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SEPTEMBER 25TH, 1876.

WILLIAM MACLEAY, Esq., President in the Chair.

The Secretary announced the receipt of a donation from the Rev. Dr. WOOLLS, M.A., of Part 3 of Dr. Von. Mueller's Educational Collection of Australian Plants.

The following Papers were read :—

Observations on the *Genus Risella*, by Rev. J. E. TENISON-WOODS, F.L.S., F.G.S., C.M.R.S., Sydney, Tasmania, and of Linn. Soc., N.S.W.

Risella is a genus separated from the genus *Trochus* principally on account of the complete absence of any nacreous character, and according to M. Quoy the sexes being in different animals. In 1839, Dr. Gray, in the Zoology of Beechey's Voyage, p. 141, proposed to unite such shells with the genus *Littorina*, but in the following year, in his Synopsis of the British Museum, created a separate genus for their reception, which he named *Risella*, but gave no definition. Philippi, in the Zeitsch. f. Malac. for 1846, gave a definition of the genus and called it *Bembicium*. Finding, however, that he had been anticipated in the name, but not in the description, he with great modesty withdrew his generic title in favor of that of Gray in his Handbuch f. Conch. u. Malak, 1853, p. 176. In 1864, M. H. Crosse gave in the Jour. de Conch., p. 225, a monograph of the whole genus, in which he reviewed the synonymy in an exhaustive manner. He also drew attention to certain peculiarities of real generic value which had escaped previous observers, notably the funiculate thickening of the basal part of the throat. The genus may therefore be characterised as follows :—

G. RISELLA, Gray, 1840.

Testa univalvis, spiralis, conica, imperforata, haud margaritacea; anfr. 6-7, planis, ultimo angulato, saepe acute carinato. Apertura depressa, obliqua, rhombea; fauce in parte basali incrassata; columella simplex, obliqua, scindens; operculum oblongum, corneum, paucispinatum, nucl. marginato.

This definition differs in important particulars from that of Philippi, Crosse, or Adams, but principally in the thickening of the throat and the oblong paucispinial operculum. No authors have hitherto described the operculum in detail.

M. Quoy in his very elaborate notice of *Trochus melanostomus* and *T. nanus*, now recognised as *Risella melanostoma* and *R. nana*, gives full details of the anatomy. He states (*Voy. de l'Astrolabe, Zool. vol. 3, p. 271-278*) that the sexes are distinct. After having dissected a very large number of specimens in Tasmania, I am convinced that the animals are truly hermaphrodite, and are provided in every species with male and female organs. Nevertheless, the sexes seem to be distinct, because some take the office of the male and some the female. In such cases the shells differ, and have been hitherto regarded as distinct species, whereas they are only male and female shells, as I shall presently show.

Mons. Crosse enumerates no less than nine species of the genus, all of which are indigenous to Australian seas. The following is his list :—

Risella melanostoma, Chemnitz (?) Gmelin, Crosse, and Angas.

Hab. Port Phillip, var. S. Australia. Angas.

Risella aurata, Quoy, Deshayes (in Lamarck) Philippi, *Risella lutea*, H. and A. Adams.

Hab. D'Entrecasteaux Channel, Tasmania, Quoy; St. Vincent's Gulf, S. A., Crosse.

Risella nana, Lamarck, Quoy, Delessert; *Littorina australis*, Gray, *Bembicium nanum* Philippi, *pictum*, idem *R. nana*, H. and A. Adams, Chnu. manuel.

Hab. Storm Bay, Tasmania, Quoy; "sur quelques points du grand continent Australien," Crosse.

Risella plana, Quoy, Philippi, Adams.

Hab. Western Port, Quoy; St. Vincent's Gulf, Crosse; Port Jackson, Angas.

Risella lutea, Quoy, Kiener, Philippi: *Trochus cicatricosus*, Jonas.

Hab. Brackish waters, Western Australia; Port Jackson, Angas.

Risella Bruni, Crosse, Jour. de Conchy., 1864, p. 239.

Hab. Spencer's Gulf, South Australia.

Risella livida, Philippi, Adams.

Hab.—?

Risella vittata, Philippi, Adams.

Hab. Adelaide (?).

Risella imbricata, Gray, Philippi, Adams.

Hab.—?

From this list I think we may at once erase the three last. From the definition given by the authors of the specific names, we may be quite sure that we are dealing with mere varieties, or young individuals of the three first species named. Having paid attention to this genus for some years, and having examined some hundreds, nay, I may say thousands of specimens from all the Australian colonies as well as Tasmania, I may safely say that there are no such species as *R. imbricata*, *viatata*, and *livida*, but that individual specimens of *R. nana* may easily be found to correspond with all of them.

It is with some considerable hesitation that I say that I think Mons. Crosse's species, *R. Bruni*, should also be reduced to a mere local variety of *R. nana*. I should say it is no more than a pale and rather more tumid species inhabiting Spencer's Gulf.

This leaves us five species which must again be reduced, because *R. aurata* is only the male animal of *R. nana*. This may appear startling, but it is a fact which I have established after long-continued observation. In the first place, the two animals may be seen breeding together any day upon the rocks of D'Entrecasteaux Channel at low tide. If, moreover, the two species are kept in a small aquarium, they will breed readily, and *R. nana* will be the mother of the fry.

My observations here, however, revealed a still more surprising fact. Having ascertained beyond a doubt that both male and female shells (as for convenience we may call them, though some other term is required to express the sexual relations) are hermaphrodite, if *R. nana* (female) and *R. aurata* (male) are kept apart in separate glass jars, they are seen to couple together, that

is, *R. nana* with its own kind, and *R. aurata* with its own kind, as indeed they may sometimes be seen to do upon the rocks; but they do not become fertile. I say this, however, with hesitation, as my observations were only continued for a few weeks, and in that time the experiment could not be regarded as conclusive. It would not surprise me to find that either or both can become fertile, because there are many places on the coast where no species can be found, except the variety now known as *R. aurata*. On the beach by the side of Government House, Hobart Town, no grown specimen of *R. nana* is seen, yet young individuals are just as plentiful there as elsewhere. From my observations, I hold it is quite certain that the normal arrangement is for *R. aurata* to fertilise *R. nana*, which latter brings forth the fry.

How then are we to regard the names *R. nana* and *R. aurata*—as synonyms, or what? The names of species they are not; neither are they the names of varieties. Their date is the same, having both been bestowed by Messrs. Quoy and Gaimard in 1834 (*loc. cit.*, p. 273, 276, *pl.* 62.) I should prefer keeping *R. aurata* as less liable to lead into error for *nana*; a dwarf is not applicable, the species being by no means the smallest of the genus, and being, moreover, very variable in size. The following is the diagnosis of Messrs. Q. and G. with the synonymy of Crosse.

TROCHUS AURATUS, Q. and G. l. c. Kiener, *species pl.* 34, f. 2; *T. melanostomus*, Deshayes, 1843, in Lamarck, *ed.* 2, vol. 9, p. 157 (*rec Gmelin*); *Bembicium melanostomum*, Philippi 1846, in *Zeits. fur Malak.*, p. 130; *Risella lutea*, R. and A. Adams, 1858, *Genera vol.* 1, p. 318, *pl.* 33, *fig.* 5, *rec* (Q. and G.); Crosse, *Jour. de Conchyl.*, vol. 12 (1864), p. 233.

Testa imperforata, conica, rugosa, subplicata, lutea, flummulis longitudinalibus fuscis ornata; basi plana, striata.

Messrs. Quoy and G. found the species on the rock in D'Entrecasteaux Channel, whence all my specimens came. Mr. G. F. Angas quotes it also as from St. Vincent's Gulf, S. Australia, but the species vary there to some extent, as I shall presently notice. The following is my own diagnosis from a comparison of many hundred species:—

Shell depressedly conical, suborbicular, imperforate, rugosoplicate, subplicate, or nearly smooth, pale yellow, whitish or brown, clouded, striped with pale green, sometimes mottled white, and livid on the upper whorls; very distinctly spirally grooved, and crossed with much inclined diagonal lines of growth; whorls 6-7 generally undulately plicate at the suture, which is either impressed or overlapping; base very flat, acutely angled at the periphery, which is undulating or round, according as the whorls are plicate or not, spirally lirate with 5-7 spirally raised lines which are diagonally crossed with strongly marked lines of growth and very finely, almost squamosely undulately striate; periphery margined at the base; that is to say, there is always a clear marginal space between the liræ and the edge; aperture subquadrate, much produced above; throat conspicuously enamelled; outer lip thin, margined within with a yellow line, and then generally a rich deep brown; base of throat wholly white, or with a broad white band; columella conspicuously orange, and spirally grooved posteriorly (visible under the lens); the upper part of the throat sometimes brown, sometimes white, but always enamelled. Dimensions of the largest specimen: diameter of base 17, alt. 14, of the smallest 11-7½ millimetres.

It is worthy of remark that in this variety there is little or no thickening of the base, which is denticulate at the edge, but not lirate within; and finally, that the deep brown color is a thick vitreous translucent substance easily separated from the shelly outer covering, and when the basal part of the throat is broken away, it is seen to extend like a broad margin of brunswick black round the upper interior.

The operculum is a pale, translucent yellow, oblong, few whorled, and an almost marginal nucleus.

The odontophore (lingual ribbon) is a very fine, glassy, narrow, flattened tube, about 20 millimetres long, and lying in a coil just below the red fleshy buccal mass. Inside this tube the teeth are affixed to a somewhat thickened transparent membrane. The teeth are very numerous in sets or chevrons of seven; that is

to say, three in a diagonal line on each side from a central tooth. They are perfectly vitreous, colorless, and transparent. The central tooth is long-curved and sharp-pointed, with two very small lateral cusps. The first two laterals are also apparently provided with cusps. The outer teeth have a broad summit, which is tridentate. Thus it differs from the dental formula given after Wilton in Woodward's Mollusca (Tate's edit. 1871, p. 252), and from that of Gray (Guide to Mollusca in Brit. Mus., 1857, p. 90). The tube of the odontophore is so very thin that the upper membrane is easily destroyed in drying.

RISELLA NANA. *R. t. arbiculari, subconica, ad periphæriam, acute angulata, cinereo-virente; lineis longitudinalibus fuscis radiantibus; anfr. planiusculus; infima facie plana, concentricè sulcata, violacescente; umbilico nullo.* Lamarek 1822, an m. s. verteb., gen. Trochus n. 67. Alt. 12, diam. max. 16 mil.

This species or variety, which, as I have said, takes the office of female to *R. aurata*, differs in being a larger and more solid shell with flattened smooth whorls which are seldom rugose, and seldom with the regular plaits of the male variety. It is sometimes much corroded and rough, and is either high and obtusely conical with an obtusely angled periphery, or depressed and very acutely angled. One constant feature it possesses, unless where much corroded, and that is the transverse sloping brown or black lines on a grey or brown ground. It has the same lirate flattened base, with the smooth margin, which is common to all the species known to me. The mouth has a highly polished enamel, variously striped or clouded, yellow and brown, but much paler generally, and with less brown than the preceding variety. It is a larger shell in every way, more solid, and with a thickened base. The odontophore is similar to the last described in the number and arrangement of the teeth, but they are less crowded and longer. It is longer and broader, and like the preceding, a tube.

Though the above differences are plainly marked in the extremes of both varieties, yet it must be admitted that gradations from one form to the other may be found. The spiral liræ with plaits in

R. aurata, and the smooth whorls with diagonal lines of color in *R. nana* are the most constant distinction.

R. melanostoma is marked with *R. aurata* by Gray (*loc. cit.*) as variety of one species. This I believe. At any rate, the former is unknown to me. It is the oldest name, but from the imperfect diagnosis of Chemnitz it is impossible to identify the shell meant as a *Risella*.

R. plana, Quoy, is a very depressed solid angular lirated and plicate species with a yellowish white mouth. It is longer than the preceding, and its specific characters seem very constant. The animal I have not seen. The shell is found all round the Australian coast from Port Stephens to St. Vincent's Gulf.

R. lutea, Quoy, I believe to be only a corroded and brackish water or male variety of the preceding; but I know little of the living habits of the species. In Dr. Cox's extensive collection, I noticed the shells named *R. lutea* which appeared to me a common form of *R. nana* or *aurata*, but adult or perhaps more correctly in old age. It is corroded, and the marginal space on the base is not visible. It is common in Tasmania, and breeds readily with *R. nana*. Mr. Angas says (Zool. Proc. 1867, p. 209), this species, the most conical of the genus, is common on the rocks outside Port Jackson, and along the coast to Kiama and Jervis Bay. Mr. Crosse (*loc. cit.*, p. 238) says, on the authority of MM. Q. and G., that it is found throughout King George's Sound, but principally in the little salt creeks. The only good figures, says M. Grosse, are those of Kiener, in his monograph of the genus *Trochus*—but there is no description as the work is not completed.

Thus we should have only two species of *Risella*, with male or female varieties of both.

It is possible that these two species may even yet be reduced to one; but I respectfully beg the attention of naturalists to the fact that the sexual differences are marked by differences in the shells. This may open up a most important fact for the whole of our conchological nomenclature. I also call attention to the remarkable

manner of breeding of hermaphrodite mollusca. As yet, we know little or nothing of the physiology of reproduction under these peculiar conditions, and I submit that most important physiological and zoological facts are contained therein, bearing on the whole question of evolution. The subject may be said to be at our doors, and may be studied with the greatest ease by anyone who gives it a careful attention. I have written this paper in the hope of drawing other observers into this most inviting and interesting field.

Shells collected during the Chevert Expedition, with Descriptions of the New Species, by J. BRAZIER, C.M.Z.S.

FAMILY SCALARIDÆ.

1.—SCALARIA REPLICATA.

Scalaria replicata, Sow. Jun., Proc. Zool. Soc., London, 1844, p. 11.

" " Sowerby, Thes. Conch., vol. 1, p. 84, pl. 32, f. 23, 24.

Hab. Darnley Island, Torres Straits, 10 fathoms, sandy mud.

2.—SCALARIA PHILLIPPINARUM.

Scalaria Philippinarum, Sowerby, Jun. Proc. Zool. Soc., London, 1844, p. 12.

" " Thes. Conch., vol. 1, p. 85, pl. 32, f. 21, 22.

Hab. Darnley Island, Torres Straits, 10 fathoms, sandy mud. This species is also found in Port Jackson.

3.—SCALARIA IRREGULARIS.

Scalaria irregularis, Sowerby, Proc. Zool. Soc., London, 1844, p. 13.

" " " Thes. Conch., vol. 1, p. 90, pl. 33, f. 40, 60.

Hab. Bet Island, Torres Straits, 11 fathoms, coral and sand. Specimens also found on the beaches inside the reefs after gales.