

A REVIEW OF THE AMERICAN VOLUTIDÆ

By WILLIAM HEALEY DALL

In making a complete examination of the synonymy and various classifications proposed for the Volutidæ, it became evident that serious difficulties were in the way of a final revision of the whole group, on account of the obstacles to obtaining full data on many of the exotic genera, the habit of dealers in destroying with acid the characteristics of the nuclear shell, and the inaccessibility of some of the rarer species.

While the collection of Volutes belonging to the National Museum is fairly good, that portion of it relating to the American species is not only nearly complete as regards the several species, but it also contains large and unmutilated series of many of them. It was evident, therefore, that a review of the American forms was quite practicable, while a more complete revision must await fuller data and might be subject to much delay. I therefore decided to prepare the present paper.

Some sixteen years ago I was able, from a study of the recent and fossil species of our Atlantic coasts, to point out that the family was naturally divided into two great groups, in one of which the protoconch is membranous and is lost early in the intracapsular development of the young, being replaced by a shelly envelope which carries traces, when intact, of its secondary origin. In the other the protoconch is shelly from the beginning, often sculptured, and is never naturally lost except by mechanical erosion in the adult shell after it leaves its ovicapsule. These two series I distinguished as subfamilies *Volutinæ* and *Scaphellinæ* after their most characteristic genera. The latter name, however, I have since found to be inapplicable, because the real type of the genus *Scaphella* is not the species, I then supposed, but belongs to the *Volutinæ*. I now substitute for the second subfamily the name *Caricellinæ*, the genus *Caricella* of our Eocene being the ancestor of the North American series of Volutes with a membranous protoconch.

During recent years some very important data in regard to the anatomy of various species has been gathered and it is evident that while certain geographical groups of Volutes are doubtless homogeneous some of the species of which only the shell had been known are possessed of markedly distinctive characteristics.

The study of the nuclear shell had afforded valuable data; to these must now be added the general features of the anatomy; the presence or absence of a cæcum to the œsophagus; the characters of the radula; of the verge, or external male organ; and the presence or absence of an operculum. The greater or less expansion of the mantle-edge over the shell has long been known to distinguish certain groups. It is probable that, when known, the characters of the ovicapsule will prove to have a certain value. I have been able to determine the characters of the radula in a number of species where it had not been known, and its absence entirely in the genera *Aurinia* and *Maculopeplum*; I have also been able to examine the verge in a number of species and find it to exhibit features which prove to have a systematic value not less than specific, and perhaps in some cases of even greater weight. It is a little remarkable that more attention has not been paid to the details of structure in this organ.

In general, in the Volutidæ the external characters of the animal include a short rather blunt foot which, in the genera *Voluta* and *Lyria*, carries a small oblong operculum which is absent in all the other groups of which the animal is known. The nucleus of the operculum is terminal or subterminal. The head is wide, provided with short, rather stout, pointed tentacles which at their bases rise from large, rounded flaps or lappets. These lappets are sometimes continuous in front between the tentacles and sometimes separated partly or entirely by a deep median sinus. In other forms there is a sinus at the root of each tentacle with a wide, more or less auriculate lappet between the tentacles in addition to the two lateral lappets. In the *Volutomitrinæ* there are no lappets at all, the eyes being situated on the apex of a tentacular projection extending parallel with the true tentacle and soldered to it for about one-third of its length. In the case of *Tractolira* and some other abyssal forms the eyes are wholly absent, but in the great majority of Volutes they are situated on the flat surface near the anterior edge of the lateral lappets, and are not raised above that surface. The verge is situated behind the right lappet and as in many other Proso-branches is, when at rest, bent backward under the mantle. There is usually an appendix or supplementary smaller projection near the distal end which may assume various shapes. In many species the verge is bent upon itself when at rest, forming a blunt angle like an elbow, in others the whole organ projects backward from its root; in *V. vespertilio* the whole mass of the organ projects forward and is soldered to the nuchal surface, only the appendix (which

in this case is exceptionally long) is free and recurved. In *Adelomelon* the appendix is short and hardly distinguishable from the body of the verge, being papilliform, as is also the case in *Aurinia gouldiana*. The seminal conduit in the majority of cases is an open groove which may be partly closed in some species by small interlacing papillæ situated on its outer edges. In several cases, however, it is a closed conduit, opening near the proximal end of the appendix.

The œsophageal cæcum in the majority of Volutidæ is present and conspicuous, but in a few forms it appears to be absent.

The radula in general comprises a long series of single teeth (103 were counted in *Volutomitra*) of rhachiglossate type. *Volutocorbis* and *Ternivoluta* alone are definitely known to possess also a series of single-cusped laterals on each side of the rhachidian tooth. The great majority of species of Volutes have the rhachidian tooth tricuspid with strong, nearly straight cusps; *Adelomelon ancilla* has the cusps strongly arcuate, while *A. magellanica* has flat cusps. In *Tractolira* and *Miomelon* the cusps are tusk-like. *Voluta* has the rhachidian wide with many small denticles, but *Lyrta* has it tricuspid. *Scaphella Turneri* and *Volutomitra* have the base strongly arcuate and carry a single straight cusp, as does *Halia priamus*.

The ovicapsules are hemispherical, or flatter, in *Adelomelon*, except *A. brasiliana* which is believed to have a subspherical floating capsule buoyed up by an enclosed air bubble. In the other species the capsule is attached by its flat side to a stone or dead bivalve shell and contains five to ten embryos swimming in a viscid transparent fluid. Nothing is yet known of the capsule of most of the species.

The surface of the animal is often brightly colored, even in the case of forms which have dull shells like *Adelomelon*, but the abyssal species are usually colorless.

The mantle in the majority of species is not extensible over the shell but in *Zidona* of the *Caricellinæ*, and *Scaphella* (= *Amoria* Gray) of the *Volutinæ*, the entire shell is sometimes covered with enamel and destitute of a periostracum as in *Oliva*. It is probable that the same is true of *Aurinia dubia*, and many fossil groups like *Liopeplum* have heavy superficial coats of enamel thus deposited.

The proboscis is partly invertible and wholly retractile.

The subfamilies of the Volutidæ are provisionally accepted as follows:

Subfamily VOLUTINÆ.

Shell with the protoconch shelly and persistent, the adult usually elegantly colored; animal with the eyes sessile on epipodial lappets;

siphonal lobe of the mantle with two appendicular lobes; verge large with an appendicular process; operculum usually absent; teeth of the radula usually in one tricuspid series.

Subfamily CARICELLINÆ

Shell with the protoconch membranous and caducous within the ovicapsule; operculum absent; other characters much as in *Voluta*. The radula variable, sometimes absent.

Subfamily VOLUTOMITRINÆ

Shell with protoconch minute (shelly?), the adult unicolor with a conspicuous periostracum; small, boreal. Eyes on stalks adherent to and shorter than the tentacles; no epipodial lappets, no operculum, no siphonal lobes; radula of a single long series, the separate teeth unicuspidate with deeply arcuate bases.

We may now consider the American species.

At first one would hardly think of America as a metropolis of *Volutes*; it is only when the scattered data are brought together, as in this paper, that it is practicable to realize that more than one third of all the known species, including *Lyria* and *Enata*, occur on the coasts of America.

There are enumerated in the present paper thirty-three species belonging to ten genera. With the exception of one *Volutomitra* common to the north of Europe, and the species of *Voluta* which reach the coast of West Africa, all the species are strictly American, the Falkland Islands being faunally a part of South America. Of the ten genera, only *Voluta*, *Lyria* and *Volutomitra* are represented elsewhere than on the coast of America. A study of our Tertiary *Volutidæ* shows that all these groups originated in American waters, though some fossils like *Eucymba* and *Volutocorbis* are now extinct in their original region and represented in the recent fauna only by species of distant seas. The geographical grouping of genera will probably prove true for the species of other regions as it has here.

The centers of distribution were evidently two; one near the southern end of South America and the other in the Antillean region. Omitting the boreal *Volutomitra*, only four species from the former center (three of them abyssal) and three from the latter (all species of *Enata*) have reached the Pacific coast north of south latitude 40°. All of them are well differentiated from their Atlantic ancestors. A much more profuse *Volute* popu-

lation as regards the number of species may be inferred from the remains in American Tertiaries, but these fossil species were nearly all of rather small size. Europe has lost still more, having only two or three species, including *Volutomitra*, remaining in her living fauna, of which none is a typical *Volute*.

Family VOLUTIDÆ

Subfamily VOLUTINÆ Dall

Genus VOLUTA (Linné) Lamarck

Voluta (sp.) LINNÉ, Syst. Nat., ed. x, p. 729, 1758; ed. xii, p. 1186, 1766.

Musica, anonymous, Mus. Calonnianum, p. 18, 1797.

Plejona BOLTEN, Mus. Boltenianum, p. 39, 1798.

Voluta LAMARCK, Prodrôme, p. 70, 1799; sole ex. *V. musica*.

Volutarius FRORIEP's trans. of Dumeril, Zool. Anal., p. 167, 1806.

Harpula SWAINSON, Zool. Ill., II, p. 77, 1832, type *V. ebraea*.

Musica MÖRCH, Cat. Yoldi, p. 124, 1852.

Chlorosina GRAY, in Adams, Gen. Rec. Moll., II, p. 617, 1858, sole ex. *V. polyzonalis* Lam., = *V. virescens* Sol.

Volutolyria CROSSE, Journ. de Conchyl., xxv, p. 99, 1877; Fischer, Man. de Conchyl., p. 610, 1884.

Tropical and subtropical shores of the Atlantic, the Caribbean Sea and the Gulf of Mexico, at the present day; fossil, from the Eocene upward, in the Tertiaries of France, the Mediterranean and the Antillean region.

The first representatives of this group occur in the Eocene and resemble more closely the recent *Lyria* than the fully evolved *Voluta*. These two genera are separated on anatomical characters which are inaccessible in the fossils, the shell characters alone being insufficient to separate the groups more than subgenerically.

The Antillean region seems to have been their center of dispersion. The inter-island distribution of the various forms is very imperfectly known but it is likely that the three species enumerated, if not all their varieties, occur over a certain portion of the West African coast as well as on the American shores. The elevation in the later Oligocene of the Central American connection between the continents of North and South America seems to have barred the later developed forms of typical *Voluta* from reaching the Pacific, where only a few small species, of the *Lyria* type, are known to exist.

The type of the genus is *Voluta musica* Linné.

VOLUTA MUSICA Linné

Voluta musica LINNÉ, Syst. Nat., ed. x, p. 733, No. 370, 1758; Lamarck, Prodr. Nouv. Class. Coq., p. 70, 1799; Sowerby Thes. Conch., Mon. *Voluta*, p. 211, pl. XLIX, figs. 36-43, 1847; Reeve, Conch. Icon., vi, *Voluta*, pl. VIII, figs. 18a-18d, pl. IX, fig. 18e, 1849.

The Music Shell of the older authors was first given a binomial name by Linné in 1758, and his references to figures include both the variety afterward named by Lamarck *carneolata*, and that which is regarded as the typical variety in the present paper. The species, in a wide sense, is common to both sides of the tropical Atlantic, but little or no attention seems to have been paid to the geographical distribution of the several varieties. The collection of the National Museum is well supplied with specimens of the American varieties, but in many cases the donor has remained satisfied with giving "West Indies" as the habitat. Linné mentioned Jamaica and Barbados as the localities for the species. A search in the literature of the subject shows as habitats for *V. musica*, without specifying the variety, Cuba, Guadaloupe, Santa Lucia, Isles de Saintes, Jamaica, Barbados, and Margarita Island, off the coast of Venezuela, where Krebs states the largest known specimens were obtained. There is no doubt that certain forms of the species, as of *V. hebraea*, occur on the west coast of Africa.

We may now consider the varieties separately.

Voluta musica typica LAMARCK.

BONNANI, Recreatio Ment. et Ocul., II, p. 155, fig. 297, 1684 (cited by Linné); Lamarck, Ann. du Museum, XVII, p. 66, 1811; Encycl. Méth., pl. 380, fig. 1, 1780; Sowerby, Thes. Conchyl., p. 211, pl. XLIX, fig. 40, 1847.

Tobago, West Indies (Rawson).

Shell short, wide, buff or yellowish white under the usual brownish tracery, with six or seven subspinose stout ribs at the shoulder of the whorl; nucleus dark brown; sparse spiral sculpture near the canal only; interior of the aperture usually white; outer lip with black spots, pillar lip with nine to eleven plaits.

U. S. Nat. Mus., 54,517 and 54,522.

Lamarck names a violet tinted race of this form, variety *violacea*. This I have not seen. A specimen marked "West Indies," collected by Wright, may have been obtained in Cuba, where he gathered plants.

Voluta musica carneolata LAMARCK.

LAMARCK, Ann. du Mus., XVII, p. 67, 1811; Encycl. Méth., pl. 379, fig. 4, 1780; Sowerby, Thes. Conchyl., p. 219, pl. XLIX, fig. 37, 1847.

Barbados (Rawson); Liberia (Osborne); Porto Rico (Gundlach).

Shell oval, with prevalent red tracery over a flesh-colored ground, smaller than the variety *thiarella* Lamarck, and narrower than the typical *musica*; nucleus orange-yellow; with eight to eleven low ribs, feebly nodose at the shoulder; middle of the whorl smooth, but with spiral cords or flat ridges in front of the suture and near the canal; aperture orange-pink with brown spots on the outer lip and nine to eleven plaits on the pillar lip.

U. S. Nat. Mus., 2937, 54,516, 54,520, 118,050, 123,452, and 129,246.

An unfigured, transversely wrinkled specimen was named variety *rugifera* by Lamarck. It was perhaps pathological.

Voluta musica lævigata LAMARCK.

LAMARCK, Ann. du Mus., xvii, p. 67, 1811; Encyl. Méth., pl. 379, fig. 2a-b, 1780; Sowerby, Thes. Conchyl., p. 219, pl. XLIX, fig. 36, 1847.

La Guayra, Venezuela (Bartleman), common; "West Indies" (B. H. Wright).

Shell oval, with seven to nine low, hardly nodulous, ribs; nucleus brown; yellowish with crowded dark zigzag blotches, the parallel brown lines tending to become obsolete; spiral sculpture faint or absent in front of the suture and normal near the canal; aperture yellowish pink; outer lip with brown spots which sometimes project as nodules, the pillar lip with eight to thirteen plaits.

U. S. Nat. Mus., 75,268, 122,218.

This, from the intensity of its dark blotches, is a very well marked and easily recognized form.

Voluta musica damula DALL, nov.

SOWERBY, Thes. Conchyl., pl. XLIX, fig. 42, 1847; Curaçao (Rawson).

Shell small, oval, with eight or nine low ribs, slightly nodulous at the shoulder; nucleus pale brown; ground color whitish, with the usual tracery in fawn-color and pale brown, with vertical brown fringe-like lines and distinct spiral sculpture in front of the suture and four or five flattish ridges on the canal; aperture livid pink, or sometimes violaceous, with brown spots on the outer lip and nine or ten plaits on the pillar lip; a specimen of four whorls, beside the nucleus, measures 42 mm. long and 21 mm. wide.

U. S. Nat. Mus., 54,521 and 29,249.

This is easily distinguished by its pale coloration and small size.

Voluta musica plicata DILLWYN.

Voluta sulcata LAMARCK, Ann. du Mus., xvii, p. 68, 1811; Chemnitz, Conch. Cab., x, p. 151, pl. 149, figs. 1403-4, 1788; Sowerby, Thes. Conchyl., p. 212, pl. LIII, fig. 87, 1847. Not *V. sulcata* Gmelin, 1792.
Voluta plicata DILLWYN, Descr. Cat. Rec. Shells, I, p. 563, No. 152, 1817.

“West Indies” (Chamberlain).

Shell oval, of much the same form as variety *carneolata*, with eight or nine low inconspicuous ribs, not nodulous at the suture, white, with nebulous fawn-colored blotches and the spiral brown lines obsolete; three narrow white spiral bands articulated sparsely with dark brown, and numerous fine brown dots on the body; whole surface spirally sulcate, the interspaces having the aspect of flattish slightly elevated bands; nucleus yellowish white; aperture whitish or yellow, with brown spots on the outer lip and ten or eleven plaits on the pillar lip.

U. S. Nat. Mus., 131,232.

A well marked variety, but hardly to be considered as a species.

Voluta musica polypleura CROSSE.

CROSSE, Journ. de Conchyl., xxiv, p. 163, pl. v, fig. 6, 1876.

Antilles?, Crosse (Coll. Prévost).

This differs from the other varieties of the species in the total absence of the brown lines which mimic a musical manuscript; by strong spiral sulcations near the canal and in front of the suture but absent from the body of the shell; and by numerous longitudinal riblets in the interspaces between the usual ribs. The nucleus is horn-color; there are eleven plaits on the pillar lip, of which three are feeble; the aperture is whitish and the shell measures 56 mm. in length, with a greatest diameter of 30 mm.

This form is only known from the specimens which served Crosse for his description and of which the provenance is unknown, but which may have come from the Antilles. It is possibly referable to the *V. chlorosina* of Lamarck.

There are several other varieties which have not, so far, been reported from the West Indian region. These are the *Voluta thiarrella* Lamarck, based on the *Voluta musica clongata* of Chemnitz, which has the spire abnormally produced, and to a color variety of which Lamarck gave the name of *Voluta nebulosa*. Another is the *Voluta guiniaca* of Lamarck, founded on a shell brought from Guinea and given by a friend to Chemnitz (Conch. Cab. xi, pl. 178, figs. 1717-18; 1795), who called it *Voluta musica guineënsis*.

VOLUTA VIRESCENS Solander

Voluta virescens SOLANDER, Portland Cat., p. 26, No. 610, 1786; after Martini, Conch. Cab., III, p. 243, pl. 97, figs. 932-3, 1777; Dall, Bull. Mus. Comp. Zool., XVIII, p. 146, 1899.

Voluta polyzonalis LAMARCK, Ann. du Mus., XVII, p. 68, No. 27, 1811; Encycl. Méth., II, pl. 379, fig. 1a-b.

Muriciformes cantinelosus MEUSCHEN, Mus. Gevers., p. 326, 1787.

Voluta fulva LAMARCK, Ann. du Mus., XVII, p. 68, No. 28, 1811; Encycl. Méth., II, pl. 382, fig. 3a-b (bleached specimen).

? *Voluta pusio* SWAINSON, Zool. Ill., II, pl. 181, 1831; Sowerby, Thes. Conch., I, p. 213, No. 47, pl. 55, fig. 119, 1847.

From Mesquital, Texas, south to Nicaragua (Fluck), to Sabanilla and Carthagena, New Grenada (Schott), West Africa (Ward), Guinea coast, etc.

This species, contrary to my former suspicions, really does occur in West Africa, and probably along the whole northern coast of South America, as well as the eastern coast of Central America, Mexico, and northward to the Gulf coast of Texas. It is a well defined species, showing little variation among the specimens I have seen. The young shell is strongly spirally sulcate, a character gradually lost with growth.

Swainson's *pusio* is, if a variety, as claimed by various writers, much wider and shorter than the typical form, though Swainson's type was evidently a bleached shell.

The *V. fulva* of Lamarck, from his figures, should be referred to this species, being probably a bleached shell. I cannot, however, agree with the opinion of Dillwyn who refers *V. guinaica* Lamarck to the synonymy of this species.

U. S. Nat. Mus., 3033, 6141, 149,756, 149,757, 186,296.

VOLUTA EBRÆA Linné

Voluta ebræa LINNÉ, Syst. Nat., ed. x, p. 733, No. 372, 1758; ed. XII, p. 1194; Hanley, Conch. Lin., p. 233.

Voluta hebræa GMELIN, Syst. Nat., VI, p. 3461, 1792; Lamarck, Ann. du Museum, XVII, p. 65, No. 20, 1811; Sowerby, Thes. Conchyl., I, p. 211, No. 43, pl. LIV, figs. 95-6, 1847.

Buccinum coronatum MARTYN, Univ. Conch., II, pl. 83, 1786.

Voluta turbinata KIENER, Icon., *Voluta*, p. 19, pl. XXVI, fig. 2, 1839.

Jamaica (Martini); Pernambuco et Maceio, Brazil, common (Greeley); West Africa (Carpenter, Rich, McGuire, Stearns); Madagascar (Humphrey).

This well known shell is rather common for one of this genus. Most of the specimens in the National Museum are African. It was found by Branner's party, common along the shore near Per-

nambuco. Most of the specimens were of the normal size, but one was picked up alive with the very respectable dimensions of 150 mm. long and 90 mm. wide. The coloration, etc., agrees closely with African specimens. The *V. turbinata* of Kiener seems to be a bleached shell, thin, and without the usual brown tracery on the body. It is by most authors referred to *ebraea* as a variety or sport.

The references in the literature to *V. "vespertilio"* from the West Indies are probably based on ill-identified specimens of this species, as the *V. vespertilio* is not known from America.

U. S. Nat. Mus., 2939, 160,706, 118,043, 18,388.

Genus LYRIA Gray

Lyria GRAY, P. Z. S. Lond., 1847, p. 141; type *Voluta nucleus* Lamarck, Ann. du Mus., XVII, p. 73, 1811. Not *Liria* Gray, Phil. Mag. and Journ., 1824.

Otocheilus CONRAD, Am. Journ. Conch., I, p. 24, 1865; figured species *Fulgoraria mississippiensis* Conrad, Journ. Acad. Nat. Sci. Phila., 2d Ser., I, p. 119, pl. XIII, fig. 1, 1848.

Harpella GRAY, in Adams' Gen. Rec. Moll., II, p. 618, 1858; *V. costata* Swainson (not Solander) = *V. anna* Lesson: not *Harpella* Schrank, 1802, *Lepidoptera*.

The genus, as becomes its age, is widely distributed in tropical seas, especially in Australasia, the Indian Ocean and the Antilles. The earliest related forms, intermediate between *Plejona* and *Lyria*, are found in the Upper Cretaceous of India and the earliest Eocene of America. The nucleus is shelly and intermediate between the minute shelly nucleus of *Plejona* and the larger and blunter nucleus of *Voluta*. Like *Voluta* the animal possesses an operculum. The verge is curved and provided with a seminal groove and a terminal slender tentacular appendage. The radular teeth have few cusps, in marked distinction from those of *Voluta*.

The group, from the shell characters, may be divided into two sections, only the first of which is found in American waters.

Lyria Gray, s. s.

Shell with numerous, sometimes obsolete, ribs, a varicose outer lip smooth within, an appressed suture, and brilliant coloration. Type *Voluta nucleus* Lam.

Harpeola Dall, nov. sect.

Shell like *Lyria* s. s., but with a channelled suture and shallow posterior sulcus. Type *Voluta anna* Lesson.

LYRIA BEAUI Fischer and Bernardi

Voluta beaui F. AND B., Journ. de Conchyl., v, p. 296, pl. IX, figs. 1, 2, 1857.

Lyria beaui TRYON, Man. Conch., IV, p. 102, pl. 31, fig. 137, 1882.

Islet of Marie-Galante, near Guadaloupe, West Indies (Beau); dredged at station 2120 by the U. S. Fish Commission steamer *Albatross* in seventy-three fathoms, muddy bottom, temperature 67° Fahr., near Grenada, W. I.

U. S. Nat. Mus., 87,718.

A defective but recognizable specimen of this rare species was dredged, as above, by the *Albatross*. It remains at present the only species known of the genus from the Antilles.

Genus ENÆTA Adams

Enata H. AND A. ADAMS, Gen. Rec. Moll., II, p. 167, 1853; first species *Voluta cumingi* BRODERIP: GRAY, Guide Moll. B. M., p. 34, 1857; sole ex. cited *Lyria harpa* BARNES, = *Voluta harpa* BARNES non Lamarck, = *Voluta Barnesii* GRAY.

This group appears to be entirely American in its distribution, being found on both the Atlantic and Pacific shores, but not elsewhere.

The shell is small, peculiarly solid and heavy, with an operculum like that of *Lyria*, from which it differs by the denticulation of the outer lips within the aperture when fully adult, usually exhibiting one particularly prominent denticle about the middle of the lip. *E. barnesii* has been generally accepted as type.

ENÆTA BARNESII Gray

Voluta harpa BARNES, Ann. Lyc. Nat. Hist. N. Y., I, p. 139, pl. IX, fig. 4, 1823; not *V. harpa* LAMARCK, Ann du Mus., VII, p. 74, 1811; nor of Mawe, Linn. Syst. of Conch., frontispiece, fig. 2, 1823.

Voluta barnesii GRAY, Zool. Journ., I, p. 511, note in errata, 1825; CARPENTER, Rep. Brit. As. Adv. Sci. for 1863, p. 554.

Peruvian coast and northward to Cape St. Lucas, Lower California. Localities represented in the National Museum: 4110, Cape St. Lucas; 4605, La Paz, West Mexico; 46,385, Acapulco; 46,386, Papanoa, Mexico; 133,241, San Jose, Guatemala; 15,919, Panama.

The name *Voluta harpa*, having been used several times, once by Lamarck for a Paris basin fossil, and later by Mawe for Lamarck's *Voluta (Lyria) nucleus*, should be rejected for the present species.

The most remarkable feature of the present species when in fine condition is its acute spire, but in worn specimens it is not so notice-

able. Its smooth arcuate ribbing contrasts strongly with the tubercular sculpture of the next species, but both have very similar coloration.

ENÆTA CUMINGI Broderip

Voluta Cumingi BRODERIP, P. Z. S. Lond., 1832, p. 33 (9 fathoms, Gulf of Fonseca); SOWERBY, Thes. Conch., 1, p. 213, pl. 55, figs. 105, 106, 107, 1847.

Lyria (Enata) Cumingii H. AND A. ADAMS, Gen. Rec. Moll., 1, p. 167, 1853; GRAY, P. Z. S. Lond., 1855, p. 62.

Magdalena Bay, west coast of Lower California, the Gulf of California, southward along the coast to San Salvador (Cuming), and Peru (Carpenter), in moderate depths of water on a muddy or sandy bottom.

U. S. Nat. Mus., 133,900, 102,598, and about ten lots from the Gulf of California.

A specimen of this species is labelled "*Lyria (Enata) Sowerbyi* Adams," in the national collection, but I am unable to trace the origin of this name, which does not seem to appear in the literature.

ENÆTA PEDERSENII Verrill

Enata pedersenii VERRILL, Am. Journ. Sci., n. s., XLIX, p. 226, 1870.

La Paz, Gulf of California, Pedersen.

Five specimens of this unfigured species were taken at La Paz by Capt. Pedersen. It is about an inch in length and differs from *E. cumingii* by having fine longitudinal striation over the whole surface, and at the upper whorls also transverse striation. It is also more slender.

The remaining American species, as far as known, are from the Atlantic or Caribbean coast.

ENÆTA CYLLENIFORMIS Sowerby

Voluta cylleniformis SOWERBY, Thes. Conch., 1, p. 214, pl. 55, figs. 112, 113, 1847.

Lyria (Enata) cylleniformis H. AND A. ADAMS, Gen. Rec. Moll., p. 167, 1853; GRAY, P. Z. S. Lond., 1855, p. 61.

Florida Strait, near the Bahama banks.

U. S. Nat. Mus., 107,494.

This rare species was dredged by the party under Dr. C. C. Nutting, from the University of Iowa. The specimen was destitute of the soft parts. The habitat of the species had not been previously known. It is a perfectly good species, not resembling either of the West American forms.

ENÆTA ARCHERI Angas

Voluta archeri ANGAS, P. Z. S. Lond., 1865, p. 55, pl. II, figs. 4, 5.

Lyria archeri TRYON, Man. Conch., IV, p. 104, pl. 31, fig. 144, 1882.

Antilles, at Montserrat and Martinique.

A rare species, which, like *E. barnesii* Gray, has much the general body sculpture of the Australasian *Lyrias*.

ENÆTA REEVEI Dall, nom. nov.

Voluta guttata REEVE, Conch. Icon., Mon. *Voluta*, pl. XXII, fig. 56, Dec. 1849; not of Dillwyn, 1817.

Lyria guttata CROSSE, Journ. de Conchyl., XIV, p. 114, 1866.

Honduras (Dyson, two specimens).

Not reported since the original collection was made. Agrees in general character with *E. guildingi*.

ENÆTA GUILDINGII Sowerby

Voluta Guildingii SOWERBY, Thes. Conchyl., I, p. 214, pl. 55, figs. 110, 111, 1847.

Lyria (Enæta) Guildingi H. AND A. ADAMS, Gen. Rec. Moll., I, p. 167, 1853; Crosse, Journ. de Conchyl., XIV, p. 115, 1866.

St. Vincent, West Indies, Guilding.

This and the preceding species are the smallest of the group, but, unless the soft parts show some peculiarities not now known, seem to belong to this group. The *Lyria columbella* Sowerby and the *Microvoluta australis* of Angas, do not, from the figures, appear to be properly included in the family *Volutidæ*, but resemble elevated forms of the *Marginellidæ*.

Genus PLEJONA Bolten

Plejona (sp.) BOLTEN, Mus. Boltenianum, p. 59, 1798.

Plejona DALL, Nautilus, XIX, Apr. 1906, no. 12, p. 143; *V. spinosa* LINNÉ (as *Conus*) selected as type.

Volutospina BULLEN-NEWTON, Proc. Mal. Soc. Lond., VII, p. 103, June, 1906; same type.

In the Eocene and Oligocene Tertiary of the coastal plain bordering the Gulf of Mexico we find a variety of fossil Volutacea, some of which prefigure the later groups to be developed, while others appear to have left no successors in a direct line. As I have frequently pointed out, the place to find the nearest relatives of a given existing fauna is in the geological strata of the region at present occupied by that fauna, or in its vicinity, and not in distant regions. Also, it is practically certain that during the Tertiary epoch the then existing invertebrates were divided into faunæ nearly or quite as well marked as those recorded to-day.

Thus the *Volutoeorbis* of South Africa has its prototypes in the Tertiaries of North America and Europe and is only distantly related to the *Volutilithes* of which it has persistently been held up as the recent representative.

The genus *Lyria* is also represented in the Eocene of the Gulf States, but not until the Pliocene do typical *Voluta* make their appearance, while I have so far not come across any fossil *Enata* in the American Tertiary. Of the typical *Volutilithes*, represented by the European Eocene *V. muricina* Lamarck, none are known from American Tertiaries, but species conchologically related to the *V. spinosa* Lamarck, for which I some time since revived Bolten's name, *Plejona*, are well represented. We do not know any typical survivors of this group.

I shall elsewhere discuss the propriety of conserving the name *Plejona*, which I revived (by the process of elimination) in the *Nautilus* for April, 1906, p. 143, for the type of *Volutilithes spinosa* Lamarck. Mr. R. Bullen Newton, seeing merely the brief announcement without discussion, has objected on grounds which it would seem further consideration will show to be insufficient. He therefore has proposed for this group the name *Volutospina*. I quite agree that this would be an agreeable way to settle a disagreeable question, but unfortunately, unless we proceed by the method of elimination in this case, we shall be obliged to do worse. Bolten proposed a genus, much more homogeneous than most Linnean genera, which was properly published. Nothing authorizes us to reject this genus; the name must be applied to part of its original content and retained.

By the method of elimination we disturb no other accepted name but fix *Plejona* on a group which happily had no acceptable name. By rejecting elimination, and taking the first species, our choice must fall on either *Voluta musicalis* or *V. ebræa*, thus ousting *Voluta* as limited by Lamarck a year later than Bolten. This is exactly what Link proposed to do in May, 1807, and if his view is accepted a long list of changes would follow which are avoided by the plan I proposed in the *Nautilus*.

At any rate, there was nothing contrary to the rules of nomenclature in proposing to adopt one of the species of an atypical valid genus as its type, which is what I did on that occasion, so that even if I desired to change the decision, at present I have no authority under the rules to do so. In nomenclature, whatever else be waived, one must follow the rules or chaos is imminent.

It may be added that the fourth, or last figure to the right, under

number 10 on Argenville's plate, is probably *Melongena cornuta* Agassiz, since *M. melongena* is, I believe, not known as a European fossil, at least as species are understood nowadays.

Subfamily CARICELLINÆ Dall

After some uncertainty I have decided to adopt this name for the subfamily, characterized by a membranous protoconch, in contrast to the shelly protoconch of the typical volutes.

Genus ADELOMELON Dall

Adelomelon DALL, Nautilus, April, 1906, vol. XIX, no. 12, p. 143. Type
Voluta ancilla Solander, 1786.
Scaphella, *Cymbiola*, etc., of authors, not of SWAINSON, 1832.

ADELOMELON ANCILLA Solander

Voluta ancilla SOLANDER, in Portland Catalogue, p. 137, no. 3061, 1786.
Founded on D'Avila's "grand Buccin Magellanique," vol. 1, pl. VIII, fig. s, no. 181, p. 140, 1767; cf. also Diderot. Encycl. Recueil des Planches, vi, pl. 67, fig. 9, 1768; Favanne, Conchyl., pl. XXVIII, fig. E, 1780; Kämmerer, Cat. Rudolstadt, pl. VII, fig. 1, 1786.
Voluta magellanica CHEMNITZ, Conch. Cat., x, pp. 138-9, 1788, *ex parte*, figs. excl.
Voluta spectabilis GMELIN, Syst. Nat., vi, p. 3468, no. 142, 1792.
Voluta ancilla LAMARCK, Ann. du Mus., xvii, p. 69, 1811; Encycl. Méth., pl. 385, fig. 3, 1816; Anim. s. Vert., vii, p. 343, 1822. GOULD, Exped. Shells, Wilkes Ex. Exped., pl. xx, fig. 358, 1852.
Voluta magellanica LAHILLE, Rev. Mus. de la Plata, vi, p. 315, *ex parte* (? pl. VII, figs. 149, 154, pl. VIII, fig. 175), 1895.
Voluta (Cymbiola) ancilla CHENU, Man. Conchyl., 1, p. 189, fig. 955, 1859.
Adelomelon ancilla DALL, Nautilus, XIX, no. 12, p. 143, April, 1906.

Hab. Argentine coast and south to 43° south latitude, low water to fifty fathoms, on sandy or muddy bottom.

This species was named by Solander in the Portland Catalogue, and by some of the early writers was confused with allied forms. I have cited only the figures which appear to relate to the same species as that of D'Avila, upon whose figure Solander's name rests. The name given by Chemnitz is a return to D'Avila's vernacular name; the former regarded *V. ancilla* as identical with his own *V. magellanica* in which he included what we now regard as several species. But the form figured by Chemnitz is not the same as that regarded as *magellanica* by most iconographers; neither is it the same as Solander's *ancilla*. The true *ancilla* was figured by Lamarck in the Encyclopedie and distinguished from *magellanica* by excellent figures. Since that time the only figure of *V. ancilla* which I

have been able to identify is that of Chenu in his manual, and even this is not entirely characteristic. Lahille figures no typical *ancilla*, so far as one can judge from his figures, which represent only the backs of the shells; the figures he gives which come nearest to true *ancilla* I have cited in the synonymy, but with doubt. It may be that the veritable *ancilla* does not extend to the upper Argentine coast. The specimens in the National Museum¹ agree exactly with the figures of D'Avila and Lamarck, and come from the Straits of Magellan.

There are reasons why the name *magellanica* should be placed in the synonymy of *V. ancilla*, but the fact that Chemnitz covered more than one species under the name, and figured one which was not *ancilla*, led subsequent writers in several cases to retain the name *magellanica* for the principal form erroneously united with *ancilla*. This seems to be a variable shell, but is heavier; on the whole more slender, with a longer spire, and shorter body whorl than *ancilla*. It is dangerous to put forward dogmatic opinions on such a subject without large supplies of material for comparison, but the aspect of the two forms is distinct, though they are doubtless closely related. Strebel's figures from specimens do not seem to include any which represent the typical *ancilla* of Solander, though he copies in a reduced form the figure given by D'Avila.

ADELOMELON SUBNODOSA Leach

Voluta subnodosa LEACH, Zool. Miscel., I, pl. VIII, 1814; SOWERBY, Thes. Conch., *Voluta*, p. 203, pl. XLVII, fig. 24, 1847.

Voluta ancilla SOWERBY, Thes. Conch., *Voluta*, p. 203, pl. LIV, fig. 101, 1847 (not *V. ancilla* SOL. or LAM.); Hanley's Wood's Ind. Test., Suppl., p. 209, pl. III, *Voluta*, fig. 1, 1856; KIENER, Icon. Coq. Viv., *Voluta*, p. 39, pl. 52, 1839.

Voluta magellanica KIENER, *loc. cit.*, p. 40, according to the description.

Voluta magellanica REEVE, Conch. Icon., *Voluta*, pl. XIV, figs. 33a, 33b, 1849; not of Lamarck.

Voluta magellanica TRYON, Man. Conch., IV, p. 97, pl. XXIX, figs. 107, 108 (copied from Sowerby figs. 101 and 24), 1882.

Voluta ambigua LAHILLE, Revista Mus., La Plata, VI, p. 317 (27 of extras) pl. VIII, figs. 163-6, pl. XI, figs. 6, 9, 11; pl. XI, figs. 11-16, 1895. Not *V. ambigua* (Sol.) Sowerby, Min. Conch., IV, p. 135, pl. 399, fig. 1, 1823, or of MATON, Lin. Trans., 1807, or LAMARCK, Ann. du Mus., XVII, p. 77, 1811.

Voluta ambigua vars. *constricta*, *pseudotuberculata*, *subnodosa* and *typica*, LAHILLÉ, *l. cit.*, pp. 27-29.

¹ Nos. 9732 and 87542.

Voluta magellanica (REEVE) STREBEL, Zool. Jahrb., XXIV, no. 2, p. 127, pl. VIII, figs. 17-24, 26-32; pl. IX, figs. 36, 41; pl. 10, figs. 53, 54, 58, 1906.

Hab. Argentine coast, near the mouth of the Rio La Plata, from low water to ten fathoms, burrowing in sandy bottom; south to Magellan Straits (Punta Arenas, etc.), and Woodcock Island, Tierra del Fuego; Falkland Islands at Port Stanley.

This species is not represented in the National Museum.

ADELOMELON BENTHALIS Dall

Scaphella benthalis DALL, Proc. U. S. N. Mus., XVIII, no. 1034, p. 13, 1895.

Gulf of Panama, at station 3360, in 1672 fathoms (3087 meters), sandy bottom; dredged by the U. S. steamer *Albatross*.

U. S. Nat. Mus., 122,998.

This species, notwithstanding the type specimen is decorticated, seems sufficiently distinct in form to be separated specifically from the southern congeners. The whorls are rounder, more nearly tabulate in front of the suture, and with a more rapidly tapering and acute spire.

ADELOMELON MARTENSI Strebel

Voluta martensi STREBEL, Zool. Jahrb., XXIV, no. 2, p. 124, pl. IX, figs. 34, 35, 42-44; pl. X, figs. 56, 56a, 1906.

"Peru" Coll. Godeffroy, in Hamburg Museum; Huelmo, Chile, near Puerto Montt, about south latitude 42°, near extreme low water, Coll. Dunker; Argentina, somewhat south of the estuary of Rio La Plata, 184 miles southeast of Cape Corrientes in 100 fathoms, Strebel; east-northeast of Cape Delgado (south latitude about 43°), Argentina, in 48 fathoms, sand; U. S. S. *Albatross* (young shells).

I have not seen the above species in the adult state, which, by Strebel's rather rude figures, would seem to be very similar to a well preserved somewhat thin and inflated form of *A. magellanica*. In the absence of adult specimens for comparison it would be rash to venture upon any positive expression of opinion in regard to its relations, but it may be observed that the spiral striation of the nepionic whorls is quite variable and, in the majority of specimens of *magellanica* which I have seen, these whorls have been more or less decorticated so as to appear smoother and more slender than they were originally. It is very unlikely that either species has been collected on the Peruvian coast, and the Godeffroy label was perhaps conjectural. The young specimens which agree with Strebel's figure bear the number 96,177 in the U. S. Nat. Mus.

ADELOMELON MAGELLANICA Lamarck

- Voluta magellanica* CHEMNITZ, Conch. Cab., x, pp. 138-9, 1788, *ex parte*, pl. 148, figs. 1383, 1384. GMELIN, Syst. Nat., VI, p. 3465, no. 110, *ex parte*, 1792.
- Voluta magellanica* LAMARCK, Ann. du Mus., XVII, p. 69, 1811; Encycl. Méth., pl. 385, figs. 1A, 1B, 1816; Animaux s. Vert, VII, p. 344, 1822; WOOD, Ind. Test., ed. 1, p. 101, pl. 21, fig. 168, 1825 (after Chemnitz and Lamarck).
- Voluta gracilis* WOOD, Ind. Test., Supple., pl. III, *Voluta*, fig. 2, 1828; ed. Hanley, p. 209, pl. III, fig. 2, 1856; (not *Voluta gracilis* SWAINSON, Journ. Sci., XVII, p. 32, Exotic Conch., pl. 43, 1821; nor of Gray, in Griffith's Cuvier, p. 601, pl. 40, fig. 4, 1834).
- Voluta ancilla* KIENER, Icon. Coq. Viv., *Voluta*, p. 39 (pl. 52 by error, really pl. 51), 1839; not *V. ancilla* Lam.
- Voluta magellanica* GOULD, Expedition Shells, Wilkes' Exped., p. 278, pl. XX, fig. 357, 1852 (animal fig'd).
- Voluta braccata* ROCHEBRUNE AND MABILLE, Miss. Cap Horn, p. 48, no. 72, 1889. Identical with the preceding.
- Voluta ancilla* REEVE, Conch. Icon., *Voluta*, pl. XVII, fig. 39, 1849; Tryon, Man. Conch., IV, p. 97, pl. 29, fig. 110, 1882; not of Gould, 1852.
- Scaphella (Voluta) arnheimi* RIVERS, Proc. Cal. Acad. Sci., 2d Ser., III, July 14, 1891.
- Voluta ancilla* LAHILLE, Rev. Mus. de la Plata, VI, p. 311 (21 of extras), *ex parte*, pl. I, figs. 9, 10; pl. II, figs. 62, 63; pl. VIII, figs. 159, 173 to 183, 184 to 192, 1895; also var. *typica* LAHILLE, p. 312, pl. XI, fig. 5; vars. *ponderosa*, *clongata* (pl. XI, fig. 2), *inflata* and (?) *expansa* LAHILLE, p. 313; and var. (?) *abbreviata* LAHILLÉ, p. 314, 1895; STREBEL, Zool. Jahrb., XXIV, no. 2, p. 92, 1906.
- Voluta braccata* "Rochebrune" STREBEL, l. c. = *V. braccata* ROCHEBRUNE ET MABILLE.

Habitat.—From about south latitude 43° on the Argentine coast south to the Straits of Magellan, from low-water mark to 77 fathoms; usually on sandy bottom in which the animals burrow. Falkland Islands, Lively Island, York Bay and Port William. Burnt Island, Orange Harbor, on sandy bottom.

If the name *magellanica* be retained at all for a species distinct from Solander's *V. ancilla*, it must be for the more slender elongate-spired form figured by Lamarck, who first clearly discriminated between the species confused by the earlier writers. Considering how badly the synonymy is mixed up, it might be best to discard the name *magellanica* entirely. In this case Rochebrune's name of *braccata* is probably the earliest which could be used for the species. This name has been altered to *bracteata* by Strebel in his discussion of the species.

The *Scaphella Arnheimi* Rivers was described from a specimen collected by the U. S. steamer *Albatross* in the Straits of Magellan,

at station 2778, in 61 fathoms, where a very large number were obtained. This specimen fell into ignorant hands and Mr. Rivers was erroneously informed that it came from Monterey Bay, California, which was the false locality with which Mr. Arnheim received it. It was an immature shell which I examined carefully and of which I possess a good drawing, thanks to Mr. Rivers. The type was destroyed after the earthquake in San Francisco, by fire, but a cotype, exactly similar, is in the National Museum, No. 102,530.

Of the names used by Lahille for varieties of *magellanica*, *ponderosa* is preoccupied in *Voluta* by Dillwyn (after Solander) 1817; *elongata* by Swainson in 1821; and *inflata* by Zekeli, in 1852. From figures alone, I feel unable to express a positive opinion as to the validity of these varieties or mutations. The animal of this species is carefully figured in the atlas of the Wilkes' exploring expedition. The original specimen from which the figure was made is No. 5752 in the National collection. A specimen was dredged by the U. S. steamer *Albatross* off Bahia Blanco, Argentina, at station 2767, in 52 fathoms, sand; U. S. Nat. Mus., 87,540.

A series of some thirty-two specimens from the Straits of Magellan illustrates the species in the National Museum.

The ovicapsule, which occurred on valves of *Pecten* and other bivalves, was described by Duhaut-Cilly in 1840,¹ and has been figured by Dall, with the enclosed nepionic shell, in the Proceedings of the National Museum for 1889.²

ADELOMELON ORNATA (Lahille)

Voluta fusiformis ornata LAHILLE, Rev. Mus. de la Plata, vi, p. 299 (extras, p. 9), pl. iv, figs. 24, 25, 26, 1895; not pl. iii, figs. 16, 17..

Habitat.—Coast of Argentina near the La Plata estuary. This fine species has little in common with *V. beckii* Broderip, to which it is referred by Lahille as a variety, except the zigzag vertical streaks of brownish coloration. By its large blunt nucleus, solid shell, strong spiral striation and general form, it seems amply worthy of specific distinction. According to Lahille it attains a length of 23 centimeters. There are two clean-cut plaits behind the one which forms the edge of the pillar. A specimen four and a quarter inches long has four whorls beside the large irregularly coiled nepionic nucleus. In *V. beckii* the nucleus is small, the spire subacute, the shell rather thin for its size, recalling *ancilla*, the plaits behind the edge of the pillar are ill-defined, and the central portion of the pillar

¹ Revue Zool. Soc. Cuvier., 1840, pp. 167-9.

² Plate IX, figs. 5, 6.

is more excavated than in *ornata*. *V. beckii* attains a larger size, according to Lahille, fourteen or fifteen inches long and over seven inches wide.

ADELOMELON BECKII Broderip

Voluta fusiformis KIENER, Icon. Coq. Viv., *Voluta*, p. 41, pl. XLIX, 1839; not of DeFrance, 1829, or Brocchi, 1814, nor of SWAINSON, 1822.

Voluta festiva D'ORBIGNY, Voy. Am. Mérid., v, p. 426, 1841; not of LAMARCK, 1822.

Voluta beckii BRODERIP, P. Z. S. Lond., 1836, p. 43; *ibid.*, 1855, p. 58; SOWERBY, Thes. Conch., no. 30, p. 205, pl. LIV, fig. 104, 1847; Tryon, Man., iv, p. 97, pl. XXIX, fig. 109, 1882.

Voluta fusiformis LAHILLE, Rev. Mus. de la Plata, vi, p. 298 (extras, p. 8), pl. I, figs. 14, 15; pl. III, figs. 16 to 23; not pl. IV, 1885; also var. *connexa*, p. 300, pl. III, figs. 19, 20 (var. *ornata* excl.).

Voluta (Cymbiola) becki STREBEL, Zool. Jahrb., xxiv, heft 2, p. 97, pl. VIII, fig. 33, pl. x, fig. 55, 1906.

Habitat.—Argentine Coast, especially toward the north. Lively Island, Falkland Islands, Miss Cobb, according to Strebel. Probably not known from Magellan Straits.

Broderip's name is earlier than Kiener's, and the latter was preoccupied in *Voluta*, to begin with, so we may feel no hesitation in rejecting it in this case. The true *festiva* of Lamarck is an East African species belonging to another group.

ADELOMELON TUBERCULATA Swainson

Voluta tuberculata SWAINSON, Exotic Conch., p. 19, pl. XXIX, 1821; Wood, Ind. Test., Suppl., *Voluta*, no. 22, 1828; KIENER, Icon., *Voluta*, p. 63, pl. XXXI, 1839; SOWERBY, Thes. Conchyl., i, p. 204, pl. I, figs. 49, 50, 1847.

Voluta (Cymbiola) tuberculata SWAINSON, Exotic Conch., ed. II, p. 19, pl. XXIX, 1841; Catlow, Conch. Nomen., p. 306, no. 56, 1845; STREBEL, Zool. Jahrb., xxiv, heft II, p. 102, pl. IX, figs. 38, 39, 47, 1906.

Voluta americana REEVE, P. Z. S. Lond., 1856, p. 2, pl. 33, figs. 1, 2; Tryon, Man. Conch., iv, p. 94, pl. 28, figs. 100, 101, 1882 (nepionic shell).

Voluta cleryana PETIT, Journ. de Conchyl., v, p. 182, pl. VI, figs. 3, 4, 1856; Crosse, *ibid.*, xix, p. 294, 1871 (young undeveloped specimen).

Voluta tuberculata LAHILLE, as of Wood, with varieties *ferruginea*, *deci piens*, *fulgurca*, and *pseudofusiformis*, Rev. Mus. de la Plata, vi, pp. 340-42 (extras, pp. 30-32) pl. I, figs. 12, 13; pl. VII, figs. 140 to 146; pl. XII, figs. 3-6, 1895.

Southern Patagonia and northward on the Argentine coast, and, in deeper water, to Cape San Thomé, Brazil, about south latitude 22°.

The two Brazilian shells figured by Reeve and Petit are in the

nepionic stage, less than two inches long, and, from the figures, are probably referable to this species.

Specimens were collected by the U. S. Exploring Expedition under Wilkes near the mouth of the Rio Negro, Argentina, and by the U. S. steamer *Hassler* in the Straits of Magellan.

U. S. Nat. Mus., 7484 and 98,461.

This species seems nearest related to *brasiliانا* and *Beckii*, but has been regarded as sufficiently distinct by several good authorities. Reeve unites it with *subnodosa* under the name of *magellanica*, but it is not the *magellanica* of Lamarck, who was the first to differentiate that species. In the absence of a connecting series I prefer to let the species stand as distinct. According to Lahille it has from three to five plaits and may reach a length of nearly six inches, with a diameter of nearly four inches. Strebel unites the variety *pseudofusiformis* Lahille with *magellanica* (Strebel), and queries if the species is not identical with *fusiformis* Kiener.

ADELOMELON BRASILIANA Solander

Voluta brasiliانا SOLANDER, Portland Cat., p. 186, no. 3958, 1786.

Voluta colocynthis Brasiliانا Solandri CHEMNITZ, Conch. Cab., XI, p. 10, pl. 176, figs. 1695, 1696; 1795.

Voluta colocynthis DILLWYN, Cat. Rec. Shells, I, p. 574, 1817, LAHILLE, Rev. Mus. de la Plata, VI, p. 307 (extras, p. 10, 1895; with varieties: *lactea*; *intermedia*; *globosa* (not *V. globosa* DILLWYN, Cat. Rec. Shells, p. 569, 1817); *depressa* (not *V. depressa* LAMARCK, Ann. du Mus., Paris, I, p. 479, 1802); *pseudomagellanica*; *carinata* (not *V. carinata* ZEKELI, 1852); *subcarinata*; *alternata*; and *spirabilis*.

Voluta brasiliانا D'ORBIGNY, Voy. Am. MÉR., v, p. 424, pl. LX, figs. 4-6, 1841; KIENER, Icon. Rec. Shells, *Voluta*, p. 31, pl. XXX, 1839; SOWERBY, Thes. Conch., p. 204, no. 28, pl. LIV, fig. 98, 1847; REEVE, Conch. Icon., *Voluta*, pl. xv, fig. 34, 1849; TRYON, Man., IV, p. 98, pl. 29, figs. 113, 115 (only), 1882.

Voluta (Cymbiola) brasiliانا CROSSE, Journ. de Conchyl., XIX, p. 300, 1871; STREBEL, Zool. Jahrb., XXIV, heft 2, p. 92, 1906.

Habitat.—Shores of eastern South America from Rio Grande do Sul, Brazil, to the mouth of the La Plata and south to the Rio Negro in Patagonia. Maldonado Bay, Uruguay; young, in 10 fathoms; sand.

U. S. Nat. Mus., 185,362, 97,044, 9731 and 171,430.

This well marked species has been known for a century, but it is extremely rare to find it in good condition. The typical form reaches a length of nearly seven inches, with a width of five and one fifth inches, usually with two plaits above which may be several obscure ridges. The largest forms, which are called *globosa* by

Lahille, reach sometimes eight inches in length and five and a half in diameter. The ovicapsule of what is supposed to be this species is figured by Dall in the Proc. U. S. Nat. Museum for 1889, pl. ix, fig. 2. It floats by means of an air bubble, and is nearly spherical. The young contained in its resemble those of *A. magellanica* Lam.

ADELOMELON FERUSSACII Donovan

Voluta ferussacii DONOVAN, Nat. Repos., II, pl. LXVII, 1824; REEVE, Conch. Icon., *Voluta*, pl. x, fig. 25, 1849; SOWERBY, Thes. Conch., *Voluta*, p. 203, pl. XLVI, fig. 7, 1847.

Voluta rudis GRAY, in Griffiths' Cuvier, XIII, pl. xxx, fig. 1, 1834.

Voluta brasiliana (*pars*) TRYON, Man., IV, p. 98, pl. xxx, fig. 131 (*ferussacii*) and pl. xxix, fig. 111 (*rudis*), 1882.

Voluta (Aulica) ferussaci CROSSE, Journ. de Conchyl., XIX, p. 286, 1871.

Voluta oviformis LAHILLE, Rev. Mus. de la Plata, VI, p. 313 (extras, p. 20), pl. II, figs. 53-56; pl. VII, figs. 121-131; pl. X, figs. 4-9, 1895; with varieties *longiuscula* and *fratercula* LAHILLE.

Voluta (Cymbiola) ferussaci STREBEL, Zool. Jahrb., XXIV, p. 100, pl. IX, figs. 46, 46a, 48, 49, 1906.

Habitat.—Coast of Santa Cruz, Patagonia, Ihering and Lahille; Puerto Gallegos, Strebel; eastern part of Magellan Straits, Cunningham; Punta Arenas, Mulach.

The species reaches a length of five inches by about three and a half in diameter. It has one strong anterior plait at the edge of the pillar and from two to five lesser ridges behind it; most commonly four are visible in well developed shells. It is nearest to but apparently distinct from *V. brasiliana*.

U. S. Nat. Mus., 18,389, 102,381, 171,412.

This species is described by Cunningham (Notes on Nat. Hist. of the Straits of Magellan, p. 115 *et seq.*) as burrowing in the sand at low water and occurring near the eastern entrance of the straits, and between Cape Possession and Point Dungeness, but not farther westward than S. Jago and Philipp's Bay. The soft parts of the animal are of a purplish color, more or less spotted.

Donovan's original type is described as having only two plaits. It is quite obvious from the figures given by him that the specimen, after being more or less worn by the sea, had been "cleaned" and its color revived by a liberal use of acid, which has removed a good deal of the outer layer of the shell. In this way the feeble plaits behind the large anterior one may have been obliterated.

ADELOMELON PARADOXA Lahille.

Voluta paradoxa LAHILLE, Rev. Mus. de la Plata, VI, p. 29, pl. II, fig. 68; pl. V, fig. 41; pl. VII, figs. 139, 147; pl. XII, figs. 17-21, 1895.

Habitat.—Coast of del Sur, Argentina.

Shell resembling some of the varieties of *brasiliana* and *ancilla*, with variegated zigzag brown markings on the last whorl, but in which, according to Lahille, the young shell is so different from that of any of the other species that it cannot be properly united with any other. The young shell reaches a length of two and one fifth inches, with a diameter of one and three fifths. It usually has three plaits of which the anterior is less prominent than the third. The adult measures over seven inches long and about three and a half in diameter. A shell of this size weighed 260 grams, while a specimen of *ancilla* var. *tæniolata* Lahille, of exactly the same dimensions, weighed only 154 grams.

I have not seen specimens of this species.

ADELOMELON STEARNSII Dall

Scaphella stearnsii DALL, Proc. Cal. Acad. Sci., iv, Oct., 1872, p. 270, pl. 1, fig. 1; Proc. U. S. Nat. Mus., xxiv, no. 1264, p. 517, pl. xxxv, fig. 4, Mar., 1902.

Shumagin Islands, Alaska, and westward to Captain's Bay, Unalaska, in 40 to 100 fathoms, rocky and muddy bottom; temperature of bottom water 37° to 41° Fahr. Also in Bering Sea, northward to the line of floating ice in winter, on sandy and muddy bottoms, in 61 to 350 fathoms; U. S. steamer *Albatross*.

U. S. Nat. Mus. (type), 108,993; also 91,352, 108,998, 130,513, 162,628, 162,629, etc.

The conchological characteristics of this species are so different from those of any of the South American species that one would hesitate before including it in the same group without other evidence, but an examination of its gross anatomy shows that the general characteristics of its genitalia and dentition do not differ from those of *A. magellanica*, except in minor details, and consequently the combination is allowable. Its nearest congener, *A. benthalis* Dall, inhabits the Gulf of Panama at a distance of more than 5000 sea miles; and, omitting this abyssal species, the nearest relative occurs at a distance of nearly 9000 miles. It is probable that "*Voluta*" *Lamberti* of the British Crag may be akin to our Alaskan shell.

Genus ZIDONA H. and A. Adams

Volutella D'ORIGNY, Voy. Am. MÉR., p. 422, 1841; *V. angulata* SWAINSON, sole example, not *Volutella* PERRY, 1811, nor SWAINSON, 1830.

Zidona H. AND A. ADAMS, Gen. Rec. Moll., I, p. 161, 1853; II, p. 618, 1858; FISCHER, Man. de Conchyl., p. 605, 1883; COSSMANN, Essais Pal. Comp., III, p. 104, 1899.

The remarkable extension of the mantle and modification of the form of the shell are quite sufficient to render this subdivision of

generic rank. The nuclear portion of the shell is analogous to that of *Adelomelon*, but the ovicapsule has not been described. The animal has been carefully figured by D'Orbigny.

ZIDONA ANGULATA Swainson

Voluta angulata SWAINSON, Exotic Conchology, I, pl. III and IV, 1821; SOWERBY, Thes. Conch., *Voluta*, p. 202, pl. XLVII, figs. 13, 14, 1847; REEVE, Conch. Iconica, *Voluta*, pl. xv, fig. 35, 1849.

Voluta nasica SCHUBERT AND WAGNER, Suppl. bd. Conch. Cab., XII, p. 10, pl. 217, figs. 3031, 3032, 1829.

Voluta Dufresnei DONOVAN, Nat. Repos., II, pl. 61, 1823.

Volutella angulata D'ORBIGNY, Voy. Am. MÉR., v, p. 423, pl. LX, figs. 1-3, 1841; GRAY, Guide B. M., p. 35, 1857.

Voluta angulata WOOD, Index Test., Suppl., *Voluta*, no. 21, 1828; KIENER, Icon. Coq. Viv., *Voluta*, p. 65, pl. XXXVIII, 1839; TRYON, MÉR., IV, p. 98, pl. 29, figs. 112, 121, 1882; LAHILLE, Rev. Mus. de la Plata, VI, p. 305 (extras, p. 15), pl. I, figs. 5-8; pl. II, figs. 69-78; pl. VI, and pl. IX, 1895.

Voluta (Volutella) angulata CROSSE, Journ. de Conch., XIX, p. 301, 1871; TRYON, Struct. Syst. Conch., II, p. 164, 1883.

Zidona angulata H. AND A. ADAMS, Gen. Rec. Moll., I, p. 161, 1853; II, p. 618, 1858; FISCHER, Man. Conchyl., p. 605, 1883.

Habitat.—South American southeast coast from Rio Grande do Sul, Brazil, south to the Bay of San Blas, Patagonia; on sandy bottom, in comparatively shallow water.

U. S. Nat. Mus. 125,492.

Lahille has described varieties *luteola*, *mixta* (not *V. mixta* Galeotti, 1837), *similis*, *distincta*, *ventricosa* (not *V. ventricosa* Dillwyn, 1817), and *affinis* (not *V. affinis* of Brocchi, 1814). The shell reaches to a diameter of five and a length of over seven inches. The apical spur of callus, found only in well developed specimens and frequently broken off, may attain over an inch in length beyond the apex of the spire.

Recent explorations in Patagonian Tertiaries by Hatcher of the Princeton University Expedition, have been discussed by Ortmann, who has shown that the fossil species of that and the Chilean Tertiary have the nuclear characters of *Adelomelon* although there is a small group of species including one recent form, which from their sculpture I had previously suspected to be related to *Plejona*. These forms are the nearest relatives of the typical *Volutilithes* which have yet been discovered on the American side of the Atlantic, but are also so closely akin to *Adelomelon*, that they can perhaps only be sectionally separated from it. These forms in Tertiary time extended their range to the west coast of South America, where,

in the Chilean strata, they are represented by such forms as *Voluta triplicata* Sowerby, *V. gracilis* Philippi, and *V. domeykoana* Philippi. With these are *V. alta* Sowerby, which at once suggests itself as a possible ancestor for *Tractolira* and *V. obesa* Philippi, which suggests *Adelomelon*. At any rate, this group has a recent representative which is conchologically so close to the fossils that its relationship may warrantably be assumed. This is the following species, for which we may propose a section to include itself and the related fossils.

Section MIOMELON Dall, nov.

Shell with rather elevated spire, somewhat excavated in front of the suture, with more or less obvious axial ribbing and spiral striation; a delicate periostracum, the canal rather straight; the pillar with few rather slender plaits, the anterior larger; the animal has no operculum, the verge is situated just behind the right tentacle, small, clavate, with a smaller conical distal appendix; the radula has a single series of teeth, each with three subequal tusk-like cusps. Type *Volutilithes philippiana* Dall, 1889.

The type is blind, but this may be exceptional and due to its abyssal habitat. The fossil species will be *A. triplicata* Sowerby, *A. domeykoana* Philippi, and *A. gracilior* Ihering (new name for *Voluta gracilis* Philippi, 1887, not of Lea, 1833); and perhaps also *Voluta D'Orbignyana* Philippi. It is distinctly a localized group proper to the south coast of South America, both recent and fossil.

ADELOMELON (MIOMELON) PHILIPPIANA Dall

Volutilithes philippiana DALL, Proc. U. S. Nat. Mus., XII, p. 313, pl. ix, fig. 4, 1889.

Dredged by the U. S. Fish Commission steamer *Albatross* off the southwest coast of Chile, at station 2791, S. Lat. 38° 08' and W. Lon. 75° 53', in 677 fathoms, mud, bottom temperature 37.9° Fahr.

U. S. Nat. Mus., 97, 128.

The shell is 36.5 mm. in length and but a single specimen was obtained. The nucleus was eroded so that its exact character remains in doubt.

Genus TRACTOLIRA Dall

Tractolira DALL, Proc. U. S. Nat. Mus., XVIII, no. 1034, p. 12, 1895; type *T. sparta* Dall, l. c. p. 13.

The dentition of this peculiar and apparently degenerate abyssal form is marked by the same tusk-like cusps which are found in *Miomelon*, and therefore, while the erosion of the apex of the shell

makes it impossible to determine the character of the nucleus, I feel that the most probable relationship of the type is with the *Caricellina*. The presence in the Chilean tertiaries of what seems like a more normal relative in *Voluta alta* Sowerby is also significant.

TRACTOLIRA SPARTA Dall

Tractolira sparta DALL, Proc. U. S. Nat. Mus., XVIII, no. 1034, p. 13, 1895.

From the Gulf of Panama northward to the latitude of Acapulco, Mexico, in 1672 to 2232 fathoms.

U. S. Nat. Mus. (type), 122,999.

A fuller account of this singular and unique abyssal shell is in preparation for my report on the *Albatross* dredgings under the supervision of Dr. Alexander Agassiz.

Genus AURINIA H. and A. Adams

Voluta (sp.) BRODERIP, Zool. Journ., III, p. 81, Jan., 1827.

Fusus (sp.) SCHUBERT AND WAGNER, Conchyl. Cabinet, XII, p. 24, 1829.

Aurinia H. AND A. ADAMS, Gen. Rec. Moll., I, p. 166, 1853; Type *A. (Voluta) dubia* BRODERIP (Subgenus of *Fulgoraria*); Gray, in Adams' Gen. Rec. Moll., II, p. 617, 1858, *ex parte*; CROSSE, Journ. de Conchyl., XIX, p. 307, 1871; FISCHER, Man. de Conchyl., p. 608, Dec., 1883; *ex parte*; DALL, Trans. Wagn. Inst., III, p. 70, 1890.

Volutifusus CONRAD, Proc. Acad. Nat. Sci. Phila. for 1862, p. 563, Mar., 1863; sole ex. *Fasciolaria mutabilis* CONR., Journ. Acad. Nat. Sci., VII, p. 135, 1834; Am. Journ. Conch., II, p. 66, 1866; *V. typus* CONRAD, Miocene of North Carolina.

Livonia GRAY, *olim*, H. AND A. ADAMS, Gen. Rec. Moll., II, p. 617, 1858; not *Livona* GRAY, Guide Moll. B. M., p. 156, 1842.

This genus is the degenerate descendant in one line, as *Maculopephum* is a normal descendant in another, from the Eocene *Caricella*. Its most prominent feature is the enfeebled plaits of the pillar, usually of diminished number as well as size, its thin shell and prominent caricella-nucleus. The absence of the radula it shares with *Maculopephum*, though *Halia*, evidently a close relative, and even more degenerate as regards the shell, has retained the radula.

Volutifusus Conrad, founded on *V. mutabilis*, to which he afterward added *V. dubia*, is an absolute synonym of *Aurinia*.

AURINIA DUBIA Broderip

Voluta dubia BRODERIP, Zool. Journ., III, p. 81, pl. III, fig. 1, 1828; SOWERBY, Thes. Conch., I, pl. LV, fig. 115, 1847; REEVE, Conch. Icon., *Voluta*, pl. XXII, fig. 59, 1849. Not of DOHRN, Jahrb. d. Mal. Ges., VI, pp. 150-156, pl. IV, figs. 1-3, 1879, = *V. dohrni* SOWERBY.

Fusus tessellatus SCHUBERT AND WAGNER, Suppl. Bd. Mart. u. Chemn., Conch. Cab. (XII), p. 24, pl. 219, figs. 3048, 3049, 1829; KIENER, Icon. Coq. Viv., IV, *Fusus*, p. 39, pl. XXIX, fig. 1; copied in REEVE, Conch. Icon., IV, pl. XIV, fig. 53, 1847; not of Zekeli and Pictet Foss. Gosaugeb., 1852.

Voluta (Aurinia) dubia H. AND A. ADAMS, Gen. Rec. Moll., I, p. 166, 1853.

Voluta (Volutifusus) dubia CONRAD, Am. Journ. Conch., II, p. 66, 1866.

Voluta mutabilis TUOMEY AND HOLMES, Pleioc. fos. S. Car., p. 128, pl. XXVII, figs. 5, 6, 1856; not of Conrad, Journ. Acad. Nat. Sci. Phila., VII, p. 135, 1838, and Am. Journ. Sci., XLI, p. 346, pl. XI, fig. 7, 1841, Miocene of Maryland.

Voluta (Aulica) dubia TRYON, Man., IV, p. 90, pl. XXVII, figs. 77, 81, 1882.

Aurinia dubia DALL, Bull. Mus. Comp. Zool., XVIII, p. 151, 1889; Trans. Wagner Inst., III, p. 80, pl. 7, fig. 4, 1890; Bull. U. S. Nat. Mus., XXIV, no. 1264, p. 504, pl. XXIX, fig. 11, 1902.

Pliocene of South Carolina; south and west coast of Florida, and off the Florida reefs; between the mouth of the Mississippi and Cedar Kays, Florida, in 111 fathoms, gray mud; off Cape Hatteras, North Carolina, 36 to 40 miles, on sandy bottom, in 34, 124 and 168 fathoms; bottom temperature 48.5° Fahr.

U. S. Nat. Mus., 54,544, 83,866-69, 97,169.

A full description of the shell and gross anatomy will be found in the Blake Report, published by the Museum of Comparative Zoology above cited.

In January, 1827, Broderip described a shell, obtained from M. Roussel and belonging to Sowerby, under the name of *Voluta dubia*. This specimen, which he figured, has been lost sight of, but Broderip mentions that the only other known specimen was in the collection of Prince Massena. Two years later Schubert and Wagner, in the twelfth or supplemental volume of the Conchylien Cabinet, figured a shell which they called *Fusus tessellatus*. This figure is taken from a drawing. They state that they had not seen the shell and give no information as to the collection in which it is preserved, or the name of the person who furnished the sketch. The figure is bad, but not uncharacteristic; and if, as Kiener states, the Massena specimen served as type for all the authors who had treated of the species, it might be surmised that Schubert's figure was a hasty sketch made without authority from that specimen.¹ There is, at any rate, no reason to doubt that the two figures of Broderip and Schubert represent two immature specimens of the same species. Kiener gives an excellent figure, which was afterward copied in the

¹ The fact that Schubert's figure represents an immature shell and Kiener's a mature one, makes it most probable that they were derived from different sources.

Conchologia Iconica by Reeve in 1847, and the general accuracy of which, as compared with the Massena specimen, now in the Museum of Geneva, was confirmed by Kobelt in 1878, at the request of Dohrn.

Up to Kiener's time and for more than twenty years later the provenance of this species was unknown, but by the dredgings of the *Blake* several specimens were obtained in 34 to 168 fathoms off the eastern coast of the United States from North Carolina south to the Florida Keys and in the Gulf of Mexico. A young specimen, showing the nepionic shell and projecting spine, or calcarella, was figured by the writer in 1890, and the adult in 1902, from recent specimens, but Toumey and Holmes had given an excellent figure from a fossil specimen found in the Pliocene of South Carolina, under the name of *Voluta mutabilis*, in 1856. The true *V. mutabilis* is a very similar but more robust species not uncommon in the Miocene of the Carolinas.

Mr. Sowerby, in 1903, expressed the opinion that the *tessellatus* of Schubert and the *dubia* of Broderip are distinct species. This opinion is apparently based upon a supposed difference in the size of the nepionic shell. But Schubert's species is based upon an anonymous drawing which may have been taken from a specimen in which the nepionic shell had been altered by the use of acid in cleaning, as is usual with dealers' shells, and no specimen is known to exist. Moreover, in 1892, I showed¹ that while the *form* of this nepionic shell is quite constant, its actual size in different specimens differs widely. This is a well-known phenomenon in Prosobranchs, whose ovicapsules contain more than one embryo. And, in addition to that, the name *Voluta tessellata* had been used by Lamarck as early as 1811, so that it is not available for Schubert's shell. I have no doubt that Schubert's figure was intended to represent an immature specimen of the species which two years earlier had been named *dubia* by Broderip, and of which an adult was figured by Kiener. In 1871 Dr. Dohrn obtained on the west coast of Florida some specimens of a volute which he referred to *V. dubia*, and of which three excellent figures by Kobelt were published, together with his notes upon the shells. In my *Blake Mollusca* (p. 151, 1889) I accepted Dr. Dohrn's identification, in the absence of any specimens of his species, but pointed out characters which did not agree with those of *V. dubia*, especially the heavier shell and the presence of four plaits on the pillar instead of the obsolete two plaits in *dubia*. Up to the present month (December, 1905) I had never seen specimens of the shell figured by Dohrn. Mr. Sowerby had

¹ *Trans. Wagner Inst. Sci.*, III, p. 227.

been more fortunate, and, in 1903, he described it under the name of *Voluta Dohrni*, and gave a passable figure. Recently some collections made in 1902 by the U. S. Fish Commission steamer *Fish Hawk* were turned over to the National Museum, and among the specimens were some twenty examples of *V. Dohrni*; unfortunately, all occupied by hermit crabs and more or less dilapidated or defective. Of the distinctness of the species there is no doubt whatever, and it adds another to the remarkable group of American volutes typified by *Voluta Junonia* Hwass.

AURINIA ROBUSTA Dall

Aurinia robusta DALL, Bull. Mus. Comp. Zool., xviii, p. 153, pl. xxxv, fig. 2, 1889; Trans. Wagner Inst., III, p. 81, pl. 7, fig. 5, 1890.

Habitat.—Straits of Florida and Gulf of Mexico, on a muddy bottom; temperature 46.1° Fahr., in 119, 242 and 280 fathoms. Also off Cozumel Island in 231 fathoms, sand, temperature 50.8° Fahr.

U. S. Nat. Mus., 54,526, 83,870 and 103,478.

A remarkable species which differs from all the others in having a chalky, easily eroded outer shell-layer, and a long, sinuous canal; the interior of the aperture being porcellanous white. It still retains the brown blotches which are the characteristic of this whole group, but they are rather feeble and inconspicuous.

AURINIA GOULDIANA Dall

Voluta gouldiana DALL, Conch. Exch., II, p. 10, July, 1887; Bull. Mus. Comp. Zool., xviii, p. 154, pl. xxix, fig. 3, 1889; Trans. Wagner Inst., III, p. 81, pl. 7, fig. 2, 1890.

Habitat.—From Cape Fear, North Carolina, south and west to Key West, Florida, in depths from 159 to 509 fathoms, on a sandy bottom; temperatures from 45.2° to 48.3° Fahr.

U. S. Nat. Mus., 83,827, 83,828, 83,863, 83,871-75.

This is a small species in which the brown color is either wanting, present in broad spiral stripes, or suffused over the whole surface. A fragment in which the stripes are broken up into squarish spots, at first supposed to be of this species, is now tentatively referred to *Maculophephum dohrni*.

A full description of the shell and gross anatomy is given in the Bulletin of the Museum of Comparative Zoology, above cited. There are normally four plaits on the pillar in the young shell but these fade away until the adult shows two only and these very feeble. The

coloration of the shell fades with time; the specimens in the National Collection are much less vividly colored than when received in 1887.

Genus MACULOPEPLUM Dall

Maculopeplum DALL, Nautilus, XIX, no. 12, p. 143, April, 1906.

Scaphella (sp.) SWAINSON, Zool. Ill., 2d ser., II, no. 19, 1832. Not typical
Scaphella SWAINSON.

Caricella (sp.) CONRAD, Journ. Acad. Nat. Sci. Phila., 2d ser., I, p. 120.

Scaphella DALL, Bull. Mus. Comp. Zool., XVIII, p. 147, 1889; Trans. Wagner Inst., III, p. 79, 1890.

This genus is closely related to *Aurinia*, and for some time I hesitated as to separating them generically. However, they represent diverging lines of descent from *Caricella* and I concluded that there was less chance for confusion in a clean-cut separation than in a subgeneric connection.

The group differs from *Aurinia* in its preservation of normal characters, such as the solid and substantial shell, and well developed columellar plaits, the anterior stronger. It agrees with that genus in starting with a membranous protoconch, which is afterward lost; in having no radula or operculum; and in its style of coloration.

The observations on the animal are based on a specimen about an inch long, of which the shell was slowly dissolved by weak acetic acid, and the soft parts thus obtained without injury to their continuity. The type is the well-known species *Voluta junonia* Hwass.

In my work on the Volutes in the Tertiary Fossils of Florida, I made no attempt to revise the nomenclature of the group upon which so many naturalists had worked, and accepted without investigation the current nomenclature except in the case of *Aurinia*. Investigation, however, has shown that this was unwise, and especially in the case of *Scaphella* Swainson. While *Voluta junonia* was included among his species of *Scaphella*, it is obvious to the careful student that it cannot be regarded as congeneric with the forms like *V. undulata*, which was the type of *Scaphella*, and which were later named *Amoria* by Gray; nor with the *Cymbiola* group, founded on *Voluta vesperilio*, which is the *Scapha* of Gray and *Aulica* of Adams and Crosse. Both of these groups have the shelly protoconch of the *Volutinæ*. A new name was therefore necessary.

MACULOPEPLUM JUNONIA Hwass

Voluta junonia HWASS, in Chemn. Conch. Cab., XI, 1795, p. 16, pl. 177, figs. 1703 1704; LAMARCK, Ann. du Museum, VII, p. 70, 1811; SWAINSON, Exotic Conch., 2d ed., p. 22, pl. XXXIII, Jan., 1835; SOWERBY, Thes. Conch., I, p. 197, pl. XLIX, fig. 44, 1847; REEVE, Conch. Icon., *Voluta*, pl. XX, fig. 50, 1849.

- Voluta (Aulica) junonia* CROSSE, Journ. de Conchyl., XIX, p. 285, 1871; TRYON, Man., IV, p. 90, pl. XXVI, fig. 67, 1882.
Scaphella junonia SWAINSON, Malac., p. 108, 1840; DALL, Bull. Mus. Comp. Zool., XVIII, p. 148, pl. XXXIV, figs. 5, 5c, 5d, 5e, 1889; Trans. Wagner Inst., III, p. 79, pl. VII, fig. 9, 1890.

Maculopeplum junonia DALL, Nautilus, XIX, no. 12, p. 143, April, 1906.

Habitat.—North Carolina southward to the northern edge of the Bahamas and Barbados, and on both coasts of the Florida peninsula, reefs and keys; seventeen miles off Cape Lookout, North Carolina, in 22 fathoms, sand, bottom temperature 78.2° Fahr.; Gulf of Mexico, in 26 fathoms, sand; off Barbados in 100 fathoms, dead (Hassler exp.); Clearwater Harbor, Florida.

U. S. Nat. Mus., 27,339 (Tarpon Springs), 53,750 (Florida Keys); 53,751; 54,540 (off Tampa Bay); 60,735; 83,864 (North Carolina); 83,865 (Nassau, N. P.); 129,236; 126,800 (Barbados); 168,847 (Sanibel Id., Florida); 187,223 (off Cape Sable, Florida).

The species is fully discussed in the Blake Report, above cited, and since that publication a small live specimen was collected on the Florida Keys. It was a female and of a light flesh color with dark reddish flecks, and subgranulose surface. There is no operculum or radula. The tentacles are short and subtriangular, each expanded at the base into a rounded disk, with the eyes just outside the root of the slender part of the tentacle. The disks do not unite in the median line, where their edges overlap a little. The siphonal appendages are short and the foot duplex at its anterior edge.

The specimens dredged by Pourtalés in the Straits of Florida seem to have belonged to the next species.

MACULOPEPLUM DOHRNI Sowerby

Voluta dubia DOHRN, Jahrb. d. Malak. Ges., VI, pp. 150-156, pl. IV, figs. 1-3, 1879; copied by TRYON, Man., IV, pl. 27, figure 77; not of Broderip.

Voluta dohrni SOWERBY, Journ. Malac., X, p. 74, pl. V, fig. 8, June, 1903.

Habitat.—Florida reefs, along the Straits of Florida (Pourtalés); Gulf stream, off Key West, at station 7282, in 109 fathoms, sand, U. S. steamer *Fish Hawk*; also at station 7279, in 98 fathoms; station 7296, in 122 fathoms; and station 2316, U. S. steamer *Albatross*, in 50 fathoms, coral, off Key West; a dead specimen.

U. S. Nat. Mus., 83,862, 187,219-22.

The pedigree of this species is discussed under the remarks on *Aurinia dubia*. All the museum specimens were dead shells occupied by hermit crabs. The large number obtained would indicate that living individuals were numerous at no great distance. The

species is considerably heavier and more solid than any of the Aurinias, is smaller and more slender than *M. junonia* and is doubtless a perfectly valid species.

Subfamily VOLUTOMITRINÆ

Genus VOLUTOMITRA Gray

Volutomitra GRAY, in Adams, Gen. Rec. Moll., I, p. 172, pl. XIX, fig. 2, 1853; type *Mitra grönlandica* Beck; II, p. 619, 1858; Guide Moll. Brit. Mus., p. 36, 1857; DALL, Bull. Mus. Comp. Zool., XVIII, p. 145, pl. XXXIV, figs. 6-7, 1889.

Mitra (Beck) MÖLLER, Index Moll. Grönl., p. 15, 1842; REEVE, Conch. Icon., *Mitra*, pl. xv, fig. 106, 1844; TRYON, Man., IV, p. 124, 1882.

This small boreal group has a single row of unicuspidate rhachidian teeth with deeply arcuate base, no operculum, no appendices to the siphon, the tentacles adjacent, not seated on disks, with the eyes one third above the base of the tentacles on prominent tubercles; the verge is subcylindrical; the shell small, unicolorous, with a conspicuous dark periostracum and plaited pillar. The nucleus is small and apparently calcareous.

VOLUTOMITRA GRONLANDICA Beck

Mitra grönlandica Beck, in Moller, Index Moll. Grönl., p. 15, 1842; REEVE, Conch. Icon., *Mitra*, pl. xv, fig. 106, 1844; TRYON, Man., IV, p. 124, pl. 36, fig. 83, 1882.

Volutomitra grönlandica H. AND A. ADAMS, Gen. Rec. Moll., I, p. 172, pl. XIX, fig. 1, 1853; GRAY, Guide, p. 36, 1857; DALL, Bull. Mus. Comp. Zool., XVIII, p. 145, pl. XXXIV, figs. 6-7, 1889; SARS, Moll. Reg. Arct. Norv., p. 244, pl. 23, fig. 12, 1878.

Habitat.—Greenland coast from Disco Bay southward in from 15 to 200 fathoms; Wellington Channel (Belcher); Iceland; Spitsbergen; Finmark, in 80-100 fathoms (Sars). Also in Pleistocene of Britain (Stimpson).

U. S. Nat. Mus., 86,974, 86,975.

The shell is about an inch in length and has been well figured by Sars, whose most southerly locality is a sea-bank off Tromso. It is not known from the eastern coast of the United States, but probably occurs on the Labrador coast.

VOLUTOMITRA ALASKANA Dall

Volutomitra alaskana DALL, Nautilus, xv, p. 103, Jan., 1902.

Habitat.—Southern and eastern parts of Bering Sea and the Aleutian Islands, in 60 to 85 fathoms, mud; and southward in the Pacific, off the American coast, following the water-isotherms of

39° Fahr., to a point off San Diego, Cala., where it was dredged by the U. S. steamer *Albatross* in 822 fathoms.

U. S. Nat. Mus., 109,001-3, 122,586, 122,600-1, 123,600.

The species is larger than the Greenland shell, and finely spirally striated all over, while, with the exception of a few coarse spirals near the canal, the Greenland species is smooth.

Note.—In the synonymy of the species enumerated in this paper, while pointing out that a number of the varietal names proposed by Lahille are preoccupied in the genus *Voluta*, I have refrained from proposing substitute names in the absence of authentically named material which would enable me to judge of the validity of the proposed varieties.

Addendum.—While this paper is passing through the press, I have received from Dr. von Ihering of the Museum of San Paulo, Brazil, a photograph and data relating to a *Volute* which he supposes to be new and which was obtained from the stomach of a fish in those waters off the island of St. Sebastiano. It is an *Adelomelon* of the type of *A. ornata*, but much more slender; elongate-fusiform, with two very oblique plaits and about six whorls; the spire (above the posterior commissure of the aperture) nearly half as long as the shell, which measures 220 mm., its greatest diameter about one third of the whole length. For this undescribed form Dr. von Ihering proposes the specific name of *indigesta*.