

## The Molluscan Fauna of Tasmania.

By the REV. J. E. TENISON-WOODS, F.L.S., F.G.S., Hon. Member  
Royal Society, N.S.W., &c., &c., &c.

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HAVING recently completed a census of the Molluscan Fauna of Tasmania, it will be probably useful if I add some remarks on the nature of that fauna and its geological relations. The time has hardly come when this can be done completely. Dredging operations have not been carried out to any extent, so that the nature of the laminarian zone is little understood. The Molluscan Fauna of Australia is also only very partially known. New South Wales or the east coast is perhaps the best explored, but still far from completely; and as for South Australia and Victoria, our knowledge is extremely imperfect. It will be seen, therefore, that I can only give broad and very general conclusions, such as I think future discoveries will not materially alter.

In order to understand the fauna of Tasmania we must bear in mind first of all the physical character of the island. It is separated from Australia by a wide and deep strait, 90 miles at least at its narrowest part, though that interval is to some extent bridged over by groups and chains of large islands. It is situated in more temperate latitudes than any part of Australia, and on its southern side it is exposed to the full force of the southern ocean, as well as to the influence of much colder seas. The coast is almost without exception bold, precipitous, and rocky, with many islands. There are numerous inlets and bays running up very far into the land and perfectly sheltered, so that tranquil and shallow waters are by no means wanting. The sea, though not a warm one, appears to be very equal in temperature. It is fed by numerous freshwater streams, and there are many brackish estuaries. In these particulars Tasmania contrasts very strongly with the south coast of Australia. The sea there is warmer, and the coasts are seldom bold. There are immense stretches of sandy beach of nearly 100 miles at a time. There are few rivers, and instead of estuaries there are many shallow arms of the sea or brackish water lakes. The south-east coast of Australia differs to some extent from this, resembling Tasmania more. The shore is often bold and much more broken; there are scarcely any islands, and the seas are exposed to the full influence of the southern ocean.



First of all, it may be necessary to note from what naturalists our knowledge of the Tasmanian Molluscan Fauna is principally derived. The first that ever visited the island were undoubtedly Banks and Solander, in the celebrated expedition of Captain Cook in 1770; yet from these, or any subsequent naturalist up to the time of the voyage of the "Astrolabe," it does not appear that Tasmanian or even Australian conchology received any development. No doubt collections were made, and these stored in the museums of London and Paris, awaited the advent of such men as Lamarck; but, from actual observations during voyages, we find nothing printed until the voyage of the "Astrolabe." The only shell which appears to have been named by Solander is *Cyprea piperita*, teste Gray in the *Zoological Journal* (London, 1824, vol. 1, p. 498), and this must have been merely a name given to the specimen in the British Museum, as there is no record of any publication. Linnæus died January 10, 1778, but from the year 1772 he had ceased to take a part in scientific discovery; yet we have no less than eight Tasmanian species with his name as an authority. They are *Triton cutaceus*, *Fasciolaria trapezium*, *Cyprea annulus*, *Philine aperta*, *Teredo navalis*, *Lucina divaricata*, *Ostrea edulis*, and *Lima radula*. The latter I think we may dismiss as doubtful. The shell thus identified is described as an *Ostrea* by Linnæus, which genus according to his views included in its first section *Lima* and *Pecten*, and in the second *Ostrea*, *Malleus*, *Pedum*, &c. The shell described by him was taken from Lister (1685) and Rumphius (1705). He describes it as "Shell nearly equivalve, with twelve convex rays crossed by crenate striæ  $3\frac{1}{4}$  inches long by  $2\frac{1}{2}$  broad." He says "it inhabits the Indian Ocean, and is oblong, white or varied with white and brown, lower valve a little more convex, ends wrinkled and furrowed with oblique striæ." The shell is now recognized as a *Pecten*, and is described as such in Lamarck (*Anim. S. V.*, vol. 7, p. 134) and Sowerby (*Thes. Conch*, pl. 17, fig. 154-5). *Triton cutaceus* is described in Linné's genus *Murex*. If the identification is correct, this is also figured in Lister (Tab. 942). It is said to inhabit Barbary, Guinea, and South America. *Fasciolaria trapezium* is also of Linné's *Murices*, and figured by Lister (Tab. 930, 931) and Rumphius (*Mus. tab. 29, E.*, tab. 49, fig. K). It is said to inhabit the Indian Ocean, and to be often above 6 inches long. Sowerby says it occurs in the West Indies also.\* *Cyprea annulus* is figured by Rumphius, but not very successfully. It is said by Linné to inhabit Amboyna and Alexandria, which is not very likely. It is said also to come from the Red Sea, and certainly its appearance is different from any of the Australian *Cypreas*. I have been assured however that it occurs in Tasmania, where specimens in private collections

\* In this case the shells of two such remote places being similar is no proof that the animals are equally alike.



are not at all uncommon. It is much more like a Red Sea shell than of any other locality. It is stated to occur in New Zealand, but Captain Hutton assures me that he has never seen or heard of an instance. It is known on the E. Australian coast. Further inquiries are needed to clear up this rather mysterious case of irregular distribution. *Philine (Bulla) aperta* is described as a roundish pellucid transversely substriate small shell with one end much produced, and the apertures very open, that is with the lower lip spread out. It inhabits Europe and Africa (*sic in origine*). It is probable that Linné got his description from Gualtieri's work, which appeared at Florence in 1742, and was entitled *Index Testarum Conchy, q. adservantur in Mus. N. Gualtieri Phil. et Med. Florentini*.<sup>\*</sup> *Lucina divaricata* is another somewhat doubtful identification. It was figured by Lister, and was described by Linné as a shell with thin transverse longitudinal striæ crossing some divergent ones towards the margin, posterior impression ovate, margin crenate. Inhabits the East Indies. Turton adds that it is white, with brown lines, veins, and spots, anterior slope oblong, gaping, veined blackish brown, with 4 hinge teeth. (See *Turton's Linnæus—A General System of Nature*. London: 1806. Vol. 4, p. 226†.) No doubt many other identifications might be made if the figures in some of the earlier works were a little better, or had the types been preserved. But such an inquiry would be barren of any results, except to rake up new synonyms, of which we have quite enough already. Besides, the identifications that we have so far are by no means satisfactory, and what is admitted by one as a description or a figure of a known species is denied by another; and thus considerable confusion results. For my part, it does seem a useless waste of time, space, and printing to burden our scientific books with synonyms of a pre-Linnean history. They are doubtful at the best, and can serve no useful purpose whatever.

Every one of the eight species above enumerated are of wide distribution, and, almost certainly, the specimens from which the descriptions were made came from the West Indies, the Red Sea, the Indian Ocean, or the Mediterranean. Thus, *Ostrea edulis* was the common European form. No difference can be detected between our species and that of Linné. It may well be questioned if it be not introduced in Tasmania at least. In Australia the case is different, for it is more abundant, and is found as a Pliocene fossil. *Teredo navalis* is most certainly

<sup>\*</sup> This work is especially interesting as containing a conchological system composed by Tournéfort.

† As Turton translates Gmelin and adds a few (very few, and often incorrect) remarks of his own, I am uncertain whether the observations are his or by the continuator of Linné.



introduced and was known to Linné only from European forms. It has been brought in timber from Europe, and a more unwelcome case of acclimatization we can hardly imagine.

After Linné we have very few names or descriptions anterior to those of Lamarck, who published the first edition of his *Histoire Naturelle des Animaux sans Vertèbres* in 1815-23. During the period intervening between Lamarck and the discoveries of Capt. Cook in 1770, we have only the following names:—*Argonauta oryzata*, Meuschen; *Triton spengleri*, Dillwyn. Both these were not from Australian specimens, as the species have a wide range. *Heliotis nævosa*, Martyn; *Purpura succincta*, Martyn; *Risella melanostoma* (or *Trochus*), Gmelin; *Phasianella tritonis*, Chemnitz; *Trochocochlea Australis*, Favanne; *Patella tromoserica*, Martyn; *Patella radians*, Gmelin; *Cyprea angustata*, Gmelin; *C. comptoni*, Gmelin;\* *Turbo undulatus*, Chemnitz; *Turbo stramineus*, Martyn.

Before I make any observations on these, it may be necessary to say something about the authors and the various works where their descriptions are to be found.

The dawn of a true science of conchology may be said to date from the books of our countryman, Lister, who in 1685 commenced the publication of his great work entitled, *Historia sive Synopsis Methodica Conchyliorum*. It was in four books: 1, of land univalves; 2, of freshwater univalves and bivalves; 3, of marine bivalves and Balanidæ (*Conchis anatifervis*); 4, of marine Patellæ, Dentaliums and Buccinums. I have translated the title of the divisions of this really marvellous work—marvellous for the age, whether one regards the genius of the author or the accuracy of the figures. These were 1,057 in number; but, the plates being bequeathed to the University of Oxford, another edition of them was published in 1770, where the figures of shells alone (exclusive of fossils) amount to 1,153—all executed with rare industry by Dr. Lister's daughters, Susanah and Anne Lister. I gladly avail myself of the opportunity of helping to make known their names. The remains of Dr. Lister's Museum are still to be seen in the Ashmolean Museum at Oxford. Without mentioning any of the subsequent writers on the subject—as they may scarcely be said to have advanced it at all—we may just refer to the work of D'Argenville, a French writer, who in his work, *L'Histoire Naturelle éclaircie dans deux de ses Parties principales, les Lithologie et la Conchyhologie*, Montpellier, 1742, laid the foundation of a system which Linné subsequently adopted. His genera include—*Patella*, *Heliotis*, *Dentalium*, *Nerita*, *Helix*, *Trochus*, *Strombus*, *Nautilus*, *Conus*, *Cyprea*, *Ostrea*, *Venus*, *Chama*, *Pholas*, *Solen*. These genera correspond very nearly with those of

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\* On the testimony of Dr. J. E. Gray.



Linné, under the same name. The figures were excellent, and earned for the author from Linné the title of "nitidissimus," *i.e.*, neatest or most exact.\*

The advent of the great systematist Charles von Linné† began a new era for conchology. The first edition of his *Systema*, published in 1735, was little more than a small prospectus of fourteen folio pages, but which was sufficiently important to attract universal attention. His efforts in the matter of shells was less happy than other portions. The great aim of the author was simplicity, and this feature was decidedly destroyed by his genera being too few. Confusion, not simplicity, was the result. His original genera were only eight in number—viz., *Cochlea*, *Cyprea*, *Haliotis*, *Patella*, *Nautilus*, *Lepas*, *Concha*, and *Dentalium*. Two or three more genera were added; but it was not until the tenth edition (1753) that he augmented the number to thirty-two, which was subsequently increased to thirty-five, and the most of them we have seen were taken from D'Argenville. The genius of Linné was seen in the way in which he seized upon salient specific characters, and rejected the weak, shifting, and multitudinous features of preceding naturalists, which impeded science, as they were too numerous, non-permanent, and confusing. Still Linné never rose to a true perception of the nature of the animals with which he had to deal. The shells were all Testacea, and the animals which dwelt in them Vermes or worms, distinguished from one another by very arbitrary features. It was left to Cuvier to perceive the true relations of the animals, and to build the science on a solid and permanent basis. It must not be imagined, however, that this was all Linné ever did on conchology. His *Fauna Suecica* (1st ed. 1746, 2nd ed. 1761), his *Museum Tessinianum*, *Museum Adolphi Fred. Regis*, and *Museum Ludovicæ Ulricæ Reginae*, all contributed to extend his system, and doubtless to enlarge his own knowledge of the subject. In the last-named work he describes 434 species of shells. Strangely enough, however, though the volume is published in 1764—that is after the tenth edition of his *Systema*—it preserves his old divisions of *Conchæ* and *Cochleæ*. His *Mantissa altera* (another addition) embraces the description of thirty-five new species.

From Linné to Lamarck is nearly half a century, that is from the date of their systems; yet we have only very few pre-

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\* Swainson, however, says that the plates are inferior, and whatever was good in the work was taken from Lister. See "Shells and Shellfish," p. 14.

† The Swedish form of this name—*i.e.*, Linnæus—is the one most in use. When knighted he was better known as Charles von Linné. It is said that the termination in "us" denotes a plebeian origin, and that when in 1757 he was admitted amongst the hereditary nobility he was called C. von Linné.



Lamarckian names amongst the shells of Tasmania. This is more astonishing if we remember the numbers of different expeditions to Australia, &c., in the last twenty years of the 18th century. There was the French expedition under Captain Marion, in 1772, in the ships "Mascarin" and "Castres"; Furneaux in 1773; Cook in 1777; and the settlement at Port Jackson in 1788, from which a perfect stream of specimens of natural history must have flowed into Europe. There was Vancouver in King George's Sound in 1791, Cox in Tasmania in 1789, Bligh also in 1792, and D'Entrecasteaux, with Labillardière as naturalist, in the same year. Then came Flinders, Bass, Grant, and the French expedition under Baudin with the naturalists Peron and Freycinet. No doubt the latter contributed largely towards Lamarck's work; but until then, from the time of Linné, we have only the names already given: *Argonauta oryzata* and *Triton spengleri* may both have come from the Indian Ocean. Meuschen, who is the authority for the first, is only known for two catalogues of celebrated collections, viz.:—1. Of Laurence G. Gronow\* a senator of Leyden (published in 1781), and the collection of Abraham Gevers of Rotterdam. It is in the catalogue of the second (p. 252, n. 133) that the *Argonauta* is described. As most of these Dutch collections were made in the trade to the Indian Ocean and Spice Islands, we can generally guess to what locality to attribute any specimen. Dillwyn's species was described in "*A Descriptive Catalogue of Recent Shells, arranged according to the Linnean method with particular attention to the synonyms.* 2 vols. 8vo. London, 1817." *Purpura succincta* is from Thomas Martyn's† *Universal Conchologist*, which is described by the author as "exhibiting the figure of every known shell accurately drawn and painted after nature, with a new systematic arrangement and explanatory tables in English and French; also figures of nondescript shells collected in different voyages to the South Seas since the year 1764, with seventy-seven coloured drawings of shells. London, 1789. 1 vol. 4to." I have had a copy of this very rare work sent to me from London for inspection. It is extremely costly, and was only the first volume of a work which was never finished. The author also published "Drawings of Shells of the South Sea. 1 vol. 4to., fifty-eight plates." The whole work is an *édition de luxe*, and cannot be too highly praised for accuracy as far as it goes. The

\* This work of Meuschen's must not be confounded with the catalogue previously published by Gronow himself, entitled *Zoophylacium Gronovianum*. It came out in 3 parts, viz.:—Fasc. 1, 1763; Fasc. 2, 1764; Fasc. 3, 1781. There are twenty copper plates of figures and descriptions of 589 species. The method is Linnean.

† This author must not be confounded with W. F. Martyn, who wrote a "New Dictionary of Natural History," 2 vols. folio, coloured plates (many shells). London, 1785."



author was a systematist, but not of much genius. He gave tables of the Linnean method as well with many valuable observations on conchological writers. Gmelin was the continuator of Linné, and published a 13th edition of the *Systema Naturæ*, in 8 vols.; Leipsic, 1788-93. He is said to have raised the number of species of shells to 2,334. Messrs. Maton and Rackett,\* however, do not give him much credit for either accuracy or genius, or to his translator Turton. The names of Martini and Chemnitz occur pretty constantly in every conchological work of modern times. Both authors were engaged upon one work which is entitled "*Neues Systematisches Conchylien-Cabinet*." It was begun by F. H. W. Martini, who published the 1st volume in 1769, 2nd volume 1773, the 3rd 1774. The work would have been left unfinished but for a Danish clergyman named J. H. Chemnitz, who published the 8 concluding vols. as follows: 4th, 1780; 5th, 1781; 6th, 1782; 7th, 1784; 8th, 1785; 9th, 1786; 10th, 1788; 11th, 1795. An alphabetical index of specific names was added by J. S. Schrötter, in 1788, to the first 10 vols. All were published at Nuremberg. There were over 4,000 coloured figures, and in the latter volumes very many species from the South Seas. It is one of the most valuable of the old works, though some of the figures are barely recognizable. Its greatest value was from the new materials which it made use of from various cabinets, more particularly that of Spengler, who had one of the finest collections then known.

In the year 1797, George Humphrey, F.L.S., the chief dealer in shells then living, published a small pamphlet entitled, "*Museum Calonnianum*—Specification of the various articles which compose the magnificent Museum of Natural History collected by M. de Calonne in France. London, May 1, 1797." It was published anonymously. I mention this work, as it is much mixed up with the question of nomenclature. Some naturalists have claimed for it a merit to which it is scarcely entitled, and would even make the genera of Lamarck give way to it. The latter published his work, *Vers Testacés, Tableau Encyclopédique et Méthodique*, Paris, 1797-98, 390 Plates, a year later, but Humphrey's work is in every way inferior. It is a mere list without any definitions, its principal merit being in the indication of several good genera. We may be sure, however, that through Mr. Humphrey a large number of Tasmania shells became known to the world.† His son was one of the very early colonists. Had

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\* "A Historical Account of Testaceological Writers." *Linnean Transactions*, vol. 7, 1804. I have found this essay of great use to me, though some of the omissions are remarkable, and the details at times scanty.

† Mr. Swainson, in his "Shells and Shell-fish," goes so far as to say that Brugiere and probably Lamarck and Cuvier, borrowed from Humphrey without acknowledgment.



the pursuit of shell-collecting any really scientific pretensions at that time we should have had little to glean; but size and colour were more regarded then, so that the smaller shells or the unattractive shells were left for the scientific gleaners.

In the list I have given of the shells with pre-Lamarckian names there are none which may not have come from Australia, as they are equally common there, and two, as we have seen, extend to the Indian Ocean. One, *Patella radians*, Gmelin, cannot be made out at all, unless I am right in supposing that it is one of the many varieties of Quoy's *Acmaea septiformis*. (*Patelloidea s.* in his work.)

Having stated what I think important in reference to those books in which the older names of Tasmanian shells are to be found, I proceed to give a list of all the books in which any part of the same fauna is described. I have marked with an asterisk those works which I have not been able to consult, and shall merely name the works already referred to, marking them thus †.

First enumerating the serials, we have:—

1. PROCEEDINGS OF THE ZOOLOGICAL SOCIETY OF LONDON—generally. The earlier numbers containing the monographs of Hinds, Reeve, Adams, and the later (from 1865) the lists of Australian fauna of Angas.
2. ANNALS OF NATURAL HISTORY generally.
3. PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON—the earlier transactions.
4. THE ZOOLOGICAL JOURNAL. 5 vols., 8vo., with supplementary coloured plates. London, 1825-35.
5. PROCEEDINGS OF THE ROYAL SOCIETY OF N. S. WALES from 1866.
6. PROCEEDINGS OF THE ROYAL SOCIETY OF VICTORIA from 1857.
7. PROCEEDINGS OF THE ROYAL SOCIETY OF TASMANIA, years 1854-55, contain valuable papers by W. Swainson. Years 1875-76-77-78, papers on conchology from myself and various authors.
8. PROCEEDINGS OF BOSTON NATURAL HISTORY SOCIETY, containing all Dr. A. A. Gould's papers, descriptions of Australian shells in nearly every volume.
9. JOURNAL DE CONCHYLIOLOGIE, from 1860 to date, containing all the diagnoses of Crosse and Fischer's new Australian shells, and numerous monographs and lists of our fauna.
10. BRITISH MUSEUM CATALOGUES. All the conchological ones contain Australian materials, notably the elaborate diagnoses of Deshayes.



- 11†. LINNE. The tenth edition is the first which contains any details about conchology. The other works have been referred to already.
- 12†. MARTINI and CHEMNITZ, *ut sup.*
- 13†. MARTYN'S UNIVERSAL CONCHOLOGY, &c.
- 14†. HUMPHREY. MUSEUM COLON., *ut supra.* I have only seen Swainson's reproduction of his system.
- 15\*†. MEUSCHEN, *ut supra.*
- 16\*†. DILLWYNN'S CATALOGUE.
17. THE MALACOLOGICAL AND CONCHOLOGICAL MAGAZINE. By G. B. Sowerby, Parts I & II, London, 1838-9.
18. SPECIES CONCHYLIIORUM, or concise original descriptions and observations of all the species of recent shells, with their varieties. Part I containing a monograph of the genus *Cymba*, by W. J. Broderip, and monographs of the genera *Ancillaria*, *Ovulum*, and *Pandora*, by G. B. Sowerby. 4to, 14 col. plates. London, 1830.
- 19\*. A catalogue of the shells contained in the collection of the late Earl of Tankerville, arranged according to the Lamarckian Conchological System; with an appendix containing the descriptions of many new species. Small 4to. 9 col. plates. London, 1825. By G. B. Sowerby.
20. THESAURUS CONCHYLIIORUM, or figures and descriptions of shells. By G. B. Sowerby, jun., London. Begun in 1842, and continued for some years. I have only seen three volumes, and believe that the work was not continued.
21. A CONCHOLOGICAL MANUAL. By G. B. Sowerby, jun., 8vo., second edition, 662 figures (only 500 in the first edition). London, 1842.
22. CONCHOLOGICAL ILLUSTRATIONS, or coloured figures of all the hitherto unfigured recent shells. Containing monographs of *Cardium*, *Chiton*, *Bulimus*, *Murex*, *Cancellaria*, *Conus*, *Neritina*, *Fissurella*, *Eulima*, &c. 2 vols., 12mo., 158 coloured plates. London, 1832-41. The figures excellent, but the letter-press very bad, and the arrangement confused.
23. THE GENERA OF RECENT AND FOSSIL SHELLS. 2 vols. 8vo., 266 col. plates. By James Sowerby. London, 1820-24.
24. SWAINSON'S TREATISE ON SHELLS AND SHELL-FISH. London, Longmans, 1840. 12mo. Woodcuts only, but good figures. A rather fanciful work, but some of the genera have been adopted, and full justice has hardly been done to it. It is one of Lardner's Cabinet Cyclopædia.



25. EXOTIC CONCHOLOGY, or drawings of rare, beautiful, or undescribed shells. 4to., 48 col. plates. London, 1834. By W. Swainson. Contains only one or two Australian species.
- 26\*. APPENDIX TO THE CATALOGUE OF THE BLIGH COLLECTION. By W. Swainson. I have not seen this work; my knowledge of it is derived from the reference in the Exotic Conchology.
27. ZOOLOGICAL ILLUSTRATIONS, or Original figures and descriptions of new, rare, or otherwise interesting animals. By W. Swainson. 3 vols., 8vo; 182 col. plates of birds, insects, and shells. London, 1832-33.
28. CATALOGUE OF MARINE MOLLUSCA, &c., OF NEW ZEALAND. By Capt. F. Wollaston Hutton, N.Z., 1869.
29. CRITICAL LIST OF MARINE MOLLUSCA OF NEW ZEALAND. By Dr. E. von Martins, N.Z., 1872.
30. Addenda and Corrections to same. 1877.
31. \*BORN (Ignatius, Baron) TESTACEA MUSEI VINDOBONENSIS. (A Catalogue of the shells preserved in the Museum of the Empress of Austria at Vienna.) 1 vol., fol. Vienna, 1780. It is printed in German and Latin. The method is Linnean, descriptions terse and correct, with a copious list of synonyms which is very valuable. There are 616 species described, with indexes to the German, Dutch, French, and English names. Two years after the publication of the descriptive letter-press, which forms a thick volume, the plates appeared, 18 in number, with above 200 figures, in a splendid folio. I am not aware that there is a copy in any of the Australian Colonies.
32. CONCHOLOGICA SYSTEMATICA, or a complete system of conchology. By Lovell Reeve. 2 vols., 4to, col., 1,500 figures. London, 1842.
33. ELEMENTS OF CONCHOLOGY, an introduction to the Nat. Hist. of Shells and of the animals which form them. By Lovell Reeve. 2 vols., large 8vo., with 174 col. plates, containing 370 figures. London, 1860. The system is Lamarck's nearly. There is a useful list of all the species.
34. CONCHOLOGICA ICONICA. A complete repertory of species, pictorial and descriptive, 4to. London. By Lovell Reeve. This work was begun in 1842, and is continued to the present day. It forms perhaps the most accessible general work we have, and therefore the most valuable. It must be admitted, however, that the diagnoses are faulty and brief, and the habitats can



seldom be relied upon—Tasmania, Australia, and New Zealand are confounded; but in this respect most European writers are not particular. The figures are generally very good. But since Australian and Tasmanian conchology have made their greatest advances subsequent to the earlier monographs, the work will be necessarily very incomplete for the Australian provinces unless a supplement should be published.

35. *ICONOGRAPHIE DES COQUILLES VIVANTES.* Par L. C. Kiener. Paris. 4to. A series begun in 1834, and very similar to Reeve's. I have only seen one or two parts, but in those the figures, &c., seemed to me superior to the English work.
36. *DIE SUDAFRIKANISCHEN MOLLUSKEN.* 4to., 6 coloured plates. Stuttgart, 1848. By Prof. Ferd. Krauss. Though this work professes to deal only with S. African shells, a good many Australian and Tasmanian species are described amongst them. Dr. E. von Martins states that in the collections sent to the Museum by Baron von Ludwig there were a good many Australian shells, and that Krauss was not aware of this.
37. *VOYAGE OF H.M.S. "SULPHUR."* Zoology. 4to. Lond., 1839. Mollusca by S. Hinds. A very few Australian species in this work, but it may be consulted for the tropical fauna.
38. *VOYAGE DE LA CORVETTE "L'ASTROLABE"* sous le commandement de M. Dumont d'Urville. Paris, 1835. Zoologie, par Quoy and Garmard. 4 vols., 8vo. Atlas with coloured plates. This work is one of the most valuable we have for Australian species. The figures are good, and the drawings of the animals, anatomy, &c., very full and detailed.
39. *VOYAGE OF H.M.S. "SAMARANG."* Zoology. 4to, coloured plates. London, 1848. Mollusca by Arthur Adams, R.N. Useful for our tropical fauna. The drawings of the animals are most useful.
40. *VOYAGE OF H. M. S. "RATTLESNAKE."* 2 vols. 8vo. London, 1852. Appendix on the Mollusca by Prof. Forbes. A very few tropical Australian species described.
41. *KING'S VOYAGES IN AUSTRALIA.* London, 1827. The appendix on the Mollusca, by J. E. Gray, of the British Museum, is very full, and contains many descriptions of new species, which, however, are rather too brief. It must be consulted in all questions of nomenclature.



42. DIEFFENBACH'S NEW ZEALAND. 2 vols., 8vo. London, 1843. The appendix to this work is also by Gray, and contains very many new species.
43. YATE'S NEW ZEALAND. Appendix by Gray, with many new species. In this and the preceding work the diagnoses are far too brief. 1 vol. 8vo. London, 1835.
- 44.† LAMARCK, *ut supra*.
45. MENKE MOLLUSCORUM NOVÆ HOLLANDIÆ SPECIMEN. Hanover, 1843. 4to. A very thin tract in Latin which contains full diagnoses of a large number of Australian species, the most of which, however, were from the south-western part of the continent. A few Tasmanians are to be found amongst them. The work is very rare; I have never seen but two copies in Australia. There are none in any of our public libraries. It would be a very small expense, but a great boon to reprint it.
46. WOOD'S GENERAL CONCHOLOGY. London, 1815, with 59 coloured plates, 8vo.
47. WOOD'S INDEX TESTACEOLOGICUS, or a catalogue of shells, British and foreign, arranged according to the Linnean system. 8vo., 2nd edition, 2,300 coloured figures. London, 1828. Supplement with 480 coloured figures. This work, though the figures are all of one size and small, yet are tolerably executed. The arrangement is very confusing; but still, I may safely say it is indispensable to any person collecting, and is a very convenient handbook of species.
48. GENERA OF MOLLUSCA, by A. & H. Adams. 3 vols., small 8vo., with 138 plates. London, 1858. This is certainly one of the most valuable books on the subject; but, according to the opinion of many, much marred by the revival of many useless genera, and by the substitution on the most slender claims, of the forgotten names of Humphrey, Bolten, Montague, &c., for the well-known ones of Lamarck. I shall refer to this subject again in this essay.
49. WOODWARD'S MANUAL OF THE MOLLUSCA, being a treatise on Recent and Fossil Shells. 3rd edition, with an appendix of recent and fossil conchological discoveries, by Ralph Tate, pp. xiv, 542, 86; 23 plates and many woodcuts, 8vo. London. The appendix treats of those recent and fossil shells not mentioned in edition 2. It contains, therefore, descriptions of all the genera founded since 1866. It is separately paged, and illustrated by 27 woodcuts. No commendation is needed for this most excellent manual. There is no other book



in any language like it for cheapness and high scientific character. It has done more to popularize conchology than any other book in the range of the subject. Professor Tate's additions are very valuable.

50. MANUEL DE CONCHYLIOLOGIE et de Paléontologie conchyliologique, par le Dr. J. E. Chenu. 2 vols., large 8vo. Paris, 1859. This work is illustrated by very nearly 5,000 exquisite wood engravings. It is much more costly than Woodward, but then its range is much wider. A very large number of Australian species are figured. With its aid one ought to be able to arrange and name the most of the species in any collection.
51. A MONOGRAPH OF AUSTRALIAN LAND SHELLS, by James C. Cox, M.D., 8vo., Sydney, 1868, with 18 coloured plates, containing over 400 figures. This work, I need hardly say, is perfect of its kind, and reflects the highest credit upon the author. It is truly an astonishing production for a young Colony.
52. COX'S EXCHANGE LIST OF AUSTRALIAN SHELLS, Sydney. Names only. Dr. Cox very properly did not undertake the question of synonymy or genera, but merely gave a list of such species as he had recognized.
53. A MONOGRAPH OF THE LAND SHELLS OF TASMANIA, 1 vol., 8vo., Tasmania, 1873. By W. Legrand. A smaller work than that of Dr. Cox, but nearly equal to it in finish and completeness.
- 54.\* FAVANNE DE MONTEVILLE, père et fils. 3 vols., 4to., Paris, 1780. This is an augmentation of D'Argenville, *vide supra*.
- 55.\* KOCH in Abbildungen und Beschreibungen neuer oder wenig gekannter Conchylien. 3 vols., 4to., col. plates. R. A. Philippi. Cassel, 1842-50.
56. PFEIFFER MONOGRAPHIA HELICORUM VIVENTUM. 2 vols., 8vo. Leipzig, 1848.
57. JONAS Zeitschrift, für. Malac., &c. The German Journal of Conchology, in which many Australian species are described.
58. C. F. SCHUMACHER. Essai d'un nouveau système des habitations des vers testacés. Copenhagen, 1817. 4to., plates. I only know of one copy of this scarce work in these Colonies, which is in the library of the Royal Society of Tasmania.
- 59.\* H. C. KUSTER. This is a new edition of Martini and Chemnitz, published in Nuremberg from 1837, and for many years subsequently. Many new Australian shells are described.



60. DESHAYES HISTOIRE NAT. des animaux sans vertèbres. This is a second edition of Lamarck from 1835-45, in 11 vols., 8vo. In this edition Milne Edwards also assisted. A good many† of the Tasmanian shells are described in it, but the diagnoses are very brief.
61. DESHAYES TRAITE ELEMENTAIRE DE CONCHYLIOLOGIE. 8vo., 8 pl. Paris, 1838.
62. THE YOUNG CONCHOLOGIST'S BOOK OF SPECIES. Univalves. 12mo., with figures. London, 1840. By Silvanus Hanley.
63. An illustrated and descriptive CATALOGUE of recent shells. By SILVANUS HANLEY. 8vo. London, 1844.
64. COOPER in Magazine of British Zoology, vol. 2.
65. BLAINVILLE in Bulletin des Sciences Naturelles. Feb., 1817.
66. BLAINVILLE. MANUEL DE MALACOLOGIE et de Conchyliologie. 2 vols., 8vo., 87 plates. Paris, 1836-7.
67. ED. DONOVAN. THE NATURALIST'S REPOSITORY, vol. 3, p. 78. (The whole work is in 5 vols., 1824-27.)
- 68.\* SPENGLER Schrift. Nat. Ges. Z. V. Copenhagen, 1790.
69. D'ORBIGNY-ALCIDE. Voyage dans l'Amérique Méridionale, dans 1826-33. Mollusques Foraminifera et Géologie. Paris, 4to., 1834-44.
70. A. Adams and Angas refer to the Zool. of Beechey's Voy. of the "Beagle" for a description by Sowerby of *Patella costata* = *Acmaea costata* Angas. I have not been able to find any such name.
71. JAY'S CATALOGUE OF SHELLS, 4to. New York, 1852. This contains a very extensive list of Australian and New Zealand species. There is also a bibliography, though not extensive, in the library catalogue of the author at the end of the work.

I have not arranged these works chronologically, because I have kept the works by the same authors together. I have only enumerated those authors or those works where the original figures or descriptions, or both, of species inhabiting Tasmania are to be found, or else of works which will give the greatest help in the classification of the Tasmanian fauna.

It remains to state that until the date of the census published in last year's Proceedings of the Royal Society of Tasmania, nothing whatever was done towards a classification of the mollusca of those seas. Indeed it has only been lately that anything has been done towards making a census of the mollusca of any part of Australia. The first step was by Mr. Angas, who, in 1865, published a very complete list of the shells of South



Australia. This appeared in the Proceedings of the Zoological Society, and was accompanied and followed by the description of very many new species. In 1867 a similar list was made in the same periodical for the mollusca of New South Wales. This, however, was more than a list, for it had descriptions or a short diagnosis of each species dealt with. Ever since that time Mr. Angas has been making additions to the list by publishing new species, and we may say that no naturalist has so persistently laboured to classify Australian shells, or done more for our molluscan fauna. Next to him Dr. Cox and Mr. J. Brazier. The latter, in his painstaking enumeration of the mollusca of the Chevert Expedition, has done much to simplify the labours of all future observers.

I now proceed to enumerate from the works of the naturalists named above what shells Tasmania really possesses; for the mistakes of habitats found in most European writers are really innumerable. I find the following shells mentioned as occurring in Tasmania which I have not been able to trace. *Ancillaria mucronata*, Sowerby; *Terebra Kieneri*, Deshayes; *T. nitida*, Hinds; \* *Conus pontificalis*, Lamarck; *Littorina philippi*, Carpenter; *Clanculus nodulosus*, A. Adams; *Cerithium serotina*, A. Adams; *Zizyphinus granulatus*, Born; *Patella costata*, (?) *Patella radians*, Gmelin; *Chiton*: *C. piceus*, Gmelin; *C. proteus*, Reeve; *C. glaucus*, Gray; *C. Sinclairi*, Gray; *Corbula zelandicus*, Gray; *Anapa triquetrum*, Hanley; *Tellina diemanensis*, Deshayes; *T. tristis*, Deshayes; *Gari compta*, Deshayes; *Hiatula vitrea*, Deshayes; *Semele exigua*, H. Adams; *Callista planetella*, Lamarck; *C. candida*, Deshayes; *C. rutila*, Desh.; *C. citrina*, Lamarck; *Dosinia coryne*, A. Adams; *D. crocea*, Deshayes; *Rupellaria brevis*, Quoy; *Mytilus Dunkeri*, Reeve. To this may be added *Patella limbata*, which Phil states came from N. Australia, but which has been identified with *P. tramoserica* Chemnitz; but whether rightly or no we have no authentic specimens to determine. Some of these shells are distinctly stated to have come from Tasmania by the authors, and others are referred to as coming from places which can only be doubtfully identified with Tasmania.

It is curious however to observe the converse of this list, that is, of shells which are attributed to other countries which belong only to Tasmania. A list has lately been published in the *Journal de Conchyliologie* (1878, p. 1), by Capt. F. W. Hutton, of the shells known to occur in New Zealand and the Chatham Islands. In this list is given the names of shells attributed to New Zealand, but which the author had been unable to find there. Amongst those the following are found in Tasmania—*Thalotia conica*, Gray; *Siphonaria diemanensis*, Quoy; *Mytilus*

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\* This is a West Australian shell.



*hirsutus*, Lamarck; *Venus* (*Chione*) *lamellata*, *Cardita amabilis*, Deshayes' Lamarck; *Cominella lactea*, Reeve; *Haliotis albicans*, Sw.; *Littornia vilis*, Reeve (which is a young and dwarfed species of *L. pyramidalis*, Quoy); *Kraussia lamarckiana*, Davidson.

On the other hand, some of the missing shells of the former list are chronicled as occurring in New Zealand, which is the true habitat of the following—*Chiton sinclari*, *Chiton glaucus* *Corbula zelandica*, *Mytilus dunkeri*.

I must now refer to another matter, that is, the names of the genera. Mr. G. F. Angas, in his list, has followed the generic names of Messrs. Adams in his critical list, a plan which I have not adopted. My reasons for this are best found in the words of M. Chenu, whose opinion I shall quote in the extract which follows—"Lamarck is the true founder of conchology as a science, and his generic names, which were always judiciously chosen, have been universally adopted. They belong to science, and consecrated by use ought to be preserved, if we do not desire to throw into confusion a science which is already complicated enough, and which the necessary creation of new genera is complicating still more. Let us leave to Lamarck the credit which no one can deny him, and do not let us uselessly re-baptize his families and his genera for the sake of ascending to equivocal and trifling genealogies, which are not in most cases improvements. The principle of priority is a good one, but it is not advisable to apply it too strictly in such cases, and above all in the names of genera. Most of the authors whose generic names are thus revived knew but a small number of species, and their observations were too limited for the names they employed to have any other importance than their historic interest. The collections with which Linné had to deal were not proportionate to the power of his genius, and we cannot suppose that he would have misunderstood the differences which did not escape Lamarck, whose opportunities for observation were more than double, and which have led him to divide the great genera proposed by that prince of science. It was thus that Lamarck, more favoured than Linné, was able to lay the foundations of conchology, and as it were incorporate the science, but at the same time giving us an example by respecting the names given by his predecessors when they had come into general use. For instance, if he divided a genus of the Swedish naturalist into many others, he kept the name given by his illustrious predecessor for the principal one. We have always thought that everything should be avoided which tends to render the access to science difficult, and all that would discourage the first steps. But we regret to see that Messrs. Adams, in order to submit themselves to the principle of priority, have adopted names generally ignored or completely forgotten, for genera



which all conchologists know perfectly well by names long consecrated by use. We will give some instances to prove that certain names which have no motive whatever for their adoption, cannot be preferred at the present day to names given since or about the same epoch by a man of science, whose book is still the most sure and most generally adopted guide. Who is the collector of the present day who would go back willingly to the names given formerly by Bolten, Klein, Gronovius, Humphrey, Link, and Denys de Montfort, to genera which often did not exist, or whose characters, relations, and limits Lamarck was the first to establish? If we place side by side of the names employed by Lamarck the old names whose revival we condemn, the question will be decided at once. Thus—*Architectonica*, Bolten = *Solarium*, Lamarck. *Bursa*, B. = *Ranella*, L. *Angavia*, B. = *Delphinula*, L. *Harpago*, Klein = *Pterocera*, L. *Actinobolus*, K. = *Cardita*, L. *Pentadactylus*, K. = *Ricinula*, L. *Dactylus*, K. = *Oliva*, L. *Gladius*, K. = *Rostellaria*, L. *Amphiperas*, Gronovius = *Ovula*, L. *Eutropia*, Humphrey = *Phasiarella*, L. *Isognomum*, K. = *Perna*, L. *Umbonium*, Link = *Rostella*, L." After stating his appreciation and admiration of the labours of Messrs. Adams, whose divisions he follows where possible, as well as those of Albers, Pfeiffer, and partly Gray, and after making every allowance for fossil genera, M. Chenu states that he preserves all the names of genera hitherto received, and he expresses a hope which I am sure has been generally reciprocated, except by a very few conchologists in England, that a stand will be made for the defence and preservation of the old names. Otherwise, he says, we must begin to forget the scientific language we have learned, and which is not such a simple thing, but with which we are now familiar for more than half a century, to acquire a new language which offers us no advantage whatever."\*

I am sure there are few who will not be convinced by this most reasonable appeal. What have we to gain by the new names? They are not better and they are of doubtful import, for many of them have not been defined. But if we do adopt them will all European conchologists adopt them? Certainly not. And if they did would the geologists do so? I think not. In any case the whole science of paleontology would have to be learned again, and all the books hitherto printed on the fossils would be useless, and only tending to confuse or mislead those who relied on them for scientific names. Besides, paleontologists cannot adopt those sub-divisions which rest on the animal alone; they can never study that part of the subject, except indirectly.

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\* See Preface to *Manuel de Conchyliologie*.



For these reasons, therefore, I have declined to follow the example of Mr. G. F. Angas, whose labours in other respects have been such a wonderful help to conchology in Australia. I cannot consent to call the well-known *Phasianella* by the name of *Eutropia*, *Ranella* by the name of *Bursa*, *Modiola* by the name of *Perna*. The latter is a good instance of the confusion which would result, for *Perna* is a most important name in geology, and means quite a different shell. Neither will I call *Pectunculus* *Axinia*, but I need not extend the list, which will, I hope, speak for itself.

It must not be imagined, however, that on this account all the names are to be rejected which have been introduced by the necessity of creating new genera. But I have not adopted all the new genera. Some of them appear to me to be erected on slight and insufficient grounds. Yet it was not so much on that account that I have not adopted them, because my experience is not wide enough to pronounce on systems which far more learned, and more experienced and industrious men have erected after such care and labour. But I have been doubtful of their application to Australian shells, and in cases where the genera were wholly Australian I may perhaps safely estimate their value, but upon what grounds I have always given and will always give scientific men an opportunity to judge.

In the census published by me I did not attempt to mention families, except in rare and undisputed instances. With regard to this part of the subject we may well say "*adhuc sub judice lis est.*" From the time of Linnæus to our own day systems have followed one another in increasing rapidity. To mention only a few of the leading ones: Lamarck, Cuvier, Blainville, Ferussac, Latreille, Deshayes, D'Orbigny, Savigny, Sander Rang, Milne Edwards, Schumacher, Hartmann, Muhlfieldt, Philippi, Pfeiffer, and Albers, on the Continent, and Humphrey, Fleming, J. E. Gray, Swainson, Adams, and Gwynn Jeffreys, in Britain, have not succeeded in establishing a system which all accept. Still there has been progress. Even some of Lamarck's divisions are still preserved. In the beginning all were too artificial, and now the aim at a perfectly natural arrangement prevents anything short of a perfect system being stationary. It would have been well if some had known where to stop in this matter. As far back as 1822 an eminent Scotch conchologist, Dr. Fleming, in his very able "*Philosophy of Zoology*" uttered a warning note which would be well worth our while to listen to now. He says in his preface: "There is now much declamation about the worthlessness of artificial systems and the excellence of natural methods. But this excellence is more apparent than real. Many of those natural groups which are so much praised are ill-defined, and it is even acknowledged by their admirers that precise limits must



not be assigned to them. Hence it frequently happens that the definition of a group is applicable to a few genera only, which are considered as its type, and does not embrace other genera which are regarded as belonging to it but beginning to assume the characters of some of the other neighbouring groups. There is here the use of a method where there is no precision, and a boasting that the plan of nature is followed when that plan is confessedly incomprehensible. Indeed it often happens that the admired natural method of one differs from the censured artificial method of another merely in the circumstance that different systems of organs have been made choice of as the basis of the respective classifications. Unless zoologists in the formation of their primary groups endeavour to determine those characters which all the members possess in common, admitting only such marks into the definition, and practise the same method with all the subordinate divisions, the progress of the science will be unsteady; the student will be startled at its contradictions, and the revolutions in nomenclature be as frequent as the cultivators of the science are numerous."

I now proceed to give a brief view of the Molluscan sub-kingdom as it affects Tasmania.

#### Class, CEPHALOPODA.

Argonauta, Spirula, Sepia, &c. I do not enter into detail in this matter, as absolutely next to nothing has been done towards their classification in Tasmania.

#### Class, GASTEROPODA; Sub-class, PROSO-BRANCHIATA; Sub-order, PROBOSCIDIFERA; Family, MURICIDÆ.

Shell thick, with numerous scaly spiniform projections, and more or less salient varices or spines; *operculum* oval, oblong; nucleus apical. Murex 3, Typhis 1, Trophon 9, Fusus 6, Siphonalia 5.

#### 2nd Family, PLEUROTOMIDÆ.

*Animal*, with a posterior slit in the mantle corresponding to a sinus in the shell, and a straight siphon. *Shell* turriculate, with a canal; *operculum* horny; odontophore, two lateral series of teeth only. Pleurotoma 1, Drillia 7, Clathurella 2, Mangelia 9, Daphnella 2.

#### Family, TRITONIDÆ.

*Animal*: Head large; foot short, thick, truncated in front; odontophore 7, only 3-1-3; *operculum* horny, oval, oblong; nucleus subapical. *Shell* ridged, with irregular varices. Triton 5, Tritonidea 1, Ranella (varices regular) 3, Pisania 1.



## Family, BUCCINIDÆ.

*Animal*: Head flat, large, two conical tentacles, with ocular tubercles at base; *operculum* horny, small, dentate at the edge; *odontophore*, three lingual teeth in the series, one central and two lateral. *Shell* oval, oblong, turriculate, notched anteriorly; columella smooth, rounded, with conspicuous callosity, Buccinum (*alveolatum*) 1, Cominella 5, Adamsia 1, Nassa 5. Eburna 1.

## Family, PURPURIDÆ.

*Animal*: Head small, two conical tentacles often obtuse, in the middle of which are the eyes; foot short, elliptic; *operculum* horny, with a lateral nucleus. *Shell* smooth, tuberculous or spiny; columella flattened, pointed, aperture wide with an oblique notch. Purpura 6 (this includes one of the family of Coralliophilidæ of *Chenu* our *P. madreporarum*, but the Tasmanian shell does not live on corals).

## Family, OLIVIDÆ.

*Animal*: Almost covering the shell; foot very large, with two auriculate lobes in front; *operculum* rudimentary. *Shell* polished, spire almost always very short; columella often twisted, callous.

Ancillaria 2, Oliva 1.

## Family, FASCIOLARIDÆ.

*Animal*, with an enclosed mantle and a straight siphon. *Operculum* ovate acute, nucleus apical. *Shell* fusiform, with a straight canal and plaits on the fore part of the pillar.

Fasciolaria 3. Josephia 1. The latter a genus which perhaps might belong to the Buccinidæ.

## Family, VOLUTIDÆ.

*Animal*: Head large, eyes sessile, placed at the back of the tentacles, a reversed and auriculated siphon, very large foot partly enclosing the shell. No operculum, one single line of teeth. *Shell* highly coloured, ovate, or fusiform, smooth or tuberculate with distinct folds on columella. Voluta 7, Mitra 14, Marginella 8, Erato 1.

## Family, COLUMBELLINÆ.

*Animal*: Head large, flat, foot narrow, elongated, oval, siphon short, no operculum. *Shell* short with a periostraca, spire short aperture rather narrow often toothed on the outer margin, a slight notch at the anterior end of aperture. Columbella 10.

## Family, CASSIDÆ.

*Animal*: Head large, thick with fine tentacles, eyes at base, siphon extensile, thick and salient, mantle with filaments and a double fold. *Operculum* horny, *Odontophore*, 3-1-3. *Shell* solid, globose, more or less tubercular, aperture narrow, canal abruptly recurved. Cassis 4.



## Family, NATICIDÆ.

*Animal*, very large, head small, tentacles wide apart, united by a veil-mantle almost covering the shell, eyes none or minute, *operculum* multispiral and horny, often with a second calcareous plate. *Shell* large, globose, smooth, spire short, aperture large, almost round, with an umbilicus or a callosity. *Odontophore* short, 3-1-3, central quadrate, broad based.

Natica 4, Ruma 2, Sigaretus 1.

## Family, SCALARIDÆ.

*Animal*, cylindric, foot short, sub-quadrangular, head short obtuse flattened, tentacles conical, eyes at the external base. *Operculum* horny, 1 or  $1\frac{1}{2}$  whorled, nucleus central. *Odontophore* with no central teeth, but simple transverse rows of teeth. *Shell* turriculate with ribs, mouth entire, round, reflected. Scala\* 8.

## Family, TEREBRIDÆ.

*Animal*: Head large, tentacles small, a rather long siphon between, mouth at the end, *operculum* oval, horny. *Shell* very long, conical, with a notch in the aperture.

Terebra 4 (though others are described).

## Family, PYRAMIDELLIDÆ.

This is a rather heterogeneous family, as will be seen by the genera included in it by various authors. M. Chenu makes it receive such genera as Ringicula. Messrs. Adams's definition is less than that of Gwynn Jeffreys, who includes Stylifer. But following his arrangement we should have the Families Pyramidellidæ with Turbonilla 4, Odostomia 2, Aclis 1, Fam. Eulimidæ, Eulima 5, Elusa 1, Syrnola 2, Stylifera 1, Styloptigma, Cingulina 1, Acus 1. All small shells, agreeing generally in their terriulate habit and entire mouth, with or without plaits on the columella.

## Family, CERITHIOPSIDÆ.

*Animal*: Head short, broad, tentacles subulate obtuse, eyes at base, mouth with retractile probocis, mantle not reflected with rudimentary siphonal fold, *operculum* horny, on a well developed lobe. *Shell* turreted, many-whorled, spirally keeled. *Odontophore* like Naticidæ. Cerithiopsis 2.

Family SOLARIDÆ, doubtfully represented, no species determined.

## Family, CONIDÆ.

*Animal*: Head with produced tubular veil, tentacles subulate, eyes on tubercles at outer side, mantle enclosed, an elongate siphon at fore part, foot simple, undivided, oblong, conspicuous

\* This name is Klein's, and before Linnæus, but we may adopt it as it is shorter and not much different from Lamarck's.



aquiferous pore on middle of under surface. Teeth subulate in two series, on tubular prolongation of retractile proboscis, bundle of sharp subulate teeth at extremity. *Shell* inversely conical, aperture long and narrow, outer lip thin, free or notched near suture. Conus 5.

Family, CYPREIDÆ.

*Animal*, elongate, mantle very large with many cirrous filaments, almost concealing shell, tentacles very long, eyes upon a protuberance, siphon short. *Odontophore* with seven rows 3-1-3, branchial plume single, no operculum. *Shell* in general like cowry. *Cyprea* 6 (one doubtful), *Trivia* 1, *Birostra* 1.

Family, CANCELLARIDÆ.

*Animal*, with subulate tentacles united at the base, eyes at the outside, foot small, simple and triangular without operculum, spire short, whorls convex, often cancellate and ribbed, mouth entire, no odontophore, rostrum rudimentary. *Cancellaria* 4.

Family, CERITHIIDÆ.

*Animal*, with a large foot, short, and angular, a front mantle with anterior rudimentary siphonal fold, rostrum large, short, folded, eyes at external base of tentacles, which are subulate and very wide apart. *Odontophore* long linear, 3-1-3, conical, curved. *Operculum* horny, subspiral. *Shell* turriculate, many whorls, notched at the anterior aperture, labrum produced.

*Cerithium* 3, *Lampania* 1, *Bittium* 4, *Triforis* 1.

Family, LITTORINIDÆ.

The family of Perrywinkles, best characterized by that name. See Proc. Linn. Society, N. S. Wales, June, 1878, for the reasons why I only make one genus *Littorina* of *Risella*, *Tectaria*, of which we have probably four species in Tasmania. *Fossarus* 2, *Ampularina* 3, *Fossarina* 1.

Family, PLANAXIDÆ.

*Animal*, with a long rostrum, subulate tentacles, eyes sessile on the swollen exterior base, foot short, simple with small tentacular filaments, operculum thin, horny paucispiral, *odontophore* 3-1-3, and in general much like the perrywinkles. Tasmanian representatives (included doubtfully), *Diala* 3.

Family, RISSOIDÆ.

Small white or horny shells of various forms, but more or less turriculate. *Animal* with a probosciform head and subulate tentacles, eyes at base, foot long, sub-triangular truncated in front. *Odontophore* with a 3-1-3 inner lateral; teeth very broad, outer dissimilar; all with denticulated apices.

*Rissoa* 12, *Rissoina* 7.



## Family, TURRITELLIDÆ.

*Animal*: Rostrum short, broad, tentacles long, fine, eyes at base. Mantle with a fringed margin obscurely siphonated at right side. *Operculum* horny. *Odontophore* very short, 3-1-3, median square, laterals ligulate, summits hooked, serrulate. *Shell* turreted, subulate many-whorled imperforate, spirally grooved, aperture entire, outer lip acute.

Turritella 5. Siliquaria 2. Vermetus is also placed in a different family. We have two of the former and one of the latter, or perhaps two. Both are abnormal mollusca—the latter fixed, and with the foot rudimentary. Lingual dentition unknown.

## Family, CALYPTREIDÆ.

*Animal* dilated and depressed on its sides, tentacles medium, eyes at their external base, foot large, no operculum. *Odontophore* winged on each side in front, 3-1-3, central small, broad, lateral long, hooked, gill a single plume. *Shell* limpet-like, apex subspiral, interior simple or with a diaphragm. The egg-cases in this family are membranaceous in a tuft in front of foot, under the neck. Trochita 1, Concholepas 2, Crepidula 1 or 2.

It is doubtful whether some of the species ranged under the above genera should not be placed in others. In the family *Pileopsidæ* they are not known from the animals. *Amalthea*, of which we have probably two species, is referred to the latter family, which generally corresponds to Adam's *Capulidæ*. The animals hardly differ in either.

## 2ND ORDER, SCUTIBRANCHIATA.

Hermaphrodite molluscs, with a double branchial plume in the neck, or in cirrhi round the foot.

1. Sub-order, Podophthalma—eyes pedunculate.

## Family, NERITIDÆ.

*Animal*: Muzzle broad, short, tentacles slender, eyes on stout peduncles at outer base, no head lobes or neck lappets, foot oblong, triangular, no filaments, operculum shelly, articulated, subspiral, operculum central, teeth 5-1-5, with a long comb of very numerous laterals. *Shell* depressed, oval, spire short, no umbilicus. Nerita 1.

## Family, TROCHIDÆ.

*Animal*: Head probosciform, tentacles fine, often ciliated, eyes on free peduncles at their outer base, head lobes between tentacles, gill single, long, neck lappet at sides of foot near eye peduncle, continuous with a side membrane with 3 to 5 filaments on free margin, operculigerous lobe ornamented with cirrhi, operculum horny, spiral, often calcareous. *Odontophore* like Neritidæ. *Shell* pyramidal, turbinated, or ear-shaped, pearly



within. Phasianella 5, Turbo 4, Carinidea 2, Astele 1, Liotia 5, Cyclostrema 7, Monilea 2, Ethalia 1, Adeorbis 1, Minolia 2, Clanculus 13, Euchelus 3, Thalotia 4, Zizyphinus 7, Elenchus 4, Bankivia 1, Gibbula 6, Trochocochlea 2, Trochus (Diloma) 2, Stomatella 1, Gena 1.

Family, HALIOTIDÆ.

*Animal*: Head large, flat, tentacles long, eyes on terminal peduncles, foot very large exceeding the shell, and fringed, Branchial plumes two, no operculum, shell ear-shaped, nacreous. The *Odontophore* is like Trochus 1 median, two beam-like laterals, and numerous uncini with denticulated hooks, the four inner very large. Haliotis 4.

Sub-Order EDRIOPHTHALMA, eyes sessile.

Family, FISSURELLIDÆ.

*Animal*: Head with short wide muzzle, body broad, conical, tentacles short, fine, eyes at base on protuberances, mantle margin fissured in front, free edges forming an oval siphon through apex of shell, gills two at back of neck, foot dilated upper sides with rudimentary filaments. No operculum. *Shell* not nacreous, conical, perforated at the apex or slit.

Fissurella 4, Macroschisma 1, Emarginula 4, Scutus 1, Tugalia 1.

Family, DENTALIDÆ.

*Animal*, long, conical, truncate entirely enveloped in a mantle terminated in a fringed or plicate varix, foot probosciform, head distinct and pedunculate, lips with tentacles, but no other filaments or eyes. Dentalium 2: but there are others which may belong to the genus *Cæcum*, which is a family by itself near to the Vermitidæ.

Family, TECTURIDÆ.

*Animal* like preceding, but with gill plume at back of head. *Odontophore* long, two central and two hooked lateral teeth on each side in an oblique line. *Shells* like limpets, apex not central. Acmaea 9.

Family, PATELLIDÆ.

*Animal* like preceding, but with gills in cirrhi all round foot. *Odontophore* very long, teeth simple in numerous transverse rows. *Shell* a simple cone. Patella 6 or 7.

Family, CHITONIDÆ.

*Animal* elongated. Gills in lamellæ, placed like last. Heart central, alimentary canal terminating at end of median line. *Odontophore* not long, teeth 3 central, median small, laterals large, with dentated hooks, uncini five. *Shell* of numerous plates, Chiton. 6? Cryptoplax 2.



## Sub-class, OPISTHOBRANCHIATA.

Hermaphrodite molluscs, branchia always posterior uncovered, or only covered by a fold of the mantle. Shell external or internal, testaceous, membranaceous, rudimentary, or none.

1st Order Tectibranchiata. Branchia covered by shell or fold.

## Family, CYLICHNIDÆ.

*Animal* with frontal disk, head sub-quadrate, truncate in front, produced behind into broad flattened recumbent lobes, with eyes immersed in front of their bases, mantle with posterior thickened lobe, foot shorter, thin shell truncate in front, no operculum. *Odontophore* 6-6, no median, inner large and hooked, outer uniform. *Shell* without colour, cylindrical, spirally convoluted, spire short. *Cylichna* 2, *Tornatina* 1.

## Family, BULLIDÆ.

*Animal*, partly or wholly covering shell, frontal disk expanded, no eyes or sessile on frontal disk, mantle with right margin thickened, left thin. *Odontophore*, one central tooth and lateral numerous in an arched series, gizzard with calcareous plates, foot expanded for swimming. Shell thin ventricose, spire none. *Bulla*, 1, *Haminea*, 1. I include in this *Philine* 1, but the shell is wholly covered and the head differs.\*

## Family, APLYSIIDÆ.

*Animal* large, eyes sessile, tentacles (?) ear-like, mouth with tentacles, mantle with internal calcareous plate protecting gill. *Odontophore* broad, short, teeth, central one, lateral numerous similar, gizzard with cartilaginous plates. *Aplysia* 2.

Nothing has been done hitherto with the Nudibranchiate molluscs, and I need not pursue the classification for the brackish water shells, such as *Ophicardelus* 2 and *Auricula*, as they are so widely separated from the other families that it would extend this essay too long to explain the intermediate system. Our *Marinula* is a marine shell, and until the animal is studied and known I should hesitate on what system to place it. The Family SIPHONARIDÆ is also very far removed. It is distinguished by a pulmonic cavity for respiration, a conical shell, and a short ligulate odontophore, with one small central tooth and an immense number of laterals.

The length to which this paper has extended prevents me from giving a synopsis of the Conchifera, to which I may return on a future occasion, as well as to the Land and Freshwater mollusca.

I wish to conclude with some observations on the geographical distribution of the species. I have already published my opinion that for convenience it would be well to divide Australia into several molluscan provinces. The S.E. coast forms one, Victoria

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\* The *Bullina lineata* of Wood found at Port Jackson has a horny operculum.



another, South Australia, as far as Eucla, another, and Western Australia another. In this sense we should have to divide Tasmania into two provinces. The north side, which would have its relations with the South Australian coast, and the eastern and southern, which would be found more in relation with the S.E. province of Australia. But just as there is in all these provinces the same general character, or as we term it, the same Australian facies, so in Tasmania,—it has the most of the species which are very common on the South Australian coasts. Beginning with the littoral shells, we have the same *Patella* (*P. tramoserica* Chem.) on the rocks of New South Wales, of Port Phillip, or South Australia, but it differs a good deal in character. In its young state it is streaked with bright vermillion in Victoria; on the New South Wales coast it is often a rosy red; in South Australia it is of a beautiful golden yellow; while in South Tasmania it is a dull leaden colour, and attains a much larger size than anywhere else. Perhaps the two most common shells on all the south coast of Australia are *Phasianella tritonum* and *Turbo undulatus*. Every one is familiar with the former of these shells, which assumes such astonishing varieties of colour, all of great beauty. It would be hard to find any part of the Tasmania coast where they are not washed up on the beach; but as we proceed south they become more scarce, *T. undulatus* especially so. On the other hand, the common coast shell of Tasmania is the beautiful *Venus lamellata*. On the beach of Sandy Bay, near Hobart Town, they are drifted up in immense numbers at times. The same shell is common on the north coast, and on the South Australian coasts they are considered great rarities. A shell that is very common throughout Tasmania, and equally common on all the south coasts of Australia, is *Buccinum alveolatum*, Kiener. The animal acts as a kind of scavenger to the coast. Its powers of sight or scent must be very keen, because if a large limpet is cut out of its shell and thrown into a rocky pool it is in a very short time completely covered with this mollusc. It has a long siphon or proboscis, which contains the *radula*. This is a thin sharp spear-like instrument, strongly barbed on each side. It evidently tears away the muscular tissue with great facility.

Taking Southport, Port Esperance, or Recherche Bay in South Tasmania as places for comparison, we find a very marked difference from the Australian coasts. The rocks are covered with *Patella tramoserica*, *P. ustulata*, *Acmæa altcostata*, *A. marmorata*, *A. septiformis*, *Siphonaria zonata*, *S. diemanensis* *Littorina* (*Risella*) *melanostoma*. (*L. nana* and *aurea* occur, but I have shown that these are simple varieties.) *Trochocochlea australis*, *T. constricta*, with the variety *T. tæniata*, *Diloma odontis*, *Littorina cærulescens*, the many varieties *ziczac*, *Phillipi*, &c.



All these shells are between the tide marks. A little further from the shore we find *Haliotis nœvosa*, *Carinidea aurea*, *Cominella costatum*, *Purpura littorinoides*, *Ostrea edulis*, and in sandy places *Venus roborata*, *V. gallinula*, *V. conularis*, *Pecten asper*, *P. bifrons*. There are also three species of *Mytilus* in thick patches on some of the rocks, *M. latus*, *M. rostratus*, and *M. hirsutus*. In this list I mention only the most common shells, to which I may add in places, *Chiton petholatus* and *C. australis*. Compare this now with Guichen Bay on the South Australian coast. We still find *Patella tramoserica* and *Acmaea alticostata* and the usual varieties of *Littorina*. But in place of the *Trochocochlea australis*, which in Tasmania swarms under every stone, we find large numbers of a *Thalotia*, *T. conica*, with occasionally *T. picta*, and the variety (which is regarded as a species by Messrs. Crosse and Fischer), *T. Ramburi*, *Elenchus bellulus*, *E. badius* and *E. irosodontis* are also very common and very large, but not upon the rocks; they are found feeding on the sea-weeds a little way out from the shore. Now all of these shells are found on the north coast of Tasmania, but the genus *Thalotia* is not at all common. On South Tasmania it is never found so far as I could learn. *Elenchus bellulus* is found rarely in Bass's Straits. *E. badius* is not at all rare in any part of Tasmania, but rather smaller. The finest and commonest specimens appear to be found at Lacepede Bay, a little north of Guichen Bay. *Nerita atrata*, a very common shell above tidal marks on the south and south-east coast of Australia, is rarely found on the south coast of Tasmania. *Haliotis nœvosa* is common through all the S. E. and S. coasts, and in Tasmania everywhere; it forms an article of export to some Chinese fishermen on the south coast. *Haliotis albicans* is found only on the north coast; it has not been found in Victoria, and is more generally on the S. A. coast.\* The Littorindæ of Tasmania generally are those of the Australian coast, except *Littorina scabra*, and *L. pyramidata* so common on the south-east. The latter is found on the north Tasmanian coast, but rarely and very small. *Ostrea mordax*, so abundant in N. S. W., is almost entirely absent from Tasmania. *Cardium cygnorum*, from W. Australia, occurs on the north T. coast, but small and thin. It occasionally extends to N. S. W.

These remarks might be very much extended, but sufficient has been said to give a general idea of the differences of the fauna, and as the subject is too large to be disposed of in one paper, further details may form the subject of a future essay. In conclusion, I give a list of those fossil forms more or less abundant in our tertiary strata which are found living in Australia.

\* This shell was first named *H. glabra* by Swainson, but as that name was preoccupied, the name *albicans*, of Quoy, by which it is generally known, may be adopted.



*Pecten laticostatus*, south coast only, small and rare. *Limopsis decussata*, doubtfully on the north coast. *Cylichna arachis*, common. *Liotia discoidea*, rather common. *Fissurella concatenata*, rather rare, and in Sydney.

#### DISCUSSION.

The CHAIRMAN said, precisely the same thing occurred with the vegetable kingdom as with the animal, as described by Mr. Tenison-Woods. Along our own coast and the coast of Queensland there were upwards of 200 species of ferns, whereas on the west coast of Australia there were not more than two or three species. As we go to the southward and westward the number of ferns decreases, while as we go to the north the number increases. There was nothing so marked in the vegetation of this country as the want of ferns in the southern part of Victoria, South Australia, and Western Australia; whereas there was nothing more marked than the large number of ferns on the eastern coast. Some of them attained a very great height. Some of them did not extend beyond the Dandenong Range, west and south. (Mr. Tenison-Woods: I do not think there are any in South Australia.) No, but in this country they abound, and reach a height perhaps equal to any in the world. On the Blue Mountain Range they attain a height of about 60 feet. He desired to make a suggestion with regard to the discussions on their papers. The late Sir William Denison endeavoured to get short papers read in order to excite discussion. He believed if they had short papers read, they would excite discussions that would be both interesting and instructive to the members of the Society.

Dr. NEILD thought, with regard to the suggestion of the Chairman, the idea about discussions could be carried out in even a simpler way, namely, by members having the power to propose certain subjects. He was a member of an institution in England, and they met once a month and had exceedingly valuable discussions in this way. He thought the idea, if carried out, would lead to profitable results, and greatly increase the interest of the meetings.

The CHAIRMAN thought that could only be done by means of short papers.





Woods, Julian Tenison. 1878. "The molluscan fauna of Tasmania." *Journal and proceedings of the Royal Society of New South Wales* 12, 29–56.

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