. 134, 1867; vol. v, p. 211, pl. lxxiv, fig. 1, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 490, 1871; Proc. Zool. Soc. London, p. 346, 1884.
- 1850—72. *Odostomia unidentata*, S. V. Wood, Mon. Crag Moll., pt. ii, p. 317, pl. xxxi, fig. 11, 1850; 1st Suppl., pt. i, p. 64, 1872.
1853. *Odostomia unidentata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 264, pl. xcv, figs. 7, 8.
1859. *Odostomia unidentata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 1.
1872. *Odostomia unidentata*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 209.
1872. *Odostomia unidentata*, Verkrüzen, Ann. Mag. Nat. Hist. [4], vol. x, p. 374.
- 1873—76. *Odostomia unidentata*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 354, no. 283, 1873; vol. vii, p. 94, no. 575, 1876.
1878. *Odostomia unidentata*, G. O. Sars, Moll. Reg. arct. Norv., pp. 201, 360, 400, pl. xi, figs. 6, 7, 8.
1883. *Odostomia unidentata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 161, pl. xix, figs. 13, 14.
1886. *Odostomia unidentata*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xli, p. 211.
1889. *Odostomia unidentata*, Carus, Prod. Faun. Medit., vol. ii, p. 270.
1892. *Ptychostomon unidentatum*, Locard, Coq. mar. Côtes de France, p. 149.
1892. *Odostomia unidentata*, Sacco, Moll. Terr. Terz. Piem., pt. xi, p. 38.
- 1893—98. *Odostomia unidentata*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 146, 1898.
1901. *Odostomia unidentata*, Friele og Grieg, Norske Nordh. Exped. Mollusca, iii, p. 81.
1901. *Odostomia unidentata*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 657, pl. v, fig. 16; pl. xix, fig. 22.
1905. *Ptychostomon unidentatum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 82, pl. lxvii, figs. 7, 8.
1914. *Odontostomia unidentata*, Cerulli-Irelli, Palaeont. Ital., vol. xx, p. 255, pl. xxii, figs. 38, 39.

Specific Characters.—Shell minute, solid, variable in form, usually conical, with a broad base, and a more or less distinct keel at the periphery and the base of the upper whorls; spire rather short, regularly tapering; whorls 5, smooth, nearly flat, gradually enlarging, the last about half the total length; suture narrow but distinct, defined by the basal keel; mouth squarish, expanded; outer lip

gently rounded, slightly incurved; inner lip extremely thin above, reflected, thickened and angulated below; tooth rather long; sometimes having a small umbilical chink.

Dimensions.—L. 3 mm. B. 1·5 mm.

Distribution.—*Recent*: British coasts, generally diffused, Norway, as far north as Hammerfest, Lofoten Islands, Iceland. Atlantic coasts of France, Mediterranean, Canaries.

Fossil: St. Erth. Coralline Crag: Sutton (A. Bell). Waltonian: Walton-on-Naze (S. V. W.). Estuarine clays: Belfast, Portrush.

Lower Pliocene: Piacenziano.

Upper Pliocene: Astiano, Monte Mario, Messina, Altavilla.

Pleistocene: Monto Pellegrino, Reggio, Livorno. Christiania—*Mya*- to *Tapes*-banks.

Remarks.—The fossil specimen given under this name is from St. Erth and belongs to the Wood Collection at the British Museum, where it is described as *O. unidentata*, var., no. 18162. It has been found also, though rarely, in the English Crag, being allied to *O. turrita*, but the whorls are less numerous, the base is generally wider and sub-angular, and in form it is more characteristically conical. The specimens represented by the authors quoted above show that it is a variable shell, and as this is so I give also a typical recent example from the Norwich Museum for the purpose of comparison (fig. 6).

Odostomia striolata (Alder), Forbes and Hanley. Plate LXIV, fig. 8.

1853. *Odostomia striolata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 267, pl. xcv, fig. 5.

1859. *Odostomia striolata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 24.

1867. *Odostomia turrita*, var. *striolata*, Jeffreys, Brit. Conch., vol. iv, p. 136.

1893—98. *Odostomia striolata*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147, 1898.

1900. *Odostomia turrita*, var. *striolata*, Marshall, Journ. of Conch., vol. ix, p. 285.

1901. *Odostomia turrita*, var. *striolata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20.

1905. *Odostomia striolata* (F. and H.), Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 84.

Specific Characters.—Shell minute, conical, solid, spire short, obtusely angulated at the periphery; whorls rapidly increasing in size, the last much the largest; mouth large in proportion, spirally striated, with delicate or inconspicuous lines.

Dimensions.—L. 1·5 mm. B. 0·75 mm.

Distribution.—*Recent*: Ilfracombe, Land's End, Guernsey, Scilly, Bantry Bay.

Fossil: St. Erth.

Remarks.—The specimen here figured is one of two in the British Museum from St. Erth (no. 18180) under the present name, which I accept provisionally on its authority. Except that otherwise it shows little or no trace of the

characteristic striation (possibly it is worn), it corresponds with the figure given by Forbes and Hanley. It seems that only one specimen was known to them, but Jeffreys says that a few others were afterwards met with.

Odostomia pallida (Montagu). Plate LXIV, fig. 9.

1803. *Turbo pallidus*, Montagu, Test. Brit., pt. ii, p. 325, pl. xxi, fig. 4.
 1846. *Turbonilla oscitans*, Lovén, K. Svensk. Vet.-Akad. Förh., vol. iii, p. 91.
 1848—84. *Odostomia pallida*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 335, 1848; Brit. Conch., vol. iv, p. 124, 1867; vol. v, p. 211, pl. lxxiii, fig. 5, 1869; Proc. Zool. Soc. London, p. 348, 1884.
 1853. *Odostomia eulimoides*, Forbes and Hanley, Brit. Moll., vol. iii, p. 273, pl. xcv, figs. 1, 2.
 1874. *Odostomia pallida*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 354, no. 284.
 1878. *Odostomia pallida*, G. O. Sars, Moll. Reg. arct. Norv., pp. 203, 360, pl. xxii, fig. 12.
 1886. *Odostomia pallida*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
 1889. *Odostomia pallida*, Carus, Prod. Faun. Medit., vol. ii, p. 269.
 1892. *Odostomia pallida*, Praeger, Proc. Roy. Irish Acad. [3], vol. ii, p. 263.
 1892. *Ptychostomon pallidum*, Locard, Coq. mar. Côtes de France, p. 151.
 1892. *Odostomia pallida*, Sacco, Moll. Terr. Terz. Piem., pt. xi, p. 39.
 1892—98. *Odostomia pallida*, A. Bell, Rep. Yorks. Phil. Soc., p. 63, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 146, 1898.
 1899. *Odostomia pallida*, Marshall, Journ. of Conch., vol. ix, p. 228.
 1901. *Odostomia pallida*, Friele og Grieg, Norske Nordh. Exped., Mollusca, vol. iii, p. 81.
 1905. *Ptychostomon pallidum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 86, pl. lxxviii, figs. 22, 25.

Specific Characters.—Shell minute, somewhat spindle-shaped, solid; whorls 5—6, compressed, rapidly enlarging, the last two-thirds of the total length; spire short, regularly tapering to a blunt point; suture distinct but not deep; sculpture microscopical; mouth oblongo-oval, contracted above, expanded below; outer lip gently curved, not projecting; inner lip straight, thickened and reflected below; umbilicus wanting; tooth small, strong.

Dimensions.—L. 3—4 mm. B. 1—2 mm.

Distribution.—*Recent*: British seas, widely distributed. Atlantic coasts, Mediterranean, Norway, Sweden, Denmark.

Fossil: St. Erth. Selsey, Clyde Beds, Belfast estuarine clay.

Pleistocene: Monte Pellegrino, Reggio, Livorno, Valle Biaia.

Remarks.—This species is said to be chiefly found on the ears of *Pecten opercularis* and *P. maximus*. It has rather a wide range as a recent shell, but has not been reported from the English Crag. The fossil specimen now figured belongs to the British Museum (no. 18183), and was obtained at St. Erth. Prof. Sacco describes two varieties of it, one from the Italian Miocene, the other—var. *italica*—from Asti, which he says is not unlike the British shell. It seems to be a variable species.

Odostomia suboblonga, Jeffreys. Plate LXIV, fig. 10.

1884. *Odostomia suboblonga*, Jeffreys, Proc. Zool. Soc. London, p. 345, pl. xxvi, fig. 3.

1889. *Odostomia suboblonga*, Carus, Prod. Faun. Medit., vol. ii, p. 271.

1898. *Odostomia suboblonga*, A. Bell, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147.

Specific Characters.—Shell minute, oblong, conical, moderately solid, glossy, without sculpture; whorls 4—5, compressed, gradually enlarging with an obtusely angulated base; spire short; nucleus not prominent, twisted inwards; suture shallow; mouth contracted above, expanded and angulated below; outer lip rounded, not incurved; inner lip thin, spread on the pillar; tooth small, sunken.

Dimensions.—L. 2·5 mm. B. 1·5 mm.

Distribution.—*Recent*: Bay of Biscay. Mediterranean. Morocco, "Adventure Bank," Messina, Tunis.

Fossil: St. Erth.

Remarks.—The St. Erth fossil from the British Museum (no. 18178), where it has been identified with Jeffreys' shell, seems to agree generally with his figure and description. As to this, he says it is different from any species described in his 'British Conchology,' and presumably from anything known to him elsewhere. Mons. Dautzenberg suggests that Jeffreys' shell may be immature.

Odostomia erthensis, sp. nov. Plate LXIV, fig. 11.

Specific Characters.—Shell minute, fairly solid, elongato-conical, polished; whorls 5, compressed; spire gradually tapering to a blunt point; suture well marked; peristome obtusely keeled; mouth angulate above, contracted and expanded below; inner lip reflected on the pillar; tooth small, inconspicuous.

Dimensions.—L. 3·5 mm. B. 1·5 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—The undescribed and somewhat imperfect fossil here figured is from the Warburton St. Erth Collection at the British Museum (no. 18174), where it bears Mr. Bell's MS. name of *O. eulimoides*. As the latter has been used for a different shell, I propose provisionally the one given above for it. Possibly some of these St. Erth specimens, which we have been unable to refer satisfactorily to any recognised species, may be more definitely identified hereafter. The *O. eulimoides* of Hanley figured on my Plate L, fig. 35, and verified by M. Dautzenberg, is a different shell.

Odostomia denticulata, A. Bell, MS. Plate LXIV, fig. 12.

Specific Characters.—Shell minute, solid, smooth and polished; whorls 5, compressed, the last about half the total length; spire slender, gradually tapering

to a blunt and twisted apex; suture well marked but not deep; mouth ovate, angulate above and below; outer lip gently curved, not expanded; inner lip straight, reflected on the pillar, expanded below; tooth strong and projecting.

Dimensions.—L. 2·75 mm. B. 1·25 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—The undescribed shell here figured is from the Warburton Collection at the British Museum (no. 18184). It was found at St. Erth by Mr. A. Bell, whose MS. name of *O. denticulata* it bears. It seems specially characterised by its strong and projecting tooth.

I have submitted it to my friend M. Dautzenberg. He informs me he does not recognise it as anything he knows.

***Odostomia eulimæformis*, Etheridge and A. Bell.**

1893—98. *Turbonilla eulimæformis*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; *Odostomia eulimæformis*, Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147, pl. ii, fig. 14, 1898.

Specific Characters.—Shell long, slender; whorls 4—5, convex, the last two-thirds the total length; spire attenuated, rapidly diminishing in size upwards; suture oblique; mouth long, very narrow, compressed and pointed at both ends; tooth strong; apparently without sculpture.

Dimensions.—L. 16 mm. B. 5 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—This shell is represented by Mr. Bell in one of his St. Erth papers, but I doubt whether the figure he gives is a very accurate one. At present the specimen cannot be traced, but if it should turn up hereafter, it may be possible to identify it by the description that has been given by Mr. Bell.

***Odostomia rissoides*, Hanley. Plate LXIV, figs. 13, 14.**

1844. *Odostomia rissoides*, Hanley, Proc. Zool. Soc. London, p. 18.

1848—84. *Odostomia rissoides*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 337, 1848; Brit. Conch., vol. iv, p. 122, 1867; vol. v, p. 211, pl. lxxiii, fig. 4, 1869; Proc. Zool. Soc. London, p. 348, 1884.

1853. *Odostomia rissoides*, Forbes and Hanley, Brit. Moll., vol. iii, p. 285, pl. xcvi, fig. 4.

1859. *Odostomia rissoides*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 20.

1873—76. *Odostomia rissoides*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 352, no. 279, 1873; vol. vii, p. 94, no. 576, 1876.

1878. *Odostomia rissoides*, G. O. Sars, Moll. Reg. arct. Norv., p. 360.

1878—84. *Odostomia rissoides*, Monterosato, Enum. e Sinon. Conch. Medit. (Giorn. Soc. Sci. Nat. Palermo, vol. xiii), p. 91, 1878; *Brachystomia rissoides*, Nomen. Gen. e Spec. Conch. Medit., p. 94, 1884.

- 1883—98. *Odostomia rissoides*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 164, pl. xix, figs. 6—10, 1883; vol. ii, p. 767, 1898.
1886. *Odostomia rissoides*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 211.
1889. *Odostomia (Brachystomia) rissoides*, Carus, Prod. Faun. Medit., vol. ii, p. 271.
1892. *Odontostomia (Brachystomia) rissoides*, Sacco, Moll. Terr. Terz. Piem., pt. xi, p. 41.
- 1892—98. *Odostomia rissoides*, A. Bell, Rep. Yorks. Phil. Soc., p. 63, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147, 1898.
1892. *Ptychostomum rissoide*, Locard, Coq. mar. Côtes de France, p. 151, fig. 130.
1901. *Brachystomia rissoides*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 434.
1901. *Odostomia rissoides*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 661, pl. xix, fig. 25.
1905. *Ptychostomon rissoide*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 95, pl. lxxviii, figs. 1—12; pl. lxxix, fig. 8.
1914. *Odontostomia rissoides*, Cerulli-Irelli, Palaeont. Ital., vol. xx, p. 254, pl. xxii, fig. 33.

Specific Characters.—Shell minute, oblongo-conical, smooth, polished, thin; whorls 5, slightly convex, rapidly enlarging; spire short, turreted, regularly tapering to a blunt point; suture fairly deep; mouth oval; not expanded nor angulated below; outer lip regularly curved; inner lip forming a thin film on the pillar above, thickened and reflected below; umbilicus small; tooth inconspicuous; a very variable form.

Dimensions.—L. 2·5—3 mm. B. 1—1·5 mm.

Distribution.—*Recent*: British seas (generally diffused). Coasts of Sweden, Norway, Denmark, and France. Mediterranean.

Fossil: St. Erth. Selsey, Ireland—estuarine clays. Scotland—raised beach, Ayrshire.

Upper Pliocene: Piedmont, Monte Mario, Val d'Era, Messina.

Pleistocene: Messina, Reggio. *Isocardia*- and *Tapes*-banks, Christiania.

Remarks.—This common British form, which ranges both to the north and south of our shores, has not been reported hitherto from the Anglo-Belgian Crag, though it has been obtained from the Pliocene of St. Erth, the Pleistocene of Selsey, and from one or two other fossil localities in Ireland and Scotland. Prof. Brøgger gives it also from the later and post-glacial deposits of the Christiania region, where he groups it with other forms regarded by him as Lusitanian, indicating, he thinks, a somewhat milder climate than that now obtaining in that district. Signor Cerulli-Irelli records the fossil from Monte Mario, Seguenza from Sicily and Calabria, and Prof. Sacco from the Pliocene of Piedmont. The latter authority, however, does not regard his shells as typical of *O. rissoides*, giving to one of them the name of var. *pliocenica*. The authors of the 'Marine Mollusca of Roussillon' express a doubt, moreover, as to whether such Mediterranean fossils are the true *O. rissoides*. Possibly it may often be the case that unfigured specimens recorded from southern sources as the equivalent of British species differ more or less widely from them. I figure for the use of collectors a recent specimen (fig. 13) received many years ago from Dr. Gwyn Jeffreys.

Odostomia inedita, sp. nov. Plate LXIV, fig. 15.

Specific Characters.—Shell minute, rather solid, irregularly conical with a broad base; whorls 6, slightly convex, the last more than half the total length; spire elongate, compressed towards the apex; suture slight; mouth oval, angulate above, rounded below; outer lip not expanded; inner lip thin.

Dimensions.—L. 3 mm. B. 1 mm.

Distribution.—Not recorded living.

Fossil: St. Erth.

Remarks.—The minute specimen figured under the present name is from the St. Erth Collection at the British Museum, where it is labelled *O. acuta*, no. 4095, but that species is shown by Jeffreys and others to be more strictly conical in form, with a slender spire, an acutely pointed apex and a channelled suture. As I cannot satisfactorily identify it with any other *Odostomia* known to Mr. Bell or myself, I call it provisionally and for the present *O. inedita*.

Odostomia obtusa, sp. nov. Plate LXIV, fig. 16.

Specific Characters.—Shell minute, smooth, strong, elongate, slender; whorls about 5 or 6, flattened, the last about half the total length, regularly diminishing to an abruptly truncated apex; mouth narrow, pointed and projecting below, angulate above; obtusely but slightly keeled at the periphery; tooth small.

Dimensions.—L. 3 mm. B. 1.5 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—When examining the St. Erth shells which were handed to his brother at Wood's death, Mr. A. Bell found two specimens, neither of them perfect, which have since been identified in error as *O. elongata*, no. 18177; to one of them, however, a note in the younger Wood's writing is attached stating that Dr. Jeffreys considered them to be new—an opinion in which both the former and the present author concur. These two shells appear to be the same and differ in form from anything which either Mr. Bell or I can discover. One of them has lost its apex; the other, which is probably younger, shows it to be abruptly coiled and truncated. Possibly a perfect specimen may be found hereafter.

Odostomia incognita, A. Bell, MS. Plate LXIV, fig. 17.

Specific Characters.—Shell minute, elongate, slender; whorls 5 or 6, slightly convex, the last about half the total length; suture well marked, not deep; spire regularly diminishing to a blunt and compressed point; ornamented by numerous fine and straight ribs, which do not extend beyond the periphery; mouth small,

ovate, angulate above and below; outer lip slightly incurved; inner lip with a prominent tooth; peristome continuous.

Dimensions.—L. 1·5 mm. B. 0·5 mm.

Distribution.—Not known living.

Fossil: St. Erth.

Remarks.—I figure provisionally this minute specimen under the generic name of *Odostomia* adopted for it in the British Museum (no. 18185), although such a costated sculpture is very unusual in that genus. It was obtained at St. Erth by Mr. A. Bell many years ago, and up to the present has not been otherwise identified. Such minute forms are not easy to reproduce, but in this case the artist seems to have been fairly successful.

***Odostomia plicata* (Montagu). Plate LXIV, fig. 18.**

- 1803—8. *Turbo plicatus*, Montagu, Test. Brit., pt. ii, p. 325, 1803; Suppl., pl. xxi, fig. 2, 1808.
1836. *Rissoa elongata*, Philippi, Enum. Moll. Sic., vol. i, p. 154, pl. x, fig. 16.
- 1848—84. *Odostomia plicata*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 329, 1848; Brit. Conch., vol. iv, p. 137, 1867; vol. v, p. 211, pl. lxxiv, fig. 3, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 490, 1871; Proc. Zool. Soc. London, p. 349, 1884.
1851. *Odostomia plicata*, S. P. Woodward, Man. Moll., p. 125, pl. viii, fig. 12.
1853. *Odostomia plicata*, Forbes and Hanley, Brit. Moll., vol. iii, p. 271, pl. xxviii, figs. 1, 2.
1859. *Odostomia plicata*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 5.
- 1870—98. *Odostomia plicata*, A. Bell, Journ. de Conch., vol. xviii, p. 349, no. 325, 1870; Rep. Yorks. Phil. Soc., p. 63, 1892; Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 146, 1898.
1872. *Odostomia plicata*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 163, pl. iv, fig. 22.
- 1873—76. *Odostomia plicata*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 352, no. 280, 1873; vol. vii, p. 94, no. 565, 1876.
- 1878—84. *Odostomia plicata*, Monterosato, Enum. e Sinon. Conch. Medit. (Giorn. Soc. Sci. nat. Palermo, vol. xiii), p. 91, 1878; *O. (Brachyostomia) plicata, conoidea*, Nomen. Gen. e Spec. Conch. Medit., p. 95, 1884.
- 1883—98. *Odostomia plicata*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 163, pl. xix, figs. 3—5, 1883; vol. ii, p. 767, 1898.
1886. *Odostomia plicata*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 212.
1889. *Odostomia (Brachyostomia) plicata*, Carus, Prod. Faun. Medit., vol. ii, p. 272.
1892. *Ptychostomum plicatum*, Locard, Coq. mar. Côtes de France, p. 148.
1901. *Odostomia plicata*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 429.
1905. *Ptychostomum plicatum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 94, pl. lxvii, figs. 4—6.
1912. *Odostomia plicata*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 74, no. 174.
1913. *Odostomia plicata*, Dautzenberg et Durouchoux, Feuille des Jeunes Natur., vol. xlv, p. 36, pl. iii, fig. 5.
1914. *Odontostomia plicata*, Cerulli-Irelli, Palaeont. Ital., vol. xx, p. 255, pl. xxii, fig. 44.

Specific Characters.—Shell minute, ovato-conical, with an attenuated base; periphery rounded, not keeled or angulated; spire gradually enlarging, regularly

tapering to a blunt point; whorls 5 to 6, rounded but compressed; sculpture none that can be seen without a microscope; suture slight; mouth oval, angulated above, rounded but not expanded below; outer lip not projecting; inner lip thickened, reflected and curved; umbilicus slight; tooth small and but slightly conspicuous.

Dimensions.—L. 4 mm. B. 2 mm.

Distribution.—*Recent*: British seas, south and west; range mostly southern, from north of France to Mediterranean, Adriatic and Madeira.

Fossil: St. Erth. Coralline Crag: Gedgrave, Ramsholt, Sutton, Boyton. Waltonian: Walton-on-Naze. Newbournian: Sutton. Selsey. Scotland. Belfast—estuarine clay, Portrush.

Lower Pliocene: Biot.

Upper Pliocene: Monto Mario, Altavilla.

Pleistocene: Ficarazzi, Messina, Reggio, Livorno, Valle Biaia.

Remarks.—This southern species is reported from several localities in the Coralline and from one or two in the Red Crag. It occurs also at St. Erth and Selsey, and occasionally in the Pleistocene and Holocene deposits of Scotland and Ireland. The specimen here figured, no. 30323, belongs to the Jermyn St. Museum.

Sub-genus **ONDINA**, de Folin, 1870.

Odostomia (Ondina) Warreni (Thompson). Plate LXIV, fig. 19.

1845. *Rissoa Warreni*, Thompson, Ann. Mag. Nat. Hist. [1], vol. xv, p. 315, pl. xix, fig. 4.
 1850—67. *Odostomia decorata*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. v, p. 109, 1850; *O. obliqua*, var. *Warreni*, Brit. Conch., vol. iv, p. 143, 1867.
 1853. *Odostomia Warrenii*, Forbes and Hanley, Brit. Moll., vol. iii, p. 292, pl. xcvi, figs. 2, 3.
 1859. *Odostomia Warrenii*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 28.
 1873. *Odostomia Warreni*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 354, no. 288.
 1873. *Odontostomia (Auriculina) Warreni*, Weinkauff, Cat. eur. Meeresconch., p. 24, no. 427.
 1878. *Auriculina Warreni*, G. O. Sars, Moll. Reg. arct. Norv., p. 360.
 1890. *Odostomia (Brachystomia) Warreni*, Carus, Prod. Faun. Medit., vol. ii, p. 274.
 1892. *Ondina Warreni*, Locard, Coq. mar. Côtes de France, p. 153.
 1893—98. *Odostomia warrenii* (?), A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147, 1898.
 1898. *Odostomia Warreni*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. ii, p. 794.
 1900. *Odostomia Warreni*, Marshall, Journ. of Conch., vol. ix, p. 288.
 1901. *Ondina Warreni*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 443.
 1905. *Ptychostomum warreni*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 104, pl. lxxviii, figs. 20, 21.

Specific Characters.—Belongs to the same group as the shells described below, but the spire is longer in proportion and the mouth shorter. Our specimen has

traces of indistinct fine spiral striæ near the mouth of the shell, a few fine longitudinal markings, and an umbilicus which has been insisted on as characteristic of the present species. The fine spiral lines can hardly be seen without the aid of a microscope, especially in worn specimens.

Dimensions.—L. 2 mm. B. 0.75 mm.

Distribution.—*Recent*: Coasts of Ireland. Scotland and the south of England, the Scilly islands, Isle of Man and Orkneys.

Fossil: St. Erth.

Pleistocene: Ficarazzi, Monte Pellegrino, Reggio.

Remarks.—The present shell was regarded by Jeffreys as a variety of *O. obliqua*, but by other authorities it has been separated from that form, both generically and specifically. In the Conchological Society's list it has been grouped with the subgenus *Ondina* of de Folin.

The specimen here figured, from St. Erth, belongs to the British Museum, where it has been called *Odostomia Warreni*, no. 18179, which name I adopt, using *Ondina* as subgeneric.

***Odostomia (Ondina) insculpta* (Montagu). Plate LXIV, fig. 20.**

1808. *Turbo insculptus*, Montagu, Test. Brit., Suppl., p. 129.
- 1848—84. *Odostomia insculpta*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 342, 1848; Brit. Conch., vol. iv, p. 139, 1867; vol. v, p. 211, pl. lxxiv, fig. 4, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 144, 1871; Proc. Zool. Soc. London, p. 349, 1884.
1853. *Odostomia insculpta*, Forbes and Hanley, Brit. Moll., vol. iii, p. 289, pl. xcvi, fig. 6.
1859. *Odostomia insculpta*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvii, fig. 6.
1872. *Odostomia insculpta*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 62, pl. iv, fig. 18.
1872. *Odostomia insculpta*, Verkrüzen, Ann. Mag. Nat. Hist. [4], vol. x, p. 371.
1872. *Odostomia insculpta*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.
1878. *Auriculina insculpta*, G. O. Sars, Moll. Reg. arct. Norv., pp. 204, 360, pl. xi, fig. 12.
1886. *Odostomia insculpta*, Kendall and R. G. Bell, Quart. Journ. Geol. Soc., vol. xlii, p. 212.
1890. *Odostomia insculpta*, C. Reid, Plioc. Dep. Brit., p. 250.
1892. *Ondina insculpta*, Locard., Coq. mar. Côtes de France, p. 152, fig. 131.
- 1893—98. *Odostomia insculpta*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 628, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 147.
1900. *Odostomia insculpta*, Marshall, Journ. of Conch., vol. ix, p. 286.
1901. *Ondina divisa*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 440.
1901. *Auriculina insculpta*, Friele og Grieg, Norske Nordh. Exped., Mollusca, vol. iii, p. 82.
1901. *Auriculina insculpta*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 658, pl. xviii, fig. 8.
1905. *Ptychostomum (Ondina) insculptum*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 99, pl. lxix, fig. 23.

Specific Characters.—Shell minute, somewhat cylindrical, with a narrow base; whorls 6, convex but compressed, with a narrow rim below the suture, the last about one-half the total length; ornamented by fine incised spiral lines; spire

fairly long, somewhat turreted, with a truncated apex; suture narrow, slightly channelled, rather oblique; mouth oblong, expanded below; outer lip flexuous, inflected in the middle; lower part of the inner lip reflected and nearly straight; umbilicus small and narrow; tooth retired and inconspicuous.

Dimensions.—L. 0·2 mm. B. 0·75 mm.

Distribution.—*Recent*: British Seas, coralline and deep sea zones, widely distributed; coasts of Norway from Christiania to the Lofoten islands, and Finmark, Iceland, Sweden, Brittany, Bay of Biscay.

Fossil: St. Erth. Coralline Crag: Sutton.

Pleistocene: Estuarine clay, Belfast. *Isocardia*- and *Tapes*-banks, Christiania.

Remarks.—This species, which may be recognised by its incised basal sculpture, was reported by Jeffreys and Wood from the Coralline Crag of Sutton, by Prof. Kendall and R. G. Bell from St. Erth, by A. Bell from the latter locality and from the Estuarine clays of Belfast. Prof. Brøgger, moreover, obtained it from the latest zones of the Pleistocene deposits of Christiania. It belongs to the *Ondina* group. The specimen here figured belongs to the British Museum (no. 10272). I follow this identification provisionally, but with some doubt, as the specimen is worn.

***Odostomia (Ondina) scandens* (Monterosato). Plate LXIV, fig. 21.**

1872. *Odostomia obliqua*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 64, pl. iv, fig. 24.

1878—84. *Odostomia (Auriculina) obliqua*, Monterosato, Enum. e Sinon., p. 32 (*nec* Alder), 1878;

Auriculina scandens, Nomen. Gen. e Spec. Conch. Medit., p. 97, 1884.

1892. *Ondina scandens*, Locard, Coq. mar. Côtes de France, p. 153.

1905. *Ptychostomon scandens*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 93, pl. lxxix, figs. 14, 15.

Specific Characters.—Shell minute, ovate, turreted; whorls 4—5, slightly convex, the last much the largest, two-thirds the total length; spire short, gradually tapering to a blunt point; spirally marked with very fine lines, hardly visible without the aid of a microscope; mouth ovate, angulate above, rounded below; suture well marked.

Dimensions.—L. 2 mm. B. 1 mm.

Distribution.—*Recent*: Mediterranean.

Fossil: St. Erth. Coralline Crag: Sutton.

Remarks.—The shell here figured was originally identified by Wood with the *Odostomia obliqua* of Alder, but this seems to have been an error. It is now more usually referred to the sub-genus *Ondina* as *O. scandens*, a name suggested for it by the Marchese di Monterosato. As an English fossil it has been reported only from St. Erth and from one locality in the Coralline Crag. The worn specimen figured is from the British Museum, no. 18170, where it is called *O. obliqua*.

Genus **TURBONILLA**, Risso (continued from p. 566).

Turbonilla delicata, Monterosato. Plate LXIV, fig. 22.

1844. *Chemnitzia gracilis*, Philippi, Enum. Moll. Sic., vol. ii, p. 137, pl. xxiv, fig. 11 (not *Turbo gracilis*, Brocchi).
 1859. *Chemnitzia simillimus*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvi, fig. 2
 1884. *Turbonilla delicata*, Monterosato, Nom. Gen. e Spec. di Conch. Medit., p. 92.
 1892. *Odostomia delicata*, A. Bell, Rep. Yorks. Phil. Soc., p. 76.
 1892. *Parthenina delicata*, Locard, Coq. mar. Côtes de France, p. 143.
 1893. *Odostomia delicata*, Marshall, Journ. of Conch., vol. vii, p. 255.
 1905. *Turbonilla delicata*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 144.

Specific Characters.—Shell small, aciculate, sub-cylindrical; whorls 8, nearly flat, gradually decreasing in size to an acute point, ornamented by fine closely-set costæ; spire slender, elongate; suture slight; mouth small, angulate above, rounded below.

Dimensions.—L. 5 mm. B. 1 mm.

Distribution.—*Recent*: Southern and western coasts of England. Ireland—Antrim, Donegal bay, Killala bay. Atlantic coasts of France and Portugal. Mediterranean to Spezia and Alexandria. Adriatic.

Fossil: Selsey.

Pliocene: Biot, Livorno, Val d'Era.

Pleistocene: Taranto, Livorno, Valle Biaia.

Remarks.—The southern species here described is rare in Great Britain, and is only known as an English fossil from a single specimen obtained at Selsey by Mr. Bell, who remarks that though corresponding with the *Chemnitzia gracilis* of Philippi, it is neither the *Turbo gracilis* of Brocchi nor the *Chemnitzia gracilis* of Koninck. Monterosato's specific name of *delicata*, therefore, has been generally adopted for it by recent authorities.

Jeffreys reports it as obtained by the "Porcupine" expedition near Bundoran in co. Donegal.

The example from Selsey here figured belongs to the Yorkshire Museum, where it bears the name of *Chemnitzia gracilis*, Phil.

Turbonilla Crowfootii, sp. nov. Plate LXIV, fig. 23.

1872. *Chemnitzia plicatula* (pt.), S. V. Wood, Mon. Crag Moll., 1st Suppl., pp. 61, 208.
 1890. *Chemnitzia plicatula* (pt.), C. Reid, Plioc. Dep. Brit., p. 242.

Specific Characters.—Shell small, solid, slender, elongate; whorls slightly convex, gradually diminishing in size; apex broken; ornamented by about a

dozen strong, widely separated longitudinal costæ, which do not reach the smooth, rounded base; mouth short, small; outer lip slightly incurved above, somewhat flattened below; suture well marked.

Dimensions.—L. (of broken specimen) 5 mm. B. 1 mm.

Distribution.—Not known living.

Fossil: Icenian Crag: Beccles, boring at water-works.

Remarks.—Two distinct shells are recorded by Wood as *Chemnitzia plicatula*. The present one, obtained only at Beccles, for which I adopt the specific name of *Crowfootii* in memory of its discoverer, my friend Dr. Crowfoot, who was for many years a zealous collector from the Suffolk Crag. It is, however, a different species from the shells described either as *Turbo plicatulus* by Brocchi¹ or as *Turbonilla plicatula* by Hörnes.²

Turbonilla discrepans, sp. nov. Plate LXIV, fig. 24.

1871. *Odostomia (Chemnitzia) plicatula*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vii, p. 359; Geol. Mag., vol. viii, p. 454.

1872. *Chemnitzia plicatula* (part), S. V. Wood, Mon. Crag Moll., 1st Suppl., pp. 61, 208, pl. vii, fig. 3.

1890. *Chemnitzia plicatula* (part), C. Reid, Plioc. Dep. Brit., p. 242.

Specific Characters.—Shell of moderate size, slender, cylindrical; whorls nearly flat, elongate, regularly diminishing in size; ornamented by about 14 fine, closely-set costæ, angulated at the periphery, without spiral sculpture; mouth oval, rounded and expanded below; outer lip incurved.

Dimensions (of broken fragment).—L. 10 mm. B. 3 mm.

Distribution.—Not known living.

Fossil: Red Crag: Walton-on-Naze, Butley. Icenian: Beccles.

Remarks.—The shell now described is another for which the specific name *plicatula* was adopted by Wood, neither of them corresponding, I consider, with those of Brocchi or Hörnes, the sculpture of the latter being finer and the spire more tapering. The first, *Turbonilla Crowfootii*, has been obtained from the Icenian deposit of Beccles only, the other, which I here call *T. discrepans*, from Beccles and from the Red Crag of Walton and Butley.

Sub-genus **PYRGOSTELIS**, Monterosato, 1884 (continued from p. 572).

Turbonilla (Pyrgostelis) fulvocincta (Thompson). Plate LXIV, fig. 25.

1840. *Turbonilla fulvocincta*, Thompson, Ann. Mag. Nat. Hist. [1], vol. v, p. 98.

1853. *Chemnitzia fulvocincta*, Forbes and Hanley, Brit. Moll., vol. iii, p. 245; vol. iv, p. 274, pl. xciii, fig. 3.

¹ 'Conch. foss. sub-ap.,' vol. ii, p. 376, pl. vii, fig. 5.

² 'Foss. Moll. Tert. Wien,' vol. i, p. 503, pl. xliii, fig. 33.

1859. *Chemnitzia rufa*, var. *fulvocincta*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvi, fig. 5.
 1867–84. *Odostomia rufa*, var. *fulvocincta*, Jeffreys, Brit. Conch., vol. iv, p. 163, 1867; vol. v, pl. lxxvi, fig. 2, 1869; Proc. Zool. Soc. London, p. 356, 1884.
 1872. *Chemnitzia fulvocincta*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 218.
 1872. *Chemnitzia fulvocincta*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 61.
 1873. *Turbonilla rufa*, var. *fulvocincta*, Weinkauff, Cat. Europ. Meeresconch., p. 25.
 1883. *Turbonilla rufa*, var. *fulvocincta*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 185.
 1884. *Pyrgostelis fulvocincta*, Monterosato, Nomen. Gen. e Spec. Conch. Medit., p. 89.
 1890. *Parthenina (Pyrgostelis) fulvocincta*, Carus, Prod. Faun. Medit., vol. ii, p. 281.
 1892. *Chemnitzia fulvocincta*, A. Bell, Rep. Yorks. Phil. Soc., p. 63.
 1892. *Turbonilla fulvocincta*, Locard, Coq. mar. Côtes de France, p. 141.
 1900. *Odostomia rufa*, var. *fulvocincta*, Marshall, Journ. of Conch., vol. ix, p. 332.
 1901. *Pyrgostelis interrupta*, Conch. Soc. List, Journ. of Conch., vol. x, p. 20, no. 454.
 1905. *Turbonilla (Pyrgostelis) fulvocincta*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 157, pl. lxxiii, figs. 18, 19.

Specific Characters.—Allied to *Turbonilla rufa*, but differing somewhat in form and texture, being smaller, more delicate and conical; the whorls are but slightly convex, the base obtusely angulate, the suture more strongly marked and the spire more slender.

Dimensions.—L. 6—9 mm. B. 1·5—2 mm.

Distribution.—*Recent*: Dogger Bank, coasts of Great Britain and Atlantic to the Mediterranean and Ægean.

Fossil: Coralline Crag: Sutton. Selsey.

Remarks.—Some difference of opinion has existed as to whether the form here described should be regarded as specifically distinct from *T. rufa* or as a variety of it. It is clear, I think, they are not the same. Marshall, who adopts the latter view, says (*op. cit.*, p. 332) that generally speaking the type is southern and the variety northern, but that this is not exclusively so, the two being found together in many parts of the latter region and at various depths.

As neither the Coralline Crag specimen nor that from Selsey mentioned by Mr. A. Bell can be traced, I have been permitted, by the courtesy of the Curator of the Norwich Castle Museum, to figure a recent one from the Holmes Collection at that institution.

***Turbonilla (Pyrgostelis) communis* (A. Bell). Plate LXIV, fig. 26.**

1871. *Chemnitzia communis*, A. Bell, Geol. Mag., vol. viii, p. 454.
 1872. *Chemnitzia communis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 213.

Specific Characters.—Shell subulate, turreted; whorls 7—8, slightly convex, the last about one-third the total length; spire slender, regularly tapering to a blunt apex; suture distinctly marked; sculpture numerous closely-set costæ, not

very prominent, becoming fainter towards the base; mouth short, angulate above, rounded below.

Dimensions.—L. 11 mm. B. 3 mm.

Distribution.—Not known living.

Fossil: Butleyan Crag: Butley, Neutral Farm pit.

Remarks.—This shell, from the Reed Collection at the York Museum, has been labelled there *Chemnitzia communis*, Risso—an evident mistake, as no such species is in existence. Most of the Crag species of this genus figured in the present work have a shorter spire and a smaller number of whorls.

Genus EULIMA, Risso, 1826 (continued from p. 592).

Eulima glabella, S. V. Wood. Plate LXIV, fig. 27.

1842—72. *Eulima glabella*, S. V. Wood, Ann. Mag. Nat. Hist., vol. ix, p. 534, 1842; Mon. Crag Moll., p. 95, pl. xix, fig. 2, 1848; 1st Suppl., pt. i, p. 27, pl. vii, fig. 4, 1872.

1872. *Eulima glabella*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 219.

Specific Characters.—Shell small, slender, smooth, subulate; whorls 6—7, contiguous, flattened, base rounded; spire elongate, regularly tapering to a blunt point; suture distinct; mouth short, oval, narrow, acutely angulated above, expanded below.

Dimensions.—L. 5 mm. B. 1 mm.

Distribution.—Not known living.

Fossil: St. Erth. Coralline Crag: Sutton. Waltonian: Walton-on-Naze, Little Oakley.

Remarks.—This species was described by Wood in 1842 and in 1848 as *E. glabella*, and afterwards in 1872 by him from a different specimen under the same name on the ground that his earlier figure did not accurately represent the form in question.

It was subsequently identified by Jeffreys with the *E. Statioi* of Brusina, and later as intermediate between Wood's first specimen and a recent Mediterranean species, *E. brevis* of Regnier, but it seems to me to be different from Brusina's shell. The specimen here figured most nearly resembles Wood's later figure, and I therefore reserve Wood's name of *E. glabella* for it.

Genus LACUNOPSIS, nov.

Lacunopsis obtusus, sp. nov. Plate LXIV, fig. 28.

Specific Characters.—Shell strong and solid, elongato-conical; whorls 5 or 6, flattened, the last much the largest, three-fourths the total length; spire rounded;

mouth long, rather narrow, angulated above; base excavated, not keeled or angulate.

Dimensions.—L. 22 mm. B. 10 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Little Oakley.

Remarks.—As there seems some doubt whether the specimen here figured, found by Mr. Bell and myself at Oakley, can be satisfactorily referred to the genus *Lacuna*, I propose for it provisionally the generic name *Lacunopsis*. It appears to be a new form, different to anything else I know either from the Crag or elsewhere.

Genus EULIMENE, S. V. Wood, 1872 (continued from p. 598).

Eulimene terebellata, var. ***proxima***, nov. Plate LXIV, fig. 29.

Dimensions.—L. 15 mm. B. 6 mm.

Distribution.—Not known living.

Fossil: Newbournian Crag: Waldringfield.

Remarks.—Differs from the type of the present species in some minor points, which Mr. Bell, who discovered it in the Yorkshire Museum, considers worthy of notice. It has been labelled in that institution *Hydrobia pendula*, but it seems to me different to the *Eulimene pendula* of Wood, resembling more nearly my var. *acuminata* of *E. terebellata* (*supra* Pl. L, fig. 24), to which species I refer it provisionally.

Genus EULIMELLA, Forbes, 1846.

Eulimella acicula (Philippi). Plate LXIV, fig. 30.

1836—44. *Melania acicula*, Philippi, Enum. Moll. Sic., vol. i, p. 158, pl. ix, fig. 6, 1836; *Eulima acicula*, vol. ii, p. 135, 1844.

1848—74. *Chemnitzia similis*, S. V. Wood, Mon. Crag Moll., pt. i, p. 84, pl. x, fig. 11^b, 1848; *Eulimella acicula*, 1st Suppl., pt. i, p. 67, 1872; pt. ii, p. 208, 1874.

1848—84. *Odostomia acicula*, Jeffreys, Ann. Mag. Nat. Hist. [2], vol. ii, p. 349, 1848; Brit. Conch., vol. iv, p. 170, 1867; vol. v, p. 213, pl. lxxvi, fig. 6, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 490, 1871; Proc. Zool. Soc. London, p. 362, 1884.

1853. *Eulimella acicula*, Forbes and Hanley, Brit. Moll., vol. iii, p. 311, pl. xcvi, figs. 9, 10.

1859. *Eulimella acicula*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xiv, fig. 27.

1870—98. *Eulimella acicula*, A. Bell, Ann. Mag. Nat. Hist. [4], vol. vi, p. 215; Journ. de Conch., vol. xviii, p. 355, no. 490, 1870; Trans. R. Geol. Soc. Cornwall, vol. xii, p. 148, 1898.

1872. *Odostomia similis*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203; *Eulimella acicula*, p. 209.

1873. *Eulimella acicula*, Weinkauff, Cat. europ. Meeresconch., p. 23, no. 404.

- 1873—76. *Eulimella acicula*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 354, no. 294, 1873; vol. vii, p. 14, no. 518, 1876.
1878. *Eulimella acicula*, G. O. Sars, Moll. Reg. arct. Norv., p. 360.
1878. *Eulimella acicula*, de Stefani e Pantinelli, Bull. Soc. Malac. Ital., vol. iv, p. 152.
- 1883—98. *Eulimella acicula*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 187, pl. xx, figs. 17, 18, 1883; vol. ii, p. 769, 1898.
1889. *Eulimella acicula*, Carus, Prod. Faun. Medit., vol. ii, p. 266.
1892. *Eulimella commutata*, Locard, Coq. mar. Côtes de France, p. 137, fig. 120.
1892. *Eulimella acicula*, Sacco, Moll. Terr. Terz. Piem., pt. xi, p. 53.
1892. *Odostomia acicula*, Praeger, Proc. Roy. Irish. Acad. [3], vol. ii, p. 264.
1892. *Turbonilla similis*, Van den Broeck, Bull. Soc. Belg. Géol., vol. vi (Mémoires), p. 133.
1901. *Eulimella commutata*, Conch. Soc. List., Journ. of Conch., vol. x, p. 21, no. 461.
1901. *Eulimella acicula*, Brøgger, Norges geol. Undersøgelse, no. 31, pp. 514, 661, pl. xix, fig. 9.
1905. *Eulimella acicula*, Kobelt, Icon. schalentrag. europ. Meeresconch., vol. iii, p. 163, pl. lxxv, figs. 3, 4.
1912. *Turbonilla similis*, Tesch, Med. v. d. Rijks. v. Delfstoffen, no. 4, p. 72, no. 168.

Specific Characters.—Shell minute, slender, elongate, sub-cylindrical; whorls flattened but not angulate, the last from one-third to half the total length; spire attenuate, gradually tapering to a blunt point; suture narrow, rather oblique; mouth obliquely rhomboidal, contracted and angulated above, expanded below; inner lip straight, without tooth or umbilicus.

Dimensions.—L. 2.5 mm. B. 0.75 mm.

Distribution.—*Recent*: British seas, Zetland to the Channel, N.E. Ireland, local, not common, ranging also from Norway to the Mediterranean, Adriatic and Ægean.

Fossil: St. Erth. Coralline Crag: Sutton. Waltonian: Walton-on-Naze. Icenian: Beccles, Yarn Hill. Boulder clay: Caithness. Estuarine clay: Ireland.

Miocene: Italy—Piedmont, Tortoniano.

Lower Pliocene: Piacenziano, Biot (A. Bell).

Upper Pliocene: Astiano, Livorno, Val d'Era. Sicily—Altavilla, Caltabiano.

Pleistocene: *Isocardia*- and *Tapes*-banks, Christiania fiord. Messina, Ficarazzi, Monte Pellegrino, Vallé Biaia, Livorno.

Remarks.—This form, occurring but rarely in the English Crag, was originally described by Wood as a variety of *Chemnitzia gracilis*, but was afterwards identified by him with the *Eulima* (*Eulimella*) *acicula* of Philippi. Jeffreys regarded *Eulimella* as a toothless *Odostomia*; it is now generally considered, however, a distinct genus. Both Locard and the Conchological Society have adopted the specific name of *commutata* (Monts.) for the present shell, but in 1898 (*op. cit.*) Messrs. Bucquoy and his colleagues gave their reasons for adhering to the old nomenclature. The specimen here figured is from the Norwich Museum and was obtained by Mr. Crowfoot at Beccles.

Genus **CÆCUM**, Fleming, 1824.

Cæcum mammillatum, S. V. Wood. Plate LXIV, fig. 31.

- 1842—48. *Cæcum mammillatum*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 459, 1842; Mon. Crag Moll., pt. i, p. 116, pl. xx, 1848.
 1867—71. *Cæcum mammillatum*, Jeffreys, Brit. Conch., vol. iv, p. 76, 1867; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, pp. 142, 487, 1871.
 1872. *Cæcum mammillatum*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 209.
 1890. *Cæcum mammillatum*, C. Reid, Plioc. Dep. Brit., p. 239.

Specific Characters.—Shell minute, tubular, curved, sub-cylindrical, strong, smooth and glossy; anterior extremity open, annulated or margined; posterior with an elevated, mammilliform projecting, slender and excentric clausum.

Dimensions.—L. 3 mm. B. 0·75 mm.

Distribution.—Not recorded living (Japan, Jeffreys).

Fossil: Coralline Crag: Gedgrave, Gomer pit, Sutton, Boyton. Waltonian: Walton-on-Naze. Newbournian: Waldringfield, Sutton.

Remarks.—This minute shell is very abundant in the Coralline Crag, especially at Sutton, from which locality there are many specimens in our collections. Although allied to Montagu's recent species *C. trachea* it was regarded both by Wood and Jeffreys as a distinct form. Generally it is without sculpture, but occasionally has traces of spiral markings. Jeffreys gives it as occurring recent in Japan.

The figures of the clausum of these three species are on a larger scale than those of the shells.

Cæcum trachea (Montagu). Plate LXIV, fig. 32.

1803. *Dentalium trachea*, Montagu, Test. Brit., pt. ii, p. 497, pl. xiv, fig. 10.
 1836—44. *Odontidium rugulosum*, Philippi, Enum. Moll. Sic., vol. i, p. 102, pl. vi, fig. 20, 1836; vol. ii, p. 73, 1844.
 1842—72. *Cæcum trachea*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 459, 1842; Mon. Crag Moll., pt. i, p. 116, pl. xx, fig. 4, 1848; 1st Suppl., p. 87, 1872.
 1853. *Cæcum tracheum*, Forbes and Hanley, Brit. Moll., vol. iii, p. 178, pl. lxix, fig. 4.
 1856. *Cæcum trachea*, Hörnes, Foss. Moll. Tert. Wien, vol. i, p. 490, pl. xlvi, fig. 19.
 1858. *Cæcum tracheum*, H. and A. Adams, Gen. Rec. Moll., vol. i, p. 355, pl. xxxviii, fig. 6.
 1859. *Cæcum trachea*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xv, fig. 6.
 1867—71. *Cæcum trachea*, Jeffreys, Brit. Conch., vol. iv, p. 75, 1867; vol. v, p. 209, 1869; *C. mammillatum*, var., in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871.
 1872. *Cæcum tracheum*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, p. 203.
 1873—76. *Cæcum trachea*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 356, no. 347, 1873; vol. vi, p. 100, no. 651, 1876.

1886. *Cæcum tracheum*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 229, fig. 2 in text.
 1890. *Cæcum trachea*, Carus, Prod. Faun. Medit., pt. ii, p. 352.
 1892. *Cæcum trachea*, Locard, Coq. mar. Côtes de France, p. 129, fig. 113.
 1902. *Cæcum imperforatum*, Conch. Soc. List, Journ. of Conch., vol. x, p. 21, no. 478.

Specific Characters.—Shell minute, solid, cylindrical, curved, transversely ribbed, anterior extremity open, margin thickened or annulated, posterior obliquely truncate, closed by an excentric obtusely pointed clausum.

Dimensions.—L. 3 mm. B. 0·75 mm.

Distribution.—*Recent*: Coralline zone of Dorset, Devon and Cornwall. Guernsey, Welsh coast, Arran, Galway, Clyde district.

Brittany, Vigo, Mediterranean to Tunis, Corsica, Sicily. Adriatic, Canaries, Cuba.

Fossil: Coralline Crag. North Britain—Cumbrae, Shewalton. Vienna basin. Catania, Palermo, Val d'Era, Etna, Messina.

Remarks.—This species may be distinguished from the other Crag forms by its ribbed ornamentation and the form of the clausum, as shown in the figures now given. Jeffreys considered that the Coralline Crag fossil described by Wood under the present name could not be identified with the recent *C. trachea* of Montagu, in which the concentric ribs are more distinct and closely arranged, preferring to regard it as a variety of Wood's *C. mammillatum*. On the whole, however, and for the reasons given above, I adopt Wood's view, which is the one most generally accepted.

***Cæcum glabrum* (Montagu). Plate LXIV, fig. 33.**

1803. *Dentalium glabrum*, Montagu, Test. Brit., pt. ii, p. 497.
 1842—72. *Cæcum glabrum*, S. V. Wood, Ann. Mag. Nat. Hist. [1], vol. ix, p. 459, 1842; Mon. Crag Moll., pt. i, p. 117, pl. xx, fig. 6, 1848; 1st Suppl., p. 87, 1872.
 1853. *Cæcum glabrum*, Forbes and Hanley, Brit. Moll., vol. iii, p. 181, pl. lxi, fig. 5.
 1858. *Cæcum glabrum*, H. and A. Adams, Gen. Rec. Moll., vol. i, p. 356; *Brochina glabra*, vol. ii, p. 628.
 1859. *Cæcum glabrum*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xv, fig. 7.
 1867—71. *Cæcum glabrum*, Jeffreys, Brit. Conch., vol. iv, p. 77, 1867; vol. v, p. 209, pl. lxx, fig. 5, 1869; in Prestwich, Quart. Journ. Geol. Soc., vol. xxvii, p. 142, 1871.
 1872. *Cæcum glabrum*, A. and R. Bell, Proc. Geol. Assoc., vol. ii, pp. 203, 219.
 1873—76. *Cæcum glabrum*, Seguenza, Boll. R. Com. Geol. Ital., vol. iv, p. 356, no. 348, 1873; vol. vi, p. 100, no. 650, 1876.
 1890. *Cæcum glabrum*, C. Reid, Plioc. Dep. Brit., p. 239.
 1890. *Cæcum auriculatum*, Carus, Prod. Faun. Medit., pt. ii, p. 353.
 1892. *Cæcum glabrum*, Locard, Coq. mar. Côtes de France, p. 129.
 1901. *Cæcum glabrum*, Brøgger, Norges geol. Undersøgelse, no. xxxi, pp. 513, 660, pl. xviii, fig. 21.
 1902. *Cæcum glabrum*, Conch. Soc. List, Journ. of Conch., vol. x, p. 21, no. 479.

Specific Characters.—Shell minute, cylindrical, curved, thin, nearly smooth; mouth annular, slightly thickened at the edge; posterior margin closed by a rounded and rather convex plug.

Dimensions.—L. 2–2·5 mm. B. 0·50 mm.

Distribution.—*Recent*: British coast from Shetland to Guernsey, often common; Norway, Denmark, Brittany, Provence, Nice, Spezzia, Corsica, Sicily, Adriatic, Ægean, Canary Isles, and Atlantic coast.

Fossil: Coralline Crag: Sutton. Waltonian: Walton-on-Naze. Pleistocene of Scotland—Largo Bay, Cumbrae, Loch Crinan, Shewalton. Ireland—Larne, Magheramorne, Newtownard.

Isocardia- and *Tapes*-banks—Christiania fiord. Sicilian Pleistocene: Messina, Livorno. Upper Pliocene: Messina, Val d’Era, Altavilla.

Remarks.—There are one or two specimens of this very distinct species in our collections of Coralline Crag fossils, but they are not nearly so common as are those of *Cæcum mammillatum*. The species is smaller than the latter and may be easily distinguished from it by its clausum, which is convex and rounded, completely closing the posterior extremity, the edges of which, however, are but slightly thickened.

Genus **HOMALOGYRA**, Jeffreys, 1867.

Homalogyra atomus (Philippi). Plate LXIV, fig. 34.

1844. *Truncatella atomus*, Philippi, Enum. Moll. Sic., vol. ii, p. 136, pl. xxiv, fig. 5.
 1853. *Skeneia nitidissima*, Forbes and Hanley, Brit. Moll., vol. iii, p. 158, pl. lxxiii, figs. 7, 8.
 1867–69. *Homalogyra atomus*, Jeffreys, Brit. Conch., vol. iv, p. 69, pl. lxx, fig. 2.
 1872. *Homalogyra atomus*, S. V. Wood, Mon. Crag Moll., 1st Suppl., pt. i, p. 86, pl. vii, fig. 28.
 1878–84. *Homalogyra atomus*, Monterosato, Enum. e Sinon., p. 28, 1878; Nomen. Gen. e Spec., p. 77, 1884.
 1878. *Homalogyra atomus*, G. O. Sars, Moll. Reg. arct. Norv., pp. 215, 361, pl. xxii, fig. 21.
 1884. *Homalogyra atomus*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 324, pl. xxxvii, figs. 30–32.
 1890. *Homalogyra atomus*, C. Reid, Plioc. Dep. Brit., p. 245.
 1890. *Homalogyrus atomus*, Carus, Prod. Faun. Medit., vol. ii, p. 346.
 1892. *Homalogyra atoma*, Locard, Coq. mar. Côtes de France, p. 201, fig. 176.
 1892–98. *Homalogyra atomus*, A. Bell, Rep. Yorks. Phil. Soc., p. 63, 1892; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 149, 1898.
 1901. *Homalogyrus atomus*, Conch. Soc. List, Journ. of Conch., vol. x, p. 18, no. 370.
 1901. *Homalogyrus atomus*, Brøgger, Norges geol. Undersøgelse, no. 31, p. 661, pl. xviii, fig. 9.

Specific Characters.—Shell minute, discoid, resembling in form a miniature *Planorbis corneus*; whorls 3, compactly coiled, rounded on the upper side, flattened on the under, the last convex, much expanded, the others very small, depressed,

rapidly diminishing to a blunt point; suture deep; mouth subcircular, projecting outwards; umbilicus wide, open.

Dimensions.—Diam. 1 mm. H. 1 mm.

Distribution.—*Recent*: British coasts, from Shetland to the Channel Islands. Irish—Donegal.

West European, Mediterranean. Norway—Finmark to Christiania fiord.

Fossil: St. Erth. Coralline Crag: Sutton. Pleistocene: Selsey, West Cheshire, Scotland.

Irish estuarine clays (common). Christiania, *Isocardia*- and *Tapes*-banks.

Remarks.—This minute form has a wide distribution both as recent and fossil. As a fossil it has been found at Selsey and in the Coralline Crag of Sutton, and it is exceedingly common locally in our Pleistocene deposits. Prof. Brøgger gives it from the post-glacial *Tapes*-banks of the Christiania district, while, as recent, Locard describes it from the French coasts as being found, though not commonly, at "*toutes les côtes*" and "*toutes les zones*." Probably it is due to its minute size that it has not been recorded from some other localities. The present specimen was obtained from St. Erth and belongs to the British Museum, where it bears the name of *H. atomus*, no. 18132.

Genus **OTINA**, Gray, 1847.

Otina otis (Turton). Plate LXIV, fig. 35.

1819. *Helix otis*, Turton, Conch. Dict., p. 70.
 1851. *Velutina (Otina) otis*, S. P. Woodward, Man. Moll., p. 125.
 1853. *Otina otis*, Forbes and Hanley, Brit. Moll., vol. iii, p. 321, pl. xcix, figs. 2, 3.
 1859. *Otina otis*, G. B. Sowerby, Ill. Ind. Brit. Shells, pl. xvi, fig. 25.
 1869. *Otina otis*, Jeffreys, Brit. Conch., vol. v, p. 110, pl. xviii, fig. 3.
 1887. *Otina otis*, P. Fischer, Man. Conch., p. 502.
 1890. *Otina otis*, Carus, Prod. Faun. Medit., vol. ii, p. 437.
 1892. *Otina otis*, A. Bell, Rep. Yorks. Phil. Soc., p. 64, pl. i, fig. 14.

Specific Characters.—Shell minute, thin, resembling in form a miniature *Velutina*; whorls 2, convex, the last occupying nearly all the shell, expanded in front; ornamented by microscopic closely-set striæ; spire conspicuous, not prominent; apex obliquely twisted; mouth large, oval, expanded.

Dimensions.—L. 1.5 mm. B. 1 mm.

Distribution.—*Recent*: Rocks between tide marks, British coasts, Channel Isles, S. Wales, Isle of Man. Arran, N.B.

Normandy, Brest, Loire-Inferieur. Atlantic coast. Sicily.

Fossil: Selsey.

Remarks.—This minute shell, which has been represented as a fossil by a single specimen only, discovered some years ago at Selsey by Mr. Bell, was described and figured by him in the Report of the Yorkshire Philosophical Society for 1892, to which the student is referred. It is still preserved in the Yorkshire Museum, and by the kindness of the Director of that institution is here refigured.

Genus **BRAMERTONIA**, nov.

Bramertonia derivata (S. V. Wood). Plate LXIV, fig. 36.

1879. *Cerithium derivatum*, S. V. Wood, Mon. Crag Moll., 2nd Suppl., p. 39, fig. in text.

Specific Characters.—Shell strong, small, conical; whorls 7, turreted, the last about one-third the total length; spire regularly increasing in size, with a wide and angulated keel at the base of each whorl; suture deep and channelled; ornamented by strong and prominent ribs and by fine transverse lines; base flattened; mouth small, short, subquadrate; outer and inner lips thickened, continuous, the former incurved above.

Dimensions.—L. 5 mm. B. 2 mm.

Distribution.—Not known living.

Fossil: Icenian Crag: Bramerton.

Remarks.—In his 2nd Supplement Wood described two fragments, supposed to belong to the genus *Cerithium*, which Mr. Jas. Reeve had obtained from Bramerton. They are still in the Norwich Museum, though at present there are four, two of them being larger and more perfect than the others. At one time Wood was inclined to identify them with a species from the Upper Oligocene of Cassel, described by Dr. Speyer as *Cerithium Descoultresi*,¹ but afterwards he seemed to admit that view to be at least a matter of doubt. I venture to think our shell is not what is now regarded as *Cerithium*, nor can I consider it derivative in the Bramerton Crag. As I cannot find any recognised genus to which it can be satisfactorily referred, I suggest for it provisionally the name given above.

Genus **BITTIUM** (Leach), Gray, 1847 (continued from p. 526).

Bittium Reevei, sp. nov. Plate LXIV, fig. 37.

1879. *Cerithium Greenii*?, S. V. Wood, Mon. Crag Moll., 2nd Suppl., p. 23, pl. iv, fig. 16.

Specific Characters.—Shell minute, strong, elongato-conical; whorls 8, slightly convex, gradually and regularly enlarging, the last nearly half the total length; ornamented by about 20 strong longitudinal ribs, crossed by 3—4 transverse ridges, producing reticulation with distinct granulation where they intersect;

¹ 'Cassel. Tert. Conch.,' tab. xx, figs. 2a and 2b.

suture deep and channelled; mouth oval, one-third the length of the shell, angulate above, rounded below; canal notched; base without sculpture; apex acute, compressed; inner lip wide, reflected on the pillar.

Dimensions.—L. 6 mm. B. 2 mm.

Distribution.—Not known living.

Fossil: Bramerton.

Remarks.—Wood described with some doubt (*op. cit.*) two or three small specimens as *Cerithium Greenii*, Adams ('Bost. Journ. Nat. Hist.,' vol. xi, p. 287, pl. iv, fig. 12; afterwards named *Bittium Greenii* by Gould, 'Inv. Mass.,' ed. 2, p. 323, fig. 591), with the suggestion that if the shell should prove distinct it should be called *C. Reevei* after the Norwich geologist to whom its discovery was due. The present shell is evidently the same as that figured by Wood as *C. Greenii* (*op. cit.*), but it does not appear to me to correspond with Gould's *Bittium Greenii*. I therefore adopt for it the alternative specific name *Reevei* as suggested by Wood in 1879.

Bittium dubium, sp. nov. Plate LXIV, fig. 38.

Specific Characters.—Shell minute, slender; whorls 7 or 8, flattened, the last about one-third the total length; spire elongate, regularly tapering to a compressed apex; ornamented by about 12 well-marked, closely-set costæ and three transverse ridges producing reticulation and slight granulation by their intersection; suture rather slight; mouth short, about one-fourth the length of the spire, angulate above, rounded below; base without sculpture.

Dimensions.—L. 3 mm. B. 1 mm.

Distribution.—Not recorded living.

Fossil: Bramerton Crag, lower bed.

Remarks.—The small unworn fossil here figured is one of three in the Reeve Collection at the Norwich Museum which has been identified with *Cerithium Greenii*?, the species described above, probably by mistake, as it belongs to a different group. It seems too little worn to be regarded as a derivative shell in the Bramerton fauna. It is an interesting and distinct form, deserving a distinguishing, if only a provisional, name.

Genus **SOLARIUM**, Lamarck, 1799.

Solarium solarium (Nyst). Plate LXIV, figs. 41, 42.

1835—81. *Trochus solarium*, Nyst, Coq. foss. d'Anvers, p. 26, pl. v, fig. 21, 1835; Coq. foss. Belg., p. 383, pl. xxxviii, fig. 4, 1843; Conch. Terr. tert. Belg., p. 106, pl. vi, fig. 32, a, b, 1881.

1872. *Solarium vagum*, S. V. Wood, Mon. Crag Moll., 1st Suppl., p. 85, pl. vii, fig. 29.

Specific Characters.—Shell rather solid, conical, depressed; whorls slightly concave, the last much the largest, spirally ridged, ridges crenulated by the lines of growth; the upper ridge is the strongest and bears a row of prominent rounded nodules immediately below the suture, forming a margin round the whorl immediately above it; base covered by spiral tuberculate ridges, the one nearest the umbilicus being most prominent; umbilicus channelled and deeply perforate; mouth angulate above, rounded below; columella thickened and obscurely toothed.

Dimensions.—Diam. 18 mm. H. 12 mm.

Distribution.—Waltonian Crag: Little Oakley. Newbournian: Waldringfield. Scaldisien and Poederlien: Belgium.

Remarks.—Wood describes a shell from Waldringfield under the name of *Solarium vagum*, from its worn condition inclining to the belief it was derivative. I have found two other specimens at Oakley of the same shell. They also are somewhat worn, but so are many fossils from the Red Crag, owing to the conditions under which these beds originated.

Our opinion as to the derivative character of some of these fossils will require reconsideration, I think, in view of the fact that a number of them are found unworn and fresh, sometimes in considerable abundance, in the contemporary horizons of the Belgian Pliocene. Mr. Van de Wouver has kindly given me for comparison with the Oakley shells in question a specimen of *Trochus solarium*, from the Antwerp Crag, where I understand it is not rare. It is clearly the same as the English shell, while its fresh appearance and mineral condition show it has not been derived from an older deposit. If this species lived in one part of the Anglo-Belgian basin at the period in question, there seems no reason why it may not also have existed in another. The case of the Oligocene species, which I consider to be derivative in the Crag, is different. Their appearance and condition generally show them to be foreign to the Crag fauna.

Two of the figures of this form in Nyst's Memoir of 1881 are longer in the spire and have a trochiform look. They seem, however, to belong to the same species; the English Crag shells are all of the depressed type.

Solarium Dumonti, Nyst. Plate LXIX, fig. 39.

1843. *Solarium Dumonti*, Nyst, Coq. foss. Belg., p. 369, no. 312, pl. xxxvi, figs. 6a, 6b.

Specific Characters.—Shell orbicular, conical; whorls 7 or 8, separated by a bimarginate suture, the last subangular, ornamented by 4 transverse sulci, of which the two middle ones are the strongest; both the upper and the lower surface are covered by fine oblique ridges, and at the angulation of the body-whorl by a strongly marked granulated band; the base is slightly convex; umbilicus deep, with a crenulated margin which is continued spirally into the interior; in the middle of the base there is an inconspicuous spiral and transverse line.

Dimensions.—Diam. 12 mm. H. 4 mm.

Distribution.—Not known living.

Fossil: Waltonian Crag: Oakley. Belgian Crag. Lower Oligocene: Vliermach.

Remarks.—Nyst says that this form differs essentially from any other species of the present group known to him. The specimen here figured was found by myself at Little Oakley; there is another resembling it in the Norwich Museum, where it still bears the original Belgian label under which it was received by that institution in Nyst's lifetime. They agree in every detail with each other and with Nyst's description though they are smaller than the specimen figured by him. The Crag fossil is possibly derivative.

Sub-genus **PHILIPPIA**, Gray, 1840.

Solarium (Philippia) conulus (Weinkauff). Plate LXIV, fig. 40.

1766. *Trochus hybridus*, Linné, Syst. Nat., ed. xii, p. 1228.

1836—44. *Solarium tuteum*, Philippi, Enum. Moll. Sic., vol. i, p. 174, pl. x, fig. 27, 1836; vol. ii, p. 148, 1844.

1868. *Solarium conulus*, Weinkauff, Conch. Mittelm., vol. ii, p. 261.

1878. *Solarium conulus*, Monterosato, Enum. e Sinon., p. 37.

1884. *Solarium hybridum*, Bucquoy, Dautzenberg et Dollfus, Moll. mar. Rouss., vol. i, p. 256, pl. xxviii, figs. 16—19.

1893—98. *Solarium conulum*, A. Bell, Proc. Roy. Irish Acad. [3], vol. ii, p. 630, 1893; Trans. Roy. Geol. Soc. Cornwall, vol. xii, p. 150, pl. ii, fig. 18, 1898.

Specific Characters.—Shell small, solid, trochiform; whorls slightly convex, flattened, angulated and ridged at the base; spire conical, slightly elevated; sculpture microscopical; mouth rounded; umbilicus small, deep, with a denticulated margin.

Dimensions.—B. 10 mm. H. 8 mm.

Distribution.—*Recent*: Mediterranean, abundant at Messina, the coasts of Spain at Vigo and as far south as Morocco and the Canaries.

Fossil: St. Erth.

Remarks.—Except for two specimens from St. Erth in the Wood St. Erth collection at the British Natural History Museum this small shell has not been reported as an English fossil. It has been referred to the sub-genus *Philippia*, Gray, of which it is regarded as the type.

Genus **ASTRALIUM**, Link, 1807.

Generic Characters.—Shell large, thick, rough, trochiform, tubercular or spiny, keeled or angular at the periphery, base flattened, peristome non-continuous, mouth ovate or sub-rhomboidal, nacreous internally, operculum excentric, chalky thick, ovate, under-surface flattened.

Sub-genus **ORMASTRALIUM**, Sacco, 1896.

Sub-generic Characters.—Form conical, ornamented by a number of bands with a strong, acute, ventral keel, granulate at the base, which is generally depressed, allied to the sub-genus *Bolma* but differing from it in certain points.

Astralium (Ormastralium) carinatum, Borson.

Var. **perrotunda**, Sacco. Plate LXIV, figs. 43, 44.

1896. *Astralium (Ormastralium) carinatum*, var. *perrotunda*, Sacco, Moll. Terr. Terz. Piem., pt. xxi, p. 18, pl. ii, fig. xx.

Varietal Characters.—Shell of medium size, conical; whorls 4 or 5, rounded, sub-inflated above, rapidly diminishing to a blunt point, the last much the largest, more than two-thirds the total length; mouth rhomboidal, base flattened.

Dimensions.—L. 15 mm. B. 20—22 mm.

Distribution.—Not known living.

Fossil: Newbournian Crag: Waldringfield.

Miocene—Elveziano: North Italy.

Remarks.—The unique specimen here described, of a decidedly Miocene type and considerably worn, has reached me from the British Museum; it is very different from anything that has been hitherto recorded from the Crag and certainly derivative in the Newbournian deposit from which it was obtained. It has been labelled, but I think in error, *Gibbula (Steromphalus) cineraria*, belonging more probably to a group of Italian shells largely represented in the group of Elvezian fossils, of which Prof. Sacco has described and figured from northern Italy about sixty distinct forms belonging to the genera *Bolma* and *Ormastralium*.

I subjoin a list of fossils which have been found at Waldringfield (probably similarly derivative), suggesting that during the Red Crag period there may have existed in the district in question some fragmentary remains of pre-Pliocene age, which have been since destroyed.¹

¹ Wood calls the Waldringfield Crag a "museum of derivatives" ('Mon. Crag Moll.,' 2nd Suppl., p. 17, 1879).

Trivia pisolina, Lamk.

Ancillaria glandiformis, Lamk.

Cassis (*Semicassis*) *saburon*, Brug.

Mitra fusiformis, Broc.

Triton Woodii, sp. nov.

Borsonia suffolciensis, sp. nov.

Solarium Dumonti, Nyst.

Nucula turgens, S. V. Wood.

Voluta luctatris, Sol.

Voluta nodosa, J. Sow.

Ranella anglica, A. Bell.

Fusus nodifer, A. Bell.

Pleurotoma interrupta, Broc.

Cancellaria crassistriata, A. Bell.

„ *Charlesworthi*, S. V. Wood.

Astralium (*Ormastralium*) *carinatum*,

Borson, var. *perrotunda*.

Pecten disparatus, S. V. Wood.

Lucina crassidens, S. V. Wood.

PLATE LVII.

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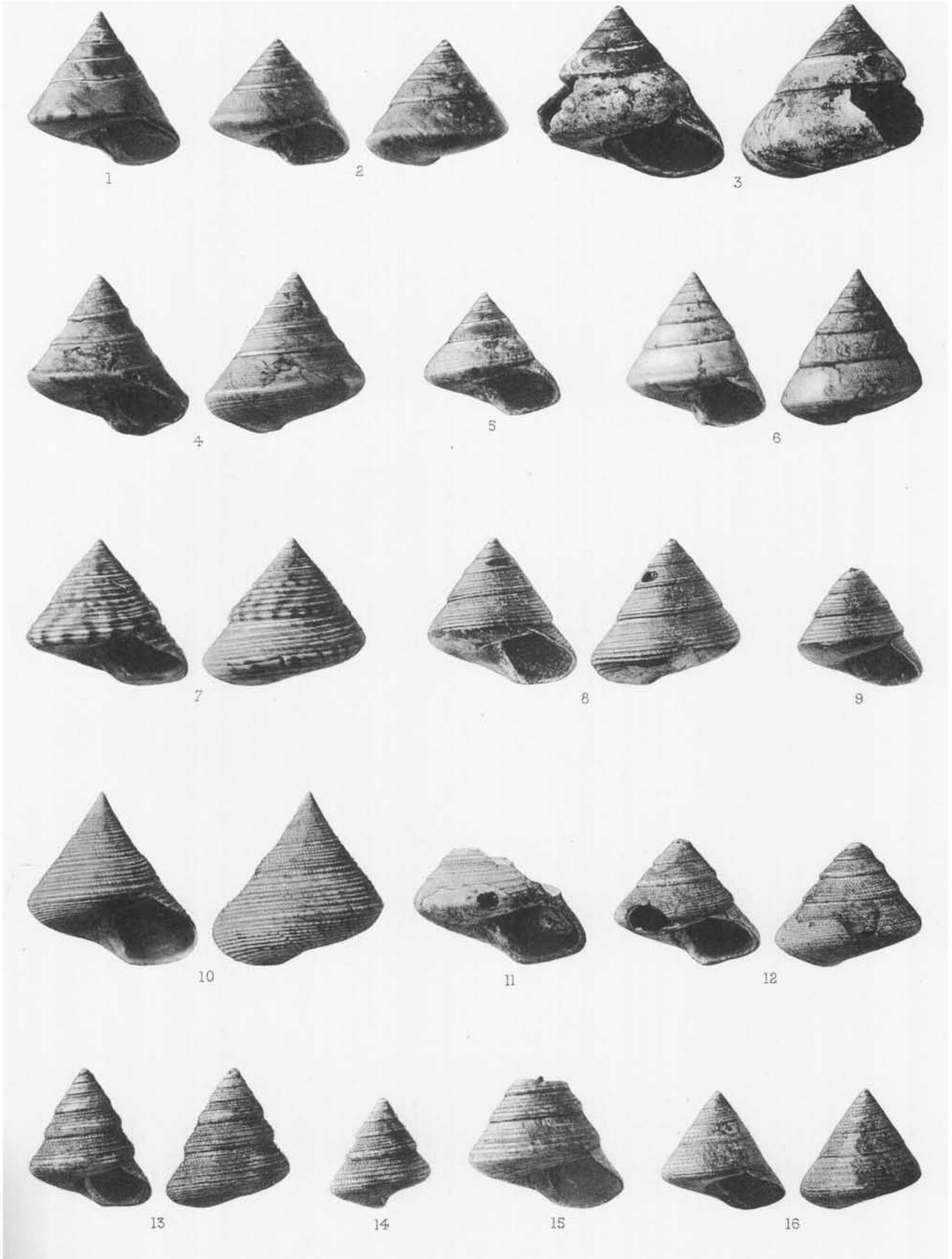


PLATE LVIII.

FIG.		PAGE.
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12.	<i>Trochus (Calliostoma) multigranus</i> (S. V. Wood). Newbournian Crag, Waldringfield. (Yorkshire Museum)	720
13.	Ditto. Coralline Crag, Boyton. (Jermyn St.)	720
14.	<i>Trochus (Calliostoma) occidentalis</i> (Mighels and Adams). Recent. (Harmer Collection)	721
15.	Ditto. Waltonian Crag, Little Oakley. (Harmer Collection)	721
16.	<i>Trochus (Calliostoma) Laugierii</i> (Payraudeau). Recent. (Harmer Col- lection)	722
17.	Ditto. Coralline Crag, Sutton. (Norwich Museum)	722
18.	<i>Trochus (Calliostoma) exasperatus</i> (Pennant). Selsey. (Yorkshire Museum)	723
19.	<i>Trochus (Gibbula) octosulcatus</i> (Nyst). Scaldisien Crag, Antwerp. (Harmer Collection)	727
20.	Ditto. Waltonian Crag, Little Oakley. (Harmer Collection)	727
21.	<i>Trochus (Gibbula) umbilicaris</i> (Linné). Waltonian Crag, Little Oakley. (Harmer Collection)	728
22.	Ditto. Recent. (Harmer Collection)	728
23.	<i>Trochus (Gibbula) magus</i> (Linné). Irish estuarine Clays. (Trechmann Collection)	729
24.	<i>Trochus (Gibbula) cineroides</i> (S. V. Wood). Waltonian Crag, Little Oakley. (Harmer Collection)	730
25.	<i>Trochus (Gibbula) cinerarius</i> (Linné). Waltonian Crag, Little Oakley. (Harmer Collection)	731
26.	Ditto. Recent. (Harmer Collection)	731

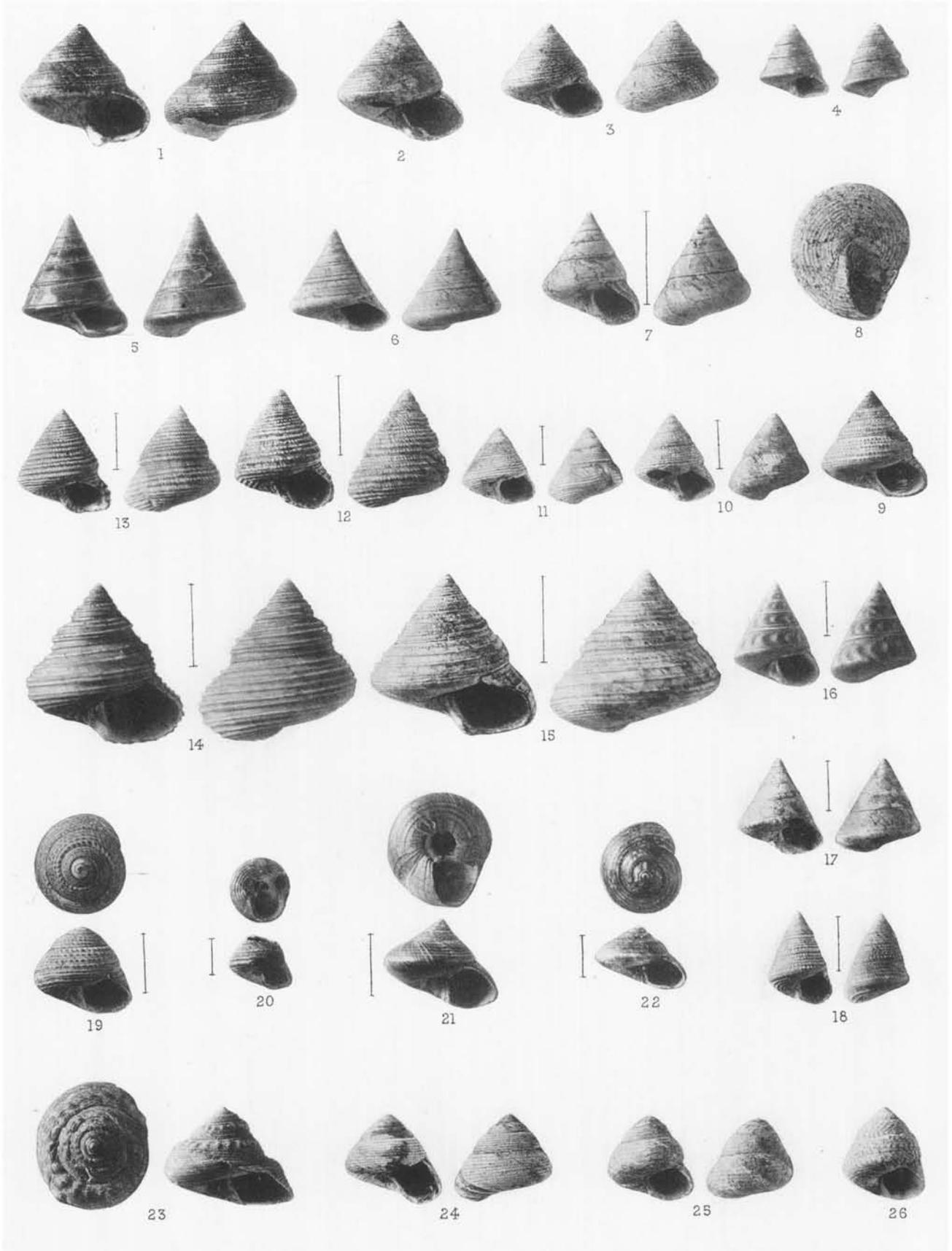


PLATE LIX.

FIG.		PAGE.
1.	<i>Trochus (Calliostoma) Montagu</i> (W. Wood). Recent. (Harmer Collection)	724
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6.	<i>Trochus (Calliostoma) incertus</i> , sp. nov. St. Erth. (British Museum)	726
7.	<i>Trochus (Calliostoma) multistriatus</i> (S. V. Wood). St. Erth. (British Museum)	727
8.	<i>Trochus (Gibbula) Adansoni</i> (Payraudeau). Scaldisien Crag, Antwerp. (Harmer Collection)	732
9.	Ditto. Recent. (Harmer Collection)	732
10.	<i>Trochus (Gibbula) tumidus</i> (Montagu). Butleyan Crag, Butley. (Harmer Collection)	733
11.	Ditto. Recent. (Harmer Collection)	733
12.	<i>Trochus (Gibbula) brevispira</i> , sp. nov. Waltonian Crag, Little Oakley. (Harmer Collection)	735
13.	<i>Trochus (Gibbula) adriaticus</i> (Philippi). Recent. Venice. (Harmer Collection)	735
14.	<i>Trochus (Gibbula) Woodii</i> , sp. nov. Coralline Crag, Orford. (Sedgwick Museum)	736
15.	<i>Trochus (Gibbula) Kickxii</i> (Nyst). Waltonian Crag, Little Oakley. (Harmer Collection)	737
16.	<i>Trochus (Gibbula) Robynsii</i> (Nyst). Waltonian Crag, Little Oakley. (Harmer Collection)	737
17.	<i>Trochus (Gibbula) Reevei</i> , sp. nov. Coralline Crag, Gedgrave. (Harmer Collection)	738
18.	<i>Trochus (Gibbula) tricariniferus</i> (S. V. Wood). Waltonian Crag, Little Oakley. (Harmer Collection)	738
19.	<i>Trochus (Gibbula) Philberti</i> (Récluz). Recent. (Harmer Collection)	739
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23.	<i>Turbo (Senectus) Newtoni</i> (Etheridge and Bell). St. Erth. (Jermyn St.)	706
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25.	<i>Trochocochlea littoralis</i> , Etheridge and Bell. St. Erth. (British Museum)	742
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27.	<i>Trochocochlea turbinoides</i> (Deshayes). St. Erth. (British Museum)	743

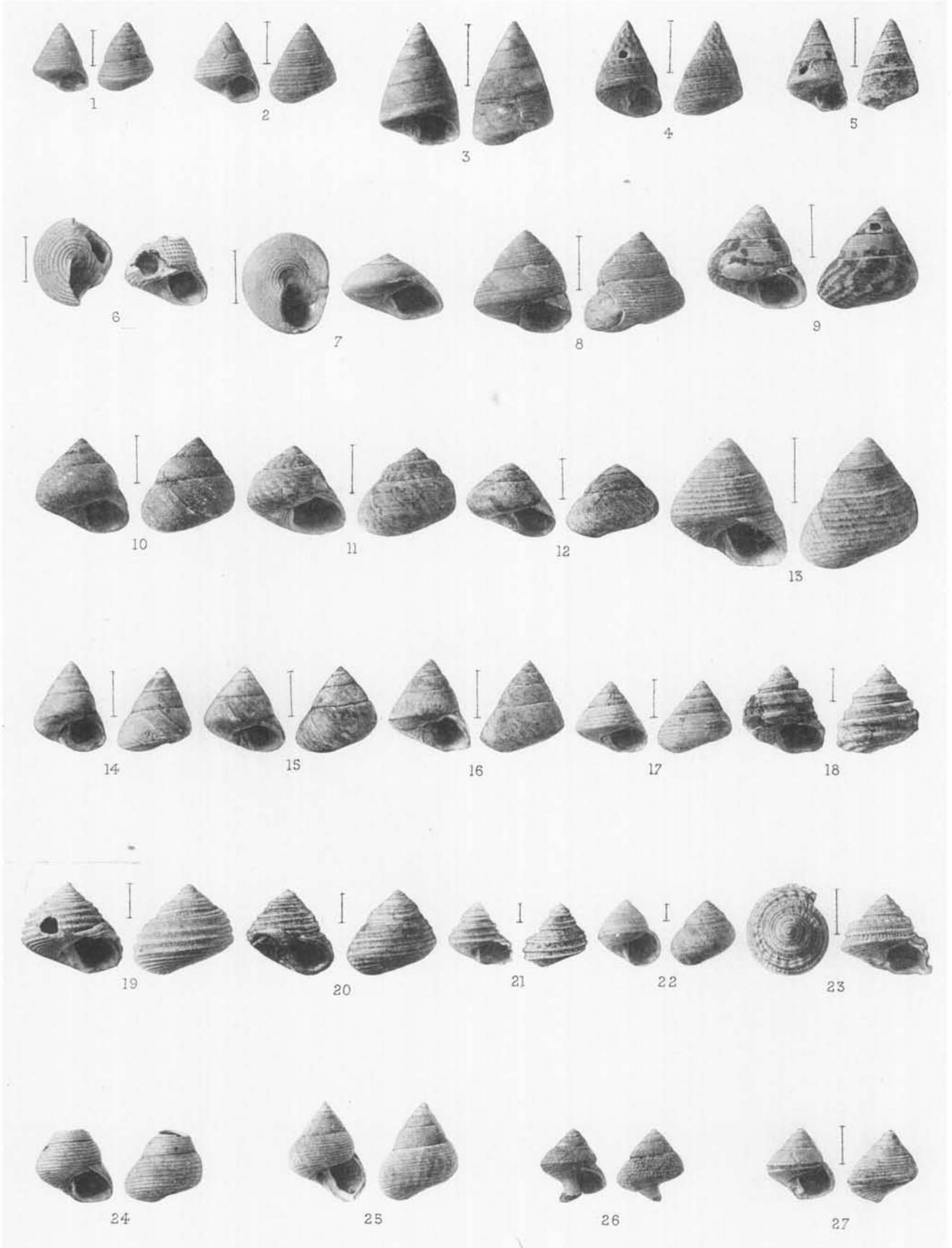


PLATE LX.

FIG.		PAGE.
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2.	<i>Solariella obscura</i> (Couthouy). Bridlington. (Headley Collection)	745
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23.	<i>Adeorbis pulchralis</i> , S. V. Wood. Coralline Crag, Sutton. (Wood Collection)	758
24.	<i>Adeorbis tricarinatus</i> , S. V. Wood. Coralline Crag, Sutton. (Harmer Collection)	759
25.	<i>Circulus striatus</i> (Philippi). Coralline Crag, Sutton. (Harmer Collection)	759
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28.	<i>Velutina undata</i> , Brown. Icenian Crag, Bramerton. (Norwich Museum)	762

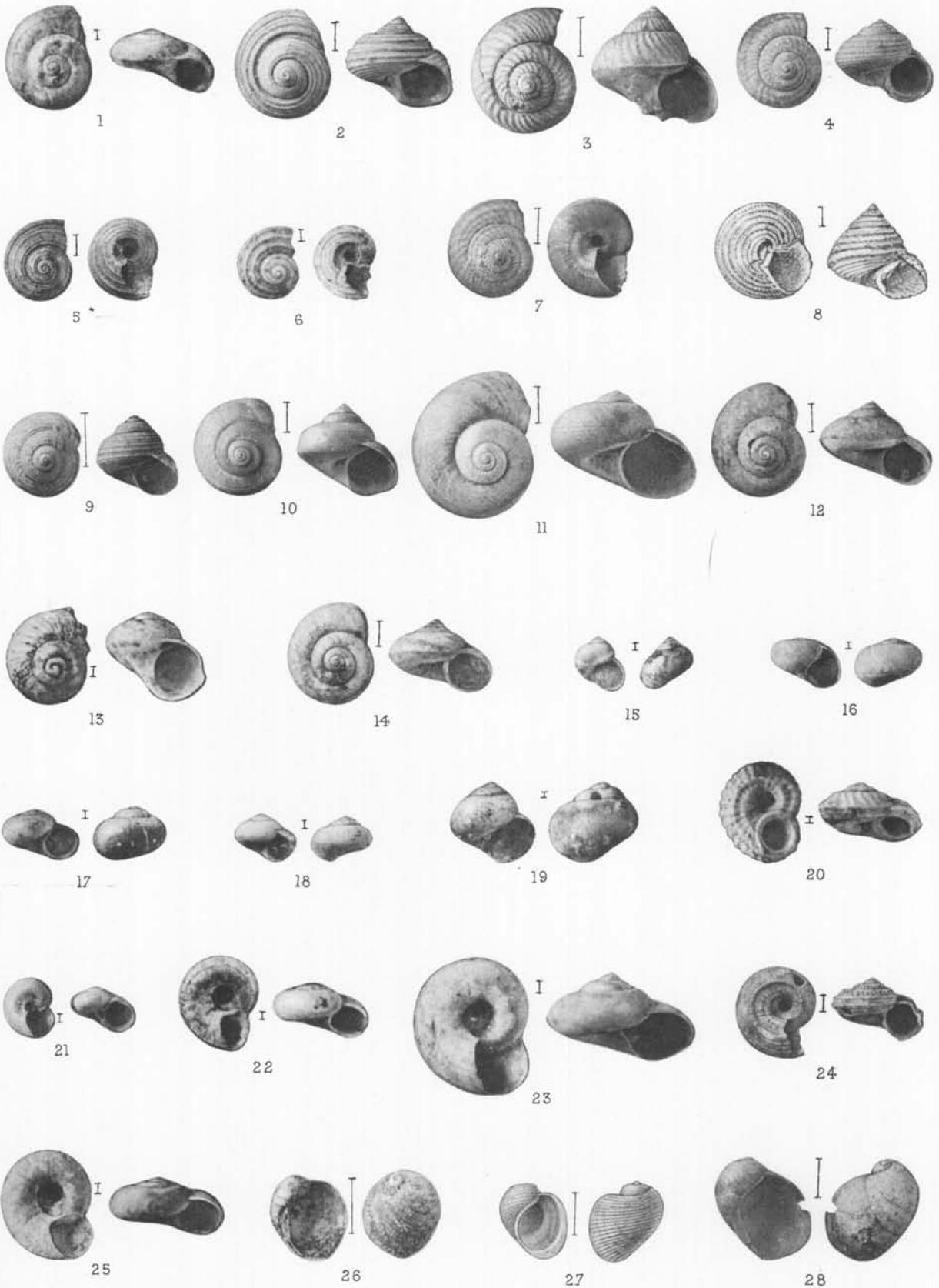


PLATE LXI.

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2.	Ditto. Recent. (Harmer Collection)	763
3.	Ditto, var. <i>regularis</i> , S. V. Wood. Waltonian Crag, Beaumont. (Harmer Collection)	764
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8.	<i>Capulus venustus</i> , sp. nov. Coralline Crag, Boyton. (Jermyn St.)	766
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10.	<i>Brocchia sinuosa</i> (Brocchi). Coralline Crag, Gedgrave. (Sedgwick Museum)	768
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12.	<i>Brocchia partim-sinuosa</i> (S. V. Wood). Newbournian Crag, Waldringfield. (Jermyn St.)	769
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21.	Ditto, var. <i>muricata</i> (Brocchi). Waltonian Crag, Little Oakley. (Harmer Collection)	774
22.	Ditto. Waltonian Crag, Little Oakley. (Harmer Collection)	774

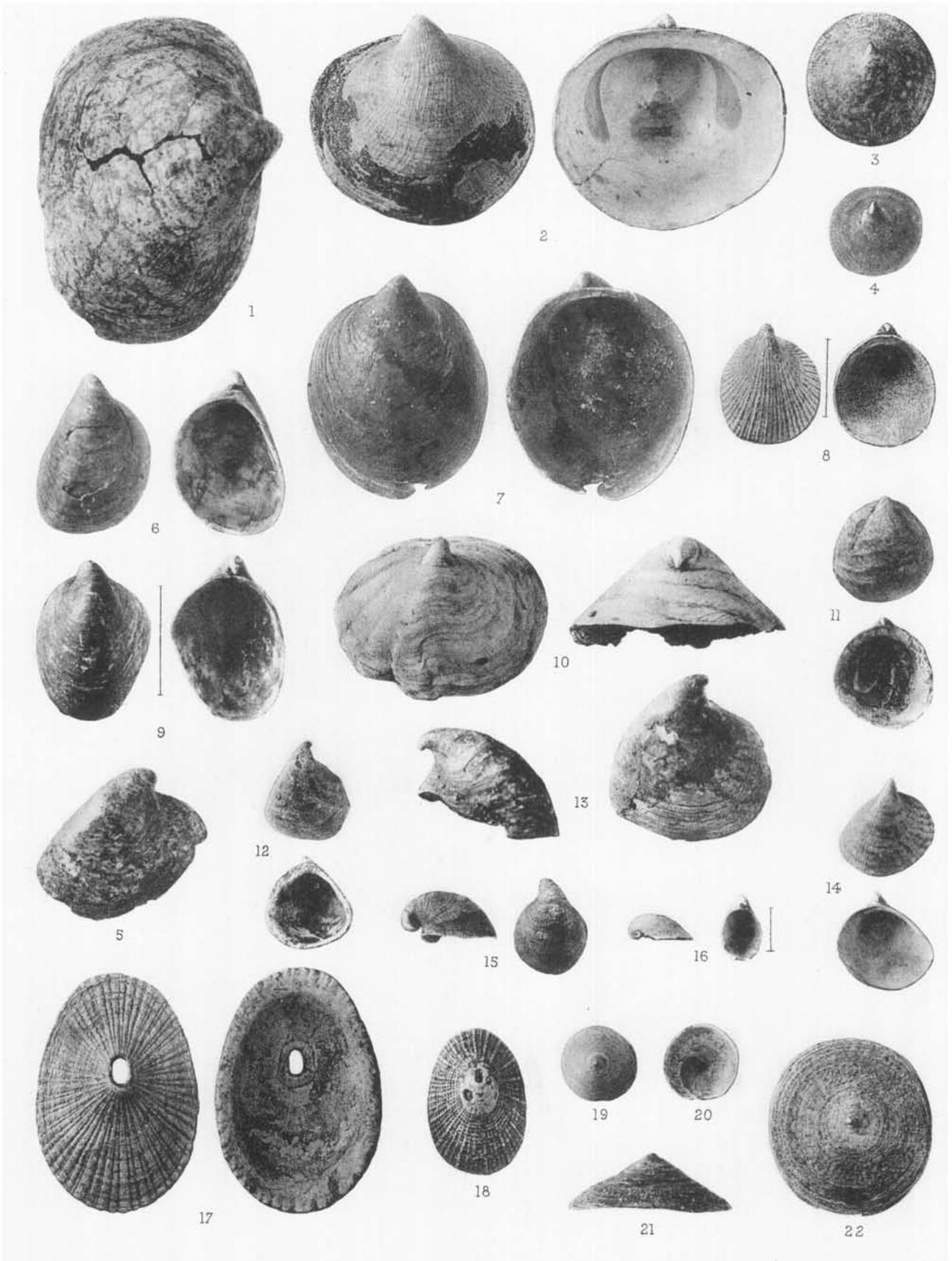


PLATE LXII.

FIG.		PAGE.
1.	<i>Emarginula crassa</i> , J. Sowerby. Newbournian Crag, Foxhall. (Harmer Collection)	774
2.	Ditto. Waltonian Crag, Little Oakley. (Harmer Collection)	774
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4.	<i>Emarginula crassalta</i> (S. V. Wood). Waltonian Crag, Little Oakley. (Harmer Collection)	775
5.	Ditto. Waltonian Crag, Little Oakley. (Harmer Collection)	775
6.	Ditto, var. <i>conica</i> (S. V. Wood). Coralline Crag, Sutton. (York Museum)	776
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9.	<i>Emarginula elongata</i> , O. G. Costa. Coralline Crag, Gedgrave. (Harmer Collection)	778
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11.	<i>Patella vulgata</i> , Linné. Selsey. (British Museum)	780
12.	Ditto, var. <i>intermedia</i> , Jeffreys. Portland. (Harmer Collection)	781
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14.	Ditto. Recent. (Harmer Collection)	782
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19.	<i>Melampus pyramidalis</i> (J. Sowerby). Waltonian Crag, Little Oakley. (Harmer Collection)	785
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21.	Ditto, var. <i>striata</i> , nov. St. Erth. (British Museum)	787
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24.	Ditto, var. <i>alba</i> (Turton). Selsey. (Harmer Collection)	788
25.	<i>Leuconia fusiformis</i> (A. Bell). Newbournian Crag, Sutton. (Ipswich Museum)	789
26.	<i>Leuconia incognita</i> , sp. nov. Waltonian Crag, Little Oakley. (Harmer Collection)	790
27.	<i>Alexia myosotis</i> (Draparnaud). St. Erth. (British Museum)	790
28.	<i>Alexia Reevei</i> , sp. nov. Icenian Crag, Bramerton. (Norwich Museum)	791
29.	<i>Acmæa parvula</i> (S. Woodward). Icenian Crag, Bramerton. (Norwich Museum)	791
30.	<i>Acmæa rubella</i> (Fabricius). Waltonian Crag, Little Oakley. (Harmer Collection)	792
31.	<i>Helcion pellucidum</i> (Linné). Selsey. (British Museum)	793
32.	Ditto, var. <i>lævis</i> (Pennant). Portland. (Harmer Collection)	794
33.	Ditto. Portland. (Harmer Collection)	794

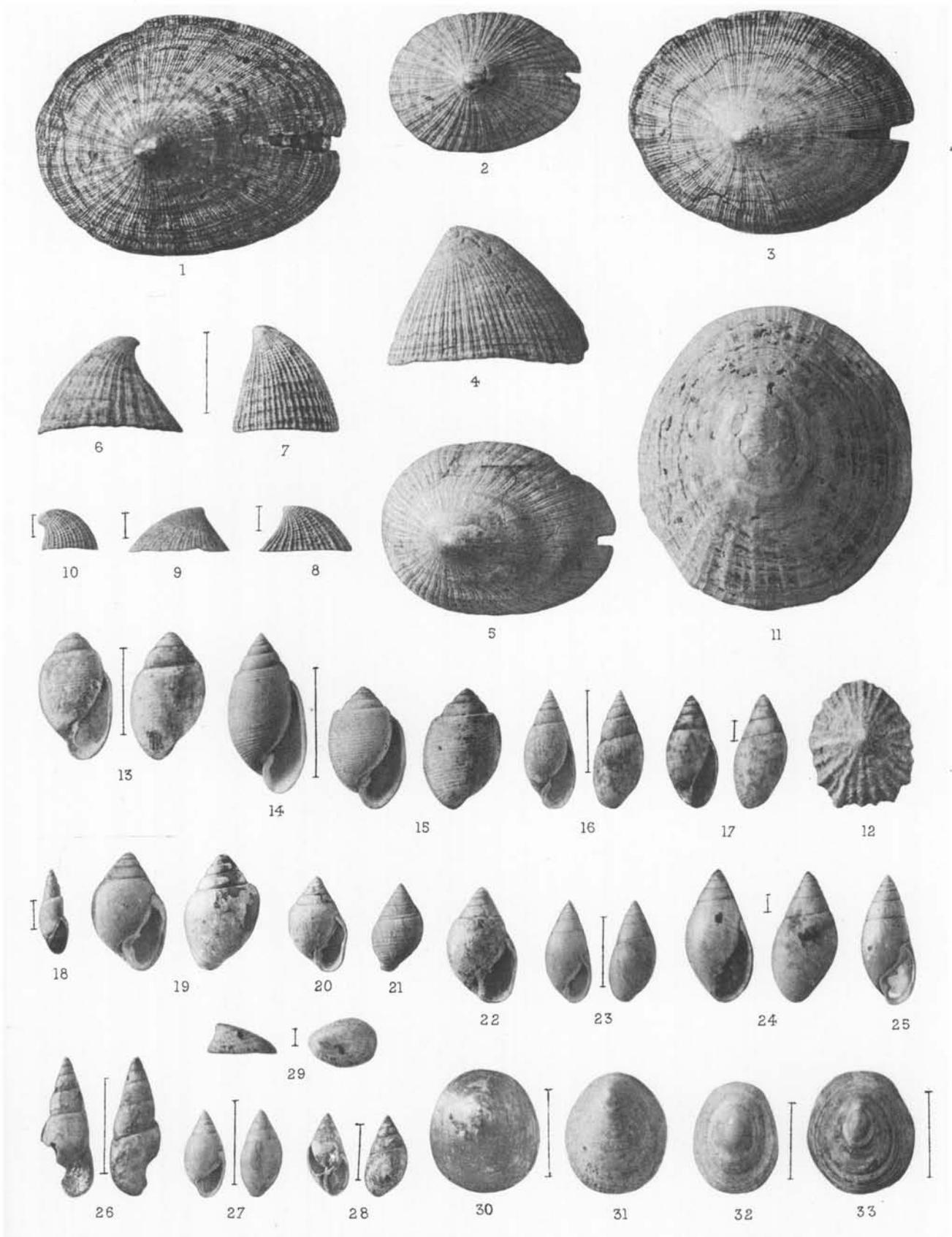


PLATE LXIII.

FIG.		PAGE.
1.	<i>Utriculus truncatulus</i> (Bruguère). Coralline Crag, Gedgrave. (Cambridge Museum)	794
2.	<i>Utriculus crebristriatus</i> (Jeffreys). Bridlington. (Headley Collection)	796
3.	<i>Utriculus Lajonkairanus</i> (Basterot). Waltonian Crag, Little Oakley. (Harmer Collection)	796
4.	<i>Utriculus constrictus</i> , Jeffreys. Garvel Park. (Harmer Collection)	797
5.	<i>Utriculus obtusus</i> (Montagu). Icenian Crag, Bramerton. (Norwich Museum)	797
6.	<i>Utriculus pertenuis</i> (Mighels). Bridlington. (Headley Collection)	798
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9.	<i>Cylichna alba</i> (Brown). Icenian Crag, East Runton. (Norwich Museum).	801
10.	<i>Cylichna concinna</i> (S. V. Wood). Coralline Crag, Sutton. (Yorkshire Museum)	802
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13.	<i>Scaphander puncto-striatus</i> , Mighels and Adams. St. Erth. (British Museum).	805
14.	<i>Scaphander lignarius</i> (Linné). Coralline Crag, Gedgrave. (Yorkshire Museum)	806
15.	Ditto. Recent. (Harmer Collection)	806
16.	<i>Haminea hydatis</i> (Linné). Recent. (Harmer Collection)	807
17.	<i>Philine aperta</i> (Linné). Irish Estuarine Clays. (Belfast Museum)	808
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19.	<i>Philine elegans</i> , sp. nov. Coralline Crag, Sutton. (Ipswich Museum).	809
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24.	<i>Ringicula ventricosa</i> (J. Sowerby). Butleyan Crag Butley. (Harmer Collection)	813
25.	<i>Ringicula ovalis</i> , A. Bell. St. Erth. (Harmer Collection)	815
26.	<i>Ringicula acuta</i> , Philippi. Red Sea. (Harmer Collection)	815
27.	<i>Dentalium rectum</i> , Gmelin. Newbournian Crag, Waldringfield. (Ipswich Museum).	816
28.	<i>Dentalium sexangulum</i> , Schroeter. Altavilla. (Harmer Collection)	817
29.	Ditto. Newbournian Crag, Waldringfield. (Harmer Collection)	817
30.	<i>Dentalium vulgare</i> , Da Costa. Recent, Palermo. (Harmer Collection)	817
31.	Ditto. Selsey. (British Museum)	818
32.	<i>Dentalium dentale</i> , Linné. Recent, Tripoli. (Harmer Collection)	818
33.	Ditto. Waltonian Crag, Little Oakley. (Harmer Collection)	819
34.	<i>Dentalium costatum</i> , J. Sowerby. Waltonian Crag, Little Oakley. (Harmer Collection)	820
35.	<i>Dentalium panormitanum</i> (Chenu). Selsey. (Harmer Collection)	820
36.	<i>Dentalium striolatum</i> (Stimpson). Gloppa. (British Museum)	821
37.	<i>Dentalium entale</i> , Linné. Gloppa. (British Museum)	822
38.	<i>Dentalium tarentinum</i> , Lamarck. Recent, Palermo. (Harmer Collection)	822
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40.	<i>Dentalium longifissum</i> , sp. nov. Coralline Crag, Gedgrave. (Ipswich Museum).	823
41.	Ditto.	823

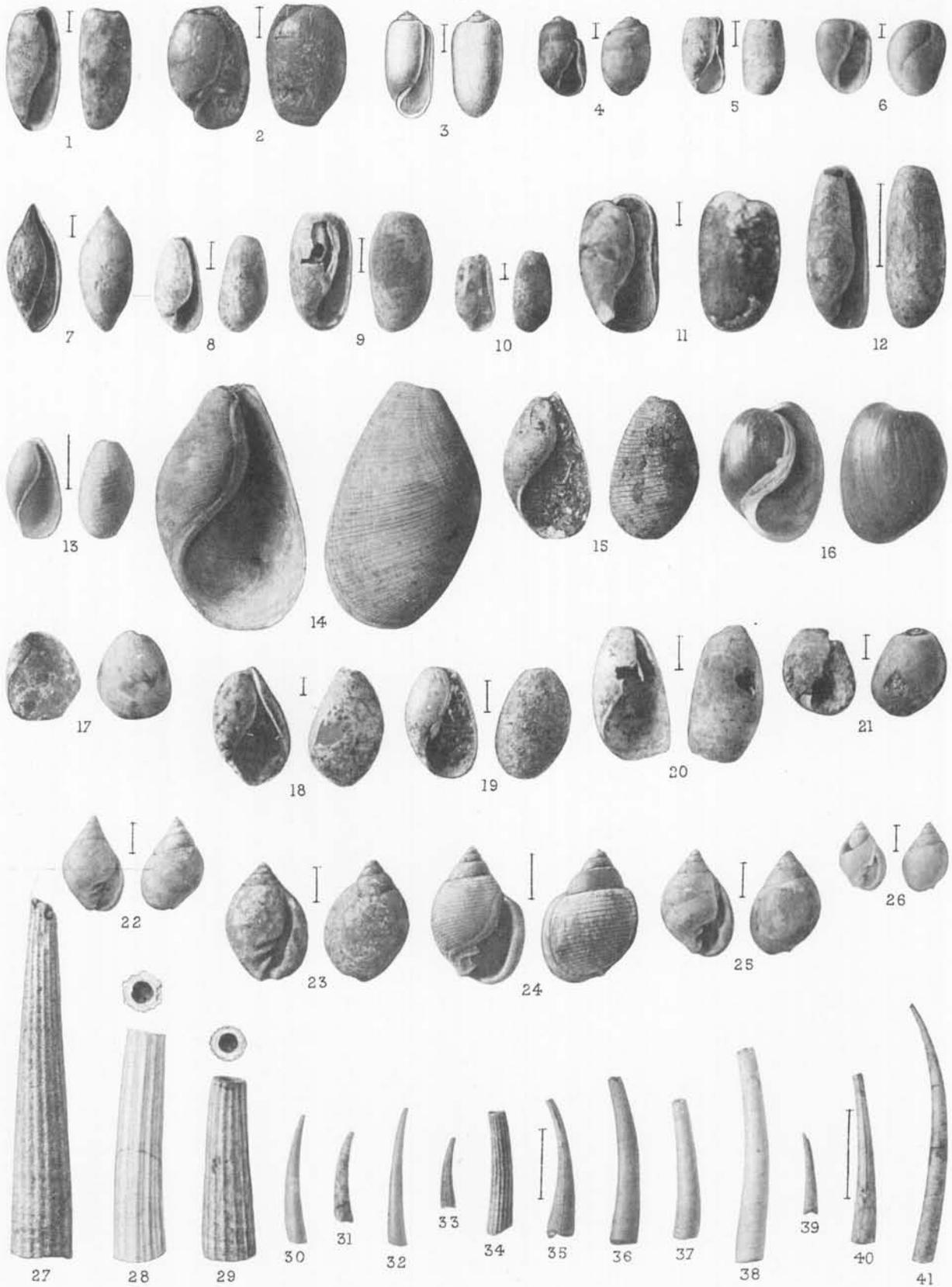


PLATE LXIV.

FIG.		PAGE.
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15.	<i>Odostomia inedita</i> , sp. nov. St. Erth. (British Museum)	836
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17.	<i>Odostomia incognita</i> , A. Bell, MS. St. Erth. (British Museum)	836
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23.	<i>Turbonilla Crowfootii</i> , sp. nov. Icenian Crag, Beceles. (Crowfoot Collection)	841
24.	<i>Turbonilla discrepans</i> , sp. nov. Red Crag, Butley. (Yorkshire Museum)	842
25.	<i>Turbonilla (Pyrgostelis) fulvocincta</i> (Thompson). Recent. (Norwich Museum)	842
26.	<i>Turbonilla (Pyrgostelis) communis</i> (A. Bell). Butley. (Yorkshire Museum)	843
27.	<i>Eulima glabella</i> , S. V. Wood. Coralline Crag, Sutton. (Harmer Collection)	844
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29.	<i>Eulimene terebellata</i> , var. <i>proxima</i> , nov. Newbournian Crag, Waldringfield. (Yorkshire Museum)	845
30.	<i>Eulimella acicula</i> (Philippi). Icenian Crag, Beceles. (Norwich Museum)	845
31.	<i>Cæcum mammillatum</i> , S. V. Wood. Coralline Crag, Sutton. (Harmer Collection)	847
32.	<i>Cæcum trachea</i> (Montagu). Coralline Crag, Sutton. (Harmer Collection)	847
33.	<i>Cæcum glabrum</i> (Montagu). Coralline Crag, Sutton. (Harmer Collection)	848
34.	<i>Homalogyra atomus</i> (Philippi). St. Erth. (British Museum)	849
35.	<i>Otina otis</i> (Turton). Selsey. (Yorkshire Museum)	850
36.	<i>Bramertonia derivata</i> (S. V. Wood). Icenian Crag, Bramerton. (Norwich Museum)	851
37.	<i>Bittium Reevei</i> , sp. nov. Icenian Crag, Bramerton. (Norwich Museum)	851
38.	<i>Bittium dubium</i> , sp. nov. Icenian Crag, Bramerton. (Norwich Museum)	852
39.	<i>Solarium Dumonti</i> , Nyst. Waltonian Crag, Little Oakley. (Harmer Collection)	853
40.	<i>Solarium (Philippia) conulus</i> (Weinkauff). St. Erth. (British Museum)	854
41.	<i>Solarium solarium</i> (Nyst). Waltonian Crag, Little Oakley. (Harmer Collection)	852
42.	Ditto. ditto. ditto.	852
43.	<i>Astraliium (Ormastraliium) carinatum</i> , var. <i>perrotunda</i> , Sacco. Newbournian Crag, Waldringfield. (British Museum)	855
44.	Ditto	855

