III.—*Notes on the Jaw and Lingual Dentition of Pulmonate Mollusks.*

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I propose in this paper to give, both in text and plates, a synoptical view of the jaws and lingual dentition of all the species of each genus which I have examined,—the descriptions and figures already published having lost a great deal of their usefulness by being scattered through the publications of many years of numerous scientific periodicals. I shall also have an opportunity to judge of the limits of variation, and of the amount of reliance to be placed on the characters of these organs for the purposes of classification.

In the fifth volume of the "Terrestrial Mollusks and Shells of the United States" (Bulletin Mus. Comp. Zool., IV), I have given an account of the various forms of lingual dentition, mode of extraction, etc., and descriptions of those organs in the genera found in the United States. These I will not repeat here; but, in order to understand the terms I use, I will state, that apparently the normal condition of the lingual membrane is to have three types of teeth: the central, the lateral and the marginal, named from their position on the lingual. Between the laterals and marginals there are generally several transition teeth, as the change is not sudden. The central tooth normally (that is, in the greatest number of species as yet examined) consists of a quadrute base of attachment (*a, b, c, d*, of pl. VII, fig. 1), with expanded lower outer angles, and the whole upper surface reflected. The reflection (*e*) is tricuspid (one median, *f*, and two

side ones, *g, h*), and each cusp is continued into a cutting point (*i, j, k*). This last I have shaded in my figures, for the purpose of distinction, but no shading exists in nature. The lateral teeth differ from the central by the suppression of the inner lower angle of the base of attachment and the inner cusp and cutting point of the tooth. Thus they are asymmetrical. As they pass outward, they become modified into marginals by the comparative enlargement of the reflection and diminution of the base of attachment, and by the splitting of each cutting point, as well as by the much diminished size of the whole tooth. This form of dentition is, as seen in my description, characterized by *quadrate marginal teeth*, from which the other large division is distinguished by having marginal teeth of a strictly *aculate form* (see pl. II, fig. B, three left-hand teeth). For the purposes of classification, this distinction of quadrate and aculate marginal teeth is most important. It sometimes occurs that the central (see fig. K. of pl. XVII) is missing, or the laterals are missing (fig. H, pl. XVII). When the dentition does not agree with either of these two forms, I have considered it abnormal, and described its characters, unless the genus is found in the United States, when I simply refer to my descriptions in Terr. Moll. U. S., V. It must be remembered, however, that there is some variation found from the tooth referred to on pl. VII; the side cusps and cutting points, especially, being in some genera obsolete (see all the figures on plate IX.)

A complete list of the lingual membranes examined by me is given in Bull. M. C. Z., Vol. V, No. 16, pp. 339—350. With the original description will be found the name of the person furnishing the membrane. Those from the West Indies were identified by Mr. Thomas Bland. The mounted lingual membranes will be found in the Museum of Comparative Zoology at Cambridge.

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AGNATHA.

Chlamydephorus.

Chlamydephorus Gibbonsi, W. G. Binney. Natal Colony, Africa, Mr. J. S. Gibbons.

The lingual membrane is long and broad, consisting of about 52 chevron-shaped rows of 27-1-27 teeth, all as in *Glandina*, the central one differing only in being smaller than the adjacent marginals, and symmetrical, with a long, slender cutting point; there are no laterals, all the side teeth being purely aculeate marginals, and first rapidly increasing and then gradually decreasing in size as they pass off laterally, as is usual in *Glandina*. Buccal mass very large indeed. (Pl. XVII, fig. A.)

The plate shows the central and three adjacent marginal teeth, the eighth marginal, and the twenty-third to the twenty-seventh, which is the last.

Glandina.

For the description of the dentition of the genus, see Terr. Moll. U. S., V. All the species examined by me agree with it. There are no lateral teeth.

Glandina semitarum, Rang. (*Varicella*), Martinique. Gov. Rawson.

There are about 30-1-30 teeth. The central is long, narrow, and sharply pointed. (Plate XVII, fig. C.)

Glandina Phillipsi, Ad. (*Varicella*.) Jamaica.

As in the last species; Pl. XVII, fig. D, shows an outer marginal. There is a peculiar notch in the upper edge of the base of attachment.

Glandina rosea, Fér. Nicaragua. Mr. McNiel.

Membrane with 36 rows of 25-1-25 teeth. Centrals long, narrow, slightly incurved at sides, emarginate at top, rounded at base, and bearing a short, blunt, stout, cutting point. (Pl. XVII, fig. B.)

Glandina aurata, Mor. Costa Rica, Dr. W. M. Gabb.

Referred to as an undetermined species in Ann. N. Y. Ac. Sci. I, 261.

Teeth, 36-1-36. The central tooth has a long slender cutting point. (Pl. XVII, fig. E.) The central tooth and first four marginals.

Glandina solidula, Pfr. (*Oleacina*.) New Providence.

Lingual membrane as usual in the genus.

Glandina Albersi, Pfr. Lower California.

In L. and Fr. W. Sh. of N. A., I, 19, is a figure of the dentition of this species, drawn by Mr. E. S. Morse. There are 32-1-32 teeth.

Gonospira.

Mauritius. Consul Pike.

There are no laterals. The central tooth has a short, blunt, rounded cutting-point. The marginals increase at first very rapidly in size.

G. palanga, Fér. Teeth, 37-1-37. (Pl. XVII, fig. F.) A photograph of this membrane will be found in Am. Journ. Conch., V, 37.

G. Newtoni, H. Ad. Teeth, 6-1-6. (Pl. XVII, fig. G.)

G. Mauriliana, Morel. Teeth, 12-1-12. (Pl. XVII, fig. H.)

G. modiolus, Fér. Teeth, 25 1-25.

G. Nevillei, H. Ad. Teeth, 21-1-21. (Pl. XVII, fig. I.)

G. sulcata, Müll. Lingual membrane as in the other species examined

Ennea.

Ennea clavatulæ, Lam. Mauritius. Pl. XVII, fig. J. Consul Pike.

Lingual membrane as in *Gonospira*.

Spiraxis.

Spiraxis Dunkeri, Pfr. San Domingo. Mr. J. S. Gibbons.

The membrane (pl. XVII, fig. K) has no central or lateral teeth. Those present are all marginals, of the form common in *Glandina*, and arranged *en chevron*. The figure gives three on each side of the centre of the membrane.

Rhytida.

Rhytida vernicosa, Krauss. Cape Town, South Africa.

This genus also, has no central or lateral teeth. The marginals are arranged as in *Glandina*. Pl. XVII, fig. L, gives the whole of one half of one transverse row of teeth. The formula is 14-0-14. The rows of teeth are close together, not separated.

The species cannot be retained in *Pella*, a sub-genus of *Helix*, where Von Martens placed it.

Onchidium.

Onchidium Schrammi, Bl. and Binn. Pointe à Pitre, Guadeloupe. Mr. A. Schramm.

Pl. III, Fig. A. Both the teeth on each transverse row, and the rows themselves, are greatly crowded. The general arrangement of the lingual membrane is the same as I have described for that of *Onchidella* in Terr. Moll., V.

Onchidium is allied to the preceding genera merely by the absence of a jaw.

HOLOGNATHIA VITRINEA.

This section includes genera furnished with a jaw in one single piece, and marginal teeth of the lingual membrane *acalcate*.

Stenopus.

Stenopus decoloratus. Demerara. Mr. J. S. Gibbons.

Jaw low, wide, slightly arcuate; ends blunt and but little attenuated; cutting-edge without median projection.

Lingual membrane (pl. XVII, fig. M) long; teeth 23-1-23, arranged *enchevron*; centrals small; upper margin elongated, tricuspid; no lateral teeth; all the side teeth are aculeate marginals; those nearest the median line somewhat modified in shape.

Not having examined a living specimen, I am not able to say whether the species has the caudal appendage characteristic of *Stenopus*.

Limax.

For description of jaw and lingual membrane, see Terr. Moll. U. S., V.

Limax semitectus, Mörch. Costa Rica. Dr. W. M. Gabb.

Jaw (pl. XV, fig. I) smooth, arched, ends attenuated; a median projection to the cutting-edge; a reinforced space on the centre of the jaw.

The lingual membrane (pl. II, fig. G) is long and narrow. There are 44-1-44 teeth. The centrals have side cusps and cutting-points. The laterals, twelve in number, on each side of the central, are bicuspid; the marginals are aculeate,—all of them are bifid by having the side spur often found on the side marginals in this genus. The 13th, 14th and 15th teeth form the transition into the marginals.

The figure gives the central, the first lateral on one side of the median line, and two marginals, the sixteenth and forty-fourth teeth.

Urocyclus.

Urocyclus Kirkii, Gray. Mozambique. Mr. J. S. Gibbons.

Jaw (pl. XVI, fig. K) very low, slightly arcuate; ends scarcely attenuated, blunt; anterior surface without ribs; no median projection to the cutting-edge; a strong muscular attachment.

Lingual membrane (pl. XVII, fig. N) with tricuspid centrals, bicuspid laterals, as in *Zonites*, and aculeate marginals, all of which are bifid.

The figure shows one central, one lateral, and two marginals.

Nanina.

The species of this genus have tricuspid centrals, bicuspid laterals, and bifid aculeate marginals. I have examined from Mauritius (Consul Pike),—

Nanina Caldwelli, Benson.

N. Rawsonis, Barclay. (Pl. II, fig. D.)

N. argentea, Rve. (Pl. II, fig. C.)

N. implicata, Nev. (Pl. II, fig. B.)

N. stylodon, Pfr.

The last cannot be retained in *Erepta*, a sub-genus of *Helix*, where it was placed by Von Martens. All the above have similar dentition. Also from Mauritius—

N. philyrina, Morelet.

Though this species agrees in other respects with the above-named, the membrane is very broad, the teeth exceedingly numerous, arranged in oblique rows. The centrals, which I am confident of having seen, are small, narrow, high. The other teeth are the same in form to the edge of the membrane. They appear to have the usual aculeate form of the marginal teeth in *Nanina*; but instead of narrowing towards the cutting-point, they are broadly and obliquely truncated, reflected, and minutely denticulated. This lingual membrane is also figured by Semper (Phil. Archip., pl. VI, f. 35); but his figures give more the impression of the usual *Nanina* marginals with denticulated side and bifid points. The teeth are, however, so exceedingly numerous and small that it is very difficult to understand them.

Nanina inversicolor, Fér.

Also from Mauritius, has the character of animal, jaw, and lingual membrane of *Nanina*, so that it cannot be retained in *Caracodus*, a sub-genus of *Helix*.

Nanina militaris,

Of same locality, for the same reasons cannot be retained in *Stylodon*, and—

Nanina leucostyla, Pfr.

Nanina rufozonata, H. Ad.

From Mauritius, prove also to belong to *Nanina*.

Nanina radians, Pfr. (*Microcystis*). Rarotonga Island.
Mr. A. Garrett.

Plate XVII, fig. P, represents one central, lateral and marginal tooth. There are 40-1-40 teeth, eight on each side being perfectly formed laterals. The marginals are sometimes trifid.

Nanina conula, Pense. Island of Huahine. Mr. A. Garrett.

Central and lateral teeth as in *N. radians*, Pfr. (See above.) Lateral teeth, seven in number on each side. Marginals aculeate, multifid, very numerous.

Nanina calculosa, Gould. Island of Huahine. Mr. A. Garrett.

Jaw as usual in the genus. Lingual membrane long and narrow. Teeth, 38-1-38. Centrals and (7) laterals as in *N. radians*. (See above.) The latter, however, have slightly developed inner side cutting points. First 15 marginals bifid, the rest multifid.

Nanina Cressida, Gould. Island of Huahine. Mr. A. Garrett.

Jaw arched, high; ends blunt; cutting-margin with a median beak-like projection.

Lingual membrane (Pl. XVII, fig. Q) with 55-1-55 teeth. The bifurcation of the cutting point of the marginals commences in the 11th tooth. There are no side cusps to the centrals and laterals, which have a long, narrow base of attachment on each side. I figure one central, one lateral and one marginal tooth.

Nanina Chamoissi, Pfr. West Maui, Sandwich Islands.
Gulick.

Pl. XVII, fig. O. The marginal teeth have three or four points. An unidentified species from Oahu has similar dentition.

Nanina subcircula, Mousson. Raiatea, Society Islands. Mr. Garrett.

Lingual membrane (Pl. II, fig. A) as in the other species.

Nanina cultrata, Gould.

Lingual membrane as usual in the genus. Laterals six on both sides; extreme marginals multifid.

Nanina Calias, Benson. Foot of Himalayas. Mns. Comp. Zool.

Lingual membrane with ten laterals on each side, still more bifid marginals. (Pl. II, fig. E.) On the same plate, fig. F, is figured a central tooth from another part of the same membrane, in which the cutting point is abnormally developed.

Vollferia.

Known only by the single species, *V. Gabbi*, Costa Rica. Dr. W. M. Gabb.

Jaw with smooth anterior surface and beak-like projection to the cutting edge.

Lingual membrane (Pl. II, fig. II) with the general arrangement of *Zonites*; the first laterals have an inner side cutting point; marginals aculeate, with side spur.

Its lingual membrane resembles that of *Limax agrestis*, in having the inner, abnormal side cutting point to its first lateral teeth. All the marginals are bifid.

Macrocyclus.

Macrocyclus Baudoni, Petit. Guadeloupe, Mr. Schramm; Dominica, Mr. Guppy.

Jaw delicate, transparent, colorless; ends pointed; anterior surface smooth; cutting edge with median projection.

Lingual membrane as in *Macrocyclus*. (See Terr. Moll., V.) I could not distinguish the characters of the very small central tooth.

Macrocyclus euspira, Pfr. Placed in *Ammonoceras*, a subgenus of *Hyalina*, by von Martens, but, from its lingual membrane, shown to belong to *Macrocyclus*.

Jaw low, crescentic; ends pointed; cutting margin with a decided, sharp, median projection.

Lingual membrane (pl. II, fig. I) long and narrow; teeth arranged as in *Macrocyclus*. There are, however, no transition teeth, as in the American species; all the side teeth being true marginals of the aculeate type. Teeth, 30-1-30. The centrals are deeply emarginate at the upper edge of their base of attachment, and have expanded lower lateral angles; they have also a well-marked, simple, median cusp, with a decided cutting point.

Zonites. (See Terr. Moll., V.)

Zonites? Bermudensis. Pfr. Bermuda. Mr. J. J. Crooke; Mr. J. Matthew Jones.

Jaw extremely thin, arched, with a blunt, median projection to its cutting edge.

Lingual membrane long and narrow. Central teeth tricuspid; laterals bicuspid; the cusps in each long and slender. Marginals numerous, aculeate, in oblique rows.

The result of my examination of the lingual membrane throws light on the generic position of this species. It can no longer be retained in *Caracolus*, a sub-genus of *Helix*, as proposed by von Martens, since it has the dentition of the *Vitrinea* of von Martens' arrangement. It differs, however, from *Zonites*, in having no longitudinal furrows above the margin of the foot, and no caudal mucus-pore. It seems to belong to no described genus.

Janulus.

Janulus stephanophora, Desh. Madeira. Dr. Hillebrand.

Jaw strongly arched; ends pointed; cutting margin with a sharp, greatly produced median projection.

Janulus bifrons, Lowe. Madeira. Dr. Hillebrand.

Jaw smooth, with median projection.

Lingual membrane with 34-1-34 teeth, of which four on each side are laterals, all as in *Zonites*.

HOLOGNATHA HELICEA.

This section contains the genera furnished with a jaw in one single piece, and quadrate marginal teeth to the lingual membrane.

A. JAW RIBLESS.

I still retain this section, though several species in various genera have ribs on their jaw.

Tebennophorus. (See Terr. Moll., V.)

Tebennophorus Costaricensis, Mörch. Costa Rica. Dr. W. M. Gabb.

Jaw strongly arched, of equal width to its blunt extremities. There are sub-obsolete anterior ribs about the centre of the jaw, the ends of five of which denticulate the cutting margin.

The lingual dentition is figured on Plate VIII, fig. N. There are about 28-1-28 teeth. The centrals have a long base of attachment, with a strong line of reinforcement running parallel to its margin at the lower edge and for a short distance at the sides. The reflection is small, and bears a short, stout median cusp, and small stout side cusps; all three cusps bearing short, stout cutting points. The lateral teeth are like the centrals, but asymmetrical by the suppression of the inner cusp and cutting point and the inner lower expansion of the base of attachment. The marginals are but a modification of the laterals; the inner cutting point not becoming bifid, though the outer one is so on the extreme marginals. There are hardly more than twelve perfect laterals on each side. The change into marginals is very gradual.

Sagda.

Sagda connectens, Ad. Jamaica. Mr. Jas. Milligen.

Lingual membrane with 26-1-26 teeth. The centrals have their plates short in comparison to the reflection, and broad. The middle cusp is long, with a long slender point. The side cusps are sub-obsolete, with short, acute, triangular points. The laterals are of the same type as centrals, but bicuspid, the outer cusp more developed than the external cusps of the centrals. The marginals are wide, low, with one long, oblique, blunt, narrow inner cusp, and one or more side small cusps.

The genus is included in the *Vitrina* of von Martens; but I have shown that it belongs to the *Hidrea*, the marginal teeth being quadrate, not aculeate.

Sagda Haldemaniuna, Jay. Jamaica. Messrs. Gloyne and Vendreyes.

Jaw slightly arcuate, of almost equal height throughout; cads blunt; no anterior ribs; no median projection to the cutting edge.

Lingual membrane with about 30-1-30 teeth, as in the last species. (Pl. II, fig. K.)

Sagda Jayana, Ad. Jamaica. Mr. Henry Vendreyes.

Jaw smooth; scarcely any median projection to cutting edge.

Lingual membrane with teeth characterized as in last species.

Endodonta.

I regret not succeeding in obtaining the jaw of any species of this genus, the more because some doubt of its existence has been expressed. It is, however, probable that it will be found, as no agnathous genus has yet been noticed with the quadrate marginal teeth which characterize *E. incerta*, and also *E. tumuloides*. Garrett.

Endodonta incerta, Mousson. Huahine Island. Mr. A. Garrett.

Lingual membrane (Pl. II, fig. N) with 11-1-11 teeth, of which four on each side are perfect laterals. The marginals (of which the last is shown in the figure) are but a simple modification of the laterals. They differ from those of *tumuloides* in not having a bifid inner cutting point, unless indeed I have, from their exceeding minuteness, failed rightly to interpret them.

Endodonta tumuloides, Garrett. Rarotonga Island, Cook's Island. Mr. Garrett.

Lingual membrane (Pl. II, fig. M) with 17-1-17 teeth, with about seven perfect laterals on each side. Teeth as in last species; but the inner cutting point of the marginals is bifid.

Patula.

Patula Huahinensis, Pfr. Huahine Island. Mr. A. Garrett.

Jaw not examined.

Lingual membrane with 18-1-18 teeth, of which about six on each side are laterals. The type of dentition is about the same as in *Entodonta incerta*, described above. The marginals are, however, different, the two cutting points being bifid, the base of attachment low and wide. (Plate II, fig. L.)

Pella.

The character of the jaw does not allow the genus to hold a position here, among "ribless jaws."

Pella rariplacata, Benson. Cape Town, S. Africa. Mr. J. S. Gibbons.

The jaw has flat, crowded, numerous ribs, such as I have described for *Microphysa Imsingi*, in Terr. Moll., V.

Lingual membrane (Pl. III, fig. I) long and narrow. About 16-1-16 teeth, with four laterals on each side of the central tooth. The central tooth has small side cusps and cutting points. Laterals like the centrals, but slightly asymmetrical by the lesser development of the inner side; an unusual arrangement in the *Helicidae*. The marginals are low, wide, with one inner, wide, bifid cutting point, and one smaller, bifid outer cutting point, giving a serrated appearance to the cutting edge.

A central tooth, with its adjacent laterals, and two marginal teeth, are given in the figure.

Polymita.

Having found two different forms of dentition in the species referred by Von Martens to *Polymita*, I propose to restrict this genus to those species which have the abnormal dentition of its type, *P. muscarum*, leaving those with the usual dentition of the *Helicidae* under the name of *Hemitrochus*.

The peculiar dentition of *Polymita*, entirely unexpected from the appearance of the shell, is one of the most interesting facts I have met with. It is not only different from that of its allied forms, but also from that of all species of the Pfeifferian genus *Helix* as yet examined.

The peculiar dentition is shared by *picta*, Born, and may be looked for in *sulphurea*, Morelet. These two species are placed by von Martens, in *Liochila*, together with *Helix Jamaicensis*. The two former I put with *muscarum* in *Polymita*. For the last, see below.

Polymita muscarum, Lea.

Jaw wide, low, arched, delicately striated; ends attenuated, bluntly rounded; no anterior ribs; no median projection to the cutting edge. (Pl. XV, fig. K.)

Lingual membrane long and narrow, composed of numerous rows of about 75-175 teeth each. The transverse rows are arranged *en chevron*. Centrals with base of attachment long, narrow, incurving at the sides; upper margin slightly rounded; lower margin trilobed and fringed; on the lower fourth of the base of attachment springs a trilobed, gouge-shaped, cutting edge, broader than the base, and bearing three cusps, each produced into a cutting point, the central triangular, the external ones curving outwards, neither produced beyond the lower margin of the base of attachment. The side teeth (which do not resemble the usual form either of laterals or marginals) are of the same form as the centrals, but rendered asymmetrical by the lesser development of the inner lower angle of the base of attachment, and by its being thrown abruptly off towards the margin of the membrane; the lower edge is also rounded, and not trilobed as in the centrals; the laterals, also, are longer, narrower, with a less expanded upper margin of the base of attachment than in the centrals, in a contrary direction from which they are also thrown off by the irregular curving of the base of attachment. The cusps and cutting points of the side teeth are like those of the centrals.

In one lingual membrane examined, I noticed two abnormal rows of teeth down the whole length of the membrane, in which the cutting edge was divided into four lobes, instead of three, all bearing cutting points. These abnormal lines of teeth were separated by a normal line.

The figure (Pl. III, fig. C) shows a group of central and side teeth, while a single central, still more enlarged, is shown in D.

These peculiar, long, subquadrangular bases of attachment, not reflected along the upper margin, as usual in the *Helicidae*, but bearing the gouge-shaped, expanded cutting edge, soldered as it were upon its surface, can only be compared to those of *Gæotis*, and those of the marginal teeth of *Orthalicus* and *Liguus*.

Polymita picta, Born. Cuba. The specimen examined was found on a bunch of bananas in New York.

Jaw as in *muscarum*.

Lingual membrane (Pl. III, fig. E) with the same characteristics as that of *muscarum*; but the teeth are shorter and stouter. (Plate III, fig. E.)

HEMITROCHUS.

I have examined only five species of those remaining in von Martens' *Polymita*, after removing its type, *muscarum*, as explained above. *Helix versicolor*, Born, is the only remaining

species in which the dentition of *muscarum* and *picta* may be looked for. The others will probably agree with *varians*, etc.

The jaw of *varians*, *gallopavonis*, *Troscheli*, *rufopicata*, *graminicola*, is high, arched, without ribs, with a blunt median projection. In one species, *Milleri*, the jaw is like this, excepting that it has one decided, stout, central rib, denticulating either margin. This shows that the presence or absence of ribs on the jaw cannot be considered a reliable generic character. (See, also, *Dentellaria*.)

Hemitrochus varians, Mke. (See Terr. Moll., V.)

Hemitrochus Troscheli, Pfr. New Providence, Bahamas. Gov. Rawson.

Jaw as described; a strong, transverse line of re-enforcement.

Lingual membrane (Pl. IV, fig. A) long and narrow. Central teeth very long; the upper margin of base of attachment greatly produced above; the reflected portion not extending to the lower margin; median cusp with a short, blunt cutting point; side cusps and cutting points obsolete. Laterals like the centrals, but asymmetrical; the upper margin still more produced; outer laterals with bifid inner cutting point, and side cusp and cutting point. Marginals quadrate, with one large, oblique, rounded, bluntly bifid cutting point, and one or two side, small, blunt cutting points. The membrane is peculiar in the extension of the upper margin of the base of attachment of the teeth.

Hemitrochus gallopavonis, Val. Turk's Island. Gov. Rawson.

Jaw as described.

Lingual membrane as described in last species. (Pl. IV, fig. B.)

Hemitrochus rufopicata, Poey. Cuba. Mr. Arango.

Jaw and lingual membrane (Pl. IV, fig. C) as described above.

Hemitrochus graminicola, Ad. Jamaica. Messrs. Vendreyes and Gloyne.

Jaw as described.

Lingual membrane (Pl. IV, fig. E) as described. Teeth 40-1-40.

Of the above species, the figure gives one central, the adjacent lateral or laterals, and one or more marginals.

Hemitrochus Milleri, Pfr. Fortune Island, Bahamas. Dr. J. J. Brown.

Jaw differing from that of the above species by the presence of a stout,

median rib-like prominence, denticulating either margin. (Pl. XVI, fig. J.) See above, under generic name.

Lingual membrane with 33-1-33 teeth, characterized as in the other species. Fig. D, of pl. IV, shows one central and adjacent lateral, an outer lateral (7th tooth) showing the side cusp and cutting point; the eighth lateral, in which the inner cutting point first is bitted, the sixteenth tooth, still a lateral, though somewhat modified in form, and a marginal, the last tooth. It will be noticed that, on the central and first lateral, the cutting point has a side bulging, probably a modification of the missing side cutting point. No doubt this bulging exists in the other species of the genus, though not shown in the focus under which my figures were drawn.

Acaulus.

Acaulus Phœnix, Pfr.

Jaw wide, low, arcuate; ends but slightly attenuated, blunt, very thick and coarse; no anterior ribs; no median prominence to the cutting edge.

Lingual membrane (Pl. II, fig. O) with long and narrow centrals and laterals; the upper margin of the base of attachment produced and rounded; the reflection is stout, as are the cusp and cutting point, of which only the middle one exists. Marginal teeth simply a modification of the laterals.

Caracolus.

In this genus, also, there is a difference as regards the presence or absence of ribs on the jaw.

Lingual membrane characterized by the absence of side cusps and cutting points.

Caracolus Bermudensis, of von Martens' list, I have above shown to be more nearly allied to *Zonites* than to any known genus. *Caracolus inversicolor* I have above referred to *Nanina*.

Caracolus excellens, Pfr. San Domingo. Dr. Newcomb.

Jaw not examined.

Lingual membrane (Pl. IV, fig. F).

Caracolus sagemon, Beck. Cuba. Mr. Arango.

Jaw high, arcuate; ends rapidly but slightly attenuated, blunt; cutting margin with broad, blunt, median projection; no anterior ribs.

Lingual membrane (Pl. IV, fig. G) very long and narrow, with 36-1-30 teeth; the transverse rows of teeth being unusually oblique, though not so represented in my figure. The change from laterals to marginals is very gradual, so that it is difficult to count the former. Centrals with base of attachment long, constricted at the middle, expanded above, and with greatly produced lower lateral angles; reflection large, with obsolete side

cusps and no side cutting points, and with a very broad, short median cusp, bearing a short, widely-expanded, square edge (as it cannot be called a point). Laterals like the centrals, but asymmetrical, as usual, and with an asymmetrical cutting edge larger than in the central tooth. The cutting edge becomes more developed as the teeth pass off laterally, in proportion to the base of attachment and the cusp also. Thus the marginals become formed without any splitting of the inner cutting point, or any development of a side cusp and cutting point, excepting that on some of the teeth a blunt obsolete side cusp may be shown.

The form of this species from Gouave Island, Haiti, (Prof. Linden.) is said by Mr. Bland to have a white, instead of a reddish brown, peristome. The lingual membrane is figured on Pl. IV, fig. H. The cutting points on all the teeth are more produced than in the Cuban *sagemon* and *Arangiana*; after the eighth tooth there is a decided side cutting point on the laterals and marginals. The jaw is the same as in *sagemon*.

Caraculus Arangiana, Poey. Cuba. Mr. Arango.

Jaw (Pl. XV, fig. M) greatly arched; ends blunt, scarcely attenuated; cutting margin with a blunt, median projection.

Lingual membrane (Pl. IV, fig. I) with 33-33 teeth, arranged as in *sagemon*. The lower margin of the base of attachment seems delicately fringed.

Caraculus marginella, Gmelin. Porto Rico. Mr. R. Swift.

The jaw differs from that of the other species examined, in having stout anterior ribs.

Lingual membrane (Pl. IV, fig. J).

Leucochroa.

The genus *Leucochroa* is adopted by von Martens, the type being *Helix candidissima*, Drap., a species whose anatomy has been described by Moquin-Tandon as being more nearly related to *Zonites* than to *Helix*. The genus is classed by von Martens among the *Vitrinea*, the section of *Helicea* containing the genera furnished with ribless anterior surface and median projection to the jaw, and aculeate, marginal teeth to the lingual membrane. Among the species catalogued by von Martens is *Leucochroa Boissieri*, Charp. We find, however, that both jaw and lingual membrane in this species indicate that the genus belongs to the *Helicea*.

Leucochroa Boissieri, Charp. Palestine. Mr. John Van Nostrand.

Jaw very low, long, arcuate; ends but little attenuated, bluntly rounded; cutting edge with a decided median projection; anterior surface free from

ribs, with a strong transverse line of reinforcement. The jaw resembles that of *Causilia* or *Pupa* more than that usually found in *Helix*.

Lingual membrane as usual in the *Helicidae*. Centrals short and stout, with a blunt cutting point, ~~to the~~ central tooth; the cusp obsolete. Laterals with a very long, oblique, blunt inner cutting point; the outer cutting point obsolete. Marginals subquadrate, with several short, blunt, cutting points. (Pl. II, fig. J.)

Ochthephilu.

In this genus, again, the presence or absence of ribs on the jaw is not a reliable character.

Ochthephilu tiarella, Webb and Broll. Madeira. Dr. Hillebrand.

Jaw low, slightly arcuate; ends scarcely attenuated; anterior surface with about 15 flat, broad, crowded ribs, scarcely denticulating the cutting margin.

Lingual membrane with 21-1-21 teeth, of same character as figured in *Plebeula brevis*. About nine laterals on each side of the median line.

Ochthephilu abjecta, Low. Madeira. Dr. Hillebrand.

Jaw low, slightly arcuate; ends attenuated; cutting edge with a blunt median projection; no anterior ribs.

Lingual membrane with 24-1-24 teeth, about four on each side being perfect laterals, characterized as in the last species.

Cysticopsis.

The jaw described under *C. tumida* is peculiar. There is considerable difference in the dentition of the two species examined.

Cysticopsis tumida, Pfr.

Jaw (Pl. XVI, fig. A) wide, low, slightly arcuate, scarcely attenuated at the blunt ends; a slight, broad, median projection to the cutting edge; with delicate, separated, longitudinal striæ, passing into a long, narrowing, conical prolongation of the jaw, springing from about the centre of its surface, and distinct from the muscular attachment of the jaw.

Lingual membrane (Pl. V, fig. A) with 22-1-22 teeth. Centrals very broad, with a small reflection bearing three distinct cusps and cutting points. Laterals like the centrals, but bicuspid and asymmetrical. Marginals low, wide, with one inner, larger, cutting point, and one outer, smaller, bifid cutting point.

Cysticopsis pemphigodes, Pfr. Cuba.

Jaw not examined.

Lingual membrane (Pl. V, fig. B) long and broad. Teeth as in *Plagiop. tycha*, not as in *Cysticopsis tumida*.

Plagioptycha.

Jaw arcuate, ends slightly acuminate, blunt; no anterior ribs; a decided median projection to the cutting edge:—*P. lozodon*, Pfr., *Albersiana*, Pfr., *monodonta*, Pfr., *diaphana*, Lam., *macroglossa*, Pfr. In *P. Duclosiana*, Fér., however, there is a decided median, stout rib, denticulating either margin. Thus the presence or absence of ribs on the jaw cannot be considered a generic character in *Plagioptycha*.

The character of the lingual dentition in the species examined agrees.

Plagioptycha lozodon, Fér. San Domingo. Dr. W. Newcomb.

Lingual membrane (Pl. V, fig. C) long and narrow. Centrals having a long, narrow base of attachment, with expanded lower angles and lines of reinforcement within them; reflected portion small, with a single stout cusp and cutting point; laterals like centrals, but asymmetrical; outer laterals with outer cusp and cutting point; the inner cutting point becomes bifid as the teeth pass into marginals, which become low and wide, with two broad, bluntly rounded, usually bluntly bifid cutting points.

Plagioptycha Albersiana, Pfr.

Jaw as above.

Lingual membrane like last. (Pl. V, fig. D.)

Plagioptycha monodonta, Pfr. San Domingo. Dr. Newcomb.

Jaw as above.

Lingual membrane (Pl. V, fig. E) like that of *P. lozodon*.

Plagioptycha Duclosiana, Fér. Exuma, Bahamas. Dr. J. J. Brown.

Jaw as described above.

Lingual membrane (Pl. V, fig. F) with about 30-1-30 teeth. The figure shows the gradual changes in the teeth, the seventh being the last lateral. The side bulgings in the cutting points of central and first laterals are shown by using a different focus in the microscope than that used in drawing the figures of the other species. It represents the side cutting point.

Plagioptycha diaphana, Lam. Porto Rico. Dr. Cleve.

Jaw as above.

Lingual membrane (Pl. V, fig. G) as in *lozodon*.

Plagioptycha macroglossa, Pfr.

Jaw as above.

Lingual dentition (Pl. V, fig. H) as in *lozodon*.

Leptoloma.

Only one species examined :—

Leptoloma fuscocincta, Ad. Jamaica.

Jaw thin, arcuate, high, ends bluntly truncated; with perpendicular striae; cutting edge with a median projection.

Lingual membrane (Pl. V, fig. 1) as in *Plagioptychus*.

Achatinella.

In Annals of Lyceum of Nat. Hist. of New York, X, 331; XI, 190, are given in detail my observations on the anatomy of *Achatinella*. I here give a summary only of what relates to the jaw and lingual dentition.

Most of the specimens examined were sent by Mr. Gulick. A few were received from the Museum of Comparative Zoology.

I have here grouped the species according to von Martens' arrangement and sub-genera. I will state that, of Mr. Gulick's arrangement, the species examined represent the sub-genera—*Achatinella*, *Bulinella*, *Apex*, *Partulina*, *Auriculella*, *Laminella*, *Anastra*, *Leptachatina*,—all except *Newcombia*: *Carelia* is treated below.

The result of my examination may be briefly stated, viz.: that I find two types of dentition, one (*a*) including the species of *Partulina* and *Achatinella*, s. s.; the second (*b*) comprising all the species examined, of *Newcombia*, *Laminella*, *Leptachatina*.

Bulinella, *Apex* and *Labiella*, of von Martens' arrangement, were not examined. Of these we may expect to find the first two agreeing with my first section (*a*) in dentition; the last, with my second (*b*).

In the section (*a*) suggested by me, the species are all characterized by a jaw so extremely delicate as to be found with great difficulty. It cannot be extracted by potash. It is arcuate, extremely thin, transparent, with blunt ends. The lingual membrane agrees with that figured by Heynemann of *A. bulinoides*. It is very broad in comparison to its length. In one lingual there were 175-1-175 teeth. They are arranged *en chevron*. There is but one form of tooth for centrals and side teeth (it is difficult to call the latter laterals or marginals), but the centrals are somewhat smaller and symmetrical. The base of attachment

is long and narrow, squarely truncated below, rapidly widening and curving outwards at its upper third, so that the upper margin is twice the breadth of the lower; it is rounded and reflected along its whole breadth; reflection small, bearing five or more cusps and cutting points, the median the smallest. There is some variation in these cusps. Of this type of jaw and dentition are:—

Partulina jucunda, Smith. W. Maui.
plumbea, Gulick. E. Maui.
eburnea, Gulick. E. Maui.
solidissima, Smith. E. Maui.
solida, Gulick. Oahu.
taniolata, Pfr. Oahu.
marmorata, Gld. Oahu.
pullida, Nutt. Oahu.

Achatinella (s. s.) *producta*, Rvc. Oahu. (Pl. III, fig. G.)
Johnsonii, Newc. Oahu.
livida, Swains. Oahu.
varia, Gulick. Oahu.
auricula, Fér.

In the last three species, I failed to extract the delicate jaw. *Achatinella auricula*, Fér., on account of its having this type of dentition, I remove from *Partula*, where it is placed by von Marteus.

The peculiar type of dentition shared by the above species is seen on my Pl. III, fig. G. (*A. producta*, Rvc.)

(b) Of the second type of jaw and dentition are the remainder of the species examined. The jaw is stout, arcuate, ends blunt, no anterior ribs; generally a median projection to cutting edge. In *Laminella Mastersi* it is low, wide, slightly arcuate, horn-colored; no median projection. (Pl. XVI, fig. E.) It is the same in the other species of *Laminella*. The same type of jaw, though more arched, is found in all the species of *Newcombia* and *Leptachatina*. In *picta* (Pl. XVI, fig. M) there is a slightly produced, blunt, median projection to the cutting edge. There are often delicate vertical striæ on this type of jaw.

The lingual dentition in this section is entirely different from that in the last. The membrane is long and narrow. The transverse rows of teeth are horizontal, not *en chevron*. The teeth are like those usually found in the *Pulmonata*, with quadrate base of attachment and tricuspid centrals, bicuspid laterals, bicuspid, multicuspid, or even pectinate marginals. The centrals are very much smaller than the laterals, both in height and width.

Newcombia picta, Mighels: W. Maui.

Jaw described above. Lingual membrane, Pl. VI, fig. B. The marginals have two cutting points, each point becoming bifid as the teeth pass off laterally.

Newcombia venusta, Mighels.

Jaw slightly arcuate, with blunt ends; a few vertical wrinkles.

Lingual membrane (Pl. VI, fig. A) shown in all its changes. The marginals are decidedly pectinate in the teeth figured, but some are seen with only two cutting points. Teeth 24-1-24, eight being laterals on each side of the median line.

Luminella Mastersi, Newc. West and East Maui.

Jaw described above. (Pl. XVI, fig. E.)

Lingual membrane (Pl. VI, fig. E) with simply two or three cutting points to the marginals. A group of these latter, and of centrals and laterals, is given.

Laminella obesa, Newc.

Lingual membrane (Pl. VI, fig. C) with 27-1-27 teeth, of same type as in the last species.

The tooth shown in the figure is the 19th, a marginal, with one large, inner cutting point, and three very small outer ones. On the same membrane, however, are some marginals having three cutting points and some which are quite pectinate. This variation shows that my distinction between *b* and *c*, in my former paper, referred to above, was not well founded.

The jaw is as in *A. Mastersi*.

Laminella decorticata, Gulick. Oahu.

Lingual membrane (Pl. VI, fig. D) as in *Mastersi*.

Laminella luctuosa, Pfr. Oahu.

Lingual membrane (Pl. VI, fig. F) as in *Mastersi*.

Laminella nigrolabris, Smith. Oahu.

Lingual membrane as in *Mastersi*.

Leptachatina nitida, Newc. W. Maui.

Lingual membrane (Pl. VI, fig. H), marginals pectinate.

Leptachatina grana, Nowc. W. Maui.

Dentition as in last species.

Leptachatina dimidiata, Pfr. Oahu.

Same dentition.

Leptachatina textilis, Fér.

The dentition is as in the other species of the subgenus examined by me. There are 20-1-20 teeth, with eight laterals on each side. On Pl. VI, fig. G, I figure the whole change from central to extreme marginal teeth. The last are not pectinate.

Tornatellina.

Considered by von Martens as a sub-genus of *Cionella*, but by its dentition closely related to *Achatinella*, s. s. The jaw was not examined.

Tornatellina aperta, Pease. Huahine Island. Mr. A. Garrett.

Lingual membrane (Pl. III, fig. F). The figure represents the central, with the first and second side teeth. There is an exceedingly large number of teeth beyond this, of the same type, quite to the exterior margin of the membrane. The teeth are arranged obliquely in waving rows, as is also the case in *Achatinella*, s. s. Teeth of same type as those of *Achatinella*, s. s.

Tornatellina oblonga, Pease. Huahine Island. Mr. A. Garrett.

Lingual dentition the same as in the preceding species.

Clausilia.

The West Indian species alone examined.

Clausilia tridens, Chemn. Porto Rico. Mr. Robert Swift.

Jaw (Pl. XV, fig. J) slightly arcuate, smooth, wide, low; ends slightly attenuated, blunt; cutting edge with a blunt, wide, median projection. In the jaw figured, the lower margin is developed, but much thinner, beyond the cutting edge.

Lingual membrane (Pl. VII, fig. H) short and broad, with about 30-1-30 teeth. Centrals with long, narrow base of attachment, incurved at the sides and base, where it is also excavated or thinned, rounded at top, and reflected; reflection small, with one large cusp bearing a short, blunt, cutting point, and sub-obsolete side cusps; laterals like centrals, but asymmetrical, the base of attachment much wider, the reflection and cusp with its cutting point much stouter and longer; outer laterals with distinct side cusp and cutting point; the base of attachment of the laterals is squarely cut away on its inner angle; about the eleventh tooth the teeth begin to change to marginals; the extremes of which last are subquadrate, wider than high, broadly reflected into a large cusp bearing two oblique, large, irregularly bidd cutting points.

The figures of the jaw and lingual dentition of this species were photographed from the microscope by my friend, Mr. Samuel Powel, of Newport, to whom I am greatly indebted for assistance in my studies of lingual dentition.

Stenogyra.

See Terr. Moll., V, for dentition of *S. subula*, Pfr., and *decollata*, Lin.

Stenogyra gonostoma, Gündl. Cuba. D. Rafael Arango.

Lingual membrane as in next species.

Stenogyra octona, Chemn. Bahin. J. G. Anthony.

Lingual membrane short and broad.

Teeth about 80-130. Centrals with base of attachment long, narrow, angularly expanded at centre; reflection small, bluntly tricuspid, the central cusp bearing a short, stout, cutting point; laterals much larger, as wide as long; reflection very large, with an inner median large, and a small outer cusp on each side of it, all the cusps bearing distinct cutting points; marginal teeth low, wide, irregularly denticulated by minute cutting points. The peculiarity of the dentition, as in the other species of *Stenogyra*, is the small central as well as distinctly tricuspid laterals; the latter are not crowded on the membrane.

Stenogyra hasta, Pfr. Cuba.

Jaw (Pl. XV, fig. I) low, arcuate, ends somewhat attenuated, blunt; no median projection to cutting margin; anterior surface with numerous, vertical, delicate, striæ.

Lingual membrane (Pl. VII, fig. D). Teeth 18-18, as usual in the genus. (See Terr. Moll., V.)

Stenogyra juncea, Gld. Island of Huahine. Mr. A. Garrett. Described by Gould and Pfeiffer as a *Bulinus*.

Lingual membrane with 28-28 teeth, eight of which on each side are laterals, dentition as in *S. hasta*.

Strophia.

See Terr. Moll., V, for jaw and lingual dentition of *S. incana*.

Strophia decumana, Fér. Castle Island, Bahamas.

Jaw stout, strongly arcuate, ends slightly attenuated, bluntly rounded, anterior surface ribless, transversely striate, and with several stout lines of reinforcement; a small, blunt, median projection to the cutting edge.

Lingual membrane (Pl. VII, fig. A) with 30-30 teeth; centrals short, about as broad as long, with short, stout median cusps to the reflection, bearing a stout, broad cutting point, and subobsolete side cusps bearing

short cutting points; laterals like the centrals, but bicuspid and asymmetrical; the outer laterals have the inner cutting point bluntly bifid; marginals a modification of the laterals, low, wide, with one inner, large, blunt, bifid cutting point, and one outer smaller.

Strophia mumia, Brug. Abaco, Bahamas.

Jaw slightly arcuate, stout, rough, rather high, ends but little attenuated, blunt; cutting edge with a wide, blunt, slightly developed median projection.

Lingual membrane (Pl. VII, fig. B) with about 30-1-30 teeth, as in the last species. There is a line of reinforcement to the lower margin of the base of attachment of the central and lateral teeth.

Strophia iostoma, Pfr.

Jaw as in other species of the genus.

Lingual membrane (Pl. VII, fig. C) not differing from that of the allied species. Teeth about 20-1-20.

Clonella.

Clonella floynei, Gibbons. Curaçao. Mr. J. S. Gibbons.

Jaw and lingual membrane, as usual in *Stenogyra*.

Pl. VII, fig. E, represents the central and first lateral teeth.

Cæcilianella.

Cæcilianella Gundluchi, Pfr. St. Martin. Dr. H. E. Rygersma.

Jaw low, (Pl. XVI, figs. F, G.) wide, slightly arcuate, ends attenuated; whole surface covered with about 22 crowded, broad, flat ribs, denticulating either margin.

Lingual membrane (Pl. VII, fig. F) long and narrow. Teeth 18-1-18, with four perfect laterals. Centrals with their base of attachment long, narrow, their reflected portion about one-half the length of the base of attachment, tricuspid; the middle cusp stout, with a short blunt cutting point, side cusps subobsolete, but with small, distinct cutting points. Lateral teeth with their base of attachment subquadrate, much longer, and very much broader than that of the centrals, the reflected portion short, stout, tricuspid, the middle cusp very stout and long, reaching the lower edge of the base of attachment, beyond which projects the short, stout cutting point; side cusps subobsolete, but bearing distinct, though small cutting points. There are four perfect laterals, the fifth tooth being a transition to the marginals, by the base of attachment being lower, wider, not exceeding the reflected portion, with one inner large cusp bearing one, outer large cutting point representing the outer cutting point of the first four lateral teeth and one inner, still larger, cutting point, representing the middle cutting

point of the first four laterals, and one smaller, outer cusp, bearing one small, sharp, bifid cutting point, representing the outer side cutting point of the first four laterals. The sixth tooth has the largest cutting point bifid. The balance of the teeth are true marginals. They are very low, wide, with two low, wide cusps, bearing each several irregular, blunt, cutting points.

The dentition of this species is, as would be anticipated, of the same type as the allied *Cociliundula acicula*, as figured by Lehmann (Lebenden Schnecken Stettins, p. 128, Pl. XIII, fig. 43,) and Sordelli, l. c., fig. 26). The jaw, however, has no appearance of the "brace" like ribs described in that species by Sordelli (Atti Soc. Ital. Sc. Nat., XIII, 1870, 49, Pl. I, fig. 25). The ribs are quite like those figured of *Helix Lamsingi* (Terr. Moll., V), although they are narrower.

Lithotis.

Lithotis rupicola, Blandf. Bombay.

Referred by Pfeiffer to *Succinea*, but widely differing from that genus in not having an elasmognathous jaw.

Jaw (Pl. XVI, fig. C) arcuate, with a depression or excavation in the centre of its upper margin; scarcely attenuated towards the ends; cutting edge with a decided median projection; anterior surface with vertical striae, but no trace of ribs.

Lingual membrane (Pl. VII, fig. G): centrals with long and narrow base of attachment; the reflected portion has one long, median cusp, bearing a long cutting point; laterals like the centrals, but asymmetrical; the outer laterals have a bifid side cutting point; marginals a simple modification of outer laterals.

Limicolaria.

Limicolaria Numidica, Rve.

Jaw thin, highly arcuate, smooth, ends attenuated.

Lingual membrane not examined.

(b) JAW WITH DECIDED STOUT RIBS.

This section, also, is unsatisfactory, as the species included in it are not all so characterized.

Anadenus.

Anadenus —? Himalaya Mountains. An undetermined species.

The jaw is thick, low, wide, slightly arcuate; ends but little attenuated; anterior surface with fourteen stout, unequal, separated ribs, denticulating either margin.

On Pl. VII, fig. I, I have figured the lingual dentition of this slug, whose specific name is unknown to me. There are 58-1-58 teeth.

The dentition is of the same type as described in the genus by Heyemann, *Malak. Blatt.*, X, 1893, p. 138.

Carelia.

Carelia bicolor, Jay. Dr. W. H. Dall.

Through the kindness of Dr. Dall, I have been able to examine this species, formerly known as *Achatina bicolor*. Thus I have increased the list of subgenera or groups of *Achatinella* of Gulick's arrangement, whose jaw and lingual dentition is known, leaving still to be examined *Neocombia* only of the same arrangement. (See *ante*, p. 96.)

It will be seen from my description, that while *Carelia* (or at least this species) differs utterly in jaw and dentition from Gulick's *Achatinella*, s. s., *Bulimella*, *Apex*, *Partulina*, *Auriculella*, it agrees in dentition with his *Laminella*, *Anastra*, *Leptachatina*, but differs in having a costate jaw. *Carelia*, therefore, must stand distinct from any other groups of *Achatinella*.

The jaw (Pl. XVI, fig. D) is low, slightly arcuate, with but little attenuated, blunt ends; anterior surface with ten stout ribs, denticulating either margin.

Lingual membrane (Pl. VI, fig. I) long and narrow; teeth 37-1-37, of same type as in the species of *Laminella*, *Neocombia*, and *Leptachatina* (see above), the marginals being irregularly and obliquely pectinate as in *Achatinella obesa*.

Geomalacus.

Geomalacus maculosus, Allm. Ireland. Mr. Gwynn Jeffreys.

Jaw stout, arched, ends not attenuated, blunt; anterior surface with about twelve, broad, crowded ribs, of which four in the centre are more developed and deeply denticulate either margin.

Lingual membrane (Pl. III, fig. H) : centrals with long and narrow base of attachment; reflection large, with a stout median cusp bearing a long, stout cutting point; side cusps obsolete; laterals like the centrals, but asymmetrical; marginals to the extreme edge of the membrane a simple modification of the laterals, low, wide, with one inner, long, oblique cutting point, and a smaller, side cutting point.

Veronicella.

See Terr. Moll., V, for a description of jaw and lingual membrane of the genus. The following species agree in lingual dentition :—

Veronicella occidentalis, Guild. Guadeloupe. Mr. Schramm.

Jaw with about 30 ribs.

Veronicella Sloanei. Jamaica.

Jaw with 20 broad ribs.

Veronicella ———. Rio Janeiro, Brazil. J. G. Anthony.

The species undetermined. Body very long and slender.

Jaw with about 30 ribs.

Lingual membrane figured on Pl. III, fig. B.

Veronicella ———. Rio Janeiro. J. G. Anthony.

The species undetermined.

Jaw with 20 broad ribs.

Veronicella ———. Costa Rica. Dr. W. M. Gubb.

An undetermined species. Body long and narrow.

Jaw with from 30 to 40 ribs.

Veronicella ———. Mozambique. Mr. J. S. Gibbons.

An undetermined species.

Jaw with over 22 ribs.

Veronicella olivacea, Stearns. Polvo, Occidental Department, Nicaragua. Mr. McNeil.

Jaw with over 20 ribs.

Lingual membrane, see Terr. Moll., V.

Simpulopsis.

Shuttleworth describes the jaw as having numerous, stout, anterior ribs.

Simpulopsis corrugatus, Guppy. Trinidad. Mr. Guppy.

Jaw not observed.

Lingual membrane (Pl. VII, fig. J) with teeth of same type as figured by Heynemann for *S. sulculosus*. Centrals smaller than the laterals; base of attachment almost as broad as long, its lower margin excavated as in *Succinea*; reflection large, with three cusps and cutting points. Laterals like the centrals, but larger and asymmetrical, the inner, larger cusp of the reflection bearing a very large, expanded, blunt cutting point.

Cryptostrakon.

Cryptostrakon Gabbi, W. G. Binn. Costa Rica. Dr. W. M. Gubb.

Jaw (Pl. XVI, fig. L) high, solid, decidedly arched, ends scarcely attenuated; anterior surface with a few stout ribs, denticulating the lower margin.

Lingual membrane (Pl. VII, fig. K) long and narrow; central teeth tricuspid; laterals bicuspid; marginals quadrate, irregularly bicuspid, the inner cutting points the larger and bifold.

Microphysa.

Microphysa is put in *Helicea* by von Martens. *M. minuscula* (Terr. Moll., V), and *circumfirmata*, Redf., both belong to *Vitrinea*, having aculeate marginal teeth, and jaw of *Zonites*. *M. turbiniformis*, Pfr., has a jaw as in *Cylindrella*, *Bulimulus*, etc., i. e., with numerous very delicate, distant ribs, giving the appearance of separate plates. It would be put in *Goniognathus* of Mörch, though there are no upper triangular median plates. *M. vortex* and *incrustedata* (see Terr. Moll., V) have quadrate marginal teeth; the jaw of *incrustedata* has numerous, crowded, flat ribs; that of *vortex* was not observed.

Microphysa? circumfirmata, Redfield.

Jaw not observed.

Lingual membrane long and broad, centrals tricuspid, laterals bicuspid, cusps long and slender, marginals aculeate.

From the above description it will appear that this species belongs to the *Vitrinea* rather than to the *Helicea* of von Marten's arrangement, in which latter it is classed in "Die Heliceen" as a species of the subgenus *Microphysa*. I leave it here, not knowing what else to do with it.

Microphysa turbiniformis, Pfr. Jamaica. Mr. Henry Vendreyes.

Jaw (Pl. XV, fig. C) so extremely thin and delicate as to fold over on itself along its margin and at its extremities; very light horn-colored, almost transparent; strongly arched, attenuated towards its obtuse ends; about forty delicate ribs, such as are found in *Cylindrella*, serrating either margin on about the centre of the jaw is a curving line of reinforcement, somewhat parallel to the lower margin; the upper margin slightly incurved at its centre; the ribs at the centre of the upper margin do not run *en chevron* as do those of *Cylindrella*.

Lingual membrane (Pl. VII, fig. L) long and narrow; teeth about 23-25. Centrals large in proportion to the laterals, with a subquadrate base of attachment; three decided, separated cusps and cutting points; laterals tricuspid; marginals low, wide, with both inner and outer cusp bearing an oblique, broad, bifold cutting point. ♀

Fruticicola.

See Terr. Moll., V, for *F. rufescens* and *hispida*.

Fruticicola pubescens, Pfr. Haiti. Mr. V. P. Parkhurst.

Jaw (Pl. XV, fig. H) thin, semitransparent, low, slightly arcuate, ends scarcely attenuated, blunt; upper margin with a strong muscular attachment; no median projection to cutting edge; anterior surface with about twenty ribs denticulating either margin; these ribs appear in most cases to be broad, flat, with narrow interstices, but in others there are appearances such as I have described in *Bulinulus linnaeoides* (see below).

Lingual membrane long and narrow (Pl. VI, fig. J). Teeth as usual in the *Helicinae*. The change from laterals to marginals is very gradual, not formed by the splitting of the inner cutting point. The 12th tooth (figured) shows the commencement of the transition. The 22d (figured) is a marginal tooth. The inner cutting point of the marginals is rarely bifid. Teeth 24-1-24.

Dorcasia.

There is wide variation in the characters of the jaws in this genus. For *D. griseola*, Pfr., see Terr. Moll., V.

Dorcasia similaris, Fér. Brazil. J. G. Anthony.

Jaw arched, ends not attenuated, blunt; anterior surface with eight separated ribs, denticulating either margin.

Lingual membrane (Pl. VI, fig. L) long, with unicuspid centrals and laterals; marginals low, wide, each cusp bifid.

Dorcasia globulus, Müll.

Jaw low, wide, scarcely arcuate, ends not acuminate; no anterior ribs.

Lingual membrane (Pl. VI, fig. M) with about 40-1-40 teeth; teeth with almost square bases of attachment; both centrals and laterals are very distinctly tricuspid; marginals a simple modification of laterals, the broad cutting point trifid.

Both by jaw and lingual dentition this does not agree with the other species of *Dorcasia* examined.

Turricula.

For *T. terrestris*, see Terr. Moll., V.

Turricula tuberculosa, Conr. Palestine. A dried specimen in Mr. Bland's collection.

Jaw with numerous, crowded, broad, flat ribs, denticulating either margin.

Lingual membrane (Pl. VI, fig. N) long and narrow. Teeth 28-1-28; centrals and laterals without decided side cusps or cutting points, but the central cutting point has a decided lateral bulge; marginals low, wide.

with one inner, oblique, large bifid cutting point, and two outer smaller cutting points. A marginal is shown in the figure, with a central and lateral.

Coryda.

Coryda Gossei, Pfr. Jamaica. Messrs. Vendreyes and Gloyne.

Jaw not examined.

Lingual membrane (Pl. V, fig. J) broad; of same type as in *Plagioptycha*.

Plebecula.

Plebecula lurida. Madeira. Dr. Hillebrand.

Jaw low, slightly arcuate, ends scarcely attenuated; anterior surface with about eight broad, separated ribs.

Lingual membrane (Pl. V, fig. K) with tricuspid centrals, bicuspid laterals, all the cusps bearing cutting points; marginals with one, inner, long, oblique, bifid cutting point, and one outer, smaller, bifid cutting point.

Leptaxis.

Leptaxis undata, Lowe. Madeira. Dr. Hillebrand.

Jaw described by Mörch as narrow, with numerous ribs converging to the centre. ~

Lingual membrane (Pl. VIII, fig. C) of the individual examined, peculiarly abnormal, the malformed teeth as figured being repeated frequently on each transverse row, and down the whole length of the membrane. Such malformations are often found in lingual membranes.

Pomatia.

See Terr. Moll., V, for description of jaw and membrane of *P. aspersa*.

Pomatia Sieboldiana, Phil. Japan.

Jaw high, arched, ends but little attenuated, blunt; anterior surface with eight stout, separated ribs, denticulating either margin; no median projection to cutting edge. (Pl. XVI, fig. H.)

Lingual membrane (Pl. VIII, fig. B) long and narrow; teeth 39-139, with 21 perfect laterals on each side of the median line; base of attachment of centrals long and narrow, reflection broad, with stout median cusp and cutting point; side cusps and cutting points wanting; laterals like the centrals, but asymmetrical, the fiftieth lateral is the first with the side cutting point; marginals low, wide, with one broad, oblique, bluntly bifid cutting point, and one side, short, cutting point.

The species was put by von Martens in *Acusta*, a sub-genus of *Nanina*.

Pomatia Humboldtiana, Val. Mexico. Dr. E. Palmer.

Jaw short, arched, bluntly ending; with six broad, separated, stout ribs, denticulating either margin.

Lingual membrane (Pl. VIII, fig. A) with shorter, stouter teeth than in the last species. The centrals are pear-shaped, with no side cusps or cutting points.

Thelidomus.

Jaw with stout anterior ribs.

Lingual membrane the same in the species examined, in general characteristics, but there will be found variation as to the presence of side cutting points on centrals and laterals.

Thelidomus aspera, Fér. Jamaica. Mr. V. P. Parkhurst.

Jaw wide, low, arcuate, ends but slightly attenuated, blunt; anterior surface with eight sharp, prominent ribs, strongly denticulating either margin.

Lingual dentition (Pl. VIII, fig. E) long and narrow. Teeth 41-141. Centrals and laterals with stout broad cusps and cutting points; no side cusps or cutting points; marginals with one long, bluntly bident cutting point.

Thelidomus discolor, Fér.

Jaw arcuate, thick, ends blunt. Anterior surface with seven unequal, decided, stout ribs, denticulating either margin.

Lingual membrane (Pl. VIII, fig. D) long and narrow. Centrals with a long narrow base of attachment expanded at the base, and bearing at its corners a small reinforcement; lower margin extending beyond the cusp; reflection bluntly tricuspid, the median cusp long, stout, with a short blunt point; side cusps subobsolete. Laterals as the centrals, but asymmetrical, and with a shorter base of attachment. Marginals quadrate, wide as high, with two short, blunt denticles, the inner one slightly the longer.

Thelidomus auricoma, Fér. Lomas de Camoa, Cuba. Mr. Arango.

Jaw arched, with blunt, scarcely attenuated ends; twelve broad ribs distributed over the whole anterior surface and denticulating either margin.

Lingual membrane (Pl. VIII, fig. F) with 42-142 teeth, of which 25 may be called laterals, but the change is gradual into marginals. Teeth as in *provisoria*.

Thelidomus notabilis, Shuttl. Tortola. Mr. Robert Swift.

Jaw arcuate, low, ends blunt, narrower at the centre; decided separate ribs denticulating either margin.

Lingual membrane (Pl. VIII, fig. G). Centrals tricuspid; laterals bicuspid; the base of attachment about as wide as high, the larger cusp with a long cutting point extending beyond the lower margin of the base of attachment.

Marginals quadrate, of equal width and height, with two short, wide, blunt, round cusps, the inner one slightly the larger.

Thelidomus lima, Fér. Porto Rico. Mr. R. Swift.

Jaw arcuate, ends blunt; anterior surface with seven stout ribs; a strong muscular attachment.

No lingual membrane examined.

Thelidomus Jamaicensis, Chemn. Jamaica. V. P. Parkhurst.

The species is placed in *Liochila* by von Martens, but Mr. Bland places it in this genus.

Jaw thick, arcuate, ends attenuated; anterior surface with 14 decided but unequal ribs, irregularly disposed and denticulating either margin.

Lingual membrane (Pl. VIII, fig. II) long and narrow, with 41-1-41 teeth; there are no distinct side cusps and cutting points on the centrals and inner laterals.

Thelidomus provisoria, Pfr. New Providence, Bahamas. Gov. Rawson.

Jaw very slightly arcuate, wide, low, of equal height throughout to its blunt ends; anterior surface with 10-15 ribs, separated by irregular intervals, not always reaching the cutting edge, which has a broad, blunt, median projection.

Lingual membrane (Pl. VIII, fig. I) with 40-1-40 teeth; the centrals and laterals have a distinct side cutting point.

Eurycratera.

Eurycratera angulata, Fér. Porto Rico. Mr. R. Swift.

Jaw stout, dark claret-colored, low, wide, ends blunt; about seven very wide, very crowded ribs, bluntly denticulating either margin.

Lingual membrane (Pl. VIII, fig. J); central and laterals with distinct side cutting points.

Eurycratera crispata, Fér. San Domingo. Dr. Newcomb.

Jaw thick, arcuate, ends blunt; anterior surface with ten stout ribs.

Lingual membrane (Pl. VIII, fig. K). Centrals and laterals with the upper margin of the base of attachment produced into angles as below, with distinct side cutting point; middle cutting point of centrals and inner cutting point of laterals greatly produced.

Polydontes.

No jaw of this genus examined.

Polydontes Luquillensis, Shuttl.

Lingual membrane (Pl. VIII, fig. L) as usual in the *Helicida*. Centrals tricuspid, laterals bicuspid; cusps with long, sharp cutting points, extend-

ing beyond the base of attachment; marginals bicuspid, cusps short, bluntly rounded, the inner one, as usual, the longer, each bearing short cutting points.

Stylodon.

I have shown *H. militaris*, Pfr., placed in this genus by von Martens, to be a *Nanina*.

Stylodon Studeriana, Fér. Seychelles. Consul Pike.

Jaw stout, strongly arched, ends but little attenuated, blunt; anterior surface without ribs; there are, however, a few coarse, broad, vertical wrinkles. One jaw had a slightly developed median projection to its cutting edge, another has no approach to a projection.

Plate VIII, fig. M, shows the lingual dentition; teeth 60-1-60, with about 22 laterals on each side. There is considerable resemblance to the dentition of *Merope fringilla* described below. The cutting points on centrals and laterals are, however, more pointed. There are no side cusps or cutting points to centrals or inner laterals; the outer laterals and marginals have very oblique, broad, bluntly trifid cutting points.

Dentellaria.

In this genus, the presence or absence of ribs on the jaw is not a reliable generic character.

I have examined a large proportion of the known species. The jaw varies somewhat, so that each description should be studied. There seems a tendency to a median projection to the cutting edge, and to the presence of ribs. *D. pachygastra*, Gray, has seven decided ribs and no median projection; *orbiculata*, Fér., has traces of ribs and no median projection; *Isabella*, Fér., has decided ribs and no median projection; *dentiens*, Fér., has decided ribs and no median projection; *nucleola*, Rang., has one decided rib and a median projection; *badia* has eight decided ribs; *formosa*, Fér., has no ribs, but a strong median projection; *perplexa*, Fér., has obsolete ribs and median projection; *lychnuchus*, same as last; *punctata*, Born, has median projection and decided ribs; *Josephinae*, Fér., is strongly arched, has no ribs, but a median projection.

The species agree in their dentition.

Dentellaria orbiculata, Fér.

Jaw striated, thick, slightly arched, ends squarely truncated; cutting edge irregular, showing traces of the ends of subobsolete ribs, no median projection. (Pl. XVI, fig. W.)

Lingual membrane (Pl. IX, fig. A) long and broad, with 47-1-47 teeth. Base of attachment long and narrow in centrals, a line of reinforcement near its upper margin; reflected portion small, stout, with a short, stout median cusp bearing a short, stout cutting point, no side cusps or cutting points; first laterals like the centrals, but asymmetrical; outer laterals with side cusp and cutting point; marginals low, wide, with one large, inner bluntly billed cutting point and one outer small billed cutting point.

Dentellaria Isabella, Fér. Barbadoes. Gov. Rawson.

Jaw striated vertically and horizontally, with about eight well-defined ribs denticulating either margin.

Lingual membrane (Pl. IX, fig. B) as above.

Dentellaria denticus, Fér. Dominica. Mr. Guppy.

Pl. IX, fig. C, gives full details of the changes of the teeth from centrals to marginals, especially the side cusp and cutting point of the outer laterals, and the transition from laterals to marginals; teeth 33-1-33.

Jaw (Pl. XVI, fig. N) with 4-5 stout ribs denticulating either margin.

Dentellaria nucleola, Rang. Martinique. Gov. Rawson.

Jaw thick, arched, ends blunt; cutting margin with an obtuse median projection; one central, stout rib, denticulating either margin. (Pl. XVI, fig. O.)

Lingual membrane as usual in *orbiculata*. (Pl. IX, fig. D.)

Dentellaria nudidenticulata, Chemn. Martinique. Gov. Rawson.

Jaw (Pl. XVI, fig. V) stout, arched, ends blunt; blunt median projection to cutting edge; one stout, well-developed rib on the centre of the jaw, and three less developed, separated, on either side of it.

Lingual membrane (Pl. IX, fig. E) as in the other species.

Dentellaria pachygastra, Gray. Guadeloupe. Mr. Schramm.

Jaw (Pl. XVI, fig. P) stout, slightly arcuate, ends blunt; anterior surface with about seven irregularly disposed ribs; both ends free from ribs.

Lingual membrane (Pl. IX, fig. F) as in the other species.

Dentellaria badia, Fér.

Jaw stout, arched, ends blunt; eight decided ribs. (Pl. XVI, fig. Q.)

Lingual membrane (Pl. IX, fig. G) as in other species.

Dentellaria formosa, Fér. Antigua. Mr. Robert Swift.

Jaw arched; ends blunt; several strong, transverse lines of reinforcement, but no ribs; a median projection to cutting edge. (Pl. XVI, fig. R.)

Lingual membrane as usual in the genus. (Pl. IX, fig. H.)

Dentellaria Josephine, Fér. Guadeloupe. Mr. Schramm.

Jaw (Pl. XVI, fig. S) stout, ribless, horseshoe-shaped, ends bluntly

rounded; a decided median projection to the cutting edge, marked with strong vertical striae.

Lingual membrane as in other species. (Pl. IX, fig. I.)

Dentellaria perplexa, Fér. Island of Grenada. Gov. Rawson.

Jaw with a median projection to its cutting edge. The anterior surface is of irregular thickness, showing some approach to the ribbed form of jaw. (Pl. XVI, fig. T.)

Lingual membrane as usual. Central and lateral teeth with short, stout, blunt cusps. Marginal teeth quadrate, with one wide, stout, bluntly rounded median cusp, and two small, blunt side cusps. (Pl. IX, fig. J.)

Dentellaria lychnuchus, Müll. Guadeloupe. Mr. A. Schramm.

Jaw (Pl. XVI, fig. U) arched, ends blunt, cutting margin with a broad, blunt, median projection; strong vertical striae and transverse lines of reinforcement, and subobsolete ribs, which denticulate the upper margin.

Lingual membrane as in the other species. (Pl. IX, fig. K.)

Pleurodonta.

The jaw is decidedly costate. Lingual membrane much as in *Plagioplycha* and *Dentellaria*.

Pleurodonta acuta, Lam. Jamaica.

Jaw arched, thick, ends blunt, attenuated; anterior surface with seven distant, stout ribs, denticulating either margin.

Lingual membrane (Pl. X, fig. A) with 40-1-40 teeth as above; the marginal figured has only one long, oblique cutting point.

Pleurodonta Chemnitziana, Pfr. Jamaica. Mr. Robert Swift.

Jaw stout, arched, ends attenuated, blunt; anterior surface with about six irregularly disposed ribs, stout and denticulating either margin.

No lingual membrane received.

Pleurodonta Carmelita, Fér. Jamaica. Mr. Robert Swift.

Jaw arcuate, ends blunt, anterior surface with about six stout ribs, denticulating either margin.

Lingual membrane (Pl. X, fig. B) as usual in the genus. Central teeth short, bluntly pointed on the middle cusps, the side cusps subobsolete; laterals like centrals, also with obsolete side cusps and cutting points; marginals low, wide, with an inner large, oblique, bluntly trifid cutting point.

Pleurodonta Schroeteriana, Pfr. Jamaica. Mr. Vendreyes.

Jaw not examined.

Lingual membrane (Pl. X, fig. C) as in other species.

Pleurodonta invalida, Ad. Jamaica. Mr. Henry Vendreyes.

Jaw not examined.

Lingual membrane (Pl. X, fig. D) as in the other species. Centrals and laterals short and stout.

Merope.

Meropa fringilla, Pfe. Admiralty Island. Prof. A. G. Wetherby.

The dried remains of the animal in the shell of a cabinet specimen furnished the lingual membrane and jaw here described. The shell is the variety with the pink peristome.

Jaw with numerous crowded, stout ribs, denticulating either margin.

Lingual membrane (Pl. X, fig. E) long and narrow; teeth 28-1-28, with about 11 laterals. Centrals with base of attachment longer than wide; side cusps obsolete, side cutting points wanting; middle cusp broad, blunt, with a very short, broad, blunt cutting point. Laterals like the centrals, but asymmetrical; the cutting point becomes longer as they pass off laterally, and at the 12th tooth it commences to be bluntly trifid. The marginals are peculiar; their base of attachment is subquadrate, with a single broad cusp, bearing a very broad, oblique, expanding, trifid cutting point; the outer division very small, pointed; the median longer, very broad, squarely truncated; the inner one about half the size of the median, recurved and sharply pointed.

The left hand figure in the plate shows a marginal in profile.

The dentition of this species is peculiar, resembling that common in *Orthaticus* rather than the type usual in *Helix*.

Helix, ———. Costa Rica. Dr. W. M. Gabb.

Jaw not observed.

Lingual membrane (Pl. V, fig. I) long and narrow. Teeth 15-1-15. Centrals with a base of attachment longer than wide, with lower lateral expansions; reflection large, decidedly tricuspid, each cusp surmounted by a cutting point. Laterals like the centrals, but asymmetrical and consequently bicuspid. Marginals low, wide, irregularly denticulated or serrate, the inner three cutting points being longer than the outer ones, of which there are several.

Helix astur, Souv. I do not know the position of this species. New Caledonia.

Jaw (Pl. XVI, fig. B) low, wide, slightly arcuate, ends scarcely attenuated, blunt; anterior surface without ribs; a wide, blunt, median projection to the cutting edge; a line of reinforcement running parallel to the cutting margin; a strong muscular attachment to the upper margin.

Lingual membrane (Pl. X, fig. F) with 30-1-30 teeth, nine perfect laterals on each side; teeth as usual in the *Helicidae*; with decided side cusps and cutting points.

Helix convicta, Cox. Australia. Dr. Cox.

Subgeneric position unknown to me.

Jaw highly arcuate, thick, ends blunt; anterior surface with seven separated, stout ribs, denticulating either margin.

Lingual membrane (Pl. X, fig. G) with 30-1-30 teeth, ten laterals on each side; centrals and inner laterals without side cutting points; marginals low, wide, with one inner, large, oblique bifid cutting point, and one smaller side cutting point.

Cochlostyla.

The only subgenus examined is *Canistrum*, and this only in one species:—

Canistrum fulgetrum, Brod.

Jaw arcuate, thick, wide, low, ends but slightly attenuated, blunt; anterior surface with more than twelve stout, broad ribs, denticulating either margin.

Lingual membrane (Pl. XI, fig. G) long and broad, with 80-1-80 teeth; centrals and inner laterals without side cusps and cutting points, the reflection and cusp stout, the cutting point blunt; marginals with greatly produced, bluntly pointed upper margin to the base of attachment.

Bullmus.

Of this genus species of several subgenera were examined.

Macrodonates odontostomus, Sowb.

Jaw wide, low, slightly arched, smooth.

Lingual dentition (Pl. X, fig. H). Teeth 34-1-34; the cusps and cutting points are short and stout, no side cusps or cutting points.

Pelecychilus auris-Sileni, Born. St. Vincent.

Jaw with delicate, distant ribs, as in *Cylindrella*, q. v.

The cutting points on the teeth of the lingual membrane are very long (Pl. X, fig. I). The upper, as well as lower, lateral angles of the base of attachment in the centrals and laterals are greatly developed.

Pelecychilus glaber, Gmel. Island of Grenada, W. I.

Jaw as in last species.

Lingual membrane (Pl. X, fig. J) with decided side cusps and cutting points to all the teeth.

Anthinus multicolor, Rang.

Jaw thick, greatly arched, ends attenuated, striate; no anterior ribs; no median projection to cutting edge.

Lingual membrane (Pl. XI, fig. A) with 40-1-40 teeth; base of attachment very long, reflection small, with a short blunt cutting point; no side cusps or cutting points.

Pachyotus egregius, Jay. Brazil. J. G. Anthony.

Jaw not examined.

Lingual membrane (Pl. XI, fig. B); the upper margin of the base of at-

tachment is carried beyond the reflection in the centrals; teeth stout, with stout cusps and cutting points.

Borus oblongus, var. *albus*, Müll. Tobago. Gov. Rawson.

Jaw slightly arcuate, stout, wide, of almost equal height throughout; ends but slightly attenuated, blunt; anterior surface with vertical and transverse striae and perpendicular wrinkles, scarcely distinguishable from the ribs, of which there are ten well-developed, crenulating either margin.

Lingual dentition as published by Heynemann for *B. oblongus* in *Mul. Blatt.*, 1868.

Orphnus Hanleyi, Pfr. Brazil. J. G. Anthony.

Jaw stout, strongly arched, transversely striate; ends but little attenuated, blunt; cutting edge with a broad, stout, striated median projection.

Lingual membrane (Pl. XI, fig. D) long and narrow; teeth 50-1-50; the lower margin of the base of attachment is excavated in centrals and laterals; no side cusps or cutting points.

Orphnus foveolatus, Rve. Northern Peru. Prof. Orton.

Jaw slightly arched, wide, low, thin, with over 50 delicate ribs of the kind described below under *Bulinulus Lobbi*, Rve.

Lingual membrane (Pl. XI, fig. C) long and narrow, with 34-1-34 teeth; no side cusps or cutting points to centrals and laterals; reflection short, stout; the membrane is of the same width to its abruptly truncated ends, and very thick.

Orphnus magnificus, Grat. Brazil.

Jaw stout, low, wide, slightly arched, ends slightly attenuated, blunt; entire anterior surface covered with numerous stout ribs, breaking the regularity of both upper and lower margin, but not actually denticulating them.

Lingual membrane long, rather broad, with 30-1-30 teeth. Teeth as in *O. Hanleyi*.

Dryptus pardalis, Fér.

Jaw thick, low, wide, slightly arcuate, ends but slightly attenuated, blunt; whole anterior surface occupied by 12 broad ribs, denticulating either margin.

Lingual membrane not examined.

Dryptus marmoratus, Dünker.

Lingual membrane (Pl. XI, fig. E) long and broad; no side cusps or cutting points.

Eurytus aulacostylus, Pfr. St. Vincent. Gov. Rawson.

Jaw thin, transparent, slightly arcuate, with about sixty delicate ribs, as

found in *Cylindrella*; no upper median ribs *en chevron*, but all the ribs slightly oblique.

Lingual membrane (Pl. XI, fig. F); centrals tricuspid, laterals bicuspid, each cusp with long cutting point.

(c) JAW WITH SEPARATE, DELICATE RIBS, USUALLY RUNNING
OBLIQUELY TOWARDS THE CENTRE.

Several species are found in the last genus with this type of jaw.

Gæolis.

The genus *Gæolis* was described by Shuttleworth,* founded on a curious mollusk from Porto Rico. The lingual dentition was said by him to be nearly the same as in *Vitrina* and *Zonites*, the teeth arranged in oblique rows, centrals obtusely tridentate, laterals scarcely differing from the centrals, marginals lengthened, awl-shaped, arcuate, at base? bifurcate. The presence of a jaw was not verified by Shuttleworth. The character of the dentition was considered such as to denote carnivorous habits of the animal.

An examination of an unidentified Porto Rico specimen (Mr. R. Swift) has furnished the following description.

Gæolis ———

Jaw (Pl. XV, fig. A) long, low, slightly arcuate, ends attenuated, extremely thin and delicate, transparent; in one single piece, but divided by over forty† delicate ribs into as many plate-like compartments of the type common in *Cylindrella* and *Bulinulus*, but with no upper median triangular space; the ends of the ribs serrate the upper and lower margins.

Lingual membrane (Pl. XI, figs. H, I) long and broad, composed of numerous rows of teeth arranged *en chevron*. Centrals with base of attachment very long, narrow, obtuse above, incurved at sides, obtusely rounded and expanded at base, near which is a short, gouge-shaped, expanded cusp, whose lower edge has three bluntly-rounded cutting points. Laterals same as centrals in shape, but a little larger, and asymmetrical from the disproportionate expansion of the cutting point. Marginals same as laterals, but more slender, with more developed and graceful cutting points, of

* Férussac's figure of *Purmacella pallidum* seems to show a jaw with stout ribs; I do not think *Gæolis* can belong to the same genus, *Petella*.

† Fragments only of the jaw were saved; the largest one I have figured, and from it estimate the whole number of ribs.

which the median is pointed, often bifid. There is much variety in the shape and denticulation of the cusps. The middle denticle is always the smallest. Teeth aculeate when seen in profile.

By its jaw, *Gastis* calls to our mind the genus *Amphibulima*, and many species of *Bulinulus* and *Cylindrella*. There is some resemblance in its lingual dentition to the marginal teeth of *Orthaticus* and *Liguus*, as well as of *Polymita muscarum*. It also forcibly reminds one of some of the features of the dentition of *Triboniophorus*.

Amphibulima.

Amphibulima patula, Brug. Dominica. St. Kitts.¹

Jaw (Pl. XV, fig. E) slightly arcuate, low, ends attenuated; extremely thin and transparent, with prominent transverse striae, divided longitudinally by about forty-five delicate ribs into so many plate-like sections of the same character as those of *Cylindrella*, *Macroceramus*, and many species of *Bulinulus*. No upper triangular median plates as in *Cylindrella*. Margin serrated by extremities of ribs.

Lingual membrane (Pl. XIII, figs. C, D) from a specimen from Dominica, long and broad, composed of numerous horizontally-waving rows of teeth, of the form usual in the *Helicidae*. Centrals with subquadrate base of attachment extended at basal angles, narrowing towards the centre, expanding towards the upper edge, which is reflected and tricuspid, extending quite to the base of the tooth; the cusps are stout, the median one bluntly pointed, each bearing a cutting point. The lateral teeth are of the same type as the centrals, but asymmetrical. The marginals are long and narrow, rounded at base, narrowed at apex, reflected and bicuspid; cusps short, stout, bearing a cutting point, and generally a simple modification of those of the laterals. The extreme marginals have irregular cutting points, like simple papillæ. Fig. D shows a group of laterals. Fig. C shows the changes from centrals to extreme marginals.

Pl. XIII, fig. A, shows the dentition of the St. Kitts form, fig. B giving a group of laterals.

Lately the question of identity of these shells with the Guadeloupe *patula* has been raised (see Journal de Conchyliologie, XXI, 12). I have, therefore, again carefully examined the lingual membranes previously described, to learn if they give any difference worthy to be considered of specific value. I have figured teeth from each lingual membrane. I regret not having had the opportunity of examining Guadeloupe specimens also, but have never been able to receive the latter with the animal; indeed it seems

to be now found subfossil only.* I can only treat the question of the identity of the St. Kitts and Dominica forms, not their identity with Guadeloupe forms.

It will be seen that the Dominica form has sharper cutting points to the large cusps of its central and lateral teeth than that of St. Kitts. Fig. B shows a group of laterals of the former, in which some variation from the pointed shape is indeed shown, but no decided tendency that way. On the other hand, the laterals from the St. Kitts form, show great constancy in the square truncation of the cutting points. (Fig. B.)

The teeth of the St. Kitts form are broader in proportion to their length than those of Dominica, have a greater curve in their outlines, and more developed side cusps, which overlap the median cusps.

The Dominica lingual in the only row counted had 87-1-87 teeth. A row of the St. Kitts form had 57-1-57. The marginal teeth of the St. Kitts form show a greater tendency to splitting into sharp denticles on the cutting cusps than those of Dominica.

It cannot be denied that certain variations may be noticed in the two lingual membranes. I believe, however, that these differences are not such as suggest specific distinction, especially as the shell furnishes no grounds for doubting the specific identity of the forms.

Mr. Bland has given a detailed account of the species in *Journal de Conchyliologie*, XXI, 342, October, 1873.

Amphibulima Rawsonis, Bl. Isle of Montserrat, between Nevis and Guadeloupe. Gov. Rawson.

Jaw as in *A. rubescens*, about 33 ribs; those at the upper centre running obliquely and meeting or ending before reaching the lower margin.

Lingual membrane (Pl. XIII, figs. H, G) as usual in the genus. Centrals with the base of attachment very much larger than that of the laterals, and with an enormous, single, broad, long, rapidly and obtusely pointed cutting point. No side cusps or side cutting points. Laterals of the form usual in the *Helicinae*, with a stout, inner cusp, bearing a broadly truncated, short cutting point, and a small side cusp bearing a short cutting point.

The change from laterals to marginals is shown in the 10th, 15th and 27th teeth in the plate.

The marginals (28th and 68th teeth in the plate) have a long, narrow base of attachment, which near its lower margin bears a short, slightly expanding, bluntly trifid cusp; from this cusp springs a short, expanding, bluntly denticulated, broad, cutting edge, the inner denticle the largest. This cutting edge is shown in the 67th and 68th teeth on a more enlarged scale. There is great variation in the denticulation of the cutting edge. There are 68-1-68 teeth.

* See, also, under *A. Rawsonis*, for Fischer's description of the dentition of the Guadeloupe form.

The peculiarity of this membrane is the enormous development of the central tooth.

Fig. G shows a lateral in profile: I have given figures of the dentition of *A. patula*, Brug., of St. Kitts and of Dominica, of *A. appendiculata*, Pfr., of Guadeloupe, and of *A. rubescens*, Fér., of Martinique. Dr. Fischer (Journ. de Conch., XXII, 1874, Pl. V) figures that of *A. depressa* of Guadeloupe, and *A. patula* of Guadeloupe.

Dr. Fischer also (l. c.) figures the dentition of *A. rubescens*. He gives inner side cutting points to the lateral teeth, which I did not find in my specimens. His figure of the dentition of the Guadeloupe *A. patula* is certainly specifically distinct from the St. Kitts and Dominica form. It seems as if there were the following distinct species of *Amphibulima*: *depressa*, *appendiculata*, *rubescens*, *patula* of Guadeloupe, *patula* of St. Kitts and Dominica, and *Rawsoni*.

Amphibulima rubescens, Desh. Martinique. Gov. Rawson.

The jaw is readily detached from the muscles of the mouth, and is not connected with the lingual membrane as usual with our *Helices*.^{*} It is thin, wide, low, arched, with attenuated, bluntly pointed ends, divided by numerous (about 63) delicate ribs into separate plate-like divisions, as in the jaw of *Cylindrella*, *Bulimulus*, etc., the ribs running somewhat obliquely towards the centre of the jaw; there is no decided, upper median, triangular plate. (Pl. XV, fig. D.) The lingual membrane (Pl. XIII, fig. F) is long, broad, composed of numerous rows of 76-1-70 teeth. Centrals long, narrow, expanding below, with the lower margin of the base of attachment squarely excavated as in *Succinea*; tricuspid, the central cusp very long, wide, with a greatly expanded, squarely truncated cutting point reaching beyond the lower margin of the base of attachment; the side cusps short and narrow, simply pointed. The lateral teeth are of same type as the centrals, but asymmetrical and bicuspid. The marginals are a simple modification of the laterals, with a long, bluntly truncated median cusp, and obsolete side cusps. The extreme marginals are irregularly denticulated, the outer and inner denticles being more produced, especially the outer, and greatly curved; the inner denticles, usually two in number, are quite small.

Amphibulima appendiculata, Pfr. Guadeloupe. Gov. Rawson.

Jaw (Pl. XV, fig. F) extremely thin and transparent, long, low, slightly arcuate, ends blunt, divided longitudinally by about 40 regular ribs into as many

^{*} Even after boiling the whole buccal mass in potash, the lingual membrane and jaw remain attached in most of our *Helices* of N. A. showing a decided connection between the two.

See last species for remarks on Dr. Fischer's description and figure of the dentition of the species.

plate-like sections, of the character found in the jaws of *Cylindrella*, *Macroceramus*, and many species of *Bulinulus*. No appearance of triangular upper median plates, however, as in *Cylindrella*, though the two specimens examined by me are not perfect at that part. Both margins serrated by the extremities of the ribs. The jaw is quite membranous.

Lingual membrane (Pl. XIII, fig. E). Centrals subquadrate with a very large, stout, short, pointed cusp, the side cusps obsolete. Laterals larger and more narrow than the centrals, bicuspid, the inner cusp greatly produced, broad and quite squarely terminating. The base of attachment of the laterals is cut away on the inner side, leaving a large outer lateral expansion, bringing to mind the much less developed one of *Succinea*. Marginal teeth quadrate, gradually becoming modified from the laterals, the cusps finally passing off into simple, obtuse papillae, the inner one the larger.

Bulinulus.

The species of this genus may be grouped by their lingual dentition, independently of the character of the shell, into (a) those having the type of teeth usual in the *Helicidae*, and (b) those having the peculiar type of dentition figured on Pl. XII, fig. G (see *B. primularis*), and (c) those having the dentition of *B. Lobbi*. (Pl. XIV, fig. E.) The former two types are found in several of the subgenera noticed below.

The jaw of *Bulinulus* is usually thin, with delicate, separated ribs as in *Cylindrella*, their ends serrating either margin; the ribs at the upper centre of the jaw often run obliquely and terminate before reaching the lower margin.

Drymæus altoperuvianus, Rve. Between Balsas and Cuzamarca, Peru. Prof. Orton.

Jaw with 31 ribs, delicate, separated, as in *Cylindrella*.

Lingual membrane (Pl. XIV, fig. F) very peculiar, resembling that of *B. Lobbi*, described below, excepting that the marginal teeth are of same type as the laterals, with still more produced cutting point; one in profile is shown in the left-hand figure.

Drymæus Vincentinus, Pfr., var. : Tobago.

Jaw as usual in *Bulinulus*, thin, transparent, with numerous delicate, separated, narrow ribs.

Lingual membrane as in *Bulinulus laticinctus*. (See below.)

Drymæus Knorri, Pfr. Porto Cabello, Venezuela. Mr. Robert Swift.

Jaw arched, high, ends attenuated, blunt; an obtuse median projection to cutting edge; transverse lines of reinforcement, but no ribs.

An unusual form of jaw in this genus, though common in many subgenera of *Helix*.

Drymaeus Lobbi, Rve. - Between Balsas and Cajamarca, Peru.
Prof. Orton.

Jaw (Pl. XV, fig. P) thin, transparent, as usual in the genus, with 21 narrow, distant ribs, serrating either margin, running obliquely towards the centre of the jaw, so that those of the upper centre meet or end before reaching the lower margin; the substance of the jaw is so thin that it divides, on maceration, into separate pieces at the ribs; in some specimens the jaw seemed to be formed of distinct plates, whose overlapping forms the ribs; I have no doubt, however, that it consists of one single piece.

Lingual membrane (Pl. XIV, fig. E) broad, very delicate in texture, and difficult to handle; numerous rows of 90-100 teeth; the centrals have the base of attachment longer than wide, with lower lateral expanded angles; the reflection has one stout, median cusp, the side cusps being obsolete; this cusp bears a short, rapidly attenuated, sharp cutting point; the laterals are of same type as centrals, but differ widely in the cutting point, which is oblique, extremely long, broad as the upper margin of the base of attachment, bluntly rounded at its end, near which on the inner side is a prominent, blunt notch; the marginals are low, wide, with a very oblique cusp, bearing a much broader, trifid cutting point, the middle one much the largest, all with curving sides.

Drymaeus Bahamensis, Pfr. New Providence, Bahamas.
Gov. Rawson.

Jaw as usual in the genus, over fifty ribs; in some specimens the ribs at the centre meet or end before reaching the lower margin, so oblique are they; in others they are so slightly oblique as to reach and serrate the lower margin.

Lingual membrane (pl. XII, fig. F) with no lateral teeth, all the side teeth being marginals of the form described in *B. Lobbi*.

Drymaeus Rawsonis, H. Ad. Tobago. Gov. Rawson.

Lingual membrane as in last species.

Liostracus multifasciatus, Lam. Antigua. Gov. Rawson.

Jaw as usual in the genus.

Lingual membrane as in last species; the cusp of the central tooth has three cutting points. The marginals are in waving rows.

Liostracus alternans, Beck. Islands in the Bay of Panama. Mr. McNoil.

Jaw as usual in the genus, 52 ribs.
Lingual membrane as in last species.

Liostracus Mariolinus, Poey.
See Terr. Moll., V.

Mesembrinus primularis, Rye. Northern Peru. Prof. Orton.
Jaw as usual in the genus.
Lingual membrane (Pl. XII, fig. G) as in last species, but there is only one cutting point in the central tooth.

Mesembrinus pallidior, Sowb.
See Terr. Moll., V.
Lingual membrane as in the following, not as in last species.

Mesembrinus chrysalis, Pfr. Martinique. Gov. Rawson.
Jaw of the type common in *Bulimulus*, *Cylindrella*, etc., arcuate, low, ends blunt, thin, transparent; with eighteen narrow, separated ribs, a transverse central line of reinforcement. Attached to the upper margin is a strong triangular membrane of the same consistence and material as the jaw itself, and equally resisting the action of potash, so as readily to be mistaken for the accessory plate of the *Succinea*: (Pl. XV, fig. Q.)
Lingual membrane (Pl. XIV, fig. G) as usual in the *Helicina*: Centrals about as broad as long, tricuspid, and median cusp short and stout, its short point not extending to the base of the plate. Laterals like the centrals, but bicuspid. Marginals wide, low, with one inner, long, blunt, stout, oblique denticle, and one or two short, blunt side denticles.

Thaumatostus immaculatus, Ad. Jamaica. Mr. Gloyne.
Jaw as usual in *Bulimulus*; over 36 ribs.
Lingual membrane (Pl. XII, fig. H) as in *Bul. chrysalis*; central teeth with three cutting points.

Mormus membranaceus, Phil. Brazil. J. G. Anthony.
Jaw as usual; with about 24 ribs.
Lingual membrane as in *Bul. chrysalis*.

Mormus laticinctus, Guppy. Dominica. Mr. Guppy.
Jaw not examined

Lingual membrane (Pl. XII, fig. 1) as in *Bul. Bahamensis*; the transverse rows of teeth in this type of membrane are waving.

Mormus sufflatus, Gld.

Jaw as usual in *Bulimulus*; about 21 ribs.

Lingual membrane as in *B. chrysalis*.

Mormus Jonasi, Pfr.

Jaw as usual in *Bulimulus*.

Lingual membrane as *B. Bahamensis*.

Scutalus rhodolarynx, Rvc. Northern Peru. Prof. Orton.

Jaw ruled by the action of poison.

Lingual membrane (Pl. XII, fig. D) as in *B. chrysalis*; long and narrow; teeth 40-1-40.

Scutalus proteus, Brod. Northern Peru. Prof. Orton.

Jaw as usual, 28 ribs.

Lingual membrane as in *B. alloperuvianus*.

Leptomerus linnaeoides, Fér. St. Kitts. Dr. Branch.

Jaw (Pl. XVI, fig. 1) low, wide, semitransparent, slightly arcuate, ends scarcely attenuated, blunt; anterior surface with about sixteen ribs, denticulating either margin. It is extremely difficult to decide upon the character of these ribs. Some appear to be a simple thickening of the jaw, formed by the overlapping of distinct separate plates. Others remind me of the distant narrow ribs of most of the *Bulimuli*, of the character of the ribs in *Cylindrella*, etc. At other points upon the jaw there seem to be broad, flat ribs with narrow interstices.

Lingual membrane long and narrow (Pl. XII, fig. E). Teeth as usual in the *Edicina*. The change from laterals to marginals is very gradual, the latter being but a modification of the former, with two cutting points, the lower the longer. Thus it appears that this species in its dentition agrees with *B. cinnamomeo-lineatus*, *pallidus*, *chrysalis*, *dealbatus*, *Gundalupensis*, *alternatus*, *sporadicus*, *solatus*, *serpenteralis*, *durus*, *Peruvianus*, *rhodolarynx*, and not with *laticinctus*, *Bahamensis*, *aureo-leporis*, *pyrroceus*, *Jonasi*, *membranaceus*, *trigonotomus*, *flavidus*, *virginicus*, *convexus*, *Vincentinus*, *L. bbi*, *alternans*, *multifasciatus*, *prinnularis*.

Teeth 30-1-80, with about ten laterals on each side. The outer cutting point of the marginals is sometimes bifid.

Leptomerus sepulchralis, Pooy. New Providence, Bahamas.

Jaw stout, wide, low, arcuate, of about equal height throughout, ends bluntly rounded; anterior surface with 16 stout, broad, crowded ribs, their ends crenulating either margin; some of these ribs are of equal thickness throughout, and are separated by decided, narrow laterals; the jaw cannot, therefore, be said to resemble that usual in *Bulinulus*, though it seems to combine some of the characters of that and of the simply ribbed form of jaw.

Lingual membrane as in *B. chrysalis*; no side cutting points to centrals and inner laterals. (Pl. XI, fig. J.)

Leptomerus cornuus. Nicaragua. Mr. McNiel.

Jaw as in *Bulinulus*; 15 ribs.

Lingual membrane as in *B. chrysalis*.

Rhinus durus, Spix. Brazil. J. G. Anthony.

Jaw as usual in *Bulinulus*.

Lingual membrane as in *B. chrysalis*.

Plectostylus Peruvianus, Brug. Talenhuana, Peru.

Jaw as usual in *Bulinulus*; 30 ribs.

Lingual membrane (Pl. XII, fig. J) combining the characters of that of *B. membranaceus* in the marginals with those of *B. chrysalis* in the centrals and the five laterals on both sides of the median line; the cusp of the last is large, oblique, rounded.

Bulinulus Edwardsi, Mor. Lake Titicaca. Prof. Alex. Agassiz.

Jaw low, arcuate, ends rapidly acuminate, blunt; anterior surface with over ten distant ribs, some of the usual *Helix* type, others like the delicate ribs common in *Cylindrella*, *Bulinulus*, *Gæolis*, *Amphibulima*, etc.

Lingual membrane (Pl. XI, fig. K) with 44-1-44 teeth. Centrals of the usual *Helicinae* type, tricuspid; laterals like centrals, asymmetrical, and consequently bicuspid. The change to marginals very gradual, and formed by the simple modification of the laterals, without any splitting of the inner cutting point.

Subgeneric position of this species is unknown to me, as of the following.

Bulinulus Gabbianus, Angus. Costa Rica. Dr. W. M. Gabb; formerly referred to *B. Irazuensis*.

Jaw as in *Bul. limnæoides*, but median ribs oblique; there are about 32 ribs.

Lingual membrane with marginals as in *B. Bahameusis*. (Pl. XII, fig. L.)

Cylindrella.

Jaw arched, ends attenuated; very thin, transparent; dis-

tant, delicate, oblique ribs; serrating either margin, those of the upper centro meeting or ending before reaching the lower margin.

Lingual dentition quite peculiar. As Messrs. Crosse and Fischer, in their exhaustive paper (Journ. de Conch., XVIII, Jan., 1870), have indicated the different types of dentition found in the genus, I have referred to their respective groups the various species I have examined.

Group A.—Two lateral teeth on each side of the median line; marginals of a different form, varying in number.

Cylindrella (Casta) Chemnitziana, Fér. Jamaica.

There are 10-1-10 teeth; two laterals on each side.

Cylindrella cyclostoma, Pfr. (*Trachella*.) Lomas de Camon, Cuba. Mr. Arango.

Jaw with over 70 ribs.

Lingual membrane with 10-1-10 teeth, two being laterals on either side; the first marginal is a modification of the laterals, other marginals of usual long and narrow shape, upper margin reflected.

Cylindrella Humboldtiana, Pfr. Cuba. Mr. Arango.

Jaw with over 100 ribs.

Lingual membrane with 8-1-8 teeth, as in *C. rosea*, figured by Crosse and Fischer. The species belongs to their group *Thaumasia*.

Cylindrella rosea, Pfr. (*Urocoptis*.)

Jaw photographed in Am. Journ. Conch., V, p. 37.

Cylindrella subula, Fér. (*Mychostoma*.) Jamaica. Mr. H. Vendreyes.

Lingual membrane with 10-1-10 teeth, as in *C. gracilis*, figured by Crosse and Fischer. Lower margin of base of attachment of laterals delicately fringed or crimped; marginals 8, long, laminar, with irregularly recurved apices.

Cylindrella seminuda, Ad. (*Mychostoma*.) Jamaica. Mr. Gloyne.

Lingual membrane as in last species.

Group C.—Lateral teeth more than two; marginal teeth similar to, and not to be distinguished from, the laterals.

Cylindrella elegans, Pfr. (*Gongylostoma*). Cuba. Mr. Arango.

Lingual membrane (Pl. XIV, fig. B) with 12-12 teeth arranged *en chevron*; centrals long, narrow, apex recurved with three short, bluntly trilobed cusps and large cutting point; laterals with one inner, widely expanding, oval, inner cutting point, surmounted by a blunt narrow pedicle, and one much smaller cutting point on a narrow, high pedicle; there are no distinct marginals, the teeth becoming much modified in shape as they pass off laterally.

Cylindrella ornata, Gündl. (*Gongylostoma*). Cuba. A dried specimen in Mr. Bland's collection.

Lingual membrane (Pl. XIV, fig. A) with 18-18 teeth; as in last species.

Cylindrella Poeyana, D'Orb.

See Terr. Moll., V.

Macroceramus.

Jaw as in *Cylindrella*.

Lingual membrane, See Terr. Moll. V.

Macroceramus Gossei, Pfr. See Terr. Moll., V.

Macroceramus turricula, Pfr. Lomas de Camou, Cuba. Mr. Arango.

Jaw with 35 ribs.

Lingual membrane as in last species (Pl. XIV., fig. D).

Macroceramus inermis, Gündl. Curaçao. Mr. J. S. Gibbons.

Lingual membrane as in *M. Gossei*.

Pineria.

Pineria Viequensis, Pfr. Island of St. Martin. Dr. van Rijgersma.

Jaw with about 28 ribs as in *Cylindrella* (Pl. XV, fig. B); upper median portion of the jaw figured is imperfect.

Lingual membrane (Pl. XIV, fig. C) as in group A of *Cylindrella*; laterals two; marginals five or six, long, narrow, simple, with irregularly recurved upper margins.

Partula.

Jaw as in *Cylindrella*. Pl. XV, fig. O, represents that of an undetermined species; there are over 60 ribs on that of *P. virginea*.

Lingual membrane broad; (that of *amanda* is figured on Pl. XI, fig. L) the central tooth is as common in the *Helicidae*, with subobsolete side cusps, but side cutting points; the laterals are longer and broader than the central, with a side cusp and cutting point; the marginals have a long, narrow, quadrangular base of attachment, curving outward, extending beyond the reflection above; reflection small, with a highly developed cutting point, obliquely and bluntly tricuspid on its outer edge, the inner division the largest; the number of perfect laterals varies somewhat, 7 in *citrina*, 11 in *planilabrum*, 10 in *abbreviata* and *amanda*, 8 in *umbilicata*, *bilineata* and *virginea*; 5 in *gracilis*; there were 120 marginals in *virginea*; the number varies in the different species, but they are always numerous; the dentition of all examined by me agrees with the figure of that of *lirata* by Heynomann, Mal. Blatt., 1867, Pl. I, figs. 1—1a.

The species were determined by Mr. Garrett. I examined:—

<i>P. fusca</i> , Pease.	<i>lugubris</i> , Pease.
<i>citrina</i> , Pease.	<i>varia</i> , Brod.
<i>planilabrum</i> , Pease.	<i>compacta</i> , Pease.
<i>abbreviata</i> , Pease.	<i>Garretti</i> , Pease.
<i>umbilicata</i> , Pease.	<i>dentifera</i> , Pease.
<i>bilineata</i> , Pease.	<i>crassilabris</i> , Pease.
<i>amanda</i> , “ (Pl. XI, fig. L)	<i>Hebe</i> , Pfr.
<i>virginea</i> , Pease.	<i>prolea</i> , Pease.
<i>gracilis</i> , Pease.	<i>globosa</i> , Pease.
<i>turgida</i> , Pease.	<i>approximata</i> , Pease.
<i>rosea</i> , Brod.	<i>faba</i> , Martyn.
<i>formosa</i> , Pease.	

ELASMOGNATHA.

Jaw with accessory plate to its upper margin.

Omalonyx.

Omalonyx felina, Guppy. Demarara. Mr. J. S. Gibbons.

Jaw with the necessary plate as usual in the genus.

Lingual membrane (Pl. XI, fig. M), centralis tricuspid; laterals larger, but also tricuspid; marginals irregularly pectinate.

Specimens from Trinidad have the same dentition.

Succinea.

For jaw and dentition, see Terr. Moll., V.

Succinea pallida, Pfr. Rainton Island. Mr. A. Garrett.

Jaw as usual; no anterior ribs.

Lingual membrane (Pl. X, fig. K) with about 30-1-30 teeth; eleven inter-
als on either side.

Succinea papillata, Pfr.

Jaw as in last.

Lingual membrane (Pl. X, fig. L) with 25-1-25 teeth, nine laterals on each
side; some of the outer laterals have their outer cutting point bifid.

Succinea sagru, D'Orb. Jamaica

Jaw as usual; a median projection to cutting edge.

Lingual membrane as usual in the genus.

Succinea canella, Gld. West Maui, Sandwich Islands.

Jaw and lingual membrane as usual.

Succinea Barbadosis, Guild. Barbadoes.

As in last species.

GONIOGNATHA.

Jaw in separate pieces: the upper median one usually tri-
angular.

Orthalicus.

For jaw and lingual membrane, see Terr. Moll., V.

Orthalicus obductus, Shuttl. Islands in the Bay of Panama.
Mr. McNiel.

Jaw as usual in the genus.

Lingual membrane (Pl. XII, fig. B) as usual in the genus, with lateral
teeth; teeth about 90-1-96. The base of attachment in centrals and first
marginals is extended beyond the reflection.

Orthalicus gallina-sultana, Chenu. Marañon, Peru. Prof.
Orton.

Jaw with 15 plates (Pl. XV, fig. N).

Lingual membrane (Pl. XII, fig. C) 13 mm. broad, 16 mm. long. The rows of teeth are arranged in a backward curve from the median line for a short distance, and then run obliquely to the outer margin of the membrane; marginals as usual in the genus, but the central tooth differs in having a long, stout, lance-like cutting point, bearing at the middle of each side a prominent, subobsolete, blunt spur; three laterals on either side like the central, but asymmetrical, with the spur only on their outer sides; teeth in one row 108-1-108.

Liguus.

For jaw and lingual membrane, see Terr. Moll., V.

Liguus virgineus. Linn. Aux Cayes, Haiti, R. Swift.

Lingual membrane (Pl. XII, fig. A).

The marginal teeth are as usual in the genus, but centrals and laterals differ; membrane $4\frac{1}{2}$ x 18 mm.; teeth 40-1-40; the centrals and two first laterals have a short, stout, pointed cutting point, of the same type as described in *Orthaticus gallina-sullana*.

This completes the list of terrestrial Pulmonata* examined by me; the following have also been described from other orders, generally with a figure.

PULMONATA LIMNOPHILA.

Melampus bidentatus SAY. Ann. Lyc. N. H. of N. Y., IX, 286.

Alexia myosotis, DR L. & FR. W. Sh. N. A., II, 1.

Carychium exiguum, SAY. " " " 6.

Limnaea appressa, SAY. Am. Journ. Conch., VII, 161; L. & Fr. W. Sh., II, 28.

stagnalis, L. L. & Fr. W. Sh., II, 155.

megasoma, SAY. Am. Journ. Conch., VII, 162.

columella, SAY. L. & Fr. W. Sh. N. A., II, 24.

calascopium, SAY. " " " 55.

Pompholyx effusus, Lea. Am. Journ. Conch., VI, 312.

* Excepting *Buliminus Natalensis*, unfortunately omitted. (See Ann. N. Y. Acad. Sci., I, 302, Pl. XV, fig. J.)

- Physa vinosa*, GLD. L. & Fr. W. Sh. N. A., II, 81.
ancillaria, SAY. " " " 88.
Physa ———. Ann. Lyc., IX, 255.
Planorbis trivolvis, SAY. Ann. Lyc., IX, 203.
Ancylus Newberryi, LEA. L. & Fr. W. Sh. N. A., II, 22.
Erinna Newcombi A. AD. Ann. Lyc., X, 849; Phila. Proc., 1874, 51.
Gundlachia Californica, ROWELL. L. & Fr. W. Sh. N. A., II, 118.

PECTINIBRANCHIATA.

- Geomelania*. Am. Journ. Conch., VII, 185.
Blandiella reclusa, GURPY. " " "
Megalomastoma biluberculatum, SOWB. Am. Journ. Conch., VI, 218.
Tulotoma magnificum, CONRAD. Ann. Lyc., IX, 298.
Pomus depressa, SAY. L. & Fr. W. Sh., III, 1.
Vivipara inverteata, SAY. " " 10.
Melantho integra, SAY. " " 35.

SCUTIBRANCHIATA.

- Neritella reclinata*, SAY. L. & Fr. W. Sh., III, 101.
Stomatoma pisum, AD. Am. Journ. Conch., VII, 184.
Helicina occulta, SAY. Ann. Lyc., IX, 287; Am. Journ. Conch., VII, 29.
 ———. L. & Fr. W. Sh., III, 116.
orbiculata, SAY. Am. Journ. Conch., VI, 214.

DESCRIPTION OF PLATES.

PLATE II.

LINGUAL DENTITION OF

- Fig. A. *Nanina subcircula*, Mous. .
 B. *implicata*, Nevill.
 C. *argentea*, Rve.
 D. *Rawsonis*, Barclay.
 E. *Calias*, Bens.
 F. *Calias*, Bens. Abnormal central tooth.
 G. *Limax semitectus*, Mörch.
 H. *Velifera Gabbi*, W. G. Binn.
 I. *Macrocyclus euspira*, Pfr.

- J. *Leucochroa Boissieri*, Charp.
- K. *Sagra Haldemania*, Ad.
- L. *Patula Huahinensis*, Pfr.
- M. *Endodonta tumuloides*, Garrett.
- N. " *incerta*, Mouss.
- O. *Acavus Phoenix*, Pfr.

PLATE III.

LINGUAL DENTITION OF

- Fig. A. *Onchidium Schrammi*, Bl.
 B. *Veronicella* — (from Brazil).
 C. *Polymita muscarum*, Lea.
 D. " " (central magnified).
 E. " *picta*, Born.
 F. *Tornatellina aperta*, Psc.
 G. *Achatinella producta*, Rvc.
 H. *Geomalacus maculosus*, Allm.
 I. *Pella triplicata*, Bens.

PLATE IV.

LINGUAL DENTITION OF

- Fig. A. *Hemistrochus Troscheli*, Pfr.
 B. " *gallopavonia*, Val.
 C. " *rufopicta*, Poey.
 D. " *Milleri*, Pfr.
 E. " *graminicola*, Ad.
 F. *Caraculus excellens*, Pfr.
 G. " *Sagemon*, Beck, Cuba.
 H. " " *Gonave Is. Haiti*.
 I. " *Arangiana*, Poey.
 J. " *marginella*, Gmel.

PLATE V.

LINGUAL DENTITION OF

- Fig. A. *Cysticopeis tumida*, Pfr.
 B. " *pemphigodes*, Pfr.
 C. *Plagioptycha loxodou*, Pfr.
 D. " *Albersiana*, Pfr.
 E. " *monodonta*, Lea.
 F. " *Duclosiana*, Fér.
 G. " *diaphana*, Lam.
 H. " *macroglossa*, Pfr.
 I. *Leptoloma fuscocincta*, Ad.

- J. *Coryda Gossel*, Pfr.
 K. *Plebicula lurida*, Lowe.
 L. *Helix*,—Ann. N. Y. Ac. Sc., I, 281 (see p. 118).

PLATE VI.

LINGUAL DENTITION OF

- Fig. A. *Newcombia venusta*, Mighels.
 B. *Laminella picta*, Mighels.
 C. " *obesa*, Newc.
 D. " *decorticata*, Gul.
 E. " *Mastorsii*, Newc.
 F. " *luctuosa*, Pfr.
 G. *Leptachation textilis*, Fér.
 H. " *nitida*, Newc.
 I. *Carelia bicolor*, Jay.
 J. *Fruticicola pubescens*, Pfr.
 K. *Dorcasia pyrozoona*, Phil.
 L. " *similaris*, Fér.
 M. " *globulus*, Müll.
 N. *Turricula tuberculosa*, Conr.

PLATE VII.

LINGUAL DENTITION OF

- Fig. A. *Strophia decumana*, Fér.
 B. " *numia*, Brug.
 C. " *iosstoma*, Pfr.
 D. *Stenogyra basta*, Pfr.
 E. *Cionella Gloynei*, Gibbons.
 F. *Cæcilianella Gundlachi*, Pfr.
 G. *Lithotis rupicola*, Blandf.
 H. *Clausilia tridens*, Chemn.
 I. *Anadenus*, ———.
 J. *Simpulopsis corrugatus*, Guppy.
 K. *Cryptotrakou Galibi*, W. G. B.
 L. *Microphysa circumfirmata*, Redf.

PLATE VIII.

LINGUAL DENTITION OF

- Fig. A. *Pomatia Humboldtiana*, Val.
 B. " *Sieboldtiana*, Phil.
 C. *Leptaxis undata*, Lowe.

- D. *Thelidomus discolor*, Fér.
 E. " *aspera*, Fér.
 F. " *auricomis*, Fér.
 G. " *notabilis*, Shuttl.
 H. " *Jamaicensis*, Chemn.
 I. " *provisoria*, Pfr.
 J. *Eurycratera angulata*, Fér.
 K. " *crispata*, Fér.
 L. *Polydonte Luquillensis*, Shuttl.
 M. *Stylodon Studerianna*, Fér.
 N. *Tebennophorus Costaricensis*, Mörch ?

PLATE IX.

LINGUAL DENTITION OF

- Fig. A. *Dentellaria orbiculata*, Fér.
 B. " *Isabellæ*, Fér.
 C. " *denticata*, Fér.
 D. " *nucleola*, Rang.
 E. " *nuxdenticulata*, Chemn.
 F. " *pachygastræ*, Gr.
 G. " *badia*, Fér.
 H. " *formosa*, Fér.
 I. " *Josephinæ*, Fér.
 J. " *perplexa*, Fér.
 K. " *lychnuchus*, Müll.

PLATE X.

LINGUAL DENTITION OF

- Fig. A. *Pleurodonta acuta*, Lam.
 B. " *Carmelita*, Fér.
 C. " *Schroeteriana*, Pfr.
 D. " *invalida*, Ad.
 E. *Merope fringilla*, Pfr.
 F. *Helix astur*, Souv.
 G. " *convicta*, Cox.
 H. *Macrodonates odontostomus*, Sowb.
 I. *Pelecychilus auris-Sileni*, Born.
 J. " *glaber*, Gmel.
 K. *Succinea pallida*, Pfr.
 L. " *papillata*, Pfr.

PLATE XI.

LINGUAL DENTITION OF

- Fig. A. *Anthinus multicolor*, Rang.
 B. *Pachytus egregius*, Jay.
 C. *Orphnus foveolatus*, Rve.
 D. " *Hanleyi*, Pfr.
 E. *Dryptus warmoratus*, Dunker.
 F. *Eurytus nuncostylus*, Pfr.
 G. *Canistrum fulgetrum*, Brod.
 H. I. *Grotis*, ————
 J. *Leptomerus sepulcralis*, Poey.
 K. *Bulinulus Edwardsi*, Mor.
 L. *Partula amanda*.
 M. *Omalouyx felina*, Guppy.

PLATE XII.

LINGUAL DENTITION OF

- Fig. A. *Liguus virgineus*, Lin.
 B. *Orthalicus obductus*, Shuttl.
 C. " *gallina sultana*, Chemn.
 D. *Scutalus rhodolarynx*, Rve.
 E. *Leptomerus limnreoides*, Fér.
 F. *Drymæus Bahamensis*, Pfr.
 G. *Nesembrinus primularis*, Rve.
 H. *Thaumastus immaculatus*, Ad.
 I. *Mormus laticinctus*, Guppy.
 J. *Plectostylus Peruvianus*, Brug.
 L. *Bulinulus Irazuensis*, Ad.

PLATE XIII.

LINGUAL DENTITION OF

- Fig. A. *Amphibulima patula*, Brug. St. Kitts.
 B. " " " "
 C. " " " " Dominica.
 D. " " " "
 E. " *appendiculata*, Pfr.
 F. " *rubescens*, Desh.
 G. H. " *Rawsonis*, Bl.

PLATE XIV.

LINGUAL DENTITION OF

- Fig. A. *Cyliodrella ornata*, Gundl.
B. " *elegans*, Pfr.
C. *Pincta Viequeensis*, Pfr.
D. *Macroceramus turricula*, Pfr.
E. *Drymeus Lobbi*, Rve.
F. " *nitoperuvianus*, Rve.
G. *Mesembrinus chrysalis*, Pfr.

PLATE XV.

JAW OF

- Fig. A. *Grotia*.
B. *Pincta Viequeensis*, Pfr.
C. *Microphyas turbiniformis*, Pfr.
D. *Amphibullina rubescens*, Desh.
E. " *patula*, Brug.
F. " *appendiculata*, Pfr.
G. *Pella rariplcata*, Benson.
H. *Fruticicola pubescens*, Pfr.
I. *Stenogyra hasta*, Pfr.
J. *Clausilia trideens*, Pfr.
K. *Polymita muscarum*, Lea.
L. *Limax semitectus*, Morch ?
M. *Caracolus Arangiata*, Poey.
N. *Orthalicus gallina-sultana*, Chem.
O. *Partula*.
P. *Bulimulus (Drymeus) Lobbi*, Rve.
Q. " (*Mesembrinus*) *chrysalis*, Pfr.

PLATE XVI.

JAW OF

- Fig. A. *Cysticopsis tumida*, Pfr.
B. *Helix astur*, Souv.
C. *Lithotis rupicola*, Blandf.
D. *Carelia bicolor*, Jay.
E. *Achatinella (Laminella) Mastersi*, Newc.
F. G. *Cæcilianella Gundlachi*, Pfr.
H. *Pomatia Sieboldiana*, Phil.
I. *Bulimulus (Leptomerus) limnæoides*, Fér.
J. *Hemitrochus Milleri*, Pfr.

- K. *Urocyclus Kirki*, Gray.
 L. *Cryptotrakon Gabbl*, W. G. Blinn.
 M. *Achatinella* (*Newcombia*) *picta*, Mighels.
 N. *Dentellaria dentiens*, Pfr.
 O. " *nucleola*, Rang.
 P. " *pachygastru*, Gr.
 Q. " *badia*, Fér.
 R. " *formosa*, Fér.
 S. " *Josephinae*, Fér.
 T. " *perplexa*, Fér.
 U. " *lychnuchus*, Moll.
 V. " *nuxdenticulata*, Fér.
 W. " *orbiculata*, Fér.

PLATE XVII.

LINGUAL DENTITION OF

- Fig. A. *Chlamydephorus Gibbonsi*, W. G. B.
 B. *Glandina rosea*, Fér.
 C. " *semitarum*, Rang.
 D. " *Phillipsi*, Ad.
 E. " *aurata*, Mor.
 F. *Gonospira palanga*, Fér.
 G. " *Newtoni*, H. Ad.
 H. " *Mauritiana*, Mor.
 I. " *Nevilli*, H. Ad.
 J. *Ennea clavatula*, Lam.
 K. *Spiraxis Dunkeri*, Pfr.
 L. *Rhytida vernicosa*, Kraus.
 M. *Stenopus decoloratus*.
 N. *Urocyclus Kirki*, Gr.
 O. *Nanina Chamoissi*, Pfr.
 P. " *radians*, Pfr.
 Q. *Trochomorpha Cressida*, Gld.

WGB del

J. R. Patterson, Sharp & Shoemaker

W G E del.

J. B. Haffner and J. B. Haffner

WGB:del

J.B. Sullivan and others

WGB:el

J.N.H. Morris Scott Museum

WGB del

J. E. Howard and others

WGE del

JNE. Hmc. Coll. Boston