SECOND SERIES: PULMONATA.

MANUAL

OF

CONCHOLOGY

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

FOUNDED BY

GEORGE W. TRYON, JR.

CONTINUED BY

HENRY A. PILSBRY, Sc. D.,

CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

VOL. XVI.

UROCOPTIDÆ, ACHATINIDÆ.

PHILADELPHIA:

Published by the Conchological Section,

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

1904.

ERRATA.

Page 11. After 3*b* A. ADAMSI Pils., read *Achatinidæ* pl. 26, figs. 12, 13.

Page 57. 12. B. OBESULA Pils. new name for *Cyl. obesa.* W. et M., not of C. B. Adams, xv, 124.

Page 105. The reference to no. 48*e*, *B. alba* var. *striatula*, is Contrib. to Conch. no. 2, p. 21 (1849).

Page 120. Top line should read : Shell wider, diam. *more* than one-third the length.

Page 187. The genus PALÆOSTOA Andræe (1884) includes Danien species which seem to have essentially the characters of the later (Eocene) group *Eomegaspira.* This carries the group into the Mesozoic. I was not aware of the existence of *Palæostoa* when *Eomegaspira* was proposed. See also H. Nicolas, Asso. Franc. Avan. Sci. 26 session, St. Etienne, 1897, p. 360.

PREFACE.

THE First Part of the present volume treats of the *Urocoptidæ*, which also formed the subject of Vol. XV. In the determination of species and genera, the keys on pp. xxxi and xxxv should first be consulted.

It is usually necessary to examine the interior of the shell. In small species, this may be done by rubbing the dorsal side of the shell upon a fine file, or better, a clean oil-stone, until the whole interior is exposed, as in the specimens drawn in pl. 2, figs. 3, 14; pl. 8, fig. 60, etc. In large forms, such as *Eucalodium*, it is not usually essential that the whole length of the shell be opened. The radula may often be found in shells so opened, coiled closely about the axis. By soaking in warm water it can be removed and mounted in the usual manner.

The diameter of the shell in this family, as in *Clausiliidæ* and others of like contour, is measured across the largest portion of the cylinder, not to the edge of the outer lip, as in Helices and Bulimi. H. A. P.

CONTENTS.

MANUAL OF CONCHOLOGY.

Family UROCOPTIDÆ Pils. & Van.

Cylindrellidæ TRYON, Amer. Journ. of Conch., iii, p. 311 (April, 1868), and of many subsequent authors.—*Eucalodiidæ* (*Eucalodium* and *Cœlocentrum*) and *Cylindrellidæ* (*Anisospira, Holospira, Epirobia, Macroceramus,* and Antillean genera), STREBEL & PFEFFER, Beitrag zur Kenntniss der Fauna mexikanischer Land- und Süsswasser-Conchylien, Theil iv, pp. 53, 74 (1880).—*Urocoptidæ*, PILSBRY & VANATTA, Proc. A. N. S. Phila., 1898, p. 285.—*Pupidæ* in part, of FISCHER and some other authors.

Shell cylindric, fusiform or turrite-conic, composed of many narrow whorls (except in *Pineria*), the early ones generally lost in the adult stage; last whorl adnate or free. Aperture small, circular or squarish; the peristome more or less expanded or reflexed, usually continuous, but interrupted above in some genera. Axis hollow or solid, simple or variously sculptured.

Foot very small and short, united by a long pedunele with the visceral mass, and with the usual Holopod structure. Jaw plaited, striate, ribbed or smooth. Radula as in normal Holopoda or variously specialized. Lung long and narrow, with a long pulmonary vein, but otherwise very weak venation. Kidney narrow, wedge-shaped, about as long as the pericardium. Genitalia of the haplogonous type, the spermatheca on a long duct, ovo-testis wholly imbedded in the liver.

Distribution, Antilles, southern Florida, northern coast of South America, Central America and Mexico, and the adjacent southwestern United States.

Strebel has justly remarked upon the difficulty of defining the Cylindrella family, its component genera being brought together not on account of a number of important characters common to them all, but because of the interrelations of the individual genera, forming links of affinity from one group of the family to another; so that while few if any characters special to the group run through all the genera, yet so interlaced are the varying combinations of structural peculiarities, that the whole is bound into one group of forms, undoubtedly of common ancestry, and more nearly related among themselves than any component of the group is to genera of other families.

General Morphology of Urocoptidæ.

The general structure of the PALLIAL ORGANS is rather that of the *Bulimulidæ* than of the *Clausiliidæ*. The kidney is about as long as the pericardium, as in the former family, while in *Clausiliidæ* it is about twice that length. As in other land snails, the size of the kidney bears no constant proportion to the degree of elongation of the visceral sac and lung.

The REPRODUCTIVE ORGANS have been examined in a few species of *Eucalodium* (vol. xv, p. 1), *Cœlocentrum* (xv, p. 31), *Berendtia* (xv, p. 57), *Anisospira* (xv, p. 298), *Epirobia* (xv, p. 59), *Holospira* (xv, p. 70), *Urocoptis* (xv, p. 107), and *Brachypodella* (xvi, p. 41). In the first six genera (*Eucalodiinæ*) the penis is usually very short, generally thick, with apical retractor, inserted on the diaphragm, and there is a long epiphallus. The spermatheca is borne on a duct about as long as the entire oviduct, and inserted on the atrium, or at least not very high on the vagina. In the *Urocoptinæ* (*Urocoptis* and *Brachypodella*), the penis is longer, and the spermatheca is inserted higher; the epiphallus is apparently obsolete. The penis may have a normal retractor as in *Brachypodella chemnitziana*, or it may be replaced by a secondary retractor connected with the ocular retractor, as in *Urocoptis brevis*. This metamorphosis came about in this way: The ocular retractor in many cases gives

off a few strands, which insert distally in the vagina. The vas deferens then becomes involved in them, as in *Brachypodella chemnitziana;* and by gradual movement along the v. d., these muscles finally reach the apex of the penis, and assume the function of its normal retractor, which then degenerates and is lost.

The eggs of *Eucalodium* are elliptical, with white, hard shell, rough to the touch, and showing crystalline facets under a lens. They are comparatively large, that of *E. decollatum ghiesbreghti* measuring 11.2 x 7.2 mm. *E. mexicanum* was found by Crosse and Fischer to have a similar egg, but that of *E. walpolcanum* (belonging to the subgenus *Oligostylus*) is smaller and narrower, 7 x 4 mm. Some species of *Brachypodella* (subgenera *Apoma* and *Mychostoma*) are viviparous.

The ALIMENTARY CANAL is much lengthened, and apparently varies to a considerable extent in the various genera. In the forms I have studied the long œsophagus coils close to the axis of the shell as far as the stomach, which lies high in the spire; beyond the stomach there is a loop, after which the hind-gut follows along the suture (see vol. xv, p. 2, *Eucalodium;* p. 69, *Holospira;* p. 108, *Urocoptis*). The pharynx or buccal mass is always short, as in the *Helicidæ*.

The JAW is thin, and varies from nearly smooth (as in some species of *Holospira*, vol. xv, pl. 27) to vertically striate (*Holospira*), or deeply, irregularly striate, almost plaited (*Anisospira,* etc., xv, pl. 63), or with very wide, flat plaits (*Berendtia,* xv, pl. 19, f. 45). In the subfamily *Urocoptinæ* it is very thin, highly arched, and composed of many narrow, slightly imbricating plaits, which converge so that there is a triangular area of short plaits in the middle. A similar wide range of structure has been noted in the jaw in the families *Helicidæ* (vol. ix, p. xii), and *Bulimulidæ*.

The RADULA, in the unspecialized Mexican genera of *Eucalodiinæ* resembles that of the *Helicidæ* or unspecialized *Bulimulidæ*, both in its general proportions, the nearly straight transverse rows of teeth, and the form of the latter. In this subfamily the central tooth is as wide as the laterals. It is

noticeable, however, that neither cusp is emarginate or bifid, even on the marginal teeth. In *Holospira* some specialization has made progress, the central and lateral teeth having wide mesocones and *no ectocones*. The ectocones appear on the transitional and marginal teeth, which differ from those of *Eucalodium* and its allies in being low and wide, with one or both cusps split. *Epirobia* (vol. xv, pl. 50, f. 6, 7) is still more specialized, but in another direction. The mesocones of the central and lateral teeth are broad and rounded, and the ectocones are small and basal, separated from the mesocones. The marginal teeth are like those of *Holospira*. Both shell and teeth mimic *Urocoptis*, though of course no affinity is indicated.

The *Urocoptinæ* have a profoundly modified radula. The transverse rows of teeth run v-shaped or *en chevron*. The general morphology of this type of tooth has been fully described in vol. xv, p. 108, pl. 60, figs. 5, 6. In more primitive groups, such as *Cochlodinella* and *Autocoptis*, the central tooth is not very much narrower than the laterals (vol. xv, pl. 61, f. 19); but in the Jamaican subgenera (pl. 60, f. 3, 4) and those of East Cuba (pl. 61, f. 17, 18) it has been independently reduced. No genus of *Urocoptinæ* has the slightest traces of ectocones on the central tooth.

In an exceedingly interesting side line of differentiation the mesocones are notched (vol. xvi, pl. 14, f. 8, *Macroceramus*) or squarely truncate and finely serrate (vol. xv, pl. 43, f. 6-13, *Anoma* and *Spirostemma*). In the latter two genera the teeth are much more numerous and minute than in any other *Urocoptinæ*.

In *Pineria vicquensis* (vol. xvi, pl. 1, f. 13), *Brachypodella* (xvi, plates 9 and 10), and in the subgenus *Tetrentodon* (vol. xv, pl. 43, fig. 4) the four inner lateral teeth are much enlarged, the rest greatly reduced and functionless or nearly so. The whole radula, too, is greatly lengthened and very narrow. There is good ground for the belief that this specialization took place independently in the three groups mentioned, all arising from parent forms having the teeth of *Urocoptis*. In *Brachypodella* the specialization is most ex-

treme, the ectocones being reduced or even absent. This genus has perhaps the most highly specialized radula of any Pulmonate Gastropod.

The CENTRAL NERVOUS SYSTEM is in general less concentrated than in *Helicidæ*, but the data available are too scanty for any general conclusions. Fischer and Crosse have investigated the ganglia of several Mexican forms, and I have figured (xvi, pl. 14) the circumœsophageal ganglia of *Brachhypodella agnesiana*.

The FREE RETRACTOR MUSCLES have been studied in *Eucalodium* (pl. 49, f. 16), *Cælocentrum* (pl. 19, f. 43), *Holospira* (pl. 27, f. 43), *Urocoptis* (pl. 27, f. 44), and *Brachypodella* (xvi, pl. 14, f. 3). In *Eucalodium* the pharyngeal and left retractors branch from the root of the columellar, and then the right ocular, which is thus united a short distance with the columellar. Anteriorly the two ocular retractors join in a muscular plate over the pharynx. In *Cælocentrum* the left ocular and pharyngeal retractors are united for a third of their length, and anteriorly the pharyngeal retractor gives off a band to each of them. In *Holospira* the left ocular is united partway with the pharyngeal, and the right with the columellar muscles. In *Urocoptis brevis* the muscles arise as in *Eucalodium*, but are independent distally, and the right ocular functions also as a penial retractor. Finally, in *Brachypodella chemnitziana* the pharyngeal and ocular retractor muscles are united for a third of their length, and the columellar or tail-retractor runs free of them. The left ocular retractor (morphologically the *right*, as this is a sinistral species) gives off a group of fibers to the vas deferens and vagina. It will thus be seen that each of the five genera investigated has a marked individuality in the details of musculature; but up to this time only about one-third of the genera of the family have been examined in respect to the muscles, and these in only one or two species of each; so that as yet not much use can be made of the data in phylogenetic studies or systematics. Valuable results will probably follow more extended research.

The SHELL is always longer than wide, usually more or

less cylindric, and composed of many narrow whorls. In only very few species, such as *Pineria vicquensis* (xvi, pl. 1), it is markedly conic, and the number of whorls is reduced. It is dextral as a general rule, but a few species are sinistral (*Urocoptis scæva,* xv, 195; *U. coronadoi,* xv, 218; *Brachypodella agnesiana,* xvi, 98; *B. diminuta,* xvi, 100; *B. chemnitziana,* xvi, 106; *B. gracilis,* xvi, 107).

In many genera the early whorls are abandoned by the soft parts in the adult stage. The mantle and liver tissue occupying these whorls are not renewed with new cells, and hence an empty space is left. This is partitioned off from the living portion by a flat or convex septum. Being deprived of organic connection with the mantle, it becomes dry and brittle, and in course of time is usually broken off. Occasional individuals of species normally truncate by chance retain the spire complete; but in all such shells the partition or septum may be found at the appropriate place. In some cases there may be several septa and successive truncations; but so far as my observations go, there is, as a rule, in *Urocoptidæ* only one partition formed. The spire may break off down to the partition, as in the Jamaican group of *Urocoptis,* or an empty whorl or two may persist above it, as in the Haitian *Autocoptis.* The number of whorls amputated may exceed the number retained, or (as in *Macroceramus*) only the very apex is broken. In this case the utility of the operation is lost, and it lingers on in some of the species merely as the reminiscence of an obsolete function. There is no evidence that shell-substance is absorbed at the point of breakage. The immature shell is invariably thin, and the fragility incident to the loss of organic connection with the mantle fully accounts for its fracture. Some genera, such as *Holospira, Pineria, Microceramus,* are never truncate; their early whorls are less slender, the cone of the spire shorter, than in truncate genera. The prevalence of spire-amputation in many non-related groups of the family probably indicates a polygyrous, truncate, ancestral stock for the whole. The number of whorls, in either entire or truncate shells, is subject to a wide range of individual variation.

The apex is comparatively large and bulbous, somewhat globular in most *Urocoptidæ*. In some forms of *Brachypodella* it is specially modified. The protoconch is composed of several whorls, and may be either smooth, or, by acceleration, longitudinally ribbed, assuming sculptural characters of a later stage of growth. This acceleration has been irregularly developed, occurring in many diverse phyla. This gives apical characters in *Urocoptidæ* less value as indicating the affinities of genera than in *Bulimulidæ;* but there is probably much more in them than I have been able to utilize in the systematic part of this work, from lack of sufficient material. Collectors should especially look for immature shells and amputated spires when collecting *Urocoptidæ*, and carefully preserve them with the adult shells they occur with. The junction of the after-growth with the protoconch is usually marked by some change in sculpture or by a slight widening of the whorl at that place.

The latter part of the last whorl, in most species of this family, is straightened and built forward, carrying the aperture to or beyond the level of the ventral face of the shell. This necessitates the building forward of the columellar and parietal margins of the peristome, causing it to be *continuous*. An entire peristome is of general occurrence, though in a few genera (*Anoma, Macroceramus, Microceramus, Pineria*) the peristome is discontinuous, as in *Bulimulidæ*. These genera are not in the same phylum, and are highly and diversely specialized in other respects, so that the interruption of the peristome in them is apparently a secondarily acquired character. Throughout the series there is a tendency to form an angle or keel where the outer wall passes into the base, or on the base itself; but this feature is very weakly developed in some genera, and absent in *Holospira, Epirobia,* and a few other groups, probably by degeneration. The presence of such a keel in most genera of the family probably indicates it as one of the characters of the primitive *Urocoptidæ*. In many forms the last whorl is partially or wholly uncoiled, descending in a short or long neck. The significance of this uncoiling will be alluded to below. It is

greatest in those genera which are most highly specialized in other characters, notably those of the radula.

Coloration of the shell is not highly developed, except in the brilliant and polychromatic arboreal genus *Anoma*. Other *Urocoptidæ* are either white (*Holospira, Apoma, Mychostoma*) or some shade of brown or yellow, rarely with a brown band (as in *Urocoptis sauvallcana*, etc.); a few Jamaican species being rose-color or purple.

Sculpture is not much diversified in *Urocoptidæ*, consisting of subvertical or oblique rib-striæ. In some forms these become weak or wholly obsolete (*Anoma*, etc.); in others the rib-striæ are diminished in number and increased in size, as in the ribbed species of *Urocoptis*. A further development is seen in species in which the ribs are hollow, the mantle expanding into each as it is formed, as in the marine Murices and Tritons, subsequently building a floor over the hollow space. Such ribs represent the acme of sculptural development in *Urocoptidæ*, and occur in various unrelated phyla, such as *Holospira minima* (vol. xv, pl. 24, f. 5, 6), *Idiostemma uncata* (xv, pl. 44, f. 32), *Callonia* (xv, pl. 48, f. 3, 6), *Urocoptis blainiana* and *scalarina*, and *Brachypodella pallida* (vol. xvi, p. 84). The ribbed type of sculpture is sometimes transformed to a smooth surface by degeneration of the ribs, which become reduced to nodes at the suture and base, and then disappear, as illustrated by various species of *Idiostemma* (vol. xv, pl. 45, 46), and also by the Cuban species of *Macrocramus*. No species of the family has developed spines or hairs, and very few show spiral sculpture, though that is seen in some forms of *Cœloccntrum*.

The axis of the shell in the *Urocoptidæ* may be a simple pillar, but it is usually more or less specialized by the presence of spiral or obliquely vertical sculpture. Spiral lamellæ may be superposed upon an axis which is either straight or twisted, the pillar itself having a spiral trend. The number of superposed lamellæ varies from one to half a dozen. They may be either short, confined to one or two whorls (*Anisospira*), or extend throughout the length of the shell (*Eucalodium* s. str.). Vertical sculpture consists primarily of rib-

lets in the direction of growth-lines on the pillar. These riblets sometimes break into granules, as in some species of *Cœlocentrum*, sometimes become wide-spaced nodes, or in combination with spiral sculpture are transformed into spines (*Cœlocentrum astrophorca*, *Gongylostoma*) or hooks (*Idiostomma*); or the vertical sculpture may be obsolete except on the crests of the spiral lamellæ, as in the crenate lamellæ of *Amphicosmia* (xvi, pl. 3).

The column may be either solid, as in all *Urocoptinæ*, or hollow, as in most genera of *Eucalodiinæ*. When the axis is hollow, oblique white lines may be usually seen in its bluish or gray substance, caused by the local thickenings of the latter by striæ or riblets inside the cavity or tube of the axis.

Significant Characteristics and Evolution of the Urocoptidæ.

Phylogerontic characters. Many genera of Urocoptidæ are in the stage called by Hyatt phylogerontic. They are in the old age of the race, and there is every reason to believe that many phyla in the family will not outlast the present geological period. The stigmata of decadence are seen on many sides. (1) The specialization of the radula in all *Urocoptinæ* indicates an adaptation to special conditions, probably too extreme to survive any material change in environment. (2) The fusiform shape of the shell indicates decreasing growth-power. This is well illustrated by *Holospira*, in which the greatest diameter of the shell is often above the middle, the later whorls successively reduced, sometimes overhung by those above. Just as overhanging whorls mark failing nutrition of the individual, so decreasing calibre in the species indicates ebbing vitality of the race. *Cf. Tetrentodon* and *Brachypodella*, vol. xv, pl. 62, etc. (3) The straightened, more or less uncoiled last whorl has the same meaning. It has long been recognized that laxity of coil, the tendency of the last whorl to project in a rounded neck, is a feature of senility in the individual gastropod or cephalopod, and of old age in the race. This tendency is almost universal in the *Urocoptidæ*, but some otherwise highly

specialized genera, such as *Pineria,* seem to have passed through this stage and regained a more primitive form, judging from the ancestry indicated by the anatomy of *P. viequensis.* (4) The structure of the axis indicates that many phyla have passed the acme of their specialization, and are on the decline. Axial lamellæ, etc., are protective in function, and evidently had their inception in the later whorls, the soft parts retracting up beyond them, as in typical *Holospira* (vol. xv, pl. 21, f. 31), or *Anisospira* (xv, pl. 11, f. 1). By progressively earlier development they appear in the young shell, until finally a lamella which at first occupied the lower whorls only, extends throughout the shell, as in typical *Eucalodium.* Now in some forms, such as *Idiostemma perlata* (xv, p. 167), the most complex development of the axis is located in the earlier whorls, the structure degenerating in the later. The species has passed its prime when the axial structure was most elaborate. Similarly, in a large proportion of the Gongylostomoid group the downward-pointing spines of the axial lamella are obsolete in the median and later whorls, but the earlier whorls retain them as minute vestiges of formerly functional structures. (5) Sculpture of the exterior is greatly modified in several phyla of the family, the riblets being transformed into hollow ribs or bosses (see xv, pl. 44, 45, 48, etc.), the acme of sculptural evolution in *Urocoptidæ.*

In the forms with a partially uncoiled last whorl, the latter frequently retains a conspicuous "impressed zone," as Hyatt has called the concave or flat parietal surface which in close-wound spiral shells is impressed by the preceding whorl. This appears as a concave surface in *Eucalodium,* etc., as a sulcus or groove in many Urocoptis, such as *U. (Callonia) dautzenbergiana* (vol. xv, pl. 48, fig. 6).

The *Urocoptidæ,* as a whole, seem therefore to have passed their acme. The *Urocoptinæ* especially, by the wealth of extremely and diversely specialized phyla, bring to mind the specialized and retrogressive Ammonites of the Cretaceous, and the outre Strombidæ of the later Mesozoic and early Eocene, which have left in *Rostellaria, Aporrhais,* etc., only

a few small survivors. Packard has remarked of the Trilobites, Brachiopods and Ammonites, that "these types, as is well known, had their period of rise, culmination, and decline, or extinction, and the more spiny, highly ornamented, abnormal, bizarre forms appeared at or about the time when the vitality of the type was apparently declining." The *Urocoptinæ* are now apparently in a similar stage of extravagant variation.

Parallel and Convergent Evolution.—No one who studies species belonging to a number of groups of *Urocoptidæ* can fail to be impressed by the apparent "parallelism" or "convergence" in the structure of the axis of the shell, in the members of genera but distantly related. To some extent a similar tendency affects the dentition of the radula also. Thus at least part of the specialization of the lateral teeth of *Brachypodella*, *Pineria* and *Tetrentodon* seems to have been an independent process in each of these groups, as though the former two had successively seceded from an ancestral stock having teeth similar to *Urocoptis*, while *Tetrentodon* certainly came from *Gongylostoma*, a much later stock than that whence the others arose.

In the shells, *homologous regions of the shell or its axis have given rise to similar structures, wholly independently, in various phyla of the family.* Thus we find hollow ribs of like structure in species of *Holospira, Idiostemma, Tetrentodon, Callonia,* and *Brachypodella*—groups belonging to two subfamilies and several minor phyla, and in each case related far more nearly to forms with normal sculpture than to each other.

The axial appendages are almost interminably repetitive. Among many equally available instances, the following may serve as illustrations of structures similar in the three subfamilies:

	Axis simple.	Lamella throughout.	Lamella in later whorls.	Axis with vertical ribs.
Eucalodiinæ:	*Oligostylus.*	*Eucalodium.*	*Anisospira.*	*Cyclocentrum.*
Urocoptinæ:	*Urocoptis* s. s.	*Arangia.*	*Spirocoptis.*	*Idiostemma.*
Microceraminæ:	*Microceramus.*	*Spiroceramus.*		

In each of the subfamily groups certain members of the several phyla have been similarly modified. Thus in the Eucalodiinæ, *Cœlocentrum, Cœlostemma* and *Epirobia* are alike in having narrow vertical riblets on the tubular axis, although not otherwise closely related. *Anisospira, Elasmocentrum* and *Bostrichocentrum*, though rather widely separated in a phylogenetic classification, have axial armature of almost identical pattern. In the Urocoptinæ such convergence is common. Thus *Mychostoma* and *Idiostemma,* terminal twigs of two divergent branches, have developed an almost identical armature of hooks upon the axis, in both cases by modification of vertical axial ribs; and further, these ribs were undoubtedly absent, or rather, latent, in the common ancestor of the two groups. The convergence has gone so far in some cases that the position of a group cannot be predicted by shell characters, even when there has been great specialization. Thus, I was formerly deceived in the relationships of *Amphicosmia*, of the series of slender west Cuban Tetrentodons, of *Spirostemma*, etc., etc.

This evolution of *identical complex structures, de novo, in two or more widely divergent phyla* is what Lankester and Osborn have called *homoplasy*—"independent similar development of homologous organs or regions giving rise to similar new parts." (Osborn, American Naturalist, 1902, p. 261.) The structures in question are not homologous, because that term implies community of origin, whereas in the instances now under consideration only the tendency toward certain modes of modification is common heritage. It is as if only a strictly limited number of possible lines of shell-specialization had been assigned to the primitive Urocoptid.

In general, the modes of internal specialization in *Urocoptidæ* are very different from those of the *Clausiliidæ*, the only family of long slender shells of comparable extent. In the *Megaspiridæ* and *Achatinidæ* (subfamily *Cœliaxinæ*), there is more similarity to some Urocoptid structures: compare *Holospira* s. str. and *Sectilumen* with *Cœliaxis, Thomea* and *Distœchia*, and with *Perrieria*. Whether the similar structures in this case are homoplastic, or whether they are

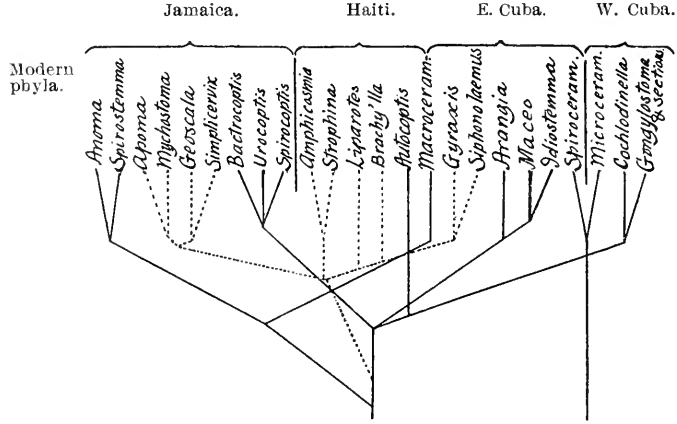
the result of fortuitous convergence due to similar mechanical conditions need not here be discussed. The latter view seems now the more probable.

The wide range of conditions of life, no less than the instability of the regions in which the evolution of *Urocoptidæ* has taken place, has favored the formation of a great number of phyla. Thus in Mexico, *Holospira, Spartocentrum* and *Berendtia* live under conditions as totally diverse from the environment of *Eucalodium, Cœlocentrum,* etc., as though they were on another continent. There has been local adaptive radiation, whereby the various genera of *Eucalodiinæ* have diverged to occupy stations where they no longer compete with one another, and are exposed to the incidence of different groups of external forees.

In the unstable Antilles, adaptive radiation has played a great role. With each period of depression, there was evolved on each isolated area series of forms to fill the various stations or sets of conditions available; and upon re-elevation, with consequent union of some formerly separated areas, the more or less parallel specialized series of snails were thrown together, in competition. Thus, western Cuba was apparently cut off from eastern Cuba, Haiti and Jamaica, before the evolution of the genus *Brachypodella*, and remained isolated until comparatively recently. It was inhabited by a species, or a homogeneous group of species, of a stock of *Urocoptis* having the comparatively generalized character of wide central teeth, by *Microceramus,* and perhaps by other Urocoptid groups now extinct. The former genus, by local adaptive radiation, produced (1) a group of rather large terrestrial species, with many functional radular teeth, *Pycnoptychia*, etc.; a group of smaller forms of the same general type, *Gongylostoma elegans*, etc. (2) A group of partially arboreal forms, with incomplete or very shortly free peristome, *Tomelasmus torquata*, etc. (3) Elongate, slender, rock-living forms, *Callonia;* and (4) slender, small, long-necked species, with the inner four teeth of the radula enlarged, *Tetrentodon*. Now these several groups, from an ecological point of view, are more or less exactly equivalent

to similarly modified groups in Haiti, Eastern Cuba and Jamaica. Thus, in Jamaica group (1) is represented by *Urocoptis* s. str., and *Bactrocoptis;* (2) by *Anoma;* (3) by *Mychostoma* and *Apoma;* (4) corresponds to Geoscala, etc. In western Cuba, the four groups mentioned, of snails diverse in habits and external form, have so much the same internal structure that their radiation from one form will not be seriously questioned; but the representative groups in Jamaica belong to several diverse phyla, as would be expected from its more eventful geologieal history, including periods of connection with the great East Cuba-Haiti island. It seems likely that the vast variety of the Urocoptid fauna in small areas in the Greater Antilles is due to such exigencies and repeated re-adaptations.

The above considerations are illustrated by the following phylogenetic "tree" of Antillean *Urocoptidæ*, of the two subfamilies *Urocoptinæ* and *Microceraminæ*. The table does not represent the distribution of the *Microceramus gossei* group.



Mesozoic Urocoptinæ and Microceraminæ.

Geological and Zoogeographic Data Bearing on Urocoptidæ.

The general sequence of epeirogenie and major orogenic movements of the Antilles has been discussed by a number

of geologists, most extensively by Robert T. Hill and J. W. Spencer. The data as interpreted by Hill indicate extensive Cretaceous land areas, although in the later Cretaceous large portions of the present islands were submerged. There is abundant evidence of orogenic elevation in the early Eocene, and considerable land areas, supplying debris for the formation of thick beds carrying a scanty marine fauna of Cretaceo-Eocene aspect. This was followed in the later Eocene by profound subsidence, culminating at the end of the Eocene, or possibly the early Oligocene (Vicksburgian). This subsidence reduced the Antilles to islands smaller and more widely separated than at present. In mid-Oligocene time a great elevation is believed to have ensued, indicated chiefly by extensive erosion of the preceding deposits. This elevation probably united Jamaica with Haiti; the latter with eastern Cuba, and with the islands eastward; and at this time there was land in Florida, and probably the Bahamas, carrying an Antillean fauna, and somewhere connected with the main Antillean mass. As the close of Oligocene time approached, there was a subsidence somewhat below the present level, marked by the deposition of the shallow water deposits of late Oligocene age at Bowden, Jamaica, and at various places in Cuba, Santo Domingo, and Tampa, Florida. The present general outlines of the islands were assumed at this time, although it is likely that the unification of Cuba did not take place until much later, the eastern, central and western portions remaining separate as three or more islands. No movements of great magnitude are indicated in later Miocene, Pliocene or Pleistocene time; the evidence adduced for the gigantic elevations and subsidences advocated by Spencer being scanty and of very uncertain meaning, and emphatically negatived by the zöogeographic facts.

The materials for correllating geological changes with the evolution of land-snail genera in the Antilles are not yet in our possession, owing to the scarcity as yet of fossil land shells; but what have been found afford some suggestive data. Simpson has shown that the late Oligocene land snails of Bowden, Jamaica, are of characteristic modern Jamaican types.

The land snails of about the same age found at Tampa, Florida, belong to subgeneric or smaller groups still existing, and with two exceptions now living. It may, therefore, be considered certain that since numerous subgeneric groups of land snails in essentially their modern forms were established before the end of the Oligocene, the generic differentiation dates from a decidedly earlier epoch. Probably the first adaptive modification or radiation of the *Urocoptinæ* took place upon Mesozoic Antillean land area, the degradation of which supplied materials for the late Cretaceous rocks of the present islands. The succeeding Eocene depression isolated various branches of the existing stocks, western Cuba being probably the first fragment to be dismembered. Here *Microceramus*, a branch of the primitive radiation, survived; *Cochlodinella* retained primitive features of axis and dentition, also shown by the Haitian *Autocoptis;* and *Gongylostoma* was evolved from the same stock. It was probably not until near the close of the Tertiary that continuity of land was restored with east Cuba, permitting some migration of these groups eastward, and of *Macroceramus* westward as far as Matanzas province, the reconstruction probably having proceeded from the west eastward. Haiti and Jamaica would seem to have remained united after both western and eastern Cuba had seceded; and on the Haiti-Jamaica area the *Brachypodella* line was established, probably also the ancestral stock of the notched or serrate-toothed genera. Finally, these islands were widely separated by the subsidence culminating at the end of the Eocene or in the beginning of the Oligocene. During and subsequent to this subsidence most of the modern subgenera of *Urocoptis* and *Brachypodella* were differentiated. The remarkable number of minor phyla in these groups may well have been due to independent local adaptive radiations consequent upon the dismemberment of the main islands into a number of smaller islets, due to the amplitude of the subsidence, which carried the land far below its present level.

This depression was followed by elevation in the Oligocene, according to Hill, probably sufficient to unite many of the

islands; but the evidences of great elevation are unsatisfactory. It is, however, likely that there was at least transitory connection between Jamaica and Haiti; some forms which had become differentiated in Jamaica then migrating into Haiti, such as *Sagda*, *Stoastoma*, possibly *Anoma*. It may be that there was no all-land Haiti-Jamaican bridge, but an extension of Jamaica eastward in a peninsula, which subsequently became an island, and then was annexed to Haiti. Something of this sort is needed to account for the absence of many Cuba-Haitian groups in Jamaica. Between Haiti and east Cuba the connection may have been longer, resulting in the homogeneous distribution of *Macroceramus*, *Liguus*, the banded *Caracolus* species, etc. Towards the end of the ensuing depression the rich fossiliferous beds of late Oligocene age at Bowden, Jamaica, and in northern Santo Domingo were deposited at a level not greatly below the present.

It is likely that during the mid-Oligocene elevation, the Haitian mass included Porto Rico, the Virgin Islands and the islands of the Anguilla bank, the deep channel now intervening being of later formation. By this means the Antillean portion of the Caribbean fauna—*Brachypodella*, *Pineria*, *Pleurodonte*, etc.—reached these islands. Subsequently, in the Pliocene, the whole Caribbean chain was elevated into a ridge connected with South America, as the presence of large fossil mammals of South American type (*Amblyrhiza* and *Loxomylus*) in the Pliocene of Anguilla demonstrates. At this time, *Brachypodella* extended its range to the continent, migrating thereon westward to Yucatan.

On zöogeographic grounds, there seems to be but scanty evidence of any direct land-connection between the Greater Antilles and the mainland of Central America or Yucatan during the whole of tertiary time, although the presence of a species of *Capromys* on Swan Island argues a former great extension of Jamaica westward along the ridge indicated by the Pedro and Rosalind banks, and species of *Cepolis*, etc., on the Cayman Islands indicate a former extension of Cuba westward from Cabo Cruz, parallel to the Jamaican extension. The investigation of the invertebrates of the Swan and

Cayman islands will, no doubt, illuminate these questions. Ortmann ('02, p. 360) postulates a later Tertiary connection of the Greater Antilles with northern Central America, based upon the occurrence of identical species of *Potamocarcinus* (s.-g. *Pseudothelphusa*) in Mexico, Cuba and Haiti; but since this genus occurs in the Lesser Antilles also, its dispersal can perhaps be explained in the same manner as that of *Brachypodella*. The anomalous distribution of the genus *Archegocoptis* (vol. xv, p. 301) remains to be explained.

The distribution of the *Urocoptidæ* is favorable to Wallace's idea of an old mid-American continent. This Palæozoic and early Mesozoic land, including the Antillean and Central American areas, divided in Mesozoic times into an Eastern and a Western division, the *Urocoptidæ* of the former giving rise to the modern *Urocoptinæ*, while the less modified group *Eucalodiinæ* were evolved in the Western area.

Historical Notes on the Classification of Urocoptidæ.

I.

Before the year 1840, when Pfeiffer established the genus *Cylindrella*, the few species of *Urocoptidæ* known were scattered in several genera. The earliest records of species of this family are certain rude figures in the works of Petiver and Lister (1665), evidently representing Jamaican and Haitian forms, though their specific identity is somewhat uncertain. No species were known to Linné. In 1786 Chemnitz figured and described a Haitian form as *Helix decollata et fasciata*, and later a Jamaican species, *Turbo cylindrus*, both being recognized by recent naturalists. About the end of the second decade of the nineteenth century, Férussac issued his *Tableau Systématique*, in which about seventeen species referable to the *Urocoptidæ* are enumerated, though part of them were at this time undefined names. He places them in the sections *Pupoides*, *Trachéloides* and *Anomales*, of *Cochlodina*, a subgenus of *Helix*, also comprising *Clausilia*, *Balea*, and an *Odontostomus*. Férussac clearly appreciated the relationship to one another of the various species of the

modern genera *Macroceramus, Urocoptis* and *Brachypodella,* composing his list, and grouped them together.

Lansdown Guilding, in 1828, was the first to recognize the distinctness of the group from any of the Lamarckian genera of land snails. He proposed the new genus *Brachypus* for the species known to him. This name unfortunately was preoccupied, so the real merit of Guilding's observation has been lost sight of.

Beck, in 1837, placed part of the species in the genus *Pupa,* founding a subgenus *Urocoptis* for species of the *U. cylindrus* type, and s.-g. *Brachypodella* for slender forms of the *antiperversa* type, equivalent to *Brachypus* of Guilding. In the genus *Clausilia,* Beck made a subgenus *Apoma* for the species now known as *Brachypodella chemnitziana.* All three of these names still stand. Beck's classification of the group was in this case not an improvement on Férussac.

In 1840 Swainson proposed several names for species of *Urocoptidæ,* in his haphazard manner, and evidently with no knowledge of the subject. Dr. L. Pfeiffer, in the same year, proposed the genus *Cylindrella,* to include all of the slender species then known to him. At this time he did not include the stout forms such as *Urocoptis cylindrus,* which he left in *Pupa;* so that the new genus was about equivalent to *Brachypodella* plus *Apoma* of Beck. Subsequently Pfeiffer enlarged the limits of *Cylindrella* to comprise all *Urocoptidæ* with an entire peristome. The species of *Macroceramus* he left in *Bulimus* until about 1859. The universal use of Pfeiffer's *Monographia Heliceorum* by all students of land shells, caused most authors and collectors to accept the name *Cylindrella* to this day, notwithstanding the priority of those proposed by Beck.

In 1850, Albers subdivided the genus *Cylindrella* thus:

Leia (for maugeri Wood).

Thaumasia (= Eucalodium and Urocoptis s. str.).

Mychostoma (= Brachypodella).

Gongylostoma (= Arangia, Gongylostoma, Urocoptis, Cochlodinella).

Casta (= Apoma Beck).

Acera (= Holospira).

Anoma (for C. acus, gossei and tricolor Pfr.).

Diaphera (a group of *Streptaxidæ*).

Species of the genera *Macroceramus* and *Microceramus* he places in *Colobus*, the 41st subgenus of *Bulimus*.

In 1857 Pfeiffer published an interesting historical sketch and revised classification of *Cylindrella* (Malak. Blätter, iii, pp. 209-229). He recognizes these subdivisions:

1. *Thaumasia* Alb. (= Anisospira, Urocoptis s. str. and Autocoptis).
2. *Mychostoma* Alb. (= Eucalodium, Cœlocentrum, Urocoptis sp., and Brachypodella sp.).
3. *Gongylostoma* Alb. (= Urocoptis sp., Epirobia, Geomelania).
4. *Trachelia* Pfr. (= slender Urocoptis and Brachypodella).
5. *Apoma* Beck (= Apoma and Mychostoma agnesiana).
6. *Acera* Alb. (= Holospira).
7. *Anoma* Alb. (= Tomelasmus, Spirostemma).
8. *Leia* Alb. (= Anoma).

In von Martens' edition of Albers, 1860, *Cylindrella* is placed among the Agnatha, and subdivided thus:

Urocoptis Beck (= Eucalodium, Cœlocentrum, large Urocoptis).

Mychostoma Alb. (= Anoma, Spirostemma, Brachypodella, and some Urocoptes).

Gongylostoma Alb. (= slender Urocoptes and Brachypodellæ of many groups).

Holospira (= Holospira and Epirobia).

Trachelia (= slender Urocoptis and Brachypodella).

Diaphora (= Diaphera Alb.).

Scalatella (= Geomelania).

The genus *Macroceramus* is widely separated from *Cylindrella;* includes the species of *Microceramus* and two subgenera:

Anoma Alb. (= Anoma, Urocoptis sp., and Bulimulus sp.).

Lia (= Leia Albers).

It will be noted that practically no advance in the natural classification of the *Urocoptidæ* was made in the foregoing

series of works since Férussac. The number of species had been largely augmented; numerous groups had been established; but they were based upon mere external form and general appearance of the shell, and hence were for the most part artificial and heterogeneous.

II.

It was in 1870 that H. Crosse and P. Fischer inaugurated the scientific classification of *Urocoptidæ*, in their masterly paper, "Étude sur la mâchoire et l'armature linguale des Cylindrellidæ et de quelques genres voisins sous le rapport conchyliologique," in the *Journal de Conchyliologie*, xviii, pp. 5-27. They demonstrated that two widely diverse types of jaw and teeth occurred in the assemblage of species formerly referred to *Cylindrella*. On the one hand, *Holospira*, and the new genera *Eucalodium* and *Berendtia*, have a jaw sculptured with vertical riblets, folds or striæ, and a wide radula, with horizontal rows of teeth resembling those of *Helix*. These forms they referred to the family *Helicidæ*. On the other hand, those left by them in *Cylindrellidæ* were found to have an extremely thin jaw, made up of narrow plaits, converging to form a chevron in the middle; the radula is longer and composed of oblique series of teeth of a special peculiar shape. The following classification is proposed:

Cylindrellidæ.

1. Groupe A. *Cylindrella* Pfr. (= Brachypodella and Tetrentodon).
2. Groupe B. *Callonia* C. & F. (C. elliotti, now placed in Urocoptis).
3. Groupe C. *Thaumasia* Alb. (Urocoptis of Jamaica and Cuba).
4. Groupe D. *Lia* Alb. (= Anoma).
5. Groupe E. *Macroceramus* Gldg. (M. signatus, etc.).

Helicidæ.

1. Genre *Eucalodium* C. & F. (*Cœlocentrum* was defined, but not named until later).

2. Genre *Berendtia* C. & F.

3. Genre *Holospira* Mts. (exclusive of Epirobia, left in Cylindrella).

Except for some readjustment of the nomenclature, it will be seen that most of the prominent genera of the family were correctly indicated by Crosse and Fischer. The whole classification was recast in a new mould of their own discovery, without material assistance from former authors.

Further research has shown that *Eucalodium* and its allies are not really *Helicidæ* as that family is now restricted; but this could not have been foreseen in 1870. Some confusion in their groups *A*, *B* and *C* was due to the parallelism of specialized forms of *Urocoptis*, etc., but the recognition of this too is an essentially modern conception. It would be difficult to find many instances where the main outlines of a natural classification of so diversified a family have been so completely laid down in a single paper, and with so little assistance from previous authors. It must be admitted, however, that Crosse and Fischer did not understand the morphology of the teeth of the Antillean genera, and failed to grasp their natural divisions.

The next notable contribution to the phylogeny and taxonomy of *Urocoptidæ* was by Hermann Strebel and Georg Pfeffer, in Theil iv, of their "Beitrag zur Kenntniss der Fauna mexikanischer Land- und Süsswasser-Conchylien" (1880), a work full of original ideas and new points of view. They recognize two families: *Eucalodiidæ*, with the genera *Eucalodium* and *Cœlocentrum*, and *Cylindrellidæ*, for *Anisospira*, *Holospira*, *Epirobia*, *Macrocramus*, and the Antillean groups. The reasons for the segregation of the *Eucalodiidæ* are nowhere stated, and that course seems ill-advised. Strebel understood the morphology of the teeth of *Urocoptinæ*, and pointed out the homology with teeth of normal types, correcting the exaggerated view held by Fischer. He showed that *Epirobia*, to some extent, connects the two diverse types of dentition in the family. By cutting the shell, many features of the axis not previously appreciated were exposed, and their importance for phylogenetic research was recog-

nized, particularly in *Holospira, Epirobia* and *Anisospira.* Indeed, the structure of the axis of the shell was for the first time utilized in classification, in Strebel's work.

The classification of Pfeiffer-Clessins' *Nomenclator Heliceorum Viventium* (1878) is no advance upon that of Fischer and Crosse. *Berendtia, Holospira, Eucalodium* and *Cœlocentrum* form two subfamilies of *Achatinida;* and are followed by the family *Cylindrellida,* where are placed the genera *Leia, Pineria, Macroceramus* and *Cylindrella;* the last a very heterogeneous group.

Nothing further bearing upon the taxonomy of *Urocoptidæ* appeared for some years. In 1895 (Nautilus, ix, pp. 50, 51), Dr. W. H. Dall offered a "Synopsis of the subdivisions of Holospira and some related genera" (*Cœlocentrum* and *Eucalodium*), in which the work of Strebel upon the internal characters of the shells was supplemented and extended.

In 1898 Pilsbry and Vanatta published "Materials toward a Natural Classification of the Cylindrelloid Snails" (Proc. A. N. S. Phila., pp. 264-286). The generic nomenclature was critically reviewed and revised in this paper, and a new classification of Antillean species was based upon the structure of the radula and axis. While the main features of this classification are retained in the present work, further anatomical investigation has resulted in some notable changes, as in the case of *Archegocoptis, Spirostemma, Tetrentodon, Microceramus,* etc.

Classification of Urocoptidæ.

In the differentiation of the teeth of the radula we have an excellent basis for classification of the *Urocoptinæ,* the more useful because this organ is generally preserved in dry cabinet specimens of the shells. The teeth are so complex that, provided their morphology is rightly understood, the phylogenies based thereon cannot be far wrong. At the same time, there can be no doubt that new data of a good deal of value will be gained by a study of the rest of the soft anatomy, particularly the genitalia and free muscles. The rela-

tions of the genera to one another will become clearer, and it may be that some groups nearly similar in teeth will be found to have diverged in other respects. It seems likely that the genera *Urocoptis* and *Brachypodella* will be further divided into several genera each; although in the present work I have not considered it best to make further generic division, which would now rest upon purely conchological features. Among other points to be ascertained are the relationships of *Microceramus*.

In the *Eucalodiinæ*, there is no such strong differentiation of the radula; and while the genera now recognized are certainly well characterized, their inter-relations are not yet worked out satisfactorily, awaiting more material. Information is especially needed upon the free retractor muscles; and the amputated apical whorls of *Eucalodium* and of the several groups of *Cœlocentrum* call for further investigation. Some such relation seems to exist between *Spartocentrum* and *Berendtia* as between *Mychostoma* and *Apoma*, the second group in both cases differing from the first in little besides the reduction of the axis and the diminished number of whorls. *Cœlocentrum*, as now constituted, is somewhat heterogeneous. Another question arises regarding the relationship between *Eucalodium*, *Anisospira* and *Cœlocentrum* on the one hand, and *Holospira* and *Epirobia* on the other. The last two genera may be found to constitute a subfamily apart from the others.

The following classification is proposed in this work:

Family UROCOPTIDÆ Pils. & Van.

Subfamily EUCALODIINÆ C. & F.

Genus Archegocoptis Pils.
Genus Eucalodium C. & F.
  Subg. *Oligostylus* Pils.
Genus Anisospira Strebel.
Genus Cœlocentrum C. & F.
  Subg. *Liocentrum* Pils.
  Subg. *Elasmocentrum* Pils.
  Subg. *Spartocentrum* Dall.
Genus Berendtia C. & F.
Genus Holospira Mart.
  Subg. *Holospira*.
    Sect. *Eudistemma* Dall.
    Sect. *Distomospira* Dall.
    Sect. *Haplostemma* Dall.
    Sect. *Bostrichocentrum* [Streb.

Genus Holospira (*continued*)
Subg. *Haplocion* Pils.
Subg. *Metastoma* Streb.
Subg. *Cælostemma* Dall.
Genus Epirobia Strebel.

Subfamily MICROCERAMINÆ Pils.

Genus Microceramus Pils & Van.
Subgenus *Spirocceramus* Pils. & Van.

Subfamily UROCOPTINÆ Pils.

(Serrate- or notch-toothed series.)

Genus Spirostemma Pils. & [Van.
Genus Anoma Alb.
Genus Macroceramus Gldg.

(Entire-toothed series.)

Genus Urocoptis Beck.
Subg. *Urocoptis.*
Sect. *Bactrocoptis* Pils.
Sect. *Spirocoptis* Pils.
Subg. *Arangia* P. & V.
Subg. *Idiostemma* P. & V.
Sect. *Maceo* P. & V.
Subg. *Autocoptis* Pils.
Subg. *Cochlodinella* P. & V.
Subg. *Gongylostoma* Alb.
Sect. *Fibricutis* Pils.
Sect. *Sectilumen* P. & V.
Sect. *Esochara* P. & V.
Sect. *Pycnoptychia* P. & [V.
Sect. *Paracallonia* Pils.
Sect. *Callonia* C. & F.
Sect. *Liocallonia* Pils.
Sect. *Gongylostoma* s. str.
Sect. *Tomelasmus* P. & V.
Sect. *Tetrentodon* Pils.
Genus Pineria Poey.
Genus Brachypodella Bk.
Subg. *Brevipedella* Pils.
Subg. *Amphicosmia* P. & V.
Subg. *Strophina* Mörch.
Subg. *Liparotes* Pils.
Subg. *Siphonolœmus* Pils.
Subg. *Gyraxis* Pils.
Subg. *Brachypodella* s. str.
Sect. *Brachypodella.*
Sect. *Geoscala* P. & V.
Sect. *Simplicervix* Pils.
Subg. *Mychostoma* Alb.
Subg. *Apoma* Beck.

The first of the two keys following is based upon natural characters; the second is partly artificial, taking shell characters only into account.

Analytical Key to Genera.

I. Radula of the ordinary shape, the teeth arranged in nearly

straight transverse rows; central teeth about as wide as the adjacent laterals. Jaw either striate, nearly smooth, or widely plaited, the sculpture not converging mesially. EUCALODIINÆ.

a. Teeth of the ordinary Helicid form, the ectocones (when present as distinct elements) attached basally on the side of the main cusps, as usual.

b. Ectocones developed on all the lateral teeth, and, at least minutely, on the central; cusps of the marginal teeth simple, never bifid. Shell rather large.

c. Axis of the shell solid, slender and straight. Adult shell subcylindric, decollate, the lost protoconch ribbed; sculpture peculiar, of dense, waved striæ. Haiti. *Archegocoptis*, xv, p. 301.

c^1. Axis slender, solid or minutely perforate, either straight, sinuous, or bearing a compressed spiral lamella, median in each whorl; shell subcylindric, broadly truncate. *Eucalodium*, xv. p. 1.

c^2. Axis very slender, imperforate and simple; shell tapering, entire, the early whorls costulate. *Berendtia*, xv, p. 57.

c^3. Axis moderately strong, minutely perforated, bearing a sub-basal cord or lamella in the last whorl or two only; shell truncate, rapidly tapering above. *Anisospira*, xv, pp. 24, 298.

c^4. Axis hollow, tubular, variously sculptured. *Cœlocentrum*, xv, p. 30.

b^1. No ectocones developed on the central and inner lateral teeth, which bear broad, more or less pointed mesocones only; ectocones appearing on the transition and marginal teeth, both cusps sometimes split on the latter. Shell small, cylindric, with conic summit and entire spire, the protoconch smooth. *Holospira*, xv, pp. 66, 300.

a^1. Central and inner lateral teeth with broad, rounded mesocones and very small ectocones distinctly separated from them basally (xv, pl. 50, fig. 7). Marginal teeth wide and short, with both ectocone and mesocone

bifid. Shell slender, slowly tapering, with hollow axis and entire spire, the protoconch smooth.

Epirobia, xv, p. 59.

II. Radula of the ordinary shape, the teeth arranged in nearly straight transverse rows (pl. 14, figs. 5, 10); central teeth narrower than the laterals, and notably different in shape; lateral teeth crowded, oblique, with the mesocone long and narrow, the ectocone small; marginals differing only in the increased size of the ectocone, and more normal shape of the tooth. Jaw high-arched, very thin, composed of many narrow plaits, converging to form a triangular area of short plaits in the middle (pl. 14, fig. 4). MICROCERAMINÆ. *Microceramus*, xvi, p. 151.

III. Radula with teeth arranged in oblique, v-shaped, transverse rows, the central tooth narrower and very unlike the lateral teeth in shape; laterals with broad mesocones widely separated from the ectocones. Jaw thin, narrow-plaited, plaits converging, leaving a triangular area of short plaits in the middle. UROCOPTINÆ.

a. Cusps with the cutting edges rounded and even.

b. Side teeth all of essentially the same shape (except the rudimentary outermost ones), gradually decreasing in size outwardly, or the third tooth abruptly smaller; all with the ectocone well developed, though smaller than the mesocone (vol. xv, pl. 60, 61). *Urocoptis*.

c. Central tooth of the radula very narrow, its cusp much narrower than the ectocones of the lateral teeth.

d. Axis of the shell slender and straight or nearly so.

e. Shell small, diam. 4.5 mm. or less.

Sect. *Bactrocoptis*, xv, p. 143.

e[1]. Shell stout, larger.

Sect. *Urocoptis*, xv, p. 121.

d[1]. Lower half of the axis thickened, more or less twisted; shell rather large.

Sect. *Spirocoptis*, xv, p. 114.

d^2. Axis nodose, or encircled with a spiral crenate cord or ribbed double cord.
Subg. *Idiostemma*, xv, p. 164.

d^3. Axis with a strong spiral lamella. *Esochara*, xv, p. 188, has rather narrow central teeth; and *Arangia*, xv, p. 162, may also prove to belong here.

c^1. Central tooth wider, its cusp approaching in size the ectocones of the lateral teeth.

d. Axis without lamellæ or spines.

e. Shell stout; an accessory lamina in base of last whorl, which is carinate below. Haiti. Subg. *Autocoptis*, xv, p. 147.

e^1. Shell thin, small, subcylindric; base not distinctly carinate. Western Cuba.
Subg. *Cochlodinella*, xv, p. 175.

e^2. Shell very slender, fusiform or subcylindric, with round neck and small round aperture; axis weakly one- or two-plicate.
Sect. *Tetrentodon*, xv, p. 267.

d^1. Axis with one or more spiral lamellæ, the lower one crenate or spinose, at least in the upper whorls.
Subg. *Gongylostoma*, xv, p. 182.

b^1. Two lateral teeth on each side very large, the marginal teeth usually 4 to 7 in number, very much smaller than the laterals, vestigial, and of conspicuously different shape; radula extremely long and narrow.

c. Ectocones of one or both lateral teeth reduced, more or less vestigial; marginals in nearly straight transverse rows (vol. xvi, pl. 9, 10). Shell with the peristome entire or nearly so.
Brachypodella, xvi, p. 40.

c^1. Ectocones of the lateral teeth moderately developed; marginals in oblique rows (xvi, pl. 1, fig. 13). Shell with thin peristome, widely interrupted above (pl. 1, figs. 1-12).
Pineria, xvi, p. 108.

a^1. Cusps with the cutting edges notched or serrate, all the side teeth of about the same shape.

b. Mesocones merely notched or emarginate (xvi, pl. 14, fig. 8). Shell tapering, with entire or slightly truncate apex and usually discontinuous peristome. *Macroceramus*, xvi, p. 113.

b^1. Mesocones with broadly expanded, serrate cutting edges; ectocones large. Teeth extremely minute and numerous (xv, pl. 43, figs. 6-13).

c. Shell pillar-shaped, striate, reddish or brown, with the axis coiled cork-screw-like in the later or last whorls, and the peristome entire. *Spirostemma*, xv, p. 284.

c^1. Shell fusiform, very glossy and often variegated, the axis straight, though often calloused and truncate in the last whorl; peristome widely interrupted above. *Anoma*, xvi, p. 1.

Key to Genera, etc., by Shell-characters.

* AXIS OF THE SHELL HOLLOW OR PERFORATE, though usually closed at the base.

I. Rather large forms, diam. 6 mm. or more, almost invariably truncate.

1. Axis rather slender, imperforate at the truncate summit, or showing only a small axial slit.

a. Axis slender, straight or slightly sinuous. *Oligostylus*, xv, p. 8.

b. Axis slender, encircled throughout by a compressed spiral lamella, median in each whorl; upper part of the truncate shell not abruptly tapering. *Eucalodium*, xv, p. 3.

c. Axis rather strong, encircled in the last whorl or two by a sub-basal cord or lamella; upper part of the truncate shell rapidly tapering. *Anisospira*, xv, pp. 24, 298.

2. Axis moderate or of large size, tubular, its cavity visible as a round hole at the truncate summit.
Cælocentrum, xv, p. 30.

II. Smaller forms, the shell 5 mm. or less in diameter, retaining the spire complete.
1. Protoconch ribbed; shell long and slender, the axis smooth, with a spiral swelling below the middle in each whorl. *Spartocentrum,* xv, p. 51.
2. Protoconch smooth.
a. Shell thin, slender, the length 4½ to 8 times the diam.; *gradually tapering,* and *attenuate* above; axis with longitudinal white streaks or laminæ, sometimes interrupted or broken into granules.
Epirobia, xv, p. 59.
b. Shell shorter, the length 2½ to 4 times the diam.; cylindric, with a conic summit.
Holospira, xv, pp. 66, 300.

** AXIS OF THE SHELL SOLID or barely perforate; the summit when truncate is closed by a steeply-sloping, flat, or somewhat convex septum; aperture higher than wide, the lip not much reflexed, its parietal margin more or less straightened. Shells of medium or large size, all but *Archegocoptis* Mexican.

I. Shell gradually tapering to an entire, costulate apex.
Berendtia, xv, p. 57.

II. Shell somewhat cylindric, the summit truncate.
1. Axis straight or slightly sinuous; shell cylindric or slowly tapering, broadly truncate above.
a. Surface lusterless, densely sculptured with fine, waved, irregular striæ; whorls flattened, the last carinate beneath. Haiti. *Archegocoptis,* xv, p. 301.
b. Surface sculptured with arcuate striæ, sometimes interrupted by malleation; base not carinate, though a low cord is sometimes discernible. Mexico and Central America. *Oligostylus,* xv, p. 8.
2. Axis encircled throughout with a strong, compressed lamella, median in each whorl. *Eucalodium,* xv, p. 3.

3. Axis with a sub-basal cord or lamella in the last whorl or two only. *Anisospira,* xv, pp. 24, 299.

*** AXIS A SOLID, IMPERFORATE COLUMN, whether thick or slender. (Chiefly Antillean; the species of the mainland are all small, and either have the base strongly carinate or the apex entire.)

I. Axis encircled by a single, strongly projecting lamella, submedian in each whorl.
   1. Peristome interrupted above; spire entire, the protoconch costulate. *Spiroceramus,* xvi, p. 172.
   2. Peristome entire; spire normally truncate.
      a. Spiral lamella with the edge smooth; base of the shell carinate. *Arangia,* xv, p. 162.
      b. Spiral lamella stout, with rounded, closely crenulate edge; last whorl rounded beneath. *Maceo,* xv, p. 173.

II. Axis encircled by *two subequal lamellæ, both serrate or crenulate* at the edges; base of shell carinate. *Amphicosmia,* xvi, p. 49.

III. Axis with one or more spiral lamellæ, *the lower one serrate or spinose* at the edge, at least in some of the upper whorls; base of the shell usually rounded. *Gongylostoma,* etc., xv, p. 182.

IV. *Lower half or more of the axis thickened;* cylindric, twisted, biplicate or nodose.
   1. Shell rather large and stout, red, purple or brown, finely and evenly striate; axis thickened in the lower whorls, with a low, obtuse plait. Jamaica. *Spirocoptis,* xv, p. 113.
   2. Shell stout, barrel-shaped or cylindric, ribbed; axis thick, with two low, smooth cords. Santo Domingo. *Strophina,* xvi, p. 55.
   3. Shell pillar-shaped, *white,* finely striate; axis cylindric, biplicate or nodose-hooked. Jamaica. *Mychostoma,* xvi, p. 96.
   4. Shell smooth or coarsely ribbed, corneous or brown; axis armed with pairs of hooks or flat nodes, or begirt

with a wide callous band or double cord bearing oblique nodes or riblets. Eastern Cuba.

Idiostemma, xv, p. 164.

V. Axis slender, coiled corkscrew-like around a central space in the later whorls or the last one.

1. Shell pillar-shaped or cylindric-fusiform, widely truncate, brown or reddish, evenly striate; last whorl but shortly or not free, strongly carinate below, the keel bounding a concave basal area. Aperture rounded-ovate, the lip adnate above or free, continuous. Protoconch ribbed. Jamaica. *Spirostemma,* xv, p. 284.
2. Shell fusiform, slender, with moderate or long descending neck and circular aperture; apex smooth when present. Eastern Cuba, Santo Domingo.

Gyraxis, xvi, p. 58.

VI. Axis slender and straight (usually arcuate in the last whorl), or weakly twisted spirally; without lamellæ, ribs or spines.

1. Peristome continuous, free, or rarely adherent above.
   a. Shell sinistral, slender, *white,* the axis very slender; last whorl shortly free or adnate, with a cord-like basal keel; aperture longer than wide.

   Apoma, xvi, p. 106.

   a[1]. Shell dextral; aperture not noticeably longer than wide, usually subcircular; last whorl rounded, though sometimes having a basal keel.
      b. Rather large species of stout figure, the last whorl only shortly free or adnate.
         c. Shell red, purple or brown, rarely white, uniform or with a sutural band; truncate, the plug long, curved and tongue-shaped. Jamaica. *Urocoptis,* s. str., xv, p. 121.
         c[1]. Shell variously colored, often light or variegated; last whorl with a strong basal carina; an accessory lamina encircling the axis in the last whorl, sometimes united with it; plug flat or shortly tongue-shaped, an empty whorl often persisting above it. Haiti.

         Autocoptis, xv, p. 147.

b^1. Smaller, slender species, 4.5 mm. diam. or less; truncate.

c. Uniform brown, rose or white; very finely, evenly striate; last whorl shortly free, carinate below. Jamaica.
Bactrocoptis, xv, p. 143.

c^1. Whitish, brown or variegated, striate or rib-striate; last whorl free, with the basal keel weak or wanting; amputated apical whorls smooth. Western Cuba, Florida.
Cochlodinella, xv, p. 175.

c^2. Clear corneous; evenly striate; last whorl subangular below. Amputated apex normal, costulate. E. Cuba to Porto Rico.
Brevipedella, xvi, p. 45.

c^3. Similar, but apical whorl elevated. Jamaica.
Simplicervix, xvi, p. 94.

b^2. Shell *obesely* fusiform, striate; apex not attenuate, smooth, often persistent; whorls 12-13 in entire shells. Axis slender, straight. Haiti.
Liparotes, xvi, p. 57.

b^3. Shell slender, tapering, fusiform or subcylindric, the apex often entire; neck round.

c. Axis weakly 1 or 2 plicate. Western Cuba. *Tetrentodon,* xv, p. 267.

c^1. Axis straight and simple. Eastern Cuba. *Siphonolœmus,* xvi, p. 58.

a^2. Shell small, dextral, ribbed, with round or squarish aperture, *the neck strongly carinate below and swollen on the right side;* axis slender, straight or with one weak spiral. *Brachypodella,* xvi, p. 64; *Geoscala,* xvi, p. 90.

2. Peristome incomplete, widely interrupted above, the parietal wall with merely a thin callous film. Axis straight or slightly twisted; spire usually strongly tapering.

a. Shell truncate, fusiform, the surface *glossy,* often bright colored. *Anoma,* xvi, p. 1.

a^1. Spire entire or nearly so; dull or not especially glossy.

b. Apex ribbed. *Microceramus,* xvi, p. 151; *Pineria,* xvi, p. 108.

b^1. Apex smooth, the tip sometimes amputated. *Macroceramus,* xvi, p. 113.

MANUAL OF CONCHOLOGY.

Genus ANOMA Albers, 1850.

Anoma Alb., Die Heliceen, p. 209, 1850, for *acus* Pfr., *gossei* Pfr., *tricolor* Pfr. (the last selected as type by von Martens, Die Hel., 2d edit., 1860, p. 269).—Pils. & Van., Proc. A. N. S., Phila., 1898, p. 279. Not *Anomus* Fairm. Hemiptera, 1846.

Leia Albers, Die Hel., 1850, p. 207; sole species *L. maugeri* Wood. Not *Leia* Meigen in Diptera, 1818, nor Meg., Coleoptera, 1821.—*Lia* Mörch, Catal. Yoldi, 1852, p. 35; sole species *L. maugeri*.—Fischer & Crosse, Journ. de Conchyl., 1870, p. 20, pl. 3, f. 1-5 (dentition). Not *Lia* Esch., in Coleoptera, 1829.

Inliaculus Schaufuss, in Paetel's Moll. Syst. et Catal., 1869, p. 15.

Vondrysia Simpson, Proc. U. S. Nat. Mus., xvii, 1894, p. 430; proposed as a substitute for *Leia*.

Shell rimate, fusiform or oblong-conic, usually truncate; *glossy*, white, yellow or brown, smooth or striate, the last whorl with a basal carina. Aperture rounded or subangular below, truncate above, the well-expanded or reflexed peristome *discontinuous above*. Columella sloping or truncate. Axis slender throughout or thick in the last two whorls; straight or sinuous below. Apex unknown.

Jaw thin, highly arched, composed of many narrow laminæ, as in *Urocoptis*. Radula composed of very numerous teeth, in V-shaped rows. Central tooth very narrow, its cusp much smaller than the ectocones of the lateral teeth. Laterals with two cusps nearly terminal on the narrow basal-plates: *both cusps broad, squarely truncate, with serrate cutting edges,*

the mesoeone very wide (Vol. XV, pl. 43, fig. 7, group of central and lateral teeth; f. 6, the 9th lateral in profile, of *A. splendens citrina*). In the outer laterals of some species the cutting edges are smooth, perhaps in part the result of wear (Vol. XV, pl. 43, fig. 8, a lateral tooth of *A. solida striatula*). Soft anatomy otherwise unknown. Type *A. tricolor* Pfr.

Distribution, Jamaica (and the southwestern peninsula of Haiti?). According to Gloyne (J. de Conch., 1872, p. 33), the species of this group always live on plants. He collected *A. "maugeri"* in great numbers in the parishes of Manchester and St. Anne, especially in the pimento or allspice plantations. The species spread over the plateau of the western two-thirds of Jamaica, east to Mt. Diablo and Bogwalk, and reappear in the extreme eastern part of the island, in Portland parish. So far as we know, the intervening region is without species of this genus, though this apparent discontinuity may be due to deficient collecting in the Blue Mountains. Only two species have been found in the East, *A. nigrescens* and *A. sinuata.*

The species are mostly restricted in distribution like nearly all Jamaican snails; though a few seem to have a somewhat wide range. Most of them have been differentiated into numerous local races, distinguished merely by color, or sometimes by other and more important characters also. *There are both dark and albinistic forms of many species completely alike in all other characters.* Examples of this are *A. splendens* and *citrina; A. nigrescens* and *A. n. rufilabris,* etc. The whole series seems to be composed of variable forms, in which numerous sports occur, and are frequently perpetuated, perhaps by the action of Mendel's law. Whether the striking color-forms bear any direct or simple relation to their environments has not yet been observed.

Owing to their great differentiation in color, the determination of species should be less difficult than in the related genus *Spirostemma.* Most of them are herein figured for the first time; and it is hoped that the time and thought given to the group have materially illumined a subject hitherto obscure.

In *A. solida* var. *striatula,* I found 11 to 13 denticles on the

mesocones and 5 to 8 on the ectocones of the lateral teeth. The latter are of about the same size out to the 28th, so that there are evidently many teeth in a transverse row. Unfortunately, the radulæ obtained from dry museum specimens were very imperfect. Fischer's figures of the teeth of *A. maugeri* give no idea of the actual structure; but Morse correctly saw the main characters in *A. nigrescens quadricolor.*

The genus *Anoma* is very closely related to *Spirostemma,* its brilliant gloss and bright coloring being consequent upon the assumption of arboreal habits, as usual in the land snails. Otherwise it differs in little but the discontinuous peristome and swollen shape. The species have been distributed by Pfeiffer in two genera, grouped with various forms of *Urocoptis,* which resemble them superficially. Von Martens placed the species in the sections *Anoma* and *Lia,* which he considered to belong to the genus *Macroceramus.* They were first dissociated from Cuban and other unrelated species by Fischer, in 1870 (J. de C., p. 20).

The study of the species of *Anoma* is very complex, and demands much more investigation in the field. Prof. C. B. Adams recognized two species, *gossei* and *maugeri,* describing twenty-four varieties of the latter, arranged thus:

"*a. Dark-colored varieties.* In this group the dark colors fade to a pale brown or cinnamon color. Var. *nigrescens, solida, levis, tricolor.*

b. Light-colored fasciate varieties, not distinctly *striated* above the middle whorls. In this group pale yellow fades into a dingy or pearl-white, or is replaced by pearl-white in fresh shells. Var. *crassa, unicincta, bicincta, concinna, sinuata.*

c. Light-colored varieties, not fasciate, and *not* distinctly *striated* above the middle whorls. Changes of color the same as in the preceding group. Var. *rufilabris, citrina, fusiformis, albida, valida, unicolor.*

d. Strongly striated varieties, light-colored, not fasciate. Var. *striatula, striata, corpulenta, fusca, conica.*

e. Tesselated varieties. Var. *tesselata, cinerea.*

f. Aberrant, slender forms. Var. *gracilis, integra.*"

This arrangement is open to the criticism that it is based primarily upon color, the most variable of all characters, and one widely separating varieties which are closely related. Prof. Adams fully recognized that the varieties are of very unequal value. Taking into account the shape of the last whorl and aperture, the sculpture, and the degree of development of the basal keel, it seems best to give specific rank to many of Adams' varieties, grouping together forms which differ in coloration only. Chitty, in describing new forms, has emphatically advocated the recognition of numerous species in the assemblage grouped under *C. maugeri.*

It might be mentioned that Verkrüzen applied a number of new names to various forms of *Anoma,* but, so far as I can learn, these are merely collection-names, printed only in a dealer's sale catalogue, and not in any way defined.

The colors of the shell after death are affected by light, the yellow and pink tints being especially fugitive, fading to whitish, so that old museum specimens are frequently quite unlike fresh ones. The brown coloring does not fade.

Key to Species.

[Species no. 2, *tricolor,* and no. 8, *virginea,* are reported from southwestern Haiti; all the others are Jamaican.]

I. Back of the last whorl usually rather coarsely striate, or, if finely striate, there is *a blackish or colored streak behind the lip; tapering* downwards to a strong basal keel or angle; aperture longer than wide; no conspicuous white subsutural band; lip white.

1. With a colored or blackish streak behind the white lip.

a. Shell imperforate; whorls tessellated with olive-brown spots on a white ground; keel strong and white; lip sinuous, strongly retracted or notched at the insertions. *A. jarvisi,* no. 4.

aa. Shell rimate; whorls of the spire streaked; keel strong and acute, cream-white.

b. Slender, the diam. one-fourth the length or less; whorls 12 to 15, the last very acutely carinate; length 17 to 18, diam. 3.8 to 4.5 mm.

A. tricolor, no. 2.

bb. Stoutly fusiform, the diam. 3½ times the length; profusely striped with brown or corneous-brown on a creamy ground, the streak behind the lip blackish; columella not truncate; 20 to 21 x 6 mm., whorls 7½ to 8. *A. tesselata,* no. 5.

bbb. Shape similar; striped with corneous-brown on a gray-white ground, and with a gray or blackish *line or band above the suture,* and sometimes at the periphery of the last whorl; 16 x 5.3 mm. with 7½ whorls to 19 x 5 mm. with 8½-9½ whorls. *A. t. cinerea,* no. 5*a.*

aaa. Shell reddish-brown or dull yellowish, *darker at the ends;* keel strong and acute, white or cream-white.

b. A brown stripe behind the outer lip from suture to keel, and with a brown band above the creamy keel-band; smooth, except behind the lip. *A. nitens,* no. 6.

bb. Aperture angular below; a plum-colored streak behind the lip; striæ visible nearly to the apex, coarse on the last whorl; 19 x 5.7 mm., with 8½ whorls. *A. prunicolor,* no. 7.

aaaa. Spire pale, uniform.

b. Shell slender; keel strong and acute.

c. Pale corneous, obliquely rib-striate, more weakly so above; basal keel very strong; aperture oblique, angular below; columella not truncate; 18 x 3.3 mm. with 11½ whorls, to 21 x 4 mm., with 12-16 whorls. *A. gossei,* no. 1.

cc. Pearl-white, with a pure white keel and lip; coarsely striate at end of the last whorl, elsewhere with excessively minute striæ. *A. gracilis,* no. 3.

bb. Shell stouter, the diam. not far from a third of the length; spire only faintly striate, very pale.

c. Keel high near the lip; clear bluish or por-

celain white, a brown streak behind the lips; aperture oblique; columellar margin notched at the insertion; columella not truncate; 20 x 6.2 to 19 x 5.7 mm., with 7⅔ whorls; Westmoreland. *A. n. simpsoni,* no. 6*a*.

cc. Keel rather blunt, the striæ passing over it; yellow or whitish, with a brown pink streak behind the lips; aperture subangular below, the columella lip hardly notched at the insertion; columella strongly truncate; 18 x 6.9 with 6½ whorls to 19.5 x 6.5 with 7-7½ whorls. Mt. Diablo. *A. fuscolabris,* no. 9.

2. No color-streak behind the lip; pale yellow or white; finely plicate striate throughout, with the suture somewhat crenulate; a strong basal angle defining a small basal area.

A. radiata, no. 10; *A. flexuosa,* no. 11.

II. Back of last whorl very finely and densely striate or nearly smooth, strongly tapering to the basal keel; rest of the shell glossy and nearly smooth; shape fusiform; whorls 7-9, the last often with a white band below the suture.

1. Back of last whorl with one or two blackish-brown bands on an opaque-white ground; peristome white.

a. Peristome sinuous; length 18-20 mm.

b. Early whorls blackish-brown, the last whorl with two spreading or confluent bands of the same color. *A. levis,* no. 12.

bb. Spire pale yellow or gray-white; last whorl with a blackish band above the middle, and a short, oblique one at the base; a gray streak behind the lip; 19-20 x 6-6.5 mm. *A. l. bicincta,* no. 12*a*.

bbb. Spire opaque white, with some clear gray streaks, and a band of the same above the suture, becoming dark brown, and below the periphery on last whorl; a pinkish streak behind the lip and below the very strong keel; 18-20 mm. long. *A. l. unicincta,* no. 12*c*.

aa. Peristome thin and in a plane, not recurved at the ends; pale yellow or gray-white, with a black-brown band above the periphery on back of last whorl, and a waxen streak behind the lip; 14-15 x 5-5.3 mm. *A. l. concinna,* no. 12*b*.

2. Back of last whorl with a blackish band above the basal keel, and a gray or olive belt ascending above the suture to the summit; peristome sinuous, both the face and back deep rose-red.
A. l. balteata, no. 12*d*.

3. Without black bands on the last whorl, but often having a snow-white band below the suture; basal keel *short,* strong near the lip.
a. Shell dark, at least at the ends; lip pink or rose.
b. A white band below the suture; keel dark.
c. Length 16-19, diam. 6-6.2 mm., whorls 7-8.
A. splendens, no. 13.
cc. Length 17.5, diam. 4.66, whorls 9, the last rib-striate behind. *A. dohrniana,* no. 15.
bb. Merely a white line, or none, below the suture; otherwise like *splendens.*
A. s. rosealabris. no. 13*a*.
aa. Shell yellow or whitish, often pink tinted behind and on the lip.
b. An opaque-white band below suture.
A. s. citrina, no. 13*b*.
bb. Merely a subsutural line, or none.
A. s. albida, no. 13*c*.

4. Not banded; basal keel long, not abruptly becoming stronger near the lip, which is *white;* no distinct subsutural white band; shell whitish or yellow, with the last whorl white; small 13-15 mm. long; aperture oblique, the insertions of the lip but little retracted. *A. alboanfractus,* no. 14, and varieties.

5. Basal keel very strong, whitish, at least a half whorl long; columellar lip *deeply notched above;* columella truncate; lip pink.
a. Shell dark brown at the ends; last whorl with a

slowly widening white belt below the suture; keel white; 15-17 x 5-5.5 mm., whorls 7-8.

A. pulchella, no. 16, and var. *pulla,* no. 16*a*.

aa. Similar, but more slender, 17.5 x 4.66 mm., with 9 whorls, the last rib-striate behind.

A. dohrniana, no. 15.

aaa. Gray-white, with fine white lines at suture and keel; lip pale red, very sinuous; 17 x 4.7 to 17.6 x 5.4 mm., 8-8½ whorls. *A. sinuata,* no. 17.

III. Shell robust below, tapering rapidly and conic above, the last whorl well rounded, with a narrow and rather low basal keel; last half of the last whorl distinctly, often coarsely, rib-striate.

1. Shell obesely fusiform, white or reddish below, finely rib-striate throughout, more closely so on last whorl; keel low, cord-like; aperture subvertical, oval, the *peristome white, thin, broadly expanded, level* and in a plane, the *ends converging above;* 19 x 6.6 mm., whorls 7-7½. *A. striata,* no. 18.

2. Last whorl hardly narrower than preceding one; spire conic; aperture wide, the lip somewhat sinuous, its ends distant above; keel narrow and delicate.

a. Spire straightly conic and decidedly slender above; no white sutural band, or only a narrow one; columella hardly truncate; whorls 7½-8; forms from eastern Jamaica (Portland).

A. nigrescens, no. 20, and varieties.

aa. Spire thicker, the truncation wider; forms of central and western Jamaica.

A. solida, no. 19, and varieties.

Group of A. tesselata.

Fusiform species with the last whorl rib-striate behind, and tapering to the usually strong basal keel.

1. A. GOSSEI (Pfeiffer). Pl. 17, figs. 10, 11, 12, 13.

Shell cylindric-tapering, attenuate above, thin, *pale cor-*

neous or somewhat transparent-bluish; surface glossy, sculptured with *oblique rib-striæ*, the upper whorls smoother. Whorls 12-16, but slightly convex, slowly and regularly increasing, the last *acutely keeled at the base*, the keel cream-white, with *a brown spot behind the outer lip and another on the base*, both showing within the aperture. Aperture oblique, angular below and guttered within; peristome discontinuous, expanded and narrowly reflexed, the *outer margin sinuous*, columellar margin retracted and *notched*, and suddenly dilated at the insertion; parietal wall covered with a closely adherent callous. Axis *strongly oblique* and sinuous in the last whorl, *not truncate* at its base.

Length 18, diam. 3.3 mm., whorls remaining 11½.

Length 21, diam. 4 mm., whorls remaining 12-16 (Pfr.).

Jamaica (Gosse, in Mus. Cuming; Swift and A. D. Brown, in coll. A. N. S. P.).

Cylindrella gossei PFR., P. Z. S., 1845, p. 137; Phil., Abbild., ii, p. 53; iii, p. 7, pl. 3, f. 10; Conchyl. Cab., p. 70, pl. 7, f. 29, 30; Monogr., ii, p. 384.—*Macroceramus pfeifferi* MARTENS, in Albers, Die Hel., 1861, p. 270 (based upon *C. gossei* Pfr., the name changed on account of *Bulimus gossei* Pfr., a *Microceramus; cf.* PFR. Malak. Bl., xxiii, 1876, p. 215, no. 9).

A. gossei is narrower and more cylindric than *A. tricolor*, more coarsely and strongly sculptured, and not tessellated. The two species are otherwise nearly related. *A. gossei* is a rare species, and its exact locality is unknown.

2. A. TRICOLOR (Pfeiffer). Pl. 17, figs. 6, 7, 8, 9.

Shell subperforate, *fusiform*-turrite, *strongly attenuated* towards the truncate apex; smooth, *glossy*, opaque; white, ornamented with translucent corneous-ashy streaks. Whorls 12 to 15, a little convex, the last *acutely carinate* at the base, ascending in front, chestnut-bordered behind the lip. Aperture oblong, the base somewhat effuse; columella obsoletely folded; peristome simple, expanded, the margins not connected, right margin sinuous, columellar margin angularly reflexed above. Length 18, diam. 4.5 mm., aperture 4.5 mm. long, 3.3 wide (*Pfr.*).

Jamaica: Moncrieff Gully, parish of St. Ann, on a plant (Gloyne).

Cylindrella tricolor PFR., Zeitschr. f. Malak., iv, 1847, p. 67; Monogr., ii, p. 384; Conchyl. Cab., p. 69, pl. 7, f. 27, 28.—GLOYNE, Journ. de Conch., xx, 1872, p. 34.—BLAND, Ann. Lyc. N. H. of N. Y., vi, p. 154 (1855).—*Cyl. gossei* PFR., Phil., Abbild., ii, p. 218, pl. 1, *Achatina*, f. 10.—*Cyl. maugeri* var. *raphinina* CHITTY, Contrib. to Conch., p. 11 (Oct., 1853).

This species is distinct by its slender shape, much attenuated and very narrowly truncate spire, and acute, strongly projecting basal keel. The streaks are often brownish-gray on the upper half of the shell, and the chestnut stripes behind the lip and on the base show conspicuously in the aperture. The last whorl is delicately rib-striate, the rest of the shell only faintly striate. The axis is thickened and sinuous in the last whorl, and usually appears truncate in an oblique view in the aperture.

Pfeiffer's description is translated above, and his figures copied, pl. 17, f. 6, 7. The italics are mine. Specimens before me measure 17.5 x 4.2 mm., with 14 whorls (the first 3 above the septum); 17 x 3.8 mm., with 12½ whorls, etc. Both Bland and Pfeiffer, after seeing specimens of *C. m. raphinina* from Chitty, pronounced it identical with *tricolor*. It was described from "St. Ann's." Chitty's description is very apt—radish-shaped, cream-white, with alternate rectangular and other spots of very pale reddish-ash color, etc.

Von Martens records this species from Haiti, specimens occurring in the collection made by Weinland in the neighborhood of Jeremie (Malak. Bl., vi, 1859, p. 56, in text under *Mac. angulatus*), but no other Haitian collector has found it. It seems unlikely that a species of very limited distribution in the middle of Jamaica would occur in Haiti, either native or introduced; but *Macroceramus virgineus* described from Jeremie is excessively like the Jamaican *maugeri*, and placed next to it by von Martens.

3. A. GRACILIS (C. B. Adams).

Shell quite slender; pearl-white, with a pure white keel and

lip; at the end of the last whorl coarsely striated; otherwise with excessively minute striæ (*C. m.* var. *gracilis* C. B. A., Contrib. no. 9, p. 166).

No locality is given for this insufficiently-described form, which, with var. *integra,* composed Adams' group of "aberrant slender forms." I have not seen specimens, and rank the form as a species merely because, in the absence of structural details or measurements, I do not know what else to do with it.

3*a*. Var. *integra* (C. B. Adams).

"Shell quite slender; dull white, with a clear white lip; striæ very oblique, quite distinct on the last whorl, very minute on the spire. The only specimen before me is not truncated" (*C. m.* var. *integra* C. B. A., Contrib. no. 9, p. 166).

Maroon Town, Hanover (Adams). Not seen.

3*b*. A. ADAMSI Pilsbry, n. sp.

Shell perforate, slenderly fusiform, narrowly truncate, resembling *A. t. cinerea,* pl. 17, fig. 14, in general shape, or a little more attenuate above. Surface glossy, *very finely striate throughout,* the last third of the last whorl becoming more coarsely rib-striate. Bluish-milky, touched with light brown at the summit; the *base, back of the lip* and adjacent surface, *brownish-fleshy.* The keel, a subsutural line on the last whorl, and *a wide arcuate stripe (behind the fleshy lip-stripe) are opaque-white;* and *behind the white stripe there is a second fleshy-brown oblique area,* fading on its right side into the blue-white ground-color. These colors show within the mouth. The well-expanded lip is flesh-pink and but slightly thickened, somewhat sinuous, and a little retracted at both ends. Columella distinctly truncate in oblique view. Length 19.3, diam. 5, length of aperture 4.6 mm., whorls 10.

Spring Garden, near Ulster Spring, Trelawny, Jamaica (P. W. Jarvis).

In the distribution of colors on the back of the last whorl, *A. adamsi* is not very unlike *A. nitens;* but it is a more slen-

der species, with distinctly, though very finely, striate spire. It was received too late for figuring. Named in honor of Prof. C. B. Adams.

4. A. JARVISI Pilsbry, n. sp. Pl. 13, figs. 7, 8, 9.

Shell *imperforate,* cylindric-fusiform, moderately strong; *white, tessellated with olive-brown spots vertically placed in pairs,* the upper series of spots smaller; the base and a stripe behind the lip are blackish-brown, several upper whorls are dusky in some specimens. The surface is glossy, nearly smooth, showing some weak, fine striæ and minute malleation under a strong lens; and on the latter part of the last whorl the striation becomes distinct, though fine. The basal keel is white, strong and compressed, rather long. The aperture is small and subvertical. *Peristome white* on both face and back, expanded, slightly reflexed, and obtuse, being a little thickened. The outer lip is strongly sinuous, *arching forward above* and retracted to the insertion. The columellar lip is also arched forward, and at the insertion it is *deeply notched, the edge being narrowly turned over and adnate.* The columella in oblique view is obliquely truncate in some shells, not perceptibly so in others.

Length 19, diam. 5 mm., whorls 8¾ to 9.

Length 18, diam. 4.8 mm., whorls 8¾.

Length 16.5, diam. 5.3 mm., whorls 8.

St. Ann: "Outer Penitentiary," a "cockpit" near Aenon Town (P. W. Jarvis).

The imperforate axis, very sinuous lip, and the peculiar color-pattern, readily distinguish this from *A. tesselata* and other allied species of the group, having a white peristome and blackish streaks behind its expansion. This elegant species is named in honor of Mr. P. W. Jarvis, of Kingston.

A single poor specimen from Mt. Diablo, sent by Mr. Jarvis, is similar to *A. jarvisi,* but more slender, 17 x 3.7 mm. It has lost most of the color, so the specific identity is uncertain.

5. A. TESSELATA (C. B. Adams). Pl. 17, figs. 1, 2, 3, 4, 5.

Stout fusiform, the upper half tapering rapidly to the

rather narrow truncation; rather solid, cream-white, *profusely striped with brown or corneous-brown,* squarish or wedge-shaped stripes. Surface *glossy,* finely and *faintly* striate, the striæ becoming stronger, rib-like and arcuate on the back of the last whorl. Whorls 7½ to 8 remaining, slightly convex, the last strongly carinate beneath, the keel cream-white; having *a black-brown stripe behind the white lip, and a black-brown area on the base,* both showing also within the aperture. Aperture usually subvertical, the outer lip but slightly sinuous, well expanded, white; columellar lip well dilated, hardly notched above; terminations of the lip approaching, connected by a short, transparent-white parietal callous. *Columella not noticeably truncate* in an oblique view. Axis straight, vertical, and rather stout in the last whorl, sinuous in the penult., above which it is slender and straight.

Length 20-21, diam. 6 mm.

Jamaica: St. Elizabeth (C. B. Ad.).

Cyl. maugeri var. *tesselata* C. B. Ad., Contrib. to Conch. no. 9, p. 166 (April, 1851).—*Cyl. zebrina* Pfr., P. Z. S., 1852, p. 68, no. 58 (May 23, 1854); Monogr., iii, p. 581 (1853); Novit. Conch., p. 258, pl. 65, f. 3, 4.—Sowerby, C. Icon., xx, pl. 14, f. 127. *C. m.* var. *cinerea* C. B. A., Contrib., p. 166.

Easily distinguished from species of the *splendens* group by the longer basal keel, different form of the aperture and lip, and the particular color-pattern, which seems to be very constant. *C. zebrina* Pfr. (pl. 17, f. 1, 2, copies of orig. figs.) applies to exactly the same form as *tesselata.*

5*a*. Var. *cinerea* (C. B. Ad.). Pl. 17, figs. 14, 15, 16.

"Shell of medium size and form. Pale ash color, black at the summit, with transverse broad umber stripes, which are numerous and deeply colored on the upper whorls, distant and pale on the middle whorls, and obsolete on the last whorl, with a dark brown line along the suture and another on the anterior keel. Lip white, with a black stripe behind it on the right, and a black spot behind on the left. Back of the last whorl distinctly striated, otherwise very lightly striated" (*Ad.*).

Western Jamaica: Northern St. Elizabeth, at Accompong, near the Trelawny and St. James boundaries (C. B. Ad.); Ipswich (J. B. Henderson, P. W. Jarvis). St. James, at Hanna Rock (P. W. Jarvis).

I have given Adams' description above. The shell is somewhat smaller and usually more slender than *tesselata*. Some specimens before me are *striped with corneous-brown* on a gray-white ground, the stripes usually sparse or wanting on the last whorl or two. A *narrow corneous-brown band or line runs above the suture* of the last 3 to 5 whorls, and on the left side of the last whorl it continues just above, then runs *upon the basal keel*, but does not reach the lip, behind which the dark stripes of *tesselata, tricolor*, etc., appear. The keel is not very strong, but is long, as in *tesselata*. The sculpture does not differ much from *tesselata*. Specimens measure: 19 x 5.3 mm., with 8½ whorls (Ipswich); 19.5 x 5 mm., with 9½ whorls; 19.5 x 5.5 mm., with 8½ whorls; 16 x 5.3 mm., with 7½ whorls, the last being quite a stout form, with the aperture very dark brown within.

Specimens from Hanna Rock differ from the above in having the sutural line blackish-brown, and obsolete, or nearly so, at the periphery and keel of the last whorl. The lip is cream-colored on face and back, the columellar margin is conspicuously notched at the insertion, and the throat is chestnut-colored.

6. A. NITENS (Chitty). Pl. 13, figs. 1, 2, 3, 4.

"Shell medium size and form, shining, yellowish, truncated; 8 whorls left, the uppermost of which is of a light, rich brown; at the back of the right lip a narrow band of rich brown; over the keel, which is white, is a shading off band for one-half the whorl of similar brown; over the umbilical region the same coloring. Very obsolete lines of growth, except on the last whorl, where the striæ are closely and strongly set. Length .77, breadth .21" [19.2 x 5.2 mm.] (*Chitty*).

Westmoreland: New Hope (Chitty), Negril Spots (P. W. Jarvis).

Cyl. maugeri var. *nitens* CHITTY, Contrib. to Conch., p. 9, Oct., 1853.—*C. maugeri* DESH. in Fér., Hist., pl. 164, f. 33.

A typical example from Negril Spots (Jarvis collection) is figured. It is *yellowish olive, the first whorl or two blackish-brown;* no sutural line. The last whorl has a *cream-white, widening band on the keel, spreading upwards to the suture behind a deep brown stripe back of the lip.* Above this keel-band there is *a narrow brown band, fading on its upper edge;* and *the base is black-brown.* The thin lip is white, both on face and reverse, and the columellar margin is deeply notched at the insertion. The columella is not truncate. The basal keel is long and rather acute. The surface is smooth, showing only faint growth-lines, except on the last third of the last whorl, where there are fine, crowded rib-striæ.

Length 19.5, diam. 5.5 mm.; whorls 8½.

Length 18, diam. 5.5 mm.; whorls 7¾.

6*a*. Var. SIMPSONI Pilsbry, n. v. Pl. 17, figs. 17, 18, 19.

The shell is *clear bluish-white or porcelain-white,* with a brown stripe behind the lip and a curved patch on the base. *There is no band above the keel,* and the apex is white. Aperture long, oblique, the outer lip but slightly thickened, and sinuous; columellar lip deeply notched above. The columella is not truncate below, as seen obliquely in the aperture. The surface is *very glossy* and only faintly striate, except on the last half whorl, where the striæ become stronger, as in typical *nitens.* The keel is well pinched up near the lip, but becomes almost obsolete a half whorl back. Specimens measure 20 x 6.2 mm. to 19 x 5.7 mm., with 7⅔ whorls.

The habitat of this variety is unknown. Several specimens before me vary only in size. It is named for Mr. Charles Torrey Simpson, in recognition of his work on the Jamaican and Porto Rican land snail faunas.

The absence of stripes on the spire, the longer, more oblique aperture and notched columellar lip, separate var. *simpsoni* from all forms of *A. tesselata;* the absence of a band above the keel, etc., from *A. nitens.*

7. A. PRUNICOLOR (Chitty).

"This shell is named from the band of deep plum color

behind the lip. Shell less robust, rather long. Not a fresh specimen, red-brown, deeper at either extremity. Lip long and angulated below, expanded and thin at the margin, pure white, with behind it the plum-colored band. Keel acute, white. Striæ visible almost to the truncated apex, coarse and wide on the last whorl. Whorls 8½. Length .76, breadth .23 '' (19 x 5.75 mm.). (*Cyl. m.* var. *prunicolor* Chitty, Contrib., p. 8.)

The locality is unknown. No specimens seen, but from the acute white keel, angular base of the aperture and dark streak behind the lip, it is probably related to *A. nitens,* from which the stronger sculpture chiefly distinguishes it, so far as I can judge by Chitty's description, given above.

8. A. VIRGINEA (Weinland & Martens).

'' Shell rimate, fusiform, the apex truncate; very smooth, glossy, milk-white. Whorls 8, flattened, the last not longer than the penultimate, *costulate,* the base obtusely carinate. Aperture oblong, *angular at base, the columella distinctly plicate;* peristome reflexed, the margins converging, joined by a thin, adherent callous; fauces brown. Length 18, diam. 6, aperture with peristome 5 mm.'' (*Mart.*).

Haiti: neighborhood of Jeremie (Weinland).

Macroceramus virgineus W. & M., MARTENS, Malak. Bl., vi, 1859, p. 56.—*Cyl. virginea* W. & M., PFR., Monogr., vi, p. 357.—*Lia virginea* W. & M., CROSSE, J. de C., 1891, p. 133.

'' Nearest related to the so-called *Cylindrella maugeri,* differing from that in the characters emphasized above and the more obese shape.'' The species is known by the above description only. This suggests a shell not very unlike *A. fuscolabris* or *nitens.*

9. A. FUSCOLABRIS (Chitty). Pl. 11, figs. 75, 76, 79.

'' Shell robust and moderately thickened; shining sulphur-yellow in the middle, brick-red tinge on the truncate apex; last whorl white, with an ill-defined band of brick-red on the back of the lower part of the lip. Last whorl much rounded; keel obtuse. Aperture semiorbicular, much contorted, and

slightly angular at its base. Striæ well defined on the last whorl. Whorls 8. Length .76, breadth .25 (19 x 6.25 mm.). A younger semitransparent specimen (I have only two) has only 7¼ whorls, length .72, breadth .26 " (18 x 6.5 mm.).

Central Jamaica: Mt. Diablo, St. Ann (John B. Henderson, Jr., P. W. Jarvis).

Cyl. m. var. *fuscolabris* CHITTY, Contrib., p. 7 (1853).

The locality was unknown to Chitty, whose description is quoted above. The specimens before me from Mt. Diablo are stoutly fusiform, pale yellow shells (old museum specimens fading to gray-white), the last whorl white, with a brownish-pink streak behind the basal and outer lips, but not extending up to the suture; and in three of eleven shells seen, the early whorls are similarly but faintly tinted. The glossy surface is faintly, irregularly striate, almost smooth; the latter half of the last whorl becoming closely *rib-striate*. The keel is blunt and low, though distinct, the striæ passing over it. It is an angle rather than a keel. The aperture is somewhat oblique, distinctly or slightly angular below, white inside, with a brown stripe within the lip, which is white on both sides. The outer lip is strongly sinuous; columellar lip only a little retracted at its insertion. *Columella strongly truncate.*

Length 18, diam. 6.9 mm., whorls 6½ (Mt. Diablo).

Length 19.5, diam. 6.5 mm., whorls 7 (Mt. Diablo).

Length 17, diam. 6 mm., whorls 7½ (Mt. Diablo).

Length 19.5, diam. 7 mm., whorls 7 (Mt. Diablo).

It has some resemblance to *A. nitens* (Chitty), but that is a strongly carinate form.

10. A. RADIATA (Chitty). Pl. 18, figs. 31, 32, 33.

" Shell long, not robust, shining; lip and last part of last whorl white; rest dirty yellow; whole shell boldly but beautifully striated. Aperture long and angulated below, where the peritreme is much expanded and but little reflected. Whorls nearly 9. Length .9, breadth .23 " (22.5 x 5.75 mm.).

Bogwalk, interior of St. Catherine (C. W. Johnson).

Cyl. maugeri var. *radiata* CHITTY, Contrib. to Conch., no. 1,

p. 7 (Oct., 1853).—*Leia maugeri* var. *striatula* C. B. Ads., JOHNSON & FOX, Nautilus, v, p. 34 (July, 1891).

The locality of Chitty's unique type was unknown. The figured specimens, collected at Bogwalk by C. W. Johnson, are pale yellow, becoming white on the last whorl, or gray-white throughout. The glossy surface is everywhere *plicate-striate,* a little more coarsely so on the back of the last whorl. *The suture is finely crenulate above.* Whorls very slightly convex, the last *rapidly tapering to the strong basal angle.* The area within the angle is small. Aperture small oblique; the peristome is thin, white, expanded and narrowly reflexed; outer margin strongly sinuous; columellar margin arched forward in the middle. The basal margin is somewhat angular and noticeably recurved. The columella is abruptly truncate deep within. 19.5 to 20.5 x 5.7 mm., with 8½ whorls.

Well distinguished by the fusiform shape, finely plicate surface, strong basal angle, the absence of bands or streaks, and the small, oblique, angular aperture. It is most nearly related to *A. fuscolabris* and *A. flexuosa.* The latter species differs by the greater number of whorls and vertical aperture.

11. A. FLEXUOSA (Pfeiffer).

"Shell shortly and deeply rimate, fusiform-turrite, solid, somewhat *closely plicate-striate, alabastrine;* spire regularly tapering above the middle, the apex shortly truncate; *suture crenulated by the plicæ; 11 whorls remaining,* flattened, the last compressed-carinate at the base, somewhat ascending in front. Aperture *vertical,* oblong; peristome interrupted, the margins joined by an appressed callous, sinuous, the right margin with a weak tooth within [' *dextro intus subunidentato* ']. Length 23.5, diam. 6 mm." (*Pfr.*).

Jamaica? (Bland).

Cyl. flexuosa PFR., Malak. Bl., xiii, 1866, p. 88; Monogr., vi, p. 357.

Known to me by the above description only, the italics being my own. Except in the more numerous whorls, the shell would seem to have much in common with *A. radiata* Chitty. Has Pfeiffer put the tooth on the *wrong* margin of the aperture in locating it in the right margin?

Group of A. splendens.

The shell tapers towards both ends, and is smooth and glossy, except for some extremely fine striation on the latter part of the last whorl. Aperture oblique, decidedly longer than wide.

12. A. LEVIS (C. B. Adams).

Somewhat fusiform shells, smooth except for some striation back of the lip, usually with one or two dark bands on the opaque-white ground of the back of the last whorl. Keel moderately strong, but short. Aperture oblong. A number of races inhabiting central and western Jamaica are grouped under the above specific name merely to show their close relationship to one another, and to segregate them from the *splendens* group of varieties which form a similar assemblage. The two groups are very closely related; but, in general, *levis* is less fusiform than *splendens*, has a larger aperture and wider lip.

Typical *A. levis*. Pl. 19, figs. 33, 34, 35, 36, 37.

"Shell robust, but rather thin; livid black in the upper whorls, pale livid brown along the middle, anteriorly with a rapidly widening pure white stripe, which unites behind the lip with a broad transverse white stripe that runs through a large triangular black spot; lip white; without striæ. Some pale specimens have a tinge of red along the middle. Inhabits Kilmarnock, in the east part of Westmoreland. In another part of Westmoreland is a subvariety in which the form is less robust, the anterior white stripe is larger and tinged with yellow, and the transverse white stripe, being interrupted by the black spot, appears more like a short spiral stripe; the lip is rather less reflected, and the aperture smaller and more oblique" (*C. B. Ad.*).

Western Jamaica: Kilmarnock (C. B. Ad.) and water-wheel between Savanna-la-Mar and Bluefields, and at Little London (P. W Jarvis), all in Westmoreland.

Cyl. maugeri var. *levis* C. B. A., Contrib. no. 9, p. 162.—*C. maugeri* DESH. in Fér., Hist., pl. 164, f. 33.

Prof. Adams' description of this form, reprinted above, is by no means lucid. The shell has an oily gloss, showing, under a lens, some sparse striæ on the spire, and stronger striæ, either close or well spaced, behind the lip, wanting in some specimens. *The early whorls are black-brown,* the intermediate ones reddish, or dirty brown-gray, which continues over part of the last whorl, where there are *two glossy black-brown bands,* the upper one at or above the middle, the lower below the keel, its upper end rising above it. *Between these bands it is opaque-white,* and usually the same between the upper band and the suture. Behind the white outer lip there may or may not be a brown streak. The keel is rather strong for a fourth of a whorl, becoming a mere line above that, but is not so strong as in var. *unicincta.* Outer lip is somewhat sinuous and thickened, and the mouth is much longer than wide. The columella is indistinctly truncate. This form is extremely variable in coloration, and intergrades with var. *bicincta.* Specimens measure 19.5 x 5.7 to 6.3 mm., with 7 to 9 whorls. Some shells from Little London have the lip pink.

12*a*. Var. BICINCTA (C. B. Adams). Pl. 19, figs. 43, 44, 45.

" Shell either short and robust or of medium size and form; pale yellow in the upper whorls and in the lip and behind it; on the back of the last whorl pure white, with two brownish-black stripes; otherwise pearl-white; with fine striæ on the last half of the last whorl. Inhabits Westmoreland " (*C. B. Ad.*).

Cyl. m. var. *bicincta* C. B. A., Contrib., p. 164.—*C. mangeri* var., PFR., Conch. Cab., pl. 7, f. 39, 40.—SOWERBY, C. Icon., x, pl. 15, f. 134*d*.

The yellow tint fades with age, museum specimens becoming gray-white, with the lip faintly buff-tinted, a gray streak behind it; back with *two black-brown bands on an opaque-white ground,* the upper one situated *above the middle, arising on the left side, faint at first, and stopping short of the gray streak behind the lip;* the lower band is short, *merely an oblong spot,* arising above the keel, which it crosses obliquely,

the greater portion of the spot lying below it. The outer lip is sinuous and retracted above; the columellar lip *strongly notched at the insertion.* Columella indistinctly truncate below, *slender* and slightly sinuous within (pl. 11, fig. 78). Length 19, diam. 6.5 mm. with 7½ whorls to 20 x 6 mm. with 8 whorls.

This form differs from *unicincta* in the higher position of the principal band, the absence of a gray belt above the suture and of gray variegation of the spire, and in wanting a pink streak behind the lip. The shape and sculpture are about the same in the two forms. Var. *bicincta* is identical with *levis* except in the color, which is far paler, with the dark markings much reduced.

12*b*. Var. CONCINNA (C. B. Adams). Pl. 19, figs. 38, 39, 40.

Small, but stout in figure; glossy, faintly striatulate, the last half of the last whorl finely striate; *pale yellow or gray-white*, the *last half of the last whorl opaque-white, with a black-brown band above the middle*, and stopping far short of the lip; *base and a streak behind the lip waxen.* Keel strong and acute. Aperture oblique, the peristome white, *thin and in a plane*, not retracted or notched at the ends. Columella strongly truncate. Length 14 to 15, diam. 5 to 5.3 mm., whorls 7.

East part of Manchester, on the Whitney River estate (C. B. Ad.); Whitney (Jarvis).

C. m. var. *concinna* C. B. A., Contrib., p. 164.

Similar to the larger var. *bicincta*, but there is no basal dark patch and the lip differs, being thin and not sinuous. It is quite a distinct race, and should, perhaps, be treated as a separate species.

12*c*. Var. UNICINCTA (C. B. Adams). Pl. 19, figs. 46, 47, 48, 49.

Shell somewhat fusiform, rather solid, *opaque-white, with some gray streaks* and speckling on the spire, and *a translucent-gray belt above the suture* of the last 2 or 3 whorls, becoming a *purple-brown band on the last whorl*, below the

periphery, but a short distance above the keel. *Behind the white outer and columellar lips there is a fleshy or brownish-pink streak,* interrupted by the white keel, below which there is an ill-defined band of similar color. These markings show inside the aperture. Surface glossy, nearly smooth except behind the lip, where it is densely and minutely striate. *Keel very strong on the last half whorl,* merely traced on the first half. Aperture oblong, much longer than wide, the lip thickened, well expanded, sinuous, whitish, both outer and columellar margins retracted above, joined by a whitish parietal callous. Columella more or less distinctly truncate in oblique view, thick inside (pl. 11, fig. 77). Length 20, diam. 6.2 mm., whorls 8, or a little smaller, 18.5 x 5.5 mm.

Central Jamaica: Manchester (C. B. Adams); Cave Valley, southwestern St. Ann (P. W. Jarvis).

Cyl. maugeri var. *unicincta* C. B. A., Contrib. no. 9, p. 163. —CHITTY, Contrib., p. 11.—*C. maugeri* var., PFR., Conchyl. Cab., pl. 9, f. 11, 12.

The axis is strongly thickened within the last whorl (pl. 11, fig. 77), quite unlike the slender axis of var. *bicincta* (fig. 78). This, the preceding and the following varieties are from central Jamaica, and are widely separated geographically from the western *levis* and var. *bicincta*. Perhaps they form a distinct species, as no intermediate forms, either structurally or geographically, are known.

12*d*. Var. *baltcata* Pilsbry, n. v. Pl. 13, figs. 5, 6.

Shell similar to var. *unicincta* except that *the entire lip is of a brilliant rose-red,* and the olive *band above the suture ascends to the summit,* becoming darker on the upper and on the last whorls; elsewhere the shell is glossy, opaque-white, without the gray streaks of var. *unicincta*, or with them very faint. The black band on the last whorl runs into the color-streak behind the lip. Columella truncate. Surface smooth, under a strong lens showing excessively minute, close striæ on the early whorls, a dense, shallow pitting on the intermediate whorls, and fine striation, as in *unicincta,* on the last whorl. Length 17, diam. 5.7 mm.

Aboukir, in southwestern St. Ann (P. W. Jarvis).

13. A. SPLENDENS (' Menke ' Pfr.).

Shell *fusiform,* widest near the middle, smooth and *glossy,* with some *excessively fine striæ behind the lip only;* whorls but slightly convex; *basal keel short,* blunt and strong, very weak except just behind the lip. Aperture oblique, *long,* the outer lip sinuous, columellar lip angular and notched near the insertion. Columella truncate, though sometimes not very noticably so from the aperture. Axis distinctly sinuous in the penult. whorl, *thickened by a subspiral callous in the last whorl* (pl. 12, fig. 57).

Central Jamaica: Manchester.

A group of middle Jamaican varieties, very closely related to the *A. levis* series, but without dark bands on the last whorl, smoother, with shorter basal keel and more twisted axis.

The identity of Wood's original *Helix maugeri* (pl. 18, fig. 24) probably cannot now be positively settled. It is a matter of conjecture. The figure suggests *A. nigrescens rufilabris* somewhat, but the correspondence is not sufficiently close to be conclusive. It was originally introduced by Wood in the Supplement to the second edition of his *Index Testaceologicus,* p. 22, pl. 7, f. 31 (1828), without description, with the habitat West Indies, and a sign indicating the length as three-quarters of an inch. Sowerby (1834) figured as *maugeri* a form differing from that of Wood, and referable to *A. nigrescens quadricolor.* Pfeiffer (1848) gave the first *description of maugeri,* which, while it covered several forms, applied particularly to *tricolor, citrina* and *albida* of C. B. Adams; but earlier (1841) the names *splendens* and *hornbeckii* had been proposed for the first of these, and none of the three agrees very closely with Wood's figure. Regret as we may the change of a well-known name, it is the better course to delete *maugeri* as not identifiable.

Typical *splendens* (' Mke ' Pfr.). Pl. 12, figs. 50 to 57.

Shell fusiform, the last whorl tapering; *very dark brown towards the ends,* lighter in the middle, with *snow-white band*

below the suture on all, or all but the earliest, whorls. Smooth and glossy, with excessively fine striæ only behind the lip. Basal keel short and strong. Aperture oblong, oblique, the lip expanded or reflexed, *pink* on face and back, a white spot at its upper insertion. Columella truncate deep within. 18 x 6 to 20 x 6½ mm., with 7½ to 8 whorls.

Central Jamaica: Manchester (C. B. Ad.); a variety with the subsutural band much narrower at Peace River, Manchester (Chitty); Balaclava, St. Elizabeth (P. W. Jarvis).

Pupa splendens Menke, Pfr., Symbolæ ad Hist. Hel., i, p. 45, no. 51 (1841).—*Torquilla hornbeckii* Villa, Dispositio Systematica Conch. terr. et fluv. in coll. Villa, p. 57, no. 12 (1841).—*C. maugeri* var. *tricolor* C. B. A., Contrib., p. 163.—Chitty, Contrib., p. 11.—*C. maugeri* Pfr. in Philippi, Abbild., iii, pl. 3, f. 13*a*; Conchyl. Cab., pl. 7, f. 37.—Desh. in Fér., Hist., pl. 164, f. 29, 30.—?*Helix ignifera* Fér., Prodr., p. 61, no. 495 (nude name).

This form differs from *citrina* only in its dark color. The intermediate whorls vary from brown to olive, and there is a local form found near Peace River in which they are gray-white or yellowish (figs. 54, 55). Examples of this pale race measure from 16 x 6 to 19 x 6.2 mm.

The names *splendens*, *hornbeckii* and *tricolor* were all based upon the same dark variety, though both Pfeiffer and Villa considered the pale shells (*citrina*) to be specifically the same as the dark ones.

The original description of *Pupa splendens* is as follows: Shell subfusiform, rimate, apex truncate, very smooth, glossy, fulvous or green, girdled at the suture with white; whorls 8, flattened, the last not larger than the penult., carinate at the base; aperture suborbicular, peristome reflexed, roseate, the margins converging, joined by a thin callous, right margin dilated, columellar margin strongly folded within. Length 8.5, diam. 3 lines (*Pfr.*).

In figure 53 there should be some fine striæ on the last whorl, as in fig. 64 of the same plate. They were omitted by the lithographer.

13*a*. Var. *roscalabris* (Chitty).

" Named from its beautiful rose-colored lip. Shell robust, short, shining; coloring same as in var. *tricolor* [*splendens*]; keel short, pink; no white line as in var. *tricolor*, or, at most, a very microscopically thin one. Lip oblique and elongated. Whorls 7, very fine striation extending only over one-fourth of the last whorl, but more so than in var. *tricolor*. Length .72, breadth .25 inch (*C. m.* var. *roscalabris* Chitty, Contrib., p. 8).

Habitat Maroon Town? (Chitty). Not seen. It would seem to be related to *albida* as *splendens* is to *citrina*.

13*b*. Var. *citrina* (C. B. Adams). Pl. 12, figs. 63, 64, 65.

" Shell more or less robust; sulphur yellow; sometimes pearl-white when the lip is pure white; with *a pure white, well-defined narrow stripe next below the suture;* tinged with red at the end of the last whorl; with excessively fine striæ behind the lip only " (*Ad.*).

Central and western Jamaica: Manchester (C. B. Adams); Mandeville and Spur Tree Hill, in the same parish (Henderson). Balaclava, St. Elizabeth; Spring Garden and Albert Town, Trelawny, and Ft. William, Westmoreland (P. W. Jarvis).

C. maugeri var. *citrina* C. B. A., Contrib., p. 164.—*C. maugeri* Pfr., in Phil., Abbild., iii, pl. 3, f. 13*b*.—Sowerby, C. Icon., xx, pl. 15, f. 134*b*, *c*.—Desh. in Fér., Hist., pl. 164, f. 31, 32.

This is one of the commonest varieties in collections, easily known by the opaque-white subsutural band on a yellow or whitish ground, the smooth surface and short basal keel. In some localities the last part of the last whorl is pink-tinted, and the lip pink; often the first whorl or two are similarly colored. In others there is no pink whatever. The tinted shells form a transition towards pale forms of *splendens*.

Pupa fusiformis C. B. Adams. Shell fusiform, glossy, very finely striate, opaque, ashen, decollate. Five or six whorls lost, planulate; eight whorls remaining, not very convex, white-banded, the band below the suture. Lip solid, white,

rounded, sinuous, scarcely continuous above; umbilicus narrow. Length after decollation .8 inch, width .27 inch [20 x 6.75 mm.] (*C. B. Ad.*).

Pupa fusiformis C. B. A., Proc. Bost. Soc. N. H., Jan. 1, 1845, p. 14.—*Cyl. m.* var. *fusiformis* C. B. A., Contrib. no. 9, p. 164. Not *Pupa fusiformis* Deshayes, 1832.

In his arrangement of the varieties of *maugeri,* Adams places this between *citrina* and *albida,* remarking that " it is of a pearl or ashy-white color." It seems, from the description, to be very similar to *citrina* and *albida,* and, in any case, must be dropped, as the name is preoccupied. Locality unknown.

13*c*. Var. ALBIDA (C. B. Adams). Pl. 12, fig. 66.

Shell fusiform, glossy and *smooth,* except for some very fine striæ behind the lip, *bluish-white,* the suture marked with a fine white line; apex and a space behind the lip sometimes faintly pink-tinted. *Keel very short,* blunt. Aperture longer than wide, oblique, the peristome reflexed, moderately thickened, white; outer lip retracted slightly above; columellar lip projecting in a slight angle near the insertion. Columella more or less truncate in an oblique view in the aperture. Length 18, diam. 6 mm., whorls 7½. Length 20, diam. 5.5 mm., whorls 8½.

Bristol, Trelawny (P. W. Jarvis).

Cyl. maugeri PFR. in part, Monographia, ii, 384; iii, 581; iv, 712; vi, 356 (includes numerous forms of the *splendens* and *levis* group).—*Cyl. maugeri* var. *albida* C. B. ADAMS, Contrib., p. 165.

Type locality unknown, but the Jarvis collection contains typical examples from the locality noted above. It differs from *citrina* by the fine white sutural line, not widening into a band on the lower whorls, and sometimes inconspicuous.

Adams thus describes *albida:* " Shell like var. *citrina,* but the white stripe reduced to an ill-defined line, slightly tinged with yellow on the penult whorl, with the red tinge very faint." No locality is mentioned.

14. A. ALBOANFRACTUS (Chitty). Pl. 19, figs. 41, 42.

Small, but stout in figure; smooth and glossy, the latter part of the last whorl densely, finely striate; *pale yellow,* fading to *opaque-white on the last half or more of the last whorl.* Keel distinct but low. Aperture oblique; peristome but little thickened and slightly retracted at the ends. *Columella strongly truncate* in most individuals. Length 14.5, diam. 4.8 to 5.2 mm., whorls 7½ to 8. Chitty's type measured .62 x .22 inch. Habitat unknown, perhaps Northside, according to Chitty.

C. m. var. *alboanfractus* CHITTY, Contrib., p. 8 (Oct., 1853).

Like *concinna,* but without bands or streaks, and with the peristome sinuous. It differs from *paivana* chiefly in the opaque-white last whorl.

14*a*. Var. *bicolor* (Chitty).

" Shell short and robust. Lip and penult whorl white, gradually growing into a pure rich yellow to the truncate apex; very shining, with lines of growth only perceptible under a strong lens. Whorls 6, Length .6, greatest breadth .24 (15 x 6 mm.). One is longer, 7½ whorls, length .64, breadth .21 " (16 x 5.25 mm.). (*Cyl. m.* var. *bicolor* Chitty, Contrib., p. 10.)

Habitat unknown. It seems, from the description, to be near *alboanfractus* and *paivana,* if, indeed, it is not identical with the latter.

14*b*. Var. *paivana* (Pfeiffer). Pl. 12, figs. 58-62.

" Shell subperforate, obese-fusiform, broadly truncate, rather solid, smooth, glossy, waxen whitish. Spire swollen below the middle, obese; 7 whorls remaining, the upper ones flat, lower a little convex, the last whorl narrower, somewhat acutely thread-keeled at base. Aperture slightly oblique, oblong; columella with a tooth-like fold within; peristome white, reflexed, the ends joined by a thin callous, right margin sinuous, columellar margin somewhat toothed, angular outwardly, below the insertion. Length 13.5 to 14.5, diam. 5.5 mm." (*Pfr.*).

Jamaica.

Cyl. paivana Pfr., Novit. Conch., pt. 22, p. 258, pl. 65, f. 8, 9 (May, 1865); Monogr., vi, p. 357.—Gloyne, J. de C., 1875, p. 122.

The small size, uniform yellow or dingy yellow tint and abruptly truncate columella readily distinguish this form, which is not uncommon. The yellow tint fades in time to dirty white. Except for excessively fine striation on the latter part of the last whorl, the surface is nearly smooth. The keel is longer than in *A. splendens citrina*. Both size and form vary rather widely, specimens measuring: 15 x 5.3 mm.; 17.2 x 6 mm.; 16.5 x 5.2 mm. Figures 58 and 59 are copies of Pfeiffer's. Gloyne has reported *paivana* from Mt. Diablo, but whether the specimens were correctly identified or not is an open question.

15. A. dohrniana (Pfeiffer). Pl. 16, figs. 23, 24.

"Shell subperforate, subfusiform, slender, smooth, glossy; coffee-colored, with a whitish band at the suture. Spire slightly tapering downwards, and slowly tapering upwards from the middle, narrowly truncate; suture simple, little impressed. Nine whorls remaining are flattened, the last one scarcely higher than the preceding, rib-striate anteriorly, the base with a somewhat compressed keel. Aperture oblique, subcircular, the peristome rose-flesh colored, expanded, the margins joined by a rather thin callous; right margin produced upwards at the insertion; columellar margin sinuous, somewhat toothed above. Length 17.5, diam. 4.66 mm.; length of aperture with peristome 4, width 3.75 mm." (*Pfr.*).

Jamaica.

Cylindrella dohrniana Pfr., Malak. Bl., xviii, 1871, p. 119; Novit. Conch., iv, p. 74, pl. 121, f. 14, 15; Monogr., viii, 423.

I have not seen this form, which apparently differs from *A. splendens* chiefly by its slender shape and the rib-striation of the back of the last whorl.

16. A. pulchella (Chitty).

"This pretty shell in color resembles var. *tricolor*. Shell

small, not over robust, shining. Last whorl and part of the penult., and the three upper whorls of the decollated apex, of *a deep rich brown;* intermediate space of a light olive-brown. *Lip and behind the lip rose-pink except where it is interrupted by the sharp white keel,* which extends over one-half of the last whorl. Next *below the suture is a gradually-widening white line,* commencing at one-half of the penult. whorl and terminating at the rose-pink behind the lip. Whorls 7½. Transverse striæ well marked on one-half of the last whorl, obsolete above. *Lip very oblique,* with *a deep sinus on the left side.* Length .64, breadth .21 inch " (*Cyl. m.* var. *pulchella* Chitty, Contrib., p. 8).

Manchester? (Chitty, two specimens). Specimens from Mr. Jarvis' collection (pl. 13, figs. 10, 11) from the Cockpit country near Troy, St. Elizabeth, agree fairly with Chitty's description, except in the paler intermediate whorls. The glossy shell is whitish, with a brown or fleshy tint, the upper whorl dark brown. The last whorl, and the lower part of the preceding whorl, are also dark brown, with a widening white band below the suture, and another on and above the basal keel. The face and reverse of the sinuous lip are rose-pink. The broad median dark belt on the latter part of the last whorl runs directly into the pink and brown at the back of the lip in some specimens, but in that figured (pl. 13, f. 10) a white streak intervenes. The columella is more or less truncate within, and the columellar margin of the lip is deeply notched at the insertion, the edge being reflexed, and either *adnate or leaving a small umbilical chink.* The basal keel is strong, and longer than in *A. splendens.* The surface is smooth except for some fine striæ near the end of the last whorl. Specimens measure from 17 x 5.7 mm. to 18 x 5.4 mm., with 7½ to 9 whorls. One of this lot is figured. Except in having wider white bands at suture and keel, these shells are similar to those below referred to var. *pulla.*

A. dohrniana seems to have the coloration of *pulchella*, but differs by its more slender contour. *A. splendens* is larger than *pulchella*, without a white basal band, and with less deeply notched lip-ends.

16*a*. Var. *pulla* (Chitty). Pl. 11, figs. 67, 68, 69, 70.

Fusiform, swollen in the middle; *dark brown at the ends,* paler in the middle, the *last whorl* with *a slowly widening creamy band below the suture.* Smooth and polished, with some very fine striæ on the latter part of the last whorl only. *Keel long and very strong,* its latter part creamy-white. Aperture long, the lip well expanded, flesh-tinted or creamy, sinuous; *columellar margin very deeply notched at the insertion,* dilated and reflexed, *closely applied over the umbilical chink, closing it.* Columella strongly truncate in oblique view. Length 15, diam. 5 mm., with 7 whorls.

Maroontown, St. James (Chitty).

C. m. var. *pulla* CHITTY, Contrib., i, p. 9 (Oct., 1853).

Remarkable for the closure of the axial chink by the reflexed and adnate columellar margin. Otherwise it resembles *A. paivana,* except in color.

Chitty's type measured .68 x .22 inch (17 x 5.5 mm.), and is thus described: "Shell small, rather slender, dark red-brown, almost black at the back of peritreme. Lip cream-white, and so also around the back of it, and a white line running along the top (below the suture) of one-half of the last whorl, narrow and gradually diminishing. I have but three specimens before me, not the best I imagine, and, though the brown body-color is good, each seems covered with a white substance which scales off on application of a steel instrument, as though the substance were the natural exterior. Whorls 7¾, with deep suture, generally shining; with transverse striæ but slightly developed on the last whorl. At the top of the left side of the labrum is a very deep, well-marked sinus. Aperture very much lengthened, and keel very sharp. Length .68, breadth .22 inch."

17. A. SINUATA (C. B. Adams). Pl. 11, figs. 71, 72.

"Shell not robust and rather thin, with the lip remarkably sinuate; of a dingy pearl-white, with, on the last whorl, a fine white line below the suture and another on the anterior keel. Lip pale red, with a tinge of brown behind. With excessively fine striæ on the back of the last whorl" (*C. B. Ad.*).

Eastern Jamaica: the east part of Portland (C. B. Ad.); Mooretown (P. W. Jarvis).

Cyl. m. var. *sinuata* C. B. A., Contrib., p. 164.

There are in the collection of the Academy only two poor, worn specimens, one of which is figured. They measure 17.6 x 5.4 mm. with 8 whorls, and 17 x 4.7 mm., with 8½ whorls. The mouth and lip are like *pulla*, but the axial chink, though very narrow, is not wholly closed, and the keel is less strong, though still quite strong and much longer than in *A. splendens*. The "east part of Portland" of Adams' time is now middle Portland, since the union with that parish of St. Thomas-in-the-East, a parish which once included the John Crow Mts. and coast.

In the collection of P. W. Jarvis there are two fresh shells of this species from Mooretown, Portland. They are glossy, bluish-white, with a faint pink tint at the summit. The last whorl becomes faintly straw-tinted, the keel and suture white. Both face and back of the lip are rose-pink.

Group of A. solida.

Shell conic above, robust below, with well-rounded (rather than tapering) last whorl, and a rather narrow, often inconspicuous, keel; back of the last whorl rib-striate.

18. A. STRIATA (C. B. Adams). Pl. 16, figs. 40-47.

Shell rimate, obesely fusiform, thin but moderately strong; *white*, typically uniform, but sometimes tinted with red-brown at the base. Surface somewhat glossy, *finely rib-striate*, the striæ weaker on the upper whorl or two. Whorls somewhat convex, the last tapering, with a rather low, cord-like keel below, subobsolete near the columellar lip; *suture strongly ascending* to its termination. *Aperture nearly vertical*, oval, *longer than wide*, the peristome *thin, broadly expanded* and reflexed, white; *the outer and columellar margins level and in a plane*, not sinuous, *converging above*, where a *short*, thin parietal callous unites them. Columella seen in an oblique view to be truncate below. Length 19, diam. 6.6 mm., whorls 7 to 7½.

Jamaica: Waterloo, in the back part of Manchester (Adams); Troy, St. Elizabeth (Jarvis).

Cyl. maugeri var. *striata* C. B. A., Contrib. no. 9, p. 165 (April, 1851).—*Cyl. macrostoma* PFR., P. Z. S., 1857, p. 111; Conchyl. Cab., p. 73, pl. 9, f. 15-17; Monogr., iv, 712.—SOWERBY, C. Icon., xx, pl. 3, f. 26.—GLOYNE, J. de Conchyl., 1875, p. 122 (Manchester).

Quite distinct by its thin, much expanded lip, the very short parietal callous, striate surface, etc. In one lot before me the last whorl is reddish-brown, this color fading on the preceding whorls to corneous white in the upper half of the shell (fig. 40). Figs. 45, 46, 47 are copied from Pfeiffer's figures of *macrostoma*, which is exactly synonymous with *striata*.

19. A. SOLIDA (C. B. Adams).

The forms here included under *A. solida* are closely related to the east Jamaican *A. nigrescens*, but the shell in *A. solida* is stronger, the lip is thicker, the spire does not taper so rapidly, and the color-patterns differ.

Pfeiffer's description of *C. blandiana* and "variety 1" thereof (see pl. 16, figs. 25, 26) apply exactly to typical *solida*. The several varieties included may be determined by the following key:

I. Striation even, fine and close on the spire, not coarser on the last whorl; pale yellowish; peristome white and thick; columella strongly truncate; 16.5-18 x 6.3-7 mm., with 6½-7 whorls.

A. s. striatula, no. 16*f*.

II. Striation stronger and coarser on the latter part of the last whorl.

1. A slowly widening white band on the last whorl below the suture.

a. Black-brown at both ends; lip thick, pink or flesh-colored, a pink or white streak behind it. 19.5 x 6.7 mm., whorls 7½.

A. solida, no. 16.

aa. Gray-white or yellowish, with white lip and a widening white subsutural band.

A. s. valida, no. 16*a.*

2. No distinct white band below the suture.

a. White, a tinge of red at both ends.

A. s. conica, no. 16*b.*

aa. Pale umber, darker near end of last whorl, lip white; lightly striate on upper whorls, regularly and rather coarsely so on the rest.

A. s. fusca, no. 16*c.*

aaa. Large and robust, pearl-white, sometimes red-tinted at the ends, lip white, a large irregular black spot behind it.

A. s. corpulenta, no. 16*d.*

aaaa. Pale yellow or pearl-white; lip white.

A. s. unicolor, no. 16*e.*

Typical *A. solida* (C. B. Adams). Pl. 18, figs. 20, 21.

Shell rimate, the lower half obese, upper half rapidly tapering, truncate; solid. *First* 1½ *or* 2 *whorls and the last whorl blackish-brown, intermediate whorls pale, roseate,* the penult. one often olive-tinted; on the last whorl *the suture is bordered below by a white line widening into a band* on the back; lip bordered behind with flesh-color or whitish. Surface glossy, finely but rather weakly striate, the striæ becoming *strong and close-set riblets on the last half of the last whorl.* Suture weakly crenulate near the apex. Basal keel weak and thread-like, stronger near the lip. Aperture vertical, bluish or purplish inside, with a white band above. Peristome *thick,* with very convex face, pink, but paler or white at the ends, which are *widely separated,* joined by a transparent parietal callous; outer lip slightly sinuous; columellar lip calloused and scarcely retracted at the insertion. Columella with a heavy, deeply-placed fold, indistinctly truncate below, as seen in the aperture. Length 19.5, diam. 6.7 mm., whorls 7½.

Central Jamaica: vicinity of Peace River, in the eastern part of Manchester (C. B. Ad.).

Cyl. maugeri var. *solida* C. B. A., Contrib. no. 9, p. 162

(April, 1851).—*C. blandiana* and var. 1, Pfr., P. Z. S., 1852, p. 68; Conchyl. Cab., p. 71, f. 33, 34; Monogr., iii, p. 582 (1853).—*Cyl. m.* var. *valida* C. B. A., Contrib. p. 165.

19*a*. Var. *valida* (C. B. Ad.). Pl. 18, figs. 22, 23.

Similar in form, size and sculpture to *solida; gray-white* or with a slight yellow tint; the last whorl often whiter, and with *an opaque-white line below the suture, widening into a band on the back.* Lip white throughout, usually somewhat more sinuous than in *solida.*

Near Peace River, Manchester (C. B. Adams, P. W. Jarvis).

Although widely separated from *solida* in Adams' arrangement, this is only a white or albinistic race of that species. Probably Pfeiffer's *C. blandiana* var. no. 2 belongs here. It is the var. *b* of the *Monographia.*

19*b*. Var. *conica* C. B. Adams.

" Shell widest in the penult. whorl; white, with a tinge of red at both ends " (*C. m.* var. *conica* C. B. A., Contrib. p. 166).

No locality is given for this inadequately-described form, which is placed by Adams in his group of " strongly striated varieties, light-colored, not fasciate." It may belong under *A. nigrescens.*

19*c*. Var. *fusca* (C. B. Adams).

" Shell short, robust, but moderately thickened; pale umber color, darker near the end of the last whorl; lip white; lightly striated on the upper whorls, in the rest regularly and rather coarsely striated " (*Cyl. maugeri* var. *fusca* C. B. A., Contrib. p. 165).

Maroon Town, in Hanover (Adams). Not seen. It seems to belong to the *solida* series.

19*d*. Var. *corpulenta* (C. B. Adams).

" Shell large and robust, but moderately thickened; pearl-white, sometimes with a tinge of red on the upper whorls and anteriorly; lip white; with a large, irregular black spot be-

hind the lip; coarsely striated near the end of the last whorl, otherwise with the striæ of the lower half of the shell most lightly impressed." *C. m.* var. *corpulenta C. B. A.*, Contrib. no. 9, p. 165).

Inhabits St. Elizabeth (Adams). I have not seen specimens of this race.

19*e*. Var. *unicolor* C. B. Ad.

"Shell of medium size and form; pale yellow or pearl-white, with a white lip; strongly striated on the back of the last whorl, finely striated on the middle whorls." (*Cyl. m.* var. *unicolor* C. B. A., Contrib. no. 9, p. 165.)

Porus, in the east part of Manchester (Adams). Known to me by the above description only.

Chitty, in his Contrib. no. 1, p. 10, thus defines a subvariety: *a*. "It is less shining, the striæ are coarser; it is less robust, and it seems less liable to decollation. Out of three specimens, all I have, two have apparently lost only the very apices, having 13¾ whorls remaining, and the third has 10½ whorls left. Near Maroon Town, St. James."

Still another variety of *solida* from Porus, in eastern Manchester, is glossy, sculptured like *solida*, but rather smoother, dark at the ends, but apparently without a subsutural white band. The specimens are not sufficiently fresh for exact description.

19*f*. Subsp. STRIATULA (C. B. Adams). Pl. 16, figs. 36, 37, 38, 39.

"Shell thick, short, robust; pale greenish yellow, sometimes with a tinge of pale brown or horn color; lip white, thick and well expanded; with fine, regular, approximate striæ, which are obsolete only at the summit" (*C. B. Ad.*).

Stouter in figure than *solida* and *valida*, usually suffused with reddish-brown on the last whorl, the suture whitish; *keel delicate, narrow and low* throughout; *very closely, finely and evenly rib-striate*, the striæ *not* coarser on the last whorl; becoming weaker on the first whorl or two. Aperture *somewhat oblique*, livid brown inside; peristome white and thick-

ened, in a plane, the outer lip but slightly sinuous. *Columella strongly truncate*, as seen obliquely in the aperture. Axis sinuous in the last whorl.

Length 18, diam. 7 mm.; whorls 6½ to 7.

Length 16.5, diam. 6.3 mm.; whorls 6½.

Cyl. maugeri var. *striatula* C. B. A., Contrib. no. 9, p. 165.

While this form resembles *solida* in shape, the widely separated ends of the lip, and the delicate basal keel, it differs notably in the even, fine striation and strongly truncate columella, constant in several lots before me. Its locality is unknown. I think that it will eventually be separated specifically from *A. solida*. Possibly Pfeiffer's figures, 31, 32. of *C. blandiana* (my pl. 16, f. 25, 26) represent *striatula*, but they look more like *A. nigrescens* var. *rufilabris*.

20. A. NIGRESCENS (C. B. Adams).

Markedly conic above, the last two whorls stout, of about equal diameter; keel slender and rather low, the last whorl well rounded, coarsely rib-striate, at least on the latter part. Aperture wide, rounded below, subvertical, the lip well reflexed, somewhat retracted at the insertions. Columella usually not truncate, as seen in the mouth.

Eastern Jamaica, in the parish of Portland.

This group of closely-related races is characteristic of the extreme east. It is related to *A. solida* of Manchester, differing from that type in the more conic and slender spire, less conspicuously truncate columella, etc. A key to the varieties follows:

I. Early whorls and last one dark, the intermediate whorls lighter.

1. Merely a whitish streak on the keel; latter half of the last whorl rib-striate, elsewhere with irregular, weak striæ only; lip roseate; 18-20 x 6 mm. *A. nigrescens*, no. 20.

2. A *widening white band* at the keel; last whorl closely rib-striate, the rest more spaced striate; aperture black-brown inside, with a white trian-

gular spot; peristome pink, not thick; 18-19 x 6.5-7.4 mm. *A. n. quadricolor,* no. 20*b*.

3. Small, but robust and thick; dark livid-brown at both ends, or bluish-gray anteriorly, elsewhere pearl-white; lip white, thick; a narrow white line below suture of last whorl, and another on the keel; sculpture as in *nigrescens*.

A. n. crassa, no. 20*a*.

II. Gray-white or yellowish; lip vermilion or pink-tinted; columella not truncate. *A. n. rufilabris,* no. 20*c*.

III. Gray-white or yellowish, the lip white.

A. n. leucostoma, no. 20*d*.

Typical *A. nigrescens* (C. B. Adams). Pl. 18, figs. 28, 29, 30.

"Shell robust in the lower part, conic above; black on the last whorl and on several of the upper whorls, fading into brown in the middle, with a dingy white stripe anteriorly, and a red lip; with a few striæ behind the lip. In some localities the shell is of medium size and form, rather more coarsely striate on the last half of the last whorl, and faintly striated on the first half" (*Ad.*).

Eastern Jamaica: Portland, at Manchioneal, and various other localities westward (C. B. Ad.).

Cyl. maugeri var. *nigrescens* C. B. A., Contrib. no. 9, p. 162 (April, 1851).

The specimens before me are attenuate above, the last two whorls of about equal diameter. They are *blackish-brown at the ends*, varying from *brown to brownish-yellow in the middle*, *the lip bright roseate*. There are only weak growth-wrinkles, except on the last whorl, or its latter half, where rib-striæ appear. The suture is marked with a fine pale line. The narrow and low, but distinct, basal keel is dingy-whitish, at least in its latter portion, but there is no white band above it, such as marks var. *quadricolor*. The aperture is dark within, rather wide, well rounded below, and hardly oblique. Outer lip thin, reflexed, retracted above; columellar margin similarly somewhat retracted. *Columella not folded or truncate*, as seen in the mouth. 18 to 20 x 6 mm., with 7½ to 8 whorls.

Var. *quadricolor* is stouter in form, with a larger mouth, wider lip, stronger sculpture and a *wide basal white band.*

20*a*. Var. *crassa* C. B. Adams.

" Shell rather small, but robust and thick; dark livid-brown at both extremities, or bluish-gray anteriorly; with a thick white lip; with a narrow white stripe next below the suture of the last whorl, and a slender white line on the anterior keel; otherwise pearl-white; with very strong striæ on the back of the last whorl, which diminish in ascending the spire, becoming microscopic on the middle whorls. Inhabits Portland." (*C. B. Ad.*)

C. maugeri var. *crassa* C. B. A., Contrib. no. 9, p. 163.

Not known to me by specimens.

20*b*. Var. *quadricolor* Chitty. Pl. 16, figs. 29-35.

Shell *markedly conic* above the last two whorls, which are quite robust; varying from red-brown to olive in the intermediate whorls, *the last and several upper ones blackish-brown.* Last whorl having a sutural white line, and *a white band below, which is narrow and above the keel in front, gradually widening and covering the keel on the back,* but *not extending to the lip* except upon the keel. *Surface closely and regularly costulate* on the last half whorl, the *ribs more spaced on the spire,* subobsolete on the first whorl or two. *Basal keel delicate* and thread-like, becoming stronger near the lip. Aperture subvertical, black-brown with a white triangle inside; peristome pink in front and behind, but little thickened, well reflexed, *the ends remote,* joined by a transparent parietal film; outer margin retracted at the upper insertion, spreading upward in a little pad; columellar margin a little retracted at the insertion or not noticeably so. *Columella quite weakly or not truncate* in an oblique view in the aperture.

Length 19, diam. 7.4 mm.; whorls 7½.

Length 18.5, diam. 6.5 mm.; whorls 8.

Length 18.75, diam. 6.5 mm. (Chitty).

Manchioneal and the east end of Portland (Chitty); Egg Hill, Portland (Jarvis).

C. maugeri var. *quadricolor* CHITTY, Contrib. p. 10 (1853). —*C. blandiana* BLAND, Ann. Lyc. Nat. Hist. of N. Y., ix, p. 85, f. 5 (dentition).—*Pupa maugeri* var., SOWERBY, The Genera of Shells, f. 6.—REEVE, Conch. Syst., pl. 170, f. 6.

Differs from *nigrescens* chiefly in the spaced costulation of the spire. This is subject to a good deal of variation, the riblets sometimes being weak and irregular above the last whorl. The tint, too, of the intermediate whorls varies a good deal. Mr. Jarvis found *quadricolor, rufilabris* and *leucostoma* at Egg Hill, and I am a good deal disposed to think them merely forms of a polymorphic race, rather than true varieties.

20*c*. Var. *rufilabris* (C. B. Adams). Pl. 18, figs. 25, 26, 27.

Shell rather wide below, the last two whorls of equal diam., preceding whorls *rapidly tapering;* rather thin; *gray-white or slightly yellow-tinted, without markings* other than a faint, fine sutural white line. Glossy, sculptured with *sparse, irregularly-spaced and small* riblets, becoming *stronger and more regular* on the latter part of the last whorl. Keel slender, rather low, an opaque creamy band above it. Aperture white inside; peristome thin, both outer and columellar margins a little retracted at their insertions. *Columella not noticeably folded or truncate.* "*Lip vermilion,* sometimes whitish on the inner side," but in old museum specimens fading to a very *faint rose tint,* both front and back.

Length 20, diam. 6.5 mm., whorls 8½.

Length 18.3, diam. 6 mm., whorls 7½.

Eastern Jamaica: Portland (C. B. Adams). Egg Hill, Portland (P. W. Jarvis).

Cyl. maugeri var. *rufilabris* C. B. A., Contrib. p. 164.—*C. maugeri* var. PFR., Conchyl. Cab., pl. 7, f. 41, 42.—(?) *C. blandiana* Pfr., in part, Conchyl. Cab., p. 71, pl. 7, f. 31, 32.

An albinistic race of the conic Portland type of *Anoma.* There is sometimes a white band at the keel, shaped like that figured for var. *quadricolor.* The original figure of *Helix*

maugeri Wood, copied in my pl. 18, fig. 24, resembles *rufilabris*, but it has hitherto been referred to various other forms of the genus, and I feel no certainty that it was drawn from this rather than some other of the numerous closely-related forms.

I refer here, with some doubt, two of Pfeiffer's figures of *C. blandiana*, copied on my pl. 16, f. 25, 26.

20*d*. Var. *leucostoma* Pilsbry, n. v.

Shell with the last two whorls obese, the spire conic and strongly tapering, as in other forms of the species; pale yellowish or gray-white, with an inconspicuous white subsutural line and a rapidly-widening opaque-white band at the keel; lip white. Sculpture as in var. *quadricolor*.

This variety from Egg Hill, Portland, is exactly like var. *quadricolor* except in color. The pure white lip separates it from var. *rufilabris* C. B. Ad. Described from the collection of Mr. P. W. Jarvis.

Genus BRACHYPODELLA Beck, 1837.

Brachypus Guilding, Zoölogical Journal, iii, p. 167 (1828), for *B. costatus*. Not *Brachypus* Swainson, 1824 (Aves), or of Meigen, 1824 (Diptera).—*Brachypodella* Beck, Index Molluscorum, p. 89 (1837), for *B. perplicata* Fér., *collaris* Lam., *subula* Fér., *antiperversa* Fér.—Pilsbry & Vanatta, Proc. A. N. S. Phila., 1898, p. 277, 278 (type *B. antiperversa* Fér.—*Brachypodisca* Agassiz, Nomenclator Zoölogicus, Index Universalis, p. 51 (1847), an emendation of *Brachypodella*.—*Cylindrella* Pfr. (in part), Archiv f. Naturgeschichte, 1840, p. 41.—*Cilindrella* (in part), Pfr., Conchylien Cabinet, p. 1.—*Urucoptis* (in part), Mörch, Catalogus Conchyliorum quæ reliquit C. de Yoldi, p. 35 (1852).—*Siphonostoma* Swainson (in part), Treatise on Malacology, 1840, pp. 168, 333 (for *costata* Gldg. and *fasciata* Brug. (preoc. in *Vermes*).—*Cochlodina*, 2ème groupe *Trachelioides* in part, Ferussac, Tabl. Syst., p. 61.—*Trachelia* Pfr., 1853, in part.—Includes *Apoma* Beck, *Mychostoma* Alb., *Casta* Alb., *Strophina* Mörch.

Shell fusiform, cylindric or tapering-turrite, frequently

truncate, the last whorl either free or adnate, the base generally angular. Aperture oblong, round or squarish, the lip expanded or reflexed, generally continuous. Axis solid, and either simple or variously modified.

Jaw thin, arcuate and plaited, as in *Urocoptis*. Radula very long and very narrow, the central tooth with a narrow basal-plate and small cusp, two adjacent laterals on each side enormously enlarged, with very broad, rounded mesoeones, the ectocones small or obsolete; marginal teeth few and narrow, each with a small bilobed cusp (plates 9 and 10).

Type *B. antiperversa*. Distribution, Antilles except western Cuba and the Bahamas; mainland from Trinidad and Venezuela to the isthmus of Tehauntepec. Most of the species live on the ground under stones, etc.

Soft Anatomy of Brachypodella.

The genitalia (pl. 14, fig. 3, *B. chemnitziana;* fig. 6, *B. agnesiana*) are similar to typical *Urocoptis* in general structure. In both species examined the penis is moderately developed, with the vas deferens and retractor muscle apical. The vagina is at least as long as the penis. The spermatheca (fig. 3, *sp.*) is subglobular, on a very long and slender duct (fig. 3, *sp. d.*). The uterus (fig. 3, *ut.*) in the viviparous *B. chemnitziana* is capacious; in the individuals opened contained two or three young shells in various stages of development. The vas deferens, as usual in viviparous land snails, is free from the uterus nearly to the upper end of the latter.

The free retractor muscles (pl. 14, fig. 3, *B. chemnitziana*) unite into a common band at the columellar insertion. This shortly divides into the columellar muscle proper (*col.*) and a wide band which divides into three: the right ocular retractor (*r. o.*), which also gives off some minor branches to the foot; the pharyngeal retractor, split distally; and the left ocular (*l. o.*), which is inserted on the vas deferens and the vagina, as well as the eye-stalk. The retractor muscle of the penis has its insertion on the lung floor.

The central nervous system (pl. 14, fig. 1, *B. agnesiana*) is less concentrated than Fischer found it to be in *Eucalodium*

and *Berendtia*. The cerebro-pedal and cerebro-pleural connectives are long. The pedal, pleural, visceral and parietal ganglia do not form a compact subœsophageal mass, but a large open ring, chiefly by reason of the separation of the pleural and pedal ganglia by rather long connectives. The cerebral ganglia are not noticeably subdivided. They are united by a broad commissure. The bases of the optical nerves are not noticeably enlarged (pl. 14, fig. 1: *c*, cerebral ganglia; *par.*, parietal; *ped.*, pedal; *pl.*, pleural; *v*, visceral ganglia; *o*, base of the optic nerve).

The buccal mass or pharynx is of the short, oblong form usual in this and allied families, but the radular sheath is enormously lengthened, at least half as long as the shell in *B. chemnitziana* and *B. agnesiana* (pl. 14, fig. 2, *ph*, pharynx; *r*, radular sheath; *f*, foot); and it projects free in the visceral cavity, the forward part being thrown into longitudinal folds. The distal end is noticeably dilated. The radula is correspondingly long and narrow. The special modifications of the teeth are discussed under the several subgeneric heads.

Compared with *Urocoptis* (see vol. xv, pl. 27, fig. 44), it will be seen that *Brachypodella* presents various differences in the soft anatomy. The pharynx and salivary glands are similar, but the radular sheath in *Brachypodella* stretches its enormous length far into the visceral cavity. The muscles are not very unlike, but they are united further at the proximal end in *Brachypodella*, and the left ocular retractor inserts upon the vas deferens and vagina, a normal penis-retractor being present. In *Urocoptis brevis* a condition further advanced has been attained, the insertion of the ocular band having moved downward to the apex of the penis itself, where it functions as a penial retractor, the true penis-retractor being superseded and lost. These differences are such as would be expected in the two widely differentiated genera of the same subfamily. Some other divergencies are adaptive, dependent upon the viviparity of *Brachypodella chemnitziana;* and upon the sinistrality of *B. chemnitziana* and *agnesiana*, causing the morphologically right side and organs of these forms to be on the left side. Unfortunately,

I have been able to dissect only the most highly evolved forms of *Brachypodella.*

There is no character of the shell common to all the forms of *Brachypodella,* which will separate the genus from all forms of *Urocoptis;* though the various minor groups when once learned are more or less characteristic. The chief differentiation of the two groups has been in the structure of the radula.

Brachypodella is very closely related to *Pineria,* or at least to *P. viequensis,* which has a radula of the same type. In *P. viequensis,* however, the ectocones of both lateral teeth are larger and better developed than in *Brachypodella. Brachypodella* differs widely from *Pineria* in having the columellar margin of the peristome built forward, while in *Pineria* it is not built forward from the columella proper, being formed as in *Liguus, Oxystyla,* etc.

While *Brachypodella* contains fewer species than *Urocoptis,* there has been fully as much differentiation within the genus, and when the soft parts are studied it may be found necessary to divide it into several genera, which, however, will in any case be more nearly allied to one another than to *Urocoptis,* etc. At present the phylogenetic arrangement of the several series of species is based upon the structure of the axis, of the apical whorls, and of the radula. The typical section of the genus contains apparently the least specialized existing forms.

Key by shell-characters to subgenera of Brachypodella.

I. Axis encircled by two strong, thin, subequal lamellæ, serrate or crenulate at the edges; base carinate. Island of Santo Domingo.
Subgenus AMPHICOSMIA, sp. 6 to 10.

II. Axis thickened in the lower half of the shell, cylindric, biplicate or nodose; base carinate.

1. Shell stout, barrel-shaped or cylindric, ribbed; axis thick, with two smooth, low spiral cords. Santo Domingo. STROPHINA, sp. no. 11.

2. Shell pillar-shaped, white, finely striate; axis cylindric, biplicate or nodose-hooked. Jamaica.
MYCHOSTOMA, sp. 44 to 48.

III. Axis thin; either straight, weakly uniplicate, or spirally gyrate.

1. Last whorl carinate below, not free; shell sinistral, white, slender, densely striate, the whorls convex, oblique; aperture oval, longer than wide; peristome barely free or adnate above. Jamaica.
APOMA, sp. 49, 50.

2. Last whorl *strongly carinate below*, and with a lateral swelling or angle near the squarish or rounded aperture; axis slender, straight, or with one spiral; shell rather slender, small.
   a. Apical whorl very high. Jamaica.
   Geoscala, sp. 38 to 40.
   b. Apical whorl not greatly elevated. Haiti to Trinidad; northern S. America to southern Mexico. *Brachypodella*, s. s., sp. 19 to 37.

3. Last whorl angular below, shortly free; shell corneous, cylindric-tapering, truncate, densely and finely striate; axis slender and straight.
   a. Apical whorls normal, costulate. Porto Rico to eastern Cuba. *Brevipedella*, sp. 1 to 5.
   b. Apical whorls elevated. Jamaica.
   Simplicervix, sp. 41 to 43.

4. Last whorl round below, at least near the aperture; form slender.
   a. Neck round; apex usually entire, substriate; axis slender and straight. Eastern Cuba.
   Siphonolæmus, sp. no. 14.
   b. Neck moderate or long; axis cork-screw gyrate in the later whorls; apex smooth; shell slender, fusiform. Eastern Cuba, Santo Domingo. *Gyraxis*, sp. 15 to 18.

5. Last whorl angular or rounded below; shell *obesely* fusiform, striate; apex not attenuate, smooth; whorls few, 12-13 in entire shells; axis slender, straight. Haiti. *Liparotes*, sp. no. 12, 13.

Subgenus BREVIPEDELLA Pilsbry, nov.

The shell is clear corneous, moderately stout in figure, truncate, and *densely, evenly rib-striate*, the *last whorl somewhat angular below*, very shortly free. The apex is *delicately costulate vertically* (pl. 8, fig. 55); the *axis simple, slender,* and nearly straight. The central tooth of the radula has a *narrow,* peg-like cusp; both laterals have small, peg-like ectocones (pl. 9, fig. 1, *B. angulifera;* fig. 2, *B. imitatrix*). Type *B. imitatrix.*

A Haitian group, with one species in Cuba and one in Porto Rico, distinguished chiefly by the *narrow cusp of the central tooth*, but with minor features of the sculpture and form of the shell which will enable it to be recognized, though hardly defined intelligibly from shell-characters alone on account of their similarity in several groups, such as *Cochlodinella, Baetrocoptis* and *Simplicervix.* The adult shell of the Jamaican section *Simplicervix,* indeed, is practicably indistinguishable from that of *Brevipedella,* but the different apex shows it to belong to another line of differentiation, the resemblance of adult shells being due to convergent evolution.

The radula of *Brevipedella* is characteristic by the very small size of the central tooth, which is narrower than in any other of the subordinate groups of *Brachypodella.* Its cusp is short, upright and peg-like, as are the ectocones of the lateral teeth. The teeth are extremely similar in the four species I have examined, *B. imitatrix* (pl. 9, fig. 2), *B. angulifera* (pl. 9, fig. 1), *B. portoricensis,* and *B. weinlandi.* There are five or six marginal teeth on each side.

In distribution *Brevipedella* resembles the banded *Caracolus* species, and, like them, part of the forms of the three islands are but slightly differentiated.

I. Suture crenulate, *B. weinlandi,* no. 1.

II. Suture even.

1. Length 16, diam. 3 mm., whorls 13 to 14.
B. kraussiana, no. 2.

2. Length 9 to 11, diam. about 2.5 mm., whorls 8 to 9½.
a. Haiti, *B. imitatrix,* no. 3; Cuba, *B. angulifera,* no. 4.

3. Length 9 to 13, diam. 2 to 3 mm., whorls 8 to 9½.
Porto Rico. *B. portoricensis,* no. 5.

1. B. WEINLANDI (Pfeiffer). Pl. 8, figs. 52, 53.

Shell cylindric, the upper half or third slowly tapering to a truncation about half as wide as the greatest diameter of the shell; thin; corneous or somewhat pink-tinted. Surface glossy, *closely, finely and regularly rib-striate,* the riblets as wide as their intervals, nearly vertical and but slightly curved, *alternate riblets strengthened into narrow beads below the suture,* making it denticulate. Whorls but slightly convex, the last obtusely keeled below, very shortly free in front. Aperture oblique, irregularly rounded, the peristome expanded and somewhat reflexed, the outer margin narrower. Axis slender, straight and simple.

Length 13.2, diam. 3 mm., whorls 10⅓.

Length 11.7, diam. 2.6 mm., whorls 10¾.

Length 12.66, diam. 3 mm., whorls 10 (Pfr., type).

Haiti: near Jeremie (Weinland, Henderson).

Cyl. weinlandi PFR., Malak. Bl., vii, 1860, p. 214, pl. 2, f. 12-15; Monogr., vi, p. 373.—CROSSE, J. de C., 1891, p. 145.

Near *B. angulifera* Gundl. of eastern Cuba, and *B. smithiana,* but distinct by the sutural crenulation and larger size. A young shell in coll. of J. B. Henderson, Jr., shows the apical whorls to be delicately striate vertically. The deciduous portion is quite attenuate, and consists of about 8 to 10 whorls. The radula is very similar to that of *B. angulifera,* but with lower ectocones. In the proportions and absolute size of the large cusps and basal-plates the two species are identical.

2. B. KRAUSSIANA (Weinland). Pl. 8, figs. 46, 47.

"Shell covered-rimate, cylindric-turrite, truncate, rather thin; closely and elegantly undulate-costellate, a little shining, whitish-brown, diaphanous; suture slightly sunken, *not in the least denticulate.* Whorls remaining 13-14, nearly flat, the last shortly free, slightly carinate. Aperture oblique, nearly circular; peristome white, narrowly expanded throughout, flexuous, continuous. Length (truncate) 16, diam. 3 mm.; diam. aperture with perist. 2⅓ mm." (*Weinl.*)

Haiti: in the mountains near the town of Corail, on the N. side of the S.W. peninsula (Weinl.).

Cyl. kraussiana Weinl., Malak. Bl., xxiii, 1876, p. 171, pl. 2, f. 3, 4.—Pfr., Monogr., viii, p. 621.—Crosse, J. de C., 1891, p. 145.

Differs from the related *C. weinlandi* by the greater number of whorls, the complete absence of dentieulation of the suture, and the much stronger costulation (*Weinl.*). I have not seen specimens.

3. B. imitatrix Pilsbry, n. sp. Pl. 8, figs. 54, 55.

Shell whitish-corneous, truncate, not one of over fifty specimens before me retaining the spire complete. The surface is glossy, closely and evenly rib-striate. The upper half or more tapers. The last whorl is shortly free, obtusely angular but not carinate below, flattened on its outer-lower face. The aperture is obtusely angular above the middle of the outer margin, the peristome somewhat straightened on both sides of the angle. A young shell is attenuate above and the apical whorls are delicately costulate vertically (fig. 55, x 25).

Length 10, diam. 2.5 mm., whorls 8¾.

Length 11, diam. 2.6 mm., whorls 9½.

Length 9, diam. 2.3 mm., whorls 8.

Haiti: Port-au-Prince, Sans-Souci, St. Mark (Marc), and La Ferriére (Henderson & Simpson).

The shell is indistinguishable from that of *B. angulifera* of eastern Cuba. The figures here given represent the remarkably even sculpture better than those already given of *angulifera*, on pl. 42 of vol. xv, figs. 87, 88. The wide distribution of both the Cuban and the Haitian forms precludes the idea of colonization by commerce. The specific distinction is based upon differences in the teeth. In *B. imitatrix* (pl. 9. fig. 2) the lateral teeth are decidedly smaller than in *angulifera* (pl. 9, fig. 1), and the cusps are shorter, both absolutely and relatively, not projecting beyond the posterior margin of the basal plates, while in *angulifera* the cusps extend beyond the basal plates, and over the ectocones of the succeeding teeth. In *imitatrix* they stand somewhat more

upright, and thus are more foreshortened in a view from above. In both species there are five marginal teeth. The ectocones in both species are merely upright pegs, scarcely or not at all recurved. I examined two radulæ of each species. The figures are drawn from corresponding parts of the radulæ, and to the same scale.

B. krausseana is a more slender, longer form than *imitatrix*, with more whorls, but it is evidently allied.

4. B. ANGULIFERA (Gundlach). Vol. xv, pl. 42, figs. 87, 88.

Shell cylindric-tapering, whitish, thin, truncate, the summit about half the greatest width of the shell or less. Surface glossy, *finely and regularly* thread-striate, the *striæ smooth, as wide as the intervals.* Whorls 8 to 9½, moderately convex, with a well-impressed suture, the last whorl free in front, the rather short neck flattened above, and a little descending; more or less visibly subangular below, the outer surface flattened, tapering downwards. Aperture *round-ovate, the outer margin subangular;* peristome white, reflexed, wide on the columellar side, narrow along the outer margin. Axis simple and straight. Length 9-10.5, diam. 2.4-2.7 mm.

Eastern Cuba: near Santiago, at the *partido* Ramon (Gundlach); Bayamo (Gundl.); Mayari (Wright); Baracoa (Arango).

Cyl. angulifera GUNDL. in Pfr., Malak. Bl., v, 1858, p. 187. —PFR., Monogr., iv, p. 701.—ARANGO, Contrib., p. 114.

The shape of the mouth and of the free portion of the last whorl are characteristic. In texture and sculpture it is like *Urocoptis presasiana,* and I formerly placed the species in *Cochlodinella;* but having examined the dentition (pl. 9, fig. 1), I find that it is a *Brachypodella.* See under *B. imitatrix,* a Haitian species indistinguishable from *angulifera* in shell characters.

5. B. PORTORICENSIS (Pfeiffer). Pl. 15, figs. 7, 8.

Shell cylindric below, the upper half slowly tapering to a rather wide truncation; whitish-corneous. Surface slightly glossy, densely sculptured with subvertical, somewhat arcuate,

minute rib-striæ as wide as the intervals. Whorls weakly convex, the last shortly free in front, obtusely angular beneath. Suture impressed, simple. Aperture subcircular, the peristome narrowly expanded and subreflexed, thinner, a little sinuous, and slightly angular outwardly. Axis straight, slender and simple.

Length 12.6, diam. 2.6 mm., whorls 9.

Length 9, diam. 2.1 mm., whorls 8.

Length 13, diam. 3 mm., whorls 9 to 9½ (Pfr., types).

Porto Rico: San Juan (Blauner); Quebradillas, Aguadilla and Vegabaja (Gundlach).

Cyl. portoricensis Pfr., Zeitschr. f. Malak., 1852, p. 151; Monogr., iii, pp. 572; Conchyl. Cab., p. 30, pl. 4, f. 13-15.—Shuttleworth, Diagn. n. Moll., no. 6, p. 146.—Crosse, J. de C., 1892, p. 26.—*Brachypodella portoricensis* Pfr., Pils. & Van., Proc. A. N. S. Phila., 1898, p. 278.—Dall & Simpson, The Mollusca of Porto Rico, Bull. U. S. Fish Commission, xx, 1900, p. 377.

This species is related to *B. angulifera* and *B. imitatrix*, but is usually larger than either, though the smallest Porto Rican specimens could not, I think, be separated with any certainty from the Haitian or Cuban shells. *B. kraussiana* is more slender and retains more whorls than *portoricensis*. The teeth of the radula are practically identical in size and shape in *portoricensis*, *weinlandi* and *angulifera*, but in the former species the ectocones are lower and less distinctly developed than in *angulifera*, those of the inner laterals being especially indistinct in the usual view from above. In profile, they appear as small, conic bosses.

Fig. 7 is copied from one of Pfeiffer's.

Subgenus Amphicosmia Pils. & Van., 1898.

P. & V., Proc. A. N. S. Phila., 1898, pp. 271, 277. Type *C. salleana* Pfr.

Brachypodellæ with two prominent subequal spiral axial lamellæ, both of them serrate or crenulate; base of the shell carinate; spire shortly, narrowly truncate, the apical whorls smooth. Distribution, Island of Haiti.

The species are illustrated on plate 3. The group was supposed to be subordinate to *Urocoptis* until I investigated the radula of *B. truncatula,* when it became at once evident that *Amphicosmia* is a specialized *Brachypodella.* The general disposition of the teeth (pl. 9, figs. 6, 7, 8) is as in other subgenera of that genus. The central tooth (fig. 8, profile) is much narrower than in the typical section of *Brachypodella* (see figs. 3, 5, 14-16), though slightly bilobed at the cutting edge; and the inner lateral has the basal-plate much wider, not contracted into a long neck. In these respects the teeth of *Amphicosmia* approach those of *Strophina* (pl. 10, f. 19), *Brevipedella* (pl. 9, f. 1, 2) and the Cuban group *Gyraxis.* The ectoeone of the inner lateral (see pl. 9, fig. 6) is a good deal reduced, however, not forming an overhanging cusp, as in *Strophina.* The marginal teeth are comparatively well developed, as in *Strophina.* While rather isolated, it seems that *Amphicosmia* is more closely related to *Strophina* than to other known groups of *Brachypodella.*

Key to Species of Amphicosmia.

I. Somewhat glossy, closely and finely striate species. S. Domingo.

1. Rather large, diam. 4-5 mm., the neck short, axial lamellæ finely crenulate, smooth in the lower whorls. *B. sallcana,* no. 6.
2. Smaller and slender, diam. 2.3-3.3 mm., the neck long, axial lamellæ serrate. *B. hjalmarsoni,* no. 7.

II. Dull, rib-striate, the intervals much wider than the riblets. Haiti.

1. Neck short, conspicuously swollen at the periphery, the keel near the middle of its base; axial lamellæ finely and very weakly crenulate. *B. truncatula,* no. 8; *B. cristata,* no. 9.
2. Neck longer; last whorl flattened on periphery and base, the keel latero-basal; axial lamellæ denticulate. *B. dohrni,* no. 10.

6. B. SALLEANA (Pfeiffer). Pl. 3, figs. 5, 13, 14, 15.

Shell cylindric, the upper third or more tapering to a rather narrow truncation; thin, reddish-brown or pale corneous-reddish. Surface somewhat glossy, closely and finely rib-striate, the striæ arcuate and as wide as the intervals. 12 to 15 moderately-convex whorls are occupied, but generally several abandoned ones remain attached, so that the total number ranges from 14 to 18. The last whorl is pinched at the base into an *acute, strongly-projecting, whitish keel;* it is shortly free in front. Aperture irregularly oval, channelled at the position of the keel, the peristome expanded and reflexed, angular at the termination of the keel. Internal axis encircled by two equal spiral lamellæ, with very finely crenulate edges.

Length 26, diam. 4.3 mm., whorls 16.

Length 25, diam. 4 mm., whorls 20.

Length 27, diam. 5 mm., whorls 17-18 (Pfr.).

Haiti: Tablaso, near San Cristobal, in the Rep. San Domingo (A. Sallé).

Cyl. salleana PFR., Zeitschr. f. Mal., 1850, p. 74; Proc. Zoöl. Soc., 1851, p. 149; Conchyl. Cab., p. 38, pl. 4, f. 35, 36; Monogr., iii, p. 570.—SOWERBY, C. Icon., xx, pl. 5, f. 40.—CROSSE, Journ. de Conchyl., 1891, p. 146.—*Urocoptis (Amphicosmia) salleana* PILS. & VAN., Proc. A. N. S. Phila., 1898, p. 277, pl. 18, f. 22 (axis).

Larger than the other species of the section. The dark brown specimens in the series before me are more slender than the pale ones, but there is some gradation in both size and color.

7. B. HJALMARSONI (Pfeiffer). Pl. 3, figs. 1, 2, 3, 4.

Shell cylindric, the upper third tapering to a narrow truncation, or with the spire complete; thin, light brown or whitish-corneous and translucent. Surface glossy, sculptured with *very close, fine, smooth striæ.* Whorls slightly convex, the last produced in a rather long neck, which is rounded except at the base. Base narrowly concave on each side of a strong, cord-like keel. Aperture obliquely ovate,

angular at the outer-basal part; peristome narrowly reflexed. Axis encircled by two subequal, conspicuously serrate lamellæ.

Length 20, diam. 3 mm.; whorls 17.

Length 19, diam. 3.3 mm.; whorls 19 (spire complete).

Length 14, diam. 2.3 mm.; whorls 15.

Haiti: Sierra Monte Cristi, in the Republic of S. Domingo (Hjalmarson).

Cyl. hjalmarsoni Pfr., Malak. Bl., v, 1858, p. 153, pl. 3, f. 16-18; Monogr., vi, p. 371.—Crosse, J. de C., 1891, p. 145.

Related to *B. salleana*, but distinct by its smaller size, slender form and finer striation. It varies widely in size and number of whorls. Pfeiffer calls it "rose-whitish," but in the specimens before me, collected by Hjalmarson, the rose color has faded.

8. B. TRUNCATULA (Lamarck). Pl. 3, figs. 16-21.

Shell cylindric, the upper third tapering to a wide or narrow truncation; thin, flesh-colored, the lower whorls paler. Surface lusterless, sculptured with strong, *thread-like, straight rib-striæ, separated by intervals of three or four times their width* on the lower whorls, more crowded on the upper; *some of the striæ connected at their lower ends in pairs* by whitish bosses above the suture, and more rarely some are connected at their upper ends also. Whorls but slightly convex, the last free in front, flattened or even concave above, conspicuously swollen on the right side of the neck, the base pinched into a very strongly projecting keel. Aperture irregularly rounded or squarish, often more or less distinctly angular at the base and the outer side; peristome reflexed. Axis encircled by two subequal lamellæ, the edges of which are very minutely crenulate in the median and upper whorls, nearly smooth in the lower.

Length 18, diam. 3.3 mm.; whorls 13⅓.

Length 16.3, diam. 3.2 mm.; whorls 14½.

Length 12.8, diam. 3.2 mm.; whorls 10.

Length 11, diam. 2.8 mm.; whorls 10.

Haiti: Port-au-Prince (Mrs. W. Klatte, H. Rolle, J. B. Henderson and C. T. Simpson); eight miles west of the same place (Henderson).

Helix (*Cochlodina*) *gracilicollis* Fer., Prodr., p. 61, no. 505 (nude name); Hist., pl. 163, f. 10.—*Clausilia truncatula* Lam., An. s. Vert., vi, pt. 2, p. 113 (April, 1822).—Delessert, Recueil, pl. 27, f. 11.—*Urocoptis truncatula* Bk., Index, p. 83.—*Clausilia gracilicollis* Desh., in Lam., p. 197.—*Cylindrella gracilicollis* Fér., Pfr. in Wiegmann's Archiv für Naturg., 1840, i, p. 41; Phil. Abbild., i, p. 179, pl. 1, f. 6 (1844); Conchyl. Cab., p. 43, pl. 5, f. 1-3 (bad); Monogr., ii, p. 376; iii, 574; iv, 704; vi, 378.—Bland, Ann. Lyc. Nat. Hist. of N. Y., xi, 1874, p. 82 (axis).—Crosse, Journ. de Conch., 1891, p. 146.

The size varies within wide limits, and the supersutural whitish tubercles, while characteristic, are often much reduced, very few in number, and on some specimens they are represented only by slight, drop-like thickenings of the lower ends of a few striæ. This was the case with Lamarck's type. The first really good description was that of Pfeiffer in 1844. I have been unable to find any evidence that the name *gracilicollis* was published, with a description or figures, prior to the date of Lamarck's diagnosis.

9. B. cristata (Weinland & Martens).

Shell not rimate, fusiform, the apex slender, not truncate, thin, obliquely closely costulate-striate, brownish-rose colored; suture deep, simple. Whorls 14, the upper ones pale, slender, median ones swollen, the last whorl free, descending forwardly, the neck with an elevated crenulate crest at the base, base provided with an elevated keel. Aperture oblique, subcircular, angular at the base and outer margin; peristome expanded, whitish. Length 12, diam. 3, aperture with perist. 2 mm. (*Martens*).

Haiti: neighborhood of Jeremie (Weinland).

Cyl. cristata W. et M., Martens, Malak. Bl., vi, 1859, p. 55. —Pfr., Monogr., vi, p. 386.

This unfigured species must be near to, if not *identical with*, *B. truncatula* Lam. According to Von Martens, it differs from *B. gouldiana* Pfr. in the structure of the neck. Where the last whorl deviates from the preceding, a crest begins on

its lower side, which is crenulated by the riblets crossing it, and is bounded on each side by an impressed furrow. That on the outer side is more conspicuous, on account of a rounded swelling parallel with the crest, and terminating in the angle of the outer lip. These features are also characteristic of *B. truncatula*.

10. B. DOHRNI (Maltzan). Pl. 3, figs. 6-12.

Shell rimate-perforate, long-turrited, a little decollate, rather thin, obliquely rib-striate, the ribs delicate, distant; corneous, subpellucid. Whorls numerous (20-22), a little convex, very slowly increasing, the lower 6 or 7 of about equal diameter, the last encircled by a very distinct keel at the base, free, projecting a rather long distance; suture simple, impressed. Aperture subovate, lightly angularly channelled outwardly, the peristome expanded, a trifle thickened. Length 19, diam. 3.5 mm. (*Maltzan*).

Haiti: Sans-souci (H. Rolle, 1887-88); La Férriere (Henderson & Simpson).

Cyl. dohrni MALTZ., Nachrichtsblatt d. D. Malak. Ges., xx, Dec., 1888, p. 177.—CROSSE, Journ. de Conchyl., 1891, p. 146, pl. 2, f. 1, *a*, *b*.

The specimen figured by Crosse, received from Rolle, is 16 mm. long, and has 14 or 15 whorls, according to the figures (pl. 3, figs. 11, 12). The shells collected at La Férriere by Henderson and Simpson (pl. 3, figs. 6, 7, 8, 9, 10) seem to have fewer whorls, and the larger specimens are rose-colored. I have thought it well to fully describe them:

Shell cylindric, turrited, the upper half tapering to a narrow truncation; *rose-colored*, becoming paler below, the last whorl white or reddish-brown, or nearly so; thin; surface lusterless, sculptured with oblique, thread-like, arcuate, or somewhat sigmoid rib-striæ, separated by spaces of two or three times their own width. Whorls slightly convex, the last broad at the base, produced in a rather *long free neck*, which is rounded above, *very strongly carinate at the periphery of the flattened base*, concave above and below the stout keel. Aperture obliquely short-oval, the peristome narrowly re-

flexed, subangular at the termination of the keel. Internal axis slender, encircled by two subequal lamellæ, the edges of which are serrate.

Length 18.5, diam. 3.2-3.3 mm.; whorls 16½.

Length 15, diam. 2.9 mm.; whorls 15.

Length 14, diam. 2.7 mm.; whorls 17⅓ (spire complete).

Length 12.7, diam. 2.7 mm.; whorls 11.

In one specimen retaining the apex, the nepionic whorls are smooth.

Subgenus STROPHINA Mörch, 1852.

Strophina MCH., Catal. Yoldi, pp. 35.

Shell strong, obese, carinate below, the base excavated, last whorl shortly free. *Axis very thick and heavy,* smooth, somewhat grooved along the partitions, and perceptibly compressed mesially (pl. 8, fig. 60).

The radula (pl. 10, fig. 19, *B. laterradii* var. *strophina*) is large for the size of the shell, and the teeth resemble those of *Amphicosmia.* The central has a long narrow cusp, but slightly wider than its basal-plate. The inner lateral tooth has a stout ectocone, that of the outer lateral being decidedly lower. There are 7 marginal teeth on each side.

A relationship to *Amphicosmia* is shown by the weakly biplicate axis. It also resembles the axis of *Mychostoma.*

11. B. LATERRADII (Grateloup). Pl. 8, fig. 58.

Shell cylindric-turrite, somewhat ventricose, umbilicate; apex truncate; thin, obliquely and symmetrically plicate. Whorls a little convex; neck at the base angulate, subarcuate. Aperture simple, subquadrate. Length 14 to 15, diam. in the middle 5 mm. (*Grat.*).

Santo Domingo: Island of Beate, or Beata, off the south coast, between Cape Falso and Cape Mongon (Laterrade, *teste* Mörch.; Suensen, *teste* Pfr.).

Clausilia laterradii GRAT., Actes de la Soc. Linn. de Bordeaux, xi, p. 430, pl. 2, f. 10 (1839).—*Cylindrella laterradii* Grat., PFR., Symbolæ, ii, p. 137; Monogr., ii, p. 378.—PHIL., Abbild., i, p. 182, pl. 1, f. 18 (from Grat.).—CROSSE, J. de C.,

1891, p. 148.—*Urocoptis* (*Strophina*) *laterradii* MÖRCH., Cat. Yoldi, p. 35.

Grateloup compares the species to *subula* Fér. and *perplicata* Fér. It is named for Prof. J. F. Laterrade, author of *Flore Bordelaise et de la Gironde* and other works. I do not know that the typical form of *B. laterradii* has been rediscovered.

11*a*. Var. STROPHINA Pils. n. v. Pl. 8, figs. 59, 60.

Shell deeply rimate, strong, with somewhat the shape of *Cerion uva;* widest above the middle, contracting in a short cone above, and tapering downwards; white, faintly cream-tinted above, bluish below, lusterless, sculptured with coarse ribs, weak on the cone, strong on the last whorl. Whorls slightly convex, the last tapering, strongly keeled below, shortly built forward; the base narrow and concave within the keel. Aperture subcircular, chestnut-colored inside, the expanded peristome being continuous and white. Interior light chestnut-colored. Axis colored and excessively thick in the penult. and antepenult. whorls, grooved along the partitions, slender above and in the last whorl. Length 10.5, diam. 4.5 mm., whorls 7.

Santo Domingo (Gabb).

Pfeiffer's figures in the *Conchylien Cabinet*, pl. 5, f. 10, 11, p. 45, resemble this short form more than they do Grateloup's original figure. The shell is notable for its stout, *Cerion* or *Holospira*-like shape, and the very thick internal pillar.

Sowerby's figure of "*Cylindrella lateradii*" (C. Icon., xx, pl. 10, f. 86) represents the young of some very slender *Urocoptis*, probably *U. lateralis*.

Subgenus LIPAROTES Pilsbry, 1903.

The shell is *obesely* fusiform, striate, of few (12 to 13) whorls in entire specimens, the first 4 conic, not attenuate, and often lost in adults; last whorl rounded or angular below, more or less free. Apex smooth, the first whorl not unduly elevated (vol. xv, pl. 64, fig. 17, *B. obesa*). Axis slender and nearly straight. Dentition unknown. Type *B. obesa*.

A Haitian group of obese shells with conic, not especially attenuate, early whorls. The dentition is unknown.

12. B. OBESA (Weinl. et Mart.). Pl. 8, fig. 57.

Shell obese-fusiform, widest at or above the middle, rapidly tapering above to a narrow truncation or an entire apex, slowly tapering downwards; thin, brownish-corneous, hardly shining, closely and evenly striate, the striæ oblique, nearly straight. Whorls slightly convex, the last tapering, its latter half at first closely appressed, then free and descending; the base with a low but distinct straight keel. Aperture oblique, rounded, the peristome narrowly expanded. Axis straight, slender and tapering, very slightly twisted in each whorl.

Length 11.5, diam. 3.2 mm., whorls 12½ (entire).

Length 10.5, diam. 3.3 mm., whorls 9 (truncate).

Length 11, diam. 3.5 mm., whorls 13 (type).

Haiti: near Jeremie (Weinland, Henderson).

Cyl. obesa W. & M., MARTENS, Malak. Bl., vi, 1859, p. 55.—PFR., Monogr., vi, p. 386.—CROSSE, J. de C., 1891, p. 148.—Not *C. obesa* SOWERBY, C. Icon., xx, pl. 8, f. 73, which is probably a form of *Urocoptis brevis*.

Peculiar in the shape of the last whorl, the very full neck being, as it were, pressed into the base. The upper 4 whorls are abandoned by the adult snail, and may either break off or persist.

13. B. SUTURALIS (Weinland). Pl. 8, figs. 44, 45.

Shell slightly rimate, oblong-fusiform, rather thin, obliquely and closely hair striate, little shining, whitish-corneous; spire entire, swollen in the middle, the apex rather acute; suture with a chestnut border. Whorls 12, a little convex, the last slightly free, the base with a chestnut band, not keeled. Aperture oblique, subcircular; peristome thin, narrowly expanded throughout. Length 16½, diam. 5 mm.; diam. of aperture nearly 4 mm. (*Weinl.*).

Haiti: near Jeremie (Weinland).

Cyl. suturalis WEINL., Malak. Bl., ix, 1862, p. 194.—PFR., Novit. Conch., p. 262, pl. 65, f. 18, 19; Monogr., vi, p. 371.—

CROSSE, J. de C., 1891, p. 142.—SOWERBY, C. Icon., xx, pl. 3, f. 19.

In form it has great similarity to *C. tumidula* W. & M., but differs from this species, as well as from *C. obesa* and *cristata*, which are related in other respects, by the absence of a keel on the last whorl (*Weinland*). I have not seen specimens.

Subgenus SIPHONOLÆMUS Pilsbry, 1903.

The shell is small, turrite, and usually entire, with straight, simple and slender axis, *cylindric neck, rounded below,* and delicately, vertically, striate, apical whorls, the striæ very fine and close, very low, often hardly or not perceptible. The dentition is unknown. Eastern Cuba.

14. B. MINUTA ('Gundl.' Pfr.). Vol. XV, pl. 62, figs. 32, 33.

Shell minute, the lower half cylindric, upper half tapering and attenuate, the apex entire; thin, corneous; closely and regularly rib-striate. Whorls convex, the latter half of the last whorl free, *cylindric*, projecting and descending, sculptured with wide-spaced, lamellar riblets. Aperture circular, the thin lip well expanded. Axis straight and simple.

Length 7.66, diam. 1.66 mm., whorls 16 (Yateras, type).

Length 7.5, diam. 1.6 mm., whorls 15 (Yateras).

Length 7, diam. 1.5 mm., whorls 15 (Monte Verde).

Eastern Cuba: Yateras; somewhat smaller forms at Monte Toro (Gundlach) and the plantation Monte Verde, near Yateras (Wright), in Guantanamo district.

Cyl. minuta Gundl., mss., PFR., Malak. Bl., vi, 1859, p. 99; Monogr., vi, p. 385.—ARANGO, Contrib., p. 124.

The small size, regular and dense costulation, and the straight neck with very widely-spaced ribs, distinguish this species. It resembles *B. dominicensis* in size and general shape, but differs in the round neck, finer sculpture and more numerous whorls. The specimen figured is from Monte Verde.

Subgenus GYRAXIS Pilsbry, 1903.

Slender, uniform, corneous, delicately-sculptured shells, with a moderate or long neck, and with the axis gyrate in the

later whorls, forming an open, corkscrew-like spiral. Apical whorls smooth (except in *B. g. sericata* and probably *B. gouldiana*). Radula as in the typical group of *Brachypodella*.

Distribution, eastern Cuba, with one species in Santo Domingo. It is evidently related to the typical section of *Brachypodella*, the teeth being modified in much the same manner. In *B. turcasiana* (pl. 9, fig. 11, an inner lateral tooth in profile, and fig. 12) the central tooth has a cusp wider than the basal-plate, but not so wide as in typical *Brachypodella*. The lateral teeth are quite as in *Brachypodella*. There are only 3 or 4 marginal teeth on each side. Type *B. brooksiana*.

Key to Species of Gyraxis.

I. East Cuban forms, with smooth apical whorls.
   1. Neck very long, the free portion about one-third the length of the shell, carinate below, 16 to 18 x 1.8 to 2 mm., with 21 to 25 whorls in entire specimens. *B. brooksiana*, no. 15.
   2. Free neck shorter, round, rib-striate; shell shorter; 17-18½ whorls in entire shells.
      a. Last adnate whorl obtusely carinate below. *B. gundlachiana*, no. 16.
      b. Last adnate whorl roundly tapering below; neck shorter. *B. turcasiana*, no. 17.

II. Haitian species, with the apical whorls delicately ribbed; last whorl becoming free, the neck angular below.
   1. Shell turrite, very densely costulate-striate, the suture subdenticulate; 10 x 2.3 mm., with 9 whorls remaining. *B. gouldiana*, no. 18.
   2. Shell widest at the upper third, the striation excessively fine and close; suture even. 10 to 12 x 2 mm., with 13 whorls in entire, 11 in truncate shells. *B. g. sericata*, no. 18*a*.

15. B. BROOKSIANA ('Gundl.' Pfr.). Vol. XV, pl. 62, figs. 20, 21; pl. 64, fig. 7.

Shell thin, corneous-white, slender, fusiform, widest at the upper third or fourth of the length, rather rapidly tapering

above to a narrow truncation, or retaining about 7 whitish whorls above the plug; *tapering downwards, the last whorl wholly free, descending in a sinuous curve about one-third the whole length of the shell;* rounded above, *the base conspicuously keeled,* the keel subobsolete near the aperture. Surface sculptured with oblique rib-striæ, separated by wider intervals, but finer and closer on the upper whorls, sharper on the neck. Whorls moderately convex, the later ones marginate above the suture. Aperture very oblique, subcircular, the peristome expanded and reflexed. Axis (pl. 64, fig. 7) slender and straight above, but in the last 5 whorls elevated into a lamella describing a broad, corkscrew-like spiral, around a central well or false umbilicus; in the last whorl straight again, the lamella descending some distance in the free portion.

Length 18.6, diam. 2 mm., whorls 25 (apex entire).

Length 16, diam. 1.8 mm., whorls 21 (apex entire).

Eastern Cuba: Monte Libano, in Guantanamo (Gundlach); also Monte Toro.

Cyl. brooksiana Gundl. mss., Pfr., Malak. Bl., vi, 1859, p. 98; Novit. Conch., p. 249, pl. 63, f. 16, 17; Monogr., vi, p. 384. —Arango, Contrib., p. 124.—Crosse, J. de C., 1890, p. 239, pl. 4, f. 7, 7*a*, 7*b*.—C. & Fischer, J. de C., 1870, p. 11 (dentition).—*Cyl. brookesiana* Sowerby, Conch. Icon., xx, pl. 6, f. 52.—(?) *Cilindrella prusiana* Gundlach, Deshayes, An. s. Vert. Bassin Paris, ii, p. 871.

Extraordinary for the long free deviation of the last whorl, and the spiral, lamellar axis, which resembles somewhat that of *Spirostemma*. This species is named for Don Teodoro Brooks, of Saltadero, one of those whose cordial welcome and hospitality made it possible for Gundlach to carry on his wonderfully successful researches in Guantanamo.

16. B. gundlachiana (Poey). Vol. XV, pl. 62, figs. 24, 25; pl. 64, fig. 8.

Shell thin, corneous, fusiform, widest near or above the middle, tapering to a small apex above, also tapering downwards to the last whorl, which is largely free, descending and

brought forward in a strongly arcuate curve. Surface delicately, regularly striate, the neck ribbed. Whorls moderately convex, the last *carinate below*, the keel not extending upon the free neck. Aperture subvertical, circular, the lip thin, narrowly reflexed. Axis (pl. 64, fig. 8) slender, nearly straight in the upper whorls, but gradually becoming sinuous, spirally coiled, in the later ones.

Length 11.4, diam. 1.8 mm., whorls 18.

Length 10.4, diam. 1.8 mm., whorls 17.

Eastern Cuba: Monte Verde, near Yateras (Wright); Monte Toro. "Cuba" (Adams, Redfield); type no. 465 Poey coll.

Cyl. adamsiana POEY, Memorias, i, p. 448, no. 34 (June, 1854). Not *C. adamsiana* Pfr., 1851.—*Cyl. gundlachiana* POEY, Mem., ii, p. 9, no. 465 (1856).

Near *B. turcasiana*, from which the less convex whorls, the last compressed and obtusely carinate below, the longer neck and subvertical aperture, separate it. The shape of the last whorl recalls *B. brooksiana*. The axis is like that of *B. turcasiana*. The specimens from Monte Toro are a variety with straightly descending neck. Sowerby's figures of "*turkasiana*" are probably this species.

The original description follows: "Shell very slender, subtruncate, fusiform, tapering towards both ends, very finely striatulate, pale corneous, glossy. Whorls 16-18, nearly flat, the last disjoined and much projecting, very closely costulate-striate, the base carinate. Aperture oblique, circular; peristome narrowly expanded throughout. Length 11.5, diam. 1.5, aperture 1 mm." (*Poey*).

According to Poey, this species differs from *C. gracillima* by the more numerous whorls, less cylindric form, glossy texture, etc.; from *C. porrecta* Gld. by the well-marked keel, the close striæ of the neck, by being a little more swollen and shorter. It was unknown to Arango, and has not been figured hitherto; but I believe that the East Cuban specimens I have described and illustrated are referable to Poey's species.

17. B. TURCASIANA ('Gundl.' Pfr.). Vol. XV, pl. 62, figs. 22, 23.

Shell fusiform, widest at or near the middle, tapering to a small apex above, much less tapering downward. Corneous, thin, finely striate throughout, the neck distantly, irregularly ribbed. Whorls strongly *convex,* the last not carinate, its latter half free, and descending in a nearly straight, cylindric and contracted neck. Aperture quite oblique, subcircular, a little piriform, the peristome narrowly reflexed. Axis slender, straight above, becoming somewhat corkscrew-like in several later whorls.

Length 12.7, diam. 2 mm., whorls 18.

Length 12, diam. 2.2 mm., whorls 18½.

Eastern Cuba: Monte Toro, in Guantanamo district (Gundlach).

Cyl. turcasiana Gundl. mss., PFR., Malak. Bl., vi, 1859, p. 99; Novit. Conch., p. 458, pl. 100, f. 17-19; Monogr., vi, p. 385. —ARANGO, Contrib., p. 124.—(?) *C. turkasiana* SOWERBY, C. Icon., xx, pl. 16, f. 141.

Near *B. gundlachiana,* but distinct by its somewhat larger size, shorter and less curved neck, more oblique aperture, and the more convex whorls, the last one not compressed or carinate below. In the original lot taken by Gundlach, some of which are before me, the first 4 whorls are pale, the next two reddish from the contained viscera, as figured by Pfeiffer. In others from Monte Toro, reddish color is wanting, all the early whorls being pale.

Gundlach mentions that "a smaller variety, otherwise just like the type, was collected at the plantations Los Hermanos and Sta. Maria, at Monte Toro. A more slender form, making an approach to *B. brooksiana* by having the last whorl more prolonged below (but not keeled), was taken at the plantation "Yemen." The species is named for Don. Leoncio Turcas, who furthered Gundlach's explorations in the district of Guantanamo.

Group of B. gouldiana.

The following forms from Santo Domingo are placed here

on account of the long neck and slightly gyrate axis, but the costellate apex would indicate rather alliance with *Brevipedella*. The true position of the species depends upon the dentition, which is unknown.

18. B. GOULDIANA (Pfeiffer).

Shell slightly subrimate, turrite, truncate, very densely costulate-striate, silky, pale corneous; suture impressed, subdenticulate. Whorls remaining 9, a little convex, the last free, shortly descending forward, somewhat compressed basally. Aperture suboblique, nearly circular, the right margin subangular; peristome white, narrowly expanded throughout. Length 10, diam. 2.33 mm., aperture 2 mm. long and wide (*Pfr.*).

Haiti: Rocks of Tablaso, near San Cristobal, in the Republic of Santo Domingo (A. Sallé).

Cyl. gouldiana PFR., Proc. Zoöl. Soc. Lond., 1851, p. 149; Monogr., iii, p. 577.—CROSSE, J. de C., 1891, p. 148.

Differs from *C. subtilis* by the less slender, truncate spire, wider whorls, the last not carinate, etc. (Pfr.). Not known to me by specimens.

18*a*. Var. SERICATA Pilsbry, n. var. Pl. 8, figs. 54, 55, 56.

Shell slender and subcylindric, widest at the upper third, slowly tapering downwards, rapidly tapering above to the obtuse, usually *entire* apex, which is delicately costellate vertically; whitish-corneous, thin, sculptured with *excessively fine and close, hair-like striæ*. Whorls quite convex on the upper part, elsewhere slightly convex, separated by a deeply-impressed suture, the last becoming free and descending forwardly in a *rather long*, somewhat contracted neck, which is rather obtusely angular below, elsewhere rounded. Aperture subcircular, the peristome broadly expanded. Axis slender, spirally revolving about a central well or false-umbilicus in the later whorls.

Length 11.7, diam. 2 mm., whorls 13 (entire).

Length 11, diam. 1.9 mm., whorls 12½ (entire).

Length 9.9, diam. 1.9 mm., whorls 11 (truncate).

Santo Domingo (W. M. Gabb).

This form agrees partially with the description of *B. gouldiana,* but all the specimens are entire or nearly so (that last measured above having lost the apical whorl only); the sculpture is even finer than I would suppose was intended by Pfeiffer's expression "*confertissime costulato-striata,*" and the suture is not at all dentieulate. The shell seems also to be somewhat less wide, and having its greatest diameter at the upper third, would hardly be described as "*turrita.*" The spiral curvature of the axis is similar to that of the Cuban *B. turcasiana,* a more coarsely sculptured species. The apex (fig. 54, x 20) does not differ materially from that of *B. imitatrix.*

Section BRACHYPODELLA s. str.

Brachypodella Beck, 1837, for *perplicata* Fér., *collaris* Lm., *subula* Fér., *antiperversa* Fér.—*Mychostoma* in part, ALBERS, Die Hel., 1850, p. 207, for *Cyl. subula* Fér., Pfr., *collaris* Fér., *gracilicollis* Fér., *hanleyana* Pfr., *pallida* Guild., *seminuda* Adams. *C. subula* Fér. selected as type by von Martens, Die Hel., 1860, p. 37.

Turrite, or cylindric below, varying from rib-striate to ribbed, the last whorl *swollen at the periphery, strongly carinate beneath,* concave above the keel, which is serrate. Aperture more or less angular at the outer and basal margins. Apex costulate or smooth. Axis slender, straight, or with a low spiral lamella. Radula with the cusp of the central tooth much wider than the basal-plate; ectocone of the inner lateral born on a long, slender extension of the basal-plate.

I. Mainland species, southeast Mexico to Trinidad, with costulate or striate apical whorls, and a small axial lamella; species 19 to 27.

II. Caribbean species (including Curaçao), with smooth apical whorls, and straight or twisted axis; species 28 to 31.

III. Species of St. Croix and the Virgin Islands to Haiti, with the apical whorls costulate, the axis straight or nearly so; species 32 to 37.

In groups II and III, the initial half whorl appears somewhat unduly elevated, approaching the condition of the Jamaican subgenera.

The radula in the typical group of *Brachypodella* is characteristic. The *central tooth has a very wide cusp* (see pl. 9, figs. 3, 4, *B. antiperversa*), far wider than the marginal teeth or than its own basal-plate. Its edge may be either straight, or bilobed (as in *trinitaria*, pl. 9, fig. 16), the latter condition perhaps being brought about by wearing of the median part of the cusp, while the sides, protected by the large laterals, are less worn. The inner lateral tooth on each side has the *basal-plate very narrow in front* (above in the figures), so that the small ectocone seems born on the end of a slender peduncle, which is crowded inward, so that the ectocone stands close to the basal-plate of the median tooth (fig. 16, etc.). Finally, the *two lateral teeth on each side are more or less crowded together*, so that in a superficial view there seems to be a single row of large laterals on each side (pl. 10, fig. 17, *B. pallida;* fig. 24, *B. dominicensis*). I have examined the radula of the following species: *costata* (pl. 9, fig. 5), *collaris, antiperversa* (pl. 9, figs. 3, 4), *raveni* (pl. 9, fig. 14), *trinitaria* (pl. 9, fig. 16), *pallida* (pl. 10, fig. 17), *riisei, dominicensis* (pl. 10, fig. 24), *leucopleura* (pl. 9, fig. 13, an inner lateral in profile), *hanleyana, bourguignatiana, subtilis, morini* (pl. 9, figs. 9, outer, and 10, inner, laterals in profile), and *speluncæ* (pl. 9, fig. 15), so that practically the whole group is known to agree in the peculiarities described above.

Group of B. morini: southeast Mexico to Trinidad.

Slender, long shells, usually with 18 to 25 whorls in entire specimens, but usually more or less truncate. Apical 3 whorls delicately costulate or striate vertically, the first whorl not abnormally elevated. Axis encircled by a distinct, though small, spiral lamella.

A natural group of closely related species, differing from those of the Caribees by the distinctly twisted axis and sculptured apical whorls, by the greater number of whorls in entire shells, and the somewhat longer neck. *B. aequatoria,* said to

be from near Quito, the only species of the group I have not seen, is placed here for want of a better place. The Mexican and Guatemalan forms have recently been grouped by Prof. von Martens in *Epirobia,* which he ranks as a subgenus of *Holospira;* but the slender, *imperforate,* uniplicate axis, sculptured apex, and strongly keeled base of the shell alike indicate their alliance to *Brachypodella.* Their generic position is herein demonstrated by the dentition (pl. 9, figs. 9, 10, 13, 15, 16), which is that of *Brachypodella,* and shows no kinship whatever with *Epirobia,* figured on pl. 50 of vol. xv, f. 6, 7.

The first whorl is less elevated than in *B. antiperversa* and other Antillean species of the typical section of *Brachypodella,* approaching the more normal contour seen in most Cuban and Haitian subgenera of the genus (pl. 6, f. 9, *B. hanleyana;* f. 14, *B. speluncæ*). The radula is quite similar to that of the Antillean species of the subgenus (pl. 9, fig. 9, outer, and 10, inner, lateral of *B. morini,* in profile; fig. 13, inner lateral of *B. leucopleura* in profile; 15, *B. speluncæ;* fig. 16, *B. trinitaria,* large form.

Key to species.

(*B. subula,* no. 23, is not included in the following key.)

I. Central American species. Apical whorls, when present, very finely, densely striate.

1. Riblets very low, wide-spaced, closer and sharper on last whorl; 12 to 14 mm. long with 16-21 whorls, or, in entire shells, 23 whorls. *B. subtilis,* no. 20.

2. Riblets strong but narrow.

a. Whorls very convex, with 25 to 30 or more riblets on the penult. 11-15 mm. long with 15-18 whorls in truncate, 15-16 mm. long with 22-24 whorls in entire shells. *B. morini,* no.19.

b. Whorls moderately convex, with 14-16 riblets on penult. whorl. 10-12 mm. long with 12-14 whorls in truncate, 14-16 mm. with 22 whorls in entire shells. *B. speluncæ,* no. 21.

c. Penult. whorl with 18-20 riblets; shell widely trun-

cate, with 8½-10 whorls remaining in a length of 9.5-11.5 mm. *B. bourguignatiana,* no. 22.

II. South American and Trinidad species.

1. Diam. 5, length 18 mm.; closely rib-striate; Ecuador. *B. aequatoria,* no. 24.
2. Slender shells, diam. 2 to 3 mm.; north coast of South America.
   a. Regularly, rather closely costulate, with 12-14 whorls in truncate, 18-20 in entire shells; Columbia, Venezuela. *B. hanleyana,* no. 25.
   b. Riblets distant, pale; shell slender, 12.5-13.5 mm. long, truncate, with 15 whorls; Venezuela. *B. leucopleura,* no. 26.
   c. Riblets rather wide-spaced; whorls very convex; 9 to 15 x 2 to 2.3 mm. with 12-17 whorls in truncate, 16.5 to 17.5 mm. with 21 to 25 whorls in entire shells; Trinidad. *B. trinitaria,* no. 27.

19. B. MORINI (Morelet). Pl. 6, figs. 4, 5, 6, 10.

Shell cylindric below, the upper half tapering to a narrow truncation or an entire apex, thin, corneous, with whitish riblets. Surface lusterless, sculptured with oblique, hardly arcuate, thread-like riblets, parted by spaces of three or four times their width, and usually 25 to 30 in number on the penult. whorl. Whorls very convex, the last free, projecting forward, swollen at the periphery, strongly carinate below, concave above the keel. Aperture subvertical, rounded-ovate, the outer margin being a little pulled out; peristome thick, white, widely expanded and reflexed. Axis slender, encircled by a single low spiral lamella.

Length 15, diam. 2.3 mm., whorls remaining 18.

Length 11.5, diam. 2.3 mm., whorls remaining 15.

Length 15-16, diam. 2.5 mm., whorls 22-24 (Morelet).

Guatemala: Vera Paz, in rocky places in forest (Morelet); Cahabon (Sarg). Southeast Mexico: Montanas de Poana and San Juan Bautista, Tabasco (Jose N. Rovirosa). Form *pulchella* at Livingston, eastern Guatemala, in the Bay of Honduras (Stoll); form *salpinx* probably near Coban or Lanquin, in Vera Paz (Salvin); form *sargi* at Cahabon (Sarg).

Cyl. morini MORELET, Test. Noviss., i, p. 11 (1849).—PFR., Monogr., iii, p. 578; Conchyl. Cab., p. 48, pl. 5, f. 24-26.—FISCHER & CROSSE, Miss. Scient. Mex., i, p. 412, pl. 17, f. 12.—SOWERBY, C. Icon., xx, pl. 16, f. 136.—PILSBRY, Proc. A. N. S. Phila., 1892, p. 338.—*Holospira morini* v. MARTENS, Biologia, p. 285, with var. *pulchella*, pl. 17, f. 3, 3*a*; *salpinx*, pl. 17, f. 5, and *sargi* (Dec., 1897).—*Cyl.* (*Gongylostoma*) *pulchella* v. MART., Sitzungsber. d. Ges. nat. Freunde Berlin, 1886, p. 162.—*Cyl. salpinx* TRISTRAM, P. Z. S., 1861, p. 231.

B. morini differs from *B. subtilis* in the strong sculpture. *B. speluncæ* has the riblets even stronger and more widely spaced, and is a rather more slender shell, with less convex whorls. The initial three whorls are very finely, vertically striate, as in *B. speluncæ*.

The two measurements first given above are from specimens received from Morelet, one of which is drawn in fig. 6. The smaller specimen would be called var. *pulchella*, but, after examining specimens collected by Morelet and Sarg in Guatemala, and Rovirosa in Tabasco, I believe that none of the so-called varieties of this species have any racial characters. They are merely individual variations. Entire specimens from S. Juan Bautista, Tabasco, have a diameter of about 2.2 mm., and vary in length from 14 mm., with 21 whorls, to 12.5 mm., with 19½ whorls. About three apical whorls are brown and delicately costulate vertically. Truncate shells from the same place measure 11 to 12.7 mm. long, and retain 12 to 14 whorls.

The form *pulchella* Martens measures 10.5 mm. long, 2.5 wide and has 13 whorls remaining (pl. 6, figs. 1, 2).

Form *sargi* Martens has the last whorl but slightly produced, the lip being nearly appressed to the penultimate whorl; l. 12.5, diam. 2.5 mm., 15 whorls remaining.

Form *salpinx* Tristr. (pl. 6, fig. 3) has 16 whorls left, and measures l. 14.5, diam. 2.5 mm. One of the two typical specimens differs from *morini* "in having a pure white varix on the fifth and sixth whorls before the last, one just above the other, and a less distinct varix on the following whorl, immediately below the others; its general color is a dull ashy-gray. The second specimen is pure white, probably bleached" (*v. Mart.*).

20. B. SUBTILIS (Morelet). Pl. 6, figs. 11, 12, 19, 20.

Shell very slender, fusiform, the upper half or more tapering to a narrow truncation or rarely an entire apex; corneous, thin. Surface somewhat shining, sculptured with *low, wide-spaced riblets.* Suture slightly margined. Whorls *strongly convex*, the greatest convexity above the middle of each; the last whorl is swollen at the periphery, strongly carinate below, projecting forward and a little descending, the neck much more sharply and closely costulate than the preceding whorls. Aperture slightly oblique, subangular outwardly and below; peristome thin, broadly expanding and subreflexed. Axis slender, encircled by a small spiral lamella, as in *B. morini.*

Length 13.5, diam. 2.2 mm., whorls remaining 17½; plug at 13.

Length 12.5 to 14, diam. 2.5 mm., whorls remaining 16 to 21 (Crosse).

Northern Guatemala: woods of the province of Peten (Morelet).

Cyl. subtilis MOREL., Testac. Noviss., i, p. 11 (1849).—PFR., Monogr., iii, p. 577; iv, 708; vi, 386; vii, 444; Conchyl. Cab., p. 51, pl. 5, f. 33-35.—CROSSE ET FISCHER, Moll. Mex., i, p. 413, pl. 17, f. 13.—SOWERBY, C. Icon., xx, pl. 14, f. 125.—*Holospira subtilis* v. MART., Biologia, p. 284.

According to Morelet, the type, with the spire entire, has 23 whorls. It stands near *B. morini*, differing in the reduction of the ribs to low welts, which are more widely spaced than the lamella-like ribs of *morini*, and in the slightly margined suture. The specimen described and figured on my plate, as well as those in Crosse's and Pfeiffer's collections, came from Morelet, no other naturalist having found the species.

21. B. SPELUNCÆ (Pfeiffer). Pl. 6, figs. 13, 14, 17, 18.

Shell not rimate, cylindric-turrite, subulate, very slender, rather thin, hardly shining, yellowish-corneous, with somewhat oblique, distant, lamellose riblets. Spire long, entire, the suture impressed. Whorls 22, a trifle convex, the first

embryonic ones smooth, paler, following ones costulate, subcompressed, slightly subangular at the suture; last whorl subtetragonal, free in front, shortly drawn out, a little descending, angular at the side and carinate below, at its junction with the external margin frequently costulate. Aperture irregularly rounded-subquadrangular, somewhat channelled at the base, whitish inside; peristome continuous, somewhat thickened, a little expanded, subreflexed, glossy, white. Length 16, diam. 3 mm.; aperture with peristome scarcely 2 mm. long and wide (*Crosse & Fischer*).

Northern Guatemala: walls of the cave Jobitsinal, near the capital of Peten (Morelet). Yucatan: cave at Tabi, Ticul, and between Sitilpech and Tunkas; a small form at Labna (Heilprin exped.).

Cyl. costulata Morel., Testac. Noviss., ii, p. 12 (1851); not of C. B. Ad., 1849.—*C. speluncæ* Pfr., Zeitschr. f. Malak., 1852, p. 151; Monogr., iii, p. 577.—Fischer et Crosse, Miss. Scient. au Mex. Moll., i, p. 410, pl. 17, f. 11.—*Holospira speluncæ* v. Mart., Biologia, p. 284.—*Cyl. speluncæ* Pilsbry, Proc. A. N. S. Phila., 1891, p. 315, pl. 15, f. 15, 15*a*, with var. *dubia*, p. 316, pl. 15, f. 14, 14*a* (Aug. 25, 1891).

B. speluncæ is closely related to *B. morini*, but it has fewer, more widely-spaced riblets, the peristome is less reflexed and more fragile, and the whorls are less convex.

Crosse and Fischer's description of Morelet's type is given above, and their figures copied, pl. 6, figs. 17, 18. Their measurement of diameter includes the lip of the shell, and hence exceeds by a millimeter the measurement as taken in this work. It is a common species in Yucatan. The first three whorls, in entire specimens, have a sculpture of excessively fine, close, vertical striæ; then coarse riblets abruptly set in (pl. 6, fig. 14, apex of a shell from Ticul). Fig. 13 is drawn from a specimen taken at Tabi.

An entire specimen taken from Ticul measures 14.3 x 2 mm., with 22 whorls, and has 16 riblets on the penult. whorl. Truncate shells from the cave at Tabi measure 10 to 12 mm., with 12 to 13½ whorls, with about 14 riblets. The slender axis has a spiral lamella as in *B. morini*.

A small form, which I called var. *dubia,* occurs at Labna. The shells measure about 10 x 2 mm., retain 12 to 13½ whorls, and have 17 to 18 riblets on the penult. whorl.

22. B. BOURGUIGNATIANA (Ancey). Pl. 7, figs. 32, 33, 34.

Shell subrimate, cylindric, slightly tapering to a broad truncation, pale brownish gray, rather solid but thin; surface lusterless, sculptured with slightly oblique, nearly straight lamella-like ribs, separated by intervals of three or four times their width, and 18 to 20 in number on the penult. whorl. Whorls but slightly convex, separated by a deep suture, the last whorl free, slightly descending and projecting forward, swollen at the periphery, very strongly carinate beneath, flattened above the lateral bulging. Aperture somewhat oblique, rounded, subangular outwardly and less so at the base; peristome expanded and somewhat reflexed. Axis stouter than in allied species, very indistinctly twisted.

Length 10, diam. 2.6 mm., whorls 10.

Length 9.5, diam. 2.5 mm., whorls 8½.

Length 9.5, diam. 2.3 mm., whorls 9.

Length 11.5, diam. 3 mm., whorls 9-10 (Ancey, types).

Honduras: Utilla island, off the N. coast (C. T. Simpson).

Cylyndrella bourguignatiana ANC., Annales de Malacologie, ii, p. 243 (May, 1886).—*Cylindrella b.*, PILSBRY, Proc. A. N. S. Phila., 1891, p. 316, pl. 15, f. 13, 13*a*.—v. MART., Biologia, p. 286.

This species, of which part of the original lot is before me, is closely related to *B. speluncæ* and *B. morini.* The number of riblets is intermediate between these two species. It differs from both in being wider, and more shortened by truncation, and in the perceptibly stouter and less spirally twisted internal axis. The relationship with *B. pallida* and other forms mentioned by Mr. Ancey is not especially close.

23. B. SUBULA (Férussac). Pl. 2, figs. 20, 21, 22.

Shell truncate, slender, subcylindric, tapering above. Obliquely, very closely [*confertissime*] costulate-striate; the numerous very fine and oblique lamellæ are distributed quite

regularly over the surface of the whorls, and in passing over the keel of the last whorl they are lengthened in a series of little scales. Pale corneous, with a perceptible fawn tint, the ribs standing out white. Whorls 16 or 17, very narrow and convex, parted by a simple, impressed suture, nearly equal in width, the last two more rapidly enlarging; the last whorl is very short. The flattened base is bounded by an acute angle, the more projecting because of an accompanying depression of the side. The last whorl projecting obliquely forward, terminating in a small, squarish aperture; peristome white, quite wide and strongly reflexed.

The largest individuals are 14 or 15 mm. long, and hardly 2.5 mm. in diameter (*Desh.*).

Habitat unknown.

Helix (Cochlodina) subula FÉR., Prodr., p. 61, no. 508 (nude name; no locality); Hist., pl. 163, f. 8.—*Clausilia subula* DESHAYES in Lam., An. s. Vert., viii, p. 216, no. 41 (1838). —*Brachypodella subula* BECK, Index Moll., p. 89, no. 3.—*Cylindrella subula* Fér., PHILIPPI Abbild., i, p. 181, pl. 1, f. 17 (copy from Férussac).—DESH. in Fér., Histoire, ii, p. 230.

This species rests upon the figures given by Férussac in his *Histoire*, copied on my plate. Deshayes' description, given above, may or may not have been based upon the type specimen, as he describes the surface as "*oblique confertissime costulato-striata*"—terms but ill agreeing with the detail figure in Férussac. However, both the description and figures were evidently drawn from shells of the Continental group of *Brachypodella*, and, in my opinion, if the type of *subula* is ever found, it will prove to be either *B. leucopleura*, *B. spelunca*, or *B. morini*. The Jamaican *Cylindrella subula* of Pfeiffer is certainly not the Férussacian species.

24. B. ÆQUATORIA (Morelet). Pl. 6, figs. 15, 16.

"Shell rimate, cylindric, tapering above, thin, arcuately and closely rib-striate, grayish corneous, not glossy. Whorls 11, a little convex, the last shortly projecting, base carinate. Aperture vertical, rounded; peristome expanded, free. Length 18, diam. 5 mm." (*Morelet*).

Ecuador: in the neighborhood of Quito (Dr. Destruges).

Cyl. æquatoria Morel., Journ. de Conchyl., 1873, p. 124, pl. 5, f. 1.—Pfr., Monogr., viii, p. 433.

The dorsal carina of the last whorl varies from a mere indication to a strongly projecting keel; and the peristome may be either quite free or adherent at its upper margin. The fine costulation is uniform, except on the latter half of the last whorl, where it becomes sharper and lower. The species is known only from Morelet's description and figures, which indicate a larger and especially stouter form than any other continental *Brachypodella*. It is far removed from the range of other known species, and apparently has been found by none of the numerous other naturalists who have collected around Quito, so that confirmation of the habitat and examination of the interior of the shell are desirable.

25. B. hanleyana (Pfeiffer). Pl. 6, figs. 7, 8, 9, 21, 22.

"Shell slightly rimate, subcylindric, tapering towards the truncate apex, thin, diaphanous, pale corneous; regularly and closely costulate, the riblets oblique, subarcuate, thread-like. Whorls 14, subequal, but slightly convex, the last shortly projecting forward, compressed carinate dorsally and basally, the right side angular. Aperture obsoletely angulate-subcircular; peristome free, whitish, expanded throughout. Length 13, diam. 3, diam. aperture 2 mm." (*Pfr.*).

Venezuela: Province of Cumana (Cuming, type loc.); Caraccas and Puerto Cabello (R. Swift). Colombia: near Cartagena (Swift), and Turbaco, 12 miles southeast of Cartagena (A. D. Brown coll.).

Cyl. hanleyana Pfr., Zeitschr. f. Malak., 1847, p. 16; Phil. Abbild., iii, p. 7, pl. 3, f. 3; Monogr., ii, p. 378; Conchyl. Cab., p. 42, pl. 4, f. 26-28.—Sowerby, C. Icon., xx, pl. 5, f. 37.—? *Cyl. trinitaria* Pfr., specimen from Sabanilla, New Grenada, Gibbons, Journ. of Conch., ii, 1879, p. 131.

Apparently an abundant species along the northern shores of South America, eastward nearly to Trinidad, and thus far known from points on the coast only. Pfeiffer's description is given above, and his figures copied, pl. 6, f. 21, 22. The

abundant series in the collection of the Academy is further illustrated in figs. 7 and 9, Cartagena, and fig. 8, Puerto Cabello. It is related to *B. morini* of Guatemala and *B. trinitaria* of Trinidad. The latter has more numerous and more convex whorls. In *B. morini* the whole shell is more slender, the last whorl is more compressed and tapering below, the riblets are more widely spaced, and those of the apical whorls are much finer and more crowded.

The axis is twisted much as figured for *B. morini*. The apical whorls have delicate, rather wide-spaced riblets. The crowded, thread-like striæ of the rest of the shell are a little bent at the ends, elsewhere but slightly curved, and are whitish on a brownish-corneous ground.

Specimens from Cartagena, with the apex entire, measure 12.4 x 2.2 mm., with 18½ whorls, or 15 mm. with 20 whorls. Truncate shells are 10.5 to 12 mm. long, with 12 to 14 whorls. Truncate shells from Puerto Cabello vary from 9 x 2.4 mm. with 9½ whorls to 11.5 x 2.4 mm. with 12 whorls. Entire specimens from this place taper more rapidly above, and have fewer whorls than those from Cartagena.

Gibbons' "*C. trinitaria*" from Sabanilla, N. G., was doubtless either this species or *B. leucopleura*.

26. B. LEUCOPLEURA (Menke). Pl. 15, figs. 9, 10, 14, 15, 16.

"Shell slightly rimate, subcylindric, tapering towards the truncate apex, thin, pellucid, glossy, pale corneous; obliquely ribbed, the ribs straightened, distant and paler. Whorls 15, a little convex, the last shortly projecting, acutely serrate-carinate at the base, the right side subangular. Aperture subcircular, obsoletely angular at the base; peristome free, shortly expanded throughout. Length 13.5, diam. 2.66, diam. aperture 2 mm." (*Pfr.*).

Habitat unknown (Menke). Venezuela: Puerto Cabello (Paetel); Caracas (F. Coeking).

Cyl. leucopleura MKE., Zeitschr. f. Malak., 1847, p. 2.—PHILIPPI, Abbild., iii, p. 6, pl. 3, f. 2.—PFR., Monogr., ii, p. 379.—PAETEL, Catal., p. 103.—? *C. trinitaria* Pfr., GIBBONS, specimen from Sabanilla, New Grenada, Journ. of Conch., ii, 131.

Pfeiffer's description and one of his figures are given above (fig. 14). Menke states that the ribs are lamellar, distant and white. Paetel locates the species at Puerto Cabello, but I do not know who identified his specimens. I have identified as *leucopleura* a series of five shells collected by F. Cocking at Caracas, two of which are figured on pl. 15, figs. 9, 10, 14-16. The shell is slender, 12.6 x 2 mm., narrowly truncate, with 14¾ whorls. The ribs are thin, somewhat lamellar, widely, irregularly spaced, white or pale, and stand on a pale red-brown ground. They become close on the neck, which has the very strong, serrate basal keel and peripheral inflation common to the group. The whorls are less convex than in *B. trinitaria*, and the peristome is thinner and narrower than in *B. morini*, in which, moreover, the ribs are a little closer and the last whorl tapers more downwards. The axis is markedly sinuous. This form, whether it be the true *leucopleura* or not, is apparently distinct from *B. hanleyana* by its more slender figure and wide-spaced riblets.

27. B. TRINITARIA (Pfeiffer). Pl. 5, figs. 37, 38, 39.

Shell cylindric below, the upper half regularly tapering to a narrow truncation or entire apex; thin, brownish corneous. Surface hardly glossy, sculptured with oblique, wide-spaced, pale riblets, the intervals three or four times their width. Whorls very numerous and *very convex*, the last strongly keeled below, projecting in a descending neck, which bulges conspicuously at the periphery. Aperture slightly oblique, tetragonal-rounded, angular at the outer and basal margins; peristome broadly expanded, the upper and columellar margins white and reflexed, basal and outer margins brownish. Axis very slender, encircled by a small, thin, spiral lamella.

Length 9.3, diam. 2 mm., whorls 12 remaining.

Length 13, diam. 2.1 mm., whorls 15 remaining.

Length 14-15.5, diam. 2.5 mm., whorls 16-17 remaining (Pfr., types).

Length 16.5, diam. 2.1 mm., whorls 21 remaining.

Length 17.5, diam. 2.2 mm., whorls 24½ (entire).

Trinidad: northern portion, Laventille Hills, near Port-of-Spain, on the sides of limestone rocks (Guppy).

Cyl. trinitaria PFR., Malak. Bl., vii, 1860, p. 213, pl. 2, f. 4-7; Monogr., vi, p. 388.—GUPPY, Ann. & Mag. N. H. (3), xvii, p. 52; P. Z. S., 1875, p. 320; Journ. of Conch., i, p. 109; Journ. of Conch., vii, p. 219; Trans. Linn. Soc., xxvi, pl. 11, f. 12 (teeth, bad).—GIBBONS, Journ. of Conch., ii, 1879, p. 131 (varieties and habitat).—BLAND, Amer. Journ. of Conch., iv, p. 186, fig. of teeth and jaw in text.—FISCHER, Journ. de Conchyl., 1870, pp. 9, 10 (jaw and teeth).—CROSSE, J. de C., 1890, p. 43.

Related by its spiral axis and the long spire of numerous whorls to the mainland species, not to those of the Antilles. The whorls are decidedly more convex than in the Venezuelan species. Probably Guppy's statement that *trinitaria* occurs at Carupano, Venezuela, was based upon the specimens of *B. leucopleura*.

The species was first collected by Prof. Theodore Gill, and reached Pfeiffer through Bland and Poey. These typical specimens, some of which are before me, are from 13 to 15 mm. long, with 15 to 17 whorls. The rest of the shells before me are separable into two lots, (1) larger shells, entire or with many whorls remaining, as in the last two measurements given above, and (2) smaller shells, first two measurements above, with fewer whorls remaining, about seven usually lost by adult shells, judging by the broken-off tips among the specimens. This small form was collected by both Gill and Guppy. There does not seem to be intergradation of the three sizes in the series of about 60 shells from all sources before me; they are probably local sub-races. Figs. 38, 39 are copies of the type figures. Fig. 37 is a typical specimen. The variations of *B. trinitaria* have been already commented on by Gibbons, who however seems to have included *B. hanleyana* or *B. leucopleura*.

Group of B. antiperversa: Caribees, Curacao.

Small forms, usually with 7½ to 12 whorls in truncate, 14 to 18 in entire shells, the last but shortly or not free. Two or three apical whorls smooth, the first one decidedly elevated. Axis straight or a little twisted.

In the smooth apical whorls, the first one being somewhat abnormally elevated (see Vol. XV, pl. 64, f. 15, 16, *B. antiperversa*), this group of species differs from the continental forms, which in dentition and other respects are closely related.

Key to Species.

I. Axis noticeably twisted; closely and finely rib-striate.
   1. Diam. 2, length 6.4 to 7.3 mm., with 7½ to 9 whorls remaining. Caracao. *B. raveni,* no. 28.
   2. Diam. 2.5, length 9 mm., with 9-9½ whorls remaining; spire somewhat swollen in the middle. St. Lucia. *B. tatei,* no. 30.

II. Axis straight; diam. 2.4 to 2.7 mm.
   1. Sculpture of low, rather coarse riblets; last whorl hardly or not free. Barbados. *B. costata,* no. 29.
   2. Sculpture of much finer riblets; last whorl very shortly free. Martinique; Guadeloupe. *B. antiperversa,* no. 31.

28. B. RAVENI (' Bld.' Crosse). Pl. 7, figs. 40, 41, 42.

Shell *small,* shortly rimate, cylindric-fusiform, rather broadly truncate, corneous with whitish riblets, thin. Surface lusterless, closely and finely costulate, the riblets oblique, narrower than the intervals. Whorls slightly convex, the last swollen at the periphery, carinate beneath, concave above the keel, very shortly free in front, not descending. Aperture rounded, slightly angular outwardly; peristome reflexed. Axis slender, encircled by a small and narrow spiral cord.

Length 6.4, diam. 2 mm., whorls 7½.

Length 7.25, diam. 2 mm., whorls 8½ to 9 (Crosse, types).

Curacao (Henry Raven, J. S. Gibbons); Buen Ayre (E. Hartert).

Cyl. raveni Bland MSS., CROSSE, Journ. de Conchyl., xx, 1872, p. 157; CROSSE & BLAND, J. de C., xxi, 1873, p. 40, pl. 1, f. 4.—PFR., Monogr., viii, p. 441.—GIBBONS, Quart. Journ. of Conch., i, p. 340.—MARSHALL, t. c., p. 380.—E. A. SMITH, Proc. Malac. Soc. Lond., iii, p. 113, 115 (1898).

A small species, more finely rib-striate than *B. costata* or

other related forms of the Lesser Antilles. Mr. Gibbons found a specimen with two apertures, which he correctly explains by the accidental breakage of a hole in the shell, which is used instead of the natural aperture; an incident observed in other *Urocoptidæ* and *Clausiliidæ*. Mr. Marshall's explanation puts the cart before the horse.

29. B. COSTATA (Guilding). Pl. 7, figs. 35, 36, 37.

Shell rimate, cylindric below, the upper half tapering to a narrow truncation, or more rarely entire and attenuate above; brown. Surface rather dull, sculptured with oblique, nearly straight, low riblets, separated by wider intervals. Whorls narrow, convex, the last not free in front or but slightly so, strongly carinate below, concave above the keel. Aperture rounded, angular below and obtusely so outwardly; peristome reflexed above and along the columellar margin, elsewhere expanded, very narrow at the outer angle, continuous, but usually adnate above. Axis slender and simple.

Length 10.3, diam. 2.6 mm., whorls 11. Truncate.

Length 7, diam. 2.5 mm., whorls 8. Truncate.

Length 11, diam. 2.4 mm., whorls 16. Entire.

Length 9.6, diam. 2.7 mm., whorls 14. Entire.

Barbados (Guilding, Swift and others), very abundant under stones, particularly in the lowlands (Fielden). St. Vincent (British Mus., *teste* Smith).

Brachypus costatus GLDG., Zoölogical Journal, iv, p. 167 (1828).—*Siphonostoma costata* Guild., SWAINSON, Malacology, p. 168, f. 22 (not p. 333, f. 97*c*, *d*).—*Cylindrella costata* Guild., PFR. in Philippi, Abbild., i, p. 183, pl. 1, f. 16 (after Swainson); ii, p. 52, pl. 2, f. 8; Conchyl. Cab., p. 44, pl. 5, f. 4-6; Monogr., ii, p. 379; iv, 705; vi, 381.—FISCHER & CROSSE, J. de C., 1870, pp. 11, 25, pl. 4, f. 2 (teeth).—SOWERBY, C. Icon., xx, pl. 12, f. 109.—E. A. SMITH, Ann. Mag. (6), viii, 1891, p. 255.

The specimens figured are from Barbados, where it occurs in abundance. I have not seen the species from other islands. The collector of the alleged St. Vincent specimens in the B. M. is apparently unknown. Guilding does not record it

from that island. The locality St. Lucia rests upon Prof. Tate's identification of shells which subsequently proved to be a distinct species, *B. tatei*. It was not found there by Ramage, whose shells were examined by E. A. Smith (Ann. Mag. (6), iii, 1889, p. 405), who includes *costata* on Tate's authority. Bland (Ann. Lyc. Nat. Hist. of N. Y., ix, p. 240) reports *costata* from Anguilla; but this island is so remote from Barbados that confirmation of the record is needed. There is a series of 10 white, slightly translucent specimens (form *albida*) in the collection of the Academy.

30. B. TATEI (' Bld.' Crosse). Pl. 7, figs. 38, 39.

Shell rimate, turrite, fusiform, transparent and of a light corneous tint; sculptured with small, crowded and noticeably oblique striæ. Spire truncate, noticeably swollen and enlarged in the middle. Suture well marked. Whorls remaining to the number of 9 or 9½, slightly convex, the last shortly projecting forward, detached, having a compressed basal keel crenulated by the striæ, and excavated around the umbilical chink. Aperture vertical, subcircular, subangular basally; peristome shortly reflexed throughout, and whitish. Internal column twisted. Length 9, diam. 2½ mm. (*Crosse & Bld.*)

Saint Lucia, upon damp walls and among stones in shady places, common (Ralph Tate).

Cylindrella costata Guild., TATE, Ann. Mag. Nat. Hist. (4), iv, p. 356, no. 10.—*C. tatei* Bland, CROSSE, J. de C., 1872, p. 158.—CROSSE & BLAND, J. de C., 1873, p. 41, pl. 1, f. 3.—PFR., Monogr., viii, p. 435.

Differs from *B. costata* by the finer costulation, free last whorl and twisted axis. The latter character also separates it from *B. antiperversa*.

31. B. ANTIPERVERSA (Férussac). Pl. 5, figs. 35, 36.

Shell shortly rimate, turrite, the lower three whorls of about equal diameter, the upper half or more of the shell rapidly tapering to a narrow truncation or an attenuate, entire apex; pale brown or corneous-brown, thin, nearly lusterless. Sculpture of rather fine, low riblets, but slightly curved,

and not noticeably denticulating the suture. Whorls convex, the last very shortly free in front, strongly carinate beneath, concave above the keel. Aperture rounded in general outline, obtusely angular at the outer and basal margins; the peristome being rather widely reflexed except at the outer angle. Axis slender, straight and simple.

Length 11.5, diam. 2.7 mm., whorls 16½; the plug at 11.

Length 7.8, diam. 2.4 mm., whorls 11; truncate.

Length 10, diam. 2.5 mm., whorls 11; truncate.

Guadeloupe (Fér., B. Sharp, *et al.*): Pointe-à-Pitre, morne à l'eau, Capesterre, Petit Bourg, etc.; the Saintes, Terre de haut, anse Mirre, Saint Martin, Saint Bartholomew; and Mariegalante, Grand-Bourg, ravine Bambara (Maze). Martinique: Fort de France (Maze). St. Vincent: a dry rocky hillside in the forest above Chateaubelair, leeward side, at about 1000 ft. (H. H. Smith).

Helix (*Cochlodina*) *antiperversa* Fér., Prodr., p. 65, no. 509 (no descr.); Histoire, pl. 163, f. 5, 6.—*Clausilia a.*, Desh. in Lam., An. s. Vert., viii, p. 215.—Pot. et Mich., Galerie, i, p. 177, pl. 17, f. 19, 20.—*Brachypodella antiperversa* Beck., Index, p. 89.—*Cylindrella collaris* Pfr., Wiegmann's Archiv f. Naturg., 1840, i, p. 41; Monogr., ii, p. 375; C. Cab., p. 41, pl. 4, f. 29-34; and in Phil., Abbild., i, p. 182, pl. 1, f. 10, and var. *brevicollis*, p. 183, f. 9 (1844).—*C. collaris* Fér., Maze, Journ. de Conchyl., xxii, 1874, p. 165 (Martinique); xxxi, 1883, pp. 22, 44, 48 (Guadeloupe); 1890, p. 27 (Saintes).—E. A. Smith, Proc. Malac. Soc. Lond., i, p. 310 (St. Vincent).—Sowerby, C. Icon., pl. 11, f. 95.—? *Pupa truncatula* Sowerby, Genera, f. 7.—*C. bicanaliculata* Pfr., Albers, Die Hel., 1860, p. 39 (*teste* Pfr.).

A common species in Guadeloupe; apparently less so in Martinique, and also recorded from St. Vincent. Other records for *antiperversa* must be looked upon with suspicion. I am unable to see any difference between shells from the two islands first named. It is much more finely sculptured than *B. costata* of Barbados. The largest entire specimen I have seen is slightly over 12 mm. long, and has 17½ whorls; the smallest, 9½ mm. long with 15½ whorls. Usually when the

apex is truncate, about 9 whorls remain. Pfeiffer examined specimens in Férussac's cabinet, and found that his *collaris* and *antiperversa* are merely extremes of a single species, and he adopted the former name; but, for reasons given below, I do not think his course a tenable one.

The spire when entire is attenuate above (Vol. XV, pl. 64, figs. 15, 16). The first whorl is much elevated, though depressed at the tip, as shown in the figures, fig. 16 representing the apex revolved 90 degrees to the right of the position shown in fig. 15. The plug is at the end of the sixth whorl, and that many are ordinarily lost by adult snails.

Helix (*Cochlodina*) *collaris* was enumerated by Férussac in his Tableau Systématique, p. 61, no. 507. His specimens were said to be from Porto Rico, collected by Mauge. He gives no description, referring merely to Lister, pl. 20, f. 4, and a copy of the same figure in Petiver's Gazophylacii Naturæ, etc. This figure is very rude, but probably represents *B. costata*, as the shell is stated by Lister to be from Barbados, and no other species has been found on that island.

In the Animaux sans Vertebres, vi, pt. 2, p. 114 (April, 1822), Lamarck refers to Férussac, repeats his references, and defines the species under the name *Clausilia collaris:* "Shell fusiform-subulate, very acute, longitudinally and obliquely striate, reddish; whorls very numerous; aperture small, rounded, toothless. Length 6½ lines." He gives the same locality and collector, but as some of Mauge's other localities have proven erroneous, too much dependence should not be placed upon them.

In interpreting *collaris* we are confronted with the following conditions: (1) *Helix collaris* Férussac was not defined by him except by reference to a figure representing a Barbados species, probably *B. costata*. This was the first use of the name *collaris* for a *Brachypodella*, as is proven by Lamarck's citation of the Tableau in his synonymy. (2) *Clausilia collaris* Lam. was not defined with sufficient precision to identify the species; he repeats Férussac's reference to Lister. (3) It is certain, in the light of information and figures published later, that the form actually before Férussac

and Lamarck was not that figured by Lister, but a larger shell, with the last whorl free.

Under these circumstances, I regard the use of the name *collaris* for any species as inadmissible. It cannot fairly be used for *B. costata*, because the figure in Lister is not good enough for reasonably certain identification, and it is known that that form was not the one intended. It cannot be used for *antiperversa*, because the first use of the name *collaris* was in connection with Porto Rican and Barbados forms.

Group of B. pallida: Haiti, Porto Rico, Virgin Islands, and St. Croix.

Slender shells, cylindric below, tapering above, with carinate base, straight or almost straight axis, and costulate early whorls.

The nuclear whorls are costulate, as in continental species, but the first one is somewhat elevated, as in the Caribbean group. The dentition (pl. 10, fig. 17, *B. pallida*) is similar to that of the other species of the subgenus.

The spire is quite attenuate when entire. The first third of a whorl is smooth, as usual in *Urocoptidæ;* the next 2½ whorls are vertically costulate; then the adult sculpture begins, the oblique ribs quite weak at first, merely indicated, but attaining a moderate size by the end of 5½ or 6 whorls, where the plug is located, marking the portion ordinarily cast off by adults (Vol. XV, pl. 64, fig. 18, *B. chordata*).

Key to Species.

I. Sculpture of wide-spaced riblets, sometimes interrupted; neck rather long.
   1. Small, 5.7-7.6 mm. long, with 8 to 9½ whorls in truncate, 12 to 13 in entire specimens. Santo Domingo. *B. dominicensis*, no. 36.
   2. Larger, 7.6 mm. long or more; 15-19 whorls in entire shells.
      a. Riblets slender, continuous, usually a little enlarged at the ends; intervals substriate.

b. Santo Domingo; length 8 to 9.3 mm., with 8½ to 10½ whorls; truncate.
B. d. gabbi, no. 36*a*.

bb. St. Croix; length 7.6 to 10.3 mm. with 10 to 12 whorls in truncate, 10 mm. with 15 whorls in entire shells.
B. chordata, no. 34.

bbb. Length 15, diam. 3.5 mm., with 12-14 whorls in truncate shells.
B. perplicata, no. 32.

aa. Ribs rather stout, rounded, depressed in the middle, more or less hollow; Porto Rico and Virgin Is. *B. pallida,* no. 33.

aaa. Ribs low or subobsolete, stronger near the suture; form slender; Porto Rico.
B. riisei, no. 35.

II. Sculpture of close rib-striæ; last whorl very shortly free; Haiti. *B. smithiana,* no. 37.

32. B. PERPLICATA (Férussac). Pl. 7, figs. 23, 24.

Shell truncate, cylindric, thin, diaphanous, pale corneous, longitudinally closely undulate-striate, and provided with distant folds projecting like lamellæ. Whorls 12-14, convex, the last plicate-angulate at the base, shortly, almost horizontally drawn out. Aperture nearly circular, somewhat channelled at the position of the keel, the peristome free, white, expanded throughout. Length 15, diam. 3.5 mm. (*Desh.*).

Antilles, exact habitat unknown.

Helix (*Cochlodina*) *perplicata* FÉR., Prodr., p. 65, no. 506; Hist., pl. 163, f. 9.—*Clausilia perplicata* DESH. in Lam., An. s. Vert., viii, p. 216 (1838).—*Brachypodella p.,* BECK, Index, p. 89.—*Cylindrella p.,* PFR. in Phil., Abbild., ii, pl. 1, *Achatina,* f. 9; Monogr., ii, p. 377; vi, 379.—DESH. in Fér. Hist., ii, p. 229.

Known to me by the above-cited works only. According to Deshayes, the ribs follow one another from whorl to whorl, as in *Urocoptis fastigiata* and *B. pallida.* Sowerby's figure

29 is evidently not *perplicata*. The original figures of Férussac are copied on my plate.

33. B. PALLIDA (' Guild.' Pfr.). Pl. 7, figs. 30, 31.

Shell subcylindric below, the upper half or more tapering to a narrow truncation, or rarely a perfect apex; often widest in the middle; thin, fleshy whitish or bluish in places from the contained soft parts; lusterless, sculptured with *large, rounded, subvertical ribs, which are depressed or almost interrupted in the middle*, swollen towards both ends, and are more or less *hollow;* the *intercostal intervals being delicately striate*. Whorls somewhat convex, parted by a deep suture, the last whorl projecting free, strongly but bluntly carinate below, concave above the keel. Aperture rounded-squarish, obtusely angular at the outer and basal margins; lip broadly reflexed, excavated within at the positions of the outer and basal keels. Axis simple, slender and straight.

Length 10.5, diam. 2.2 mm., whorls 12.

Length 8.7, diam. 2 mm., whorls 10.

Length 10, diam. 2 mm., whorls 15 (apex entire).

Virgin Islands and Porto Rico: St. Thomas, on the hill opposite Baker's; St. John (Bland); Tortola (Bland, Swift); Porto Rico: San Juan, Vega Baja, and Penuelas.

Brachypus pallidus Guilding in coll. B. M.—*Cylindrella pallida* Guild., PFR. in Philippi, Abbild., ii, p. 52, pl. 2, f. 14 (1845); Monogr., ii, 379; iii, 575; vi, 381; Conchyl. Cab., p. 46, pl. 5, f. 15-17.—BLAND, in C. B. Ad. Contrib. to Conch., no. 11, p. 217; Ann. Lye. N. Y., vi, p. 71.—MARTENS, Jahrb. d. D. Malak. Gesell., iv, 1877, p. 352; Naehrbl., xxiii, 1891, p. 132.—CROSSE, Journ. de Conchyl., 1892, p. 26.—SOWERBY, C. Icon., xx, pl. 4, f. 30.—*Brachypodella pallida* P. & V., Proc. A. N. S. Phila., 1898, p. 278.—DALL & SIMPSON, Bull. U. S. Fish Comm., xx, 1900, p. 377.—*Siphonostoma costata* Gldg., SWAINSON, Malacol., p. 333, f. 97*c*, *d*.—*C. costulosa* C. B. AD., Contrib. to Conch., no. 6, p. 98 (March, 1850).

Very distinct by its strong hollow ribs, similar to those of *Idiostemma*, *Callonia*, etc. Description and figures are from Tortola specimens, with which those of St. John and St.

Thomas agree. They often retain the apex entire. The types were probably from one of the Virgin Islands, as Porto Rican shells are mainly larger, less tapering above, and more widely and more constantly truncate, a specimen measuring: l. 12, d. 2.3 mm., whorls 10. This form has been called var. *major* Pfr. *B. perplicata* Fér. differs from *pallida* in little but its larger size. An erroneous locality, Jamaica, has found its way into some of the books, probably traceable to a shell sent to Adams by Cuming.

34. B. CHORDATA (Pfeiffer). Pl. 7, figs. 25, 26, 27.

Shell cylindric, the upper third or half tapering to a narrow truncation, or rarely an entire apex; thin, white or corneous-white, lusterless; sculptured with oblique, *straight, widely-spaced white narrow ribs*, which are generally a little enlarged at the ends; the intervals very delicately thread-striate. Whorls slightly convex, the last strongly carinate below, concave above the keel, projecting free and descending. Aperture oblique, rounded, obtusely angular at the base and outer margin; peristome broadly reflexed, white, excavated within at the outer angle. Axis slender and straight.

Length 10.3, diam. 2 mm., whorls remaining 12.

Length 7.6, diam. 1.8 mm., whorls 10.

Length 10, diam. 2.2 mm., whorls 15 (entire).

St. Croix: Christiansted (Riise, Swift).

Cyl. chordata PFR., Proc. Zoöl. Soc. Lond., 1855, p. 117; Malak. Bl., 1855, p. 102, pl. 5, f. 10, 11; Conchyl. Cab., p. 48, pl. 5, f. 21-23; Monogr., iv, p. 708.—SOWERBY, C. Icon., xx, pl. 5, f. 38.

A beautiful white species, related to *B. pallida*, from which it differs chiefly in the reduction of the sculpture to narrow, wide-spaced, straight riblets. Figs. 25, 26 are after Pfeiffer.

"*Cylindrella S. Croixii* Pfr.," Schaufuss, Moll. Syst. et Catal. Conch. Paetel, 1869, p. 68, and *C. santacroixi* Sh., of the Catalog der Conchylien-Sammlung von Fr. Paetel, ii, 1889, p. 250, are nude names possibly referable to this species, as none other has been reported from St. Croix.

35. B. RIISEI (Pfeiffer). Pl. 7, figs. 28, 29.

Shell slender, cylindric, the upper third or half tapering to a narrow truncation on rarely an entire apex; thin, pale brownish-corneous or whitish, nearly lusterless, sculptured with *low, wide-spaced riblets, often obsolete on the convexity of each whorl, but strong near the suture.* Whorls but slightly convex, the last obtusely carinate below, becoming free, descending and built forward. Aperture oblique, rounded, the outer and basal margins obtusely angular; lip reflexed, excavated within at the outer angle. Axis straight, slender, with a very slight twist.

Length 12, diam. 2 mm., whorls remaining 13½.

Length 9, diam. 1.9 mm., whorls remaining 10½.

Length 13.2, diam. 1.9 mm., whorls 18½ (apex entire).

Length 10, diam. 1.9 mm., whorls 15½ (apex entire).

Length 13, diam. hardly 2½ mm., whorls 19 (Pfr., type).

Porto Rico: San Juan, Santa Catarina (Blauner); Aguadilla Vega Baja, Caguana (Gundlach); Penuelas (Sintensis), Arecibo (Dr. Cleve).

Cyl. riisei PFR., Zeitschr. f. Malak., 1852, p. 133; Conchyl. Cab., p. 48, pl. 5, f. 18-20; Monogr., iii, p. 578.—SHUTTLEWORTH, Diagn. n. Moll., 1854, p. 54.—MARTENS, Jahrb., iv, 1877, p. 352; Nachrbl., xxiii, 1891, p. 132.—SOWERBY, C. Icon., pl. 11, f. 94 (rüsei).—CROSSE, Journ. de Conch., 1892, p. 27.—*Brachypodella r.*, PILS. & VAN., Proc. A. N. S. Phila., 1898, p. 278.—DALL & SIMPSON, Bull. U. S. Fish Comm., 1900, xx, p. 377.—*C. rissei* Pfr., Paetel, Catalog, ii, p. 249 (1889).

Near *pallida* and *chordata*, but with the ribs partially degenerate, and the shell is more lengthened and slender. Four or five whorls are generally deciduous. Figure 29 is from a specimen received from Riise; 28 is after Pfeiffer.

36. B. DOMINICENSIS (Pfeiffer). Pl. 8, figs. 48-51.

Shell *small*, cylindric, the upper half tapering to a narrow truncation or rarely retaining the apex entire (fig. 51, x 20). Pale grayish or fleshy corneous; thin. Surface hardly shining, sculptured with *narrow whitish riblets* parted by spaces about 4 times their width. Whorls convex, the last tapering,

angular below, its later half free, pinched into a *strong, stout basal keel*, concave on both sides of the keel, narrowly swollen at the periphery, flattened above; projecting and slightly descending. Aperture oblique, rounded, but a little angular at the base and outer margin, the lip white and reflexed. Axis simple and slender.

Length 7.6, diam. 2 mm., whorls 9½ (truncate).

Length 6, diam. 1.6 mm., whorls 8 (truncate).

Length 5.7, diam. 1.4 mm., whorls 8 (truncate).

Length 6, diam. 1.6 mm., whorls 12 (entire).

Length 7, diam. 2 mm., whorls 13 (entire, *Pfr.*).

Haiti: environs of Santo Domingo (Sallé).

Cyl. dominicensis Pfr., Zeitschr. f. Malak., 1850, p. 70; Monogr., iii, p. 574; Conchyl. Cab., p. 44, pl. 5, f. 7-9.—Crosse, J. de C., 1891, p. 147.—Sowerby, C. Icon., xx, pl. 14, f. 120.

The smallest species known from the island, readily recognized by its strong sculpture and angular neck.

36*a*. Var. *gabbi* Pils., n. var. (pl. 8, fig. 56). Larger, with the neck somewhat longer and decidedly descending. Truncate. Length 9.3, diam. 1.8 mm., whorls 10½, to length 8, diam. 1.8 mm., whorls 8½. The riblets are perceptibly enlarged at the ends, and sometimes hollow or with a minute pit there. Were it not that the specimens were taken in Santo Domingo by Gabb, they would hardly be separated from *B. chordata* of St. Croix.

37. B. smithiana (Pfeiffer). Pl. 8, figs. 52, 53.

"Shell subrimate, somewhat fusiform, rather thin, subarcuately closely costulate, translucent, brownish-corneous. Spire entire, swollen in the middle, the apex acute. Whorls 15, a little convex, the last narrowed, compressed-carinate at the base, slightly free in front. Aperture oblique, subcircular, subangular at the base; peristome continuous, everywhere narrowly reflexed. Length 11.5, diam. 2.75 mm." (*Pfr.*).

Haiti: Mont Platon, 10 leagues northeast of the town Les Cayes (Smith).

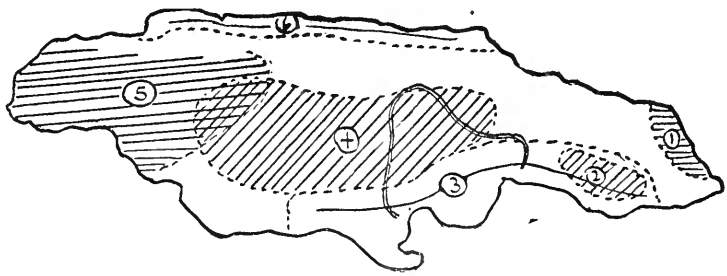
Cyl. smithiana Pfr., Malak. Bl., xiii, 1866, p. 87; Monogr., vi, 380.—Crosse, J. de C., 1891, p. 147.

The original description is given above. The specimens before me (pl. 8, figs. 52, 53) are narrowly truncate, light brown, sculptured with slightly sinuous, oblique riblets (shown too weak in the lithograph), parted by spaces two or three times their width. The last whorl has a rather strong and stout basal keel, and is distinctly pinched in on both sides of it. The axis is simple and straight. Length 9.6, diam. 2.5 mm., whorls 9½.

It differs from *B. angulifera* by the far stronger basal carina, more spaced and less regular costulation, brown color and smaller size. The plug is at 8½ to 9½ whorls, another whorl persisting above it in the shells examined. It is related to *B. dominicensis*, but is larger, more closely costulate, and has the last whorl only very shortly free.

Jamaican Species of Brachypodella.

All the Jamaican forms, so far as known, are characterized by the very high initial whorl; and the teeth have lost ectocones to a greater extent than in Haitian or other forms. The distribution of the species is shown on the following map, prepared by Mr. P. W. Jarvis.



1. B. alba cos.
2. B. agnesiana.
3. B. seminuda.
4. B. costulata.
5. B. alba (part)
6. B. robertsi.

The area doubly outlined above (3) is that of *B. chemnitziana.*

Key to Jamaican species of Brachypodella.

I. Last whorl subangular or somewhat carinate below; sculpture of fine striæ; axis slender and straight; aperture subcircular, the lip narrow. Section *Simplicervix.*

1. Length 9-10.5 mm., about 8 whorls remaining; base merely subangular; a short neck.
B. inornata, no. 41.
2. Length nearly 8, diam. 2.5 mm., 10½ whorls remaining, basal carina moderately sharp.
B. simplex, no. 42.
3. Length 5, diam. 1.25 mm., 8-8½ whorls remaining, the last scarcely produced, subangular below.
B. humilis, no. 43.

II. Last whorl strongly carinate below.

1. Small (length 5-10 mm.), sculptured with continuous or interrupted ribs; whorls 8-10 in truncate, about 16 in entire shells; axis thin and straight. Section *Geoscala.*
a. Ribs continuous, distant, about 10 on the penult. whorl; length 5.5 to 6.5 mm.
B. costulata, no. 38.
aa. Larger, length (truncate) 7.5 to 9 mm.; ribs more numerous.
b. Ribs interrupted in the middle of each whorl; suture only moderately impressed. *B. robertsi,* no. 39.
bb. Suture deeply impressed or constricting. *B. seminuda,* no. 40.
2. Shell larger, *white,* pillar-shaped, the whorls more numerous, short, flattened, very finely and evenly striate, the last projecting, squarish. Aperture as wide as long; axis straight and *thick,* variously sculptured. Section *Mychostoma.*
a. Sinistral.
b. Large; axis cylindric or spool-shaped in each whorl. *B. agnesiana,* no. 44.
bb. Smaller, length 17-19, diam. 2.7 mm.; axis armed with hooked processes.
B. diminuta, no. 45.

aa. Dextral.

b. Diam. about 3.5 mm.; basal keel short. *B. pearmanæana,* no. 47; *B. alabastrina,* no. 46.

bb. Diam. 2 to 2.7 mm.; basal keel long. *B. alba,* no. 48.

3. Shell cylindric-tapering, white, densely obliquely striate, the whorls convex, oblique, the last not free, carinate below only; aperture longer than wide; axis very slender, sinuous in the later whorls. Section *Apoma.*

a. Length 21-30, diam. 4.5 mm. *B. chemnitziana,* no. 49.

aa. Length 19-31, diam. 3.3-4 mm., thus more slender. *B. gracilis,* no. 50.

Section *Geoscala* Pils. & Van., 1898.

Proc. A. N. S. Phila., 1898, pp. 272, 279. Type *B. seminuda.*

Shell small, cylindric or fusiform, sculptured with continuous or interrupted ribs, the last whorl more or less free, the neck strongly carinate below, roundly angular peripherally; aperture rounded; axis slender and straight; apical whorl high. Type *B. seminuda.*

Radula intermediate between that of *Brachypodella* s.s. and that of *Mychostoma.* The cusp of the central is moderately wide; the inner lateral has a very small, peg-like ectocone; the outer lateral and the marginals are like those of *Mychostoma* (pl. 10, fig. 18, *B. seminuda,* Clarendon Park).

Geoscala differs from *Simplicervix* by its strong sculpture and basal keel. It stands very close to the typical group of *Brachypodella,* but differs by the very weak development of the ectocone of the inner lateral tooth and the less expanded cusp of the central.

38. B. COSTULATA (C. B. Adams). Pl. 5, fig. 43.

"Shell subovate, but elongated; whitish; with thin, very prominent, very distant, moderately oblique ribs, of which

there are about ten on the penult. whorl, and which, as usual in this genus, are more crowded on the last whorl—anteriorly with a prominent but not sharp carina; spire with convex outlines along the middle; apex truncate, with the loss of five or six whorls; nine or ten whorls remaining, rather flattened, but with a deep suture; last whorl much detached and produced, angulated on the right; aperture much dilated on the right, anteriorly a little angular, the rest rounded; lip somewhat thickened, rather narrow and sharp, reflected into the plane of the aperture " (*Ad.*).

Length 6.25, diam. 1.9 mm.; length of an entire specimen 8 mm. (C. B. Ad.).

Length 6.6, diam. 1.8 mm., whorls 8.

Jamaica: interior of the western half. Whitney, Clarendon; Troy and Balaclava, St. Elizabeth (Jarvis); Mandeville, Manchester, and Montpelier, St. James (Henderson). Also reported from Bellevue, St. Andrew (Gloyne).

Cyl. costulata C. B. Ad., Contrib. to Conch., no. 2, p. 20 (4), Oct., 1849.—Pfr., Monogr., iii, p. 574.—Sowerby, C. Icon., xx, pl. 12, f. 104 (bad).—Gloyne, Journ. de Conch., 1872, p. 35.

The whorls are most convex just below the suture. In some specimens from Mandeville, coll. J. B. Henderson, the ribs are weak, almost obsolete on the last two whorls, reappearing on the neck, where they are almost interrupted in the concavity above the keel. Figure 43 represents a specimen from Whitney, Clarendon.

39. B. robertsi (C. B. Adams). Pl. 5, figs. 45, 46.

" Shell elongate, fusiform, widest a little below the middle: pearl white: with, on each side of the suture, a series of very transverse, prominent ribs, which abruptly terminate so as to leave a large portion of the middle of the whorls smooth; ribs about fifteen on each whorl; the series below the suture being the larger; both series are continued on the two angles of the produced part of the last whorl, over on the back part of which each rib is united to its opposite by a small lamella; spire with the outlines quite convex except in the upper

third: apex truncate with the loss of — whorls: whorls remaining nine or ten, planulate or slightly concave, with a deep suture; last whorl widely disjunct in its last third part from the penult. whorl, with an angle on the right and another on the lower side: aperture subangular above and below, more angular on the right: lip rather thin, reflected into the plane of the aperture, moderately expanded. Length .37 inch; breadth .095 inch " (*Ad.*).

Length 9, diam. 2 mm., whorls remaining 9.

Length 8.4, diam. 2 mm., whorls remaining 8½.

Length 9.5, diam. 1.7 mm., whorls 16 (entire).

Jamaica: along the northern coast from Montego Bay to Port Maria.

Cyl. robertsi C. B. Ad., Contrib. to Conch., no. 9, p. 160 (April, 1851), in Ann. N. Y. Lyceum of Nat. Hist., v, p. 84. —Pfr., Monogr., iii, p. 575.—Sowerby, C. Icon., xx, pl. 12, f. 111.—Henderson, Nautilus, viii, p. 20.—Gloyne, Journ. de Conchyl., 1875, p. 122 (Rio Bueno).

A larger form than *B. costulata*, and well differentiated therefrom by the interruption of the ribs, which persist only near the sutures, or are weakly connected across the middle of the whorls, and are more numerous than in *B. costulata.* I have seen specimens from Montego Bay (Henderson), Falmouth, Trelawny (Jarvis, figs. 45, 46), and west of Ocho Rios (Henderson).

While the upper whorls are a little shouldered below the suture, the latter is only moderately impressed, not deeply constricting as in the next species.

40. B. seminuda (C. B. Adams). Pl. 5, figs. 41, 42, 44.

Shell slowly tapering, broadly truncate, corneous, rather thin, nearly lusterless. Whorls flattened in the middle, subangular below the very deeply impressed sutures, the last whorl angular below also, the sides sloping inward; its latter half concave between the basal and supraperipheral angles, free in front. Sculpture of numerous whitish ribs, low or partially obsolete in the middle of each whorl, prominent below, and somewhat less so above, the suture. Aperture trans-

versely ovate, the lip reflexed, channelled within at the narrower, outer margin. Axis slender and straight.

Length 7.5, diam. 2.3 mm., whorls 8.

Length 9, diam. 2.3 mm., whorls 8½.

Length 8.2, diam. 2.2 mm., whorls 9 (Adams).

Jamaica: in the south, from the parish of Manchester to St. Thomas, inland to Clarendon Park and Bogwalk (Jarvis, Henderson); Mt. Diablo, in St. Ann (Henderson & Simpson). Also reported from Jeremie, Haiti (Weinland).

Cyl. seminuda C. B. Ad., Proc. Bost. Soc. N. H., 1845, p. 14.—Philippi, Abbild., ii, p. 51, pl. 2, f. 16.—Pfr., Monogr., ii, p. 380; Conchyl. Cab., p. 46, pl. 5, f. 12-14.—Sowerby, C. Icon., xx, pl. 5, f. 46.—Gloyne, J. de Conchyl., 1875, p. 122 (Long Mt. and Yallahs).—Bland & Binney, Amer. Journ. Conch., vii, p. 184 (teeth).—Weinland, Jahrb. D. Malak. Ges., vii, 1880, p. 358 (occurrence in Haiti).—Henderson, Nautilus, viii, p. 20, no. 100.—*Cyl. minuda* Ad., Rush, Nautilus, v, p. 69, no. 119.

The type originally described by Adams was the least aberrant form of the species, shown in fig. 41 (Clarendon Park, western Clarendon). Such shells occur at many other localities, with variously divergent forms, so that the latter seem to be merely extremes linked together in a continuous chain of variations, though certain forms may predominate in some places. The typical form resembles *B. robertsi*, but has invariably deeper sutures. The most northern point is Mt. Diablo, where it was found by Henderson and Simpson, a locality out of the ordinary range as mapped by Mr. Jarvis.

In some specimens the whorls become more shouldered, more contracted below, and the basal series of short riblets disappears except on the earliest whorls and the neck (fig. 42, Clarendon Park), leaving the whorls smooth except for a diadem of short riblets. This form occurs at Watermount, St. Catherine and Good Hope, St. Andrew (Jarvis), Mt. Diablo (Henderson), and other places, usually intergrading with the typical form.

Another incipient variety (fig. 44) is similar to the preceding in shape, but the riblets are strong and continuous to the

base, usually interrupted on the penult. whorl. It occurs at Mona House, St. Andrew (Henderson), with the typical *seminuda* and intermediate forms. Typically this variety, and the preceding (which do not occur together in any lot examined), are very distinct; but on account of the intergradation of each with the type form, in most lots examined, I do not think it worth while to name them at present. The distribution of each should be studied in detail.

Crosse suggests that the presence of *B. seminuda* at Jeremie, Haiti, reported by Weinland, may be due to accidental transportation by commerce. Messrs. Henderson and Simpson did not find it there.

Subgenus SIMPLICERVIX Pilsbry, 1903.

Brachypodella, with the high initial whorl of all Jamaican forms of the genus, the neck shortly free and almost cylindric, merely subangular below; aperture nearly circular; axis slender and straight. Type *B. inornata*. (*Simplex*, simple; *cervix*, neck.)

The shell resembles *Brevipedella* of Cuba, Haiti and Porto Rico, but the apex has the characteristic Jamaican modification. I have not seen the species *simplex* and *humilis* of Adams, and they may prove to belong elsewhere, as somewhat similar shells are contained in the sections *Bactrocoptis* (Vol. XV, p. 143) and *Spirostemma* (Vol. XV, p. 284). The dentition of *Simplicervix* is unknown.

41. B. INORNATA (C. B. Adams). Pl. 5, figs. 40, 47, 48, 49.

"Shell subovate or fusiform, but elongated; whitish; with fine, oblique, arcuate, sharp, prominent, but not very closely-set, raised lines, anteriorly with two carinæ, which are not prominent; spire with the outlines moderately convex in the middle and lower whorls; apex truncate, with the loss of — whorls; 8 or 9 whorls remaining, quite convex, with a deep suture; last whorl well detached and produced; aperture subangular on the right side, in the rest rounded; lip a little thickened, narrow, moderately reflected. Length .38 inch; breadth .11 inch" (*Adams*).

Jamaica: In the interior: Bellevue, St. Andrew (Swift coll.); Mt. Diablo, St. Ann (Henderson); Whitney, Clarendon (Jarvis); Mandeville and Spur Tree hill, Manchester (Henderson); Troy, St. Elizabeth (Jarvis); Montpelier, St. James (Henderson); Great Valley estate, Hanover (Taylor, in Clapp coll.).

Cyl. inornata C. B. Ad., Contrib. to Conch., no. 2, pp. 22, 39 (Oct., 1849).—Pfr., Monogr., iii, p. 573; iv, 703; vi, 377; viii, p. 436.—Gloyne, J. de C., xx, 1872, p. 35.—Sowerby, C. Icon., xx, pl. xi, f. 99.—Henderson, Nautilus, viii, p. 20.—? *Cyl. aspera* Ad., Sowerby, C. Icon., xx, pl. 11, f. 98, renamed *C. asperata* Sowb. in index to *Cylindrella* (1875?).

This species has some resemblance to *U. pupæformis*, but in that the striæ are closer, flattened and glossy, the shell is of stouter form, and the lip more developed. It is much more like the Cuban *B. angulifera* and the Haitian *B. imitatrix*, especially in the shape of the neck; but the apex of *inornata* shows the high, wall-like first half-whorl and deeply depressed tip of all the Jamaican Brachypodellas.

Adams' description mentions "two carinæ which are not prominent" on the last whorl; but the shells I have seen have no carinæ, merely a slight, hardly noticeable angle at the base, and a swelling at the periphery, above and below which the sloping surface is somewhat flattened. The striæ are narrow and thread-like, separated by much wider intervals. Size of truncate shells varies from 9 x 2.5 to 10.5 x 2.7 mm., with about 8 whorls. An entire specimen from Hanover (Clapp coll.) is 12.2 mm. long, and has 15½ whorls.

It is a widely distributed form, though apparently found nowhere in copious quantity. It occurs over the high interior of the western two-thirds of the island, not descending to the lower levels near the coast. I have observed no mentionable variation in specimens from the localities recorded above.

42. B. simplex (C. B. Adams).

"Shell subovate or fusiform, moderately elongated; whitish: with very oblique, straight, faint striæ, with one moderately sharp carina at the anterior extremity, and another

which is slight and obtuse a little above the middle of the last whorl; spire with the outlines quite convex throughout most of the shell; apex truncate, with the loss of —— whorls; 10½ whorls remaining, quite convex, with a deep suture; last whorl slightly produced. Aperture angular at the anterior extremity and on the middle of the right side; lip thin, sharp, narrow, and moderately reflected. Length .315, breadth .1 inch " (*Ad.*).

Jamaica (C. B. Adams).

Cylindrella simplex C. B. A., Contrib. to Conch., no. 2, p. 22, 39 (Oct., 1849).—PFR., Monogr., iii, p. 573.

Known to me by the above description only.

43. B. HUMILIS (C. B. Adams).

" Shell cylindrical in the lower two-fifths, tapering above; pale horn color, with rather numerous oblique, nearly straight equidistant, fine, elevated, transverse lines; spire truncate, with the loss of —— whorls; whorls remaining 8 to 8½, very convex, with a well-impressed suture; last whorl subangular anteriorly, scarcely produced from the penult. whorl; aperture orbicular, moderately large; labrum moderately reflected and dilated, very thin. Length .2, breadth .05 inch " (*Ad.*).

Jamaica (C. B. Adams).

Cyl. humilis C. B. A., Contrib. to Conch., no. 7, p. 101 (1850).—PFR., Monogr., iii, p. 573.

This very small species (length 5 mm.) is known to me by Adams' description only.

Subgenus MYCHOSTOMA Albers, 1850.

Mychostoma (in part) ALB., Die Hel., 1850, p. 207, for *C. subula, collaris, gracilicollis, hanleyana, pallida, seminuda.*—v. MARTENS, Die Hel., edit. 2, p. 37, type *C. subula.*—PFR., Nomencl. Hel. Viv., p. 279.—PILS. & VAN., Proc. A. N. S. Phila., 1898, p. 279.

Shell long, truncate, slenderly cylindric or pillar-shaped, white, finely striate, whorls numerous, nearly flat, the last becoming free, projecting, acutely keeled below, angular outwardly. Aperture rounded or squarish, as long as wide, gut-

tered within, the lip reflexed. Axis straight, thick and variously sculptured in the lower half of its length. Apical whorl high. Type *B. alba* C. B. Ad.

The radula is very long and narrow, its sack projecting free into the cavity of the body (pl. 14, fig. 2, *B. agnesiana*). The teeth (pl. 10, fig. 21, *B. alba occidentalis*, Great Valley estate, and fig. 22, *B. agnesiana*, Creighton Hall) resemble those of *Apoma*. The centrals have a very wide cusp, as in *Brachypodella s. str.* The *inner lateral has no trace of an ectocone* (fig. 23). The outer lateral has a boss without overhanging cusp in place of the ectocone. The marginals have bilobed cusps. Other characters as in the genus generally.

B. agnesiana is said by Gloyne to be viviparous.

The axis in shells of this group is thickened in the lower half, and more or less distinctly biplicate, somewhat as in the Haitian *Strophina*. In the upper half it retains the earlier structure, is thin and singly plicate, the spiral being continuous with the lower of the two cords in the thickened portion. This spiral is often serrate or spinose; and the whole surface of the pillar may be roughened or granulate, but this minor sculpture varies individually within wide limits. In *B. diminuta* there has been extraordinary hypertrophy of the asperities of the spiral cords, which become few in number and enlarged into thick hooks, which stand obliquely opposite on the two cords, in pairs, almost exactly reproducing the structure of the pillar in the Cuban *Urocoptis* (*Idiostemma*) *uncata* (*Cf.* pl. 2, f. 19, with Vol. XV, pl. 44, f. 33). It will be noted that in *U. uncata* also, the hooks have arisen from primitive small nodes on a biplicate axis, as shown by the related, less evolved, species.

Another extraordinary feature of *Mychostoma* is the presence in at least one species of a structure resembling the clausilium of the genus *Clausilia*. In *B. alba occidentalis* there is found within the fifth whorl from the base a tongue-shaped, whitish process (pl. 1, figs. 14, 15), which above, at its origin, is continuous with the solid axis, but below hangs free in the cavity. When wet, this process is flexible; and is found to consist of a thin plate of conchiolin covered with an uncon-

solidated layer of carbonate of lime crystals. While projecting below, the process does not nearly close the cavity of the whorl. The animal retracts its foot a whorl or two above the process. *B. alba minima* from Swift River also has a similar process.

This structure was first noticed by Mr. G. H. Clapp. It differs from the closing plate of *Clausilia* by being flexible throughout, with a wide attachment instead of a slender peduncle, and probably the two structures are not homologous. Owing to its incoherent texture, this process is, doubtless, soon lost in dead individuals, from which the soft parts are ordinarily removed by maceration; but in shells collected alive and dried, it seems to be invariable. I saw no trace of it in *B. agnesiana*. The other species should be examined with fresh material.

The name *Mychostoma* was originally proposed for a series of species now classed as *Brachypodella s. str.*, but including *C. subula* Fér., with a reference to Pfeiffer's *Monographia*, which shows that by "*C. subula* Fér." a form of *C. alba* C. B. Ad. was intended. Von Martens subsequently nominated *C. subula* Fér. as type of *Mychostoma*, referring to Pfeiffer's *subula* illustrated in Philippi's *Abbildungen*, and representing a form of *alba*. It seems allowable, therefore, to use the name *Mychostoma* for the Jamaican group of forms related to *alba*, rather than to restrict it to the real *subula* of Férussac, a species the author of *Mychostoma* did not intend.

There are two groups of species: that of *B. agnesiana*, sinistral forms from the southern watershed of the eastern end of Jamaica, and that of *B. alba*, dextral, and chiefly from the western end of the island, but occurring in Portland also, in the East.

44. B. AGNESIANA (C. B. Adams). Pl. 2, figs. 13-16.

Shell sinistral, very long, pillar-shaped, white except where stained by the contained soft parts; lusterless; densely and minutely sculptured with fine, very oblique and slightly curved thread-striæ. Whorls nearly flat, the last convex above, then concave, its last half freely projecting in a rather

long, quadrangular neck, pinched into very strongly projecting basal and peripheral keels, strongly angular above, and obtusely so on the columellar or concave side of the neck. Aperture vertical, rounded, angular and channelled within at the outer and basal margins, the lip white, broadly and flatly reflexed. Axis slender in the upper whorls, at first simple, then encircled with two low spiral cords in the upper third of the shell's length; then growing thicker, cylindric, usually with two or three additional low spirals, which become weak or disappear in the lower half, where the axis is stout, a little thickened at the ends in each whorl, and grooved along the partitions.

Length 40½, diam. 4 mm., whorls 21.

Length 36, diam. 4 mm., whorls 19-20 (typical size).

Length 30, diam. 4 mm., whorls 16½ (White River).

Length 26, diam. 3.8 mm., whorls 15½ (White River).

Jamaica: Yallahs hills, at about 2,000 ft. elevation; abundant at the source of the White River (Jarvis). Map p. 88, area 2.

Cyl. agnesiana C. B. A., Contrib. to Conch., no. 2, p. 19 (Oct., 1845).—Bland, Ann. Lyc. N. H. of N. Y., vi, p. 151, pl. 5, f. 16 (axis).—Pfr., Monogr., iii, p. 575; Conchyl. Cab., p. 58, pl. 6, f. 26, 27; Malak. Bl., xxiii, 1876, p. 216.—Fischer, Journ. de Conchyl., 1870, pp. 11, 25, pl. 3, f. 7, 8 (teeth).—Sowerby, C. Icon., xx, pl. 5, f. 43.—Gloyne, J. de C., 1872, p. 36; Quart. Journ. of Conch., i, p. 53 (food, viviparity).—*Brachypodella agnesiana* Ad., Pils. & Van., Proc. A. N. S. Phila., 1898, p. 279, pl. 18, f. 19 (axis).

The largest species of the group, truncate shells, varying from 25 to 42 mm. long. A small entire specimen examined by Adams had 28 whorls, with a length of 41 mm. Mr. Jarvis found it in profusion at the source of the White River, in the Yallahs hills, on limestone rocks. He remarks that it does not seem to be widely distributed in these hills. Gloyne gives the localities Yallahs and Orange Park, but I do not know whether he refers to the small or the typical large form.

From the dimensions given above, the size diminishes to half the greatest length of the species. Shells similar to the

typical form, except in being smaller, with fewer and slightly more convex whorls, occur at Creighton Hall (pl. 2, f. 16), measuring from length 25.6, diam. 3.9 mm., whorls 15½, to length 19, diam. 3.2 mm., whorls 12½.

45. B. DIMINUTA 'Ad.' Pilsbry, n. sp. Pl. 2, figs. 17, 18, 19.

Shell pillar-shaped, slightly tapering and truncate above; thin, whitish. Densely sculptured with extremely narrow, thread-like, oblique, opaque-white striæ, standing on a translucent-gray ground. Whorls convex, the latter part of the last projecting free. The neck is squarish, pinched into a strong basal keel, the peripheral keel wider; it is angular above, and the columellar side is strongly convex. Aperture rounded, angular outwardly and below, channelled within. Lip thin, expanded and reflexed. Axis slender and simple above, thicker in the lower half, where it bears an upper and lower series of oblique nodes, terminating in hooks, opposite to and directed towards each other.

Length 19, diam. 2.7 mm., whorls 15.

Length 17, diam. 2.75 mm., whorls 15.

Jamaica: Good Hope, near Flamstead, in the eastern part of St. Andrew parish (Jarvis). Types no. 84971, A. N. S. P.

Cylindrella agnesiana var. *diminuta* C. B. AD., Contrib. to Conch., no. 9, p. 160 (April, 1851), in Ann. N. Y. Lyc. of Nat. Hist., v, p. 84.

Smaller than ordinary *B. agnesiana,* though the smallest shells of that species are equally short, but of greater diameter; chiefly distinguished by the extraordinary modification of the axis, on which the two spiral cords of the less modified species of the group are interrupted and transformed into nodes ending in hooks. The structure is exceedingly like that of *Idiostemma* (*cf. U. uncata,* Vol. XV, p. 166, pl. 44, f. 33). This is the most extraordinary case of convergent evolution I have ever seen.

C. B. Adams did not properly define this species. His account follows: "We are indebted to Dr. A. Barrett for this remarkably small variety with the following dimensions: length after truncation .67, breadth .22 inch. In the speci-

mens before us the lip is but slightly expanded. It inhabits Flamstead, in the Port Royal mountains." This brief account is vitiated by an error: the diameter ".22 inch" is a mistake for .11 inch, apparently from misreading the scale; and no character whatever is given to differentiate the species from the small variety of *B. agnesiana*. Under these circumstances, my identification of the specimens taken by Mr. Jarvis with Prof. Adams' form lies open to the objection that it is hypothetical; but I believe the hypothesis justified, though it is only by courtesy that Adams can be quoted as author of the species. His types should be examined.

The range of this species lies west of that of *B. agnesiana*.

46. B. ALABASTRINA (Pfeiffer).

Shell truncate, exactly cylindric, obliquely and closely, elegantly costulate-striate, alabastrine; apex slightly tapering, black; whorls 15, flat, the last projecting, acutely carinate basally. Aperture subcircular, channelled at the base; peristome expanded throughout, subreflexed. Length 15, diam. 3.66 mm., aperture 2.5 mm. long (*Pfr.*).

Jamaica (Brit. Mus.).

Cyl. alabastrina PFR., in Phil., Abbild., ii, p. 52 (Oct., 1845); Monogr., ii, p. 375.—?? SOWERBY, C. Icon., xx, f. 81.

Quite unknown to recent collectors in Jamaica, so far as I have been able to learn. It is decidedly wider than any form of *B. alba*, but certainly approaches *B. pearmanæana* in dimensions, and the type should be compared with that species.

47. B. PEARMANÆANA (Chitty). Pl. 4, figs. 23-27.

"This shell approaches nearest to *Cyl. alba* var. *striatella* (Contrib. to Conch., p. 20), and may be *C. alabastrina* Pfr., of which I have not seen even the description. Shell almost cylindrical, rounding off in the last whorl, and with convex outlines from the 9th whorl towards the truncate apex; cream white. Striæ very visible under a good lens, but much finer than in *C. alba* var. *striatella*. Half of last whorl carinated; but by no means so much so as in the last-named shell. Apex

truncate, with loss of — ? whorls; whorls left, fourteen, much flattened, but with a well-impressed suture. Last whorl much produced, obliquely. Aperture sharply angular on the right side, and rounded on the left; so that when the shell is held with the apex to the right, the aperture is like a tunnel or archway. Lip reflected, but little thickened, shining. Length .71, greatest breadth .14, least breadth, at apex, .07 " (*Chitty*).

Western Jamaica: Retrieve, Westmoreland (Chitty).

Cyl. pearmanæana CHITTY, Contrib. to Conch., i, p. 6 (Oct., 1853).—PFR., Monogr., iv, p. 703.

At present a rare species in collections. It is related to *B. alba*, but readily known by the greater calibre of the cylinder and the shorter keel, which is developed only on the straightened latter part of the last whorl; moreover, the internal pillar is stouter in the lower half of the shell, wound about with two stout spiral ridges, and in some whorls a weak median cord. The last whorl is swollen at the periphery, as usual in the group, and rounded above and on the axial side. The shell figured measures 18 x 3.5 mm., and has 13¾ whorls. Chitty's type measured 17.75 x 3.5 mm., with 14 whorls. It must be close to *B. alabastrina* Pfr., if not, as I suspect, actually identical with it.

48. B. ALBA (C. B. Adams).

" Shell subfusiform, widest above the middle; pure white; striæ scarcely visible under a common magnifier, except on the last two whorls; the last whorl is sharply carinate anteriorly, rather obtusely carinate just above the middle; spire with rectilinear outlines; apex truncate, with the loss of thirteen or fourteen whorls, the upper part of the spire before truncation being very long and slender; thirteen or fourteen whorls remaining, slightly convex, with a well-impressed suture; last whorl much produced obliquely; apex sharply angular anteriorly, obtusely so on the right, in the rest well rounded; lip moderately thickened, reflected nearly into the plane of the aperture, shining, sharp, rather narrow. Length .4 inch, breadth .083 inch " (*Ad.*).

Jamaica.

Cylindrella alba C. B. Ad., Contrib. to Conch., no. 2, p. 20 (Oct., 1849).—Pfr., Monogr., iii, p. 566; Conch. Cab., p. 40, pl. 4, f. 23-25.—Gloyne, Journ. of Conch., 1872, p. 34 (Derry, northern Manchester).—Johnson and Fox, Nautilus, v, p. 34.—Henderson, Nautilus, viii, p. 20, no. 98 (north of Savanna la Mar).—*C. subula* Pfr. in Wiegm. Archiv f. Naturg., 1840, i, p. 41; Phil., Abbild., ii, p. 50, pl. 2, f. 13.—Binney, Ann. N. Y. Acad. Sci., iii, p. 125 (teeth).

The type locality of *B. alba* was not stated, and until Adams' type is re-examined, its precise characters will remain unknown. The type measured 10 mm. long, 2.075 wide, with 13 or 14 whorls remaining. It was thus a short-whorled race, like the varieties *eos* and *minima*, but differing from both in being narrower, with more whorls for its length.

The large series of specimens before me shows rather wide variation, indicating several ill-differentiated races. Indeed, Mr. Jarvis is disposed to segregate the form from the extreme east specifically, as his researches up to this time have shown no connection between the eastern and western herds, which may thus be separated by an area over half as long as the island without species of the *alba* type. This course seems to me barred by the impossibility of separating eastern specimens from some lots taken in St. Elizabeth Parish, in the west. I have hesitated to attempt the definition of any varieties, but finally decided to do so, merely to stimulate closer study of the group. Their characters are briefly given in the following key:

I. Whorls very short, their number greater than the number of mm. in the length of the shell.
   1. Nearly smooth, the striation very faint and fine.
      a. 10 x 2 mm., with 13-14 whorls; typical *alba*.
      b. 12.5 x 2.5 mm., with 13½ whorls, to 11.2 x 2.5 mm., with 11½ whorls. Portland. Var. *eos*.
      c. 9.5 x 2 to 2.2 mm., whorls 11-12. Var. *minima*.
   2. Striation comparatively coarse; 13 x 2.1 mm., with 15½ whorls, to 11 x 2.1 mm., with 13 whorls. Westmoreland. Var. *striata*.

H. Whorls not so short, their number less than the length of the shell in mm. Westmoreland and Hanover. Var. *occidentalis.*

48*a*. Var. *eos* nov. Pl. 4, fig. 34; pl 2, fig. 8.

Shell apparently *smooth,* but under high magnification showing excessively fine, close striation. Greatest diameter above the middle. Whorls slightly convex, parted by a well-impressed suture, *very short,* compactly coiled. Axis thick and biplicate in the 4th, 5th, and sometimes the 6th whorls up, then abruptly slender and singly plieate.

Length 12.6, diam. 2.5 mm., whorls 13½.

Length 11.2, diam. 2.5 mm., whorls 11½.

Eastern Jamaica, parish of Portland: Swift River, near Hope Bay (Fox and Johnson, type locality, pl. 4, fig. 34; pl. 2, fig. 8); Rural Hill (P. W. Jarvis, pl. 4, figs. 28, 29). Also in the west, see below.

At Rural Hill there is a somewhat more coarsely striate, cylindric form (pl. 4, figs. 28, 29), with the same internal characters, and measuring 13.6 x 2.5 mm. with 14 whorls, to 12 x 2.5 mm. with 11½ whorls.

Smooth, short-whorled shells, very like the Portland variety are before me from Ipswich, pl. 4, fig. 32; pl. 2, fig. 10 (Jarvis, Henderson), and Mulgrave (Henderson), in St. Elizabeth parish, western Jamaica. They are a trifle more slender, diam. 2.2 to 2.3 mm., with the enlarged whorls of the axis a little less distinetly biplicate. Length varies about as in eastern speeimens. Perhaps this is typical *alba.*

48*b*. Var. *minima* nov. Pl. 4, fig. 30; pl. 2, fig. 12.

Similar to the preceding form in the smooth surfaee and short whorls, but the last whorl only shortly projects. The axis is largest in the 4th and 5th whorls up, and biplicate, above that becoming slender and with one spiral fold.

Length 9.5, diam. 2.2 mm., whorls 11 (Swift R.).

Length 9.4, diam. 2 mm., whorls 11¾ (Clifton).

Clifton, near Balaclava, St. Elizabeth (Jarvis, type loc.), and Swift River, Portland (Johnson and Fox).

I do not overlook the possibility that the western and eastern forms here brought together may be related more nearly to the respective forms of the preceding race than to each other; but it seems simpler at present to group similar forms together. The Swift River *minima* is shown in pl. 4, fig. 33.

48*c*. Var. *striata* nov. Pl. 2, fig. 9.

Related to var. *eos*, but more slender, more strongly and coarsely striate than any other variety. The sculpture of a specimen from Mt. Stewart is shown in fig. 9, magnified to the same scale as the other detail figures of sculpture. Specimens are before me from Withorn (Henderson) and Mt. Stewart (Jarvis), in Westmoreland. Specimens measure 13 x 2.1 mm., with 15½ whorls, to 11 x 2.1 mm., 13½ whorls (Mt. Stewart), and 11 x 2 mm., 13 whorls (Withorn). The axis is like that of var. *eos*. It is a much more slender shell than var. *striatula*.

48*d*. Var. *occidentalis* nov. Pl. 4, fig. 31; pl. 2, fig. 11.

Shell larger, the whorls less shortened, distinctly though finely striate; neck rather long. Axis more slender than in the preceding forms, widest in the fifth whorl up.

Length 17, diam. 2.9 mm., whorls 15½.

Length 15.5, diam. 3 mm., whorls 14.

Length 12.5, diam. 2.2 mm., whorls 14.

Great Valley estate, Hanover (type loc., Taylor, in Clapp coll.); Withorn estate (Henderson) and Fort William (Jarvis), Westmoreland.

The specimens from Withorn are like those from the Great Valley estate. Those from Fort William are larger, with the axis widest in the sixth whorl; measuring 21 x 3.1 mm., with 17 whorls, to 17.3 x 2.6 mm., with 16 whorls.

It will be noted that in this race the number of whorls is less than the number of millimeters in the length, while in the races *minima* and *eos*, as well as in typical *alba*, this proportion is reversed. I have already described the flexible internal process of this variety (pl. 1, figs. 14, 15).

48*e*. Var. *striatula* C. B. Ad.

"Striæ very distinct under a common magnifier; length .52, breadth .11 inch" (13 x 2.75 mm.). Locality unknown.

Subgenus APOMA Beck, 1837.

Apoma BK., Index Moll., p. 89, for *elongata* Chemn. (*chemnitziana* Fér.).—*Casta* ALBERS, Die Hel., 1850, p. 208, for *elongata* Ch. and *gracilis* Wood, the former selected as type by v. Mart., 1860.—*Cochlodina* 3ème groupe *Anomales*, Férussac, Tabl. Systém, p. 62 (in part; for *Balea perversa* and *Brachy. chemnitziana*).

Shell sinistral, slender, cylindric-tapering, white, densely and finely striate; whorls about 16 in entire shells, about 7-8 being below the plug; suture oblique; last whorl not free, carinate at the base; aperture longer than wide, the peristome reflexed, free or adnate above. Axis simple, very slender, straight above, spirally coiled in the later whorls. Apex high, with a deep axial pit. Viviparous, the young at birth having about 5 whorls. Teeth as in *Mychostoma* (pl. 10, fig. 20, *B. chemnitziana*).

A group of the high interior of Jamaica, allied to *Mychostoma*, but distinct by the oblique whorls, very slender and spirally coiled axis, adnate last whorl and long aperture.

The species are viviparous, as first noticed by Gloyne. The young shells of *B. gracilis* at birth are about 4 mm. long, composed of 5-5⅓ faintly striate whorls, the last of which is somewhat more globose than the sueceeding post-natal whorl, thus distinguishable in adult shells when the apex is retained. Fig. 5 of pl. 2 represents a young shell of *B. gracilis* removed from the mother, and not quite at full term.

49. B. CHEMNITZIANA (Férussac). Pl. 2, figs. 1, 2, 3, 4.

Shell sinistral, turrite, tapering, rather thin, white. Usually truncate, about 9 whorls being abandoned and part of them lost, there being about 7 whorls below the long, roughened and convex plug. Whorls strongly convex, densely and regularly striate obliquely, the last having a short but strong basal keel. Aperture oval, vertical, the peristome wide, white and flatly reflexed, barely free above or adnate there. Axis extremely thin, spirally coiled in the lower 2 whorls, straight above.

Length 26, diam. 4.5 mm., whorls remaining 8½.

Length 30, diam. 4.5 mm., whorls 16 (entire).

Length 21, diam. 4.5 mm., whorls remaining 6¾.

Jamaica: Parishes of St. Catherine and St. Andrew, away from the coast; Natural Bridge, Riversdale, Bogwalk, Stony Hill, Mt. Diablo.

Turbo clongatus turritus CHEMNITZ, Conchyl. Cab., ix, p. 23; *Turbo clongatus albus contrarius t. c.*, p. 114, pl. 112, f. 956 (1786).—*Apoma elongata* BECK, Index, p. 89 (1837).—*Cylindrella elongata* Chemn., PFR., Monogr., ii, p. 380; iii, 575; iv, 706; vi, 383; viii, 442; Conchyl. Cab., p. 57, pl. 6, f. 21, 22.—GLOYNE, Quart. Journ. of Conch., i, p. 53 (habits, food, viviparity).—SOWERBY, C. Icon., xx, pl. 4, f. 33.—JOHNSON, Nautilus, v, p. 34.—HENDERSON, Nautilus, viii, p. 20, no. 102.—*Helix* (*Cochlodina*) *chemnitziana* Fér., Tabl. Syst., p. 62, no. 512, based upon Chemnitz, *l. c.*—*Pupa chemnitziana* GRAY, Ann. of Philos., n. ser., ix, p. 413.—*Clausilia c.*, DESH. in Lam., viii, p. 217.—*Cylindrella chemnitziana* PFR., Symbolæ, ii, p. 136; Philippi, Abbild., ii, p. 49, pl. 2, f. 4.—W. G. BINNEY, Ann. N. Y. Acad. Sci., iii, p. 125 (teeth).—*Cyl. cumingi* C. B. AD., Proc. Boston Soc. N. H., 1845, p. 14.—*Pupa gracilis* SOWERBY, Genera of Shells, f. 8; reprinted in REEVE, Conch. Syst., pl. 170, f. 8.—*Brachypodella elongata* Ch., PILS. & VAN., Proc. A. N. S. Phila., 1898, p. 279, pl. 17, f. 4 (teeth); pl. 18, f. 21 (axis).

It is a larger, more robust shell than *B. gracilis*, with more convex whorls. Range limited to a small area on the southern watershed, east of the middle of the island. The name *clongata*, usually applied to this species, was not used as a binomial until long after Férussac had called it *chemnitziana*, after the competent and industrious author of the *Conchylien Cabinet*. The type is, or was, in the Spengler collection at Copenhagen, and was known to be from Jamaica.

50. B. GRACILIS (Wood). Pl. 2, figs. 5, 6, 7.

Shell sinistral, slender, the upper half or more tapering, generally truncate; white; finely rib-striate obliquely. About 7 to 8½ whorls are below the plug, but several usually persist above it, and rarely the spire is retained entire. Whorls but

weakly convex above, more strongly so below, the last with a short, strong basal keel. Aperture vertical, oblong, angular at the base, the peristome expanded and reflexed, very shortly free from the preceding whorl above. Axis thin and simple, slightly spiral in the later whorls.

Length 26, diam. 4 mm., whorls remaining 8½.

Length 29.5, diam. 4 mm., whorls remaining 12.

Length 24.5, diam. 3.7 mm., whorls remaining 11½.

Length 29.5, diam. 3.8 mm., whorls 16 (entire).

Length 31, diam. 4 mm., whorls 15¾ (entire).

Jamaica: western half, in the high interior. Aenon Town, Clarendon; Porus (Jarvis), Mandeville and Spur Tree Hill, Manchester (Henderson); Ipswich, St. Elizabeth (Henderson).

Turbo gracilis Wood, Index Test., suppl., p. 20, pl. 6, f. 38 (1828).—*Cyl. gracilis* Pfr. in Phil., Abbild., ii, p. 49, pl. 2, f. 5; Monogr., ii, p. 381; viii, p. 442; Conchyl. Cab., p. 57, pl. 6, f. 23-25.—Crosse & Fischer, J. de Conchyl., 1870, p. 11, pl. 4, f. 1 (teeth).—Gloyne, J. de C., 1872, p. 36; Quart. Journ. of Conch., i, p. 53 (habits, food, viviparity).—Sowerby, C. Icon., xx, pl. 9, f. 78.—Henderson, Nautilus, viii, p. 20.—*Casta gracilis* Wood, Strebel, Beitr. Mex. Conch., iv, p. 106, pl. 13, f. 8 (teeth).—*Cyl. chemnitziana*? Pfr. in Phil., Abbild., i, p. 184, pl. 1, f. 5.

A more attenuate shell than *B. chemnitziana*, usually retaining more whorls. It is widely distributed over the plateau of the centre and the western half of the island, but does not approach the coasts nor trespass upon the much smaller area of *B. chemnitziana*. The specimens sent by Mr. Jarvis from Aenon Town are small, 19 x 3.3 to 22 x 3.8 mm., with 7½ to 8½ whorls below the plug.

Genus PINERIA Poey, 1854.

Pineria Poey, Memorias sobre la Historia Natural de la Isla de Cuba, i, p. 428, for *P. terebra* and *P. beathiana*.—v. Mart. in Albers' Die Hel., p. 293, type *P. beathiana* (1860).—Binney & Bland, Ann. of the Lyc. Nat. Hist. of N. Y., x, 1871, p. 22.

Shell imperforate, cylindric-tapering or conic, thin, delicately ribbed obliquely; composed of 6-9 whorls, swollen or angular peripherally, the last not free in front. Aperture very oblique. Peristome *discontinuous*, simple, hardly expanded, the outer margin oblique, the *inner margin not built forward* from the columella proper; their insertions widely separated though converging. Axis slightly sinuous. Apical whorls vertically ribbed, retained in the adult stage.

Head (of *P. terebra* and *beathiana*) with but two tentacles, the eye-stalks; the true tentacles being obsolete, according to Poey.

Jaw of *P. viequensis*, as in *Brachypodella*, composed of a great number of narrow plaits.

Radula of *P. viequensis* much like that of *Brachypodella*, two inner lateral teeth on each side being enlarged, with larger ectocones than in *Brachypodella;* the other (marginal) teeth are few (5 or 6) in number, with minute cusps (pl. 1, fig. 13, *P. viequensis* from St. Bartholomew; pl. 14, fig. 7, *P. viequensis*, strongly carinate form from Guadeloupe).

Type, *P. beathiana*. Distribution, Isle of Pines, and from Vieque to Barbados, and perhaps Buen Ayre, inhabiting the coastal belt of raised reefs. All the known species are illustrated on plate 1.

The genus *Pineria*, at least as represented by *P. viequensis*, is closely related to *Brachypodella*, and probably branched off from the Urocoptid stock at about the same time. In details, the teeth, central, lateral and marginal, are less modified from the Urocoptid type than in *Brachypodella;* the ectocones of the enlarged laterals, especially the inner ones, are better developed than in *Brachypodella*, in which the inner lateral on each side invariably has a much reduced ectocone or none; so that it is likely that *P. viequensis* is to be looked upon as a phylum parallel to *Brachypodella*, which arose from the same Urocoptid stock, but was independently specialized.

The chief modification has been in the shell, which has lost that extension forward of the last whorl so characteristic of *Urocoptidæ*, and which in most of the genera brings the columellar margin up into the plane of the outer lip, even when the aperture is not carried free of the preceding whorl.

The dentition of the type species from the Isle of Pines is unknown; and despite the similarity of aperture and sculpture, there is some doubt about the relationship of the Pinerian species with those of the Caribbean islands. The former may, perhaps, prove to be closely related to *Microceramus* in dentition. The single species reported from the islands off Venezuela (Buen Ayre) is probably a *Microceramus*.

1. P. BEATHIANA Poey. Pl. 1, fig. 9.

Shell imperforate, cylindric-turrite, thin, corneous-brown; sculptured with *very oblique, narrow riblets,* which are *white or stippled with white.* Spire slowly tapering from the last whorl to the rather obtuse apex. First two whorls radially ribbed, convex; several whorls following decidedly *flattened below the suture, very convex* and almost angular; two or three later whorls merely convex, the last rounded. *Aperture very oblique*, ovate; peristome whitish, a little obtuse, hardly expanded, the columellar margin blunt, not expanded, its insertion remote from that of the outer lip; columella concave. Length 6.4-7, diam. 2.5 mm.; whorls about 8.

Isle of Pines: Sierra de Caballos (G. Beath).

Pineria beathiana POEY, Memorias, i, p. 430, pl. 34, f. 17, 18 (1854).—PFR., Monogr., vi, 343.—ARANGO, Fauna, p. 87.—CROSSE, J. de C., 1890, p. 202.—*Bulimus beathianus* Poey, PFR., Malak. Bl., 1854, p. 194; Monogr., iv, p. 494.

Poey remarks that on the Caballos were found *Trochatella stellata, Pineria beathiana, Cyclostoma pupoides,* and a smooth wood-louse. On the mountain of Casas, only a league distant, and of the same geological structure, there are four species differing from these only in the greater development of ornamentation: *Troch. constellata, P. terebra, Cycl. moreletianum,* and a similar but very spiny wood-louse.

2. P. TEREBRA Poey. Pl. 1, figs. 3, 4.

Shell imperforate, turrite, thin; brown; sculptured with narrow, oblique cuticular riblets. Spire regularly tapering from the last whorl. First two whorls convex, the rest *flat above,* convex and *sloping inward below,* the *sutures very*

deeply constricting. Aperture small, very oblique; peristome simple, the columella whitish, somewhat concave.

Length 4-5, diam. 2.5 mm., whorls 7½.

Length 5-5.5, diam. 2.7-3 mm., whorls 8 (*Pfr.*).

Isle of Pines: Sierra de Casas (Gundlach).

Pineria terebra Poey, Memorias, p. 429, pl. 34, f. 12-16.—Pfr., Monogr., vi, 343.—Arango, Fauna, p. 86.—Crosse, J. de C., 1890, p. 202.—*Bulimus terebra* Poey, Pfr., Mal. Bl., 1854, p. 195; Monogr., iv, p. 495.

An excessively peculiar shell, in which the sutures are constricted even more than in *Brachypodella seminuda,* a Jamaican species, which has evolved along parallel lines.

3. P. viequensis (Pfeiffer). Pl. 1, figs. 6-8, 11, 12.

"Shell imperforate, ovate-conic, rather thin, obliquely striate; corneous, variegated with white flames. Spire somewhat scalar, the apex acute. Whorls 6½, with a spinose keel in the middle, the last hardly one-third the length of the shell, with the keel more obsolete. Aperture diagonal, nearly circular; peristome simple, the margins converging; right margin arcuate, columellar margin somewhat straightened, callous. Length 5, diam. 3 mm.; aperture 2 mm. long." (*Pfr.*).

Island of Vieque, among dry leaves (Riise). Saint Martin: Simson Bay (Van Rijgersma), in rock-crevices, on the lowlands. St. Bartholomew and Anguilla (Dr. Cleve). Guadeloupe: Maudet plantation, in crevices of a ruined wall built of blocks of madrepore (Schramm, Maze). Barbados: confined to coral rocks bordering the sea on the east side, in Christ church and St. Philip parishes (Feilden).

Bulimus viequensis Pfr., Malak. Bl., iii, 1856, p. 46; Monogr., iv, p. 495.—*Maeroceramus viequensis* Pfr., Novit. Conch., p. 408, pl. 93, f. 39-41; *Pineria v.,* Pfr., Monogr., vi, p. 343, with var. *minor,* Barbados (1868).—Bland & Binney, Ann. and Lyc. Nat. Hist. of N. Y., x, p. 23-27 (distribution, synonymy, dentition).—Binney, Ann. N. Y. Acad. Sci., iii, p. 126, pl. 15, f. B (jaw), and pl. 14, f. C (teeth), of St. Martin specimen.—Smith & Feilden, Ann. and Mag. Nat. Hist. (6), viii, p. 253 (Barbados).—Brown, Journ. of Conch., x, 1903,

p. 269 (Barbados).—*Helix schrammi* FISCHER, Journ. de Conchyl., vii, 1858, p. 184, pl. 7, f. 7, 8 (Guadeloupe).—*Pineria schrammi* Fisch., PFR., Monogr., vi, p. 343.—MAZE, Journ. de Conchyl., 1883, p. 21 (Guadeloupe); J. de C., 1890, p. 27 (St. Martin).

Pfeiffer's original description is given above, and figs. 8, 11 represent specimens from Vieque, the type locality. Shells from St. Martin and St. Barts (figs. 6, 7) are similar.

Pfeiffer has applied the name var. *minor* to specimens from Barbados, but no dimensions or other characters have been given, and I do not see that the shells differ materially from those of the northern islands. Curiously enough, they do not belong to the Guadeloupe race. One is drawn in fig. 12.

The species seems everywhere restricted to the coastal belt of elevated coral reefs, where the snails subsist upon lichens or fungi growing on the limestone. The radula of an individual from St. Barts (pl. 1, fig. 13) has the formula 6.2.1.2.6. That of the more strongly carinate form (*schrammi*) from Guadeloupe (pl. 14, fig. 7) has 5.2.1.2.5 teeth, very similar in form. I found the radula of an individual from St. Martin to be the same; so I am somewhat inclined to think that figured by Binney was abnormal in the greatly reduced size of the median three teeth.

Var. *schrammi* (Fischer). Pl. 1, figs. 1, 2, 5.

The specimens from Guadeloupe are somewhat wider, more conic, the last whorl more strongly carinate, and the keel is more distinctly and coarsely serrate or tuberculate. While some individuals from St. Martin and St. Barts approach this form, yet there is in the average a noticeable difference, which may properly be recognized in nomenclature. Figs. 1, 2 are copied from the original illustrations of *schrammi;* fig. 5 was drawn from a Guadeloupe specimen.

4. P. BONAIRENSIS E. A. Smith. Pl. 1, fig. 10.

Shell small, long-pyramidal, slightly rimate; brown-corneous, obscurely variegated with oblique whitish streaks. Spire moderately acuminate, obtuse at the apex. Whorls 8½,

a little convex, slowly enlarging, sculptured with close, very oblique, raised striæ; the penult. whorl a little wider than the last. Aperture nearly circular; peristome pale, moderately thin, the margins converging, columellar margin reflexed. Length 6. diam. 2.5 mm., aperture 1.5 mm. wide (*Smith*).

Buen Ayre (Hartert).

Pineria bonairensis E. A. S., Proc. Malac. Soc. Lond., iii, p. 114, f. 1 (Dec., 1898).

"The minute thread-like lines which cover the surface of the shell are very oblique, and extend even to the apical whorls. One specimen only was obtained. Allied to *Pineria beathiana* Poey, from the Isle of Pines, but more finely sculptured, with less convex whorls, a larger apex to the spire, a narrower body-whorl, and differs in the reflexion of the columella." (*Smith.*)

It is likely that this species will prove, when the dentition is examined, to be a *Microceramus*. W. G. Binney has examined the teeth of a species from Curacao, finding them to be of the *M. gossei* type; and his identification of the shell as *M. inermis* Gundl., while doubtless erroneous, indicates a species not unlike *P. bonairensis*.

Genus MACROCERAMUS Guilding, 1828.

Macroceramus Gldg., Zoölogical Journal, iv (Oct., 1828), p. 168, type and sole species *M. signatus*.—Albers, Die Hel., 1860, p. 269 (in part).—Fischer & Crosse, Miss. Scient. Mex., i, p. 416.—Pfr., Nomencl. Hel. Viv., p. 271.—*Leptospira* Swainson (in part), Malacology, 1840, p. 335, for *striata* Sw. (= *Obeliscus calcarea* Born), and *signata* (= *M. signatus* Gldg.).—*Colobus* Albers (in part), Die Heliceen, 1850, p. 177.—*Bulimus* sp., Pfr., Monographia Helic. Viv., ii, iii, and of Reeve.—*Cochlodina*, 1re groupe *Pupoides*, Férussac, Tabl. Syst., p. 61.

Shell shortly rimate, conic-turrite or oblong, always strongly tapering above, composed of 9 to 14 whorls, or fewer by the loss of 1 to 3 apical ones. The nepionic shell is composed of *about* 2½ *smooth whorls*, often crenate below the suture (pl. 15, fig. 5, *M. signatus*). The succeeding whorls are usually

striate, the later ones similar or smoothish; last whorl rounded, with a basal keel or none. The suture is either smooth or crenate. The axis is slender and solid, straight or somewhat twisted spirally. (*Macroceramus*, a long earthen vessel.)

"Head somewhat bilobed; tentacles four, the two on the upper surface of the head bearing the eyes; foot short, tapering behind and simple" (Guilding).

Jaw highly arched, very thin, composed of many thin, narrow, slightly imbricating plates, converging toward the middle, thereby causing the median plates to be shorter.

Radula rather narrow, its width hardly one-fourth the length; teeth *arranged in v-shaped rows;* general shape of the individual teeth as in *Urocoptis* (pl. 14, fig. 8, *M. tenuiplicatus* var. *swiftianus*). The central tooth is narrower than the laterals, but still well developed, with a simple, obtuse cusp. The side teeth are all of one type, and decrease very slowly in size; the broad *inner cusp is emarginate* or notched; the outer cusp is rounded and rather short. Near the outer edge of the radula the teeth are more oblique. The basal-plates are very indistinct. There are 27.1.27 teeth in *M. signatus*, 28.1.28 in *M. t. swiftianus*.

Soft anatomy otherwise unknown.

Distribution: Eastern Cuba, Haiti, Porto Rico, and the faunally similar islets eastward. Not in western Cuba or Jamaica.

Macroceramus stands well apart from all other genera of *Urocoptinæ*, being apparently nearest to *Anoma*, which it resembles in the incomplete peristome and rapidly tapering spire of the shell, and the general shape of the outer lateral teeth, as well as in having very much smaller teeth than other *Urocoptinæ*, and a larger number of them. The teeth of the central row are like those of *Autocoptis*. The notch in the inner cusp of the lateral teeth probably indicates that that cusp in *Urocoptinæ* is formed by the union of entocone and mesocone, though in other genera of the subfamily no record of its composite origin remains. *Macroceramus* resembles *Anoma*, *Spirostemma* and *Microceramus* in the minute size of the individual teeth. The teeth of equally small species of

Urocoptis or *Brachypodella* are comparatively enormous. The jaw is entirely similar in all the genera of *Urocoptinæ*.

The shell is like that of *Microceramus* in shape and ornamentation, but differs in the smooth nuclear whorls, so that when any of these are retained, as is usually the case, *Macroceramus* can at once be distinguished from *Microceramus* by this feature of the initial whorls, aside from the diverse radula.

Cochlicellus subantiquatus Beck, Index Moll., p. 63, no. 10, is a nude name, probably based upon some species of *Macroceramus*.

In Haiti the genus is represented by three groups of species: the groups of *M. tenuiplicatus*, of *M. klatteanus*, and of *M. lineatus*. The first of these has no Cuban representative; the second is represented in Cuba by the *pupoides* group, and in part by the *pazi* group, but the latter also approaches the Haitian group of *M. lineatus*. Cuba also has another group, that of *M. canimarensis*, unrepresented in Haiti; and a somewhat similar group also occurs in Porto Rico and eastward, that of *M. microdon*, which however stands near the Haitian group of *M. klatteanus*. Eastern Cuba and Haiti, in short, support a nearly homogeneous fauna of *Macroceramus* species, about equally differentiated in the two areas. East and west from this centre the species diminish very rapidly in numbers and variety.

The general sequence of groups given below is from the east westward.

1. Species of Porto Rico and islands eastward, no. 1 to 3.
2. Species of Haiti, no. 3*a* to 17.
3. Species of Cuba, no. 18 to 35.

Species of Porto Rico and Islets Eastward.

Group of M. microdon.

1. M. MICRODON (Pfeiffer). Pl. 24, figs. 71-74.

Shell very shortly rimate, slender, turrited, thin, the outlines of the spire slightly convex. Brown-tinted whitish, with irregularly-spaced *longitudinal brown streaks, each preceded*

by a white border. Surface shining, *sculptured with curved riblets*, narrower than their intervals. Whorls 12 to 13, slightly convex, the last having a *distinct cord-like carina* at the base. Aperture small, vertical, rounded-truncate; peristome thin, slightly expanded, the columellar margin broadly dilated, concave above. *Columella conspicuously truncate below.* Axis *strongly sinuous within.*

Length 15, total diam. 4, of last whorl above apert. 3.5 mm.

Length 12.7, diam. 4, of last whorl above apert. 3.5 mm.

St. Thomas: summit of the hill opposite Baker's, under stones and on rocks (Bland, type locality); St. John (Bld.); Tortola (Swift); Anageda (Swift); Porto Rico at San Juan (Blauner).

Cylindrella ——? sp. undet., BLAND, in Adams' Contrib. to Conch., no. 11, p. 218 (Oct., 1852).—*Bulimus microdon* PFR., Monogr., iii, p. 365 (1853); P. Z. S. for 1851, p. 261 (Dec. 7, 1853); Conchyl. Cab., p. 127, pl. 42, f. 7-9.—*Macroceramus m.*, SHUTTLEWORTH, Diagn., no. 6, Bern. Mittheil., 1854, p. 145.—BLAND, Ann. Lyc. Nat. Hist. of N. Y., vi, p. 71.—PFR., Monogr., iv, 689; vi, 350.—CROSSE, J. de Conch., 1892, p. 25.—DALL & SIMPSON, Moll. Porto Rico, p. 377.

The slender shape, attenuate above, the strong sculpture and keel, and the truncate base of the columella, well distinguish this species. It should be compared with *M. unicarinatus* (Lam.), but Delessert's figure of that species does not show the characteristic columellar structure of *microdon*.

The shells above described and measured are from St. Thomas, the type locality, though Pfeiffer, in his original paper, thought it was from Jamaica, probably because the specimens were sent to him through C. B. Adams. This error he subsequently corrected. Those from Tortola, St. John and Anageda (fig. 71) are similar, but in the latter island a little larger, 17 mm. long.

In Porto Rico (figs. 72, 73) they vary from 13 to 19.5 mm. long. The smaller examples are a little less strongly costulate than typical *microdon*. The large shells may be separated as:

1*a*. Var. SHUTTLEWORTHI (Martens). Pl. 24, fig. 74.

"Larger and comparatively wider than the type, with much weaker riblets and almost no basal keel. Length 17, diam. 5⅓ mm." (*Martens.*)

Porto Rico (Albers coll.); Penuelas (Sintensis).

M. shuttleworthi MARTENS, Jahrb. d. Malak. Ges., iv, 1877, p. 352; Nachrbl., xxiii, 1891, p. 132.

These large forms intergrade with the small Porto Rican shells, so that no rigid distinction can be made. The keel is completely wanting in some shells, noticeable in others. The specimen figured measures: length 19.5, diam. above aperture 5.5, length and width of aperture 5 mm., whorls 12¾, but many smaller shells have the keel very weak, almost wanting, such as the original of fig. 73, which measures hardly 13 mm. long. Possibly all Porto Rican *microdon* are referable to var. *shuttleworthi*, even when moderately keeled (like fig. 72), and costulate.

2. M. JOHANNIS Pfeiffer. Pl. 24, figs. 79, 80, 81.

"Shell subperforate, subfusiform-turrite, thin, obliquely plicatulate; brown-corneous. Spire regularly tapering, the apex slightly obtuse, suture moderate, somewhat toothed by the projecting folds. Whorls 11-12, moderately convex, slowly increasing, the last slightly exceeding one-fourth the length, obtusely angular below the middle. Aperture oblique, irregularly rounded; peristome thin, the margins distant, right margin regularly arcuate, expanded, columellar margin dilated, triangularly spreading, having a tooth-like prominence within. Length 15, diam. 4 mm." (*Pfr.*).

Porto Rico: Aguadilla, in the western part (Gundlach).

M. johannis PFR., Malak. Bl., xxii, 1874, p. 119; Monogr., viii, p. 621; Novit. Conch., v, p. 27, pl. 142, f. 7-10.

This species, which I have not seen, seems to stand close to the Porto Rican race of *M. microdon*, from which the description seems hardly to distinguish it. It is named for the distinguished Cuban naturalist, Dr. Johann Gundlach. A slightly smaller variety, variegated with opaque white, is mentioned and figured by Pfeiffer (fig. 81).

Group of M. lineatus.

3. M. SIGNATUS Guilding. Pl. 24, figs. 65-70.

Shell shortly and deeply rimate, pyramidal, rather thin, the lateral outlines nearly straight; glossy, white, marked with a series of 8-like figures, each upon a narrow brown streak, the base bounded by a brown band and usually having a median band also; apical whorls dark. Sculpture of fine striæ on the earlier whorls, the later ones smooth except for growth-lines. Whorls usually 11 to 12, somewhat convex, the last rounded, without a keel or angle. Aperture slightly oblique, rounded-truncate, as wide as long, ochre tinted and banded within; peristome white, thin, very narrowly expanded, the columellar margin dilated. Axis very slender and straight, encircled by an inconspicuous spiral cord.

Length 17.5, diam. above aperture 6.5 mm.

Length 16, diam. above aperture 6.3 mm.

Length 14, diam. above aperture 5.5 mm., whorls 10½.

Virgin Islands: Tortola (type locality; Guilding, Swift, *et al.*); Anageda (Dr. Cleve). Also Anguilla (Sawkins).

Macroceramus signatus GUILDING, Zoöl. Journal, iv, p. 168 (1828).—BECK, Index, p. 73.—PETIT, J. de C., i, 1850, p. 379.—PFR., Monogr., iv, p. 688; vi, p. 344.—CROSSE & FISCHER, Journ. de Conch., 1870, p. 12, pl. 3, f. 14-16 (teeth).—BLAND and MORSE, Ann. Lyc. Nat. Hist. of New York, viii, p. 162, f. 5 (jaw), 6 (teeth); repeated in Ann. Lyc., ix, p. 84, f. 4; and by W. G. BINNEY, in Proc. Acad. Nat. Sci. Phila., 1875, p. 223, f. 65 (jaw).—CROSSE, J. de C., 1891, p. 131.—*Bulimus signatus* SOWERBY, Conchol. Illustr., f. 57.—*Leptospira signata* SWAINSON, Malacology, p. 335, fig. 97, *a*, *b* on p. 333 (1840).

Bulimus articulatus TURTON, Manual of the Land and Fresh-water Shells of the Brit. Is., p. 85, f. 68 (1831).—*Bulimus cylindricus* Gray, PFEIFFER, Monogr., ii, p. 80; not of Gray.—*B. cylindrus* GRAY, Turton's Manual, etc., new edit., 1840, p. 20, f. 68.—*Bulimus guildingii* PFR., Symbolæ, i, p. 82; ii, p. 115; Monogr., iii, p. 362; Conchyl. Cab., p. 128, pl. 42, f. 10-12.—REEVE, Conch. Icon., pl. 64, f. 445.

Distinct by its peculiar chain-like markings. Figures 65, 66 represent well-marked specimens from Tortola. Figs. 67, 68, 69 are Anageda shells, which differ from the typical form in being paler, and less closely marked. The specimens from Anguilla are similar to those of Anageda, the one figured (fig. 70) being more distinctly marked than most of those before me.

This species is the *Bulimus cylindrus* of Gray in Turton's *Manual*, but not the *B. cylindricus* of his earlier description, which was probably *M. formosus*.

Species of Haiti.

I. Shell conic, with a brown band below the periphery, upon which stand goblet-shaped figures, sometimes irregular or interrupted. *M. signatus* var. *salleanus*, no. 3*a*.

II. Conic or turrited, with nearly straight lateral outlines, having a brown band below the periphery and an umbilical spot, the base radially streaked, without a median band.

a. Upper surface of whorls decorated with spiral lines, intensified where they cross oblique streaks, often obsolete between the latter.

b. 5 or 6 such lines; glossy; length 17-19, diam. above aperture 7 mm.; about 12 whorls. *M. lineatus*, no. 4.

bb. 4 interrupted lines; length 13-14, diam. 4 mm., whorls 13. *M. r. lineatostrigatus*, no. 5*a*.

aa. 2 series of rather large chestnut spots above, and radial streaks and a series of oblique marks below the subperipheral band. 18.5 x 7 mm., whorls 12½. *M. gabbi*, no. 6.

aaa. Upper surface of whorls having straight, narrow, irregularly-spaced, brown streaks, but no spirals; 11½ to 14½ whorls.

b. Shell narrow, slender, diam. 3 to 4 times in the length. *M. richaudi*, no. 5.

bb. Shell wider, diam. less than one-third the length. *M. r. sublineatus*, no. 5*b*.

III. Base marked with radial streaks, crossed by median and subperipheral bands; apex blackish or blue-black.

a. Oblong-ovate, the outlines of spire very convex; upper surface of whorls marked with brown spots in obliquely longitudinal rows, about 3 spots in a row, sometimes united by lines, chain-like. *M. formosus*, no. 8.

aa. Convexly conic, the outlines slightly convex; marked with oblique rows of chestnut spots, 3-4 spots in a row. About 18 x 8 mm. *M. dominicensis*, no. 7.

aaa. Spire with almost straight lateral outlines.

b. Small spots upon oblique streaks. Sculptured with rather fine, low rib-striæ throughout. About 16-19 x 5.5 mm. *M. tenuiplicatus*, no. 9.

bb. Marked with spiral brown lines crossing streaks; sculpture of rather coarse, low rib-striæ. *M. t. swiftianus*, no. 9*a*.

IV. Base with a subperipheral band and umbilical patch (one or both rarely wanting), but not distinctly streaked radially.

a. Shell cylindrical below, the upper third or half tapering and conic; base very convex; suture more or less crenulate.

b. White, dotted and irregularly marbled with corneous; irregularly, coarsely, obtusely striate; suture crenulate; 10-11 x 3.3-3.7 mm., whorls 10-11. Santo Domingo. *M. hermanni*, no. 16.

bb. Cream or brown-tinted, copiously streaked with brown; finely and closely sculptured with thread-like striæ; 11 x 4 to 15 x 4-4.5 mm., with 9½-12½ whorls. S. Domingo. *M. subcylindricus*, no. 17.

aa. Shell regularly or somewhat cylindrically tapering; suture even.

b. Outlines of spire more or less convex; a series of brown spots at the periphery and above the suture, with some scattered dots and streaks; upper whorls with fine, thread-like striæ, lower ones smoothish; 14 x 4.3 to 17 x 4.5 mm., whorls 10-12. Santo Domingo.
M. ludovici, no. 11.

b^1. Similarly colored, but more tapering and acute; thread-striate throughout; 11 x 3.7 mm., with 9½ whorls.
M. ludovici var., no. 11*a*.

b^2. Outlines of spire somewhat convex; white with spots in oblique rows, 3 or 4 in a row; strongly ribbed; 15 x 4.7 mm., with 12 whorls. S. Domingo.
M. cyrtopleurus, no. 10.

b^3. Tapering from last whorl, the lateral outlines slightly convex; white with a few brown spots in pairs, or gray-brown with the spots united into streaks, and cream-bordered on one side. A distinct but low keel; sculptured with rather strong but low riblets, malleate between them; 10-11 x 4 mm., with 10 whorls. Port-au-Prince. *M. klatteanus*, no. 12.

b^4. Tapering, gray-white, sculptured with coarse striæ; a distinct basal keel; length 14 mm.
M. unicarinatus, no. 13.

b^5. Rather straightly tapering, buff-whitish spotted and tinted with ashy-brown; sculptured with distinct, irregular ribs; a basal keel; 14 x 5 mm., with 12-13 whorls. Gonaives. *M. costatus*, no. 14.

b^6. Conic-turrite, obliquely striatulate; white with longitudinal, interrupted, corneous streaks; suture crenulate; an obtuse keel; 13 x 5 mm., with 9 whorls. Jeremie.
M. angulatus, no. 15.

Group of M. lineatus.

3*a*. M. SIGNATUS var. SALLEANUS Pilsbry, n. v. Pl. 23, figs. 59, 60.

Shell very shortly rimate, long ovate-conic, with the outlines of the spire straight or slightly convex; thin, cream-white, with *a brown band below the periphery, upon which stand goblet-shaped markings, faintly ocellate* in the swollen upper part of each; sometimes brownish oblique streaks across the whorl pass through each of the goblet-shaped spots, which, moreover, may be irregular or interrupted. Base with no umbilical marking, but usually with a median band or row of spots. Protoconch brown or blackish-brown. Surface lightly, finely striate, the suture minutely crenulate, becoming almost smooth at the lower whorls. Whorls 10 to 11, only slightly convex, the last well rounded. Aperture rounded, the lip thin, expanded; columellar margin dilated, somewhat reflexed.

Length 16, diam. 6, length apert. 4.4 mm.

Length 13.6, diam. 5.5, length apert. 4 mm.

Length 12, diam. 4.8, length apert. 3.6 mm.

Santo Domingo (Sallé, Gabb).

Bulimus guildingi var. *g. minor, litturis rarioribus,* PFR., Monogr., iii, p. 363.

This strongly marked race, of which 21 specimens from several sources and collectors are before me, seems to be constant in its differentiation from *signatus;* but certain forms of that species from Anguilla and Anageda have undergone a similar reduction of the markings. The small size, usually 13 to 14 mm. long, is characteristic; only one shell of the series before me exceeds 15 mm. long.

4. M. LINEATUS (Bruguiere). Pl. 23, figs. 55, 56, 57, 58.

Shell shortly rimate, turrite, with straight lateral outlines. White, with a blackish-brown band below the periphery, bordered above by a white band. *Above this there are five or six brown spiral lines, which are intensified and coalescent where they cross numerous subvertical dark streaks,* which are irregularly spaced, and are *continued on the base as continuous*

radial stripes of dark brown and tawny; interior of umbilical area dark brown; apical whorls varying from corneous-brown to blue-black. Surface glossy, very closely and finely striate on the upper half, the later whorls smoother or merely marked with growth-lines, the base generally finely striate. Whorls about 12, slightly convex, the last well rounded, often weakly angular at the periphery. Aperture vertical, obliquely oblong, the lip thin, narrowly expanded, the outer lip a little retracted above, columellar margin dilated and reflected. Length 17-19, diam. 7 mm.

Haiti: coast of the cul-de-sac, at Gonaives (Richaud, Rolle), St. Marc (Henderson & Simpson), Port-au-Prince (J. J. Brown).

Bulimus lineatus BRUG., Encycl. Meth., i, p. 323.—PFR., Monogr., ii, p. 535; iii, 363.—*Macroceramus lineatus* Brug., PFR., Monogr., vi, p. 344.—CROSSE, Journ. de Conchyl., 1891, p. 130.—*M. lineatus* var. *glabrata* WEINLAND, Jahrb. d. D. Malak. Ges., viii, 1881, p. 158.—*Bulimus cylindricus* Gray, REEVE, C. Icon., pl. 64, f. 444.—PFR., Zeitschr. f. Malak., 1849, p. 88; Conchyl. Cab., p. 129, pl. 42, f. 16, 17. Not of Gray, 1825.—*Macroceramus guildingi* PETIT, Journ. de Conch., i, 1850, p. 379, pl. 13, f. 5.—?? *Helix carinula* GMEL., Syst. Nat. (13), p. 3655, no. 242, based upon Chemnitz, ix, pl. 136, f. 1263, n. 1-4.

Variation is chiefly in the intensity of the numerous brown spiral lines, which may be continuous and strong, or interrupted between the oblique streaks, and weak, as in numerous specimens before me from Port-au-Prince. Some of the shells from St. Marc are ochre-yellow between the radial streaks of the base. A variety was proposed by Weinland, based upon Port-au-Prince shells collected by Dr. J. J. Brown; but having examined forty shells from the same place and collector, it seems to me that they are typical *lineatus*, though many of them are rather pale. The name *guildingi*, given by Petit (pl. 23, f. 55, copy of original figure), is an absolute synonym of the species excellently described by Bruguiere.

5. M. RICHAUDI Petit. Pl. 24, figs. 75, 76.

"Shell pyramidal-turrite, brown-tinted whitish, glossy,

slightly umbilicate. Whorls 13 to 14, flattened, longitudinally rib-striate and marked with dark brown streaks; the last whorl encircled by a brown zone. Aperture rounded. Length 15 mm." (*Petit.*)

Haiti: Gonaives (Dr. Richaud, H. Rolle).

M. richaudi PETIT DE LA SAUSSAYE, Journ. de Conchyl., i, p. 377, pl. 13, f. 4 (1850).—PFR., Monogr., iv, p. 688.—CROSSE, J. de C., 1891, p. 132.—*Bulimus richaudi* Petit, PFR., Monogr., iii, p. 364.

The original figure is copied, pl. 24, fig. 76. Fig. 75 is a large typical example. The lateral outlines are nearly straight, only a trifle convex. It is somewhat coarsely striate, the striæ subobsolete except near the sutures, on the lower whorls. The early whorls are brown, and the rest are marked with narrow brown streaks at unequal intervals; some of the spaces between these color-varices being white, some faint lilac; and there are a few irregular dots scattered about. The base is radially streaked with chestnut, and defined by a dark brown band, above which there is a white border, indicating the place of the wanting keel. There is a small brown patch in the umbilicus. The expanded, thin lip is white, the throat ochre-brown or red-brown, paler in the base. The specimen illustrated in fig. 75 measures: length 20, diam. of last whorl above aperture 5, length of aperture 4.5 mm., whorls 14⅓. Other specimens are smaller, with the same shape, sculpture and coloring: length 14.4, diam. 4.5 mm., whorls 11¾.

In a few shells before me the narrow longitudinal streaks are a little serrate on the upper side. These lead the way toward the following form.

5*a*. Var. LINEATISTRIGATUS Pils. n. v. Pl. 22, fig. 32.

Shaped like *M. richaudi*. White, with four brown spiral lines, which are faint or wanting except at their intersections with the unequally-spaced, brownish, longitudinal streaks, upon which they form oblong spots. Length 13.3, diam. 4, apert. 3.2 mm., whorls nearly 13. Other characters as described above for *M. richaudi*. It is more slender than *M. lineatus*, smaller, and with fewer spiral color-lines, though

there is a tendency to intercalate minor ones on the later whorls.

5*b*. Var. SUBLINEATUS Pilsbry, n. v. Pl. 24, fig. 87.

Shell similar to *M. lineatus* in shape, but the coloration is of narrow longitudinal streaks on a whitish ground. 2⅓ apical whorls blackish-brown. Last whorl with radially streaked base, a small, dark umbilical patch, and a subperipheral brown band, bordered with white above, as in *M. richaudi*. Length 19, diam. of last whorl above aperture 7, longest axis of aperture 5.5 mm., whorls 13.

St. Mark, Haiti (Henderson & Simpson).

Types in coll. of J. B. Henderson. It has the shape of *M. lineatus* and the coloration of *M. richaudi,* and might with almost equal propriety be referred to either. The preceding variety, *lineatistrigatus*, has the shape of *richaudi* with the color-pattern much as in *lineatus*.

Another form from St. Mark, in the Henderson collection, has numerous light brown streaks, which are shaded at the edges, not sharply defined; there is a narrow brown line below the suture, marked with a dark spot at the end of each oblique streak. The only specimen is broken and immature.

6. M. GABBI Pilsbry, n. sp. Pl. 23, figs. 50, 51.

Shell very narrowly rimate or imperforate, turrite with straight sides, being of about the size and shape of *M. lineatus*. White, with *a narrow dark chestnut band below the periphery*, and *two spiral series of chestnut spots above,* the upper one next to the suture. Base with numerous curved *radial streaks, connected near the periphery by a series of oblique dashes*. Ascending the spire the spots become sparse, and the color changes to *blue-black* near the smooth, black-brown protoconch. Surface glossy, finely and regularly striate on the upper whorls, smoother and sculptured with slight growth-lines only on the later two whorls. Whorls about 12½, slightly convex, the last rounded. Aperture ovate, the outer lip thin, simple, the columellar lip dilated and reflexed above; parietal wall covered with a transparent film only.

Length 18.7, diam. 7.3 mm.; length of apert. 6 mm.

Length 18, diam. 7 mm.; length of apert. 5 mm.

Santo Domingo (Gabb).

Closely related to *M. lineatus* in shape and sculpture, but conspicuously unlike in pattern of coloring. The pattern of the base (fig. 51) is peculiar.

Group of M. tenuiplicatus.

7. M. DOMINICENSIS Crosse. Pl. 23, figs. 48, 49.

"Larger (than *signatus* Gldg.), with yellowish chestnut-fulvous streaks, which are transversely striated with white. Length 18, diam. 8⅓ mm." (*Pfr.*)

Haiti (Pfr.).

Bulimus guildingi, var. 1, PFR., Conchyl. Cab., Bul., p. 129, pl. 42, f. 13-15.—*Macroceramus signatus,* var. *b, dominicensis* CROSSE, Journ. de Conch., 1891, p. 131.

Crosse has given a name to the form figured by Pfeiffer, which is still without adequate description. He says that it has been collected by Hjalmarson in the neighborhood of Puerto Plata and of Jamao, on tree trunks. Typical *M. signatus* is quite a different thing, and has not been found in Haiti or Santo Domingo. The Cuban *M. clerchi* seems to be marked somewhat like *dominicensis.*

8. M. FORMOSUS (Wood). Pl. 22, figs. 29, 30, 31.

Shell shortly but deeply rimate, oblong-ovate, solid. White, marked with *brown spots in obliquely vertical rows,* usually three spots in a row, formed by the wide interruption of three bands; the spots sometimes united by lines, enclosing a pair of white spots; the *last whorl has five spiral bands, the 3 upper ones interrupted,* the lower bands usually continuous and crossed by several radial streaks; summit becoming blue-black and then *black on the glossy* 2⅓ *nepionic whorls.* Surface but slightly glossy, densely and finely striate above, smoother on the later whorls. Whorls about 10, moderately convex, the last rounded and without trace of a basal keel. Aperture vertical, the outer lip thin, a little expanded, columellar lip dilated.

Length 15-16.5, diam. 6.3 mm.

Santo Domingo: Arroyo hondo (A. Sallé); Buliodinero (Lafont, *teste* Férussac).

Turbo formosus Wood, Index Testac., suppl., p. 19, pl. 6, f. 24 (1828); Edit. Hanley, p. 223 (1856).—*Bulimus formosus* Wood, Pfr., Symbolæ ad Hist. Hel., iii, 84; C. Cab., p. 127, pl. 42, f. 4-6; Monogr., ii, 80; iii, 362.—Desh. in Fér. Hist., p. 101, pl. 150, f. 21-23.—Reeve, C. Icon., *Bul.*, pl. 64, f. 448.—*Macroceramus f.*, Petit, J. de C., i, p. 379.—Pfr., Monogr., iv, 687; vi, 344.—Crosse, J. de C., 1891, p. 130.—*Helix pupiformis* Fér., Prodr., no. 492, p. 71, according to tradition.—*Bulimus cylindricus* Gray, Annals of Philos., ix, 1825, p. 414.

The wide spire, rapidly tapering above and contracted near the black summit, are characteristic. Wood's type had chain-like markings, like fig. 29, but they are often undeveloped, as in fig. 31.

Probably Gray's *M. cylindricus* (1825) was based upon this species, though subsequently Gray himself confused it with *M. signatus*, and Reeve and Pfeiffer identified it as *M. lineatus*. The translation of Gray's original description follows: "Shell conic-cylindric, perforate, whitish, densely concentrically striate, ornamented with 6 interrupted brown bands; whorls 9 or 10, a little convex; aperture nearly round, peristome thin; length six-tenths, diam. three-tenths of an inch." As so expert a conchologist as Pfeiffer failed to recognize this as *formosus*, it would, perhaps, be inadvisable to insist upon the identification and displace the name given by Wood, which was unmistakably defined by a good figure. Férussac's *Helix pupiformis* was not described.

9. M. tenuiplicatus (Pfeiffer). Pl. 22, figs. 33, 34, 35.

"Shell subrimate, oblong-turrite, rather solid, longitudinally subarcuately, delicately plicate; opaque, chalky, ornamented with chestnut streaks, interrupted or in three ranges. Spire long, with somewhat convex outlines, the apex acute, black; suture nearly simple. Whorls 12, a little convex, the

last a little narrower, rounded, about equal to one-fourth the length, having two chestnut basal bands. Columella obsoletely folded. Aperture subvertical, lunate-rounded, the peristome thin, with converging margins; right margin sinuous, with a thread-like expansion, columellar margin dilated. Length 18, diam. 6.5 mm.; apert. 4.66 mm. long, 4.33 wide." (*Pfr.*)

Santo Domingo: Ocoa (Sallé).

Bulimus tenuiplicatus PFR., Conchyl. Cab., p. 129, no. 170, pl. 42, f. 18, 19; Monogr., iii, p. 363 (1853); P. Z. S., 1852, p. 139 (1854).—*Macroceramus t.* PFR., Monogr., iv, 688.—CROSSE, J. de C., 1891, p. 130.

The original description is given above. The specimens figured were received from Sallé, and are doubtless part of the original lot.

The shell is slender, with almost straight lateral outlines, the convexity mentioned by Pfeiffer being barely perceptible. 2½ smooth apical whorls are purplish-brown, the rest being whitish, with a more or less developed pattern of small spots in three spiral series, and arranged along narrow, oblique, brown streaks; and there is a narrow band below the periphery, a small spot at the axis, and another band midway of the base, which is also radially streaked. This pattern may be either quite distinct or very much reduced. The sculpture is a fine, close striation throughout, the striæ as wide as their intervals. Specimens measure: 16.3 x 5.3, apert. 4.3 mm.; 19 x 5.6, apert. 4.3 mm.; 15.5 x 5.5, apert. 4 mm. Whorls from 11 to 12½.

9*a*. Var. SWIFTIANUS Pilsbry, n. v. Pl. 23, figs. 52, 53, 54.

Shell shortly, openly rimate, turrite, with the shape of *M. lineatus*. White, with a *dark band below the periphery, two narrower bands above it*, continuous or *interrupted*, and on the base there is *a band within the umbilical area and another midway between that and the subperipheral band;* all of the bands crossed by rather *widely and irregularly-spaced longitudinal lines*. Early whorls blackish-brown or purplish. Sculpture of *rather coarse, but low, close striæ throughout*

the shell, except on the smooth protoconch. Whorls somewhat convex, the last well rounded. Aperture nearly round, somewhat oblique, the outer lip a trifle expanded, columellar lip dilated.

Length 16, diam. 7.5, apert. 4.5 mm.; whorls 11¾.

Length 18, diam. 6.6, apert. 4.8 mm.; whorls 10 (truncate).

Santo Domingo (Gabb, Sallé).

This form differs from *M. tenuiplicatus* chiefly in being much more coarsely plicate-striate, and in its more robust shape. It is much more coarsely striate than *M. lineatus* or *gabbi*, and differs notably from both in the color-pattern, which is constant, in the main, in 11 specimens from three sources before me. Those from Gabb (fig. 54) have fewer longitudinal dark lines and are larger than the shells received from Sallé, in the Robert Swift collection (figs. 52, 53). I believe that this species is what Weinland mistook for *lineatus* when he described var. *glabrata;* and the loeality Azua, Santo Domingo, quoted by Crosse for *M. lineata*, probably pertains to this form.

Group of M. klatteanus.

10. M. CYRTOPLEURUS (Pfeiffer). Pl. 24, figs. 77, 78.

"Shell subperforate, oblong-turrite, rather solid; *strongly ribbed*, the ribs curved; somewhat glossy; white, painted with *round, brownish-corneous spots in somewhat oblique rows.* Spire with *somewhat convex lateral outlines*, turrite, the apex acute, pale corneous; suture simple. Whorls 12, moderately convex, the last a little narrower, slightly exceeding one-fourth the whole length, having a thread-like keel and ornamented with a narrow, corneous basal band. Columella very slightly folded. Aperture somewhat oblique, lunate-subcircular; peristome thin, with somewhat converging margins, the right margin very much arched, only a trifle expanded, the columellar margin dilated. Length 15, diam. 4.75 mm.; oblique length of aperture 4, width 3.5 mm." (*Pfr.*)

Santo Domingo: Barrero (A. Sallé). Type from Cuming collection.

Bulimus cyrtopleurus PFR., Conchyl. Cab., p. 126, no. 165,

pl. 42, f. 1-3; Monogr., iii, p. 364 (1853); P. Z. S., 1852, p. 139 (June 27, 1854).—*Macroceramus c.* PFR., Monogr., iv, 688.—CROSSE, J. de C., 1891, p. 132 (exclusive of loc. *Rio Amina*).

Pfeiffer's description is given above (the italics being my own), and his figures of the type are copied. I have not seen the species, which must be closely related to *M. ludovici* and the smaller *M. klatteanus.*

11. M. LUDOVICI (Pfeiffer). Pl. 22, figs. 36-40.

Shell shortly rimate, turrite, solid; outlines of the spire more or less convex. White, with a narrow dark-brown *band below the periphery* of the last whorl, and having *a series of brown spots at the periphery and above the sutures;* sometimes with some oblique chestnut streaks and scattered spots or dots; and there is *a brown patch around the umbilicus.* Some, or all, of these markings may be absent or reduced. Surface smoothish, sculptured with growth-lines only, except the upper third or half, where there are fine, thread-like striæ. The *apical whorls are pale corneous,* sometimes broken off. Whorls 10 to 12, convex, separated by a smooth, impressed suture; the last whorl is more or less compressed laterally, and has no basal keel. Aperture about one-fourth the length of the shell, vertical, brown inside, oval, the outer lip slightly and narrowly expanded, columellar lip spreading.

Length 17, diam. 4.5, apert. 4 mm. long.

Length 14, diam. 4.3, apert. 3.6 mm. long.

Santo Domingo: Nicayagua (Sallé).

Bulimus ludovici PFR., Monogr., iii, p. 364 (1853); Conchyl. Cab., p. 130, pl. 42, f. 20-22; P. Z. S., 1852, p. 139 (1854).—*Macroceramus l.* PFR., Monogr., iv, p. 688.—CROSSE, J. de C., 1891, p. 132.

The small size of the brown aperture, the smoothness of the lower whorls, and the color-pattern, distinguish this species from *M. tenuiplicatus.*

There is a variety, pl. 22, figs. 41, 42, 43, in which the shell is smaller, more attenuate and acute above, with the surface delicately thread-striate throughout. There are about 9½

whorls, the first 2½ pale, next one dark; the coloration of the rest being about typical, though often more profusely streaked with blackish-brown. Length 11, diam. 3.7 mm., length of aperture 3 mm. It looks a good deal like *M. gundlachi* of eastern Cuba. These specimens were collected in Santo Domingo by Gabb; exact locality unrecorded.

12. M. KLATTEANUS Bland. Pl. 22, figs. 44-47.

"Shell rimate, oblong-turrited, rather solid, obliquely ribbed; whitish, with chestnut-colored, interrupted stripes and spots. Spire elongate, apex whitish; suture subcrenulated. Whorls 10, rather convex, the last rounded, compressed at the base near the aperture; one interrupted dark band below the periphery. Aperture diagonal subcircular; peristome white, obtuse, with approximating margins, right margin subarcuate, columellar margin scarcely dilated. Length 11, width 4 mm.; aperture 3 mm. long." (*Bld.*)

Haiti: near Port-au-Prince (Mrs. Wm. Klatte; Henderson and Simpson).

M. klatteanus BLD., Ann. of the Lyc. of Nat. Hist. of New York, xi, p. 83 (Feb., 1875).—PFR., Monogr., viii, p. 418.—CROSSE, J. de C., 1891, p. 130.—*Macroceramus nitidulus* MALTZAN, Nachrichtsblatt der deutschen malak. Ges., 1888, p. 178.—CROSSE, J. de C., 1891, p. 133.

The original description is copied above, and fig. 47 represents one of the original specimens, received from Bland. It is about the size of *M. hermanni*, but differs from that in the tapering shape, stronger sculpture and coloration. The last whorl is widest, the whole spire tapering to the apex, which may be whitish, but is ordinarily brown; and the lateral outlines are slightly convex. The sculpture is of rather strong, but low, curved riblets, the spaces between having more or less distinct hammered impressions. The shell may be white, with sparse spots in pairs, and a brown subperipheral band, or it may be light gray-brown with darker vertical streaks at unequal intervals, formed by coalescence of spots, each streak with a cream-white border on the right side; these darker shells having a subperipheral band and umbilical spot

of brown. The suture is either weakly crenulate or not perceptibly so. The last whorl shows a distinct but low keel, defining the base.

M. klatteanus is closely related to *M. ludovici*, agreeing with that in shape and general pattern of color; but it is a smaller shell, and much more coarsely sculptured. It is apparently an abundant species around Port-au-Prince, where Messrs. Henderson and Simpson took it copiously, figs. 44, 45, 46 representing well-colored shells from Henderson's collection.

M. nitidulus Maltz., described from Port-au-Prince (H. Rolle coll.), is a synonym of *M. klatteanus*. It is thus described:

"Shell very narrowly rimate-perforate, long-conic, thin, rather glossy, obliquely rib-striate. the striæ but slightly projecting, intervals malleate; whitish, marked dimly with tawny between the ribs, and regularly painted with interrupted brown streaks. Whorls 10, a little convex, regularly increasing, separated by a linear suture; the last whorl slightly larger, obsoletely angular basally, and encircled with an interrupted brown band below the angle. Aperture small, subvertical, lunate-oval, the peristome simple, margins distant, the columellar margin slightly reflexed. Length 10, diam. 4.5 mm." (*Maltzan.*)

13. M. UNICARINATUS (Lamarck). Pl. 15, figs. 12, 13.

"Shell cylindric-tapering, acute-conic above; whitish-gray; having obsolete longitudinal striæ; last whorl encircled with a small keel; aperture toothless; lip thin, the margin reflexed. Length about 7 lines." (*Lam.*)

Pupa unicarinata LAM., Anim. s. Vert., vi, p. 107, no. 10 (1819); edit. Deshayes, viii, p. 173 (1838).—DELESSERT, Recueil de Coq. de Lam., pl. 27, f. 4.

Known only by Lamarck's description and Delessert's figures of his type specimen. In my opinion these indicate a shell very similar to the Haitian *M. costatus*, which, indeed, may prove identical; but *M. microdon* also resembles *unicarinata* somewhat. Pfeiffer's identification of Lamarck's species with the Cuban *M. canimarensis* does not seem to me

at all probable. Lamarck gave the locality "Guadeloupe," which is almost certainly wrong.

14. M. COSTATUS Maltzan. Pl. 15, fig. 11.

"Shell narrowly perforate, conoid; buff-whitish, profusely spotted and tinted with ashy-brown; sculptured with distinct, irregular ribs, obsoletely striated spirally between the ribs. Whorls 12-13, regularly increasing, a little convex, separated by an impressed, somewhat irregular suture, the last whorl slightly tapering, encircled with a projecting basal keel, marked with a brown band. Aperture ovate-circular, lightly truncate-emarginate above, subvertical; peristome simple, thin, the outer margin straightened, below and at the base expanded and slightly reflexed; margins distant, the columellar margin reflexed, appressed. Length 14, diam. of last whorl 5 mm." (*Maltz.*)

Haiti: Gonaives (H. Rolle).

M. costatus MALTZ., Nachrichtsblatt d. deutschen malak. Ges., xx, p. 178, no. 3 (Dec., 1888).—CROSSE, J. de C., 1891, p. 133, pl. 2, f. 2.

This is a rather straightly turrited, ribbed shell, related to *M. ludovici* and *klatteanus*, and perhaps identical with *M. unicarinatus*. I have not seen specimens.

15. M. ANGULATUS Weinland & Martens.

"Shell *perforate*, conic-turrite, thin, obliquely striatulate, glossy; white, with longitudinal interrupted corneous streaks, the apex pale; *suture crenulate;* whorls 9, rather flattened, the *last not narrower, having a very obtuse white basal keel, convex below the keel.* Aperture subquadrangular, scarcely one-third the length. Columella having *an ascending fold.* Peristome flattened, thin, white, the right margin arcuate, columellar margin dilated. Length 13, diam. 5 mm.; aperture 4 mm. long, 4 wide." (*Mart.*)

Haiti: environs of Jeremie (Weinland); Plaisance (H. Rolle).

M. angulatus W. & M., Malak. Bl., vi, p. 56 (1859).—PFR., Monogr., vi, p. 345.—CROSSE, J. de C., 1891, p. 132.

In contour resembling *M. signatus,* but nearest related to *M. unicarinatus, tenuiplicatus* and *gundlachi,* chiefly to be distinguished from these by the much weaker angle of the rounded last whorl, the more rapidly tapering cone and distinct columellar fold. The striation is stronger below the angle. The species is unknown to me except by von Martens' description and remarks, given above.

16. M. HERMANNI (Pfeiffer). Pl. 15, fig. 1.

Shell very shortly rimate, somewhat cylindric, with the upper third or half tapering, slender towards the apex; rather thin; white, dotted and *irregularly marbled with corneous, several early whorls brown* or corneous-brown. Surface glossy, rather irregularly and *coarsely striate, the striæ obtuse and low.* Whorls 10 to 11, slightly convex, separated by closely and *distinctly serrate or crenulate suture.* Last whorl rounded, with no trace of a basal keel. Aperture irregularly rounded-oval, whitish inside; outer lip very narrowly expanded, a little sinuous; columellar lip dilated. Axis slender and *distinctly twisted spirally* within.

Length 11, diam. 3.7 mm.; length apert. 2.8 mm.

Length 10, diam. 3.3 mm.; length apert. 2.3 mm.

Santo Domingo: Yaque (Sallé, type loc.); high on Mt. Cibao, near Matas (Hjalmarson).

Bulimus hermanni PFR., Monogr., iii, p. 366 (1853); Conchyl. Cab., p. 131, pl. 42, f. 33-35; P. Z. S., 1852.—*Macroceramus h.* PFR., Monogr., iv, 689.—CROSSE, J. de C., 1891, p. 132.

Distinct by the closely crenate suture, thin texture, the absence of a basal band and the corneous maculation, which may be either copious or sparse. The apical 2⅓ whorls are smooth, as usual in this group.

17. M. SUBCYLINDRICUS Pilsbry, n. sp. Pl. 24, figs. 82-86.

Shell shortly rimate, *cylindric,* the upper third (or half) tapering to the apex, which is dark brown (but light in individuals which have vacated the apical whorls). Cream-whitish, usually somewhat brown tinted in places, *irregularly and rather copiously streaked with corneous-brown,* the base

corneous-brown, sometimes defined by a slightly darker band. Surface slightly or not glossy, *very finely and closely sculptured with thread-like oblique striæ*, which usually crenulate the sutures a little. Whorls convex, the last having a *very low* basal keel, sometimes wanting, defining the very convex base. Aperture subcircular, slightly oblique, built forward to the anterior outline of the shell. Peristome slightly expanded and thickened, whitish, dark-bordered within, the margins approaching; columellar margin arcuate, dilated, generally *concave* between the columellar fold and the margin. Axis slender, distinctly twisted spirally within.

Length 15, diam. 4.5, apert. 3.6 mm.; whorls 11.

Length 15, diam. 4, apert. 3.3 mm.; whorls 12⅓.

Length 11, diam. 4, apert. 3.3 mm.; whorls 9½.

Santo Domingo (Gabb); near the Amina river (Robert Swift coll.).

? *M. cyrtoplcurus* and *M. gundlachi*, specimens from "près du Rio Amina, sur un gazon court (Hjalmarson)," CROSSE, Journ. de Conchyl., 1891, p. 132.

Very much more finely striated than the smaller *M. hermanni*, which agrees in having a convex base and very weak or obsolete keel. About 30 specimens before me, collected by Gabb and others, agree closely in sculpture, except that in a few shells the thread-like striæ are more spaced on the last whorl or two. The size of the shell and the length of the terminal cone vary somewhat widely.

Gabb also collected a very small form apparently referable to *M. subcylindricus*, measuring 9 to 10 mm. long, 3 wide, with about 10½ whorls; but unfortunately he gave no locality but Santo Domingo. The axis is distinctly spiral, as in the type form.

EAST AND CENTRAL CUBAN SPECIES.

I. Base of shell rounded, not carinate.

1. Periphery bordered below with a dark band, another at or around the umbilicus; outer lip more or less expanded. Group of *M. pazi*, sp. no. 18 to 22.
2. Obliquely streaked on an opaque whitish ground, or

with a series of spots above the periphery; apical whorls often amputated; the early post-embryonic whorls sharply striate, usually dark colored.

Group of *M. pupoides*, sp. no. 23 to 32.

II. Base of shell carinate; shell thin, smoothish, with persistent apex, the following whorls not distinctly striate; peristome expanded.

Group of *M. canimarensis*, sp. no. 33 to 35.

Group of M. pazi.

Forms related to the group of *M. pupoides*, but with a dark band below the periphery and usually another at or around the umbilical region. Last whorl rounded, not carinate. Lip usually more or less expanded.

Eastern Cuba. This group is intermediate between the Haitian groups of *M. lineatus and klatteanus*. The first two species somewhat resemble the group of *M. canimarensis* by the smooth spire and expanded lip, while the last three approach the group of *pupoides*. The protoconch is like that of the *pupoides* group, and is often deciduous.

I. Upper post-embryonic whorls not more striate than the last whorl; shell smooth and glossy.
   a. Length of aperture more than one-third that of the shell; outer lip well expanded. *M. pazi*, no. 18.
   b. Length of aperture less than one-third that of the shell; an elaborate color-pattern of bands and streaks. *M. pictus*, no. 19.

II. Upper post-embryonic whorls more distinctly and regularly striate than the last whorl; surface somewhat dull.
   a. Shell conic; length of apert. slightly more than one-third that of shell; length 11-14 mm. *M. parallelus*, no. 20.
   b. Shell turrite; apert. less than one-third length of shell; marked with 3 series of squarish dots, sometimes coalescent in bands and streaks; length 15-17 mm. *M. clerchi*, no. 21.
   c. Shell turrite; apert. contained 3½ to 4 times in length of shell; whorls streaked; length 14-15 mm. *M. gundlachi*, no. 22.

18. M. PAZI ' Gundlach ' Pfr. Pl. 21, figs. 7, 8, 9, 10, 12.

Shell shortly rimate, high-conic, rather solid. Whitish, with *a dark chestnut band below the periphery, another around the umbilical area,* the base elsewhere radially streaked; above the periphery there are usually several lighter bands, or *bands of spots on oblique streaks,* sometimes wanting; *apical whorls perfect, black-brown.* Surface glossy, almost smooth. Spire straightly conic, the whorls but slightly convex, the last well rounded. *Suture with a crenulate border* below. Aperture slightly oblique, brown or ochraceous within, the peristome white, *thin-edged, rather widely expanded,* the columellar margin *triangularly reflexed and excavated* at the insertion.

Length 15, diam. 6.5 mm., whorls 9½.

Length 11, diam. 5 mm., whorls 9.

Eastern Cuba: Guisa, in the dist. of Bayamo, and at Ramon and Aguadores, near Santiago (Gundlach).

M. pazi Gundl., in PFR., Malak. Bl., v, 1858, pp. 43, 182.—PFR., Novit. Conch., p. 381, pl. 89, f. 1-5; Mal. Bl., xi, 1864, p. 126; Monogr., iv, p. 687; vi, 345.—ARANGO, p. 80.

The peristome is more expanded, and the columellar lip more flatly reflexed than in *pictus* and *parallelus,* both of which are very closely related to *pazi.* There is wide variation in the color-pattern, which is sometimes reduced to the two basal bands. A whorl or two below the brown apical whorls are broadly flamed with brown and white.

19. M. PICTUS ' Gundl.' Pfr. Pl. 20, figs. 4, 5.

Shell shortly rimate, turrite, slightly solid. Whitish, with a dark chestnut band below the periphery, another around the umbilical area, the rest of the base being radially striped, and having *three dilute-brown bands above, crossed by chestnut streaks, which are toothed on the right side at the positions of the bands. Apical 2 or 2½ whorls generally lost,* but when retained they are smooth and pale, with a reddish crown; following whorl blackish, the next 2 or 3 dark and white flamed. Suture crenulate. Surface weakly striate on the earlier whorls, smoother and glossy below, the last one

rounded. Aperture brownish and banded inside, lip pale, very slightly expanded, thin; columellar margin dilated above.

Length 13.5, diam. 4.8 mm., whorls 11 (entire).

Length 14.5, diam. 5 mm., whorls 9½ (truncate).

Length 12.3, diam. 5 mm., whorls 8½ (truncate).

Eastern Cuba: Yateras, on trees and cliffs (Gundlach); Jibara (Arango); Farallones (Wright).

M. pictus Gundl. in Pfr., Malak. Bl., vi, 1859, p. 93, no. 60; Monogr., vi, p. 348.—Arango, Fauna, p. 82.

Has some resemblance to the Haitian *M. lineatus*, but is most closely related to *M. pazi*, from which it differs in the less expanded peristome, more elaborate color-pattern and more striate surface. Figured specimens are from Farallones.

20. M. PARALLELUS ' Arango ' Pfr. Pl. 21, figs. 15, 16; pl. 20, fig. 9.

Shell very shortly rimate, ovate-turrite, cream-white, with a *dark brown band below the periphery*, its lower edge denticulate, and a *small dark umbilical patch;* above the periphery there is a *single spiral row of small brown dots, each connected with a narrow oblique streak* toward the suture above. Early whorls usually truncate, the next two or three dark-flamed. Surface striate above, the last whorl smoother, sometimes weakly malleate. Spire straightly high-conic, the suture finely crenulate, at least above. Whorls 7-8 in truncate, 9-10 in entire shells, but slightly convex, the last rounded at the periphery and below. Aperture slightly oblique; peristome very slightly expanded, the columellar margin widely dilated and reflexed, its face a little excavated.

Length 11.5-13, diam. 5.5 mm.

Length 14, diam. 6 mm. (type).

Eastern Cuba: Cape Maisi, on spiny plants (Arango).

M. parallelus Arango mss., Pfr., Malak. Bl., xiii, 1866, p. 59; Novit. Conch., p. 402, pl. 93, f. 9, 10; Monogr., vi, p. 347. —Arango, Fauna, p. 81.

Closely related to *M. pazi* and *pictus*, but distinguished by the rather faint, golf-stick-shaped markings of the upper

surface, and the reduced umbilical patch. There is sometimes another row of spots above the wide dark band.

21. M. CLERCHI ' Arango ' Pfr. Pl. 21, figs. 27, 28, 29.

Shell perforate, oblong-turrite, rather solid, lightly striate, somewhat glossy; white, encircled by series of chestnut spots. Spire nearly regularly turrite, the apex buff, rather obtuse, suture slightly subdenticulate. Whorls 12, a little convex, the last rounded, ornamented with a blackish band below the middle. Aperture subvertical, rounded-lunar; peristome simple, the margins slightly converging, right margin narrowly expanded, columellar margin reflexed, spreading, distinctly folded within. Length 17, diam. 6 mm., aperture 4.5 mm. long. (*Pfr.*)

Eastern Cuba: at the mouth of the Tacre river (type loc.), Cajobabo and Imias, dist. of Baracoa; also Jauco and Jojo (Arango).

M. clerchi Arango mss., PFR., Malak. Bl., xiii, 1866, p. 61, no. 20; Novit. Conch., p. 382, pl. 89, f. 6-8; Monogr., vi, p. 345.—ARANGO, p. 80.

Pfeiffer's description is given above, and his figures are copied on my plate. He remarks that it stands about midway between *M. pazi* and *M. gundlachi*, but is very different from both in mouth and peristome, and from other similar species in wanting a keel.

Two and a half apical whorls are smooth, white, with a brown crown. They are often lost in adults. The next whorl is of the same color but striate, and several whorls following are blue-blackish. These early whorls are closely striate, but the last 2 or 3 whorls are nearly smooth. The last whorl has a black-brown subperipheral band, its lower edge often serrate, and three spiral series of squarish chestnut spots, arranged in oblique, irregularly-spaced series. Some specimens have very few of these spots, while in more heavily-colored examples the spots may be partially united into spiral bands and oblique streaks. In one shell before me there is a faint trace of an umbilical dark patch.

22. M. GUNDLACHI (Pfeiffer). Pl. 20, figs. 1, 2, 3.

Shell rimate, oblong-turrite; whitish, sparsely marked with *dark brown stripes,* which are either continuous or interrupted, or have *two or three projections on the right side;* a narrow dark band usually revolving below the periphery. Surface striate on the early whorls, becoming smoother or smooth on the later ones, but the striæ reappear on the base. Suture finely crenulate on the upper part of the spire, or sometimes throughout. Spire long, with straight lateral outlines. Whorls 11 in entire to 8 in some truncate specimens, the first 2½ smooth, globose and glossy, pale; next whorl usually dark; last whorl globose, with a weak subperipheral carina. Aperture small, brown within, the lip whitish, acute, unexpanded; columellar margin a little dilated. Axis slender and straight.

Length 14, diam. 4.8 mm.; length of aperture 4 mm.

Length 15, diam. 5.66 mm.; length of aperture 5 mm. (type).

Eastern Cuba: Punta de San Juan de los Perros (type loc.), Cayos de Cardenos and Guisa, in Bayamo district (Gundl.); Holguin (Clerch).

Bulimus gundlachi PFR., Zeitschr. f. Malak., 1852, p. 174, pl. 1, f. 29-33; Monogr., iii, p. 365.—*Mac. gundlachi* PFR., Malak. Bl., 1854, p. 193; Monogr., vi, p. 348.—ARANGO, Fauna, p. 82.—CROSSE, J. de C., 1890, p. 204.

In length it varies from 12 to 15 mm.; and the fine costulation may extend over all but the last whorl or be confined to the upper ones only. It is less solid and calcareous than related Cuban species. If it occurred in Haiti, it would be grouped with *M. klatteanus.* Pfeiffer's original is copied in my fig. 1.

Group of M. pupoides.

Shell rimate, rather solid, *opaque whitish,* usually streaked obliquely, or with a series of spots at the periphery and above the suture; no dark band below the periphery or around the umbilical region. Surface varying from ribbed to smoothish, but *the post-embryonic whorls are always rib-striate and*

usually blue-black and maculate. Last whorl rounded, not distinctly carinate. Peristome not expanded or but feebly so, the columellar margin in a plane with the outer lip. Protoconch of 2⅓ smooth whorls, frequently deciduous in the adult stage.

A group of closely related forms confined, so far as is known, to the province of Santiago. Sculpture is inconstant in many of the species, both ribbed and smoothish forms occurring together. Most of those known are from the southern coast.

Hardly differing from the Haitian group of *M. klatteanus,* except in wanting a subperipheral band; but this is occasionally absent in Haitian species.

23. M. CLAUDENS 'Gundl.' Pfr. Pl. 21, figs. 21-26.

Shell rimate, ovate-turrite, solid, smoothish, under a lens showing some faint growth-lines and often a close malleation. Bluish or fleshy-white, typically marked with irregular, more or less interrupted tawny streaks; several of the early whorls bluish and finely striate. Whorls about 11 in perfect, 8-9 in truncate shells, the first 2⅓ smooth, white with a brownish top, globose. Last whorl rounded. Aperture vertical, oval, dark within, the peristome whitish, very slightly expanded, obtuse; parietal callous thin.

Length 17, diam. 6.2 mm. (truncate).

Length 15.5, diam. 6 mm. (entire).

Length 14, diam. 6 mm. (truncate).

Eastern Cuba: Caimanera (type loc.), Yateras and Oeujal, in the dist. of Guantanamo, on shrubs (Gundlach).

M. claudens Gundl. mss., PFR., Malak. Bl., vi, 1859, p. 93; Novit. Conch., p. 388, pl. 89, f. 34-39; Monogr., vi, p. 351.—ARANGO, Fauna, p. 85.

A large, solid, high-conic species, with the last whorl wider than in the related forms. There are several color-forms, as follows: (1) Bluish-white, with scattered blue-gray dots and streaks (figs. 23, 24). (2) Larger, 18-21 mm. long, with some black-brown stripes among the tawny ones (figs. 25, 26).

24. M. PUPOIDES Pfeiffer. Pl. 20, figs. 13, 14.

Shell deeply rimate, pupiform, the spire being somewhat thickened, with convex outlines; solid; blue-white with a series of blackish spots at the periphery and above the suture, and often with a few faint brown streaks. Surface glossy, finely, very closely and regularly striate, varying to nearly smooth on the later whorls. 7 to 8 whorls remain, the earlier ones being lost; they are convex, the last well rounded, not keeled or only faintly so. Suture finely and regularly crenulate, usually with a cream-white border below. Aperture small, rounded; peristome thin, whitish, very narrowly expanded; parietal callous thin.

Length 14, diam. 5.6 mm.

Length 12.5, diam. 5 mm.

Eastern Cuba: Hacienda San Antonio, on the road from Guantanamo to Baracoa (Wright, type loc.); Imias, district of Baracoa (Arango).

M. pupoides PFR., Malak. Bl., xi, 1863, p. 15; Monogr., vi, p. 347.—ARANGO, Fauna, p. 81.—*M. poeyi* PFR., Mal. Bl., xi, p. 126; Novit. Conch., p. 403, pl. 93, f. 11-15; Monogr., vi, p. 347.

A larger shell than the closely related *M. jeannereti*, with the spire more robust The synonymous *M. poeyi* Pfr. (pl. 21, figs. 5, 6, 30, 31, 32), from the type locality of *pupoides*, is merely a form in which the striæ are obsolete on the later whorls, while typical *pupoides* is closely striate throughout. This is a trivial variation, common to most of the related species, and it is evident from the lots before me from Wright, Gundlach and Arango, that the smoothish and striate shells occur together.

25. M. JEANNERETI 'Gundl.' Pfr. Pl. 21, figs. 13, 14.

Shell rimate, oblong-turrite, solid, regularly rib-striate, the last whorl often smoother. Whitish or blue-white, with a series of black-brown spots at the periphery and above the suture on the last two or three whorls; usually reddish-brown or purplish near the truncate apex, on the second

sculptured whorl. Spire with more or less convex lateral outlines, the apex obtuse. Whorls 9½ to 11 in entire, 7 to 9 in truncate shells, the first 2⅓ whorls smooth, pale; last whorl rounded, sometimes obtusely carinate. Aperture small, but slightly oblique, nearly round, either pale or with a dark band inside. Peristome acute, unexpanded.

Length 12, diam. 4.3, length apert. 3.3 mm. (truncate).

Length 12, diam. 4, length apert. 2.8 mm. (entire).

Length 9.5, diam. 3.3, length apert. 2.5 mm. (entire).

Length 14, diam. 5, length apert. 4 mm. (type).

Eastern Cuba: Santiago, on plants (Gundlach).

M. jeannereti Gundl. in PFR., Malak. Bl., v, 1858, p. 182; Novit. Conch., p. 405, pl. 93, f. 22, 23; Monogr., iv, p. 688.—ARANGO, Fauna, p. 82.—*Megalomastoma pupinum* Gundl. mss., POEY, Memorias, ii, pp. 10, 89.—*Macroceramus pupinus* Gundl. mss., ARANGO, in Poey's Repertorium, ii, p. 82, and in many collections.

This species is closely related to *M. pupoides* and *M. festus*, but both of these are nearly smooth, while *jeannereti* is strongly ribbed. *M. costulatus* differs by its continuous peristome. The suture in *M. jeannereti* is slightly crenulated by the ribs.

26. M. CRENATUS 'Gundl.' Pfr. Pl. 20, figs. 21-24.

Shell subperforate, oblong-ovate, solid, striatulate and obsoletely pitted; blue-whitish, irregularly painted with corneous spots, especially towards the apex. Spire ovate-conic, shortly truncate; suture coarsely and unevenly crenate. Whorls remaining 7, a little convex, the last encircled by one or two elevated ridges, and banded with chestnut below the middle, somewhat constricted in front, somewhat descending. Aperture a little oblique, irregularly, subtransversely oval; peristome simple, unexpanded, obtuse, continuous. Length 8.5, diam. 4 mm., oblique length of aperture 2.5 mm. (*Pfr.*).

Eastern Cuba: Santiago de Cuba (Gundlach), and Juragua, a short distance eastward (Jeanneret).

M. crenatus Gundlach mss., Pfr., Malak. Bl., xi, 1863, pp. 16, 127; Novit. Conch., p. 384, pl. 89, f. 15-19; Monogr., vi, p. 353.—Arango, p. 86.

Not known to me by specimens.

27. M. festus 'Gundl.' Pfr. Pl. 20, figs. 15-18.

Shell rimate, oblong-turrite, solid, the upper whorls rib-striate, later ones *nearly smooth*. Bluish or fleshy-white, one or two early post-embryonic whorls dark, the following ones more or less streaked indistinctly, last whorl uniform or with a peripheral series of blackish spots or streaks. Spire long, a little swollen in the middle, the apex generally truncate; when retained it is smooth and whitish. Whorls 10-11 in perfect, 7-8 in truncate shells; slightly convex, the last well rounded, somewhat contracting at the aperture. Suture crenulate, at least above the middle of the shell. Aperture subvertical, obliquely oval, dark within, the lip obtuse, not expanded, continued in a thick callous across the parietal wall.

Length 8 to 12, diam. 4 mm., whorls remaining 6 to 9.

Length 10.5 to 13.3, diam. 5 mm. (types).

Eastern Cuba: Caimanera, dist. of Guantanamo, and on both sides of the mouth of the bay, on bushes (Gundlach).

M. festus Gundl. mss., Pfr., Malak. Bl., vi, 1859, p. 94, no. 62; Novit. Conch., p. 386, pl. 89, f. 25-28; Monogr., vi, p. 352.—Arango, p. 85.

M. festus is closely related to *M. costulatus*, from which it differs in being somewhat larger and smoother, but there are some intermediate forms. *M. jeannereti* is generally more spotted, but differs chiefly in the thinner parietal callous, and different shape of the mouth. All of these species from the southern coast of the province of Santiago are very closely related, and probably will be connected by intermediate forms when more localities are worked up.

Some specimens of *M. festus* are quite prettily marked. On a ground color of pale ochre there are two blue-white bands, the upper one narrow, the lower one wider, at the

periphery, and interrupted with irregular blackish spots (fig. 18). The ordinary color is livid bluish-white, becoming fleshy on the spire, dark above, with but few dark spots at the periphery. They are often worn, and show dull, flesh-tinted patches.

28. M. COSTULATUS 'Gundl.' Pfr. Pl. 20, figs. 10, 11, 12.

"Shell rimate, oblong-turrite, solid, closely, somewhat obliquely ribbed; whitish, marked with brown streaks, which do not reach to the suture above. Spire regularly tapering, terminating in a corneous, acute apex, which is often deciduous. Suture deep, crenulated by the projecting ribs. Whorls 8 to 11, convex, the last contracted in front, the base indistinctly thread-keeled. Aperture vertical, obliquely oval, brown inside; peristome continuous, adnate, obtuse, the right margin unexpanded, very strongly arcuate above; columellar margin subappressed. Length 9-11, diam. 3.5-4.3, length of apert. 2.75 mm." (*Pfr.*)

Eastern Cuba: Caimanera, in Guantanamo (type loc.), and Punta Maisi (Gundlach).

M. costulatus Gundl. in PFR., Malak. Bl., vi, 1859, p. 94; xiii, 1866. p. 59; Novit. Conch., p. 387, pl. 89, f. 29, 30; Monogr., vi, 353.—ARANGO, Fauna, p. 385.

The original description is given above. The ribbed shell, contracted, obliquely oval aperture, with the peristome continued in *a strong ledge across the parietal wall*, are characteristic.

The ribs are often quite separated, as in pl. 20, fig. 10, and the spire frequently does not taper regularly, but is more rapidly attenuate above, somewhat swollen below. The protoconch, when retained, is white or whitish. The shell is often smaller than the original specimens.

Length 9, diam. 3.5 mm., whorls 10 (entire).

Length 8, diam. 3.5 mm., whorls 9 (entire).

29. M. INERMIS Gundl. Pl. 15, fig. 2.

Shell shortly rimate, long-turrite; white or whitish, nearly uniform or with indistinct, wide brown streaks, the earlier

whorls corneous. Surface nearly lusterless, closely rib-striate throughout. Whorls 9, convex, the last rounded, without basal keel. Suture simple. Aperture small, oblique; peristome not expanded, thickened and obtuse, the margins approaching above; columellar margin built forward, in the plane of the outer lip.

Length 7, diam. 2.5 mm.

Length 7.5, diam. 3 mm. (type).

Eastern Cuba: Santiago de Cuba, at the Aguadores (type loc.), and Lagunas, and at the Caimanera of Guantanamo, under and on stones (Gundlach).

M. inermis Gundl. in Pfr., Malak. Bl., v, 1858, p. 183, no. 19; Monogr., iv, p. 690; Novit. Conch., p. 407, pl. 93, f. 33-35. —Arango, Fauna, p. 84.

Smaller than any other known *Macroceramus* of eastern Cuba. It is closely rib-striate throughout, the riblets usually lighter than the ground. It is a smaller shell than the central Cuban *M. angulosus*, and is quite unlike that in the form of the columellar lip.

Binney, in Ann. N. Y. Acad. Sci., iii, p. 126, states that the radula of a specimen of *M. inermis* from Curacao, collected by Mr. J. S. Gibbons (*cf.* Gibbons, Journ. of Conch., ii, 1879, p. 136), is like that of *M. gossei*. The specimen could hardly have been really this Cuban species; it was evidently a superficially similar *Microceramus*, perhaps allied to or identical with "*Pincria*" *bonairensis* from the adjacent island of Buen Ayre.

30. M. arangoi Pfeiffer. Pl. 15, figs. 3, 4.

Shell subperforate, turriculate, rather solid, closely costulate, a little glossy; white, variously marked with dots and flames of corneous. Spire swollen-turrite, the apex white, acute; suture somewhat denticulate by the riblets. Whorls 9-10, a little convex, the last narrower, rounded, obtusely thread-carinate. Aperture oblique, irregularly rounded, the peristome simple, only a trifle expanded, the margins approaching, columellar margin slightly dilated, somewhat appressed. Length 8, diam. 3, height of aperture 2 mm. (*Pfr.*).

Eastern Cuba: Imias, in the district of Baracoa (Arango).

M. arangoi Pfr., Malak. Bl., xiii, 1866, p. 60; Novit. Conch., p. 387, pl. 89, f. 31-33; Monogr., vi, p. 353.—Arango, Fauna, p. 85.

Unlike *M. costulatus*, the brown flames often extend up to the suture. They are commonly interrupted. There is usually a narrow dark line below the hardly raised sub-basal keel, and the second ribbed whorl of the spire is bluish or purplish brown. The parietal callous is straight and not very thick. It is closely related to the more finely costulate *M. inermis*, and to *M. blaini*.

31. M. blaini ' Arango ' Pfr. Pl. 20, figs. 19, 20.

Shell subperforate, turriculate, solid, *lightly striate*, rather glossy, white. Spire subregularly tapering, the apex somewhat acute; suture deep, subcrenulate. Whorls 10 to 11, moderately convex, the last rounded, marked by *a blackish, somewhat interrupted band*, slightly contracted in front. Aperture slightly oblique, lunate-subcircular, the peristome simple, unexpanded, the columellar margin dilated above, a little reflexed. Length 8½, diam. 3 mm.; aperture scarcely 2 mm. high (*Pfr.*).

Eastern Cuba: Imias, dist. of Baracoa (Arango).

M. blaini Arango mss., Pfr., Malak. Bl., xiii, 1866, p. 60; Novit. Conch., p. 389, pl. 89, f. 40-42; Monogr., vi, p. 352.—Arango, Fauna, p. 85.

" Belongs to the group with the last whorl contracted in front," but distinguished by the sculpture, slender form and coloration. I have not seen specimens.

32. M. variabilis Pfeiffer. Pl. 20, figs. 25-28.

Shell subperforate, ovate-conic, solid, obliquely and rather closely, strongly ribbed; whitish. Spire swollen, attenuate above, the apex acute. Whorls 9, convex, the last somewhat constricted in front, not ascending. Aperture small, oblique, subdepressed-rounded; peristome somewhat thickened, unexpanded, continuous, adnate above and on the left side. Length 7, diam. 4 mm., aperture 1.66 mm. high. (*Pfr.*)

Eastern Cuba: Ojucal, on the way from Guantanamo to Baracoa, and in the cave of Malaño, both in the dist. of Guantanamo (Jeanneret).

M. variabilis Pfr., Malak. Bl., xi, p. 15, no. 70; Novit. Conch., p. 385, pl. 89, f. 20-24; Monogr., vi, p. 354.—Arango, Fauna, p. 86.

A smooth, tawny form with one white band was found with the typical ribbed form, and with transition forms. I have not seen the species.

Group of M. canimarensis.

The shell is rimate, thin, smoothish, the last whorl *distinctly carinate below the periphery:* the surface is smoothish, *but the last whorl becomes strongly striate beneath.* The peristome is thin, expanded throughout, the columellar margin built forward to the plane of the outer lip, and dilated. Protoconch of 2⅓ to 2½ whorls, smooth and globose, light with a brown apex, not deciduous; *the whorls succeeding it are pale and not distinctly striate.* Suture crenulate, at least above.

A group of eastern and central Cuba, extending west to Matanzas province. It is not closely related to any Haitian group. *M. microdon* has much the same form, but the axis is sinuous, not straight as in these Cuban species.

33. M. canimarensis (Pfeiffer). Pl. 23, figs. 61, 62.

Shell deeply rimate, *thin,* translucent gray-brown, copiously striped with opaque white, irregular flames, which do not pass below the white keel. Spire conic, its outlines straight above, a little convex below. Apex light gray-brown, obtuse; protoconch of 2½ smooth whorls moderately convex, obsoletely striate, nearly smooth, the last more strongly striate on the convex base and just above the *cord-like keel.* Suture distinctly crenulate. Aperture nearly round, the peristome thin, well expanded and a little reflexed.

Length 14-15, diam. 5.3 mm., whorls 10½.

Cuba: prov. Matanzas, in Canimar, at El Fundador and Tumbadero (Pfr.). Palma Sola (Poey). Prov. Santa Clara,

near Cienfuegos (E. F. Cabada). Also from further eastward: at Trinidad, and in prov. Santiago at Yateras (Gundlach), and Ermetano (Wright).

Bulimus canimensis (typog. err.) Pfr., Archiv. f. Naturg., 1839, i, p. 351.—*B. canimarensis* Pfr. in Phil., Abbild., i, p. 57, pl. 1, f. 11.—*Pupa unicarinata* Lam., Gld., Bost. Journ. N. H., iv, p. 490.—*Bulimus unicarinatus* Lam., Pfr., Monogr., ii, p. 80; iii, 366; Conchyl. Cab., p. 64, pl. 18, f. 10, 11.—*Macroceramus unicarinatus* Lam., Pfr., Monogr., vi, 346.—Reeve, C. Icon., v, pl. 66, f. 468.—Arango, Fauna, p. 81. Not *Pupa unicarinata* Lamarck.—*Macroceramus catenatus* Gundlach mss., Pfr., Malak. Bl., vi, 1859, p. 92; Novit. Conch., p. 401, pl. 93, f. 5, 6; Monogr., vi, 346.—Arango, Fauna, p. 81.

The white flames are sometimes interrupted in the middle, or dislocated to form a closely speckled pattern, fig. 62. Figure 61 represents a typical shell, received from Poey. The species has a wider range westward than its allies, apparently passing from Santiago through central Cuba to Matanzas province.

33*a*. Var. *catenatus* ('Gundl.' Pfr.). Pl. 21, figs. 19, 20; pl. 23, fig. 63.

Corneous-brown with indistinctly darker streaks, and a row of opaque white spots above the suture and at the periphery. Otherwise like *canimarensis*. Length 13, diam. 4.6 mm., whorls 10.

Eastern Cuba: Yateras, Monte Toro and Monte Libano, in the Guantanamo district (Gundlach); Ermetano, in the Cobre district (Wright).

Occurs at Ermetano with typical *canimarensis*, of which it is a mere color-variety.

34. M. notatus ('Gundl.' Pfr.). Pl. 21, figs. 1-4; pl. 23, fig. 64.

Shell shortly rimate, oblong-turrite, rather thin, obliquely striatulate, glossy; whitish, variously painted with corneous flames; spire almost regularly tapering, the apex somewhat

acute, corneous; suture minutely crenulate. Whorls 10, slightly convex, the last not tapering, *carinate,* brown banded and more distinctly striate below the keel. Columella somewhat twisted above. Aperture slightly oblique, large, subcircular; peristome thin, the right margin regularly arcuate, columellar margin somewhat dilated, spreading. Length 13.5, diam. 5.66 mm. (*Pfr.*)

Eastern Cuba: Yateras and Monte Libano, on trees (Gundl.).

M. notatus Gundl. mss., Pfr., Malak. Bl., vi, 1859, p. 92; Novit. Conch., p. 400, pl. 93, f. 1-4; Monogr., vi, p. 346.—Arango, Fauna, p. 80.

Pfeiffer notices two color-forms, one with the shell dark brown, marbled and dotted with whitish, the other whitish dotted with corneous, with a chestnut band below the keel. One of this pattern is represented on pl. 23, fig. 64, from Yateras, the type locality, where it occurs with streaked specimens. There seems to be always a chestnut band within the umbilical cavity. The shell is more widely conic than *M. canimarensis.*

35. M. grobei (Pfeiffer). Pl. 21, figs. 17, 18.

Shell subperforate, turrite, rather solid, nearly smooth; whitish ornamented with distant, interrupted, chestnut flames. Spire regularly turrite, the vertex a little acute. Whorls 9, slightly convex, the last not one-third the total length, obtusely angular in the middle, below the angle having a white thread-like keel and a chestnut band. Aperture oblique, lunate-circular; peristome rather widely expanded throughout, the margins converging, columellar margin dilated above, nearly closing the perforation. Length 11, diam. 4.66 mm. (*Pfr.*)

Eastern Cuba: Picote, in the jurisdiction of Santiago de Cuba (Jeanneret).

M. grobei Pfr., Malak. Bl., ix, p. 131, 1862; Novit. Conch., p. 402, pl. 93, f. 7, 8; Monogr., vi, p. 347.—Arango, Fauna, p. 81.

I have not seen this species, which, according to Pfeiffer, stands next to *M. pazi,* but is at once distinguishable by the projecting, thread-like keel.

Subfamily MICROCERAMINÆ Pilsbry.

Jaw as in Urocoptinæ; radula with very numerous teeth in nearly straight transverse rows, the central tooth in each row narrow, side teeth with long, narrow mesocones and very small ectocones. Shell turrite, with entire, costulate apex and incomplete peristome, the axis solid, not tubular or perforated.

Genus MICROCERAMUS Pilsbry & Vanatta, 1898.

Microceramus P. & V., Proc. A. N. S. Phila., 1898, p. 281 (July 12, 1898), type *M. floridanus.*—*Colobus* ALBERS, Die Hel., 1850, p. 177, for *kienerı, cylindrus* Gray, *unicarinatus, gossei, turricula* and *folliculus* Pfr. (preoc.).—*Macroceramus* BINNEY, Terr. Moll., v, p. 384, and of authors generally.

The shell is shortly rimate or imperforate, cylindric-turrite or conic, composed of 7½ to 13 whorls; the *apex is always entire,* the *nepionic shell composed of two vertically ribbed whorls* (pl. 15, fig. 6, *M. floridanus*); succeeding whorls are obliquely rib-striate, or the later ones smoothish; last whorl angular or rounded, the basal keel weak or wanting. The suture is usually crenulate or bordered with papillæ. Coloration of brown or corneous spots and streaks on a whitish ground. *The axis is slender, solid and straight* (except in subgenus *Spiroceramus*). (*Microceramus,* a little earthen vessel.)

Jaw delicate, high-arched and composed of many narrow, slightly imbricating plates, as in *Urocoptis* and allied genera (pl. 14, fig. 4, *M. pontificus*).

Radula rather long, proportioned about as in *Urocoptis.* Teeth closely crowded, in *nearly straight transverse rows.* The central tooth in each row has a very narrow basal-plate and wider cusp, which is somewhat trefoil-shaped, and either with almost no overhanging cutting point (*M. pontificus,* pl.

14, fig. 10), or with "three short, blunt cusps, the middle the largest, all three with distinct cutting points" (pl. 14, fig. 5, *M. gossei* of Jamaica, after W. G. Binney). The side teeth are all of one form, having a long, rather narrow inner cusp or mesocone, and a very small ectocone. The very indistinct basal-plates seem to be oblique to the cusps in *M. pontificus*. Binney figures them as long and straight in *M. gossei* (fig. 5). The outer teeth are a little shorter and wider (fig. 9). The formula is about 40.1.40 in *M. gossei* of Jamaica (Binney); 35.1.35 in *M. pontificus*. *M. turricula* has teeth much like those of *gossei*, according to Binney (Ann. N. Y. Acad. Sci., iii, 126).

Distribution: Greater Antilles, chiefly in western Cuba; Curacao; mainland from Central America to Texas; southern Florida and Bahamas; usually living under stones (limestone), coming forth in wet weather.

The species now segregated in the genus *Microceramus* have hitherto been placed in *Macroceramus*, owing to the general similarity of the shells. We owe to Binney and Bland (1872) the first intimation that *Macroceramus* was a composite group. They found that *M. gossei* has a type of dentition different from *M. signatus;* but their observation was not utilized in taxonomy, nor was its significance from an evolutionary point of view appreciated. In 1898 the subgeneric name *Microceramus* was given to the smaller, thin species of *Macroceramus*, but without knowledge of the important characters of the group. That name, however, being based upon a member of the *gossei* group of forms, will now take generic rank.

Microceramus differs from all *Urocoptinæ* in the straight, not v-shaped, rows of teeth of the radula, and in the form of the individual teeth, the inner cusps of which arise near the anterior border of the basal-plate, adjacent to the outer cusp, instead of being carried backward on the basal-plate as in all *Urocoptinæ*. Moreover, the cusps are pointed, not blunt and rounded. It agrees with the *Urocoptinæ* in the fragile, high-arched, plaited jaw, with a triangular median section; in the narrow median tooth of the radula; and in

the slender, imperforate internal column of the shell; all these being characters separating *Microceramus* from the Continental groups *Holospira, Epirobia,* and the typical *Eucalodiinæ.* What we now know seems to indicate that *Microceramus* is an unspecialized member of the primitive Antillean *Urocoptine* stock.

The nucleus in *Microceramus* is composed of two whorls, the initial half whorl smooth, the rest strongly ribbed radially, as shown in fig. 6 of pl. 15. At the beginning of the post-nuclear growth the whorl at once widens.

The distribution of the group indicates western Cuba as the place of its origin. In the late tertiary a single species, the ancestor of the *M. gossei* group, became widely spread, and gave rise to the group of slightly differentiated races inhabiting Haiti, Jamaica, across Yucatan channel to Mexico, over Florida strait to Florida, etc. This particular form evidently possesses exceptional means of transportation.

Key to Subgenera and Groups of Microceramus.

I. Axis slender and straight (MICROCERAMUS s. str.).

1. Imperforate or very shortly rimate, the columellar margin not built forward from the columella proper, or but slightly so; suture not distinctly or regularly crenulate. Cuban species.

a. Marked with opaque white on a brownish-corneous ground.

Group of M. elegans, species no. 10-15.

b. Opaque whitish, usually with a series of spots above periphery and suture; no beads or papillæ above the latter; acutely conic, the diam. more than half the length.

Group of M. costellaris, sp. no. 16-19.

2. Shortly rimate, the columellar margin a little built forward; cylindric-turrite or conic-turrite, the diam. less than half the length; suture usually denticulate or crenate. Antilles and mainland of America.

Group of M. gossei, sp. no. 1-9.

II. Axis encircled by a thin, wide, median lamella.

SPIROCERAMUS, sp. no. 20.

Group of M. gossei.

A group of very closely related species, one of which, ***M. gossei,*** with the forms immediately related to it (*concisus, arctispirus, mexicanus, texanus, floridanus* and *providentia*), has attained a general distribution in the Antilles and on the mainland. The other species stand more distinctly differentiated, and are quite restricted in distribution.

Species of the islands off Venezuela: *M.* ———? Curacao (p. 146); *Pineria* (?) *bonairensis,* Buen Ayre (p. 112).

Species of the mainland, Central America to Texas: ***M.*** *kieneri, M. concisus, M. mexicanus, M. texanus.*

Floridian species: *M. pontificus, M. floridanus.*

Bahaman species: *M. swifti, M. gossei providentia.*

Cuban species: *M. gossei, M. denticulatus.*

Haitian and Jamaican species: *M. gossei.*

1. M. KIENERI (Pfeiffer). Pl. 26, figs. 21, 22, 23.

"Shell shortly rimate, cylindric-turrite, thin, obliquely closely ribbed; irregularly marbled with brown-corneous and whitish. Spire turrite, the apex rather acute, blackish. Suture deep, crenate. Whorls 13, convex, the last about one-fourth the length, obsoletely carinate at the base. Aperture lunate-circular; peristome simple, expanded throughout, the margins converging, right margin deeply arcuate, columellar margin dilated. Length 18, diam. of antepenult. whorl 6 mm.; aperture 4.5 mm. long, 4.3 wide." (*Pfr.*)

Honduras (Dyson).

Bulimus kieneri PFR., P. Z. S., 1846, p. 40 (July, 1846); Monogr., ii, p. 79; iii, p. 365; Conchyl. Cab., p. 131, pl. 42, f. 23, 24.—*Macroceramus k.* PFR., Monogr., iv, 689; vi, 350 (exclusive of synonym *C. pontifica*).—BLAND, Ann. of the New York Acad. Sci., 1882, ii, p. 127, fig. in text.

Known by the original lot only. I copy Bland's figures of a cotype, f. 21, 22, and Pfeiffer's original figure, f. 23. It is much larger than any other species found on the mainland.

2. M. CONCISUS (Morelet). Pl. 25, figs. 7-12.

Shell very shortly rimate, cylindric-turrite or cylindric-conic, the upper part corneous-brown with oblique, whitish, thread-like striæ, the lower portion whitish with irregularly scattered spots and dots and lunate streaks of corneous; the last whorl or two usually somewhat smooth. Suture more or less distinctly and coarsely papillose, each papilla at the termination of alternate striæ, or sometimes formed by the union of two. Whorls 9½ to 12, convex, the last with a barely indicated basal keel or none. Aperture rounded, the peristome narrowly expanded.

Length 11, diam. 4 mm., whorls 12 (Morelet, type).

Length 11.2, diam. 3.3 mm., whorls 12 (Tunkas).

Length 7.6, diam. 3.1 mm., whorls 9½ (Tunkas).

Length 10, diam. 3 mm., whorls 11½ (Merida).

Length 6.7, diam. 2.7 mm., whorls 9¼ (Merida).

Yucatan (Morelet); at Izamal, Merida, Tekanto, Tunkas, Ticul, Uxmal and Santa Ana, near Calcehtok (Heilprin exped.). Guatemala: Peten, on rocky hills (Morelet); Coban (Sarg, Salvin).

Cylindrella concisa MORELET, Testacea Novissima, i, p. 12 (1849).—*Macroceramus concisus* Morel., PETIT, J. de C., i, p. 379.—CROSSE & FISCHER, Miss. Scient. Mex. Moll., i, p. 421, pl. 18, f. 1, 1*a*, 1*b*.—PFR., Monogr., viii, p. 420.—STREBEL, Beitrag Mex., etc., iv, p. 90, pl. 5, f. 4*c*. (Coban).—PILSBRY, Proc. Acad. Nat. Sci. Phila., 1891, p. 316.—MARTENS, Biologia, Moll., p. 287.—*Macroceramus polystreptus* TRISTRAM, P. Z. S., 1861, p. 233, pl. 26, f. 11.—PFR., Monogr., vi, p. 345.

This species, while closely related to the Antillean *M. gossei*, differs in the narrower whorls, there being more in a shell of the same length; the sculpture is usually less coarse, and the form of the well-grown specimens is more cylindric, though small adults of both species are conic. That the development of sutural papillæ is extremely variable is shown by the series of some hundreds of shells before me; and the size varies within the wide limits familiar to all who have studied large series of *Urocoptidæ*. Figures 8, 9, 10 are from Tunkas specimens; fig. 11 from Santa Ana; fig. 12 a small

shell from Tekanto. Strebel has figured a shell from Coban, agreeing with those from Yucatan.

2*a*. Var. *arctispirus* (Ancey). Pl. 25, figs. 5, 6.

Similar to small specimens of *concisus,* except that the umbilical chink is more reduced, almost obliterated. Length of types 7-8, diam. 3 mm., whorls 9½ to 10. Other specimens of the original lot measure 6 to 7.5 mm. long.

Utilla Island, Honduras (Chas. T. Simpson).

Macroceramus gossei var. *arctispirus* Ancey, Ann. de Malacologie, ii, p. 242 (1886).

The figures represent specimens of the original lot received from Simpson. It may possibly stand as an insular race characterized by the shorter rima, but I can find no other distinction from small individuals of *concisus,* which are often equally conic.

3. M. mexicanus (v. Martens). Pl. 26, figs. 25, 26, 27.

"Relatively shorter and broader, length 8.5 to 9.5, diam. of the last whorl 3 to 3.5 mm.; 9½ to 9¾ whorls only. White papillæ at the suture small, scattered, and few in number. Peristome of the aperture rather thin. Number of costulæ 60 or more, according to Strebel; some of them, however, are so indistinct that it is very difficult to count them." (*Mart.*)

Eastern Mexico: Orizaba (Berendt, Botteri, Höge); Atoyac (H. H. Smith); Arroyo grande, near Misantla (Salas). Central Mexico: Sayula, State of Jalisco, one specimen not full grown (Höge). Northeastern Mexico: near Victoria, in a canyon of the Sierra Madre, Tamaulipas; and Diente mountain, near Monterey, Neuvo Leon (S. N. Rhoads).

Macroceramus pontificus Strebel, Beitrag Mex., etc., iv, p. 89, pl. 5, f. 4*d* (specimen from Orizaba).—Pilsbry, Proc. A. N. S. Phila., 1891, p. 316 (Orizaba). Not *M. pontificus* Gld.—*Macroceramus concisus* var. *mexicanus* Martens, Biologia, p. 287, pl. 17, f. 2 (Dec., 1897).

Von Marten's figure (fig. 25) and description are given. A single specimen collected about 500 ft. above the town of

Orizaba, by the Academy expedition of 1890, is conic, with 8⅓ convex whorls, and measures 7 mm. long, 3.3 wide above aperture. The whitish striæ continue undiminished on the last whorl, and are almost simple at the suture, which is slightly and irregularly crenate in places, but without papillæ.

An abundant supply of shells from Victoria, Tamaulipas, and Diente, near Monterey, Neuvo Leon, is before me, pl. 26, figs. 26, 27. These are corneous, not darker at the apex, and clouded with lighter areas, which are produced by *white striæ on the corneous ground*. There are also a few whitish streaks. The surface is everywhere sculptured with delicate thread-like rib-striæ, mostly white, sometimes slightly enlarged at their lower ends, and either in pairs forming papillæ at the suture, with an unattached thread between each pair, or with the papillæ almost obsolete, the suture then being nearly simple. There are 8½ to 9 whorls. Length 7.5, diam. 3.2 mm.

This form is more conic than *M. concisus*, less cylindric; and the striation of the later whorls is stronger and much closer. The later whorls are more closely and distinctly striate than *M. texanus*, and the shell is thinner.

4. M. TEXANUS (Pilsbry). Pl. 25, figs. 1, 2, 3, 4.

Shell resembling *M. gossei* of Jamaica, but constantly stouter in figure, decidedly *less attenuated above*. Sculpture of thread-like oblique striæ, finer and closer; sutural crenulation more irregular on the lower whorls, and disposed to be subobsolete. Whorls 9½ to 10½.

Length 10.5, diam. above aperture 3.5 mm.

Length 8.66, diam. above aperture 3.5 mm.

Length 8.5, diam. above aperture 3 mm.

Southern-central Texas: San Marcos, Hays Co. (Pilsbry and Ferriss); New Braunfels, Comal Co. (J. A. Singley, Pilsbry and Ferriss); Hondo River, north of Hondo, Medina Co. (Pilsbry and Ferriss).

Macroceramus gossei PFR. and BINNEY in part.—*M. pontificus* Gld., in part, STREBEL, Beitrag Fauna Mex., etc., iv, p. 90, at top of page, pl. 5, f. 4*b*.—*Macroceramus texanus*

Pilsbry, Nautilus, xi, p. 107 (name only); xii, p. 23 (June, 1898).

A species of the rocky hill-country, living under stones, often with *Holospira*. Strebel, on the authority of Jacob Boll, reports it from Dallas, Texas; but this place is in a region of different physical character, and it is not likely that Boll got his specimens there. It is closely related to *M. concisus*, which however is less wide and has more whorls in the same length; also to the east Mexican *M. mexicanus*, a less wide and more conic shell. The specimens figured are from New Braunfels, the type locality.

5. M. pontificus (Gould). Pl. 26, figs. 17, 18, 19, 20.

Shell shortly rimate, turrited-conic, tapering from the last or the penultimate whorl, rather solid. Whitish, with a cream or brownish tint, marked with a few triangular or lunate brown spots. Surface regularly sculptured with oblique rib-striæ, alternate riblets projecting and enlarged into papillæ at the suture, which is thereby made strongly serrate. Whorls 9 to 11, convex, the last with a low, cord-like keel below. Aperture rounded, the peristome expanded and narrowly reflexed, columellar margin dilated.

Length 12, diam. above aperture 4 mm.

Length 8.3, diam. above aperture 3.3 mm.

Southeastern Florida: vicinity of Miami.

Pupa pontifica Gld., Proc. Bost. Soc. N. H., iii, p. 40 (June, 1848); Otia Conch., p. 205; in Binney's Terrestr. Moll. U. S., i, pp. 109, 128.—*Cylindrella p.* Gould, Terr. Moll., ii, p. 306, pl. 69, f. 1.—*Macroceramus pontificus* Gld., Tryon, Amer. Journ. Conch., iii, p. 301, pl. 14, f. 20.—Pfeiffer, Monogr., vi, p. 350.—Bland, Ann. N. Y. Acad. Sci., ii, p. 127.—W. G. Binney, Manual of American Land Shells, p. 414, f. 456.—Rhoads, Nautilus, xiii, p. 45 (Miami).—*M. kieneri* Pfr., Monogr., iv, 689 (in synonymy).—Binney & Bland, Land and Fresh-Water Shells of N. A., i, p. 220; Terr. Moll., v, p. 385. Not *M. kieneri* Pfr.

Quite distinct from the other forms of the *gossei* group by its larger size, coarser sculpture and very conspicuously and

regularly toothed suture. It was at one time supposed to be identical with *M. kienerí* Pfr., but is quite distinct. I have seen no evidence of the occurrence of *M. pontificus* except near the mouth of Miami river, the wider range formerly given pertaining largely to *M. floridanus*. It lives under stones near the Miami river, where specimens were taken by Mr. Rhoads and myself. Probably this was where Bartlett got the type specimens, as it is known that he was at that place, and, so far as I know, *M. pontificus* has been found nowhere else.

6. M. FLORIDANUS (Pilsbry). Pl. 25, figs. 95, 96, 97, 98.

The shell is similar in general appearance to *M. gossei*, but is usually smaller, with 9 to 10 whorls. The thread-like *striæ are finer and closer, two or three uniting to form each sutural papilla;* and these papillæ are lower and less prominent. Specimens measure 8.5 x 3 mm.; 6.5 x 2.5 mm., etc.

Florida: Sarasota Bay (type locality) and Goodland Point (Hemphill).

Macroceramus gossei Pfr., W. G. BINNEY, in part, exclusive of description and figures, which pertain to Jamaican shells.—*Macroceramus floridanus* PILSBRY, Nautilus, xi, p. 107 (name only); xii, p. 23 (June, 1898).

In the Jamaican *M. gossei* the striation is coarser, the sutural papillæ being formed by single striæ or the confluence of two; and the shell is generally larger and more conspicuously variegated than in this southwestern Florida form.

7. M. GOSSEI (Pfeiffer). Pl. 25, figs. 91, 92, 93, 94.

Shell shortly rimate, turrite with convex outlines, being therefore somewhat cylindric below. Opaque whitish, with irregular or *lunate streaks and scattered dots of corneous-brown.* Surface somewhat shining, sculptured with thread-like, oblique rib-striæ, about *every second riblet terminating in a boss or projection at the suture above, or sometimes two riblets unite to form a projection;* each riblet being a little swollen, drop-like, at the lower end in many specimens. Whorls about 11, the upper ones corneous-brown, very con-

vex, the later whorls convex, last one well rounded, with a very low cord-like keel at the base. Aperture irregularly rounded, the outer margin very strongly arcuate, the columellar margin straightened; peristome whitish, narrowly expanded and reflexed.

Length 11, diam. above aperture 3.5 mm.

Length 6.7, diam. above aperture 2.6 mm.

Jamaica: Mandeville, numerous on stone walls after rains (Gloyne, in Swift coll.); Spurtree Hill (Henderson & Simpson); Potsdam, St. Elizabeth (P. W. Jarvis). Also Cuba and Haiti, see below.

Bulimus gossei Pfr., P. Z. S., 1845, p. 137 (Feb., 1846); Conchyl. Cab., p. 132, pl. 42, f. 30-32; Monogr., ii, p. 81; iii, 366.—Reeve, Conch. Icon., v, pl. 66, f. 462.—*Macroceramus g.* Pfr., iv, p. 689; vi, 350.—Gloyne, J. de C., xx, 1872, p. 33 (Mandeville).—Henderson, Nautilus, viii, 1894, p. 20 (Spurtree Hill).—Bland & Binney, Amer. Journ. of Conch., vii, 1872, p. 187, pl. 17, f. 9, 11, 12 (teeth).—W. G. Binney, Proc. A. N. S. Phila., 1875, p. 223, pl. 15, f. 1 (teeth); Terr. Moll., v, p. 386, f. 268 (Pfeiffer's descr. and fig.); p. 384, pl. 10, f. q (teeth of same Jamaican spec.).—Strebel & Pfeffer, Beitrag Fauna Mex., etc., iv, pp. 90, 107, pl. 5, f. 4*a* (shell), pl. 13, f. 9 (teeth).—*Cylindrella hydeana* C. B. Adams, Contrib. to Conch., no. 2, p. 23 (Oct., 1849), no description; based upon Pfeiffer's *B. gossei.*

All the above references apply exclusively to the Jamaican form of the species. Binney, in his several volumes on American land shells, has repeated Pfeiffer's description and figure of the Jamaican type for the Floridian and Texan forms. I am unable to see that the Cuban and Haitian forms differ from that of Jamaica. Figures 91-94 are drawn from Mandeville specimens.

The types of this species were collected by Philip H. Gosse "in the neighborhood of Highgate, on the side of a conical hill covered with huge masses of limestone and small rubble, and crowned with a tuft of bamboo." This place is on the western edge of St. Elizabeth parish (See Gosse, A Naturalist's Sojourn in Jamaica, p. 126).

Eastern and eastern-central Cuba. Among Cuban species, *M. gossei* is closely related to *M. denticulatus* of western Cuba; but it is larger, more slender and more regularly tapering. I have seen a single Cuban specimen, and cannot see that it differs in any respect from the Jamaican typical form. Arango and others give the following localities, all in the western part of the province of Santiago and the eastern part of Puerto Principe: Guisa and San Andres in Bayamo; Casinuba in Cabo Cruz (Gundlach; Pfr. in Malak. Bl., v, p. 44, no. 20); Punta de San Juan de los Perros (Gundlach, Zeitschr. f. Malak., 1852, p. 175), and Nuevitas. Crosse (J. de C., 1890, p. 205) gives no additional information.

Haiti. Specimens collected by J. B. Henderson, Jr., at Cape Haitian have the coloration, form and sculpture of Jamaican *gossei*, but are smaller than most Jamaican shells; length 7, diam. 2.7 mm., whorls fully 9. Crosse reports the species, with doubt, from sandy places in the valley of the Yaqui river, in the northern part of the Republic of Santo Domingo, collected by Hjalmarson.

7*a*. Var. PROVIDENTIA Pilsbry, n. v. Pl. 26, fig. 16.

Sutural teeth strong, acute, close and regular; striation stronger. Whitish, sparingly maculate with lunate corneous patches. Length 9.7 to 11.5, diam. 3.2 to 3.3 mm., whorls 9½ to 11.

Bahamas: Nassau, New Providence (R. Swift coll.).

8. M. DENTICULATUS (' Gundl.' Pfr.). Pl. 25, figs. 88, 89, 90.

Shell perforate, ovate-fusiform, thin, closely costulate-striate, whitish variegated with pale corneous; spire ovate-conic, the vertex acute; suture closely denticulate. Whorls 9, convex, the last tapering, with a thread-like keel below the middle. Aperture oblique, nearly circular; peristome simple, narrowly expanded, the margins converging. Length 7.66, diam. 3.66 mm. (*Pfr.*)

Western Cuba: Punta de la Jaula, near Guane (Wright).

Macroceramus denticulatus Gundl., PFR., Malak. Bl., xi, p.

17 (1864); Monogr., vi, p. 351.—Arango, Fauna, p. 84.—*M. guanensis* C. & F., Miss. Scient. Mex., Moll., i, p. 425.

Very much like *M. turricula* in shape, but readily known by its strongly toothed suture. The keel mentioned by Pfeiffer is often so low as to be readily overlooked, and it does not extend to the smooth, rounded front of the whorl. As usual in this group of species, the earlier post-nepionic whorls are very convex, almost angular. The size varies within wide limits, topotypes measuring 8.2 x 3.5 mm. with 9⅓ whorls; 5.6 x 2.6 mm. with 8⅓ whorls, and 6 x 2.5 mm., 8½ whorls.

The name was changed by Crosse & Fischer on account of the earlier *Cyl. denticulata*, which seems, however, to be referable to *Urocoptis*. In the *Monographia*, vi, Pfeiffer misquotes both the name and volume in his reference line. Figured from topotypes collected by Wright.

9. M. swifti (Bland). Pl. 26, figs. 13, 14, 15.

Shell very shortly rimate, cylindric turrited; white, copiously *sprinkled with corneous-brown dots*, and more or less streaked with the same tint, the upper whorls mainly brown. Sculpture of very fine, close, low striæ throughout. Whorls 10 to 11½, moderately convex, the last rounded below, with an obsolete carina or none. *Suture smooth*, not crenulate. Aperture round, brown within; peristome white, very slightly expanded, the columellar margin dilated.

Length 11, diam. including lip 4 mm. (Bland's type).

Length 10, diam. above aperture 3.3 mm.

Bahamas: Turk's Island (type loc.; Geo. Gibbs, 1866, in Swift coll.); Inagua (Bld.).

Macroceramus swifti Bld., Ann. Lyc. N. H. of New York, xi, p. 83 (1874).—Pfr., Monogr., viii, p. 420.

As in allied species, the apex is costulate. It differs from *M. gossei* and its allies by *the even, not papillose suture*, which at most may be a little irregular in rare specimens, and by the coloration of brown dots and streaks on a pink-white ground. In some specimens a corneous-gray shade replaces the warm brown of the markings, and the spire then is white.

Group of M. elegans.

Imperforate or shortly rimate, thin, marked with opaque white on a brownish-corneous, somewhat translucent ground. Suture not distinctly or regularly denticulate; basal keel very weak or wanting. Sculpture of rib- or thread-like striæ, which often terminate in a series of little beads above the suture. Columellar margin not built forward from the columella proper, or but slightly so. Central Cuba, extending from Cabo Cruz to Pinar del Rio.

I. Spire almost straightly conic.
   1. Maculate and interruptedly banded with white.
      a. Very closely, finely striate; suture simple; last whorl rounded. Western Matanzas.
      M. palenquensis, no. 11.
      b. Sculptured with thread-like rib-striæ, often beaded above the suture; last whorl subangular. Pinar del Rio.
      M. elegans, no. 10, and *M. e. infradenticulatus,* no. 10*a*.
   2. Rib-striæ white on a darker ground.
      a. Shell conic, whorls 8-9. Havana prov.
      M. p. perconicus, no. 12*a*.
      b. Shell long, turrite, whorls 9-10. Santa Clara.
      M. angulosus, no. 13.

II. Spire attenuate above, then swollen.
   1. Rimate, corneous marbled with white; a low, hardly noticeable basal keel; closely sculptured with narrow riblets. *M. petitianus,* no. 12.
   2. Perforate, closely rib-striate, nearly uniform gray; 7.3 x 3.5 mm., with 8 whorls. Eastern Cuba.
      M. simplex, no. 15.
   3. Imperforate, very closely, finely striate; 8 x 4.6 mm., with 8 whorls. *M. palenquensis,* no. 11.
   4. Imperforate, with close, whitish riblets; 5.6 x 2 mm., with 9 whorls. E. Cuba. *M. minor,* no. 14.

10. M. ELEGANS (' Gundl.' Pfr.). Pl. 27, figs. 47, 48, 49.

Shell subperforate, conic, thin; corneous with white flames above and on the base, and a white peripheral belt, more or less interrupted, the apical whorls corneous. Surface glossy, several post-nepionic whorls sharply sculptured with thread-like striæ, part of them white; the striæ becoming coarser and more spaced on the last two whorls, subobsolete on the base; frequently part of the striæ terminate in little drop-like white tubercles, just above the suture. Whorls 7½ to 8, slightly convex, the last *subangular at the periphery*. Aperture oblique, rounded, the lip a trifle expanded, narrowly thickened within, the columellar margin having a small triangular dilation at the insertion.

Length 6.3, diam. 3.8 mm.

Length 7, diam. 4.5 mm., incl. perist. (type).

Western Cuba: Pan de Guajaybon, and at Hato Caimito (Gundlach) and Pan de Azucar (Arango).

Macroceramus elegans Gundl. mss., PFR., Malak. Bl., xi, p. 18, no. 76; Novit. Conch., p. 406, pl. 93, f. 27-29; Monogr., vi, p. 350.—ARANGO, Fauna, p. 83.

An elegantly marked, conic shell, differing from the following variety in being smaller, with a minute umbilical chink.

10*a*. Var. INFRADENTICULATUS (' Wright ' Pfr.). Pl. 27, fig. 50.

Shell imperforate, high-conic, thin; corneous with flames and patches of opaque white. Surface obliquely rib-striate, *each riblet ending below, drop-like, in a small tubercle,* these tubercles forming a series just above the suture, in places interrupted; base nearly smooth. *Spire almost straightly conic.* Whorls 8½ to 9, convex, the last having a low, weak, hardly noticeable keel just below the periphery. Aperture very oblique, ovate, the outer lip a trifle expanded, columellar lip subvertical, narrow, not built forward. Length 8.5, diam. 4.3 mm.

Western Cuba: Cayos de San Filipe, in the municipal district of Vinales, Pinar del Rio (Charles Wright).

Macroceramus infradenticulatus Wr. mss., Pfr., Malak. Bl., xi, 1864, p. 127; Novit. Conch., p. 405, pl. 93, f. 24-26; Monogr., vi, p. 349.—Arango, Fauna, p. 83.

Near *M. petitianus*, but larger, more strictly conic, and with the small tubercles above the suture more regularly developed. The low keel is marked with white, and the base is radially striped. It differs from *M. elegans* in little besides the larger size.

11. M. palenquensis (' Gundl.' Pfr.). Pl. 27, fig. 44.

Shell imperforate, ovate-conic, thin, very closely, finely striate; irregularly variegated and somewhat banded with whitish and corneous. Spire swollen-conic, the vertex acute, corneous; suture simple. Whorls 8, a little convex, the last rounded. Aperture diagonal, rounded-lunar; peristome simple, thin, narrowly expanded, the columellar margin somewhat calloused. Length 8, diam. 4.66 mm.; apert. 3.3 mm. high. (*Pfr.*)

Western Cuba: Palenque de Matanzas (Gundlach).

Macroceramus palenquensis Gundl. mss., Pfr., Malak. Bl., 1863, xi, p. 18, no. 77; Novit. Conch., p. 404, pl. 93, f. 16-18; Monogr., vi, p. 349.—Arango, Fauna, p. 82.

Distinguished from *M. turricula* [*petitiana*], which it resembles in stature, by the much finer sculpture, satin luster, smooth suture and comparatively larger aperture (Pfr.). I have not seen specimens.

12. M. petitianus (Orbigny). Pl. 27, figs. 30, 42.

Shell shortly rimate, ovate-acuminate, thin, corneous marbled with opaque white; surface slightly shining, densely and very obliquely sculptured with riblets narrower than their intervals. Spire acutely conic, often with slightly concave outlines above. Whorls 8 to 9, but slightly convex, the last having a very weak, hardly noticeable keel; the base smoother, corneous. Aperture oblique, rounded, the peristome narrowly expanded and a little thickened; columellar margin but slightly built forward, dilated above.

Length 7.3, diam. 3.4 mm.

Length 8, diam. 3.7 mm.

Length 9, diam. 4.5 mm. (Pfr.).

Western Cuba: Matanzas, on the Yumuri river (Pfr.); Camao and Jaruco, in Havana prov. (Arango); Managua (Poey). Also eastern Cuba at Trinidad and Cabo Cruz (Gundlach, *teste* Arango).

Bulimus turricula Pfr. in Wiegm. Archiv. f. Naturg., 1839, i, p. 351; in Phil., Abbild., i, p. 57, pl. 1, f. 13; Conchyl. Cab., p. 133, pl. 42, f. 27-29; Monogr., ii, p. 81.—Reeve, C. Icon., v, pl. 69, f. 497. Not *Bulimus turricula* Brug., Encycl. Méth., p. 324.—*Macroceramus t.* Petit, J. de C., i, p. 379.—Pfr., Monogr., iv, p. 690.—Gloyne, J. de C., 1875, p. 121 (occurrence in Jamaica).—Binney, Proc. A. N. S. Phila., 1875, p. 251, pl. 20, f. 9, and Ann. N. Y. Acad. Sci., iii, p. 126, pl. 14, f. d (teeth).—*Pupa petitiana* Orb., Moll. Cuba, p. 180, pl. 12, f. 6-8.

The rapidly tapering, acute cone of the spire is characteristic. It seems to be a widely distributed species in Cuba, and Gloyne states that Mr. Vendryes collected it at Port Henderson, Jamaica.

12*a*. Var. perconicus Pils., n. v. Pl. 27, fig. 43.

More strictly *conic;* corneous-brown with most of *the riblets in part or wholly white;* base imperforate; columellar margin hardly built forward. Length 6.5, diam. 3 mm. It is this variety that occurs at Camao. The teeth have been figured by Binney.

13. M. angulosus ('Gundl.' Pfr.). Pl. 26, fig. 28.

Shell hardly perforate, ovate-turrite, thin, brownish corneous, closely *sculptured with thread-like white or partly white rib-striæ*, some of them projecting above at the suture. *Spire long*, nearly straight-sided; whorls 9 to 10, convex, *several following the protoconch being angular;* last whorl well rounded, with no trace of a keel, the base corneous. Aperture oblique, brown within, the peristome white, slightly expanded, a little thickened; columellar margin not built forward, slightly dilated above.

Length 7.2, diam. 3 mm.

Length 8, diam. 3.5 mm. (Pfr.).

Central Cuba: Magua and Sitio Quemado, in Trinidad district, Santa Clara (Gundlach); also Guisa, in eastern Cuba.

Macroceramus angulosus Gundl. mss., Pfr., Malak. Bl., iv, 1857, p. 107; v, p. 44, no. 21; Monogr., iv, p. 690.—Arango, Fauna, p. 84.

In the sculpture of white riblets on a brownish ground this species resembles *M. petitianus* var. *perconicus*. It is also not unlike *Pineria beathiana*.

14. M. minor ('Arango' Pfr.). Pl. 27, fig. 45.

Shell imperforate, fusiform-turrite, rather thin, corneous, sculptured with close, oblique, whitish riblets. Spire swollen-turrite, the apex acute. Whorls 9, a little convex, the last tapering, rounded. Aperture diagonal, subcircular, the peristome whitish, narrowly expanded, the margins approaching, columellar margin adnate. Length 5.66, diam. 2 mm.; diam. of aperture hardly 1.5 mm. (*Pfr.*)

Eastern Cuba: Tanamo Bay, on the north shore of dist. Sagua de Tanamo, Prov. Santiago, under stones (Arango).

Macroceramus minor Arango mss., Pfr., Malak. Bl., xiii, 1866, p. 60; Novit. Conch., p. 408, pl. 93, f. 36-38; Monogr., vi, p. 351.—Arango, Fauna, p. 85.

I have not seen this species, but judging by the very oblique aperture and adnate columellar lip, it is probably a *Microceramus*, though found far to the east of its kindred. The apical sculpture is unknown.

15. M. simplex (Pfeiffer). Pl. 27, fig. 46.

Shell perforate, ovate-conic, rather solid, closely rib-striate, nearly uniform gray. Spire swollen-conic, the vertex rather acute; suture simple, impressed. Whorls 8, a little convex, the last rounded, subangular above the aperture. Aperture slightly oblique, subcircular; peristome simple, a trifle expanded throughout. Length 7.33, diam. 3.5 mm., apert. 2 mm. high. (*Pfr.*)

Eastern Cuba: at the mouth of the Yateras river (Jeanneret).

Macroceramus simplex PFR., Malak. Bl., xi, 1863, p. 19; Novit. Conch., p. 407, pl. 93, f. 30-32; Monogr., vi, 350.—ARANGO, Fauna, p. 84.

I have not seen this species, which according to Pfeiffer is related to *M. turricula* (*petitianus*). It may be a *Macroceramus*.

Group of M. costellaris.

Imperforate or nearly so, acutely conic, opaque whitish, usually marked with a series of spots above the periphery and suture. Suture not noticeably denticulate, the riblets not beaded above it. Columellar margin dilated above and usually adherent, not built forward from the columella proper. Apical whorls costellate and usually black. All known species are from Pinar del Rio.

I. Apical whorls black; imperforate.
   a. Periphery rounded; rather strongly rib-striate throughout; whitish, lusterless, with a series of irregular spots above the periphery. *M. costellaris,* no. 16.
   b. Periphery rounded; very finely striate, almost smooth. *M. paivanus,* no. 17.
   c. Periphery angular; smooth, becoming striate on the spire; glossy white, with a band of oblong spots above periphery. *M. nigropictus,* no. 18.

II. Apical whorls corneous.
   a. Subperforate, trochiform, corneous irregularly maculate with white (or gray-white, irregularly marked with brown); last whorl rather acutely carinate. *M. maculatus,* no. 19.
   b. Perforate, widely ovate-conic, whitish variegated with corneous and with a corneous band (or series of spots); last whorl rounded or but faintly subangular. *M. latus,* no. 20.

16. M. COSTELLARIS ('Gundl.' Pfr.). Pl. 27, figs. 40, 41.

Shell *imperforate,* acutely conic, rather solid; *white, with a series of triangular or irregular corneous spots above the periphery,* the *apical whorls black.* Surface lusterless, *sculptured throughout with very oblique rib-striæ* much narrower than their intervals. Spire with nearly straight lateral outlines. Whorls 9, convex, the last rounded peripherally. Aperture small, oblique, the peristome blunt, not expanded, the columellar margin vertical above, simple.

Length 6.7 to 7.5, diam. 4.2 mm.

Length 6.2, diam. 3.7 mm.

Length 8.3, diam. 4.5 mm. (type).

Western Cuba: Vinales, under dead leaves (Wright).

Macroceramus costellaris Gundl. ms., PFR., Malak. Bl., xi, p. 16, no. 72 (1863); Monogr., vi, p. 354.—ARANGO, Fauna, p. 86.

Description and figures from topotypes received from Wright. It resembles *M. latus,* but that species is perforate, only obsoletely striate on the last whorl, and differs in color-pattern.

17. M. PAIVANUS (Pfeiffer). Pl. 27, fig. 36.

Shell imperforate, conic-turrite, solid, smoothish, opaque, cretaceous. Spire high-conic, the apex black, acuminate. Whorls 9 to 10, rather flattened, the upper ones sometimes variegated with pale corneous, last whorl rounded basally. Aperture diagonal, rounded-lunar, the peristome simple, margins slightly converging, the right margin unexpanded, somewhat spreading, columellar margin adherent. Length 9-9.5, diam. 4.5 mm., aperture 3 mm. high. (*Pfr.*)

Western Cuba: Luis Lazo, in the municipal dist. of San Juan y Martinez (Wright); Pan de Guajaybon (Wright, *teste* Arango).

Macroceramus paivanus PFR., Malak. Bl., xiii, 1866, p. 61, no. 19; Monogr., vi, p. 354.—ARANGO, Fauna, p. 86.

A whorl or two following the black apical whorls are more or less maculate with black-brown, and the rest of the shell may be either almost uniform cream-white, or sparsely dotted

with corneous. The whorls of the spire are very finely, closely striate, when unworn, and there is no trace of an angle on the well rounded last whorl. It is related to *M. costellaris*, differing chiefly in the faint sculpture and thinner shell. *M. nigropictus* differs by its angular periphery.

18. M. NIGROPICTUS ('Gundl.' Pfr.). Pl. 27, figs. 37, 38, 39.

Shell imperforate, straightly conic, rather solid, white, with a *series of dark oblong spots forming an interrupted band above the periphery* and suture, sometimes wanting, the *apical whorls black*. Surface *glossy*, faintly marked with growth-lines except on the upper part of the spire, which is finely, sharply striate. Whorls 8, but slightly convex, *the last strongly angular at the periphery*. Aperture oblique rounded-squarish, the peristome not expanded, somewhat thickened; columella vertical, reflexed and adnate above.

Length 6.5, diam. 3.5 mm.

Length 7, diam. 4.3 mm. incl. lip; whorls 8½ (type).

Western Cuba: Portales de Guane and Guirade Luis Lazo (Wright).

Macroceramus nigropictus Gundl. mss., PFR., Malak. Bl., xi, 1863, p. 17, no. 74, and p. 127; Monogr., vi, p. 355.—ARANGO, Fauna, p. 86.

Near *M. costellaris* and *M. latus*, but quite distinct by its glossy surface and angular periphery.

19. M. MACULATUS ('Wright' Pfr.). Pl. 27, fig. 35.

Shell slightly subperforate, trochiform, rather thin, obliquely plicate; corneous, irregularly maculate with white. Spire a little concavely conic, the apex rather acute. Whorls 7½, convex, the last somewhat acutely carinate, a little convex below. Aperture diagonal, subangulate-lunar; peristome simple, the upper margin shortly expanded, basal margin a little reflexed. Length 7, diam. 4.3 mm., apert. scarcely 3 mm. high. (*Pfr.*)

Western Cuba: sugar plantation Quinones, dist. of Bahia Honda (Wright). A variety on the highest peak of the Pan de Guajaybon (Gundlach).

Macroceramus maculatus Wright mss., Pfr., Malak. Bl., xii, 1865, p. 119; var. *b*, xiii, 1866, p. 59; Novit. Conch., p. 404, pl. 93, f. 19-21; Monogr., vi, p. 349.—Arango, Fauna, p. 83.

This species stands nearest *M. elegans*, but is easily separable by the more convex whorls, the rather sharp keel and the form of the mouth (*Pfr.*).

A variety taken copiously on the summit of Guajaybon is more solid, gray-whitish irregularly marked with brown. I have not seen specimens certainly referable to this species.

20. M. latus ('Gundl.' Pfr.). Pl. 27, figs. 31, 32.

Shell perforate, ovate-conic, rather thin, obliquely costulate; whitish, generally variegated with corneous and with a rather wide corneous band. Spire conic, the apex rather acute; suture simple. Whorls 7½, a little convex, the last rounded, obsoletely subangular. Aperture nearly diagonal, rounded-lunar; peristome simple, expanded, the right margin spreading, columellar margin dilated at the insertion, reflexed. Length 9, diam. 5.66 mm., apert. 3 mm. high. (*Pfr.*)

Western Cuba: Mt. Guajaybon (Gundlach). A variety at Isabel Maria (Wright).

Macroceramus latus Gundl. mss., Pfr., Malak. Bl., ix, 1863, p. 17, no. 75, and p. 127; Monogr., vi, p. 348; Novit. Conch., p. 383, pl. 89, f. 9-11.—Arango, Fauna, p. 82.

Distinguished by its broad, compact form. The specimens from Isabel Maria are less depressed, have an interrupted band, and differ in several respects, so that a description and figures (pl. 27, figs. 33, 34) of them follow:

Shell minutely perforate, acutely ovate-conic, rather solid; white with *a band of oblong corneous spots above the periphery* and suture, the *earlier whorls corneous*. Surface lusterless, the *upper half of the spire sharply, finely rib-striate*, the striæ becoming *obsolete or subobsolete on the later whorls*. Spire conic, a little attenuate above. Whorls 8½, slightly convex, the last rounded peripherally. Aperture small, oblique, somewhat ovate; peristome narrowly expanded, columellar margin dilated at the insertion. Length 8.2, diam. 5 mm.; length 8, diam. 4.5 mm.

I have not been able to compare this form with typical *latus* from the Pan de Guajaybon, of which the original description and figures are given above.

Subgenus SPIROCERAMUS Pils. & Van., 1898.

Proc. Acad. Nat. Sci. Phila., 1898, p. 281, type *M. amplus*.

Shell thin, cylindric, composed of *many narrow whorls;* spire terminating in an acute cone, the apex entire, not deciduous. Protoconch composed of barely 2 *vertically costulate* whorls, several succeeding whorls subangular; last whorl rounded, without basal keel. Suture simple, not crenulate. Aperture rounded, the peristome narrowly expanded, columellar margin dilated and free. Axis encircled by a wide, *compressed spiral lamella*, median in each whorl.

Eastern Cuba. The single species has the shape of *Holospira*, the axis of *Arangia*, and the aperture and protoconch of *Microceramus*. I regard it as a tangent from the group of *M. petitiana*.

21. M. AMPLUS ('Gundl.' Pfr.). Pl. 26, figs. 24, 29.

Shell rimate, cylindric, with the upper third rapidly tapering and attenuate. Corneous, very finely and very densely sculptured with oblique striæ, which are white except where there are large, irregular corneous patches. Whorls 14-15, those of the cone subangular, the later ones and last whorl convex. Aperture somewhat oblique, rounded, the lip narrowly reflexed, columellar margin dilated above, the lip-ends remote. Axis encircled by a thin but rather wide spiral lamella.

Length 12, diam. 3.5 mm., whorls 15.

Length 10.2, diam. 3.6 mm., whorls 14.

Length 9.5, diam. 3.3 mm., whorls 14.

Eastern Cuba: Guisa (type loc.) and San Andres, in the dist. of Bayamo (Gundlach).

Macroceramus amplus Gundl. mss., PFR., Malak. Bl., v, 1858, p. 44, no. 19; Monogr., iv, p. 689; vi, 351; Novit. Conch., p. 383, pl. 89, f. 12-14.—ARANGO, Fauna, p. 84.

This peculiarly specialized form has much resemblance to

M. petitiana in sculpture, coloration and aperture, though the two are very diverse in shape and internal structure.

Undetermined and Spurious Species of Urocoptidæ.

Helix fusulus Müller, Vermium terr. et fluv. Hist., pt. 2, p. 109, no. 309 (1774) is probably a *Urocoptis*, though perhaps a *Cerion*. It is not identifiable. "H. testa cylindracea, obtusa, curvatim sulcata, apertura edentula, anfractibus undecim. Long. 7½, lat. 3 lin." No locality assigned. It is *Turbo fusulus* Gmel., Syst., 3610, and *Pupa fusulus* Beck, Index, p. 82.

Férussac mentions by name a number of species no doubt belonging to the *Urocoptidæ*, but with no clue to their identity:

Helix (*Cochlodina*) *sloanii* Fér. Les Antilles. Prodr., p. 61, no. 496.

Helix (*Cochlodina*) *draparnaldi* Fér. Les Antilles. Prodr., p. 61, no. 497.

Helix (*Cochlodina*) *blainvilliana* Fér. Les Antilles. Prodr., p. 61, no. 499.

Helix (*Cochlodina*) *rosata* Fér. Les Antilles. Prodr., p. 61, no. 501.

Helix (*Cochlodina*) *maugei* Fér. St. Thomas. Prodr., p. 62, no. 522 (? *Clausilia*).

Helix (*Cochlodina*) *interlapsa* Fér. Lesser Antilles. Prodr., p. 63, no. 532 (? *Clausilia*).

Helix flexistriata Fér. in coll. according to Pfeiffer, Monogr. ii, 386.

Beck enumerates the following, without descriptions:

Urocoptis glandula Beck. I. Antill. Index Moll., p. 83.

Urocoptis abbreviata Beck. I. St. Domingo. Index Moll., p. 83.

Urocoptis coarctata Beck. Index Moll., p. 83 (Lister, xxi, 17).

Urocoptis soluta Beck. I. Antill. Index Moll., p. 83.

Urocoptis tortuosa (Ch.) Gray, Beck *l. c.* = *Tortulosa tortuosa*.

Cylindrella pullula Morl. Ind. Occ. PAETEL, Catal. (edit. 4), ii, p. 249 (1889).

Cylindrella politula Poey (Trachelia). Cuba. PAETEL, Catal., ii, p. 249 (1889).

Cylindrella cumingiana Pfr., Monogr. Hel. Viv., ii, p. 385. Philippine Is. = *Ennea* (*Diaphera*) *cumingiana.*

Cylindrella deficiens Gund. Cuba. G. Nevill, Hand List of Mollusca in the Indian Museum, i, p. 206.

Cylindrella dortinoti Gund. Cuba. t. c., p. 207. This and the preceding are nude names.

Cylindrella beardsleana C. B. Ad., Contrib. to Conch., no. 2, p. 19 (Oct., 1849); Sowerby, C. Icon., xx, no. 140 = *Geomelania.*

Cylindrella (?) *pygmaea* C. B. Ad., Proc. Boston Soc. N. H., 1845, p. 14 = *Geomelania.*

Family *MEGASPIRIDÆ* Pilsbry.

Shell tapering-cylindric or turrite, long and slender, composed of numerous whorls coiled about a hollow or at least perforate axis, which may, however, be closed at the lower end. Apex obtuse and rounded, rather large, but the summit is sometimes truncate. Aperture small, irregularly ovate or piriform, angular above, the outer margin of the peristome thin, unexpanded or but slightly so. Cavity of the last or preceding whorls obstructed by lamellæ on the axis and often on the parietal and outer walls also. Radula of the normal, unspecialized Holopod type, the central teeth about as large as the laterals; lateral teeth with the ectocone developed, but no entocone.

A group of four or five genera, of apparently erratic distribution, as follows:

Callionepion Pils., southern Brazil.

Megaspira Lea, central-southern Brazil.

Eomegaspira Pils., Paris and London Basins; Eocene.

Perrieria Canefri, western New Guinea.

Cœlocion Pils., eastern coast of Queensland.

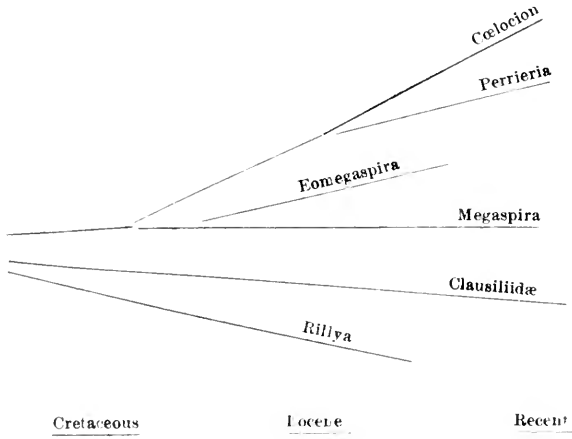
The soft anatomy is known only by a note by Fischer on the teeth of *Cœlocion*, and by my own work on *Callionepion*, *Megaspira* and *Cœlocion*. With the exception of *Callionepion* (not certainly known to belong to the family), the data at hand are confined to the jaw and radula. These organs are of unspecialized type, like ordinary *Helicidæ*, *Eucalodiinæ* and *Clausiliidæ;* but the extraordinary characters of the shell mark the *Megaspiridæ* as a group apart from these, and from the *Pupidæ*. Unlike most *Urocoptidæ*, there is usually no cord or keel defining the base of the shell, and the columellar lamella generally runs to the lip, and is visible from in front.

So far as I can see, in the present state of our knowledge, the *Megaspiridæ* seem to have been differentiated from their allies, the *Clausiliidæ*, in the Northern Hemisphere of the Old World, during Mesozoic time. *Eomegaspira* represents a branch which attained high specialization at the dawn of

the Eocene in western Europe, and shortly thereafter became extinct, either in consequence of over-specialization, or as a result of physical changes in the unstable geography of this area. The ancestors of *Perrieria* and *Cœlocion* made their way southeastward to Papua and Australia, like many other and later groups. The Brazilian *Megaspira* traces its forebears over the mid-Atlantic, like the *Streptaxidæ, Ampullariidæ*, various fresh-water fishes, etc., of the same region, from tropical Africa, whence they migrated to South America over the Cretaceous land-bridge now held by an increasing number of zoögeographers to have spanned the Atlantic (see Pilsbry, Man. Conch., Classification of *Bulimulidæ*, p. ix, Oct., 1902; and especially, Ortman, Proc. Amer. Philos. Soc., xli, 1902, 350).

The exigencies attending the existence of a type which had evidently attained a highly specialized polygyrate, internally lamellate shell before the close of Mesozoic time, have left but a few widely scattered genera, represented by but few species; and one monotypic group, *Cœlocion*, by its senile characteristics is apparently on the verge of extinction.

The phylogenetic views here submitted may be represented diagrammatically thus:



Key to Genera of Megaspiridæ.

I. Apex entire, 2½ earliest whorls granulose; shell with 9-10 whorls; columella with a single fold entering the last whorl; no other internal lamellæ.
Genus *Callionepion.*

II. Apical whorls vertically striate or smoothish.
1. Spire entire in adults; peristome discontinuous, the ends widely separated; whorls numerous.
a. Lamellæ on the axis and parietal wall penetrating several whorls, the parietal lamella scalloped; radial baso-axial nodes developed; no palatal plicæ. Genus *Megaspira.*
b. Lamellæ in the last 1 to 2 whorls only, 3 on the axis; the parietal lamella not sinuous; no radial barriers; palatal plicæ developed, at least in typical species. Genus *Eomegaspira.*
2. Spire truncate in adults; peristome entire, continuous, the mouth piriform.
a. Shell imperforate, sinistral; aperture without externally visible lamellæ; peristome adnate; interior unknown. Genus *Perrieria.*
b. Shell umbilicate, dextral, with an entering lamella on the parietal wall, and inside having two axial lamellæ and one palatal plica; peristome free from the preceding whorl.
Subgenus *Cœlocion.*

Genus CALLIONEPION Pilsbry & Vanatta, 1899.

Proc. Acad. Nat. Sci. Phila., 1899, p. 371 (Sept. 29, 1899).

Shell turrited, slowly tapering, with diamond-granulate nepionic shell of about 2½ whorls, retained in the adult, the subsequent whorls differently sculptured. Type species with 9½ moderately convex whorls, apex very obtuse. Aperture ovate, with slightly expanded outer lip, the columellar lip with free expanded edge (as in *Bulimulus* or *Opeas*); columella with a small, rather sharp oblique median fold, entering the last whorl as a low spiral lamella. Axis slender and nearly straight, perforate throughout. Type *C. iheringi.*

Genitalia (pl. 31, figs. 3, 7) without accessory organs; atrium short; the penis large, elongate, the vas deferens inserted at its apex, beyond which a hollow tube or sack (fig.7, *x.*) of unknown nature extends, terminating in a short retractor muscle; talon (*t.*) large, composed of a thick curved basal portion and a slightly longer, narrow terminal part. The vagina is short; spermatheca globular, lodged near the heart, its duct long and slender; free oviduct very short, the convoluted portion unusually long; albumen gland well developed. Hermaphrodite duct moderately convoluted.

Probably oviparous, the young shell when hatched about one-tenth the length and less than one-third the diameter of the adult shell.

The right eye-retractor muscle passes between ♂ and ♀ branches of genital system; the penis retractor muscle is inserted upon the diaphragm.

The jaw is lost, and the radula obtained is frayed at the edges, so that the number of teeth in a transverse row cannot be stated, but it was probably not over fifty. The rhachis consists of well-developed teeth, fully as wide as the laterals, with square basal plate and tricuspid reflection, the middle cusp large, about as long as the basal plate; the side cusps small. In the lateral teeth an inner cusp is absent. Marginals similar, with oblique mesocone, acute small ectocone and short basal plate (pl. 31, figs. 8, 9).

Affinities of Callionepion.—I formerly placed this genus as an aberrant group among the Stenogyroid *Achatinidæ;* but further consideration inclines me to think it more nearly related to *Megaspira,* though no close relationship can be claimed, and the question of its affinities is still an open one. The peculiar disparity between the sculpture of the nepionic and post-nepionic whorls of the shell (when not obscured by erosion), the free, expanded edge of the columellar lip, and the sharp though small median fold on the columella, are characters sundering *Callionepion* from American Stenogyroid genera.

The vagina is much shorter than in *Rumina* (where it equals the length of the spermatheca duct), and the duct of

the spermatheca is longer than in *Rumina, Achatina, Neobeliscus* or *Opeas,* being caught with the gut in the loop of the aorta, and consequently the spermatheca lies near the heart, as shown in the diagram, fig. 3. In the wide teeth of the median row, this genus differs from the *Achatinidæ,* where I formerly placed it. The radula differs in no important respect from that of *Megaspira.*

1. C. IHERINGI Pilsbry & Vanatta. Pl. 30, figs. 30, 31, 32.

Shell rimate, turrited, narrow, subregularly tapering; surface glossy, covered with a greenish cuticle, somewhat irregularly plicatulate, decussated by numerous minute spiral striæ or very short cuticular processes, which are lost by wear from the greater part of the shell, and then appear as lightly impressed lines. Whorls 9½, moderately convex, separated by impressed sutures, the apex very obtuse, with depressed tip; surface of the earlier 2¼ whorls cut into an evenly granose pattern by close, deep, obliquely descending grooves intersecting at right angles; last whorl rounded at base. Aperture irregularly ovate, slightly oblique, its length contained 3½ times in that of the shell; peristome thin, subacute, the outer margin slightly expanded, columellar margin reflexed, dilated, impressed at its insertion, bearing a low, narrow submedian oblique fold, continued inward as a low, cord-like spiral lamella within the last whorl. Internal pillar slender and nearly straight.

Length 24, diam. 7, length of aperture 6.6 mm.

Length 23.5, diam. 7, length of aperture 7 mm.

Piquete, Prov. Sao Paulo, Brazil (Dr. H. von Ihering).

C. iheringi PILS. & VAN., Proc. A. N. S. Phila., 1899, p. 372, pl. 15, f. 3, 8, 8*a* (anatomy), pl. 16, f. 11-13 (shell).

The peculiar apical sculpture separates this from all South American Stenogyroid species known to me. When this sculpture is obscured by erosion, as occurs to a greater or less extent in many adult shells, the slightly expanded lip and median fold of the columella are still obvious recognition marks. The type is No. 71,258, coll. Acad. Nat. Sci. Phila.

Genus MEGASPIRA 'Lea' Jay, 1836.

Megaspira Lea, Jay, Catalogue of Recent Shells, edit. 2, p. [81], for *M. ruschenbergiana*.—Lea, Trans. Amer. Philos. Soc., vi, p. 21 (June 15, 1838).—*Pyrgelix* Beck, Index Moll., p. 88, for *P. clata* = *elatior* Spix (1837).—*Balea* sp., Pfr., Monographia, ii.—*Pupa* sp. of various early authors.

Shell rimate, cylindric-tapering, long and narrow, composed of many (16 to over 20) narrow whorls, the last rounded peripherally and beneath. Summit obtuse; protoconch of 2½ to 3 finely striate whorls; subsequent whorls obliquely rib-striate. Aperture small, slightly oblique, but slightly longer than wide. Peristome incomplete, the terminations widely separated; outer lip narrowly expanded, columellar lip triangularly dilated above. Parietal wall bearing a median entering lamella, which penetrates several whorls inward. Columella with two or three low emerging lamellæ, the median one of which (*columellar* lamella) penetrates nearly to the apex, and is enlarged and scalloped in several of the later whorls; the other two lamellæ (supracolumellar and subcolumellar) penetrate less deeply, and are relatively inconspicuous within. The later 3 or 4 whorls are further obstructed within by a series of laminæ radiating from the axis upon the basal wall, at intervals of a third of a whorl. There are no palatal plicæ. Axis slender, perforate or hollow. (*Megas,* big, and *speira,* spire).

Radula (of *M. elatior robusta,* pl. 31, figs. 1, 2) of the usual oblong shape, composed of about 23.1.23 teeth of the ordinary Helicid form, disposed in nearly straight transverse rows. The central tooth is as wide as the laterals, with the square basal-plate slightly longer than wide; tricuspid, the mesocone as long as the basal-plate, side cusps small. The lateral teeth are similar, but asymmetrical by total suppression of the entocone. The marginal teeth differ by shortening of the basal-plates and the lengthening of the overhanging part of both cusps; the transition from laterals is gradual, the ninth to twelfth teeth being transitional. Both cusps remain simple and undivided to the edge of the radula. In the

radula figured the 3d lateral on one side is abnormal, perhaps by concrescence of two rows of teeth.

The soft anatomy is otherwise unknown.

Type *M. ruschenbergiana*. Distribution, interior of Brazil, prov. Minas Geraes. No fossil species are known.

The data now available bearing upon the phylogeny of *Megaspira* are quite insufficient for the formulation of a definite opinion. The radula is all that is known of the soft anatomy, and this is of the generalized type common to many families of Holopoda. I formerly thought that the group was related to the *Urocoptidæ*, but further study of that family causes me to renounce that opinion. Fischer and many others have placed *Megaspira* in the heterogenous family *Pupidæ*. The investigation of *Eomegaspira,* a genus characteristic of the lowest Eocene of the Paris and London Basins, gives a clue to the past history of *Megaspira,* which probably descended from an ancestral stock which crossed from Africa to tropical Brazil.

Little is known of the habitats of the several species. Most specimens in collections were procured in Rio de Janeiro, where they were brought from the interior. The allusion to *Megaspira* in Proc. Malac. Soc. Lond., i, p. 308, is an evident error for *Macrospira.*

Key to Species of Megaspira.

I. Shell with 3 columellar lamellæ, the lower one (subcolumellar) penetrating several whorls on the lower side of the median or columellar lamella; one of the lower radial laminæ continued in a spiral cord in the base of the last whorl. Length of shell over 50 mm., whorls about 23.
M. ruschenbergiana, no. 1.

II. Shell with the supracolumellar and subcolumellar lamellæ shorter and inconspicuous within; no spiral basal cord in any whorl. Smaller shells.

1. Baso-axial radial laminæ or barriers high, most of them with a small hook at the axial end; external sculpture rather coarse.

a. Columella 2-folded, the lower fold bifid; shell

decidedly tapering, 33-35 mm. long, 7.5 wide above the aperture, with 16-18 whorls; umbilical fissure narrow *M. elatior,* no. 2.

b. Columella similar; shell more cylindric and slender, about 36 x 7 mm., with 18½ to 19½ whorls; umbilicus minute. *M. e. gracilis,* no. 2*b*.

c. Larger and stouter, with wider umbilical fissure; columella distinctly 3-folded. *M. e. robusta,* no. 2*a*.

2. Baso-axial radial laminæ low, few or none of them hooked; external sculpture finer; columella biplicate, the lower fold bifid; umbilical crevice minute; length 37 to 39, diam. above aperture about 8 mm., whorls 19 to 21. *M. elata,* no. 3.

1. M. RUSCHENBERGIANA ' Lea ' Jay. Pl. 28, figs. 1, 2, 3, 4.

Shell *openly rimate-perforate,* cylindric-tapering, rather solid; yellowish, variegated with red-brown streaks and spots. Sculpture of oblique rounded riblets as wide as their intervals, the latter more or less wrinkled across; about 3 riblets in the space of 1 mm.; 3 apical whorls very finely striate, usually worn in adult shells. Whorls 22 to 24, slightly convex. Aperture slightly oblique, irregularly ovate. Peristome thin, expanded, the columellar margin dilated and reflexed above, notched at, and a short distance below, the insertion. Columella convex, bearing three entering lamellæ. Parietal wall with a strong entering lamella. Axis perforate but slender throughout. Columellar lamella wide and scalloped in 3 whorls preceding the last whorl, the scallops bent downwards; in the last whorl and the median and upper whorls it is reduced to a smooth, rather small lamella. *The subcolumellar lamella penetrates inward as far as the enlarged portion of the columellar,* running on the lower side of the latter. The supracolumellar lamella penetrates as a low cord about two whorls. Baso-axial radial barriers begin in the fourth whorl from the last; are high, curved, with the upper edge bent forward, and hooked at the axial end. *The next to the last barrier, in the back of the penult. whorl, is continued in a*

spiral thread, running on the floor of the cavity of the first half of the last whorl (fig. 2, *pl.*).

Length 62, diam. above aperture 11 mm., whorls 23⅓.

Length 59, diam. above aperture 10.6 mm., whorls 22⅔.

Length 54.5, diam. above aperture 10.3 mm., whorls 22.

Brazil: Prov. Minas Geraes (Fontaine).

Megaspira ruschenbergiana Lea, JAY, A Catalogue of Recent Shells, edit. 2, p. [81], pl. 1, f. 2 (1836).—LEA, Trans. Amer. Philos. Soc., vi, p. 21, pl. 23, f. 101 (June 15, 1838; see Proc. Am. Philos. Soc., i, 1838, p. 19); Obs. Genus Unio, ii, p. 21, pl. 23, f. 101 (June, 1838).—SOWERBY, A Conchological Manual, p. 63, f. 294 (1839); edit. 2, p. 187, f. 294 (1842).—GRATELOUP, Actes Soc. Linn. Bordeaux, xi, 1839, p. 427, pl. 2, f. 9.—*M. elatior* var. A, KUSTER, Conchyl. Cab., p. 140, pl. 17, f. 5, 7.—DESHAYES in Fér., Hist., p. 220, pl. 156, f. 1, 2.—*Balea elatior* var. *b,* PFR., Monogr., ii, p. 390.—*Pupa elatior* Spix, ORBIGNY, Amér. Mérid., p. 320.

This is the largest species of the genus, and the commonest in collections. Dr. Lea gives the measurements of his type as 2.5 inches long, .5 wide, with 23 whorls. It was united with *M. elatior* by Pfeiffer, and the really important differences between the two species have not before been pointed out. The sculpture is almost exactly the same as in the smaller *M. elatior,* and the enlarged umbilical cavity and triplicate columella (fig. 4) are like *M. elatior robusta;* but *ruschenbergiana* differs from both in the long continuation inward of the subcolumellar lamella (shown in fig. 3, *sub.*), and in the baso-axial barrier in the back of the penult. whorl, the outer end of which is prolonged in a spiral cord (fig. 2, *pl.*) on the basal wall. The larger size of the shell, and the more slender axis within the early whorls are further differences.

There is occasionally a fourth fold, short and tooth-like, on the columella; and in two specimens before me there is a very small, short fold on the parietal wall, standing close to the parietal lamella, on its outer side near the end.

Fig. 3 represents the interior of three whorls, the third, fourth and fifth from the base, enlarged more than in fig. 2;

p., parietal lamella; *s.*, supracolumellar; *c.*, columellar; *sub.*, subcolumellar lamellæ.

2. M. ELATIOR (Spix). Pl. 28, figs. 9, 10.

Shell rimate, cylindric-tapering, terminating above in a short, rapidly tapering cone and very obtuse apex; thin but solid; yellowish-corneous, with scattered oblique reddish-brown streaks and spots. First 2⅔ to 3 whorls very finely striate; subsequent whorls sculptured with oblique rounded ribs as wide as their intervals, the latter more or less wrinkled across, as though spirally striate. Whorls 16-18, slightly convex, the last rounded below. Aperture somewhat oblique, irregularly ovate. Outer lip thin, narrowly reflexed; columellar lip abruptly dilated above, the reflexed edge notched below the dilation. Columella two-folded, the lower fold slightly bifid. Parietal wall bearing an entering lamella, which penetrates 4 to 5 whorls upward. The axis is slender and perforate in the lower and median whorls, enlarged and hollow in the upper ones. The columellar lamella is low within the back of the last whorl, dilated and slightly waved or smooth in the penult., its edge becoming conspicuously scalloped within the preceding two whorls; it then diminishes rapidly, becoming a smooth, small lamella, which ascends to the enlarged earlier whorls of the axis, where it becomes obsolete. The inconspicuous subcolumellar lamella ascends hardly one whorl; the supracolumellar is somewhat longer. The basal barriers are large, erect plates, hooked at the axial, a little curved at the other end.

Length 33.5, diam. above aperture 7.5 mm.; whorls 17.

Length 15, diam. above aperture 7.6 mm.; whorls 17¾.

Brazil.

Pupa elatior SPIX, Testacea fluv., etc., Brasiliam, p. 20 (1827).—DESHAYES in Lam., An. s. Vert., viii, p. 183.—*Helix (Cochlodon) elatior* ORB., Synops., p. 21.—*Megaspira elatior* PFR., Symbolæ, ii, p. 130; Monogr., ii, p. 390 (in part).—BLAND, Amer. Journ. of Conch., ii, p. 64, fig. in text (internal structure).—*Pyrgelix elata* Spix, BECK, Index, p. 88.

Smaller than *M. ruschenbergiana*, with fewer whorls, much

less strongly developed subcolumellar lamella within, and different shaped basal transverse barriers. *M. elata* Gld. differs by its somewhat more numerous whorls and much lower transverse barriers, which are not hooked, and especially by its finer external sculpture. The original description of *elatior* follows: " Shell cylindric, long, apex obtuse, thin, pellucid; longitudinal striæ oblique, deep and close. Whorls 16, rather flattened, separated by a deep suture, sensibly decreasing, the last whorl somewhat swollen; apex obtuse. Aperture semiovate, expanded, provided with two folds: a fold on the columellar plate [parietal wall] spirally passing into the aperture, and a fold on the left margin [columella], divided by a groove. Peristome subreflexed on the right margin, the left margin expanso-reflexed, partially covering the umbilical crevice. Color brownish white, with some longitudinal chestnut streaks. Length 1 inch, 4½ lines; width 4 lines. Habitat with the preceding " [middle eastern provinces of Brazil].

The typical form of *M. elatior* is described above, and illustrated in figs. 9, 10. Fig. 10 represents the lower three whorls from the back.

2*a*. Var.*robusta* Pilsbry, n. v. Pl. 28, fig. 7; pl. 29, fig. 11.

Shell larger, with much more widely open umbilicus; columella distinctly trilamellate; scallops of the columellar lamella bent downward somewhat. Sculpture as in typical *elatior*. Length 44, diam. above aperture 9 mm., whorls 19; length 38, diam. 8.6 mm., whorls 16⅔.

This variety approaches *M. ruschenbergiana* in size and in its open umbilical chink, but differs in internal structure. The teeth of one of our specimens were figured under the name *Megaspira elata* Gld., in Proc. Acad. Nat. Sci. Phila., 1898, pp. 283, 285, pl. 17, f. 1.

2*b*. Var. *gracilis* Pilsbry, n. v. Pl. 28, fig. 8; pl. 29, figs. 14, 15.

With the typical form there are specimens in the collection of the Academy which differ by their more slender and cylindric shape, more numerous whorls and slightly smaller

mouth. The sculpture and the internal structure seem to be substantially the same. Specimens measure 36 to 36.5 mm. long, 7 wide above the aperture, with 18½ to 19½ whorls.

3. M. ELATA (Gould). Pl. 28, figs. 5, 6; pl. 29, figs. 12, 13.

Shell *minutely rimate,* cylindric-tapering, terminating above in a very obtuse, rounded apex; thin but moderately strong. Faintly yellowish corneous, sparsely streaked with reddish; sculptured with *fine, close, oblique rib-striæ,* the intervals somewhat wrinkled across. Whorls 19 to 21, slightly convex. Aperture somewhat oblique, irregularly ovate; outer and basal margins narrowly expanded, columellar margin dilated above. Columella with two folds, the lower one bifid; parietal lamella small, penetrating about 6 whorls. Interior as in *M. elatior,* but the scalloped columellar lamella is somewhat longer, and *the basal barriers are low, and without hooks,* only a few of the upper ones showing a notch at the axial end.

Length 39, diam. above aperture 7.8 mm., whorls 20⅔.

Brazil.

Pupa (*Megaspira*) *elata* GLD., Proc. Boston Soc. Nat. Hist., ii, p. 197 (March, 1847); Otia Conch., p. 34.—*Megaspira elata* GLD., U. S. Expl. Exped., Moll. and Shells, p. 91, pl. 7, f. 101.—KUSTER, Conch. Cab., p. 140, pl. 17, f. 6.—*Balea elatior* var. *g,* PFR., Monogr., ii, p. 390.

Readily distinguished from *M. elatior* and its var. *gracilis* by the decidedly finer external sculpture and the lower radial barriers of the interior. The name might be held to conflict with the earlier *Pyrgelix elata* of Beck, but that has never been used in combination with the generic term *Megaspira,* and since Beck does not claim it as a new name, it was evidently an error for *elatior.*

Gould's description follows: "Shell subcylindrical, elongated, thin, shining, longitudinally barred with crowded striæ, horn-colored, and variegated near the suture with small, dusky blotches. Spire obtuse at apex, composed of about 19 narrow, nearly plain whorls. Aperture small, oblique, lunate, somewhat effuse at base, with a lamellar plate

revolving posteriorly; columellar fold moderately developed, bilamellate. Umbilicus minute. Length an inch and a half, breadth one-third of an inch. Inhabits Brazil."

Genus EOMEGASPIRA Pilsbry, 1903.

Megaspira DESHAYES, An. s. Vert. Bassin Paris, ii, p. 861. —*Pyramidella* sp. Michaud.

Shell rimate or imperforate, long and gradually tapering to a large, obtuse apex; composed of numerous (15 to 22) narrow whorls, the last rounded peripherally and below. Sculpture of sharp vertical rib-striæ. Aperture small, irregularly ovate. Peristome incomplete, slightly expanded, the columellar margin dilated above. Parietal wall bearing a median parietal lamella, which enters about one whorl and several smaller cord-like lamellæ on both sides of it, the parietal and sometimes an infraparietal emerging. Columella 3-folded, the folds becoming three high subequal lamellæ within, rapidly diminishing upward, and apparently not more than two whorls long. Outer wall bearing numerous strong palatal lamellæ, which penetrate scarcely deeper than the last whorl. Axis slender and perforate throughout, smooth above the penult. whorl.

Type *Megaspira exarata* (Michaud) Desh., pl. 29, figs. 16, 17. Distribution, lowest Eocene of the Paris Basin and London Clay; a small species in the English Oligocene.

The shell in this Eocene genus is intermediate in contour between *Megaspira* and *Cœliaxis;* and like both, the axis, though small, is hollow, and the apex obtuse and rounded. The fine, sharp vertical striation resembles that of *Cœliaxis.* The aperture is like that of *Megaspira,* especially in the triplicate columella and the parietal lamella (concealed by matrix in Deshayes' figure of *exarata,* which I have copied). But it differs from *Megaspira* in having the lamellæ all short, not penetrating deeper than the penult. whorl, the axis above that being smooth; in the development of numerous accessory lamellæ upon both the parietal and columellar surfaces, and in the possession of palatal plicæ, as in *Cœlocion.* There

is no trace of the baso-axial radial barriers of *Megaspira*. This diversity between the Eocene and modern groups causes me to separate them generically. See pl. 29, fig. 17, drawn from a specimen in coll. A. N. S. Phila.

Both *Megaspira* and *Eomegaspira* are very highly specialized. The former, in inheriting the lamellæ at an earlier age, gives evidence of the longer life of the group since the acquisition of lamellæ. In *Eomegaspira* the lamellæ are absent until nearly the adult stage, but are then enormously developed, their evolution having been too rapid to be yet pushed back to the younger stages through acceleration; and the extinction of the group was probably due to its extreme specialization. *Eomegaspira* cannot be regarded as in any sense ancestral to *Megaspira* or to any other known genus. It is the termination of a phylum which diverged from the ancestors of *Megaspira* and run its course in Cretaceous time, the species known to us straying into the Eocene. In England a small species existed as late as the Oligocene; but no trace of the genus has been found in the rich deposits of that age in central Europe.

There are two species in the Paris Basin: *E. exarata* (Michaud) and *E. elongata* (Mellv.). See Deshayes, *t. c.*, pp. 863, 864; and Sandberger, Die Land- und Süsswasser- Conchylien der Vorwelt, pp. 156, 172. Cossmann has united them, but I think injudiciously (Ann. Soc. Malac. Belg., xxiv, 1889, p. 362). To these are to be added two English species described as *Megaspira: E. cylindrica* (Edwards MS., Newton) of the London Clay, and *E. monodonta* (Edw. MS., Newton) from the Oligocene of Headon Hill (see Proc. Malac. Soc. London, i, pp. 73, 74). Both are small species, known by imperfect single specimens, which however show the characteristic columellar and parietal lamellæ. *Pupa multispirata* Edw. MS., Newton (*t. c.*, p. 72), is probably a cast of the early whorls of *Eomegaspira monodonta*. Whether these small British species had the palatal armature of the large Parisian forms or not is unknown; but they evidently belong to the same phylum, even though they prove less specialized.

Pl. 29, fig. 17, represents the interior of the last whorl of

E. exarata. *Sc.*, supracolumellar lamella; *col.*, columellar lam.; *p.*, parietal lam.; *pal.*, palatal plicæ; *subc.*, subcolumellar lamella. The dotted line running to *col.*, on the right side, below, in the figure, is too short, not really reaching to the columellar lamella.

Genus PERRIERIA Tapparone Canefri, 1878.

Perrieria T. C., Journ. de Conchyl., 1878, p. 169 (April 1); Annali Mus. Civ. Stor. Nat. Genova, xix, p. 108 (1883).—Crosse, J. de C., 1879, p. 39.—Hedley, Proc. Linn. Soc. N. S. Wales, vii, p. 313, 1893.—*Perieria* Tapparone Canefri, Comptes-rendus Acad. Sci., 1878, p. 1150 (meeting of May 6, 1878).

"Shell sinistral, fusiform, many-whorled, the apex truncate; aperture elliptical; peristome continuous, expanded; axis sinuous, twisted at the base, so that the columella appears truncate or subdentate" (*T. C.*).

Type *P. clausiliæformis*. Distribution of the typical forms, western New Guinea. Named for Edmond Perrier, zoölogist.

The soft anatomy is unknown, and the internal structure of the shell has not been investigated. What relationship the genus bears to the externally similar forms of Queensland remains to be determined. The closure of the umbilicus and the absence of any evidence of parietal or columellar lamellæ at the mouth, in *Perrieria*, differentiate it from the species of Queensland.

By inadvertence the generic name was spelled *Perieria* in the published note of the communication to the *Académie des Sciences*.

1. P. clausiliæformis Tapparone Canefri. Pl. 30, figs. 20, 21, 22.

"Shell narrowly fusiform, rather thick and shining; brown-corneous, whitish on the back (perhaps accidentally); the peristome paler. Spire turrite, tapering above the middle, the apex decollate. Whorls remaining 7½, regularly increasing, convex-flattened, obliquely and closely, longitudinally incised-striate, separated by an impressed and subcrenulate

suture; the last whorl large, subovate beneath. Aperture pyriform, narrowed above, the peristome thickened and continuous. Length 65, diam. 12 mm." (*T. C.*)

New Guinea: Port Dorey (Raffray).

P. clausiliæformis T. C., Journ. de Conchyl., 1878, p. 169; Comptes-rendus de l'Acad. des Sci., 1878, p. 1150; Bull. Soc. Zoöl. de France, 1878, p. 272; Ann. Mus. Civ. Genov., xix, 1883, p. 108, pl. 2, f. 11, 12.—Crosse, Journ. de Conch., 1879, p. 39, pl. 1, f. 2.—*P. c.* var. *a*, Tapparone Canefri, Ann. Mus. Civ. Genov., iv, 1887, p. 129, pl. 1, f. 4, 5.

Var. *arfakiensis* nov. (pl. 30, fig. 23). Shell in every way smaller (*T. C.*). Mt. Arfak, in northern New Guinea (Beccari).

2. P. minor Smith. Pl. 30, fig. 24.

"Shell sinistral, elongate, cylindric, covered with a thin greenish-yellow cuticle; spire very long, truncate; whorls remaining 7, slowly increasing, slightly convex, obliquely striate, subplicate below the suture; separated by a steeply-sloping, subcrenulate, impressed suture; last whorl ascending somewhat in front. Aperture somewhat ear-shaped, pale lilac colored inside; peristome pale, continuous, lightly thickened, a little expanded in front; columella somewhat twisted, slightly truncate. Length 36, diam. 8 mm.; aperture 9 mm. long, 5 wide." (*Smith.*)

New Guinea: Kapaur, on the southwest coast (W. Doherty).

P. minor E. A. Smith, Ann. and Mag. Nat. Hist., 6 ser., xx, p. 414, pl. 9, f. 13 (Oct., 1897).

"Much smaller than *P. clausiliæformis* of Canefri, of a thinner texture, having finer sculpture, a differently colored periostracum, and a less truncate columella" (*Smith*).

Subgenus Cœlocion Pilsbry, 1903.

Shell similar to *Perrieria* in the cylindric-tapering form, truncate summit, piriform aperture and continuous peristome; but conspicuously umbilicate, with two lamellæ within the last whorl on the tubular axis, a spiral lamella on the

parietal wall, and a palatal fold within the penult. whorl. Dextral.

Perrieria from western New Guinea would seem from the inadequate descriptions and figures to be imperforate, though the axis may be tubular within. The two species now known are sinistral, and neither has a parietal lamella. The internal structure is unknown. It seems necessary to signalize by name the diverse structures of the umbilicate, internally lamellate Australian type, at least subgenerically. The uncoiling of the latter part of the last whorl is a feature of senile degeneration in the Queensland *Cœlocion,* not shared by the New Guinea *Perrieria.*

The radula of *P. australis* from Warroo, Port Curtis (pl. 31, figs. 4, 5), has 20.1.20 teeth. The central teeth are as wide as the laterals, and have a single wide cusp, shorter than the basal-plate. The laterals have a wide mesocone and a small ectocone. The 8th to 10th teeth are transitional to the marginals, which are wide, with the basal-plates short as usual, and the ectocone is conspicuously bifid. The jaw (pl. 31, fig. 6) is arcuate and nearly smooth, showing some extremely weak vertical striæ.

The internal closing apparatus of *Cœlocion* is inexactly paralleled by that of *Holospira* and *Sectilumen* in the Urocoptidæ, and by *Distoechia, Thomea, Cœliaxis,* etc., in the Stenogyroid Achatinidæ; but none of these genera has two axial lamellæ.

In *Cœlocion* the axial lamellæ are apparently the columellar and subcolumellar (pl. 30, fig. 28, front, and f. 29, back view of the same shell). The supracolumellar lamella, present in *Megaspira* and *Eomegaspira,* is absent. The subcolumellar lamella penetrates higher up than the columellar. The young shell has a basal plica, absorbed with further growth; but a series of shells from young to adult may possibly show that the palatal plica of the full-grown shell is a continuation of the basal plica of the young. The palatal plica is a structure *Cœlocion* has in common with *Eomegaspira.*

The precocious development of the lamellæ and plicæ in the young stages, by acceleration, gives evidence of the long

line of plicate-mouthed ancestors stretching back into Mesozoic time. The senile feature of an uncoiling last whorl seems to point to *Cœlocion* as the last of its ancient race.

3. P. AUSTRALIS (Forbes). Pl. 29, figs. 18, 19; pl. 30, figs. 25-29.

Shell umbilicate, cylindric, slowly tapering to the rather broadly truncate summit; white under a thin greenish-yellow cuticle, which is almost entirely lost in adult individuals; moderately solid. Surface but slightly shining or lusterless, sculptured with thread-like longitudinal riblets, much narrower than their intervals. Whorls numerous, somewhat convex, the last noticeably angular at the periphery, pinched into a cord-like keel around the narrow, somewhat funnel-shaped umbilicus; the last whorl becoming shortly free from the preceding in front. Aperture subvertical, pear-shaped, distinctly narrowed above, subangular below, where it is channelled within. Peristome free, a little expanded, the parietal margin with a prominence in the middle, marking the end of a low ridge or lamella running inward. Axis rather large and tubular, encircled by a small spiral cord near the base. In the penult. whorl this cord widens into a flat lamella, and is accompanied by another similar lamella above it on the pillar; both decreasing and extending downward into the first half of the last whorl. There is also a plica on the outer wall near the lower partition in the penult. and first half of the last whorl (pl. 30, figs. 28, 29, *pal.*), and a lamella on the parietal wall, beginning within the back of the last whorl, and penetrating about one whorl inward.

Length 22, diam. above aperture 4.5 mm.; whorls 11½. N. Pine River.

Length 20, diam. above aperture 4.3 mm.; whorls 10½. N. Pine River.

Length 18, diam. 4, aperture 4 mm. long; whorls 11. Forbes' type.

Length 18, diam. above aperture 4 mm.; whorls 9. Warroo.

Length 18.5, diam. above aperture 4 mm.; whorls 11. Warroo.

Length 15.7, diam. above aperture 4 mm.; whorls 9. Warroo.

Australia. Queensland coast: Port Mackay (Turner); Port Molle (MacGillivray, type loc.); Warroo Station (Musson), and Miriam Vale (Blackman), Port Curtis; Cania and North Pine River (Musson); Caboolture (Wilde).

Balea australis Forbes, Appendix to Narrative of the Voyage of H. M. S. Rattlesnake, ii, p. 380, pl. 2, f. 9, *a*, *b* (1852). —Pfr., Mon. Hel. Viv., iii, p. 584.—Cox, Monogr. Australian Land Shells, p. 81, pl. 12, f. 16, 16*a* (good).—*Cœliaxis australis* Forbes, Fischer, Journ. de Conchyl., xxxi, 1883, p. 101, pl. 3, f. 4 (shell); f. 5, 6 (dentition).—Hedley & Musson, Proc. Linn. Soc. N. S. Wales, vi, p. 559 (habits).—Cox, t. c., p. 570, pl. 21, f. 4, 7 (young), f. 9 (living animal).—*Perricria australis* Forbes, Hedley, Proc. L. S. N. S. Wales, vii, p. 313 (1893).—*Cœliaxis exigua* Adams & Angas, Proc. Zoöl. Soc. Lond., 1867, pp. 899, 907, pl. 43, f. 16, 17.—*Balea exigua* A. & A., Pfr., Monogr., vi, p. 395.

The young shell, according to Cox, is multispiral and has a rather large, obtuse summit, the second whorl bulging beyond the following ones, the contour being similar to the upper half of *Cœliaxis layardi*. The summit is successively truncated, beginning with the bulging second whorl; the cavity of the shell being closed by a convex subvertical septum. The strongly tapering, concave-sided young shells opened by me have two spiral cord-like lamellæ on the axis in the last two whorls, and a thin lamella on the basal wall. With advancing growth, the upper axial lamella and that on the base are progressively absorbed.

Mr. C. T. Musson found *P. australis* under logs and stones in "scrubs;" from a square yard of ground 150 specimens were obtained. It is very local.

The description above and figure 26 are from specimens from Warroo, Port Curtis. These are usually smaller than those from farther south, and almost denuded of the very thin cuticle. The aperture is noticeably wider, the parietal lamella stronger, and the columellar lamellæ are often visible in the throat; but they differ especially in the narrower um-

bilicus. Some specimens taper markedly, like the figures of *C. exigua*. These Warroo specimens seem to be nearer the typical form than those from farther south at N. Pine River. I have not seen specimens from Port Molle, the northernmost point for the species, and also the type locality.

The variety from North Pine River (pl. 29, fig. 19; pl. 30, figs. 27, 28, 29) is larger than the typical northern form, retains more of the cuticle, has a more widely open, funnel-shaped umbilicus, and weaker parietal ridge. It may eventually be separated from the northern form as a subspecies.

The identity of *C. exigua* with *P. australis*, claimed by Hedley, seems to admit of little question. *C. exigua* was described as from the Solomon archipelago. One of the original figures is copied in my pl. 30, fig. 25; and the original description follows: "Shell narrowly and deeply umbilicate, cylindric-turrite, thin, obliquely rib-striate, pale fulvous; spire decollate, tapering above; whorls remaining 11, subplanate, the last with a basal rib forming a groove in the interior; aperture subvertical, rhomboidal, with a spiral parietal fold in the middle; peristome simple, continuous, solute, the columellar margin expanded. Length 17, diam. 4 mill., ap. 4 mill. long." (*A. & A.*)

Other Cylindrelloid genera which should be mentioned in this connection belong to a peculiar group of Stenogyroid *Achatinidæ*, characterized by the development of internal lamellæ on the axis, parietal wall and basal wall. The axis is hollow in *Cœliaxis*, *Pyrgina* and *Distachia*, solid and slender in *Thomea*.

Cœliaxis Adams & Angas, P. Z. S., 1865, p. 54, type *Subulina* (*Cœliaxis*) *layardi* Ad. & Ang.—*Bathyaxis* Ancey, Conch. Exch., ii, p. 39 (Sept., 1887), same type.—*Sphaerostoma* Girard, Jornal de Sciencias Math., Phys. e Nat. Acad. Real Sci. de Lisboa (2 ser.), ii, p. 247 (1892), same type. South Africa.

In this genus the parietal and basal lamellæ are present in young shells only, the columellar persisting in adults. The

dentition, which I have examined, is Achatinoid, the central tooth being very narrow.

PYRGINA Greef. See GIRARD, Jornal de Sci. Math., Phys. e Nat. Acad. Real Sci. Lisboa, iii, 1893, p. 108. Island of St. Thome.

THOMEA Girard. T. c., p. 106. Same locality. Radula Stenogyroid.

DISTŒCHIA Crosse, Journ. de Conchyl., 1890, p. 164 (date?), type *Cylindrella parisiensis* Dh.—"*Distœctria* Cossman MSS.," HARRIS & BURROWS, The Eocene and Oligocene Beds of the Paris Basin, pp. 100, 114 (Sept. 23, 1891).—*Spartina* HARRIS & BURROWS, t. c., pp. 100, 113.—*Cylindrella* DESH., An. s. Vert. du Bassin de Paris, ii, 872; COSSMANN, Ann. Soc. Roy. Malac. Belgique, xxiv, 1889, p. 358.

An Eocene group of the Paris Basin, evidently related to *Pyrgina* of the recent fauna. The specimens before me do not support the reference of the genus to "*Cylindrellidæ*."

CYLINDRELLINA Munier-Chalmas. Annales de Malacologie, i, p. 324, pl. 7, f. 4-6, type and only species *Cylindrellina briardi* M.-C., of Mons, Belgium. This group has some resemblance to *Distœchia*, and may be related to it. It has no really Urocoptoid characters.

ANOMIA ADAMSI Pils. (p. 11). Illustrated on pl. 26 *Achatinidæ*, figs. 12 13.

BRACHYPODELLA OBESULA Pils., n. n. for *Cyl. obesa* Weinl., p. 57, not *Cyl. obesa* C. B. Ad.

INDEX TO

UROCOPTIDÆ AND MEGASPIRIDÆ.

NOTE.—Names of valid genera and other groups are printed in SMALL CAPITALS; of all synonyms in *Italic*.

Family *ACHATINIDÆ*.

Achatinidæ PFR., Nomenel. Hel. Viv., 1878, 260, in part.
Stenogyridæ FISCHER, Manuel, p. 486, in part.
Achatinidæ D'AILLY, Bihang K. Svenska Vet.-Akad. Handl., xxii, pt. 4, p. 61.

Genus PSEUDACHATINA Albers, 1850.

ALBERS, Die Hel., p. 192, for *A. downesii*.—SHUTTLEWORTH, Notitiæ Malacologicæ, i, p. 85.—KOBELT, Conchylien Cabinet, i, 10te Abth., pp. 8-23 (1893).—D'AILLY, Contributions a la connaissance des mollusques terrestres et d'eau douce de Kaméroun, in Bihang til Kongl. Svenska Vetenskaps-Akademiens Handlingar, xxii, pp. 85-100 (1896).

Shell imperforate, oblong-turrite or pyramidal, solid and opaque; usually coarsely plicate; reddish or red-flammulate, or sometimes white, under a more or less completely fugacious fibrous cuticle. Apex obtuse and rather large, the *first whorl closely engraved spirally, next whorl finely corrugated or granulate* (pl. 3, fig. 13). Whorls about 8. Aperture oblique, ovate, much less than half the shell's length, the *outer lip expanded or reflexed*, columella obliquely truncate at base.

Type *A. downesii*. Distribution, Kamerun and Gabun, equatorial West Africa.

These snails live on the wide leaves of the "elephant plant," and on the foliage of shrubs and trees, often as high as 5 meters from the ground. Like *Achatina marginata*, they lay their eggs in trees, in the axils of the branches near the trunk.

P. wrighti, one of the most distinct species, is the most northern in distribution, being from Old Calabar. The many forms grouping around *P. downesii* are characteristic of the Kamerun (Cameroon) region; while still further southward lies the range of *P. gabonensis*. Further exploration will, doubtless, add largely to the number of species and local races, already numerous and difficult to distinguish.

The most extensive papers dealing with *Pseudachatina* are the monograph by Kobelt, in the new edition of the *Conchy-*

lien Cabinet, 1893, and a masterly account of the Cameroon species by d'Ailly, in 1896.

1. P. WRIGHTI (Sowerby). Pl. 1, figs. 1, 2, 3, 4, 5.

Ovate or ovate-oblong, solid, finely, lightly striate, *nearly smooth;* in large part denuded of the thin, yellowish, lamellose cuticle, which adheres on part of the last whorl only. Variously colored: (1) White, with rich chestnut stripes, widening downwards, and usually coalescent below the periphery, or (2) dark chestnut below the periphery, having a reddish belt about the middle, and whitish above that, sometimes with a series of brown subsutural spots. Apical whorls either pale or violet. Whorls 7½, parted by a margined, finely crenate suture. Aperture oblique, ovate, the lip broadly reflexed, white or tinted. Columella subvertical or arcuate.

Length 67, diam. 34, length of apert. 33 mm.
Length 67, diam. 30, length of apert. 30 mm.
Length 83, diam. 38, length of apert. 40 mm.
West Africa: Old Calabar.

Bulinus wrighti SOWB., Description of a new Bulinus, 1853, with fig.—*Pseudachatina wrighti* PFR., Mon. iv, 596; Novit. Conch., pl. 113, f. 1-4.—SHUTTLEW., Notitiæ I, p. 90, pl. 9, f. 1, 2.—KOBELT, Conchyl. Cab., p. 9, pl. 4, f. 1-4; and var. *buchneri* Kob., p. 11, pl. 4, f. 5, 6.

Distinct from the multiform *P. downesi* by its regular form and smooth, even surface. The color-pattern, shape and size vary widely. I have not been able to consult the original description, and therefore do not know which color-pattern is the typical. The habitat is north of other known species.

1*a*. Var. BUCHNERI Kobelt. Pl. 4, figs. 16, 17.

Conic-turrite, the last two whorls with spiral furrows; basal color unusually distinct in the mouth and reaching out on the lip. Aperture less than half as long as the shell. Length 66, diam. 53, alt. of aperture 28 mm. Type in the Senckenberg Museum.

2. P. NACHTIGALI Kobelt. Pl. 2, figs. 5, 6.

Shell imperforate, ovate-turrite, solid, obliquely roughly striate and costulate, here and there obsoletely spirally lineate; uniform yellowish white, only the embryonal whorl yellowish, and the third and fourth whorls marked with pale brown streaks. Whorls 8, separated by a rather irregular suture; first 2 bearing the usual crowded hair-scars, next 2 simply convex; from the fourth on they are impressed below the suture and sculptured with short riblets; further down the impressed zone is bounded by a sharp line, and over the suture a tuberculate girdle also appears, which continues at the periphery of the last whorl and becomes evanescent near the outer lip; the last whorl being rendered indistinctly angular thereby. Behind the lip and along the columellar callous it is colored yellowish, and shows some dark growth-striæ; anteriorly it descends slowly, and is somewhat compressed around the umbilical region. Aperture only slightly oblique, rounded-ovate, rather large, white. Columella arcuate, strongly excised, much shorter than the mouth, scarcely truncate below. The strong columellar plate is washed with flesh color above, this color running inward band-like. Outer lip beautifully rounded, broadly reflexed, thickened with white within. Length 83, diam. 43, oblique length of apert. 38 mm. (*Kob.*).

West Africa (type in Senckenberg Museum).

Pseudachatina nachtigali Kob., Conchyl. Cab., p. 12, pl. 3, f. 1, 2.

Nearest to *P. elongata* Pfr., but with convex whorls and broader lip. Description and figures from Kobelt.

3. P. DOWNESII (' Gray ' Sowb.). Pl. 8, fig. 48.

Shell oblong-turrite, rather solid, whitish under a thin, lamellose, yellowish cuticle, usually with the base and some wide flames on the spire chestnut-colored, the early whorls generally roseate. Surface more or less roughened by irregular oblique ridges, wrinkles and elongate warts. Whorls 8-9, rather flattened, the last more or less angular at the periphery, the angle often subobsolete. Suture bordered by a

strongly plicate, concave belt below. Aperture ovate, the peristome broadly reflexed, white or flesh-tinted, somewhat thickened within. Columella vertical, abruptly obliquely truncate below, its spreading white or fleshy callous entering in a spiral band around the insertion.

Length 79, diam. 34 mm. (orig. fig.).

Length 77, diam. 33, length of aperture 33 mm.

Length 70, diam. 35, length of aperture 33 mm.

Length 85, diam. 36 mm.

W. Africa: Isowi, Kamerun (Jungner).

Bulinus downesii Gray, Sowerby, Conch. Illustr. Bulinus, f. 99 (1840?).—*Pseudachatina downesii* Gray, H. & A. Ad., Gen. Rec. Moll., ii, p. 134, pl. 75, f. 1.—Shuttleworth, Notitiæ Malac., i, p. 85, pl. 9, f. 3, 4.—Pfr., Monogr., iv, p. 597 (excl. syn.).—Kobelt, Conch. Cab., p. 13.—d'Ailly, Bihang, etc., p. 86.—*Achatina leaiana* Grateloup, Actes Soc. Linn. Bordeaux, xi, p. 416, pl. 2, f. 7 (1839).—*Helix crenata* Valenc. in Paris Mus., teste Pfr.

D'Ailly has restricted this species, excluding various forms placed here by Pfeiffer, Reeve, Kobelt, and others. His opportunities for the study of *Pseudachatina* give his opinions great weight, and his interpretation has here been followed. The original figure was not accompanied by a description, merely by the name. It is reproduced on pl. 8, fig. 48. Grateloup's *Achatina leaiana* was apparently based upon a form of this species, and the name may have priority. The original figure is copied, and the description given below.

A. leaiana (pl. 16, fig. 67). Shell solid, conic-elongate, glossy, subpellucid; white, the base reddish; with longitudinal, oblique-waved wrinkles, some of them obscurely bifurcating; whorls 8, nearly flat except the apical whorls, which are convex, smooth and reddish; aperture obovate, white inside; lip reflexed; columella callous. Length 70-75, diam. 30-33 mm.

P. downesii is extremely variable in form, sculpture and coloration. On pl. 3, fig. 10, a specimen is illustrated having the rough sculpture of var. *grandinata*, and a strong, tuberculate peripheral angle.

3*a*. Var. GRANDINATA Pfr. Pl. 3, figs. 7, 8, 9.

Oblong-turrite, like *downesii*, from which it differs by having the surface closely studded with oblong warts, by a breaking up of the folds. Apex brown. Whorls 7½. Length 79, diam. 30, length of aperture 31 mm.

West Africa: Gabun (Walker); Kamerun (Cameroon) at Itoki (Sjöstedt).

P. grandinata PFR., Malak. Bl., iii, 1856, p. 257; Monogr., iv, p. 598.—KOBELT, C. Cab., p. 23, pl. 12, f. 2 (figure of type).—*P. downesii* var. *grandinata* Pfr., D'AILLY, Bihang, etc., p. 89, pl. 4, f. 4, 5.

Fig. 7 is copied from Kobelt's figure of Pfeiffer's type. Figs. 8, 9 are from d'Ailly.

4. P. SODENI Kobelt. Pl. 4, figs. 18, 19.

Thin, very large and richly colored, the sculpture composed more of continuous ribs, often forked above and below, than of warts. The last whorl measures 44 mm. high behind, is smooth, streaked with brown-red, the streaks not confluent on the base. The columella has only a thin, translucent deposit. Throat livid blue-red, the thin, expanded peristome brownish and only quite lightly thickened within. The columella is not truncate as in typical *downesi*, but tapers obliquely. A second specimen also in the Berlin museum is thicker, with thicker peristome, more obese, and measures 95 x 46 mm., but otherwise is quite similar. Length 95, diam. 44 mm.

West Africa: Kamerun, at Etome, Batoki and Basse (Dusen).

Bulimus downesii REEVE, C. Icon., v, pl. 29, f. 177*a*.—*Pseudachatina downesii* v. MART., Monatsber., Berlin, 1876, p. 259, pl. 2, f. 3 (copied in C. Cab., pl. A, f. 1).—KOBELT, C. Cab., p. 16, pl. 5, f. 3-6; and var. *sodeni*, pl. 8, f. 1.—*P. sodeni* Kob., D'AILLY, Bihang, p. 90, pl. 4, f. 6.

D'Ailly regards this form as a distinct species, pointing out the following characters: The costulation is noticeably coarser and more spaced than in *P. downesii*, with more projecting swellings and nodes. The cuticle is also coarser, and

greenish-brown. The form and basal color also differ: *P. sodeni* is always ovoid, more or less elongate, with the last whorl of the spire swollen and large, measuring behind almost half of the total length of the shell, while in *P. downesii* the last whorl is noticeably smaller, and the lateral outlines of the spire are nearly straight. The base in *P. sodeni* lacks the continuous dark tract distinguishing *P. downesii* and several other species; it is replaced by wide flames, which are not confluent. The peripheral angle is very weak, always less emphatic than in *P. downesii*. The length varies between 76 and 105 mm.

Fig. 18 is from Kobelt's type figure; fig. 19 from d'Ailly.

5. P. PYRAMIDATA Kobelt. Pl. 4, figs. 14, 15.

The shape is almost strictly conic. The sculpture consists of rather regular, oblique riblets, with no trace of tubercles; but on the median whorls there is a girdle beset with little knots above the suture, bounded by a distinct groove above. The last whorl is visibly angular, with a few incised spiral furrows, and scarcely any markings, whilst the upper whorls are checkered with red and white, as in *buchholzi*. The aperture is yellowish-white, bluish below; the callous with a distinct band above; the peristome reflexed and brown-bordered. Length 71, diam. 33, oblique alt. apert. 27 mm.

P. downesii var. *pyramidata* KOBELT, Conchyl. Cab., p. 17, pl. 8, f. 2, 3.

Habitat unknown. Description and figures are from Kobelt.

5*a*. Var. KOBELTIANA Pilsbry, nov. Pl. 7, fig. 37.

Large and solid, elongate, with conspicuously convex lateral outlines. *Surface smoothish*, with no tubercles, ribs or waves. Last two whorls rich red-chestnut, with *a conspicuous white band below the suture*, the base darker. Preceding three whorls decorated with broad red-brown flames on a nearly white ground, the apex purple. Whorls fully 8½, slightly convex, impressed and weakly plicate below the suture, and with a convex girdle limited by a furrow above it. Last whorl indistinctly angular in the middle. Aperture

very oblique, white within; *outer lip broadly expanded and reflexed, widely brown-bordered.* Columella and *parietal callous opaque-white,* the latter not noticeably thinned out near the outer lip. Length 92, diam. 35, oblique length of aperture 38 mm.

West Africa.

This form does not appear to be referable to any of the described species or varieties, but perhaps stands nearest Kobelt's *P. d. pyramidata.* It is named for Dr. Wm. Kobelt, whose monograph of *Pseudachatina* has been quoted freely in the present work.

6. P. DENNISONI Pfeiffer. Pl. 7, fig. 40.

Shell ovate-conic, rather solid, sculptured with strong, distant folds with smaller ones interposed, roseate under a deciduous tawny epidermis, generally ornamented with blackish triangular streaks and an interrupted sutural band. Spire conic, the apex obtuse, blackish; suture undulating, not margined. Whorls 7½, moderately convex, the last swollen above, subcarinate below the middle, blackish. Columella compressed, white, twisted. Aperture oblique, sinuate-oval, the peristome thin, narrowly expanded, margins joined by a white callous. Length 77, diam. 32, aperture 32 mm. (*Pfr.*).

Gabun (Cuming coll.).

Bulimus downesii REEVE, C. Icon., v, pl. 29, f. 177*b*.—*Pseudachatina dennisoni* PFR., Malak. Bl., iii, 1856, p. 257; Monogr., iv, p. 597.—*P. d.* Pfr. et var. *connectens* D'AILLY, Bihang, p. 92, pl. 4, f. 1-3 (1896).

Reeve's figure of a specimen in the Dennison coll., which Pfeiffer refers to his species, is reproduced on pl. 7, f. 40. D'Ailly gives the name *connectens* to a series of shells intermediate between *dennisoni* and *sodeni.*

6*a*. Var. CONNECTENS d'Ailly. Pl. 3, figs. 11, 12, 13.

Upper whorls and apex flesh-colored, peristome flesh or roseate, or sometimes white, the columella pure white; rest of the shell of a more or less deep rose, brown, or nearly white. The suture is usually margined by an impressed line. The last whorl may be rounded, as in Reeve's figure (*denni-*

soni), but at the other end of the series of forms it is strongly angular, as in the shell figured (f. 11). The base in all the specimens has a dark fleshy-brown zone, more or less sharply defined at its upper edge, which is not visible above the suture. The sculpture is composed of coarse ribs, here and there broken into tubercles, and chalky white at the summits.

W. Africa: Kamerun, at Bomana (Dusen), Itoki, Bonge, Bibundi (Sjostedt), and Isowi (Jungner).

7. P. GRAVENREUTHI 'Bttg.' Kobelt. Pl. 5, figs. 20, 21, 24, 25.

Shell long ovate with turrite spire, rather solid but not especially thick, *the middle whorls sculptured with a few short ribs and tubercles, elsewhere only finely and obliquely striate*, part of the striæ rib-like below the suture. The color is yellowish horn-color. *Markings generally restricted to the third and fourth whorls, consisting of oblique stripes, forked above.* Lower half of the last whorl only slightly darker, often marked with small light flecks. The fibrous brown epidermis is mostly well preserved on the last 2 whorls. There are also specimens with handsomer coloring than the above. Whorls 9, the initial 2 convex, with the usual sculpture, next 2 also rather convex, and beautifully marked with brown stripes, sometimes bordered with yellow or white; remaining whorls flattened, parted by an impressed, yellow-white bordered, irregularly crenulate suture, and with a row of tubercles or a tuberculose keel also above the suture. Aperture oblique, ovate, acute above, bluish within, with a liver-brown border. The columella is twisted, strongly excavated, shortly and obliquely truncate below. Outer lip simple, expanded, or at most very shortly reflexed. The margins are connected by a quite thin bluish or brownish callous. Length 70 to 80 mm.

Kamerun: Buea, at 950 meters elev. (Preuss, Dusen; type loc.); Etome (Dusen).

P. gravenreuthi Boettger, KOBELT, Conchyl. Cab., p. 18, pl. 6, f. 3, 4; pl. 7, f. 1-4 (1891), with var. *preussi* KOB., p. 21, pl. 6, f. 5, 6; pl. 7, f. 5, 6.—D'ANCY, Bihang, p. 94.

A species of the *dournesii* group, distinguished from *gabo-*

nensis by the more slender spire, less plump form and diverse coloration. It is quite variable, as the figures show, but seems, so far as I can judge from a few specimens, to be fairly distinct.

7*a*. Var. PREUSSI Kobelt. Pl. 5, figs. 22, 23.

Conspicuously smaller, hardly exceeding 60 mm. long and 30 wide, with a whorl less than typical *gravenreuthi*. Taken at the same localities as the latter.

8. P. ELONGATA Pfeiffer. Pl. 2, f. 1, 2, 3.

Shell imperforate, oblong-turrite, solid, irregularly obliquely plicate, and having a granulate girdle above the suture; reddish tawny. Spire turrite, the apex rather obtuse; suture white-margined, crenate. Whorls 7½, the upper convex, the rest nearly flat, last whorl obtusely carinate in the middle, more than one-third the length. Columella callous, subtruncate-twisted. Aperture little oblique, oblong-oval; peristome simple, the margins joined by a thick white callous, right margin narrowly expanded. Length 84, diam. 33 mm.; apert. 37 mm. long, 20 wide (*Pfr.*).

West Africa: on the Gabun river (Cuming coll.).

P. elongata PFR., P. Z. S., 1865, p. 832; Monogr., vi, p. 206.—KOBELT, C. Cab., p. 17, pl. 6, f. 1, 2; pl. 12, f. 1.

Comparatively smooth, like *P. gravenreuthi*. The figures are from Kobelt, fig. 3 representing Pfeiffer's type in the Cumingian (now B. M.) collection.

9. P. PERELONGATA Rolle.

Shell very long, turrite, solid, moderately plicate-striate, decussated with evanescent spiral lines, covered with a rough, deciduous, straw-colored cuticle. Whorls 9, a little convex, separated by a distinctly margined and suberenulate suture, subangular below the suture; last whorl impressed below the suture, then somewhat angular at the periphery. Aperture moderately oblique, oblong-oval, the peristome rather expanded, white-lipped, more effuse basally. Columella rather straight, moderately twisted, subtruncate at base, forming a

rather deep sinus with the basal margin. Length 99.5, diam. 39.7 mm.; apert. 38.9 mm. long, 25 wide, 36 mm. high (*Rolle*).

West Africa: Old Calabar, Kamerun (Berlin Mus.).

Pseudachatina perelongata Rolle, Nachrbl. d d. malak. Ges., xxxiv, p. 211 (Dec., 1902).

This seems from the description to belong to the *downesii* group. Herr Rolle unfortunately did not mention the color of the shell. Compare the following species.

10. P. daillyana Pilsbry, n. sp. Pl. 1, figs. 7, 8.

Shell moderately solid, the spire long, with nearly straight lateral outlines. Surface smoothish, with some low, inconspicuous, oblique waves and ripples only. Pure white under a fibrous, dirty yellow cuticle, which in large part persists on the last two whorls. First 4½ whorls convex with simple suture, the following whorls less convex, impressed below the suture, and bordered with a closely plicate band, limited by an impressed line below, this border becoming obsolete on the last whorl, which is more or less angular at the periphery, the angle sometimes weakly tuberculate. Aperture small, oblique, pure white or faintly pink-tinted throughout. Outer lip well expanded and reflexed. Parietal callous rather thick, white.

Length 87, diam. 35, oblique alt. apert. 35.6 mm.; whorls 8½.

Length 84.5, diam. 33.5, oblique alt. apert. 33.5 mm.; whorls 8⅓.

West Africa.

This form seems nearest *P. gabonensis*, but differs by its long, narrow spire, comparative smoothness and more developed lip. It is named for Adolf d'Ailly, author of one of the best papers upon the West African snail fauna.

11. P. gabonensis Shuttleworth. Pl. 6, figs. 26-29.

"Shell long ovate-turrite, rather solid, coarsely and remotely plicate, slightly glossy; pale flesh-color or roseate, painted with wide purplish-rose streaks, the base pale chest-

nut or purplish. Spire raised, the apex brown, obtuse; whorls 8, convex, the last about two-fifths the total length, obsoletely angular; suture linear, broadly margined and plicate. Columella straightened, somewhat twisted inward, the base obliquely, lightly truncate. Aperture lunar-oval; peristome simple, acute, narrowly effusely spreading, bordered with pale flesh color or whitish, the margins joined by a thin callous, thickened outwardly at the base of the columella" (*Shuttl.*).

West Africa: Gabun (Verreaux).

Achatina downesii Desh. in Fér., Histoire, ii, p. 190, pl. 122, f. 1-3.—*Pseudachatina gabonensis* Shuttl., Notitiæ, i, p. 86, pl. 8, f. 5, 6 (1856).—Pfr., Monogr., iv, p. 598.—Kobelt, Conchyl. Cab., p. 21, pl. 9, f. 1-6.

Fig. 26, from Shuttleworth's original figure, excellently represents the typical form of the species. The other figures, copied from Kobelt, do not seem to me at all characteristic. It is a light shell, often white throughout or with the early whorls flesh tinted, but varying to forms with wide, indistinctly bounded stripes on the spire, a purplish tip, and sometimes a brown base. Some patches of the dull blackish or dirty yellowish cuticle adhere to most specimens. The spire is often more slender than in any of the figures. Specimens before me vary in length between 64 and 82 mm.

12. P. martensi d'Ailly. Pl. 6, figs. 30, 31, 32.

Shell imperforate, ovate-oblong or turrite, solid, closely and rather regularly plicate-striate. Under a scaly epidermis, which is generally lost from the upper whorls, but frequently persists on the last near the aperture, it is shining, whitish or rose-fleshy, with darker apex, and very rarely ornamented with a few short reddish evanescent streaks above the suture of the median whorl; base blackish-chestnut. Spire convexly-conic or turrite, the apex obtuse. Whorls 7½, the first 4 a little convex, smooth; following ones more or less flattened, impressed below the narrowly margined suture, irregularly, coarsely and distantly cristate-plicate or more rarely rather regularly set with distant conic tubercles above the suture. Last whorl behind nearly half the length of the shell, more

or less distinctly angular, the angle disappearing near the aperture. Aperture oblique, rounded-oval, whitish or whitish-fleshy inside, slightly pearly, the external basal brown zone showing through below. Columella compressed, twisted inward, very obliquely truncate, white. Peristome narrowly reflexed or reflexed-spreading, somewhat thickened, always white; margins joined by a whitish callous, which is thickened and opaque towards the columella, transparent towards the outer lip. Length 47.5 to 75, diam. 25 to 33, alt. apert. 20 to 31 mm. (*d'Ailly*).

West Africa: Kamerun, at Etome (Dusen), and Itoki (Dusen, Sjostedt).

P. martensi d'Ailly, Bihang, etc., p. 95, pl. 4, f. 7-9 (1896).

Resembles *P. wrighti* var. *buchneri* in general appearance and system of coloration. The basal zone does not extend to the angle of the whorl. It is more sharply limited above than in any other species, and has the same appearance at all ages of the shell (see fig. 32, base of an immature specimen). In adults the shell is solid and thick; in the young thin and semi-transparent. The embryonic shell has a noticeable umbilical perforation, which lasts in the young up to about 4½ or 5 whorls. The shell is sculptured with quite regular growth-striæ, and a very fine but strongly expressed plication on the median whorls. Besides this sculpture, at the fifth whorl from the apex there begin to be coarse folds or ridges, stronger on ventricose specimens, weaker on the turriculate. This sculpture disappears near the aperture.

13. P. LILJEVALLI d'Ailly. Pl. 2, fig. 4.

Shell imperforate, ovate-conic, thin but solid, lightly plicate-striate. Under a scaly epidermis, which is lost from the upper whorls and persistent near the aperture, it is shining, fleshy-chocolate colored, the upper whorls blackish purple, marked with fine, superficial bluish-white streaks, the median whorls sometimes ornamented with wide brown streaks and narrower white ones; the last 3 whorls encircled with a wide whitish belt below the suture, last whorl encircled at the base with a blackish-chocolate zone, extending up to the upper

insertion of the lip. Spire convexly conic, the apex obtuse, with the usual sculpture. Whorls 7, parted by a suture narrowly margined by an impressed line, the first 4 whorls a little convex, nearly smooth, the rest flattened, impressed below the suture, more or less regularly roundly cristate-plicate, the plicæ especially prominent below the sutural margin; last whorl nearly half the total length, behind, distinctly angular, the angle disappearing near the aperture. Aperture oblique, subrotund, tricolored inside, showing there the three color-zones of the exterior. Columella strongly twisted inward, obliquely truncate, white. Peristome narrowly reflexed, bordered with a whitish callous, the margins joined by a whitish callous, thickened and opaque near the columella, transparent near the outer lip. Length 45 to 50.5, diam. 24 to 27 mm.; alt. apert. 20-22 mm.

West Africa: Kamerun, at N'dian (Sjostedt).

P. liljevalli D'AILLY, Bihang, etc., p. 98, pl. 5, f. 1, 2 (1896).

The smallest species yet known. The above account is from d'Ailly.

14. P. BUCHHOLZI Kobelt. Pl. 7, figs. 35, 36, 38.

Relatively smooth, but with a number of whitish tubercles, some of them prolonged downwards below the sutural impression, and bounded by a sharply incised furrow. Coloring extremely handsome; broad red-brown stripes alternating with narrower whitish-yellow ones, and coalescent upon the lower half of the last whorl. The aperture is beautiful bluish, the lower half of the throat darker. The parietal callous has the characteristic dark band, the broadly reflexed peristome with a lighter lip. Length 80, diam. 43, alt. apert. 35 mm.

West Africa: Kamerun.

P. downesii var. *buchholzi* KOBELT, Conchyl. Cab., p. 16, pl. 8, f. 4, 5, 6.

This form is considered by d'Ailly to be specifically distinct from *downesii*, an opinion which seems, so far as I can judge from a single specimen, to be justified.

Genus ATOPOCOCHLIS Crosse & Fischer, 1888.

Atropocochlis C. & F., Journ. de Conchyl., 1888, p. 11, type *Buccinum exaratum* Müll.—*Eutaxis* Ancey, Bull. Soc. Malac. France, v, 1888, p. 67, footnote no. 5, type *B. exaratus* Müll.

Shell Bulimiform, imperforate, thin, diaphanous, roughly striate; suture crenulate; last whorl subangulate; columella vertical, straight and entire, not truncate at base; *peristome strongly reflexed.*

Type *A. exarata* (Müll.). Distribution, Island of San Thomé, in the Gulf of Guinea.

The single species composing this group has been variously classified, but its true position was indicated by Furtado in 1888, who showed that in soft anatomy it closely resembles *Perideris* Shuttl. *Atopocochlis* differs from *Perideris* (=*Pseudotrochus*) in the rougher sculpture and the *reflexed lip,* the latter character being of some importance in view of the total absence of even a tendency to expansion of the lip in *Pseudotrochus.* It is on this ground alone that the group is here given generic rank, a course in which I follow Kobelt.

The long free course of the vas deferens suggests the probability that *Atopocochlis* is ovo-viviparous, like *Pseudotrochus alabaster.*

1. A. exarata (Müller). Pl. 9, figs. 1, 2.

Shell imperforate, long-pyramidal, thin but rather solid, diaphanous, scarcely shining; longitudinally sculptured with suboblique, very rough, rude, unequal striæ; uniform whitish. Spire long-conic, the apex rather obtuse; suture crenulate, somewhat channelled. Whorls 7, nearly flat, the embryonic 1½ smooth, the last whorl not descending, longer than the spire, angular-carinate a little below the middle, strongly, subobliquely corrugate-striate; base somewhat tapering, rounded; columella vertical, straight. Aperture rather large, subangulate-ovate, glossy and white inside. Peristome simple somewhat thickened, strongly reflexed, buff-bordered, the margins distant; columellar margin dilated, basal margin thickened, expanded, subangulate outwardly. Length 59,

diam. 34 mm.; apert. with peristome 33 mm. long, 21 wide (*Crosse*).

Island of San Thomé, Gulf of Guinea: Roea Agoa Grande (Greeff); Roea Bemfica, at 350 meters (Moller).

Buccinum exaratum Mull., Hist. Verm., ii, p. 148, no. 337 (1774).—Chemnitz, Conchyl. Cab., ix, pt. 2, p. 37, pl. 120, f. 1031, 1032 (1786).—*Bulla exarata* Gmel., Syst. Nat. (13), p. 3431.—Dillwyn, Descript. Catal., i, p. 493.—*Bulimus exaratus* Brug., Encycl. Méth., i, p. 361.—Crosse, Journ. de Conchyl., 1868, p. 131, pl. 6, f. 2.—Hupe, in Castelnau, Exped. dans l'Amér. du Sud, p. 41, pl. 8, f. 3.—Morelet, Voy. Welwitsch, p. 59.—Greeff, Zöol. Anzeiger, v, no. 122, p. 520 (1882).—Nobre, Explor. Sci. ilha de S. Thomé, p. 3 (1886).—Not *B. exaratus* Müll., Vignon, Bull. Soc. Mal. France, v, p. 67, no. 21.—Furtado, Journ. de Conchyl., 1888, pp. 5-9, pl. 2 (anatomy).—Pfr., Monogr., iii, p. 301.—*Helix* (*Cochlitoma*) *exarata* Fér., Prodr., p. 49, no. 339; Histoire, pl. 118, f. 1, 2.—*Achatina exarata* Gray, Ann. of Philos. (n. s.), ix, p. 414.—Deshayes, in Lam., An. s. Vert., viii, p. 311; in Fér. Hist., ii, p. 163.—Kuster, Conchyl. Cab., i, pl. 3, f. 5, 6.—*Limicolarius exaratus* Beck, Index, p. 60.—*Limicolaria exarata* Shuttlw., Notitiæ, i, p. 51.—*Pseudachatina ? exarata* Pfr., Monogr., vi, p. 206; viii, p. 267.—*Perideris* (*Atopocochlis*) *exarata* Crosse & Fischer, Journ. de Conchyl., 1888, p. 19.—*Atopocochlis exarata* Kobelt, Conchyl. Cab., p. 2, pl. 1, f. 4, 5 (copied from Crosse).

Genus PSEUDOTROCHUS H. & A. Adams, 1855.

Perideris Shuttlw., Notitiæ Malacologicæ, i, p. 76 (1856).—Pfr., Monogr., iv, p. 592.—Kobelt, Conchyl. Cab., i, Abth., 10, pp. 24-48. Not *Perideris* Brandt, Recueil des Actes de la séance publique de l'Acad. Imp. des Sciences de St. Pétersbourg for 1835, p. 250 (Holothuria).—*Achatina*, *Helix*, *Bulimus*, and *Oxystrombus* sp., of various authors.—*Chersina* Beck, Index Moll., p. 74, sp. no. 3 (but not *Chersina* of Humphrey, Museum Calonnianum, p. 62).—*Pseudotrochus* 'Klein' H. & A. Adams, Genera of Recent Mollusca, ii, p. 135 (Feb., 1855).

Shell *imperforate,* long-ovate, with conic spire and obtuse apex; rather thin, smoothish or plicatulate, with more or less obvious fine spiral incised striæ; covered with a thin cuticle, which is often evanescent. Whorls 6-7, the first ones smooth, with no sculpture except faint growth-lines; the last whorl rounded or angular at the periphery; the suture narrowly bordered below by a band, which is almost always crenulate or beaded. Aperture oblique, ovate, the outer lip simple, *unexpanded,* often thickened within; columella subvertical, more or less distinctly truncate at the base.

Type, *P. alabaster* (Rang). Distribution: West Africa, from Liberia to Gabun, especially on the Gold Coast; Prince's Island.

Perideris, the name universally current for this group since 1856, the date of Shuttleworth's luminous monograph, was preoccupied by Brandt in 1835, for a Holothurian. Another generic term must, therefore, be found for the molluscan genus.

Chersina was first used by Humphrey, in the anonymous invoice of the Calonne collection, for some 18 species of Achatinoid snails, beginning with species of *Liguus,* and including *Achatina, Amphidromus,* and probably *Oxystyla, Strophocheilus* and other genera; though only the first three genera are represented by species identifiable by the quotation of Linnean names. Beck, in 1837, adopted "*Chersina* Humph." for a group including *Perideris alabaster* Rang and the species of *Liguus;* and Albers, 1850, restricts it to the species of *Liguus.* While I do not regard the Calonne sale catalogue as authority for names either generic or specific, yet the absence of species of *Perideris* in that work, as well as the possibility that some authors may consider it quotable in nomenclature, render it inadvisable to use *Chersina* Beck for the species *alabaster* and its allies. It seems better to leave *Chersina* Beck in the synonymy of *Liguus.*

Pseudotrochus was one of the pre-Linnean names exhumed by H. and A. Adams, who used it for species of "*Perideris*" and *Liguus.* Their first species, and one of the two figured as examples, is *alabaster* Rang; and by elimination of the

species of *Liguus*, which had long before been segregated by Montfort, only "*Perideris*" remains. It seems proper, under the circumstances, to revive *Pseudotrochus*, in a restricted sense, for *alabaster* and its allies.

A young specimen of *Perideris* has been reported from Ujiji (P. Z. S., 1880, p. 352), collected by Hore. This is so far out of the known range of the genus that there seems a possibility of misidentification owing to the ambiguous characters of a young shell.

Shuttleworth, in his *Notitiæ* (1856), gave an excellent account of the species then known. His results were adopted by Pfeiffer in subsequent volumes of the *Monographia Heliceorum*. The only recent monograph is that of Kobelt, 1893-4, who describes 19 species. The number is herein increased to 24.

1. P. ALABASTER (Rang). Pl. 16, figs. 70, 71, 73, 74.

Shell ovate-conic, solid, *gray-white, with an opaque-white sutural border*, and on the last whorl one or several *olive-yellow or brown bands of cuticle at or below the periphery*, and a narrower one below the suture. Surface smoothish, marked with faint growth-lines and minute spiral incised lines. Spire straightly conic, the apex obtuse. Whorls about 6½, nearly flat, joined by an almost even suture, the margin below it not crenulate. Last whorl varying from rounded to angular at the periphery. Aperture ovate, oblique, white inside; *peristome thickened within;* columella vertical, white, truncate at the base.

Length 36-40, diam. 18 mm.

Length 32.5, diam. 16 mm.

Length 40, diam. 22 mm. (Rang).

West Africa: Prince's Island (Rang, Folin, Welwitsch, Vignon); all over the southern part of the island, on the leaves of trees and bushes, between 15 and 20 ft. up (Dohrn).

Helix alabaster RANG. Annales des Sciences Naturelles, xxiv, p. 20, pl. 1, f. 2, 2*a*, Paris, 1831.—*Achatina alabaster* DESH., in Lam., An. s. Vert., viii, p. 312; in Fér., Hist., p. 150, pl. 124, f. 7, 8.—REEVE, Conch. Syst., ii, pl. 178,

f. 9; Conch. Icon., v, pl. 9, f. 28.—Pfr., Monogr., ii, 247; iii, 479.—Morelet, Sér. Conch., i, p. 21; Voy. Welwitsch, p. 74.—*Perideris alabaster* Shuttl., Notitiæ, p. 77.—Pfr., Monogr., iv, 592; vi, 204; viii, 267; Novit. Conch., p. 314, pl. 76, f. 2-5.—Semper, Reisen im Archip. Phil., Landmoll., p. 145, pl. 12, f. 1 (genitalia); pl. 16, f. 5 (radula).—Kobelt, Conchyl. Cab., p. 26, pl. 2, f. 2, 3; pl. 11, f. 5, 6.—*Achatina alabaster* Rang, Vignon, Bull. Soc. Malac. France, v, p. 68, no. 29.—Crosse, J. de C., 1888, p. 301.

The living animal is pale yellow or greenish, this color showing more or less through the shell. It is long and slender (70 × 5 mm.), with long tentacles. Rang has recorded that it is ovoviparous. An individual was brought to him containing 14 eggs and 10 young shells. The eggs are whitish and oblong. Four young shells dried in a shell in our collection measure 7 to 7.5 mm. long. They are very smooth, thin and transparent, and angular at the periphery. In the smallest one the axial chink is not quite closed.

Rarely the yellow or brown cuticular bands are wanting. The typical form of *P. alabaster* is rounded peripherally, but it varies to forms with a more or less obvious peripheral keel, and in these a white band usually underlies the cuticular peripheral belt, or is exposed by loss of the latter, as in the following species, which I believe to be merely an extreme variation of the *alabaster* type. In fig. 72 a specimen is shown having the last whorl strongly angular in front, rounded near the lip. Pl. 15, figs. 60, 61 represent another shell in which the angle extends to the lip, though obtuse there. Both of these are white-banded peripherally, though with a yellowish band partly concealing the white. In fig. 60 the slight columellar truncation has been overlooked by the artist.

P. alabaster is reported from Quicuje, in the district of Loanda, on the mainland, by Morelet, from specimens collected by Dr. Welwitsch. He thinks it may have been imported there.

2. P. CARINATUS (Pfeiffer). Pl. 15, figs. 62, 63.

Shell conic, smooth, alabaster-whitish, ornamented with wide, opaque-white bands at suture and periphery. Whorls 6½ flat, the last acutely angular, about two-fifths the total length. Columella subvertical, not reaching the base, very shortly truncate; aperture subquadrangular, peristome simple. Length 31, diam. 17 mm., aperture 15 mm. long, 9.5 wide (*Pfr.*).

Habitat unknown (Cuming coll.).

Achatina carinata PFR., Symbolæ ad Hist. Helic., iii, p. 90 (1846); Monogr., ii, 248.—REEVE, Conch. Icon., pl. 7, f. 24.

This form is evidently closely related to *P. alabaster*, and in my opinion is a carinated subspecies of that. It differs from the carinate variety of *alabaster* only in the more strongly truncate columella. It has been referred to *Liguus*, but erroneously.

3. P. SOLIMANUS (Morelet). Pl. 15, figs. 64, 65, 66.

Shell rather solid, oblong-conic, thin but rather strong, smoothish, under a lens showing fine growth-lines and minute spirals. White, typically with a brown line at the periphery, *a purple-brown columella and axial patch*, and a purple-brown band midway between axis and periphery; but sometimes the line and band are absent. Sutural margin white, beaded below, smooth on the upper whorls. Spire conic, the apex mamillar. Whorls 6½ to 7, moderately convex, the last obsoletely angular in front or rounded throughout. Aperture quite oblique, colored within like the outside, the outer lip acute; columella purple, twisted or nearly straight, obliquely truncate below, the basal margin receding.

Length 40, diam. 23 mm.

West Africa: Gabun, forest near Bakele (Vignon); Kamerun, at Victoria (Buchholz), Bomana (Dusen), Kitta, N'dian, Itoki (Sjostedt), Barombi (Preuss).

Bulimus solimanus MOREL., Revue Zöol., Dec., 1848, p. 353.—PFR., Monogr., iii, 299.—*Achatina solimana* MOREL., Sér. Conch., i, p. 23, pl. 2, f. 2.—VIGNON, Bull. Soc. Zöol.

France, v, p. 68.—PETIT, Journ. de Conchyl., iii, 1851, p. 267, pl. 8, f. 8.—*Perideris solimana* PFR., Monogr., iv, 593; vi, 204; viii, 266.—SHUTTL., Notitiæ, i, p. 78.—KOBELT, C. Cab., p. 32, pl. 10, f. 2, 3; pl. 16, f. 4, 5.—v. MARTENS, Monatsberichte der K. Preuss. Akad. Wissensch. zu Berlin for 1876, p. 259, pl. 3, f. 3 (living animals); Sitzungsber. Ges. Naturf. Freunde Berlin, Feb., 1891, p. 31.—D'AILLY, Bihang, etc., p. 82.—*Bulimus suturalis* PFR., Proc. Zöol. Soc., 1851, p. 255.—*Bulimus sillimani* PFR., Conchyl. Cab., p. 88, pl. 31, f. 7, 8.—*Achatina sillimani* DESH., in Fér., Hist., ii, p. 152, pl. 137, f. 14, 15.

This species is well distinguished by its broadly conic shape. Only four out of fifteen specimens before me have the two bands on the last whorl, but the columella is dark and the sutural margin is opaque-white in all. The figures represent the apex as more acute and less teat-like than it really is. Von Martens has figured the living animal of a specimen from Victoria, from a drawing by Dr. R. Buchholz. The neck and tentacles are dark green; sides of the fore part, and the entire hind part of the foot are pale gray, with numerous small white flecks.

Dusén found it on tree trunks. In an individual 30 mm. long, d'Ailly found 14 eggs, measuring 5 x 3.75 mm., polished and of a glossy whiteness.

4. P. TENUIS (Gray).

Shell ovate, subturrite, very thin, white pellucid, covered with a thin, glabrous-yellow periostracum; spire conic, the apex obtuse, somewhat produced; whorls convex, the last very obsoletely carinate, purplish-brown anteriorly; columella thin and rather straight anteriorly. Axis 15, diam. 9 lines (*Gray*).

Africa? (Gray).

Ligmus tenuis GRAY, Proc. Zöol. Soc., 1834, p. 66.—*Achatina tenuis* Gray, PFR., Monogr., ii, 247; iii, 480.—*Perideris tenuis* Gray, PFR., Monogr., iv, 592; vi, 204.—SHUTTL., Notitiæ, p. 77.

"This shell is in shape most like the young of *Hel. flam-*

migerus Fér., Moll. t. 118, f. 5; but differs in color, in tenuity, and in the shape of the front of the pillar lip" (*Gray*).

This unfigured species must be similar to, if not identical with, *P. bifrons* Shuttl.

5. P. BIFRONS (Shuttleworth). Pl. 14, figs. 48, 49, 50, 51.

Shell oblong-conic, rather thin, striate, a little shining. Under a very thin, pale straw-colored epidermis it is whitish, ornamented with a rather wide dilute blackish-purple band below the periphery, and a darker columellar area. Spire ovate-conic, rather long. Whorls 7, rather flat or moderately convex, the last about three-sevenths the total length; suture rather widely margined and very closely crenulate. Columella narrow, thin, shortly truncatulate at base, intensely and broadly bordered with black-purple within. Aperture oblique, truncate-oblong; peristome simple, acute. Length 47, diam. 22, apert. 20 mm. (*Shuttl.*).

West Africa: Grand Bassam (Verreaux); near Bourbouri, in banana plantations (Vignon).

Peridcris bifrons SH., Notitiæ, i, p. 78, pl. 1; f. 1 (1856).—PFR., Monogr., iv, 593; vi, 204.—KOBELT, Conchyl. Cab., p. 43, pl. 13, f. 5-8.—*Achatina bifrons* Sh., VIGNON, Bull. Soc. Malac. France, v, p. 69.

Differs from *P. solimanus* by the thinner and less glossy subdiaphanous shell, more ovate spire, narrower, thin columella, which is not thickened and twisted. Over 40 specimens were examined by Shuttleworth, who found them to vary from more slender forms with flattened whorls, to those more obese with the whorls a little convex. Unicolored shells, without the dark bands, also occur.

Figures 48, 49 are copied from Shuttleworth. Figs. 50, 51 represent a specimen in the Berlin Museum, sent by Shuttleworth to Albers (after Kobelt). On pl. 7, fig. 39, I have figured a specimen in coll. Acad. Nat. Sciences. These are yellowish below the suture, and have a large, purple-black basal area, which in some shells is divided, as in Shuttleworth's type, by a paler zone. In general contour the species is excessively similar to *P. reevcanus*.

6. P. REEVEANUS (Pfeiffer). Pl. 14, figs. 52, 53, 54.

Shell oblong-turrited, thin, smoothish, very finely spirally striate under a lens, rather glossy. White under a deciduous buff epidermis, with two buff bands, one at the suture, the other on the periphery. Suture regularly crenulate. Whorls 7½, all a little convex, the last three-sevenths the total alt. Columella thin, rather narrow, very shortly truncate. Aperture truncate-oval; peristome very thin. Length 48, diam. 22, apert. 22 mm. (*Pfr.*).

West Africa.

Achatina reeveana PFR., P. Z. S., 1848, p. 111; Monogr., ii, p. 247 (1848); Conchyl. Cab., *Achatina*, p. 363; *Bulimus*, pl. 47, f. 9, 10.—DESH. in Fér., Hist., p. 150, pl. 122, f. 6, 7.—REEVE, Conch. Icon., v, pl. 9, f. 30 (March, 1849). —*Perideris reeveana* PFR., Monogr., iv, 593; vi, 204.—KOBELT, Conch. Cab., p. 29, pl. 3, f. 3, 4.

Well distinguished by the two yellow bands on a white ground; but as these bands color the cuticle only, and not the shell-substance beneath, they are liable to be rubbed off, though at least traces of them are visible on all the specimens I have seen.

7. P. KERCADONIS (Grateloup). Pl. 16, fig. 77; pl. 8, fig. 41.

"Shell oblong-conic, thin, substriate; buff-roseate, ornamented with oblique reddish-violaceous flammules; whorls a little convex, granulose at the suture. Aperture obovate, the lip very acute.

"The shell is conoid, elongate, thin, fragile, finely striate; its surface is yellowish, a little rosy. It is flamed with obliquely longitudinal unequal fringed spots of a brown color with a violet tinge. The right margin is very thin and sharp. The 7 whorls of the spire are noticeably convex, the last two prettily granulate at the summit, along the suture. Length 45 to 50, diam. 25 to 28 mm." (*Grat.*).

West Africa.

Achatina kercadonis GRAT., Actes de la Soc. Linn. de Bordeaux, xi, 1839, p. 414, pl. 2, f. 1.—PFR., Monogr., ii, 245; iii, 475.—*A. moulinsii* GRAT., t. c., p. 164, no. 22 (no

description).—*Perideris kercadonis* Grat., Pfr., Monogr., iv, 595; vi, 204.—Shuttleworth, Notitiæ, i, p. 80.—Kobelt, C. Cab., p. 31, pl. 3, f. 7, 8.—? *Bulimus interstinctus* Gld., Reeve, C. Icon., v, pl. 89, f. 367*c*.

Grateloup's figure (fig. 77) and description are given. The single specimen before me (pl. 8, fig. 41) is pale yellow around the middle of the last whorl, whitish above and below. The irregularly-spaced, deep brown streaks are widest and strongest where they cross the periphery. They hardly reach the suture, and a small basal tract is free from them. The columella is bounded by a purple-brown band. The periphery is indistinctly subangular. It is conspicuously thinner than *P. interstinctus*. This specimen is labelled "Cape Palmas."

8. P. æquatorius (Reeve). Pl. 13, fig. 39.

Shell acuminately oblong, whorls 7, swollen, rounded, smooth, obliquely finely striated, encircled with a small spiral crenulated ridge at the sutures; columella scarcely truncated, lip simple. Ash-blue, whitish towards the apex, sprinkled irregularly with brown streaks and spots (*Reeve*).

West Africa: Banks of the Gaboon river (Cuming coll.).

Achatina æquatoria Reeve, Conch. Icon., v, pl. 1, f. 2 (Feb., 1849).—*A. interstincta* var. *b*, Pfr., Monogr., iii, 480; Conchyl. Cab., pl. 25, f. 26.—? *P. caillcana* Kobelt, Conchyl. Cab., p. 47, pl. 16, f. 9.

"The marking of this species, from a locality nearly on the equator, is very peculiar, not disposed in regular stripes, but wavy and scattered; the whorls are more than usually rounded, and the apex has a papillary aspect" (*Rve.*). It is a more solid shell than *P. caillcanus*, with darker ground-color; but both Pfeiffer and Morelet considered the two to be varieties of one species. Figure and description are from Reeve.

9. P. cailleanus (Morelet). Pl. 13, figs. 37, 38.

Shell imperforate, ventricose-conic, pellucid, thin, impressed with obsolete, unequal striæ; white, uniform or flamed

with fulvous; spire conic, the apex projecting, rather obtuse; whorls 7, convex, narrowly marginate at the suture; the last whorl ventricose, sometimes obsoletely carinate; columella simple, straight, rather narrow, white with a chestnut border. Aperture ovate, the peristome simple, acute; outer margin fragile; columellar margin truncate. Length 34, diam. 19 mm. (*Morelet*).

West Africa: Grand Bassam, Senegal (Morelet); Dabou (Vignon).

Bulimus caillcanus MOREL., Revue Zöol., Dec., 1848, p. 353; 1849, p. 383.—*Achatina c.* MOREL., Séries Conch., i, p. 24, pl. 3, f. 1.—VIGNON, Bull. Soc. Malac. France, v, 70.—*A. æquatoria* DESH. in Fér., Hist., ii, p. 151, pl. 22, f. 10, 11.

There are, according to Morelet, two color-varieties of this species, both white, with the columella of a handsome maroon color: one (fig. 37) is uniform; the other (fig. 38) is ornamented with flammules and small spots of brown. They are found on the leaves of trees. It is named for the hardy explorer who first visited Timbuctu.

10. P. MORELETIANUS (Deshayes). Pl. 9, figs. 3, 4, 7.

Shell ovate-conic, the apex obtuse, mamillate; smooth, substriate; spire conic; whorls 7, a little convex, narrow, crenulate-margined, the first ones reddish, the last whorl brown-black, obscurely subangular, convex, shorter than the spire. Aperture ovate-lunar, dilated in the middle; peristome simple, acute, white-edged; columella short, narrow, cylindric, slightly emarginate at the end. Length 41, diam. 23 mm. (*Desh.*).

West Africa: Grand Bassam, Senegal (Morelet).

Achatina moreletiana DESH. in Fér., Histoire, ii, 146, pl. 137, f. 7, 8.—MORELET, Sér. Conch., i, p. 22, pl. 2, f. 1; pl. 3, f. 3.—PFR., Conchyl. Cab., p. 321, *Bulimus*, pl. 26, f. 6, 7; Monogr., iii, 480.—*Peridaris m.* SHUTTLEW., Notitiæ, i, p. 79.—PFR., Monogr., iv, 594; vi, 204.—*Achatina violacea* PFR., P. Z. S., 1851, p. 259.—*Bulimus zegzeg* MORELET, Revue Zöol., 1848, p. 353.

Fig. 4 is a copy of Deshayes' type-figure of *moreletianus*,

the original of which he received from Morelet. It is dark purple-brown on the last whorl or two, the intermediate whorls being reddish, and the apex paler. The single specimen I have seen is dark brownish red-purple, with the spire, sutural margin and a columellar area pale. The surface is beautifully engraved spirally with crimped, crowded lines; and the interior of the mouth is dark purple-brown, the acute lip pale. Morelet found the species to be variable. He refers to it specimens with the spire flamed, and with a light basal band (fig. 3). He also figures a roseate young shell (fig. 7).

B. zegzeg Morelet and *A. violacea* Pfr. are identical with typical *morletiana,* having the same dark coloration.

10*a*. Var. PALLIDIOR Pilsbry, n. v. Pl. 8, fig. 42; pl. 9, figs. 5, 6.

Shell *thin,* white or nearly so, with narrow brown streaks at the median region of the last whorl and above the suture, a faint red-brown band above the slight peripheral angle. Sutural bead-margin distinct, cream-white; columella purplish-brown. Surface very smooth and glossy, the spiral striation faint. Length 40, diam. 22, apert. 19 mm.

? Perideris caillcana Morelet, KOBELT, Conchyl. Cab., p. 47, pl. 16, f. 7, 8.—*? P. morletiana* Dh., SHUTTL., Notitiæ, i, p. 79.

Shuttleworth, who examined more than 80 specimens, had apparently this variety or subspecies before him, his specimens all having a pale-immaculate area around the columella, and being either purplish variously ornamented with blackish-violaceous flames and streaks (pl. 9, figs. 5, 6), or flesh-colored, immaculate or with chestnut streaks. The shells before me are of the pattern last described.

11. P. INCOLORATUS (Shuttleworth). Pl. 14, figs. 43, 45, 46, 47.

Shell long oblong-turrite, rather solid, striatulate, somewhat shining. Under a very fugacious, pale straw-colored epidermis it is *pure white, without markings.* Spire conic

above, the apex obtusely papillar. Whorls 7½, moderately convex, the last nearly two-fifths the total length obtusely subangular; suture crenulate; columella vertical, involute, slightly truncate basally. Aperture suboval, the peristome acute. Length 58-62, diam. 24-48, apert. 24-26 mm. long (*Shuttl.*).

West Africa: Grand Bassam (Verreaux).

Perideris incolorata Shuttl., Notitiæ, i, p. 81, pl. 2, f. 4, 5.—Pfr., Monogr., iv, p. 594; vi, 204.—Kobelt, C. Cab., p. 44, pl. 15, f. 2-5.

Related to *P. onager* in form and solidity of the shell. It seems also not very unlike *P. reeveanus*. I have not seen specimens. Figs. 45-47 are copied from Shuttleworth; fig. 43 from Kobelt.

12. P. iolarynx (Shuttleworth). Pl. 9, figs. 8, 9, 10.

Shell long ovate, slightly striatulate, glossy; under a very thin corneous cuticle it is whitish-ashy, ornamented with narrow, irregular streaks, spots and dots of reddish-purple. Spire conic above, the apex obtusely papillar; whorls 7½, slightly convex, the last flattened, obsoletely angular, two-fifths the total length; the columellar region white. Suture narrowly margined, crenulate. Columella subarcuate, a little thickened, truncate at the base, outwardly pale, inwardly deep violet-margined. Aperture suboval, violaceous inside, opalescent; peristome acute, pale. Length 62, diam. 28, apert. 25 mm. (*Shuttlw.*).

West Africa: Grand Bassam (Verreaux).

Perideris iolarynx Sh., Notitiæ Malacologicæ, i, p. 80, pl. 2, f. 1 (1856).—Pfr., Monogr., iv, 594; vi, 204.—Kobelt, Conchyl. Cab., p. 45, pl. 15, f. 6, 7.

A beautiful species, related to the following. Fig. 10 is a copy of Shuttleworth's.

13. P. onager (Shuttleworth). Pl. 13, figs. 40, 41, 42.

Shell lengthened-oblong, rather solid, striatulate, a little glossy; under a very fugacious pale straw-colored epidermis it is whitish, closely ornamented with narrow, frequently

interrupted and waved streaks and spots of reddish-purple. Spire conoidal above, the apex obtusely papillar, generally roseate. Whorls 7½, a little convex, the last very obsoletely angular, two-thirds the total length, white at the columellar region. Suture narrowly margined, crenulate; columella vertical, obliquely truncate at the base, white, margined outwardly and within with blackish-purple. Aperture oval, white within; peristome acute. Length 65, diam. 29, apert. 28 mm. (*Shuttl.*).

West Africa: Grand Bassam (Verreaux).

Peridoris onager Sh., Notitiæ, i, p. 81, pl. 2, f. 2, 3 (1856). —Pfr., Monogr., iv, 594; vi, 204.—Kobelt, Conch. Cab., pp. 48, 127, pl. 30, f. 1-4; pl. 31, f. 1.

Related to the preceding, and perhaps a variety thereof, but the whorls, especially the last one, are more convex, the shell is thinner, and the interior of the aperture is not colored.

Figs. 40-42 of pl. 13 are copied from Shuttleworth. Figs. 75, 76 of pl. 16 represent specimens in the collection of the Academy. These shells are rather solid, rose-colored with the apex whitish, the last whorl either roseate or whitish under a very thin corneous cuticle; the baso-columellar area always white and distinctly limited. The spire has rather wide red-purple flames, and the last whorl varies from closely, regularly striped (fig. 76) to sparsely striped and dotted, and only near the middle of the whorl (fig. 75). The columella is white, bordered outside with purplish-brown. The sharp lip is brownish, interior white with a bluish tint, one specimen being brownish in the throat. Size quite uniform, 46 x 26 to 49 x 24 mm.

14. P. flammigerus (Férussac). Pl. 13, figs. 33-36.

Shell ovate-elongate, acuminate, rather solid, rugose-striate; whitish ornamented with narrow, close, chestnut streaks. Spire conic, the apex papillar, white; whorls 7½, flattened, the last about four-ninths the whole length, blackish at the base. Columella subvertical, subtruncate; suture margined. Aperture oval, milk-white inside, the peristome

acute, black-bordered; margins joined by a thin, diffuse, opaline callous.

Length 66, diam. 31, apert. 31 mm. long (*Pfr.*).

Length 70, diam. 36, apert. 30 mm. long (*Kobelt*).

West Africa: Guinea; Dabou, Grand Bassam, in woods (Vignon).

Helix flammigera Fér., Prodr., p. 49, no. 341; Hist., pl. 118, f. 5-7.—*Achatina f.*, Desh. in Encycl. Méth., ii, p. 10; in Fér., Hist., ii, p. 147.—Pfr., Monogr., ii, 245; iii, 479.—Morelet, Séries Conch., i, p. 25, pl. 2, f. 3.—Vignon, Bull. Soc. Mal. Fr., v, 70.—*Limicolarius flammiger* Beck, Index, p. 60.—*Peridcris flammigera* Pfr., Monogr., iv, 595; vi, 203. —Kobelt, Conch. Cab., p. 25, pl. 1, f. 2, 3.—*Orthalicus flammigerus* H. & A. Ad., Gen. Rec. Moll., ii, p. 155.—*Bulimus richii* Lam., An. s. Vert., vi, p. 118.—Kuster, C. Cab., p. 9, pl. 8, f. 3, 4.—*Achatina richii* Reeve, Conch. Syst., ii, pl. 177, f. 4.

A handsomely striped species, still rare in collections. Fig. 35 is from one of Férussac's original figures. Fig. 36 after Reeve, 33 after Kobelt, and 34 from Morelet, further illustrate it. Lamarck gave the locality Peru for his *B. richii;* and Lubomirski (P. Z. S., 1879, 725) records *P. flammigera* from Chota, Peru, where it was collected by Stolzmann. This must be a misidentification of some superficially similar species of *Oxystyla.*

15. P. auripigmentum (Reeve). Pl. 10, figs. 11 to 16.

Shell pyramidally elongated, spire acuminated, whorls 7, smooth, flatly convex, columella narrow, straight, as if rolled back, aperture small, lip simple, sharp. Of a peculiar reddish bay, the whorls being encircled around the base with irregular, short, erect, chestnut and white flames, last whorl with a broad chestnut band (Reeve).

West Africa: Calabar (Pfr.), Kamerun at Itoki (Sjostedt), Victoria (Buchholz); the form *vignoni* from Lagos (Mann).

Bulimus auripigmentum Reeve, Conch. Icon., v, pl. 29, f. 178 (July, 1848).—Pfr., Monogr., iii, 389.—*Peridcris a.,*

Pfr., Monogr., iv, 595; vi, 204.—Shuttlw., Notitiæ, i, p. 81.—Dohrn in Pfr., Novit. Conch., iv, p. 163, pl. 137, f. 5, 6, and young, f. 7.—v. Mart., Monatsber. Nat. Fr. Berlin, 1876, p. 259.—Kobelt, Conchyl. Cab., p. 37, pl. 11, f. 1-4; pl. 14, f. 6;—d'Ailly, Bihang, p. 83, pl. 5, f. 3, 4.—Schako in Furtado, Journ. de Conch., 1888, p. 8, pl. 3, f. 1-7 (jaw and teeth).—*Achatina vignoni* Morelet, Journ. de Conchyl., 1860, p. 189.—Martens, Malak. Bl., 1866, p. 107, pl. 4, f. 9.

In typical *auripigmentum* (figs. 11, 14) the ground-color is a rich brownish-yellow, paler on the spire. There is a deep chestnut belt below and at the periphery, regularly interrupted upon the latter by opaque white spots, which coalesce to form a white belt at the angle. The spire is irregularly maculate and flamed with white and chestnut. Fig. 11 (from Reeve) represents the adult, fig. 14 a half-grown specimen. Fig. 13, from the *Novitates Conchologicæ* is also nearly typical. In fig. 12 a specimen is drawn, in which the peripheral chestnut markings are much reduced, and the opaque-white patches stand on a gray-white ground, the spire being gray-white above. A form in which the dark markings predominate is shown in fig. 15, copied from Kobelt.

D'Ailly had four Kamerun specimens in which the chestnut flames extended to the suture above, and there was no white peripheral girdle (fig. 16).

The variety *vignoni* Morel. (pl. 10, fig. 17) is somewhat similar in its many, continuous dark stripes, but the latter continue to the axis below, there being no light basal area, such as all the preceding shells have. It is not merely the young of *auripigmentum;* but the definition of subspecies awaits the collection of larger series and a knowledge of their distribution. The jaw and teeth have been figured by Schako.

16. P. LECHATELIERI (Dautzenberg). Pl. 10, figs. 18, 19.

Imperforate, oblong-turrite, rather solid, a little shining. Spire conoid, the apex attenuate; obliquely striatulate. Whorls 7-8, a little convex, swollen above, suture linear, not margined; last whorl encircled at the periphery with a prom-

inent carina. Aperture quadrate, about three-eighths the total length, the margins joined by a callous. Columella callous, vertical, somewhat twisted, lip acute. Color livid-testaceous, irregularly marked with longitudinal blackish and whitish flames and brown dots. Length 62, diam. 27, apert. 23 mm. (*Dautz.*).

West Africa: Dahomey, near Affame, on the Oueme river (Capt. Le Chatelier).

Perideris lechatelieri DAUTZ., Journ. de Conchyl., xl, 1892, p. 297; xli, 1893, p. 33, pl. 1, f. 3.—KOBELT, C. Cab., p. 39, pl. 13, f. 3, 4.

Closely related to *P. auripigmentum*, from which it differs by the carinate periphery and swollen whorls. Described from a single specimen.

17. P. MUCIDUS (Gould). Pl. 15, figs. 54, 55, 56.

Shell rather solid, ovate, mamillate, indented, granulose-striate; yellow, longitudinally ornamented with interrupted black streaks; spire oval; whorls 6, the upper ventricose, the last abnormal, contracted; suture margined and crenulate. Aperture small, rounded-lunate; lip acute, pale; columella subtruncate; throat variegated black and buff. Length one and three-eighths, width three-fourths inch (*Gld.*).

West Africa: Interior of Liberia (Dr. Perkins).

Bulimus mucidus GLD., Proc. Bost. Soc. N. H., iii, p. 194 (April, 1850); Otia, p. 207.—*Achatina mucida* Gld., REEVE, Conch. Icon., v, pl. 23, f. 126.—Pfr. in Conch. Cab., p. 339, pl. 37, f. 8, 9; Monogr., iii, p. 481.—*Perideris mucida* Gld., SHUTTLW., Notitiæ, i, p. 83.—PFR., Monogr., iv, 596; vi, 203; viii, 267.—DOHRN, Malak. Bl., xxii, 1875, p. 206 (variations). —KOBELT, Conch. Cab., p. 36, pl. 10, f. 8, 9.

The specimens I have seen, two of which are shown in figs. 54, 55, are rather thin, and the last whorl is not abnormally contracted, but otherwise they agree with Gould's description. The surface is very finely plicatulate, cut into weak granules by fine spiral incised striæ; and it is also indistinctly, coarsely malleate. The ground-color is whitish at the apex, becoming red-brown on the penult. whorl and black

or purple-black at the base of the last whorl, which is copiously striped with ragged, opaque creamy or yellowish-white stripes, this coloring also showing vividly within the mouth; on the penult. whorl and the preceding one, the pattern would be described as of red-brown stripes or flames on a whitish ground. The sutural margin is very narrow, though distinct. It commonly measures 32 to 33 mm. long, 18 wide.

The dark coloring is sometimes wanting, as in a pale specimen (fig. 56), figured by Pfeiffer from Dohrn's collection.

18. P. GOULDII (Reeve). Pl. 15, figs. 57, 58, 59.

Shell imperforate, thin, ovate-conic, with teat-like apex and subangular or angular periphery; whitish or reddish under a thin yellow cuticle, which is marked with whitish, hydrophanous lacerated stripes on the upper post-embryonic whorls of the spire, and a belt of similar square spots below the peripheral angle, which is marked with a narrow reddish belt. Surface hardly shining, with low growth-wrinkles and fine, faint spiral striæ. Whorls 7, moderately convex. Aperture oblique, ovate, pale livid-whitish inside; outer lip acute; columella very narrow, thin, obliquely subtruncate below. Length 48-49, diam. 23-24 mm.

West Africa: Liberia (Dr. Perkins).

Achatina gouldii REEVE, Conch. Icon., v, pl. 23, f. 128 (March, 1850).—*Achatina balteata* GLD., Proc. Boston Soc. N. H., iii, p. 195 (April, 1850).—PFR., Monogr., iii, p. 480.—*Perideris balteata* PFR., Monogr., iv, p. 593; vi, 204.—KOBELT, Conchyl. Cab., p. 34, pl. 10, f. 4, 5; pl. 16, f. 2, 3.—Not *Achatina balteata* Reeve, 1849.

Remarkable for its belt and flames of hydrophanous, whitish cuticle; but the latter is easily rubbed off.

19. P. SAULCYDI (Joannis). Pl. 11, fig. 20.

Shell quite solid, ovoid, the spire much swollen and noticeably girdled at the suture; the first whorls teat-like. The last whorl is as large as all the rest together. Surface roughened by quite irregular striæ of growth. Two distinct descending grooves on the lower part of the belly of the shell,

extending to the mouth, which is oval; columellar margin angularly excavated, the columella truncate, and yet joined to the right margin, which is without flange and not acute. A distinct sinus at the junction of the right margin with the last whorl. Coloration in two descending bands on the last whorl, the upper one quite deep brown-violaceous, interrupted with fawn stripes; the lower of a yellowish white tinted with blue, and as though picked out with undulating, transverse lines; the second whorl without evident bands, and striped with reddish violet. The last 5 whorls of a dirty white, with some spaced yellowish bands. Inside of the mouth of a deep fawn tint. This shell is remarkable for its mamillate spire, not occurring in any other species of *Achatina*, and for its *Bulimus*-like aspect. The individual examined was covered with cicatrices. Length 7, width 5 decim. (*Joannis*).

West Africa: Prince's Isle, Gulf of Guinea (Joannis).

Achatina saulcydi JOANNIS, Guerin's Mag. de Zöol., 1834, cl. v, pl. 50.—DESH. in Lam., An. s. Vert., viii, p. 305.—PFR., Monogr., ii, 243; iii, 478.—*Peridoris s.*, PFR., Monogr., iv, 596; vi, 203.

Joannis' figure was reversed, probably by an engraver's error, as most authors have thought, though no intimation of this is contained in the original account. Fig. 20 is a copy of the original figure, modified only in being made dextral. Reeve and Deshayes have also given copies of Joannis' figure, as the species is one of great rarity in collections. The original description of the coloration agrees but poorly with the figure, and Joannis' measurements also show carelessness, at least.

19*a*. Var. NORMALIS (Pilsbry). Pl. 11, figs. 21, 22.

Shell resembling *Achatina saulcydi* Joannis in general coloration, being white streaked with livid purple, with some bluish suffusion, the penultimate whorl whitish with livid red flames. Whorls about 7½, the earlier 3 forming a mamillar mucro, higher and more distinctly differentiated than in *saulcydi;* following whorls forming a more tapering cone

than in *saulcydi,* the last not perceptibly constricted below the suture. Suture margined below by a narrow crenate or beaded band. The surface is unequally, obliquely subobsoletely plicatulate, sometimes with subobsolete spirals on the penultimate whorl, the last whorl with faint, obliquely descending, scar-like impressions or color-markings at right angles to the growth-lines. Aperture oblique, dark purplish-brown inside; parietal wall more or less distinctly orange-brown from the retention of the cuticle under the parietal glaze. Columella narrow, wholly appressed, somewhat concave, passing gradually into the thin basal lip.

Length 77.5, diam. 41, oblique length of apert. 40 mm.

Length 76.5, diam. 40, oblique length of apert. 38.5 mm.

"Taboo Africa" (Robert Swift coll. in A. N. S. Phila.).

Perideris saulcydi var. *normalis* Pils., Proc. Acad. Nat. Sci. Phila., 1897, p. 503 (1898).—? *Bulimus torridus* Reeve, Conch. Icon., v. pl. 89, f. 662*a*.

This form differs from *P. saulcydi* (Joannis) in being more elongated and slender throughout, the last whorl not concave above, aperture consequently not acuminate posteriorly as in that species; the spire is more elongated and tapering, and the terminal "mamelon" more pronounced. It is also dextral; but as the apparent sinistrality of Joannis' species may be due to an artist's failure to reverse. I do not place great stress upon this feature.

20. P. KOBELTI (Pilsbry). Pl. 11, figs. 23, 24.

Shell ovate, ventricose, whitish under an olivaceous yellow or on the penult. whorl brown cuticle. Surface obliquely finely plicatulate in the direction of growth-lines, and above the periphery decussated by numerous rather inconspicuous spiral impressed lines. Spire abruptly contracted above, mucronate. Whorls about 6½, the earlier 2½ forming a mamillar projection, the rest rapidly widening, last whorl swollen. Suture narrowly white bordered from loss of cuticle, and minutely beaded. Aperture oblique, reddish; lip obtuse, brown-edged; columella whitish, vertical, rather straight, subtruncate below. Alt. 68, diam. 41, longest axis of aperture incl. peristome 38 mm.

West Africa: Cape Palmas. Type in coll. A. N. S. P.

Perideris kobelti PILSBRY, Proc. A. N. S. Phila., 1897, p. 503 (1898).—*Bulimus torridus* REEVE, Conch. Icon., v, pl. 89, f. 662*b*.—*Perideris sauleydi* KOBELT, Conchyl. Cab., p. 42, pl. 13, f. 1, 2.

Much shorter and more globose than *P. sauleydi* or var. *normalis*, and the greenish yellow cuticle is persistent on the last two whorls. The sculpture also is markedly different, and the columella wider. The shell is much more globose than *P. torridus* (Gld.), thicker, and dark within. It is a strongly characterized species, dedicated to the able author of the later monographs on *Achatinidæ* in the *Conchylien Cabinet*. Fig. 23 is copied from one of Kobelt's. Fig. 24 represents the type specimen.

21. P. TORRIDUS (Gould). Pl. 12, figs. 25-28.

Shell ovoid, the apex mamillate; rufous-chestnut, whorls 7, ventricose, striate, the last large, contracted towards the base; suture marginate, conspicuously crenulate. Aperture small, ovate; columella white, brown-bordered, slightly truncate at the base; lip simple, brownish, white within, and thickened. Length 3.25, breadth 1.5 inch (*Gld.*).

West Africa: Liberia (Perkins, Dohrn); Millsburg on the St. Paul's river (Buttikoper); Junk river (Stampfli).

Achatina torrida GLD., Proc. Bost. Soc. N. H., i, 1843, p. 158; Otia, p. 191.—*Perideris torrida* DOHRN, Malak. Bl., xxii, 1875, p. 205.—PFR., Novit. Conch., iv, p. 161, pl. 137, f. 1, 2. —SCHEPMAN, Notes Leyden Mus., 1888, x, p. 248.—KOBELT, Conchyl. Cab., p. 28, pl. 2, f. 4, 5; pl. 15, f. 1.

Figures 25 and 28 represent the typical form. The shell is either (1) white under a glossy, smooth, yellow cuticle, which is worn from the spire, or (2) brown-tinted, or (3) brown below the periphery, which is marked by an ill-defined dark belt. The aperture is white inside, with a pale purplish or livid tint, the lip rather sharp and brown at the edge. The size varies a good deal: from 61 x 31 to 74 x 37 mm. in specimens before me; while Dr. Gould's type was even larger.

P. torrida has not the rough surface nor dark streaked

coloring of *P. saulcydi* or *normalis*, and it is a smoother, thinner, less obese shell than *P. kobelti;* it is further distinguished by the pale interior.

22. P. RUBICUNDULUS (Gould).

Shell oblong-conic, thin, with a roseate blush; whorls 7, a little convex, the last obsoletely carinate; suture marginate, whitish, elegantly crenulate; aperture ovate, columella thin, lip subreflexed, somewhat thickened within. Length 1.5, width .7 inch. Allied to *B. boholensis* Brod., and is colored like some varieties of *B. concinnus* Brod." (*Gld.*).

West Africa: Cape Palmas.

Bulimus rubicundulus GLD., Proc. Boston Soc. N. H., i, p. 158 (Dec., 1843); Otia, p. 192, 210 (stated to be a var. of *interstinctus*).—*Peridoris rubicundula* SHUTTLW., Notitiæ, i, p. 83.

Gould subsequently referred this form to *B. interstrictus* as a variety; and Pfeiffer also placed it in the synonymy of that species. The name precedes that of *interstinctus* on the same page; but their specific identity needs confirmation.

23. P. INTERSTINCTUS (Gould). Pl. 12, figs. 30, 31.

Shell ovate, the apex mamillate, imperforate, pale flesh color, variegated with streaks and letter-like purple and pale markings here and there. Whorls 7, ventricose, the last large, half the length of the spire; suture margined, whitish, very noticeably crenulate. Aperture small, subquadrate; columella roseate, evolute, posteriorly sinuous; lip acute, thickened with a rosy callous within. Length one and three-fourths, width nine-tenths [=44 x 22.5 mm.] (*Gld.*).

West Africa: Liberia at Cape Palmas (Drs. Savage and Perkins), and Hilltown (Buttikofer); Bourbouri, Grand Bassam (Vignon).

Bulimus interstinctus GLD., Proc. Boston Soc. N. H., i, p. 158 (Dec., 1843); Otia, pp. 192, 210.—REEVE, Conch. Icon., v, pl. 55, f. 367; pl. 89, f. 367*b*?—PETIT, Journ. de Conchyl., 1851, p. 368, pl. 10, f. 8 (var.).—*Achatina i.*, Gld., PFR., Monogr., iii, p. 479; Conch. Cab., p. 317, pl. 25, f. 27.—VIG-

NON, Bull. Soc. Malac. France, v, 70.—*Perideris i.*, PFR., Monogr., iv, 595; vi, 203.—KOBELT, C. Cab., p. 40, pl. 14, f. 1-5; pl. 11, f. 7, 8; pl. 12, f. 3, 4.—DOHRN in Pfr., Novit. Conch., iv, pl. 162, pl. 137, f. 3 (var.); Malak. Bl., xxii, 1875, p. 206.—SCHEPMAN, Notes Leyden Mus., x, 1888, p. 247.—*P. i.* var. *insignis* PFR., Monogr., viii, p. 266 (1877).

Figures 29-31 represent specimens of forms ordinarily encountered, figs. 30, 31 representing a shell received from Gould. The last whorl is covered with a yellow cuticle, deeper in tint from the middle down; the spire is grayish- or bluish-white, with very little cuticle. The last whorl has a few short purplish streaks, becoming more numerous and wider on the spire.

23*a*. Var. FLAVUS Pils.

The other specimen figured (fig. 29) is *quite solid,* white under a yellowish cuticle, which is thin and more or less worn on the spire; dark streaks are rare, and chiefly on the spire. The columella and parietal callous are pink, the aperture thickened within and white or pinkish. Usually there is no trace of columellar truncation. The subsutural bead-margin is very distinct. Length 49, diam. 23, oblique length apert. 22 mm. This seems to be the commonest form in collections, and has been illustrated by Kobelt on his pl. 14, f. 1-4.

23*b*. Var. INSIGNIS Pfr. Pl. 12, fig. 32.

On a reddish or reddish-yellow ground, it is marked with a wide black band interrupted with narrow, irregular yellow streaks, at the periphery of the last whorl half of this band showing above the suture; above there are some narrow blackish streaks and strewn dots. Liberia (Dohrn coll.).

Gould states (Otia, 210) that "*B. interstinctus* proves to be very variable in form, and especially in color, being green, brown ochreous, sometimes spotted, etc."

24. P. VARIEGATUS (Chaper). Pl. 16, figs. 68, 69.

Shell oblong-conic, solid; under a very thin fugacious yellowish cuticle it is *white, a small area around the axis and*

columella fleshy or brownish rose-color. Surface marked with distinct, irregular growth-wrinkles and fine, subobsolete spiral striæ. Spire a little convexly conic, slightly contracted near the obtuse apex. Whorls 7½, convex, the suture margined below, the border beaded on the last whorl or two, almost smooth on earlier whorls. Last whorl well rounded throughout. Aperture oblique, irregularly ovate, excavated and subangular in the middle of the left margin, white within; peristome simple, somewhat thickened within. Columella vertical, nearly straight, flesh-colored, somewhat thickened and round-edged, not truncate below.

Length 45, diam. 20.5, apert. 18.5 mm.

Length 54-65 mm. (Chaper).

West Africa: Cape Palmas (M. Verdier).

Peridoris verdieri Chaper, Bull. de la Soc. Zöol. de France, x, p. 45, pl. 1, f. 5 (1885).—? Kobelt, C. Cab., p. 30, pl. 3, f. 5, 6.

A solid species, distinguished by the flesh-colored columellar area. The last whorl is not so wide as in *P. bifrons* or *recvcanus,* and there is no tendency whatever to be angular at the periphery. Fig. 68 is copied from Chaper. Fig. 69 represents a typical specimen in coll. A. N. S.

Genus PERIDERIOPSIS Putzeys, 1898.

Putzeys, Procès-verbaux des séances de la Société Royale malacologique de Belgique, January 8, 1898, p. vi. Type *P. umbilicata.*

The shell is similar to *Pseudotrochus* in the obtuse apex, smooth apical whorls and generally smooth surface, more or less angular periphery, and angular-ovate aperture: the outer lip is simple, more or less thickened within; columella vertical and nearly straight, hardly truncate at base, its edge reflexed but not closing the umbilical fissure; general shape ovate-turrite. *Axis perforate.* Type *P. umbilicata.*

Distribution, Congo valley. The beautifully colored shells of this group resemble such Pseudotrochi as *P. auripigmentum,* but differ in the perforate axis and open umbilical crevice. The spire is also rather more lengthened, and the

columella is not so distinctly truncate. The area inhabited by *Peridcriopsis* lies south of that of *Pscudotrochus,* and is inland, while the other genus has not yet been found far from the coast.

1. P. UMBILICATA Putzeys. Pl. 17, fig. 85.

Shell perforate, conic-turrite, rather solid, a little shining, striatulate, frequently decussate irregularly and very delicately with spiral lines. Spire long, conic, the apex obtuse; suture impressed, delicately wrinkled. Whorls 7-8, a little convex, the upper white or roseate, following ones slightly yellowish, irregularly ornamented with streaks or flames of tawny or chestnut; last whorl subangular, the base marked with buff or chestnut, with a white band below the angle. Aperture trapezoidal, somewhat channelled; lip acute, the base visibly reflexed, thickened within; columella callous, straight, vertical, white or violaceous; margins joined by a very thin parietal callous, the columellar margin reflexed above the perforation. Length 40-45, diam. 15-18, length aperture 15-18 mm. (*Putz.*).

Congo Free State: Bena Bendi (Putzeys).

Peridcriopsis umbilicata PUTZ., Procès-verbaux des séances de la Soc. Roy. Malac. Belg., 8 Jan., 1898, p. vi, fig. 5.—*P. umbilicata,* var. *nsendweensis* (p. xxxix), and var. *albida, lowaensis* (p. xl) DUPUIS et PUTZEYS, Ann. Soc. Roy. Malac. Belg., Bull. des séances, 1901 (March, 1902).

1*a*. Var. NSENDWEENSIS Dupuis et Putzeys. Pl. 8, figs. 43, 44.

Resembles the type, but the upper part of the last whorl and the upper whorls are irregularly marbled with spots and flames of brownish and purple of various shades on a whitish ground. These patches or flames become roseate or deep brown towards the summit, which is generally roseate. The lower half of the last whorl is black-brown from the basal angle to the umbilicus, a belt of irregular yellowish spots lying below the angle. These spots may be reduced to a series of dots, or may form flames converging to the perforation. Length 45, diam. 18, length apert. 16, width 14 mm.

Nsendwe, on the lower side of banana leaves (Dupuis). Figured from a topotype.

1*b*. Var. *albida* D. et P.

The pattern of coloration is the same as in the preceding variety, but the colors differ. The lower part of the last whorl is dirty yellowish; above on the last and preceding whorls the spots or flames are roseate or rose-brown on a whitish ground; the summit is roseate. Dimensions as in the preceding, with which it occurs.

1*c*. Var. LOWAENSIS D. et P.

In this variety the shell is not quite so thick as in the preceding, and the coloration is extremely variable. The ground is ordinarily gray-white, the summit rose. The whorls of the spire are sometimes ornamented with transverse flames and patches very variable in color and appearance, and sometimes girt with a blackish brown band at the suture; but it is readily distinguished from other varieties in always having on the last whorl a rounded patch of greater or less extent at the columella, and 3 quite distinct colored spiral zones on the lower part of this whorl, a lighter zone between two darker ones. Albinistic forms occur. Length 37, diam. 16, length apert. 15, width 9 mm.

Congo Free State: A ravine facing the mouth of the Lowa river (P. Dupuis).

We also refer to this race a specimen procured at Gongo-Kitete, of a red-orange color, with a brown tract at the columella, a narrow band of deeper orange along the angle of the last whorl, with the suture whitish, and with irregular whitish spots on the upper part of the whorls of the spire (*D. & P.*).

2. P. FORMOSA Dupuis et Putzeys. Pl. 17, figs. 80, 81.

Shell elongate-ovate, a little shining, rather solid, covered with a pale brown epidermis. Upper whorls generally ornamented with transverse brown flames; following whorls with a more or less wide black-chestnut zone at the upper part, interrupted with zigzag white flames, which are generally

confluent at the suture, some of them reaching to the suture below; lower part of the last whorl chestnut-black, banded with buff flames. Suture rather deep, narrowly plicate-margined on the last whorl. Apex somewhat obtuse. Whorls 7, regularly increasing, convex, ornamented with many delicate, oblique and regular growth-lines; the second and third densely spirally striate, the following sculptured with transverse striæ, which are inconspicuous below, evanescent on the penult. and last whorls. Last whorl lightly inflated, subangular. Columella nearly vertical, slightly thickened above, violaceous, reflexed over the narrow perforation, the margin brownish, joined to the lip by a very thin callous. Lip acute, arcuate, slightly depressed in the middle, forming an acute angle with the whorl above, and a subobtuse angle with the columella. Aperture quadrate-ovate; within slightly thickened, blue-white and opalescent, the external markings visible. Length 41.5, diam. 17.5, length apert. 16, width 10 mm. (*D. et P.*).

Congo Free State: Island of Mvula, facing the Lowa river (P. Dupuis).

Peridcriopsis formosa D. et P., Ann. Soc. Roy. Malac. Belg., xxxvi, Bulletins des séances, 1901, p. xxxiv, figs. 1, 2 (March, 1902); with var. *pallida,* p. xxxv.

2*a*. Var. *pallida* Dupuis et Putzeys.

Ground-color uniform roseate-brown; the white and yellow flames are as in the type, but there are no dark bands at suture and periphery. Size and locality of the type.

3. P. FALLSENSIS Dupuis et Putzeys. Pl. 17, figs. 82, 83.

Shell solid, conic-turrite, very narrowly perforate, whitish, a little shining, striate; apex obtuse; painted with flammules dilated above the suture, or with rather narrow streaks, of reddish chestnut, sometimes interrupted. Whorls 7-8, convex, joined by a slightly margined and crenulate suture, the upper granulose, the last flattened in the middle, subangular at the periphery. Aperture ovate-subrhomboidal, the lip acute, a little reflexed, slightly thickened within; colu-

mella conspicuously arcuate-twisted, bluish-brown. Length 40-54, diam. 15-18.5 mm.; apert. 15-18 mm. long (*D. et P.*).

Congo Free State: Stanley Falls, in the forest (P. Dupuis).

Peridcriopsis fallsensis D. et P., Bull. des séances de la Soc. Roy. Malac. Belgique, Mar. 3, 1900, p. xiii, figs. 19, 20; in Ann. Soc. Roy. Malac. Belg., xxxv.

4. P. MVULAENSIS Dupuis et Putzeys. Pl. 17, figs. 78, 79.

Shell narrowly perforate, rather solid, subpyramidal-turriculate, a little shining; apex obtuse; whorls 8, a little convex, frequently minutely depressed or sloping at the suture, sometimes flattened, suture moderately crenulate and sometimes margined; upper whorls granulose, two or three following ones very delicately granulate, all the following striatulate with growth-lines. Surface diversely variegated, sometimes yellowish with brown forked flames, wider above the suture, sometimes brown, beautifully tessellate-flamed below the suture with white. Last whorl subangular, with varied basal coloration. Aperture subtrapezoidal, the lip a little reflexed, twisted, extending nearly to the base, and forming an angle with the lip margin; columellar margin reflexed, parietal callous variable. Length 38-51, diam. 17-21 mm.; length aperture 14-18.5 mm. (*D. et P.*).

Congo Free State: Is. of Mvula (P. Dupuis).

P. mvulaensis D. et P., Bull. des séances, etc., Mar. 3, 1900, p. xiv, f. 21, 22.

This species is readily distinguished from *P. fallsensis*. It is less glossy than the latter, the shell especially is thinner, the ground-color yellowish or even entirely brown, the form more regularly pyramidal, the base wider, the aperture more trapezoidal, and the lip a little reflexed and noticeably thickened at the edge, while in *P. fallsensis* the thickening is developed as an internal labial deposit. Moreover, except in the entirely brown examples, all the specimens of *P. mvulaensis* which we have are ornamented at the edge of the angle of the last whorl with a well-marked brown band, which we have not observed in any specimen of the other species (*D. et P.*).

Genus LIMICOLARIA Schumacher, 1817.

Limicolaria Schum., Essai d'un nouv. Syst. Vers Test., pp. 61, 200, type *Helix flammea* Müll.—*Limicularia* Schum., t. c., p. 200.—Shuttleworth, Notitiæ Malac., i, p. 38 (monograph).—Kobelt, Conchyl. Cab., i, Abth. 10, pp. 48-83, 115-127.—d'Ailly, Contributions a la connaissance des Mollusques terrestres et d'eau douce de Kaméroun, in Bihang till K. Svenska Vet.-Akad. Handlingar, xx, p. 72.—*Limicolarius* Beck, Index Molluscorum, p. 60 (1837). Not *Omphalostyla* Schlueter, Kurtzgefasstes syst. Verz. meiner Conchyliensammlung, p. 7 (1838), for *ustulata* Mke.—*Pythia* Oken, Lehrbuch d. Zöol., p. 321, in part (1815).

Shell conic-oblong or turrite, perforate or closed, thin, smoothish, covered with a very thin, smooth cuticle; uniform yellowish, or striped or flamed with reddish-brown. Spire regularly tapering to the obtuse apex, the first whorl or two smooth. Aperture vertical or slightly oblique, rather small, less than half the total length of the shell. Outer lip thin, simple and acute; columellar lip reflexed above, not truncate at the base, but continuous with the basal margin.

Jaw finely striate. Teeth as in *Achatina* and *Perideris*. Kidney and genitalia as in *Achatina*, etc.

Distribution: tropical Africa, from the east coast to the west, and from upper Egypt and Abyssinia throughout the Lake region; or about 15° on each side of the Equator. They live chiefly on plants, and, in the Lake region, in grass. The striped coloring of most of the shells is thought to be imitative of light and shadow in their grassy haunts.

With the coloration of *Achatina*, this genus differs by the continuity of the columella with the basal lip. *Burtoa* resembles *Limicolaria* in the non-truncate columella, but it has the broadly ovate-conic shape of typical *Achatina*, and the mouth exceeds half the total length of the shell; moreover, the apical sculpture of *Burtoa* shows it to be more closely related to *Achatina* than to *Limicolaria*.

The epiphragm of *L. marlensiana* is described by Pelseneer as thin and white, having a raised ridge with a slit on the inner side for the entrance of air. This agrees with *Achatina*.

The chief monographic work on *Limicolaria* is that of Kobelt in the *Conchylien Cabinet,* 1894, comprising 47 species. The East African forms have been thoroughly revised by von Martens in his great work *Beschalte Weichthiere Ost-Afrikas*, 1896. Mr. E. A. Smith has also contributed largely to our knowledge of the genus, in numerous articles on African mollusks, 1880 to the present time. In the present work 71 species are admitted.

Professor E. von Martens, in his work on the shell-bearing mollusks of East Africa, remarks that the species are separated with difficulty and are still harder to diagnose, for the general shape, as well as the sculpture and coloring, vary widely in a series of specimens collected together. The shape may be more or less swollen or slender, and not rarely abnormally drawn-out shells occur, which are conspicuously small-mouthed. More rarely there are shortened forms. The numerical proportion of the length of the shell to its width may, therefore, vary remarkably among individuals of a species, and also the proportionate length of the aperture to that of the whole shell.

The following species, described as Limicolariæ, belong to the Buliminoid series, as shown by the penial accessory organs of *L. revoili*, the anatomy of which has been figured by Bourguignat; no such structures are found in *Limicolaria* or other *Achatinidæ*.

L. revoili, with var. inflata; L. gilbertæ, L. rochebruni, L. armandi, L. perrieriana, L. maunoiriana, L. milne-edwardsiana, L. leontinæ, L. rabaudi, all of Bgt., and all from the Ouarsanguelis Mts., Somaliland. See Bgt., Moll. terr. et fluv., pp. 40-52, in Revoil, Faune et Flore des Pays Comalis (Afrique orientale), 1882.

The species of *Limicolaria* may conveniently be grouped geographically as follows:

West Africa (Senegal to Angola), species 1-30.

Congo Valley, species 31-34, 61*c*, 62.

Northeast Africa (Upper Egypt, Abyssinia, Somaliland), species 7*c*, 11*b*, 35-49, 52.

East Africa (Great Lake region eastward), species 50-70.

HABITAT UNKNOWN, species 71, 72.

The West African area south of the Congo will probably prove to be sufficiently distinct in species from the coast northward to be segregated as another division. The Senegal and Kamerun fauna has numerous species, both land and fresh water, in common with, or at least closely related to, species of the upper Nile, although most of the N.-E. African forms are quite distinct. The Congo valley seems to have a large element of special species; but its upper portion lies in the Great Lake faunal region.

1. L. STRIATULA (Müller). Pl. 18, fig. 96.

"Shell perforate, cylindric-turrite, rather thin, striate, and conspicuously granulose-decussate by spiral lines; immaculate whitish under a pale buff epidermis; spire long, the apex obtuse; whorls 8, moderately convex, more strongly plicatulate at the sutures, the last whorl scarcely two-fifths the total length, obtusely angulate-compressed at the perforation. Columella rather straightened above, arcuate towards the base. Aperture oblong-oval; peristome unexpanded, the columellar margin broadly reflexed. Alt. 40, diam. 19, length of aperture 18, width 9 mm." (*Shuttlw.*).

Africa.

Buccinum striatulum MULLER, Hist. Verm., ii, p. 147, no. 335.—*Bulla striatula* GMEL., Syst. Nat. (13), p. 3430.—DILLWYN, Catalogue, i, p. 492.—*Bulimus striatulus* BRUG., Encycl. Méth., i, p. 492.—PFR., Monogr., ii, 181.—*Helix striatula* FÉR., Prodr., p. 57; Hist., pl. 141, f. 9, 10.—*Limicolaria striatula* SHUTTLW., Notitiæ, i, p. 49, pl. 8, f. 1, 2.—PFR., Monogr., iv, 585.—KOBELT, Conchyl. Cab., p. 119, pl. 33, f. 3, 4.

I have copied Shuttleworth's description and figure of this old, but little known species, as he seems to have first placed it upon an identifiable basis. Kobelt's figures of a specimen in the Berlin Museum look very much like *L. aurora*.

2. L. AURORA (Jay). Pl. 20, figs. 12, 13, 22.

Shell oblong-ovate, narrowly umbilicate, the edge of the

umbilicus subangular, rather thin, white or flesh-colored under a thin, pale yellow cuticle. Surface not glossy when unworn, slightly wrinkled with growth-striæ, rather indistinctly decussate with spiral impressed lines; crenate below the suture. Spire a little attenuate above, the apex obtuse. Whorls 9 to 9½, moderately convex. Aperture slightly oblique, white inside; outer lip simple; columella vertical, straight, cylindric, the edge well reflexed.

Length 68, diam. 28 mm.; length of apert. 28 mm.

Length 55, diam. 25 mm.; length of apert. 24.5 mm.

West Africa: Kamerun: Ekumba-Liongo, Boangola (Dusen); Bonge (Dusen, Sjostedt), Bibundi, Boana, Buea, and Victoria (Jungner). Gabun and Niger river (Cuming); Senegal (Verreaux); Corisco (coll. A. N. S.).

Bulimus aurora Jay, Catalogue, 1839, p. 119, pl. 6, f. 2.—Pfr., Monogr., ii, p. 199; iii, p. 385.—*Limicolaria aurora* Pfr., Monogr., iv, p. 385; vi, p. 208.—Shuttlw., Notitiæ, i, p. 49.—Kobelt, Conchyl. Cab., p. 120, pl. 33, f. 5, 6.—v. Mart., Monatsber. Berlin, 1876, p. 258.—d'Ailly, Bihang till K. Sv. Vet.-Akad. Handl., xxii, pt. 4, no. 2, p. 77.—*Bulimus suffusus* Reeve, C. Icon., v, pl. 53, f. 350 (1848).—? *Achatina flammigera* var. *carneola* Grateloup, Actes Soc. Linn. Bord., xi, p. 415, pl. 2, f. 3 (1839).

The pale color and long spire, rather attenuate above, are characteristic. It lives on the leaves of *Canna indica* and on plantains, with *L. numidica, rubicunda,* etc., according to d'Ailly. Fig. 22 is a copy of Reeve's figure of *B. suffusus,* which is identical with *aurora.*

3. L. spectralis (Reeve). Pl. 20, fig. 20.

"Shell cylindrically oblong, slightly umbilicated, whorls 7, smooth, columella rolled back; lip thin, sharp. Whitish, covered with a thin straw-colored epidermis" (*Reeve*).

West Africa (Verreaux); Fernando Po (coll. Charpentier); Niger (Pfr.).

Bulimus spectralis Reeve, Conch. Icon., v, pl. 53, f. 348 (Nov., 1848).—Pfr., Monogr., iii, 387.—*L. spectralis* Shuttlw., Notitiæ, p. 50.—Pfr., Monogr., iv, 585.—Kobelt, Conch. Cab., p. 123.

Very near *L. aurora,* of which it may be a small variety. Pfeiffer gives the measurements of a Cumingian specimen as 40 x 17 mm.

4. L. AGATHINA 'Gabb' Pils., n. sp. Pl. 19, fig. 11.

Shell perforate, long-turrite; white under a very thin yellowish cuticle, with very few, narrow red-brown streaks, which become more numerous on the spire, where they often branch above; the upper whorls more or less reddish. Surface slightly glossy, finely, irregularly striate, the median whorls sparsely decussate, the spirals obsolete or nearly so on the last whorl. Suture a little crenulate. Spire straight-sided, the apex obtuse. Whorls 9¼, slightly convex. Aperture narrow, acutely angular above, a little receding and very narowly rounded at the base, subangular at junction of basal and columellar margins. Columella convex, dilated and revolute above, rapidly tapering below, and obliquely truncate by the receding basal margin. Length 49, diam. 19.5, length of aperture 20 mm.

West Africa (type no. 78486 A. N. S. P.).

The sparse, very narrow streaks of the last two whorls and the very narrow aperture are characteristic. An abnormal specimen in the type lot is somewhat larger.

5. L. TRYONIANA Pilsbry, n. sp. Pl. 8, fig. 46.

Shell nearly imperforate, long-turrite, thin but strong, *uniform straw-yellow.* Surface nearly smooth, slightly striate, showing some faint traces of decussation on the spire, and a little puckered below the suture. Whorls 7½, the upper ones slowly increasing and moderately convex, the last three rapidly widening and quite convex. Aperture oblique, whitish inside, the basal margin receding, the *columella strongly twisted in a spiral fold,* the columellar margin widely reflexed and adnate above. Length 58, diam. 21.5, length of aperture 23.5 mm.

This species differs from all others known to me by the spirally entering columella. Described from a single specimen of unknown locality, but received with various West African species.

6. L. OBSOLETA (Morelet).

Shell perforate, truncate, ovate-fusiform, rather solid, obsoletely striate, seen under a lens to be granulose-decussate, especially at the sutures, slightly shining, waxen, buff-fulvous. Whorls remaining 6, a little convex, joined by a white suberenulate suture, the last whorl three-tenths the total length. Aperture semi-oval, whitish-fleshy within; peristome simple, unexpanded, the columellar margin dilated, vaulted and reflexed over the minute, pervious perforation. Length 30, diam. 15 mm. (*Morel.*).

West Africa: Sierra Leone (Morelet).

Bulimus obsoletus MORELET, Journ. de Conchyl., 1864, p. 158.—*L.*(?) *obsoleta* PFR., Monogr., vi, 209.

Known only by Morelet's original description.

7. L. KAMBEUL (Bruguière). Pl. 24, fig. 4.

Shell pyramidal-ovate, perforate, rather solid; white with red-brown longitudinal streaks (often more or less zigzag) under a thin yellow cuticle. Surface slightly shining, the surface above the periphery decussate with axial striæ cut by incised spirals; below the periphery it is nearly smooth. Spire straightly conic, the apex obtuse. Whorls 8½, moderately convex. Aperture small, lilac-fleshy inside, the lip thin, columella straight or concave, subcylindric, the edge being well reflexed.

Length 55, diam. 27, length apert. 26.5 mm.

West Africa: Senegal (Adanson); Cape Palmas, Liberia (Acad. coll.); Gorea (Brunner).

Bulimus kambeul BRUGUIERE, Encycl. Méth., i, p. 322.—DESH. in Fér., Hist., p. 109, pl. 141 A, f. 3.—SHUTTLW., Notitiæ, i, p. 41.—*Bulimulus kambul* GRAY, Figs. Moll. Anim., p. 116, pl. 74, f. 3.—*Pythia flammea* OKEN, Lehrbuch der Zoologie, p. 321 (1815).

In its several varieties, this species stretches from Senegal to the sources of the Nile.

The typical form of this species is the rather small West African race, such as the Cape Palmas specimens described above and figured in fig. 4, and in Fér., Hist., pl. 141 A, f. 3.

7*a*. Var. ADANSONI (Pfeiffer). Pl. 24, figs. 2, 3, 5.

Shell larger and more glossy, the markings often wider, sometimes confluent on the last whorl. There is often an ill-defined peripheral band.

West Africa: Senegal.

Bulimus adansoni PFR., Monogr., ii, 179; iii, 384.—REEVE, C. Icon., pl. 50, f. 327.—*Limicolaria a.* PFR., Monogr., iv, 582; vi, 207.—JICKELI, Moll. Nordostafrika, p. 154, pl. 6, f. 3, 4. —KOBELT, C. Cab., p. 59, pl. 19, f. 2, 3.—*Bulimus kambeul* DESH. in Fér., Hist., pl. 141 A, f. 1, 2, 5.—*Bulimus* (*Limicolaria*) *adansoni* LEHMANN, Malak. Bl., xi, 1864, p. 48, pl. 1, f. 3 (anatomy of specimen said to be from "Cape di Verde Is.").—*Bulimus achatinoides* and *B. xantholinus* ZIEGLER, in coll., teste Pfr.

7*b*. Var. *œdilis* Fér. Pl. 23, fig. 49; pl. 24, fig. 6.

Similar to *adansoni*, but uniform white under a pale yellow cuticle. Gorea.

Helix œdilis FÉR., Prodr., p. 53, no. 390; Hist., pl. 141 A, f. 4.—*Limicolaria œdilis* SHUTTLW., Notitiæ, i, p. 40.—*Bulimus œdilis* REEVE, Conch. Icon., pl. 50, f. 328.

Fig. 49 of pl. 23 is copied from Férussac's illustration.

7*c*. Var. *turris* Pfr. Pl. 25, figs. 9, 10, 11.

Much larger than any of the preceding forms, length 114, diam. 43 mm.; whorls 10.

Central Africa: source of the White Nile (Petherick).

Limicolaria turris PFR., P. Z. S., 1861, p. 25, pl. 2, f. 3; Novit. Conch., p. 162, pl. 44, f. 1-3.—*Achatina turris* Pfr., MARTENS, Malak. Bl., xxi, 1873, p. 38.—*L. adansoni* var., JICKELI. Fauna der Land- und Süsswasser-mollusken Nord-ost-Afrika's, p. 154, pl. 6, f. 3, 4.

Fig. 9 is a copy of Pfeiffer's type figure; 10, 11 are from Jickeli. Kobelt's fig. 1 of pl. 10, Conchylien Cabinet, represents *turris*.

7*d*. Var. *substrigata* Kobelt. Pl. 18, fig. 99.

Differs from the type by the almost wholly obsolete sculp-

ture, and the streaks being confluent on the lower whorls. Three specimens in the Berlin Museum.

L. a. var. *substrigata* Kob., C. Cab., p. 119, pl. 33, f. 1, 2.

7*c*. Var. TURBINATA (Lea).

"Shell turbinate, whitish, obliquely striped and maculate; with minute decussating striæ; subcarinate; suture impressed; whorls 6, convex, impressed below the suture. Aperture small, ovate; columella incurved" (*Lea*).

Liberia (Dr. Blanding).

Achatina turbinata Lea, Proc. Amer. Philos. Soc., ii, p. 31 (May 7, 1841); Obs. Gen. Unio, iv, p. 2.—Pfr., Monogr., ii, 296.

The type of this species has not been figured or fully described, but it was apparently a form similar to *L. adansoni* Pfr., or *substrigata* Kob. Lea's original diagnosis is given above. His later description differs somewhat, and is as follows: "Shell turbinate, brownish, above obliquely banded and spotted, with minute decussate striæ; sutures impressed; whorls 8, convex, impressed below the sutures; aperture small, ovate; columella incurved. Diam. 1.4, length 2.7 inches." Lea further remarks: "It has some resemblance to *A. flammata* Caillaud, but is a larger species. Those sent me by that traveler, from Sennar, being very much exserted. The *flammata* from the south of Africa is shorter than that from Nubia, but it is not so turbinate as this species, nor do they agree in the form of their apertures, nor in the markings. On the lower whorl the *turbinata* is brown. The superior whorls are obliquely marked with brown bands, which are broken up into spots on the penultimate whorl and become darker."

8. L. BELLAMYI Jousseaume. Pl. 8, fig. 45.

Shell large, ovate-conic, striate, umbilicate, the first whorls white, following ones pale brown-streaked, the last one reddish. Spire conic, the apex rather obtuse; suture smooth; whorls 9½, a little convex, the last swollen, somewhat compressed around the umbilicus, ornamented with longitudinal

striæ evanescent below the middle. Aperture suboval, bluish inside; peristome simple, unexpanded, the columellar margin dilated above, reflexed. Length 104, diam. 52, aperture 57 x 29 mm. (*Jouss.*).

West Africa: Upper Senegal (Bellamy).

L. bellamyi Jouss., Bull. de la Soc. Zöol. de France, xi, 1886, p. 475, pl. 12, f. 1.—Kobelt, C. Cab., p. 68, pl. 21, f. 1 (copy).

Near *L. kambeul*, and apparently the same as the var. *adansoni* of that species. Jousseaume, however, includes that species also in his paper, under the name *L. kambeuil*.

9. L. africana (Reeve). Pl. 18, fig. 98.

Shell acuminately ovate, deeply umbilicated, whorls 9, somewhat rounded, reticulately striated and very finely concentrically wrinkled, crenated at the sutures; columella straight, rolled back; livid white, faintly marked with rather distant longitudinal chestnut-brown flames (*Reeve*). Length 107, diam. 56 mm. (from fig.).

West coast of Africa (Cuming coll.).

Bulimus africanus Reeve, Conch. Icon., v, pl. 50, f. 330 (Nov., 1848).—Pfr., Monogr., iii, p. 384.—*L. africana* Shuttl., Notitiæ, i, p. 39.—Kobelt, Conch. Cab., p. 116, pl. 32, f. 1, 2.—*Bulimus speciosus* Parr., *teste* Pfr.

Kobelt, who figures smaller specimens, remarks that it differs from *L. kambeul* only by the open umbilicus surrounded by an angle, as well as the more obese last whorl; and he considers transition forms between them as not improbable. The original description and figure are given.

10. L. vignoniana (Morelet). Pl. 20, fig. 14.

Shell covered-perforate, oblong, rather thin, irregularly striate, and under a lens seen to be decussate in places; buff-fulvous, silky, little shining, variegated with buff at the sutures. Spire long-conic, the apex obtuse. Whorls 9, a little convex, the upper ones granose-striate, joined by a deep suture, the last a little shorter than the spire, slightly tapering at the base, and obscurely marked with a brown

band, longitudinally plicate in front of the columella. Columella wide, arcuate, prone in front, obliquely truncate and not reaching to the base. Aperture semioval, the base subeffuse, violaceous inside; peristome simple, unexpanded, the columellar margin dilated, sloping. Length 105, diam. 47 mm. (*Morel.*).

West Africa: interior of Gabun (Capt. Vignon).

Achatina vignoniana MOREL., Journ. de Conchyl., 1874, p. 372.—*Limicolaria v.* MORELET, J. de C., 1890, p. 65, pl. 1, f. 1.—KOBELT, C. Cab., p. 63, pl. 20, f. 1.

Apparently a very distinct species. The figure is from a specimen not quite adult.

11. L. FLAMMEA (Müller). Pl. 18, figs. 93, 94.

Shell perforate, ovate-elongate, rather thin, nearly smooth; tawny-white, ornamented with wide, wavy chestnut streaks. Spire long-conic, the apex obtuse, white. Whorls 9, slightly convex, granulose-decussate above, the last three-sevenths the total length, not swollen; columella slightly arcuate, lilac-tinted. Aperture nearly vertical, subrhombic-semioval, angular at the base, opaline within; peristome simple, unexpanded, the columellar margin dilated to the base, vaultingly reflexed. Length 75, diam. 30, length apert. 35, width 16 mm. (*Pfr.*).

West Africa: Christiansborg, on the Gold Coast (Dr. Masman; type locality); on the Niger river (Fraser). East Africa: Guaso Narok, Alngaria and Leikipia (Gregory); Free Town, Sierra Leone (Stearns).

Helix flammea MULL., Verm. terr. et fluv. Hist., ii, p. 87, exclusive of synonymy (1774).—? *Bulla flammea* CHEMNITZ, Conchyl. Cab., ix, p. 32, pl. 119, f. 1024, 1025 (? = *L. kambeul*).—*Bulimus flammeus* BRUG., Encycl. Méth., i, p. 322.—PFR., Monogr., ii, p. 180.—REEVE, C. Icon., v, pl. 53, f. 352.—DESH. in Fér., Hist., ii, p. 110, pl. 141, f. 1-3.—*Limicolaria flammea* SCHUM., Essai d'un nouv. Syst., p. 200.—SHUTTLW., Notitiæ, i, p. 47, pl. 7, f. 1-3.—MARTENS, Malak. Bl., 1865, p. 200; 1869, p. 73; 1873, p. 39; 1870, p. 33 (var. *festiva*).—PFR., Monogr., iv, 584; vi, 208; viii, 269; Novit. Conch., p.

7, pl. 110, f. 6 (var. *festiva*); p. 21, pl. 113, f. 5, 6.—JICKELI, Moll. N.-O. Af., in Nova Acta Acad. Caes. Leop.-Carol. Germ. Nat. Cur., xxxvii, 1875, p. 157 (exclusive of var.).—KOBELT, Conchyl. Cab., p. 50, pl. 16, f. 1; pl. 17, f. 1.—R. E. C. STEARNS, Proc. U. S. Nat. Mus., 1893, p. 327.—SMITH, Proc. Malac. Soc. Lond., i, p. 165.—*Achatina elongata* SWAINS., Malaeol., p. 174, and *Helix ustilago* BOLT., according to Pfr.

The typical form of *L. flammea*, as described by Pfeiffer, is from the Gold Coast and adjacent districts. Jickeli unites as varieties a series of forms from the Upper Nile region and from West Africa—aurora, sennaariensis, cailliaudi, suffusa, numidica, candidissima and beccarii; but he has had no followers in this course, though it is admitted that the species stand upon a slender basis. At present it seems best to restrict *L. flammea* to West African forms. The question whether Pfeiffer has correctly identified Müller's species cannot be profitably discussed until a series of Limicolariæ from Christiansborg, the type locality, can be obtained; and its relationship to *L. kambeul* will then be clarified.

11*a*. Var. UNICOLOR Kobelt. Pl. 20, fig. 17.

Shell rather openly perforate, ovate-turrite, rather solid, hardly shining, the upper whorls distinctly, the lower obsoletely and irregularly striate; uniform corneous-buff. Spire ovate-turrite, the apex obtuse. Whorls 7-8, a little convex, separated by an impressed, whitish-margined, very delicately crenulate suture, slowly increasing, the last whorl hardly as long as the spire (measured behind), tapering at base, slightly compressed around the perforation. Aperture a little oblique, ovate, rose-whitish within; columella callous, twisted, roseate; outer lip thin, acute, unexpanded, the margins joined by a very thin callous. Length 41, diam. 19.5, alt. apert. 18 mm. (*Kobelt*).

West Africa.

L. (*flammea* var.) *unicolor* KOBELT, Conch. Cab., p. 73, pl. 23, f. 7, 8.

Based upon one specimen, the relationship of which Kobelt could not make out. E. A. Smith pronounced it a variety

of *L. flammea*. If so it is parallel to the var. *volkeni* of *L. dimidiata*.

11*b*. Var. FESTIVA (Martens). Pl. 18, fig. 95.

Shell narrowly perforate, long-conic, striatulate, a little glossy; buff, marked with rather wide chestnut stripes, frequently angulate near the suture, and rarely forked above. Spire produced, the apex obtuse, orange. Whorls 9, slightly convex, the last distinctly crenulate at the suture, tapering basally. Aperture two-fifths the length, narrowly ovate, slightly oblique, the outer and basal margins acute, brown, columellar margin a little reflexed, pale violaceous, columella slightly twisted. Length 72, diam. 29, apert. 31 mm. long, 15 wide (*Mart.*).

Upper Nile region.

Achatina (*Limicolaria*) *flammea* var. *festiva* MART., Malak. Bl., 1869, p. 73; 1870, p. 33.—PFR., Novit. Conch., p. 7, pl. 110, f. 6.

Pfeiffer remarks that this form from the Gazelle river agrees pretty well with *L. flammea*, but has a comparatively much longer spire, and is thicker and stronger; the suture, especially at the last whorl, is distinctly margined, and the flames much darker, almost black-brown.

12. L. TOGOENSIS Kobelt. Pl. 21, figs. 23, 24, 25.

Shell widely perforate, conic-turrite, rather solid, rudely rib-striate and decussate with impressed, unequal spiral lines everywhere except on the lower part of the last whorl; dirty gray-corneous, very obsoletely streaked and maculate with reddish. Spire conic-turrite, the apex obtuse. Whorls 9-10, convex, parted by an impressed, crenulate suture, regularly increasing, the last shorter than the spire, somewhat inflated, only delicately striatulate below the periphery, compressed into a crest around the perforation. Aperture slightly oblique, irregularly oval, somewhat channelled at the base, livid roseate within; peristome simple, acute, widely white-lipped within, the margins slightly connected by a very thin callous; columellar margin somewhat straightened, callous and

roseate, forming an angle with the basal margin, vaultingly reflexed over the perforation. Length 70, diam. 30, alt. apert. 30 mm. (*Kob.*).

West Africa: Bismarckburg, in Togoland (Buettner).

L. togoensis KOBELT, Conchyl. Cab., p. 70, pl. 23, f. 1, 2; p. 124, pl. 34, f. 1; pl. 35, f. 1.

"Belongs to the adansoni-turris group, distinguished by the turrited shape, relatively small last whorl and the sharp sculpture." Described from a specimen in the Berlin Museum (fig. 23). Others received from the same source differ, fig. 24 representing a long, lean shell, weakly decussate on the middle whorls and upper part of the last, brown-yellow with brown-red streaks, narrow and flame-like above, the widening to broad spots, covering the ground-color on the last two whorls. Another specimen (fig. 25) resembles the type in shape, but is more sharply sculptured, and is colored like the preceding.

13. L. GUINAICA Morelet. Pl. 19, figs. 4, 5.

Shell narrowly perforate, oblong-turrite, rather solid, glossy, striate; chestnut-purplish, regularly marked with wide blackish streaks. Spire turrite, the apex rather obtuse. Whorls 9, a little convex, the last narrowly marginate, more than one-third the shell's length. Columella straight, shortly dilated, violaceous. Aperture semioval, obsoletely angular at the base, violaceous inside, showing the streaks through. Peristome simple, unexpanded, the columellar margin a little reflexed. Length 54, diam. 21 mm. (*Morel.*).

West Africa: coast of Guinea.

L. guinaica MOREL., Journ. de Conch., 1890, p. 66, pl. 1, f. 2.—KOBELT, C. Cab., p. 64.

The spire is more slender and twisted than in *L. flammea;* the striation is more developed, close and regular, and there is no granulation of the surface.

14. L. STRIGATA (Müller). Pl. 19, figs. 6, 7.

Shell rather widely perforate, long-ovate, the base very little dilated; rather solid; striatulate, the striæ more prom-

inent below the suture; very obsoletely sulcate spirally on the median whorls and upper part of the last one; glossy, white streaked with reddish brown, the streaks coalescent on the lower whorls, but usually leaving a subsutural band; last whorl generally streaked with buff-white. Spire conic-turrite, the apex obtuse, white, somewhat mamillate. Whorls 9, a little convex, separated by an impressed suture, which is somewhat crenulate below; the last whorl hardly as long as the spire, tapering at base, somewhat compressed around the umbilicus. Aperture narrowly ovate, tapering above and below, violaceous-whitish inside with wide violaceous streaks. Columella twisted, receding. Peristome unexpanded, acute, delicately white-lipped inside, the columellar margin vaultingly reflexed over the perforation. Length 66, diam. 31, oblique length of aperture 32 mm. (*Kobelt*).

West coast of Africa.

Buccinum strigatum MULLER, Hist. Verm., ii, p. 284.—*Bulla strigata* GMEL., Syst. Nat. (13), p. 3430.—*Limicolaria strigata* SHUTTLEWORTH, Notitiæ, i, p. 44.—PFR., Monogr., iv, 583; vi, 207.—KOBELT, C. Cab., p. 117, pl. 32, f. 3, 4.—*Helix (Cochlogena) flammata* FÉR., Tabl., p. 57; Histoire, pl. 141, f. 4, 5.

Kobelt's description and figures are copied. Müller's type is lost from the Copenhagen Museum, but the specimen described by Kobelt agrees with the original description, and is confidently believed to be the true *strigata*.

15. L. FLAMMULATA (Pfeiffer). Pl. 27, figs. 1, 2.

Shell perforate, turrite-oblong, thin, striatulate, not glossy, pellucid; corneous-buff, sparsely flamed with rufous. Spire somewhat turrite, the apex obtuse. Whorls 7, rather flat, the median ones very minutely reticulate, last whorl slightly wider, a little more than one-third the total length. Columella vertical. Aperture oblique, truncate-oblong, slightly angular at the base. Peristome simple, unexpanded, the columellar margin compressed, reflexed, noticeably dilated above. Length 29, diam. 12, apert. 12 mm. long, 6 wide (*Pfr.*).

Angola (Pfr.).

Bulimus flammulatus Pfr., Zeitschr. f. Malak., 1847, p. 147; Monogr., ii, p. 181; Conchyl. Cab., p. 90, pl. 31, f. 5, 6. —*Limicolaria f.* Pfr., Monogr., iv, 585; vi, 210; viii, 270.—Kobelt, C. Cab., p. 78, pl. 28, f. 5, 6 (copy from Pfr.).

A small species, only sparsely streaked, and known only from Pfeiffer's description and figures.

16. L. numidica (Reeve). Pl. 19, figs. 1, 2, 3.

Shell ovate-turrite, thin; very pale buff boldly and irregularly striped with reddish chestnut, the stripes very wide, wavy and usually oblique on the median part of the last whorl, usually splitting into slender branches along a belt below the suture, and often dislocated at the base; the spire marked with slender stripes, widening into spots above the suture on the penult. whorl. Spire straightly turrited. Whorls 9, slightly convex. Surface dull, striate, finely decussate on the intermediate whorls and upper part of the last one. Aperture slightly oblique, rather narrow, and tapering above and below.

Length 53, diam. 22, length of apert. 23 mm.

Length 47.5, diam. 23, length of apert. 21.5 mm.

West Africa: Yoruba (or Arriba) Land, inland from the Gulf of Benin (Mann); Kamerun, in numerous localities (Dusen); Corisco; Gabun (coll. A. N. S.); Free Town, Sierra Leone (Stearns). Prince's Island (Reeve).

Bulimus numidicus Reeve, Conch. Icon., v, pl. 53, f. 351 (Nov., 1848).—Pfr., Monogr., iii, 386.—*Limicolaria numidica* Pfr., Monogr., iv, 583; vi, 207.—Kobelt, Conchyl. Cab., p. 75, pl. 12, f. 7, 8; pl. 25, f. 3-8.—d'Ailly, Bihang, etc., xxii, p. 75.—Stearns, Proc. U. S. Nat. Mus., 1893, xvi, p. 327.—*Achatina (L.) numidica* Martens, Malak. Bl., xiii, p. 105, pl. 4, f. 5-8.

Reeve reported this species from Prince's Island, probably incorrectly; but it occurs in abundance on the mainland of the Gulf of Guinea. The splitting of the stripes into narrow, paler lines below the suture, and their usual obliquity at the base are characteristic. The pale yellow, hard-shelled

eggs measure 4.5 x 3.5 mm. Twenty-two were contained in an individual in A. N. S. In Kamerun these snails are found on plants, particularly Canna and bananas.

18. L. PRAETEXTA v. Martens. Pl. 20, figs. 15, 16.

Shell elongate, very narrowly perforate, lightly striatulate, a little glossy; yellowish, painted with red-brown curved stripes, which are a little wider in the middle, and split several times at the upper and lower ends. Whorls 7½, a little convex, slowly increasing, the suture lightly crenulate; last whorl oblong, the base moderately tapering. Aperture subvertical, one-third the length of the shell, oblong, narrowed above; the columellar margin twisted, a little thickened, violaceous. Length 41, diam. 14.5, length of aperture 16.5, width 8 mm. (*Martens*).

West Africa: Barombi, Kamerun (Zeuner).

L. praetexta v. MART., Sitzungsberichte d. Gesellsch. naturf. Freunde zu Berlin, 1888, p. 148; Conch. Mittheil., iii, p. 8, pl. 43, f. 4, 5.

The dark stripes on each whorl divide into three parts: in the middle broad, with wide light interspaces; above and below by repeated splitting they are more numerous and finer. The lower division is concealed on the whorls of the spire. The eggs are 18 mm. long and 14 wide. [Probably an error for 1.8 and 1.4.]

19. L. DROUETI Morelet. Pl. 1, fig. 6.

Shell ovate-turrite, rather thin, slightly striate, glossy; corneous-reddish, closely painted with chestnut, angulate, wavy stripes and flames. Spire turrite, the apex obtuse. Whorls 7½, a little convex, the last two-fifths the total length; columella plicate, flexuous, violaceous-brown. Aperture semi-oval, violaceous inside, showing the stripes through; peristome acute, the columellar margin narrowly revolute, forming an obtuse angle with the base. Length 30, diam. 8 mm. (*Morel.*).

West Africa: Toumby, near Landana, above the mouth of the Congo.

L. droueti Morel., Journ. de Conchyl., 1885, p. 21, pl. 2, f. 14.

Resembles *A. zebriolata* in markings, and seems to be related to the preceding species.

20. L. LUCALANA Pilsbry, *n. n.* Pl. 29, figs. 9, 10, 11.

Shell subperforate, ovate-turrite, rather solid, obsoletely striate, glossy; pale buff or whitish tawny, variously marked with waved blackish or chestnut stripes, sometimes interrupted. Spire turrited, corneous above, the apex obtuse. Whorls 7½, a little convex, more distinctly striate below the sutures, the last whorl very obsoletely angular, but little more than one-third the shell's length. Columella nearly straight or receding, blackish-purple. Aperture small, semi-oval, angular below, slightly calloused and whitish-blue within, showing the streaks through; peristome unexpanded, thin, the columellar margin narrowly dilated, reflexed. Length 38, diam. 15 mm.; apert. 14.5 mm. long, 6 wide (*Morel.*).

West Africa: districts of the Duc de Braganza and Ambaca, along the marshes of the Lucala river, Angola (Welwitsch).

Bulimus jaspideus Morelet, Journ. de Conchyl., 1866, p. 155; Voy. Welwitsch, p. 62, pl. 2, f. 2. Not *B. jaspideus* Morel., 1863.—*L. jaspidea* Pfr., Monogr., vi, p. 209.—Kobelt, C. Cab., p. 64, pl. 20, f. 4, 5.

21. L. KOBELTI d'Ailly. *Not figured.*

Shell openly and deeply perforate, oblong-ovate, somewhat pellucid but rather solid, irregularly and lightly plicate-striatulate, a little glossy, the intermediate whorls decussated below the suture with a few spiral striæ, barely visible under a lens; corneous-buff, somewhat roseate towards the unicolored apex, ornamented with blackish-chestnut streaks and flames, usually oblique, linear on the upper whorls, on the last whorl wavy, frequently confluent at base. Spire convex-conic, the apex obtuse. Whorls 7, a little convex, separated by a pale, delicately crenulate and plicate suture, nar-

rowly margined with an impressed line; the last whorl (behind) is a little shorter than the spire, rounded, obsoletely flattened in the middle, the streaks bent below the middle, producing the effect of an angle, but sometimes it is really angular, the angle disappearing near the aperture; base compressed in a distinct keel around the perforation. Aperture nearly vertical, angulate-elliptical, bluish-white inside, showing the external streaks through. Columella slightly arcuate, slightly twisted, violaceous; peristome unexpanded, very narrowly brown-edged, the margins joined by a very thin callous; right margin regularly arcuate, slightly arched forward in the middle; columella with a long flat reflection, at its junction with the base forming a distinct angle, almost a channel corresponding to the external keel. Largest specimen, length 41.5, diam. 20, apert. length 17, width 9 mm. Smallest specimen, length 33, diam. 16, apert. length 15, width 8 mm. (*d'Ailly*).

West Africa: Bongo, Kamerun (Dusen).

L. kobelti D'AILLY, Bihang till K. Sv. Vet.-Akad. Handl., xxii, Afd. iv, no. 2, p. 79 (1896).

The comparatively large, open perforation, surrounded by a keel-like angle, is characteristic. The columellar lip is merely flattened, not rolled back as in other species. Spiral sculpture is almost completely absent. In general appearance it approaches *L. tenebrica*, *L. martensiana*, *L. houglini* and *L. jaspidea*, being most like the latter in coloration. It has not been figured.

22. L. CHROMATELLA (Morelet). Pl. 36, figs. 1, 2, 3.

Shell subperforate, ovate-oblong, rather solid, nearly smooth, rugose-striate near the suture; buff or tawny-orange, flamed with wide-spaced reddish chestnut streaks. Spire conic, the apex rather obtuse, suture impressed. Whorls 7 to 8, convex, the last more than two-fifths the length; columella slightly twisted, receding, lilac-tinted. Aperture elliptical, strongly angular at the base, pearly inside, marked with the external streaks; peristome unexpanded, thin, the columellar margin narrowly dilated, revolute. Length 37-

40, diam. 18-19; length of apert. 16.5-18, width 11-12 mm. (*Morel.*).

West Africa: Serra de Pedras de Guinga (Pungo-Andongo), in virgin forest, on high ground, Angola (Welwitsch).

Bulimus chromatellus Morel., Journ. de Conch., 1866, p. 154; Voy. Dr. Welwitsch, p. 62, pl. 3, f. 2.—*L. chromatella* Pfr., Monogr., vi, 209.—Kobelt, C. Cab., p. 115, pl. 31, f. 3, 4; pl. 33, f. 7, 8.

Related to *L. tenebrica* Reeve, of which Morelet thinks it may be a local variety.

23. L. tenebrica (Reeve). Pl. 19, figs. 8, 9, 10.

"Shell cylindrically oblong, whorls 7-8, rather rounded, very finely reticulated near the sutures, crenulated along the edge; columella rolled back, lip simple, sharp; whitish, stained with purple-rose and conspicuously painted with large blotches of purple-black" (*Reeve*).

West Africa: Ibu (Fraser, type loc.); Kamerun, at Ekumba-Liongo (Dusen); Grand Bassam (Verreaux).

Bulimus tenebricus Rve., Conch. Icon., v, pl. 53, f. 347 (Nov., 1848).—Pfr., Monogr., iii, p. 387.—*L. tenebrica* Shutt., Notitiæ, i, p. 50.—Pfr., Monogr., iv, 585.—Kobelt, Conchyl. Cab., p. 66, pl. 20, f. 7, 8 (?).—d'Ailly, Bihang, p. 74.

The whorls are decidedly convex. Fig. 8 is Reeve's type. I figure two specimens received from Sowerby & Fulton as from Sierra Leone, which seem referable to *tenebrica*. One (fig. 9) has rather wide stripes on a pale reddish ground; the other (fig. 10) much more numerous and narrower stripes on a yellow ground. Only a few almost obsolete spiral lines are present in these shells, which could not be described as "finely reticulated near the sutures."

24. L. subconica Martens. Pl. 21, figs. 26, 27.

Shell half-covered perforate, turrite-conic, a little glossy, delicately striatulate; isabelline-whitish, marked with few rather wide chestnut streaks, which taper above, or uni-

colored. Whorls 7, the first depressed-globose, following rapidly increasing, the last very obtusely subcarinate at first. Aperture rhombic-rounded, the columellar margin dilated, reflexed and adnate, pale fleshy or violaceous. Length 30, diam. 15, aperture 14 x 8 mm. (*Marts.*).

West Africa: Chinchoxo, in the Loango region (v. Mechow).

L. subconica Marts., Jahrb. d. D. Malak. Ges., ix, 1882, p. 246; Conchol. Mittheil., p. 188, pl. 34, f. 3, 4.

25. L. HYADESI Jousseaume. Pl. 8, fig. 47.

Shell narrowly perforate, oblong-turrite, glossy, striatulate; white-yellowish, ornamented with wide, wavy blackish stripes, the apex corneous, smooth and rufous. Whorls 9, a little convex, the first delicately reticulate, the last more than one-third the total length, tapering at the base. Aperture angularly subelliptical, the peristome simple, unexpanded, right margin slightly arcuate, columella narrowly vaulted, reflexed, corneous-reddish. Length 61, diam. 26, aperture 25 x 15 mm. (*Jouss.*).

Upper Senegal (Bellamy).

L. hyadesi Jouss., Bull. Soc. Zöol. France, ix, 1886, p. 477, pl. 12, f. 2.—Kobelt, t. c., p. 69, pl. 22, f. 1 (copy).

26. L. BASSAMENSIS Shuttleworth. Pl. 36, figs. 6, 7, 8, 9.

Shell narrowly perforate, ovate-conoid, thin, pellucid, beautifully granulose-decussate; reddish ornamented with rather wide deep chestnut deliquescent streaks, distinct on the upper whorls, confluent on the last. Spire convex-conic, the apex obtuse, subpapillar; suture moderate, slightly, obsoletely crenulate. Whorls 8, convex, the last somewhat inflated, a little shorter than the spire, without spiral lines below the suture. Columella slightly arcuate, descending to the base of the aperture. Aperture angularly subelliptical, pearly inside; peristome unexpanded, the columellar margin narrowly rolled back. Length 45, diam. 22, length of apert. 21, width 11 mm. (*Shuttlw.*).

West Africa: Grand Bassam (Verreaux).

L. bassamensis Shuttlw., Notitiæ Mal., i, p. 45, pl. 6, f. 1, 2.—Pfr., Monogr., vi, 583.—Kobelt, C. Cab., p. 121, pl. 34, f. 2-5.

Differs from *L. numidica* by the less lengthened spire, more convex whorls and color-pattern. Figs. 6, 7 are from Shuttleworth; 8, 9 from Kobelt.

27. L. felina Shuttleworth. Pl. 20, figs. 18, 19.

Shell narrowly perforate, ovate-turbinate, thin, pellucid, scarcely shining, minutely granulose-decussate; pale fulvous, closely ornamented with waved reddish-chestnut stripes. Spire conic-turbinate, the apex obtuse; suture impressed, narrowly pale margined. Whorls 7-8, a little convex, the last nearly equal to or a little shorter than the spire; columella a little straightened, receding above; aperture subelliptical, delicately pearly and streaked within; peristome unexpanded, the columellar margin with a narrow but long reflection. Length 40, diam. 20, length and width of apert. 20 mm. (*Shuttlw.*).

West Africa: Gabun and Grand Bassam (Verreaux); Bibandi and Bongo, Kamerun (d'Ailly).

L. felina Shuttlw., Notitiæ Malac., i, p. 47, pl. 6, f. 5, 6. —Pfr., Monogr., iv, 584.—Kobelt, Conchyl. Cab., p. 54, pl. 17, f. 6, 7.—d'Ailly, Bihang, p. 73.

"Undoubtedly related to *L. turbinata* Lea, but easily distinguished by the thinner shell and the color-pattern." Description and figures are from Shuttleworth.

27*a*. Var. zebra, n. var. Pl. 21, figs. 29, 30.

Shell narrowly perforate, thin but moderately strong, oblong-ovate, the spire with nearly straight lateral outlines, apex obtuse. Light yellow, closely painted with red-chestnut stripes which near the suture abruptly taper or split into slender, vanishing branches. The surface is quite finely striatulate, showing some decussating spirals under the lens. Whorls 7, convex, the suture impressed and appearing but slightly oblique. The ovate aperture is whitish inside, subvertical; columella vertical, nearly straight, with reflexed edge.

Length 32, diam. 16.5, longest axis of aperture 14 mm.

Length 34, diam. 17, longest axis of aperture 16 mm.

Cape Palmas, Liberia.

Bulimus turbinatus Lea, REEVE, C. Icon., pl. 82, f. 605.—VIGNON, Bull. Soc. Mal. Fr., 1888, p. 67.—PFR., Monogr., iii, p. 387.—*Achatina* (*Limicolaria*) *t.* SEMPER, Reisen im Archip. Phil., Landmoll., p. 142, pl. 12, f. 1 (anatomy).—*Limicolaria t.*, KOBELT, Conchyl. Cab., p. 62, pl. 19, f. 6-8.—SCHEPMAN, Notes Leyden Mus., x, 1888, p. 247. Not *A. turbinata* Lea, see species no. 7*c*.

This small, handsome Liberian form has been known as *L. turbinata* Lea, a name incorrectly given it by Reeve, whose type figure of "*B. turbinatus*" is copied on pl. 21, fig. 28.

It is a short, compact, smooth shell, with narrow, slowly widening whorls, and obtuse apex. It is less decussate than typical *L. felina*, but probably is not constantly distinguishable from that species. Schepman states that at Grand Cape Mount, Liberia, *L. turbinata* Rve. occurred with *L. tenebrica* and *spectralis* Rve., which, according to Dr. Dohrn, should be considered merely as varieties of *turbinata*.

27*b*. Var. ABETIFIANA Kobelt. Pl. 37, figs. 12, 13.

Sculpture strong, almost beaded, becoming weaker on the last whorl; color-flames not extending far above the periphery. Length 47, diam. 23, oblique alt. of apert. 22 mm.

Abetifi, a mission station on the Gold Coast. Types in Berlin Museum (Kobelt, *t. c.*, p. 76, pl. 26, f. 1, 2).

Another variety is figured by Kobelt from Togoland, but not named. It is even more roughly sculptured than the above, and narrowly streaked (pl. 37, fig. 14).

28. L. RUBICUNDA Shuttleworth. Pl. 29, figs. 12, 13, 14, 15.

Shell narrowly perforate, conoid-ovate-oblong, rather solid, pellucid, granulose-decussate, fleshy-rose, ornamented with wide, waved blackish-purple stripes and other shorter reddish ones, especially below the suture. Spire convexly conic, the apex obtuse, suture slightly impressed, narrowly margined with whitish. Whorls 7 to 8, slightly convex, the last

two-fifths the total length. Columella pale purplish, conspicuously arcuate-twisted. Aperture somewhat semi-oval, bluish-pearly inside; peristome unexpanded, the columellar margin very shortly and rather widely reflexed. Length 40, diam. 18, length of aperture 16, width 8 mm. (*Shuttlw.*).

West Africa: Kissy, on the Guinea coast (Bossard, type loc.); Bibundi and Bonge, Kamerun (Dusen).

Limicolaria rubicunda Sh., Notitiæ, i, p. 45, pl. 7, f. 4, 5. —Pfr., Monogr., iv, 583.—Kob., Conchyl. Cab., p. 125, pl. 35, f. 2-5.—d'Ailly, Bihang, p. 72.—*Achatina rubicunda* Martens, Mal. Bl., 1869, p. 73.

D'Ailly remarks that one specimen in the collection before him measures 49.5 x 20 mm. The form of the columella varies, being more or less twisted or more or less arcuate.

28*a*. Var. shuttleworthi d'Ailly. Pl. 20, fig. 21.

Shell larger than typical *rubicunda*, whitish with wide blackish-chestnut stripes, the columella less twisted, its margin widely revolute. The columella forms a distinct angle with the basal margin; the perforation is larger; the outlines of the spire are more convex, and the last whorl is more ventricose.

Kamerun: Bonge (Dusen); Victoria (Buchholz).

L. rubicunda var. aut spec. distinct. Shuttlw., l. c., p. 46.—*L. rubicunda* Martens, Monatsber. K. P. Akad. Wissensch. zu Berlin for 1876, p. 258, pl. 3, f. 4; copied in Conchyl. Cab., pl. A, f. 2.—*L. shuttleworthi* d'Ailly, Bihang, p. 73, in text under *L. rubicunda*.

The figure is a copy of that given by von Martens, representing a Victoria specimen. The description is compiled from d'Ailly's remarks.

29. L. luctuosa (Pfeiffer).

Shell perforate, oblong-acuminate, rather solid, obsoletely decussate, slightly shining; black-chestnut; spire long, the apex obtuse; suture impressed, submarginate. Whorls 7, a little convex, the last a little exceeding one-third the total length, the base subcarinate around the narrow perforation.

Columella vertical, very slightly arcuate. Aperture a little oblique, somewhat semi-oval, angulate at the columella, livid within. Peristome simple, unexpanded, the columellar margin vaulted, shortly reflexed. Length 39, diam. 17 mm.; aperture 16 mm. long, 8 wide (*Pfr.*).

West Africa (Cuming coll.).

Bulimus luctuosus Pfr., Proc. Zöol. Soc. Lond., 1851, p. 255; Monogr., iii, p. 387; Conchyl. Cab., p. 90, pl. 31, f. 3, 4.—*Limicolaria l.* Pfr., Monogr., iv, 585; vi, 210.—Kobelt, *l. c.*, p. 78.

A shell of peculiarly dark coloration, still known only by Pfeiffer's original account.

30. L. æthiops (Morelet). Pl. 18, fig. 97.

Shell perforate, turrite, rather solid, lightly striate; pale tawny ornamented with distinct reddish flammules on the intermediate whorls, confluent on the last two and dark chestnut. Spire turrite, the apex obtuse. Whorls 9, a little convex, the upper smooth, lower whorls regularly and closely plicate. Aperture nearly vertical, semi-oval, the base angular, interior blue; peristome simple, unexpanded, the columellar margin dilated, reflexed. Length 40, diam. 16 mm. (*Morel.*).

West Africa: Guinea (Morelet).

Bulimus æthiops Morel., Journ. de Conchyl., 1864, p. 157. —*L.* (?) *æthiops* Pfr., Monogr., vi, p. 208.—*Limicolaria æthiops* Morelet, J. de C., xxxiii, 1885, p. 23, pl. 2, f. 13.—Kobelt, Conch. Cab., p. 67, pl. 20, f. 9 (copy).

Morelet gives *Guinea* as the locality in his first notice; *Gabun* in the second. It is an elongate species of peculiar coloration, consisting of radiating spots of the yellowish ground-color below the suture, contrasting with the chestnut-brown color of the rest of the surface. It is quite solid, and, as Kobelt remarks, not without a tendency towards *Homorus*. Morelet's figure is copied.

31. L. watheenensis Putzeys. Pl. 17, fig. 91.

Shell obtuse, narrowly perforate, conic-turrite, thin, striat-

ulate; corneous, irregularly maculate with indistinct tawny flames. Whorls 7, a little convex, suture lightly crenulate, the upper whorls regular, the last dilated, a little exceeding the height of the spire. Aperture oval, vertical, the lip acute, columella whitish, incurved, the columellar margin reflexed over the perforation and nearly reaching to the base. Length 38, diam. 18, length of aperture 18 mm. (*Putz.*).

Congo Free State: Wathen.

L. wathenensis Putz., Bull. Soc. Roy. Mal. Belg., xxxiii, 1898, p. iv, f. 1.

The figures and descriptions of this and the following three species are from Putzeys.

32. L. paludosa Putzeys. Pl. 17, fig. 90.

Shell narrowly perforate, oblong-turrite, rather solid, glossy, striatulate; spire elongate, the apex obtuse; suture not very deep, rather regularly crenulate. Whorls 7-7½, a little convex, ornamented with wide stripes or flames, sinuous and sometimes confluent, usually evanescent; the first 4½ corneous or wine-reddish, irregularly and very distantly decussated with spiral lines, following whorls yellowish, the last obtusely angulate in three-fourths of the periphery. Aperture oval, tapering basally, the lip acute, milky within, showing the external streaks slightly; columella straightened, vertical, blackish violaceous, the margin reflexed over the perforation. Length 35, diam. 15, length of aperture 15 mm. (*Putz.*).

Congo Free State: Bena Bendi.

L. paludosa Putz., t. e., p. iv, f. 2.

33. L. distincta Putzeys. Pl. 17, fig. 89.

Shell narrowly perforate, conic-turrite, rather solid, striatulate; spire turrite, the apex obtuse; suture slightly crenulate. Whorls 7-7½, a little convex, brownish-yellow, irregularly marked with narrow streaks or flames following the growth-lines, wider above the suture; the last whorl oblong, tapering towards the base, the streaks or flames more or less wide in the middle, sometimes forked above the periphery.

Aperture elliptical, tapering basally, the lip acute, milky within; columella brown, lightly arcuate, the margin reflexed above the perforation. Length 37, diam. 16, length of apert. 15 mm. (*Putz.*).

Congo Free State: Bena Bendi.

L. distincta PUTZEYS, t. c., p. v, f. 3.

34. L. CONGOLANICA Putzeys. Pl. 17, fig. 92.

Shell very narrowly perforate, oblong-turrite, thin, striatulate; spire turrite, the apex obtuse, suture slightly crenulate; whorls 7, a little convex, yellowish or brownish-yellow, ornamented with irregular flammules or lines of brown, of very variable length, very frequently confluent and wider above the suture; last whorl oblong, dilated at base, the coloration abruptly divided at the periphery into two parts: posteriorly it is colored as described above; anteriorly it is painted with separate lines or confluent flammules. Aperture subtrapezoidal, dilated basally; lip acute, translucid, very minutely reflexed, delicately ochre-edged. Columella rather thick, twisted, ochre-violaceous, the columellar margin reflexed over the perforation. Length 39, diam. 17, apert. 17 mm. (*Putz.*).

Congo Free State: Wathen.

L. congolanica PUTZEYS, t. c., p. v, f. 4.

Var. *lineolata* Putz. Whole surface ornamented with brown lines following growth-lines. Wathen.

35. L. CHEFNEUXI Bourguignat. Pl. 17, fig. 88.

Shell slightly perforate (the perforation almost wholly covered), oblong, like a *Glandina*, subpellucid, glossy, finely striatulate, the striæ stronger at the suture; uniform pale corneous-ochraceous, without flammules. Spire oblong, at the summit obtuse, the apex smooth. Whorls 7, a little convex, regularly and not rapidly increasing, parted by a rather impressed suture; the last whorl convex, not half the length of the shell. Aperture subvertical, lunate, long, oblong-narrow, outer margin moderately and regularly convex, acutely angular above, angular at the base of the columella;

peristome unexpanded, acute, a little thickened inside; columella straight, dilated and reflexed over the perforation, tapering downward. Length 37, diam. 16, aperture 17 x 7.5 mm. (*Bgt.*).

N.-E. Africa: environs of Anboker (Soleillet).

L. chefneuxi Bgt., Moll. Choa, p. 18, fig. 22 of the plate (1885).—Kobelt, C. Cab., p. 82.

36. L. glandinopsis Bourguignat. Pl. 17, fig. 86.

Shell slightly perforate, the perforation half covered, suboblong, pellucid, glossy, rather fragile, sharply striatulate, slightly crispate below the suture; uniform corneous-chestnut. Spire rather short, oblong, obtuse at the summit, the apex smooth. Whorls 6½, a little convex, regularly increasing, parted by a somewhat impressed suture; the last whorl convex, slightly exceeding half the total length. Aperture vertical, lunate, oblong, acute above, outwardly convex; peristome simple, unexpanded, acute; columella straight, rather short, dilated and reflexed over the half-covered perforation, very acute below. Length 30, diam. 16, aperture 15.5 x 7 mm. (*Bgt.*).

Northeast Africa: Valley of Tagoulet, east of Anboker (Soleillet).

L. glandinopsis Bgt., Moll. Choa, p. 19, fig. 21 of plate (1885).—Kobelt, C. Cab., p. 81.

This species, like the last, has quite the appearance of *Glandina;* this one especially on account of its glossy, transparent and delicate shell. Both of the species are without flammules, but *L. glandinopsis* is readily distinguished from *chefneuxi* by the shorter, more ovoid form, less lengthened spire, more developed last whorl, wider aperture, which is not angular below, etc.

37. L. soleilleti Bourguignat.

Shell narrowly perforate (the perforation half covered), elongate, solid, opaque, glossy; pale rufous with red-chestnut flammules; finely striate, more sharply so below the suture. Spire elongated, obtuse at the summit. Whorls 8, a little

convex, regularly increasing, the suture a little impressed, deeply so at the last whorl. Last whorl oblong, convex, not half the length of the shell. Aperture slightly oblique, oblong, angular above, convex outwardly, a little receding at the base; peristome unexpanded, acute, a little thickened within, the outer margin somewhat arched forward. Columella straight, tapering below, reflexed-dilated and half covering the perforation above. Length 52, diam. 20, aperture 21 x 10 mm. (*Bgt.*).

N. E. Africa: environs of Alie-Amba, Choa (Soleillet).

L. soleilleti Bgt., Moll. Choa, p. 21 (1885).

This Limicolaria is remarkable for the deep impression of the suture at the last whorl, which gives the latter an excessively swollen appearance.

38. L. cordofana Shuttleworth. Pl. 36, figs. 4, 5.

Shell very narrowly, scarcely perviously perforate, ovate-oblong, rather solid, granulose-decussate; whitish, inconspicuously marked with a few narrow, pale chestnut streaks. Spire conoid, the apex obtuse. Whorls 8, convex, the last as long as the spire; suture impressed, simple. Columella moderately arcuate. Aperture suboval; peristome somewhat flexuous, the columellar margin narrowly revolute, adnate for a long distance, nearly closing the extremely narrow, chink-like perforation. Length 55, diam. 27, aperture 26 x 16 mm. (*Shuttlw.*).

N. E. Africa: Kordofan (Kotschy, in Mousson coll.).

Bulimus cordofanus Parreyss mss.—*Limicolaria cordofana* Shuttlw., Notitiæ Malac., i, p. 4, pl. 6, f. 3, 4.—*L. kordofana* Parreyss, Pfr., Monogr., iv, 582; vi, 207.—Kobelt, Conchyl. Cab., p. 122, pl. 34, f. 6, 7.

A rare and little known species of upper Egypt, resembling *L. bassamensis*. The original description and figures are given.

39. L. candidissima 'Parreyss' Shuttl. Pl. 21, figs. 31, 32.

Shell narrowly perforate, thin, subfusiform long-turrite, striatulate, a little glossy; white, obsoletely marked with a

few straw-yellow streaks on the last whorl, covered with a very thin pale corneous epidermis. Spire long, slender, the apex obtuse; whorls 8, slightly convex, the last hardly exceeding one-third the total length, tapering at the base; suture impressed, slightly crenulate; columella subarcuate. Aperture oblong-oval, the peristome unexpanded, the columellar margin narrowly reflexed. Length 62, diam. 20, aperture 23 x 10 mm. (*Shuttl.*).

N. E. Africa: Kordofan (Kotschy, in Mousson coll.).

Bulimus candidissimus Parreyss on label.—*L. candidissima* Shuttl., Notitiæ, p. 49, pl. 6, f. 7, 8 (1856).—Kobelt, Conchyl. Cab., p. 53, pl. 17, f. 3.—Jickeli, l. c., p. 160, pl. 6, f. 8.

A rather long and slender form of the Upper Nile region, probably related to *L. flammata* Caill.

40. L. dhericourtiana Bourguignat. Pl. 17, fig. 84.

Shell narrowly perforate (almost completely covered), swollen, little lengthened, rather solid, somewhat opaque, glossy, uniform ochraceous; strongly costulate, the riblets regular, produced, wide on the last whorl, and elegantly encircled with very minute and numerous spiral lines. Spire oblong, obtusely, rather shortly tapering, obtuse at the summit, the apex paler, smooth. Whorls 7, a little convex, regularly increasing, parted by a suture moderately impressed, suberenulate-marginate on the last whorl. Last whorl exactly half the total length. Aperture a little oblique, semiovate, somewhat channelled at the base of the columella; peristome acute. Columella straight, slightly twisted, widely dilated and almost closing the perforation, not vaulted in the middle but subarcuate, somewhat channelled above, acutely attenuate below. Length 50, diam. 27, apert. 25 x 14 mm.

N. E. Africa: neighborhood of Abdul Rassul, near Anboker (Soleillet).

L. d'Hericourtiana Bgt., Moll. terr. et fluv. rec. par M. Paul Soleillet dans son Voyage au Choa (Ethiopie méridionale), Sept., 1885, p. 15, f. 20 of plate.—*L. hericourtiana* Bgt., Kob., C. Cab., p. 80, pl. 29, f. 2 (copy).

A member of the group of *L. ruppelliana,* distinguished by the absence of color flames, the shell being dark ochraceous, and by the strong wide and regular riblets, decussated by an infinite number of fine spiral lines.

41. L. RUPPELLIANA (Pfeiffer). Pl. 28, figs. 32, 33, 34.

Shell umbilicate, ovate, very minutely granulose; whitish, painted with longitudinal, undulating rufous flames. Whorls 6, slightly convex, the last one swollen, slightly longer than the spire, somewhat compressed basally; suture crenulate. Aperture subauriform, the peristome thin, columellar margin straightened, broadly reflexed, half covering the umbilicus. Length 53, diam. 34, aperture 29 x 14.5 mm. (*Pfr.*).

N. E. Africa: Abyssinia (Rüppel).

Bulimus ruppellianus PFR., Symbolæ, ii, p. 50 (1842); Monogr., ii, 180; iii, 385.—REEVE, C. Icon., x, pl. 50, f. 329. —*L. ruppelliana* PFR., Monogr., iv, 583.—JICKELI, t. c., p. 152, pl. 6, f. 2.—MARTENS, Malak. Bl., 1865, p. 197.—KOBELT, C. Cab., p. 61, pl. 19, f. 4, 5.

Quite distinct by its short spire and obese shape. Figures 31, 32 are copied from Kobelt's illustrations of one of the original lot collected by Rüppel. Another example of the same lot has been figured by Jickeli (pl. 28, fig. 34).

42. L. VANATTAI Pilsbry. Pl. 25, figs. 7, 8.

Shell narrowly perforate, oblong-conic, compact, thin, white under a thin yellow cuticle, variegated with many longitudinal, almost straight, streaks of rich chestnut, rather close and narrow, but with a few broad ones among them, the latter often wedge-shaped, wider below; the streaks neither branching nor zigzag. On the last whorl the longitudinal markings are, to a great extent, coalescent or smeared together below the periphery, the darker color predominating on the base. Sculpture: close and fine costulæ stronger below the suture, cut into oblong granules by spiral impressed lines; the decussation fine and regular on the spire; but below the spirals become less regular, and disappear on the latter part of the body-whorl and are wanting on the base,

and the costulæ on the last whorl are coarser. Spire rather thick, conic, the apex very obtuse, rounded; suture moderately impressed, margined below by a light line. Whorls 11, slightly convex, the last slightly tapering below. Aperture narrowly ovate, purple within, its length a little less than half that of the shell; acuminate above. Columella cylindric, of a purple-flesh color, distinctly convex in the middle, bending toward the left as it approaches the base; the reflexed edge adnate nearly to base, where it is free, leaving a small umbilicus. Length 57, diam. 26.5, length of aperture 27.5, width including columellar reflection 15 mm.

Northeast Africa: Sheikh Husein, lat. 7° 43′ 32″ N., lon. 40° 44′ 30″ E. (Dr. A. Donaldson Smith, Sept. 21, 1894. Type no. 68115 A. N. S. P.).

L. vanattai Pils., Proc. A. N. S. Phila., 1897, p. 358.

Somewhat like *L. turris* Pfr., but the columella is distinctly convex, the spire shorter, and the apex is decidedly more obtuse. It is also a smaller, less conic shell. The spire is longer than in *L. rüppelliana* Pfr. as figured by Jickeli. The narrow, straight, not branching color streaks are also characteristic. Named for Mr. E. G. Vanatta.

43. L. heuglini (Martens). Pl. 28, figs. 24, 25.

Shell perforate, turrite-oblong, irregularly striatulate, somewhat glossy; corneous-buff, flammulate with reddish. Spire subturrite, the apex obtuse. Whorls 7½, *flat,* the upper three reddish, the last whorl a little convex, *suture crenulate, bordered by an impressed line.* Aperture two-fifths the total length, subvertical, slightly angulate at the base; peristome simple, unexpanded, the columellar margin reflexed, perpendicular, violaceous. Length 35, diam. 16, aperture 15 x 8 mm. (*Marts.*).

N. E. Africa: Southern Abyssinia (Heuglin); near Anboker, Choa (Soleillet).

Achatina (*Limicolaria*) *heuglini* Marts., Malak. Bl., xiii, 1866, p. 94, pl. iv, f. 1, 2.—*L. heuglini* Marts., Pfr., Monogr., vi, 210; viii, 270.—Bgt., Moll. Choa, p. 16.—Kobelt, C. Cab., p. 55, pl. 17, f. 8, 9.—Pollonera, Bull. Soc. Malac. Ital.,

1888, p. 71, with var. *iickelii* Poll.—JICKELI, Moll. Nord-Ost-Afrikas, p. 164, pl. 2, f. 8 (jaw and teeth), pl. 6, f. 10 (shell).

The specimens from Choa are larger, 50-52 x 22-23 mm. It is closely related to *L. senaariensis*.

43*a*. Var. *iickelii* Pollonera. Pl. 28, fig. 28.

Differs from the type by the more ovate-oblong spire and the more tapering base of the last whorl. Length 49, diam. 19, apert. 18 x 9.5 mm. (*Poll.*).

N. E. Africa: Gumbi nell' Harrar, near Havash.

Pollonera refers Jickeli's figure to this variety. It is copied on my plate.

43*b*. Var. *sabaticri* Pfr.

Bulimus sabaticri Pfr. (Proc. Zöol. Soc., 1856, p. 389, Monogr., iv, 470), described from the "Bords du Fleuve Blanc" (Sabatier), was later referred by Jickeli (Moll. N.-O.-Afrikas, p. 166) to *L. heuglini* as a young shell. It was never illustrated. The original description follows: "Shell subperforate, ovate-oblong, rather thin, nearly smooth, irregularly striatulate, painted with alternating wavy stripes of pale buff and dark brown; spire conic, paler above, the apex obtuse; whorls 6, a little convex, the last a little shorter than the spire, obsoletely angulated below the middle. Columella straightened, purple-brown; aperture a little oblique, narrowly elliptical; peristome simple, unexpanded, the columellar margin dilated above, reflexed and subadnate. Length 22, diam. 12, aperture 11 x 5.5 mm." (*Pfr.*).

44. L. CHOANA Bourguignat. Pl. 28, figs. 26, 27.

This constant form is, according to Bourguignat, distinguished from the typical *L. heuglini* by the noticeably subpyramidal shell, more swollen below; by the slower increase of the whorls, which are more crowded, and the last whorl, notably less oblong than that of *heuglini*, is not so high, is larger and more thick-set. The aperture is less oblong, more excised (by the preceding whorl), of a semi-oval form, etc.

N. E. Africa: Between Anboker and Alie-Amba, Choa (Soleillet).

Achatina (*Limicolaria*) *heuglini*, *a*, Marts., Malak. Bl., 1866, xiii, p. 94, pl. 4, f. 3, 4.—*L. choana* Bgt., Moll. Choa, p. 17, 1885.

The propriety of separating this form from *heuglini* is doubtful.

45. L. pyramidalis Bourguignat. Pl. 17, fig. 87.

Shell perforate, the perforation half covered, pyramidal, swollen below, rather opaque, somewhat glossy, sharply striatulate, crispulate below the suture of last whorl; whitish with wine-reddish flammules, especially on the last whorl. Spire moderately produced, pyramidal, obtuse at the smooth summit. Whorls 7, a little convex, all narrow except the last one, parted by a rather impressed suture, the last whorl ventricose, convex, slightly subangular around the perforation. Aperture vertical, lunate, semi-ovate; peristome unexpanded, acute. Columella straight, dilated-reflexed, tapering below. Length 42, diam. 22, aperture 18 x 11 mm. (*Bgt.*).

N. E. Africa: Choa (Soleillet).

L. pyramidalis Bgt., Moll. Choa, p. 17, pl. —, f. 23 (Sept., 1885).—Kobelt, C. Cab., p. 81.

Distinguished from *L. choana* by the more swollen last whorl, more conically tapering and shorter spire, etc.

46. L. beccarii Morelet. Pl. 22, fig. 44.

Shell narrowly perforate, turrite, striatulate and minutely decussate above, glossy, pale yellow, longitudinally painted with wavy, subequidistant chestnut streaks. Whorls 7, a little convex, the last obsoletely angulate, tapering at the base, the spire scarcely two-thirds the total length; suture impressed, minutely crenulate at the end. Aperture semi-oval, the right margin thin, acute, columellar margin narrowly revolute. Length 48, diam. 21, aperture 19 x 12 mm. (*Morel.*).

Northeast Africa: Keren in the Bogos country, Abyssinia.

L. beccarii Morel., Ann. Mus. Civ. di Storia Naturale di Genova, iii, p. 198, p. 9, f. 6 (1872).—Kobelt, Conch. Cab., p. 77.

Related to *L. numidica* and the short form of *L. heuglini* (*choana*).

47. L. OVIFORMIS Ancey.

Shell covered and minutely rimate, obtuse-oblong, solid, rather opaque, glossy; under a deciduous pale straw-buff cuticle it is gray-white variegated or flammulate with narrow pale brown streaks in the middle whorls. Spire oblong, relatively not much attenuate, the apex very obtuse. Whorls 7, convex, regularly and slowly increasing, the suture moderately impressed, somewhat irregular; regularly decussate with growth and spiral striæ, somewhat spaced; the last whorl oblong, rounded, smooth past the middle (the spiral striæ disappearing). Aperture suboblique, oblong-narrowed, whitish. Columella reflexed, thickened, nearly straight; peristome unexpanded, acute, the outer margin hardly arched forward. Length 44, diam. 21, alt. apert. 18.25 mm. (*Ancey*).

Northeastern Africa: northern border of Somaliland (Cox). *L. oviformis* ANC., Nautilus, xiv, p. 42, August, 1900; Journ. de Conchyl., xlix, 1901, p. 140.

"It is remarkable in being very obtuse and of an oblong shape. The markings are but faint, at least as far as the original specimen is concerned."

It was recorded in the first place as from Arabia, in the mountains above Aden, but this information proved to be inexact. It is probably related to *L. donaldsoni* and the immediate allies of that species.

48. L. DONALDSONI Pilsbry. Pl. 28, figs. 29, 30, 31.

Shell narrowly umbilicate, oblong-ovate, rather thin. Spire short and wide, terminating in a *very obtuse rounded apex.* Whorls slightly over 6, *quite convex,* separated by deep sutures. Surface shining, finely striated longitudinally, the striæ cut into oblong granules by decussating spiral impressed lines, which become subobsolete on the last whorl except below the suture, where they persist, although weaker. Aperture ovate, a little less than half the length of the shell, bluish-white within; outer lip thin and sharp; columella

straight in the middle and above, slightly concave below, the columellar lip reflexed over the umbilicus. Color white under a very thin, mainly deciduous yellow cuticle, with faint narrow, sinuous and interrupted ochre-brown streaks. Alt. 39.5, diam. 21 mm.; length of aperture 19, width 12 mm.

N. E. Africa: The Haud (Dr. A. Donaldson Smith, July 25, 1894). Type no. 68114 A. N. S. P.

L. donaldsoni Pils., Proc. A. N. S. Phila., 1897, p. 358.

L. beccarii and *L. dohertyi* are allied, but both have a much more strongly developed color-pattern, and the spire of the former is longer and less obtuse. *L. habrawalensis* Jouss., seems also from the description to be related. *L. donaldsoni* has very convex, beautifully granose-decussate whorls, a moderately open umbilicus and very faint coloration. *L. keniana* is similar to *donaldsoni* in coloration and the obtuse summit, but it is imperforate.

49. L. HABRAWALENSIS Jousseaume.

Shell narrowly perforate, ovate-turrite, thin, glossy, longitudinally and spirally striated, decussate; white or pale yellow, maculated with ferruginous wavy streaks in two zones; apex very obtuse. Whorls 7 to 8, convex, parted by an impressed, irregularly crenate suture, the last whorl obsoletely angular at the aperture. Aperture oval, lip thin, acute, columellar margin narrowly involute. Length 35-47, diam. 19 mm. (*Jouss.*).

N. E. Africa: Somaliland, tribe of Habr-Awal.

L. habrawalensis Jouss., Le Naturaliste, xxi, p. 91 (15 April, 1899).

50. L. KENIANA Smith. Pl. 21, fig. 33.

Shell elongate, ovate, imperforate; blue-whitish, irregularly painted with narrow, reddish-brown, obliquely arcuate or wavy streaks, and covered with a yellow-olivaceous periostracum. Spire elongate, obtuse above. Whorls 6, a little convex, striated with growth-lines and transversely sculptured with spiral striæ, more or less granulated, the last and penult. whorls margined below the suture with an impressed

line, the last whorl slowly descending in front. Aperture inversely ear-shaped, about two-thirds the total length of the shell, blue-whitish inside: peristome thin, the columellar margin lightly thickened, reflexed, straight, nearly perpendicular, obsoletely uniplicate above, brown tinted outwardly. Length 50, diam. 25, aperture 21 x 13 mm. (*Smith*).

British East Africa: Mt. Kenia (S. L. Hinde).

L. keniana E. A. Smith, Journ. of Conch., x, no. 10, April 1, 1903, p. 318, pl. 4, f. 17.

"This species is peculiar on account of the thick obtuse spire, in which respect it bears some resemblance to *L. dohertyi* Smith from Uganda. The slightly oblique lines of growth being crossed by the spiral striæ, have a granose appearance quite visible to the naked eye. The three apical whorls in the single specimen at hand are somewhat eroded and are of a dirty purplish-brown color" (*Smith*).

51. L. DOHERTYI E. A. Smith. Pl. 22, fig. 41.

Shell ovate-pyramidal, obtuse at the apex, solid, imperforate or slightly rimate; dark chestnut painted with irregular white streaks; decussate throughout with oblique growth-lines and spiral striæ. Whorls 7, convex, noticeably increasing, parted by a pale linear suture. Aperture inversely ear-shaped, blue within, about two-fifths the total length; lip thin, arcuate; columella thickened, reflexed, dirty white. Length 59, diam. 28, aperture 23 x 13 mm. (*Smith*).

British East Africa: near the present terminus of the Uganda R. R., between Sept., 1900, and April, 1901, at an elevation of 6500-9000 ft. (Wm. Doherty).

L. dohertyi E. A. S., Journ. of Malacol., viii, p. 95, f. 4 (Dec. 30, 1901).

"This very interesting species is remarkable for its solidity and its pupoid form. The white stripes upon the deep chestnut ground are irregular and somewhat wavy, oblique or zigzag in form. The three apical whorls are smoother than the rest of the shell, whitish or bluish and devoid of striping. One of the three specimens under examination is rimate, the two others being imperforate" (*Smith*). In

shape and sculpture this species is very like *L. donaldsoni*, but it differs in coloration and the larger size.

52. L. FLAMMATA (Cailliaud). Pl. 22, fig. 35.

Shell narrowly perforate, oblong-turrite, longitudinally striatulate, a little glossy; white, irregularly marked with sparse, rufous, nearly straight flames. Spire long, slender, the apex obtuse; suture suberenate. Whorls 8, slightly convex, the last about one-third the total length, tapering at the base. Columella subarcuate, receding. Aperture angulate-oblong; peristome simple, unexpanded, the columellar margin somewhat thickened, reflexed.

Length 55, diam. 19 mm.; apert. 21 mm. long, 9 wide (*Pfr., L. caillaudi*).

Length 64-77, diam. 26-28 mm. (Marts.).

N. E. Africa: Sennaar, in the neighborhood of Mouna (Calliaud); near Ankober (Pollonera); Fashoda, and between there and Jebel Ain (Flower).

Helix (*Cochlogena*) *flammata* CAILLIAUD, Voy. Meroe, Atlas, pl. 60, f. 5 (1823); vol. iv, p. 265.—*Limicolaria flammata* Caill., POLLONERA, Bull. Soc. Mal. Ital., xiii, 1888, p. 73.—*Bulimus cailliaudi* PFR., Zeitschr. f. Mal., 1850, p. 386; Monogr., iii, 1853, p. 386.—*L. cailliaudi* PFR., Monogr., iv, 584; vi, 208.—MARTENS, Beschalte Weichthiere Ost-Af., p. 103.—BGT., Voy. Choa, p. 20.—FLOWER, P. Z. S., 1900, p. 970.—*Bulimus sennaariensis* Parreyss, PFR., Monogr., ii, p. 180 (name only).—*Limicolaria sennaariensis* Parr., SHUTTL., Notitiæ, i, p. 48, pl. 7, f. 6, 7 (1856).—PFR., Monogr., iv, 584.—KOBELT, C. Cab., p. 51, pl. 17, f. 2; p. 71, pl. 23, f. 3, 4.—POLLONERA, Bull. Soc. Malac. Ital., 1888, p. 73.—*Achatina* (*L.*) *senaarensis* MART., Malak. Bl., xxi, 1873, p. 39; xii, 1865, p. 199 (with var. *hartmanni*).—*Limicolaria senaarica* BOURGUIGNAT, Malac. Abyssin., p. 118.—*L. flammea* Müll., in part, JICKELI, Land- u. Susswasser-Moll. Nordost-Af., p. 157, pl. 6, f. 5.—*Limicolarius babel* Fér., BECK, Index Moll., p. 61, no. 8.

52*a*. Var. STUHLMANNI Martens. Pl. 22, fig. 40.

Somewhat shorter, more cylindric, and more swollen to-

wards the apex, less gradually acuminate. Length 50-56, diam. 18-21 mm.; apert. 17-19 mm. long, 11-12 wide. The stripes rather wide and angular, often not quite reaching the suture, or divided into several small ones there (*Marts.*).

Matangisi, in Ugogo (Stuhlmann).

L. caillaudi var. *stuhlmanni* MARTS., Sitz.-Ber. d. Ges. Nat. Freunde zu Berlin, 1891, p. 15; Beschalte Weichthiere Ost-Afrikas, p. 104, pl. 4, f. 1.

Hildebrandt brought a form which may be referable to this variety from Ukamba, on the other side of the Dunga Mts. It is somewhat wider and rather regularly tapering above, 56 x 32 mm., apert. 21 mm. This was noted under the name *flammea* in Sitz.-Ber. d. Berlin Akad., 1878, p. 291.

52*b*. Var. SMITHI Pils., n. v. Pl. 22, figs. 37, 38.

Imperforate, long and rather cylindric, with 8½ whorls; yellow, copiously streaked, the stripes partly straight, partly zigzag. Surface smoothish, some of the upper intermediate whorls weakly decussate above; suture a little crenate. Length 63, diam. 20, length of apert. 21 mm.

Omo river (A. Donaldson Smith, Dec. 20, 1899).

52*c*. Var. SPEKIANA Grandidier. Pl. 22, fig. 36.

Long and slender, the spire swollen above as in var. *stuhlmanni*, and much more than in var. *smithi*.

Near Lake Tanganyika (Thompson).

Achatina (*Limicolaria*) *caillaudi* E. A. SMITH, P. Z. S., 1881, p. 284, pl. 33, f. 13.—*L. spekiana* GRANDIDIER, Bull. Soc. Malac. France, ii, 1885, 160.—*L. c. spekeana* MARTS., Beschalte Weichthiere Ost-Afrikas, p. 104.

52*d*. Var. GRACILIS Martens. Pl. 22, figs. 42, 43.

Small and slender, 50 mm. long, 16 wide, whitish-yellow with numerous dark streaks, only in places angular or interrupted.

Gazelle river region (Schweinfurth).

A. (*L.*) *scnnaariensis* var. *gracilis* MARTS., Malak. Bl., xvii, 1870, p. 34.—PFR., Novit. Conch., p. 6, pl. 110, f. 4, 5, copied

by KOBELT, C. Cab., pl. 17, f. 4, 5.—*L. heuglini* var. *gracilis* Marts., JICKELI, l. c., p. 164.—*L. c.* var. *gracilis* MARTS., Beschalte Weichthiere Ost-Af., p. 104.

52*c*. Var. HARTMANNI Martens. Pl. 21, fig. 34.

A slender form from Senaar, between Hedchat and Gerebin, to which Martens refers Férussac's pl. 141, fig. 3.

53. L. LONGA Pilsbry, n. sp. Pl. 32, figs. 18, 19.

Shell imperforate, very long and slender; white with broad, oblique red-chestnut stripes, which do not split above. Surface slightly roughened by some low, irregular growth-wrinkles, but without spiral striæ. Whorls 9½, moderately convex, the last tapering downwards. Aperture rather narrowly ovate; columella oblique, the columellar margin widely reflexed and adnate above, tapering rapidly downwards; basal margin deeply arcuate. Length 74, diam. 20, length of aperture 23 mm.

British East Africa: near Magois (A. Donaldson Smith).

"*L. colorata* var. *fuscescens*" Marts. is a more roughly sculptured shell with thicker spire. The species *megalæa* and *coulboisi* of Bgt. seem to be allied. The type specimen has lost its cuticle and most of the color, the stripes scarcely showing except on the back of the last and penultimate whorls. It may be an elongate form of a species usually of more normal proportions.

54. L. MEGALÆA Bourguignat. Pl. 33, fig. 26.

Shell covered-rimate, very much lengthened, subcylindric, rather opaque, somewhat thick, obsoletely striatulate, crispate around the suture; uniform buffish-white with sparse, irregular chestnut flammules. Spire very much produced, cylindraceous, slowly tapering, obtuse at the summit. Whorls 9, convex, slowly increasing, parted by a deep suture, the last whorl convex, slightly over one-fourth the total alt. Aperture oblique, ovate; peristome unexpanded, acute. Columella moderate, reflexed, shortly curved; outer margin a little arched forward; parietal callous transparent, scarcely visible. Length 60, diam. 17, aperture 17 x 8.5 mm. (*Bgt.*).

Knicomba plain, on the southwest shore of Tanganyika.

L. megalœa Bgt., Moll. de l'Afric. Equat., pp. 102, 105, pl. 6, f. 4 (1889).

This remarkably lengthened species is narrower and more regularly tapering than *L. spekeana* Grandid.

55. L. COULBOISI Bourguignat. Pl. 33, fig. 23.

Shell subrimate (the rima almost wholly closed), slender, very much lengthened, somewhat cylindric, attenuate at the obtuse summit, rather opaque and thick, glossy, striatulate; whitish with continuous or interrupted chestnut flames. Spire much produced, slender, tapering, much attenuated at the summit, but nevertheless obtuse at the apex. Whorls 9, a little convex, the first slowly, then rather rapidly increasing, parted by an impressed suture; last whorl convex, elongate, less than one-third the total length. Aperture oblique, oblong. Peristome unexpanded, acute. Columella reflexed, slightly curved; the outer margin a little arched forward; parietal callous diaphanous, though rather thick. Length 61, diam. 15.5, aperture 19 x 7 mm. (*Bgt.*).

Kerasa, Usagara.

L. coulboisi Bgt., Moll. de l'Afric. Equat., p. 106, pl. 6, f. 1 (1889).

More slender than *L. megalœa,* the only closely related species.

56. L. DROMAUXI Bourguignat. Pl. 33, fig. 25.

Shell with a puncture-like rimation,very much lengthened, tapering-cylindric, rather thick, somewhat opaque, glossy, uniform pale whitish-buff, smooth and polished, obsoletely sublamellose below. Spire greatly produced, regularly acuminate, though slightly obtuse at the summit. Whorls 10, convex, regularly and slowly increasing, parted by a deep suture, the last whorl convex, slightly exceeding one-fourth the total length. Aperture oblique, rather lunate, rounded-ovate; peristome unexpanded, acute; columella reflexed, nearly straight; the outer margin receding, arched forward a little; parietal callous rather thick. Length 44, diam. 14, aperture 13 x 7 mm.

Near the mission of Kibanga, Tanganyika.

L. dromauxi Bgt., Moll. de l'Afric. Equat., pp. 103, 107, pl. 6, f. 3 (1889).

Belongs to the group of *L. spekiana, megalæa* and *coulboisi*, but smaller than these, of a uniform tint, without flammules, and smoother, though the lower whorls have obsolete lamellæ.

57. L. saturata E. A. Smith. Pl. 32, fig. 13.

Shell long, imperforate; deep brown, painted with more or less wavy, oblique stripes. Spire elongate, somewhat mamillate and paler at the apex. Whorls 8, convex, parted by an oblique suture; granulate-cancellate by delicate oblique growth-lines and light spiral striæ. Aperture reversed auriform, dull blue-whitish inside, nearly one-third the total length; columella nearly straight, reflexed, slightly thickened, the outer lip arcuate and thin. Length 67, diam. 25 mm.; apert. 23 long, 12 wide (*Smith*).

East Africa: Albert Edward Nyanza at 3000-4000 ft. (G. F. Scott-Elliot); Kilima-Njaro, in the cultivated land, 1200-1700 meters elev., very common (Volkens).

L. saturata Smith, Proc. Malac. Soc. Lond., i, p. 323, f. 1; p. 324 (1895).—*L. colorata* E. Sm., Martens, Beschalte Weichthiere Ost-Afrikas, p. 105.

"This species is remarkable for the depth of its coloration and the length of the whorls. The lines of growth are slightly puckered beneath the suture, but the granulation of the surface generally is very feeble. Only a single specimen was obtained. The remains of the animal enclosed about 20 ovate, strong, white, calcareous eggs about 6.5 x 5 mm. The remains of a very thin olivaceous epidermis are traceable on the last and penultimate whorls" (*Smith*).

57*a*. Var. fuscescens Martens. Pl. 32, figs. 22, 23.

Cylindric-turrite, rather wide, thick-shelled and lustreless, with closely placed vertical rib-striæ which are granulose on the upper whorls; obscure brownish-yellow, with numerous narrow red-brown streaks, which often become wider above,

and frequently show forwardly-directed points in the middle of the whorls. Spire rather swollen, blunt above. Whorls 8-9, each weakly convex, shortly plicate at the sutures, the last moderately convex, rounded, somewhat sack-like below. Aperture including about three-eighths the length. Columellar margin comparatively short, somewhat arcuate, pale roseate. Interior whitish. Length 50-56, diam. 21-24, apert. 19-21 mm. (*Marts.*).

West coast of the Victoria Nyanza, at Bukoba; Kafaro, in Karagwe, about 1,350 meters high, on the ground in grass; Migere and Iwinsa, in Butumbi, on the southern shore of the Albert Edward Nyanza (Stuhlmann).

L. colorata E. Sm., var. *fuscescens* MARTS., Beschalte Weichthiere Ost-Af., p. 105, pl. 4, f. 2, 6.

Distinguished from *caillaudi* by the strong sculpture, more swollen shape and sombre coloring, with numerous narrow and often some wider stripes.

57*b*. Var. CHROMATICA n. n. Pl. 32, figs. 14, 15.

With broad, irregular, somewhat zigzag black-brown streaks, which mostly fall short of reaching the suture above, and in the middle of the last whorl coalesce to form a spiral band. Length 60, diam. 25.5; apert. 24 mm. long, 13 wide (*Marts.*).

Runssoro, at the western foot, at about 1,200 meters; grassy steppes south of Albert Edward Nyanza, at Mutambuka, in Vitshumbi (Stuhlmann).

L. colorata var. *saturata* E. Sm., Marts., t. c., p. 105, pl. 4, f. 8, 12, 14.

57*c*. Var. INFRAFUSCA Martens. Pl. 32, fig. 21.

With wider dark chestnut-brown streaks, which mostly do not reach the suture above, and which are confluent on the median and lower parts of the last and penult. whorls, the lower part of an even dark brown. Length 61, diam. 25, apert. 24 x 14 mm. (*Marts.*).

Kawirondo, east side of Victoria Nyanza (Neumann).

L. colorata var. *infrafusca* MARTS., t. c., p. 106, pl. 4, f. 10.

58. L. ROHLFSI 'Martens' Kobelt. Pl. 31, figs. 5, 6, 7.

In form and seulpture like *L. dimidiata,* but the vertical striæ are weaker, and it is wholly without spiral lines on the lower whorls. Coloration peculiar: yellow-brown, with a row of dark brown spots close under the suture, and a full dark brown band around the umbilical chink, the space between being uniform, without streaks. Upper whorls frequently reddish (*Marts.*).

Length 65, diam. 25, apert. 25 x 16 mm.

Length 60, diam. 26, apert. 25 x 15 mm.

Mhugu, northeast side of Victoria Nyanza (Neumann); grassy steppe in Vitshumbi, on the southwest end of Albert Edward Nyanza (Stuhlmann). Ngadda river, northwest of the junction of the Benue and Niger (G. Rohlfs).

L. rohlfsi Martens, KOBELT, Conchyl. Cab., p. 72, pl. 23, f. 5, 6.—MARTENS, Beschalte Weichthiere Ost-Af., p. 107, pl. 5, f. 36.

Figures 5, 6 are copies of Kobelt's type figures.

59. L. DIMIDIATA v. Martens. Pl. 31, figs. 10, 11.

Shell rather elongate, distinctly striatulate, lightly decussate; yellowish, with oblique, somewhat undulating reddish-brown stripes, visible on the lower half of each whorl, incipient on the fifth whorl. Whorls 8. Length 49.5, diam. 20, length of aperture 19 mm. (*v. Mart.*).

East Africa: Kilima-Njaro (Hans Meyer); Kenia, at Njenips-Indogo, near Lake Baringo (Dr. Gregory).

L. flammea var. *dimidiata* v. MART., Sitzungsberichte d. Gesellsch. naturf. Freunde zu Berlin, 1890, p. 132; Conchol. Mittheil., iii, p. 9, pl. 43, f. 6, 7 (1894).—SMITH, Proc. Malac. Soc. Lond., i, p. 165.—*L. dimidiata* MARTENS, Beschalte Weichthiere Ost-Afrikas, p. 106.

Seems sufficiently distinct from *L. flammea,* with which it was formerly united. Some 14 specimens of similar size and markings are known.

59*a*. Var. *volkensi* Martens.

Volkens found several specimens of a rather intense straw-

yellow color, with no stripes, among typical *dimidiata* collected on the cultivated area of Kilima-Njaro, 1000-1700 meters elev., in jungle. One of them is long drawn out, more cylindric.

60. L. MEDIOMACULATA Martens. Pl. 32, f. 16, 17.

Long-fusiform, weakly striate, the spiral striæ very weak on the penult., obsolete on the last whorl; pale brown, with numerous narrow, rather pale streaks, some of them somewhat wider and darker; *in the middle of each whorl there are contiguous subquadrate black-brown spots.* The spire rather attenuate above; there are 7-8, hardly convex whorls, with shallow suture, the last whorl rather narrow, gradually tapering below. Aperture approaching lancet-shape. Columellar margin short, somewhat twisted, rather broadly reflexed above, reddish-violet. Interior bluish, the streaks and spots showing through (*Marts.*).

Length 45, diam. 18, apert. 19 x 11 mm.

Length 39, diam. 16, apert. 16 x 10 mm.

Kawirondo country, on the northeast side of Victoria Nyanza (Neumann).

L. mediomaculata MARTS., Nachrichtsbl. d. Mal. Ges., 1895, p. 182; Beschalte, etc., p. 107, pl. 4, f. 3, 5, 7.

Related to *fuscescens* and *dimidiata*.

61. L. MARTENSIANA (E. A. Smith). Pl. 34, figs. 33-40.

"Shell rimate, rather solid, oblong, turrited, reddish towards the apex, elsewhere dark purple-red or almost black, variegated with oblique, more or less zigzag, opaque cream-colored stripes, some of which extend from suture to suture, others only a short distance from the top of the whorls. The latter are 7½ in number, scarcely convex or almost flat, and very feebly constricted beneath the suture. The upper ones are finely granosely decussated, the last and the penultimate being smooth and merely marked with the oblique incremental striæ. All exhibit a fine plication or puckering beneath the suture, beneath which an impressed line is sometimes observable upon the last and preceding volutions.

Aperture bluish within, displaying more or less of the external striping, vertical, equalling about two-fifths of the shell's length. Columella suberect, bluish and dark violet, scarcely forming any angulation at the base with the lower margin of the peritreme. Length 36, diam. 17 mm.; aperture 14½ long, 8 wide" (*Smith*).

Region of Lake Tanganyika, especially eastward; Victoria Nyanza, and northward to Lake Rudolf.

Achatina (*Limicolaria*) *martensiana* Sm., P. Z. S., 1880, p. 345, pl. 31, f. 1, 1*a*; 1893, p. 634 (Sumbu, Itawa, southwest of Tanganyika).—*L. martensiana* Sm., Crosse, J. de Conch., 1881, p. 297.—Grandidier, Bull. Soc. Mal. Fr., ii, 1885, p. 162.—Bourg., Moll. de l'Afr. équat., p. 104.—Martens, Beschalte Weichthiere Ost-Af., p. 108, pl. 1, f. 10.—Pelseneer, Bull. Mus. Roy. d'Hist. Nat. de Belgique, iv, 1886, p. 104 (epiphragm).—Sturany in Baumann, Durch Massai-Land zur Nilquelle, p. 15.—Sowerby, Shells of Tanganyika, f. 18.—*L. giraudi* Bgt., Moll. de l'Afr. équat., p. 104, pl. 6, f. 7, 8.

An abundant form in the Tanganyika region. Figures 33, 34 are copies of Smith's, 33 being the type figure, fig. 34 referable to var. *multifida*. Fig. 43 is the type figure of *L. giraudi* Bgt., which seems to be a synonym, representing a younger shell. Figures 36-40 represent specimens of a series taken by Dr. A. Donaldson Smith at Lake Rudolf. They are somewhat more slender than Smith's types, with shorter aperture, but agree well in other respects; one measures 36 x 15 mm., apert. 13 mm. long.

61*a*. Var. pallidistriga Martens. Pl. 34, fig. 46.

Agreeing with typical *martensiana* in sculpture, general shape, etc., but the streaks are pale brownish, even in specimens apparently collected alive. From a grass steppe south of Albert Edward Nyanza, at Mutambuka (Stuhlmann), and from the shore of the Victoria Nyanza (G. A. Fischer).

L. m. pallidistriga Marts., Beschalte Weich., etc., p. 109, pl. 5, f. 1.

61*b*. Var. MULTIFIDA Martens. Pl. 34, figs. 34, 35.

On the penult. and last whorls the broad dark stripes break up at the same height into 5 or 6 narrower and lighter ones, partly dislocated. Length 37.5-41.5, diam. 16.5-17, apert. 17 x 10 mm. This form comes from south of Manyora Lake (Neumann), around Victoria Nyanza and Tanganyika lakes, etc.

L. m. var. *multifida* MARTENS, Nbl. d. mal. Ges., 1895, p. 182; Beschalte Weichthiere, p. 109, pl. 1, f. 13.

Smith's fig. 1*a* of *L. martensiana* (copied in my fig. 34) is referable to this form. Similarly marked individuals occur in the Lake Rudolf series before me, so the variety is hardly racial, merely a color-phase.

61*c*. Var. ELONGATA Martens. Pl. 34, figs. 47, 48.

Long-fusiform, glossy, lightly striatulate, yellowish-white, with rather wide chestnut streaks, sometimes split and narrower above. Whorls 8½, a little convex, regularly increasing, the last narrow; suture marginate, lightly crenulate, white. Aperture nearly vertical, long-ovate; peristome unexpanded, brown-edged within, the columellar margin distinctly twisted, pale livid fleshy. Length 49, diam. 16, length of apert. 18, width 9.5 mm. (*Marts.*).

Nyangwe, on the Lualaba or upper Congo (Wissmann).

L. m. var. *elongata* MARTS., Sitzungsber. Ges. naturforsch. Freunde, 1883, p. 72; Conch. Mittheil., p. 189, pl. 34, f. 1, 2.

A similar, but shorter form in the collection of the Academy occurs at Kala, on Lake Tanganyika (pl. 34, figs. 41, 42).

61*d*. Var. EXIMIA Martens. Pl. 34, figs. 44, 45.

Ovate-elongate, strongly striate, finely decussate on the upper whorls; pale straw-yellow with wide dark brown stripes, generally angular and frequently very oblique; in the upper third of the whorls they are numerous, paler and narrow. Spire rather full and wide, of 8½ regularly widening whorls, only weakly convex, the last more convex, gradually tapering downwards. Columellar margin very little arcuate, outwardly violet, inwardly bluish-white. Length 59, diam. 25, apert. 25 x 16 mm. (*Marts.*).

Kawironda, northeast side of Victoria Nyanza (Neumann); Ukamba, British East Africa (Hildebrandt).

L. m. var. *eximia* MARTS., Nachrbl. d. mal. Ges., 1895, p. 183; Beschalte Weichthiere, p. 110, pl. 5, f. 34, 34*a*.

An egg is figured, f. 44.

62. L. TULIPA Jousseaume. Pl. 22, fig. 45.

Shell very narrowly, nearly covered perforate, ovate-oblong, glossy, thin, pellucid, lightly striate; whitish, closely ornamented with wide, wavy, black-purple streaks and short rufous ones below the suture; spire long-conic, the apex reddish, obtuse; suture impressed, margined; whorls 8, a little convex, the last two-thirds the total length; columella pale purplish, nearly straight; aperture semi-oval, peristome thin, the outer margin narrowly expanded. Length 43, diam. 16, aperture 16 x 9 mm. (*Jouss.*).

Congo river (Louis Petit).

L. tulipa JOUSS., Le Naturaliste, ix, 1887, p. 6, f. 2.

Has the coloration of *L. martensiana multifida*, but is of narrower form.

63. L. RECTISTRIGATA (E. A. Smith). Pl. 33, figs. 27, 28, 31.

"Shell oblong, cylindrically conical, narrowly perforate, whitish or a pale rosy tint, varied with oblique brown stripes, which at times become broader or blotchy at the lower part of the whorls. The latter are 8 in number, rather convex and slowly enlarging, obliquely striated by the lines of growth, divided by a simple subhorizontal suture. Last volution oblong, a little attenuated at the lower part. Aperture inversely subauriform, whitish or pale rose within, equalling rather more than one-third of the entire length of the shell. Peristome (viewed laterally) oblique, a little tortuous, thin at the edge, and inconspicuously thickened within. Columella spirally contorted, bluish, and reflexed over the perforation at the upper part, brownish inferiorly, and gradually curving into the basal margin of the aperture. Paries coated with a thin callosity. Length 44 mm., diam. 17; aperture 16 long, 8 wide" (*Smith*).

Region of Lake Tanganyika: Ujiji (Hore, type loc.); northern end of the lake (O. Baumann).

Achatina (Limicolaria) rectistrigata E. A. Sm., Proc. Zöol. Soc., 1880, p. 346, pl. 31, f. 2; 1881, p. 284, pl. 33, f. 14*a*.—*L. rectistrigata* Sm., Crosse, J. de Conch., 1881, p. 297.—Sturany in Baumann, Durch Massai-Land zur Nilquelle, p. 16.—Sowerby, Shells of Tanganyika, f. 17.—Martens, Beschalte Weichthiere, p. 111.—Grandidier, Bull. Soc. Mal. Fr., ii, p. 162.—Bgt., Moll. Afr. Équat., p. 103.—Kobelt, Conch. Cab., pp. 58, 74.—*L. bridouxi* Grandidier, l. c.

The chief characteristic of this species is the simple, not zigzag or angulate streaks. It varies from the typical form (figs. 27, 31) to a more slender and elongate shape, which has been named *bridouxi* (fig. 28). The latter approaches *L. martensi* var. *elongata*.

Another form, differing from typical *rectistrigata* in the wider base, deeper suture, etc., has been named *L. burtoniana* by Grandidier (Bull. Soc. Malac. France, ii, p. 160, 1885). See pl. 33, fig. 24.

64. L. connectens Martens. Pl. 31, figs. 8, 9.

Long-conic, strongly striate, and on the upper whorls distinctly granulose; brownish-yellow, reddish towards the apex, with many straight, simple streaks, most of them very narrow, a few broader. Spire rather slender. Whorls 8½, regularly widening and scarcely convex, the last also but slightly convex, rather narrowly rounded downwards. Columellar margin nearly vertical, pale violet. Length 51, diam. 19½, apert. 21 x 10 mm. (*Marts.*).

Mhugu, on the northeast shore of the Victoria Nyanza (Neumann); Karevia, at the western foot of Runssoro, and Bundeko (Stuhlmann).

L. connectens Marts., Nbl., 1895, p. 183; Beschalte Weichthiere, p. 112, pl. 5, f. 5, 6.

Similar to *L. rectistrigata*, but browner in color and with stronger granulation.

65. L. charbonnieri Bourguignat. Pl. 31, figs. 1, 2, 3.

A very much lengthened form, but not straightly tapering

above, with wide dark stripes, which on the last and preceding whorls split into numerous fine branches above, similar to *L. martensiana* var. *multifida*, but in a more marked degree and for a greater distance. According to Bourguignat, there is a further character in the peculiar situation of the outer lip (fig. 2). In the shell collected by Stuhlmann (fig. 3) the lip is so defective that it does not show whether there was such a curvature; or perhaps that would only develop with further growth (*Marts.*).

Length 67, diam. 21, apert. 26 x 10 mm. (*Bgt.*).

Length 47.5, diam. 18, apert. 17 x 9.5 mm. (*Marts.*).

Kibanga, in the southern part of the Ubuari peninsula, Tanganyika; Itura and Bizauda, in Ukimbo, on the caravan road (Bgt.). Kiruwe, on the southwest shore of Albert Edward Nyanza (Stuhlmann).

L. charbonnieri Bgt., Moll. de l'Afr. équat., 1889, pp. 102, 104, pl. 6, f. 7, 8.—Marts., Beschalte Weichthiere, p. 112, pl. 5, f. 2.—*L. sepulchralis* Bgt., t. c., pp. 103, 108, pl. 6, f. 2.

Figs. 1, 2 are from Bgt.; fig. 3 from von Martens.

65*a*. Var. SEPULCHRALIS Bgt. Pl. 31, fig. 4.

Somewhat smaller (length 46, diam. 17, apert. 20 mm.), and the stripes only split sparingly above. Margarazi valley, between Tabora and Ujiji.

66. L. ACUMINATA Martens. Pl. 31, fig. 12.

Long-conic, rather strongly striate, very finely granulose, and plicate at the suture, rather glossy, straw-yellow with red-brown stripes, which become broadly angular in the middle, towards the suture narrow and more numerous. *Spire strongly tapering above*, the apex obtuse. Seven (?) nearly level, regularly widening whorls, the last (?) obtusely angular, the stripes very oblique on its lower side, and more or less united into a uniform brown color. Aperture ovate; columellar margin vertical, rather broadly reflexed, reddish-violet. Length 30, diam. 15, aperture 14 x 8.5 mm. (*Marts.*).

Gallery forest on the Boa river, northwest of Lendu, west from L. Albert Nyanza (Stuhlmann).

L. acuminata MARTS., Nbl., 1895, p. 183; Beschalte Weichthiere, p. 113, pl. 5, f. 4.

The markings resemble *L. martensiana multifida,* but the upper whorls are almost flat in profile, making the upper part of the shell more slender, more regularly conic than in any related species. The type is probably young.

67. L. VENTRICOSA Smith. Pl. 32, fig. 20.

Shell pyramidal, obtuse at the apex, imperforate; pale flesh-colored, with black or deep brown stripes, more or less wavy; sculptured with delicate growth-lines and a few spiral striæ. Spire very obtuse at the apex. Whorls 7, very convex, slightly impressed and concave below the oblique sutures in the last two whorls; last whorl short, subglobose. Aperture reversed ear-shaped, wide, dark inside, about three-sevenths the total length; peristome thin, the right margin arcuate, columellar margin a little straightened, reflexed, purple. Length 44, diam. 22, apert. 18 x 11.5 mm. (*Sm.*).

Albert Edward Nyanza, 3000-4000 ft.

L. ventricosa E. A. S., Proc. Malac. Soc. Lond., i, pp. 323, 324, f. 2.

"Remarkable for the convexity of the whorls, the obtuse apex, and color. The stripes on the upper whorls are rich brown, but upon the body whorl they become almost black. They are wavy and narrow on the upper half of the whorls, but widen out into broad blotches on the lower part" (*Smith*).

68. L. TURRIFORMIS Martens. Pl. 33, fig. 30.

Turrite, rather thin, closely and somewhat granulose-striate, with sparse, indistinct impressed spiral lines; pale straw-yellow, with pale reddish vertical or weakly zigzag streaks. Apex rather obtuse. Whorls 10, slightly convex, somewhat plicate at the suture, the last whorl gradually tapering below. Aperture obliquely trapezoidal, long, two-fifths the length of the shell. Outer lip thin; columellar margin short, vertical or slightly oblique, very thin below, running out in an angle, pale violet; interior pale bluish.

Length 93, diam. 41; length of apert. 39, width 22 mm.

Length 89, diam. 35, length of apert. 37, width 20 mm.

Northeast and north of the Victoria Nyanza, North Kawirondo and Ussoga, especially at Lubwas, near where the Nile flows out (O. Neumann, 1894).

L. turriformis Marts., Nachrbl. d. mal. Ges., 1895, p. 181; Beschalte Weichthiere Ost-Afrikas, p. 102, pl. 4, f. 11.

Similar at first glance to *L. turris* Pfr., from the Gazelle river region, but more slender, with shorter mouth and much weaker spiral sculpture, the vertical raised striæ only somewhat uneven, not really granulose, the plication below the suture stronger (*Marts.*).

68*a*. Var. neumanni Martens. Pl. 33, fig. 32.

More slender, pale straw-yellow, unicolored or with separated brownish growth-arrest marks, the lower half of the last whorl more glossy, the columellar margin more or less strongly bent to the left below. Length 89, diam. 34.5; length of mouth 37, breadth 18 mm. (*Marts.*).

Ntebbi, in Uganda (O. Neumann, 1894).

68*b*. Var. solida Martens. Pl. 33, fig. 29.

Smaller, fusiform-turrite, thick-shelled, somewhat more distinctly granulose, uniform pale yellow, the columellar margin pretty vertical. No streaks whatever. Length 61-66, diam. 25-29.5 mm.; aperture 27-28.5 long, 15-18 wide (*Marts.*).

Southwestern shore of Victoria Nyanza (Emin Pasha, 1877); Ntebbi, in Uganda (Neumann).

69. L. lamellosa Bourguignat. Pl. 24, fig. 1.

Shell covered-rimate, rather small, lengthened-oblong, rather thick and opaque, somewhat glossy; uniformly buff-straw colored; elegantly lamellose, the lamellæ regular, obsolete, rather distant, evanescent on the latter part of the last whorl, the upper whorls smooth. Spire produced, oblong-tapering, a little obtuse at the summit; whorls 8, a little convex, separated by a somewhat impressed suture, the last whorl convex, slightly more than half the total length. Aperture suboblique, ovate, pearly white inside, the peristome

unexpanded, acute; columella reflexed; outer margin slightly arched forward; no parietal callous. Length 32, diam. 11½, aperture 11¼ x 6 mm. (*Bgt.*).

Ubuari (Oubouari or Ubwari) peninsula, on the west side of Lake Tanganyika.

L. lamellosa Bgt., Moll. de l'Afric. équat., pp. 104, 108, pl. 6, f. 2 (1885).

This little Limicolaria is very remarkable by its coloration of a very pale yellow and by the shell elegantly grooved by regular lamellæ, equidistant, and very strongly pronounced. Possibly it may belong to the Buliminoid series.

70. L. sculpturata Ancey.

Shell ovate-fusiform, thin, perforate, greenish-corneous, obliquely sculptured with fine and close striæ. Spire oval-attenuate, rather obtuse, the apex smooth. Whorls 7, a little convex, parted by an impressed suture, regularly increasing, the last oval, tapering at the base, the striæ gradually disappearing below the middle. Aperture oblong, a little lunate, angular above, attenuate posteriorly, slightly oblique; peristome acute, thin, the outer margin elliptical, basal margin short, forming an obtuse angle with the straight columellar margin, which is widely expanded, covering the umbilicus above, tapering below. Length 18, diam. 7.5; aperture 7.5 mm. long.

Mozambique (Ancey).

L. sculpturata Anc., Bull. Soc. Malac. Fr., vii, p. 346 (1890).

According to Ancey, this pretty unicolored species may be compared to *L. lamellosa*, but its general appearance is fusiform and the sculpture different. It was found in sacks of grain from the northern part of Mozambique.

71. L. hidalgoi Crosse. Pl. 30, fig. 16.

Shell nearly-covered umbilicate, globose-turrite, ventricose, thin, striatulate, very obsoletely decussate, somewhat shining, diaphanous, pale olivaceous-buff, uniform. Spire moderately long, the apex obtuse; suture simple, irregular, slightly sub-

crenulate. Whorls 8½, convex, the first two smooth, whitish, the last longer than the spire; columella straightened, vertical, reaching to the base. Aperture oblong-semioval, whitish inside; peristome simple, white, the columellar margin rather narrowly expanded, reflexed, partly covering the umbilicus, basal and outer margins acute. Length 46, diam. 28, aperture 28 x 13 mm. (*Crosse*).

L. hidalgoi Crosse, Journ. de Conch., xv, 1867, p. 446; 1868, p. 170, pl. 6, f. 1.—Pfr., Monogr., vi, 208.—Kobelt, C. Cab., p. 79.

A unicolored species of unknown origin.

72. L. pyrrha (Albers). Pl. 27, figs. 3, 4.

Shell subperforate, turrite-oblong, granulate-decussate throughout; dirty fulvous, ornamented with straight rufous streaks, especially on the upper whorls. Spire long, obtuse. Whorls 8, a little convex, the last nearly three-sevenths the total length, subcompressed around the perforation. Columella vertical, descending to the base of the aperture. Aperture slightly oblique, oblong-oval, white inside with a pearly luster. Peristome simple, acute, the columellar margin broadly reflexed. Length 50, diam. 22 mm.; aperture 22 mm. long, 11 wide (*Pfr.*).

Bulimus pyrrhus Albers, Die Hel., 1850, p. 173.—Pfr., Monogr., iii, p. 385; Conchyl. Cab., p. 156, pl. 48, f. 19, 20. —*L. pyrrha* Shuttlw., Notitiæ, p. 46.—Pfr., Monogr., iv, 584; vi, 208.—Kobelt, C. Cab., p. 56.

Habitat unknown. Pfeiffer's figures and description of the type are given.

Genus BURTOA Bourguignat, 1889.

Burtoa Bourguignat, Mollusques de l'Afrique Equatoriale, p. 88 (March, 1889), type *B. nilotica* var. *schweinfurthi*.—*Burtopsis* Bgt., *l. c.*, p. 98, for *B. giraudi* and *B. jouberti*.—*Livinhacia* Crosse, Journal de Conchyl., xxxvii, pp. 107, 108 (April, 1889), type *L. nilotica* Pfr.

Shell perforate, oblong-ovate, usually fleshy under a thin yellowish or brown cuticle, with occasional dark brown

streaks along growth-lines, chiefly on the last whorl. Plicatulate, cut by spiral lines, generally smoother below the periphery. Whorls 6½-8 (the early ones smooth when unworn?). Peristome more or less roseate, unexpanded except the columellar lip, which is rolled back or reflexed. Columella somewhat concave above, and obliquely subtruncate at the base in immature individuals, often not noticeably so in adults. Type, *Burtoa nilotica*.

Distribution, tropical East Africa, from the headwaters of the Nile to Matebele Land, especially in the Lake region.

Burtoa was established before *Livinhacia* for the forms of the *Limicolaria nilotica* group known to Bourguignat, and with a diagnosis applying exclusively to these forms, one of which is expressly designated as the type of the genus (see last paragraph on p. 90 of Bourguignat's *Mollusques de l'Afrique Equatoriale*). *Bulimus kraussi* Pfr. was also comprised in the list of species, but it is excluded by the terms of the description. The name *Livinhacia* of Crosse has been used for *Burtoa* by most authors, but it is of later date and proposed for the same species, *L. nilotica* having been named as its type.

The species of *Burtoa* resemble the large South American Bulimi of the *Borus* group in stature and coloring. They seem to abound around Lake Victoria Nyanza, in a vast variety of local forms and races. The rank of these is at present wholly uncertain, and no existing data show whether all the forms of the Lake region are referable to *nilotica* as subspecies, or whether a number of species occur in this area. Probably one view is as good as another.

The soft anatomy of this group is unknown. It differs from *Achatina* by the perforate axis and obsolescence of the columellar truncation in adult shells. The young are more or less distinctly truncate basally. *No form of* Burtoa *shows any trace of zigzag or oblique color-stripes*, so prevalent in *Achatina*, *Limicolaria*, etc. In place of them, there are deep chestnut-colored streaks along the growth-lines. It is not without significance that no species or specimens of *Burtoa* have been found with the characteristic decoration of *Acha-*

tina and *Limicolaria*. This apparently variable color-pattern is deep-rooted in the organization of the *Achatininæ*.

Burtoa has no direct relationship with *Metachatina*, and is evidently nearer to *Achatina* than to *Limicolaria*. Its resemblance to *Limicolaria* in the entire columella is due to convergence, the younger stages of the two groups being more unlike in this respect than the adults.

1. B. NILOTICA (Pfeiffer). Pl. 27, fig. 5.

Shell subperforate, inflated-ovate, solid, brownish, irregularly streaked with dark chestnut; spire short, conic, the apex rather acute. Whorls 6, convex, the upper smooth, following minutely decussate, the last nearly two-thirds the total length, inflated, subplicate, and latticed with rather widely-spaced spiral lines. Aperture slightly oblique, oval, pearly within; peristome roseate, the margins joined by a thick callous, right margin somewhat thickened, striate, somewhat spreading above, columellar margin thick, substriate, forming below an indistinct angle with the basal lip. Length 118, diam. 61 mm., apert. 67 mm. long (*Pfr.*).

Northeast Africa: Sources of the White Nile (Petherick).

Bulimus niloticus PFR., P. Z. S., 1861, p. 24; Malak. Bl., 1861, p. 14; Monogr. Hel. Viv., vi, p. 86.—*Achatina* (*Limicolaria*) *nilotica* MART., Mal. Bl., xii, 1865, p. 196; xiii, 1866, p. 94.—*L. nilotica* PFR., Novit. Conch., iv, p. 5, pl. 110, f. 2.—MARTS., Beschalte Weichthiere Ost-Afrikas, p. 94.—*Livinhacia nilotica* CROSSE, J. de C., 1889, p. 109.—SMITH, P. Z. S., 1893, p. 634 (Angoni Land, southwest of Lake Nyasa).

This species has much superficial resemblance to *Strophochcilus ovatus* and its allies. The typical *nilotica* is the most northern member of a group numerous in local races, and is distinguished by the comparatively elongate shape and small mouth.

Var. SCHWEINFURTHI Martens. Pl. 27, fig. 6.

Shell thin, the aperture comparatively large, nearly two-thirds the length of the shell; outer lip thin, only moderately arcuate; columellar margin nearly vertical.

Region of the Rek and Djur, tributaries of the Bahr-el-Gasal, in the woods (G. Schweinfurth, March, 1869).

Achatina nilotica Pfr., v. MARTENS, Malak. Bl., 1870, p. 32. —*Limicolaria n.*, PFR., Novit. Conch., iv, p. 5, in part, pl. 110, f. 1, 3.—*Burtoa nilotica* BGT., Moll. Afr. Equat., p. 80.—*Burtoa pethericki* BGT., Moll. Afr. Equat., p. 95.—*Limicolaria nilotica* var. *schweinfurthi* MARTS., Beschalte Weichthiere, p. 95 (1898).

There can be no reasonable doubt that the figure named *Burtoa pethericki* by Bourguignat represents merely the young of the form called *schweinfurthi*. It is copied on pl. 35, fig. 20. Both specimens are in the Berlin Museum, and were collected by Schweinfurth, not by Petherick, who collected the original *nilotica*. The name *B. pethericki* has priority for this variety, if a name based upon a figure of the young stage should be allowed to stand, which I doubt.

Var. *schweinfurthi* is the form which Bourguignat considered to be the typical *nilotica*, and the type of the genus *Burtoa*.

Var. REYMONDI (Bourguignat).

"This Burtoa, which has been found frequently in the region between the lakes Tanganyika and Nyassa, and Banguelo, differs from *kraussi* Pfr. (the only species having any resemblance to it in appearance and shape) by its smaller size, coloration, shorter, more obtuse spire, more ample last whorl, the wholly covered perforation, straightly descending columella without a projection at its base," etc.

Bulimus reymondi BGT., Notice prodromique sur les Mollusques terrestres et fluviatiles recueillis par M. Victor Giraud dans la région méridionale du lac Tanganyika, p. 13 (1885).—*Burtoa reymondi* BGT., Moll. Afr. Equat., p. 92, pl. 4, f. 1.

Var. EMINI v. Martens. Pl. 29, fig. 7.

Shell thin, ovate, moderately narrowed above, the aperture about four-sevenths the length. Outer lip about equally arcuate above and below. Columellar lip hardly arcuate,

nearly vertical. Length 97, diam. 61.5, length of aperture 56 mm.

Bukoba, on the western bank of the Victoria Nyanza; Ipala in Ugogo, abundant.

Limicolaria nilotica var. *emini* Marts., Sitz-Ber. d. Ges. nat. Freunde, 1891, p. 14; Beschalte Weichthiere, p. 94, 96.—? *L. nilotica* Dohrn, P. Z. S., 1864, p. 116.—*Burtoa nilotica* E. A. Smith, Proc. Malac. Soc. Lond., i, p. 323.

This form stands very close to *reymondi* Bgt., but it tapers less above.

Var. crassa Martens. Pl. 29, fig. 8.

Thick-shelled, globose-ovate, the spire wide and blunt; aperture about three-fifths the total length, thick-margined; outer lip obliquely sloping outward above, strongly arcuate below; columellar margin nearly vertical. Length 86, diam. 60, aperture 52 mm. Length 102, diam. 67, apert. 58 mm. long, 42 wide, including the columellar margin.

Kawirondo, northeastern coast of the Victoria Nyanza (Neumann); Massai steppe, northeast of Ussandane (Langheld).

L. n. var. *crassa* Marts., Nachrbl. d. mal. Ges., 1895, p. 181; Beschalte Weichthiere, p. 97, fig.

Var. oblonga Martens. Pl. 26, fig. 15.

Thick-shelled, produced above, evenly tapering, the mouth very little over half the total length, thick-margined. Outer lip about equally arcuate above and below; columellar margin comparatively short, only a little oblique or almost vertical. Length 96-102, diam. 56-60, aperture 50-53 mm.

Southern shore of the Victoria Nyanza, between Bukense and Ngome (Stuhlmann); Kome Island (Neumann).

L. n. var. *oblonga* Marts., Nachrbl. d. mal. Ges., 1895, p. 181; Beschalte Weichthiere, pp. 96, 97.—? *Achatina* (*Limicolaria*) *nilotica* E. A. Smith, P. Z. S., 1880, p. 345 (Ujiji).

Var. giraudi (Bourguignat). Pl. 35, fig. 22.

The description of this species is not accessible to me. The figure indicates a species of the *nilotica* type.

South of Lake Tanganyika, between Iendue and Pambete (Giraud).

Bulimus giraudi Bgt., Notice Prodromique sur les Mollusques recueillis par M. Victor Giraud dans la région méridionale du lac Tanganyika, p. 12 (1885).—*Burtopsis giraudi* Bgt., Moll. Afr. Equat., p. 98, pl. 5, f. 1 (1889).

Var. obliqua Martens. Pl. 30, fig. 18.

Thick-shelled, the last whorl very ventricose, and strongly, obliquely descending to the aperture, the penultimate whorl therefore conspicuously convex there; the spire rapidly tapering, rather acute at the summit. Aperture about three-fifths the total length. Outer margin pretty thick, very oblique and but slightly arcuate above, the lower part moderately arcuate. Columellar margin oblique. In otherwise similar specimens the umbilical crevice may be either rather open or almost wholly closed. Length 109-114, diam. 72-77, length of aperture 65-69 mm.

Ussagara, between Kidete brook and Ngombo, on the left side of the Mkondogwa river (G. Lieder); Mpwapwa (Gerrard); east side of Tanganyika, between Karema and Kiandu (Reichard), and at Kala.

L. n. var. *obliqua* Marts., Nachrbl., 1895, p. 181; Beschalte Weichthiere, pp. 96, 97.

A form intermediate between *obliqua* and *emini* was taken with var. *emini* in Ugogo by Dr. Stuhlmann.

Var. grandidieri n. n. Pl. 26, fig. 16.

Shell narrowly rimate (the chink almost wholly covered), large, oblong-ovoid, swollen, rather thin, slightly subpellucid, glossy, whitish with sparse and irregular subundulating rufous flammules, well striated, and elegantly decussate with spiral lines, subgranulose-fringed below the suture on the last whorl. Spire shortly oblong-tapering, a little obtuse at the summit. Whorls 7, convex, regularly increasing, separated by an impressed suture, the last whorl large, more than half the alt., oblong-convex, rather swollen, slowly descending to the aperture. Aperture nearly vertical, lunate, oblong, an-

gular above, subeffuse at the base; peristome straight, acute; columella nearly straight, dilated above the axial crevice, acute at the base; margins joined by a strong callous. Length 89, diam. 55, alt. of aperture 52, width 30 mm. (*Grandidier*).

Ridges near the Victoria Nyanza, southeast, in the direction of Kilima-njaro.

Limicolaria bourguignati GRANDIDIER, Moll. Cent. Afr., Bull. Soc. Malac. France, ii, 1885, p. 157, pl. 7, f. 1. Not *L. bourguignati* Paladilhe, 1872, a species of *Opeas.*—*Burtoa bourguignati* BGT., Moll. Afr. Equat., p. 91 (1889).

Var. BRIDOUXIANA Bourguignat. Pl. 35, fig. 23.

Shell with the perforation almost completely closed, ovoid-elongate, thin, subtransparent, grooved except on the upper whorls, the longitudinal striæ cut on the upper part of the last whorl by spiral lines. Coloration of long, narrow, longitudinal flames of chestnut-yellow, alternating with others of a blackish shade. Spire regular, obtusely acuminate, of 8 slightly convex whorls, slowly increasing to the last. Suture not deep. Last whorl convex, oblong, not over two-thirds the alt. Aperture vertical, excised, lengthened oblong, strongly angular above, the outer margin regularly arcuate, a little retracted below. Peristome unexpanded, acute, the columellar margin straight, reflexed in a long triangular dilatation, the lower angle of which reaches to the base of the axis. Length 79, diam. 44, aperture 44 by 25 mm.

Usugara, at Mont Kidete, between Kondoa and Mpuapua.

Burtoa bridouxiana BGT., Moll. Afr. Equat., p. 92, pl. 4, f. 3 (1889).

This is apparently a young shell. The following from the same region is much younger and may be allied:

Burtoa lavigeriana Bourguignat. (Pl. 30, fig. 19).

Shell narrowly, very deeply perforate, small, relatively very much swollen, very fragile, transparent, very finely striatulate except on the embryonic whorls, decussate with fine spiral lines on the upper part of the last two whorls. Cuticle very fugacious, of a pale yellow with dark chestnut streaks

on the last whorl. Spire short, very obtuse. Whorls 6, convex, slowly increasing; suture quite deep. Last whorl ventricose, more than two-thirds the total alt. Aperture noticeably oblique, excised, angular above, retracted at the base. Whitish inside, passing into bluish at the margins and columella. Peristome very thin and fragile, etc. Length 48, diam. 33, aperture 33 by 18 mm. (BGT., Moll. Afr. Equat., p. 96, pl. 4, f. 2).

Usugara, in the Makata valley; Mikese, in the Moueré, south of Lake Victoria Nyanza.

2. B. JOUBERTI (Bourguignat). Pl. 35, fig. 21.

Shell rimate-perforate (the perforation open and deep), large, oblong, the last whorl notably directed to the right, rather solid and opaque; strongly striate and elegantly decussated with fine spiral lines, wanting on the lower part of the last whorl; uniform fleshy-chestnut colored, roseate under the cuticle. Spire produced-oblong, somewhat swollen-acuminate, but obtuse at the apex. Whorls 7, convex, regularly and rapidly increasing, separated by an impressed suture, the last convexly oblong, somewhat more than half the total length, strongly bent to the right, slowly descending at the insertion. Aperture nearly vertical, ovate, angular above, pearly white inside, at the margins, columella and parietal callous wine-roseate. Peristome obtuse, a little thickened within, a little spreading, more so at the base, roseate throughout. Columellar margin robust, roseate, strongly reflexed, obsoletely and broadly concavely channelled above; outer margin slightly curving forward. Length 95, diam. 60, aperture 48 by 37 mm.

Unyanyembe, near Tabora, German East Africa.

Burtopsis jouberti BGT., Moll. Afr. Equat., p. 99, pl. 2, f. 1 (1889).

Smaller and less swollen than *B. giraudi,* with a relatively much smaller aperture.

3. B. SEBASMIA Bourguignat. Pl. 30, fig. 17.

Shell of very large size, deeply perforate, the perforation

mainly covered; ventricose, oblong-ovoid, solid, opaque, strongly grooved except on the embryonic whorls, decussate on the upper part of the later whorls by spiral striæ, and covered with a very fugacious cuticle, ornamented with long, pale yellow flames alternating with chestnut-black ones, the color being darker and more uniform on the upper whorls. Spire relatively not long, regularly tapering, the apex moderately obtuse. The 7 or 8 whorls are but little convex, and increase regularly to the last one, separated by a decided but not deep suture. Last whorl enormous, swollen, somewhat oblong, less than two-thirds the total length. Aperture slightly oblique, excised, oblong, strongly angular above, the outer side not dilated below, but retracted, with a regularly oblong contour. Interior pearly white, passing into rose-purplish towards the margins. Peristome simple, unexpanded, acute; columellar margin robust, strongly dilated, the dilation with several facets, and below a somewhat *Achatina*-like eminence gives the base of the axis an appearance of being channelled, but without any trace of truncation. Length 118, diam. 73, aperture 70 by 48 mm.

German East Africa: Valley of Malagarazi, between Tabora and Ujiji.

Burtoa sebasmia Bgt., Moll. Afric. Equat., p. 94, pl. 3, f. 1 (1889).

It is a little less swollen than typical *nilotica*, more regularly acuminate, with less convex whorls, the last less swollen, and especially differs by the form of the columella, which is flattened into facets and has a basal prominence.

4. B. dupuisi (Putzeys). Pl. 23, fig. 47.

Shell imperforate, ovate, ventricose, rather solid, covered with a brown cuticle, streaked with dark chestnut. Spire short, the apex mamillate. Whorls 6, a little convex, the first nearly smooth, the last three rather regularly plicate-striate, decussated with fine spiral impressed lines; last whorl large, elongate. Aperture lengthened oblong, the lip acute, pearly or roseate within. Columella roseate, straight, narrow, the margin reflexed, continuous with the basal lip in front,

and passing into a very thin, roseate parietal callous posteriorly. Length 93 to 102, diam. 54 to 57, length of the aperture 62 to 67 mm.

Congo Free State: forest of Micici, in the zone of Manyema.

Livinhacia dupuisi PUTZ., Annales de la Soc. Roy. Malac. Belg., xxxiii, 1898, p. lxxxii, fig. 17.

This western species seems well distinguished from *nilotica* and its varieties by the long, narrow columella and imperforate axis.

5. B. ARNOLDI (Sturany). Pl. 26, fig. 14.

The shell consists of 7 whorls, is globose and has an oval, rose-margined aperture. The umbilicus is half covered by the columellar reflection. The embryonal whorls are smooth, the rest sculptured with irregular growth-striæ. On the last whorl sparse decussating lines may be seen. Alt. 91, diam. 61; alt. of aperture 57, width 42 mm. (*Sturany*).

Matabele Land, near the Amanze Inyama river (Dr. Penther).

Livinhacia arnoldi STURANY, Catalog der bisher bekannt geworden Südafrikanischen Land- und Süsswasser-Mollusken, in Denkschr. der Math.-Naturwissensch. Cl. der K. Akad. Wissensch., lxvii, 1898, p. 59, pl. 2, f. 41.

A single example was collected. It approaches the short-spired forms of *B. nilotica* in shape. The external color is not mentioned by Sturany.

Genus METACHATINA Pilsbry, 1904.

Livinhacia in part, CROSSE *et auct.*—*Bulimus* and *Achatina* auct.

Shell ovate-acuminate, solid, perforate, the axis hollow; densely, minutely granulose throughout; whorls 8 to 9, those of the spire with Achatina-like flames. Apex obtuse, large and rounded. Aperture ovate, white within, chestnut-bordered in known species, the outer lip simple, columella subvertical, somewhat concave, terminating in a slight prominence below. The new-born young are subglobular, densely plicatulate and decussate above the periphery, except the

first whorl; the axis is imperforate and abruptly truncate at base (pl. 23, fig. 46, specimen 10 mm. long). Type *M. kraussi.*

Distribution, South Africa, Natal to Delagoa Bay.

The soft anatomy is unknown. The longer spire, with bulbous nucleus, the diverse sculpture and flame marking of this Natal species, all indicate that it is not to be included in the same group with *B. nilotica* Pfr., but is a parallel evolution-product from a different group of *Achatina.* That it has descended from a true *Achatina* stock is demonstrated by the young stages. The new-born young (pl. 23, fig. 46) having the imperforate, curved, abruptly truncate axis of typical *Achatina,* but with advancing growth these features are rapidly lost, and a Bulimoid aspect becomes apparent. If *Burtoa* resembles the South American group of *Strophocheilus ovatus, Metachatina* is no less like *S. oblongus.*

The view advanced above of the affinities of this group is not new. Prof. von Martens has already put on record his opinion that *kraussi* and the *nilotica* group are parallel groups, independently evolved by weakening of the *Achatina* characters in different stocks of that genus. His suggestion that the name *Burtoa* might be restricted to the *kraussi* group is not practicable, because the type of *Burtoa* was stated to be *nilotica.*

1. M. KRAUSSI (Pfeiffer). Pl. 23, figs. 46, 48.

Shell openly rimate, ovate-acuminate, rather solid and strong. Dull fleshy-white or soiled whitish, irregularly marked with dull brown streaks on the spire, but wanting on the apical and last whorls. Surface densely, finely and distinctly granulose throughout, or the granulation may be obsolete on the lower half of the last whorl. Spire straightly or a little concavely conic, of about 8 whorls, the apex obtuse, rounded. Last whorl somewhat tapering above, globose below. Aperture ovate, less than half the total length of the shell, slightly oblique, pure white inside, the columella, parietal wall and a wide band within the lip of a deep blackish-chestnut color. Outer lip obtuse, a trifle expanded; columella short, concave, bounded by a slight channel at the base.

Length 123, diam. 64; aperture 63 mm. long.

Length 120, diam. 75; aperture 63 mm. long.

South Africa: Natal Bay, in the woods, and on the Umlaas river (Krauss).

Bulimus kraussi Pfr., Symbolæ ad Hist. Hel., iii, p. 85 (1846); Monogr. Hel. Viv., ii, p. 184.—Krauss, Die Südafrik. Moll., p. 78, pl. 5, f. 4 (1848).—Reeve, Conch. Icon., f. 436 (1849).—*Limicolaria kraussi* Pfr., Nomencl. Hel. Viv., 1878, p. 262.—*Livinhacia kraussi* Pfr., Crosse, Journ. de Conchyl., 1889, p. 111.—Kobelt, Conchyl. Cab., i, pt. 10, p. 7, pl. 2, f. 1.—Sturany, Catal. Südafr. Land- und Süsswasser-Moll., p. 59 (1898).—*Burtoa kraussi* Bgt., Moll. Afric. Equat., p. 95 (1889).—*Achatina fuscolabris* Martens, in Alb., Die Hel., p. 202 (1861); Sitzungsber. Ges. nat. Freunde, p. 163 (1889).

A well-known and abundant species. Immature shells sometimes retain part of the chestnut-colored cuticle. This peels off freely, so that adult shells are wholly denuded, or retain only a narrow strip behind the lip.

Var. elongata Godet. The examples of this beautiful species procured by Mr. Junod are more lengthened than the type. The freshest are pale brown with wide brown transverse bands, obsolete on the base of the last whorl. One of the examples shows on the ventral face thin, brown, transverse rays, very crowded, resembling the pattern of *Achatina zebra*. Environs of Lourenzo-Marquez, Delagoa.

Livinhacia kraussi var. *elongata* Godet, in Junod, La faune entomol. du Delagoa, Bull. de la Soc. Vaudoise des Sci. Nat., xxxv, no. 133, p. 279 (1899).

2. M. planti (Pfeiffer). Pl. 37, figs. 10, 11.

Shell turrite-oblong, rather solid, fleshy-whitish, irregularly maculate and flamed with brownish and chestnut; spire ovate-conic, the apex rounded, suture subcrenate. Whorls 9, a little convex, the upper minutely granulate-decussate, the last two granulate at the suture, then rather distantly plicatulate, the last whorl shorter than the spire, somewhat tapering towards the base; columella slightly receding, obliquely

truncate at the base. Aperture oblique, angulate-oval, the peristome simple, unexpanded, the margins joined by a deep chestnut parietal callous, diffused inwardly over the wall. Length 134, diam. 47 mm.

Cape Natal (Plant, in Cuming coll.).

Achatina planti PFR., P. Z. S. Lond., 1861, p. 25, pl. 3, f. 6; Novit. Conch., ii, p. 160, pl. 43, f. 1, 2; Monogr. Hel. Viv., vi, 218.—*Livinhacia kraussi* var. *planti* Pfr., MELVILL & PONSONBY, Proc. Malac. Soc. Lond., iii, p. 178.

This form resembles *kraussi* in texture and color. It is placed under *kraussi* as a variety by Melvill & Ponsonby, but they do not state that intermediate specimens have been found. It is not known to me by specimens. Pfeiffer's original figure shows a stronger columellar truncation than those in the *Novitates,* which I have copied. None of them have a dark border in the outer lip.

REFERENCE TO PLATES.

VOL. XVI.

PART I: UROCOPTIDÆ AND MEGASPIRIDÆ.

PLATE 1.

PLATE 2.

Plate 3.

FIGURE — PAGE

1. Brachypodella hjalmarsoni Pfr. Pilsbry, del. 51
2, 4. Brachypodella hjalmarsoni Pfr. Malak. Bl. 51
3. Brachypodella hjalmarsoni Pfr. 4th whorl from base. Pilsbry, del. 51
5. Brachypodella salleana Pfr. Pilsbry, del. 51
6. Brachypodella dohrni Maltz. 4th whorl from below. Pilsbry, del. 54
7-10. Brachypodella dohrni Maltz. Pilsbry, del. 54
11, 12. Brachypodella dohrni Maltz. J. de Conch. 54
13, 14. Brachypodella salleana Pfr. Conchyl. Cab. 51
15. Brachypodella salleana Pfr. 4th and 5th whorls from below. Pilsbry, del. 51
16-19, 21. Brachypodella truncatula Lam. Pilsbry, del. 52
20. Brachypodella truncatula (*gracilicollis*). Conchyl. Cab. 52

Plate 4.

23-27. Brachypodella pearmaniana Ch. Pilsbry, del. . . . 101
28, 29. Brachypodella alba eos. Rural Hill. Pilsbry, del. 104
30. Brachypodella alba minima. Clifton. Pilsbry, del. 104
31. Brachypodella alba occidentalis. Hanover. Pilsbry, del. 105
32. Brachypodella alba eos. Ipswich. Pilsbry, del. . . . 104
33. Brachypodella alba minima. Swift river. Pilsbry, del. 104
34. Brachypodella alba eos. Swift river. Pilsbry, del. 104

Plate 5.

35. Brachypodella antiperversa Fér. Pilsbry, del. 79
36. Brachypodella antiperversa Fér. Fér., Histoire. . . . 79
37. Brachypodella trinitaria Pfr. Pilsbry, del. 75
38, 39. Brachypodella trinitaria Pfr. Malak. Bl. 75
41, 42. Brachypodella seminuda Ad. Clarendon. Pilsbry, del. 92
44. Brachypodella seminuda Ad. Mona Hill. Pilsbry, del. 92
43. Brachypodella costulata Ad. Pilsbry, del. 90
45, 46. Brachypodella robertsi Ad. Falmouth. Pilsbry, del. 91
40, 47-49. Brachypodella inornata Ad. Pilsbry, del. 94

Plate 6.

Plate 7.

Plate 8.

[Note.—Numbers 52 to 56 are duplicated on this plate.]

Plate 9.

Plate 10.

FIGURE PAGE

22. Brachypodella agnesiana Ad. Creighton Hall. Pilsbry, del. 97
23. Brachypodella agnesiana, inner lat. in profile. Pilsbry, del. 97
24. Brachypodella dominicensis Pfr. General view of a short piece of the radula. Pilsbry, del. 65

PLATE 11.

67-70. Anoma pulla Ch. Pilsbry, del. 30
71, 72. Anoma sinuata Ad. Pilsbry, del. 30
73. Urocoptis lucens Sowb. Conch. Icon. Vol. xv, p. 281.
74. Spirostemma intermedia Sowb. Conch. Icon. Vol. xv, p. 293.
75, 76, 79. Anoma fuscolabris Ad. Pilsbry, del. 16
77. Anoma unicincta Ad. Pilsbry, del. 21
78. Anoma levis bicincta Ad. Pilsbry, del. 20
79. Anoma fuscolabris Ad. Pilsbry, del. 16
80, 81. Urocoptis moreleti Pfr. Conch. Cab. Vol. xv, p. 282.
82. "Cylindrella" multispiralis Sowb. Conch. Icon. Vol. xv, p. 283.
83, 84. Anisospira reeticosta Pfr. Philippi, Abbild. Vol. xv, p. 299.
85, 86. Anisospira townsendi P. & C. Winchester, del. Vol. xv, p. 300.
87, 88. Anisospira sagraiana Pfr. Conch. Cab. Vol. xv, p. 282.
89. Spirostemma inusitata Vend. Pilsbry, del. Vol. xv, p. 290.

PLATE 12.

50-57. Anoma splendens Mke. Pilsbry, del. 23
58, 59. Anoma paivana Pfr. Novit. Conch. 27
60-62. Anoma paivana Pfr. Pilsbry, del. 27
63-65. Anoma splendens citrina Ad. Pilsbry, del. 25
66. Anoma splendens albida Ad. Pilsbry, del. 26

PLATE 13.

1-4. Anoma nitens Chitty. Negril Spots. Pilsbry, del. 14
5, 6. Anoma levis balteata Pils. Pilsbry, del. 22
7-9. Anoma jarvisi Pils. Pilsbry, del. 12
10, 11. Anoma pulchella Chitty. Pilsbry, del. 29
12, 13. Urocoptis dentieulata Pfr. Conch. Cab. Vol. xv, p. 283.

Plate 14.

Plate 15.

Plate 16.

Plate 17.

PLATE 22.

PLATE 23.

PLATE 24.

PLATE 25.

PLATE 26.

PLATE 27.

Plate 28.

[Figs. 1, 5, 7, 8, 9 drawn by Helen Winchester; the others by H. A. Pilsbry.]

Plate 29.

[Fig. 16 from Deshayes; 18 from Cox; the others drawn by Pilsbry.]

Plate 30.

FIGURE PAGE

PLATE 31.

1, 2. Megaspira elatior robusta Pils. Pilsbry, del..... 180
3, 7. Callionepion iheringi P. & V., *atr.*, atrium; G^2, G^3, second and third loops of the intestine; *H*, heart; *hgl.*, ovisperm duct; *p.*, penis; *sp.*, spermatheca; *t.*, talon; *x*, extension of penis. Vanatta, del..... 177
4-6. Perrieria australis Forbes. Pilsbry, del..... 191
8, 9. Callionepion iheringi. Teeth. Pilsbry, del..... 177

PART II: ACHATINIDÆ.

PLATE 1.

1-5. Pseudachatina wrighti Sowb. Helen Winchester, del. 206
6. Limicolaria droueti Morel. J. de Conch..... 261
7, 8. Pseudachatina daillyana Pils. Helen Winchester, del. 214

PLATE 2.

1, 2, 3. Pseudachatina elongata Kob. After Kobelt.... 213
4. Pseudachatina liljevalli d'Ailly. After d'Ailly..... 216
5, 6. Pseudachatina nachtigali Kob. After Kobelt.... 207

PLATE 3.

7. Pseudachatina grandinata Pfr. After Kobelt..... 209
8, 9. Pseudachatina grandinata Pfr. After d'Ailly... 209
10. Pseudachatina downesi, variety. Miss Winchester, del. 208
11-13. Pseudachatina connectens d'Ailly. After d'Ailly. 211

PLATE 4.

14, 15. Pseudachatina pyramidata Kob. After Kobelt. 210
16, 17. Pseudachatina buchneri Kob. After Kobelt.... 206
18. Pseudachatina sodeni Kob. After Kobelt..... 209
19. Pseudachatina sodeni Kob. After d'Ailly..... 209

PLATE 5.

20, 21, 24, 25. Pseudachatina gravenreuthi Kob. After Kobelt..... 212
22, 23. Pseudachatina g. var. preussi Kob. After Kobelt. 213

FIGURE PAGE

Plate 6.

Plate 7.

Plate 8.

Plate 9.

Plate 10.

PLATE 11.

PLATE 12.

PLATE 13.

PLATE 14.

FIGURE PAGE

Plate 15.

Plate 16.

Plate 17.

FIGURE PAGE

PLATE 18.

PLATE 19.

PLATE 20.

PLATE 21.

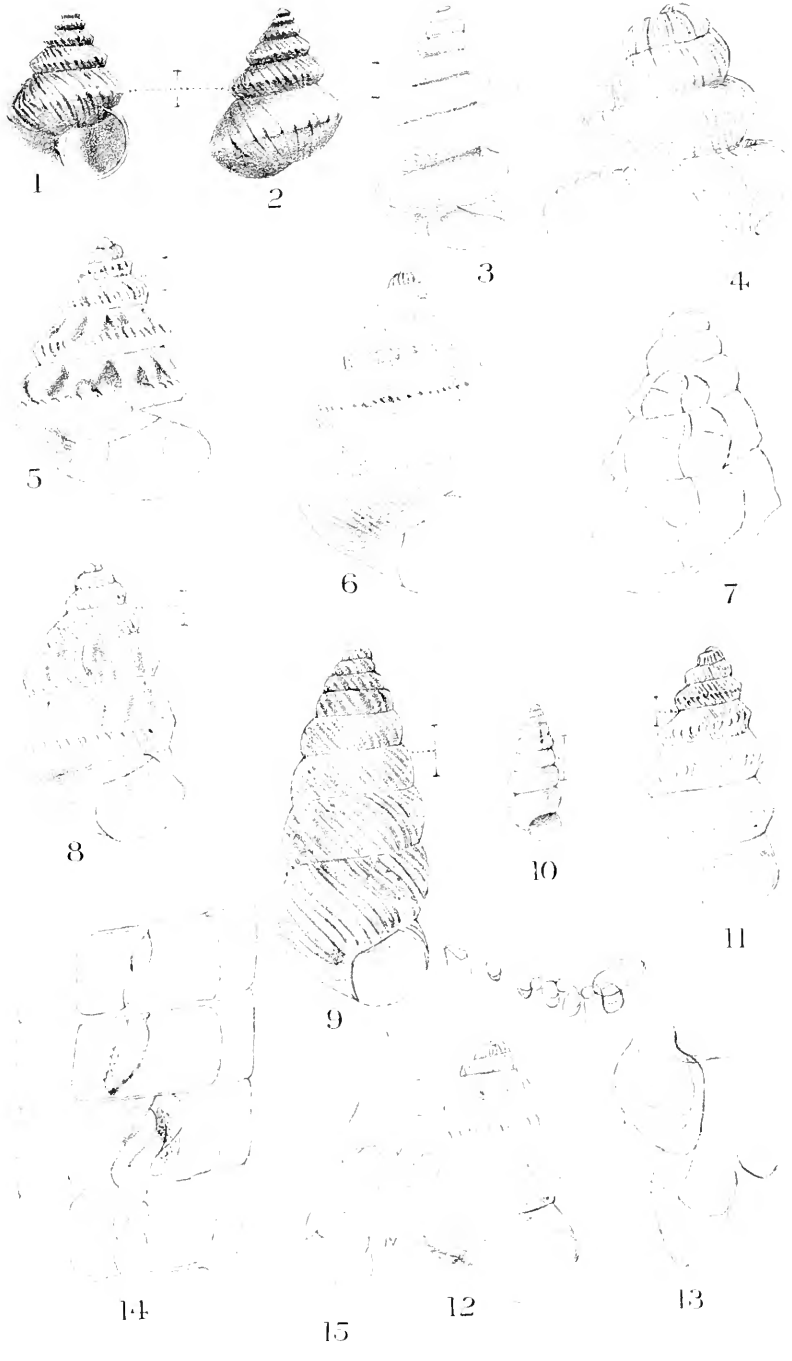
PLATE 22.

FIGURE PAGE

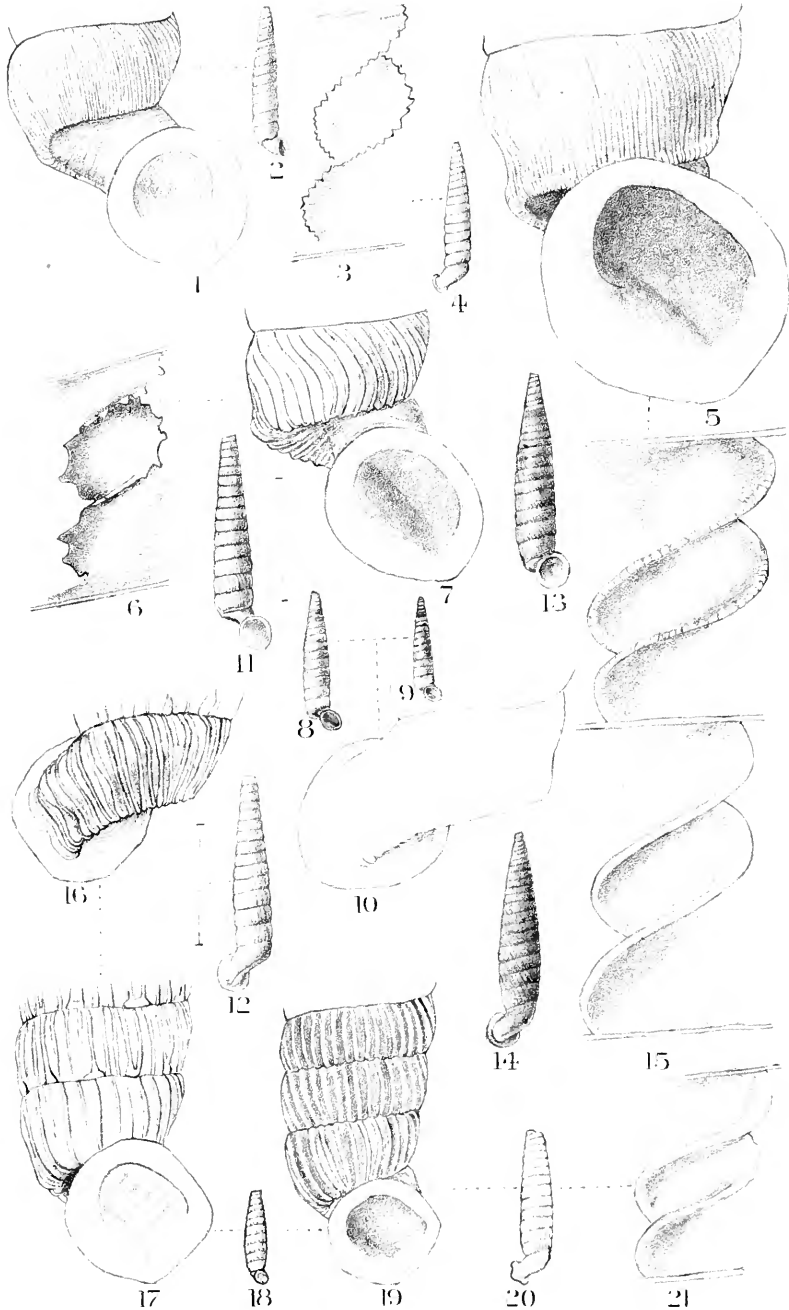
PLATE 37.

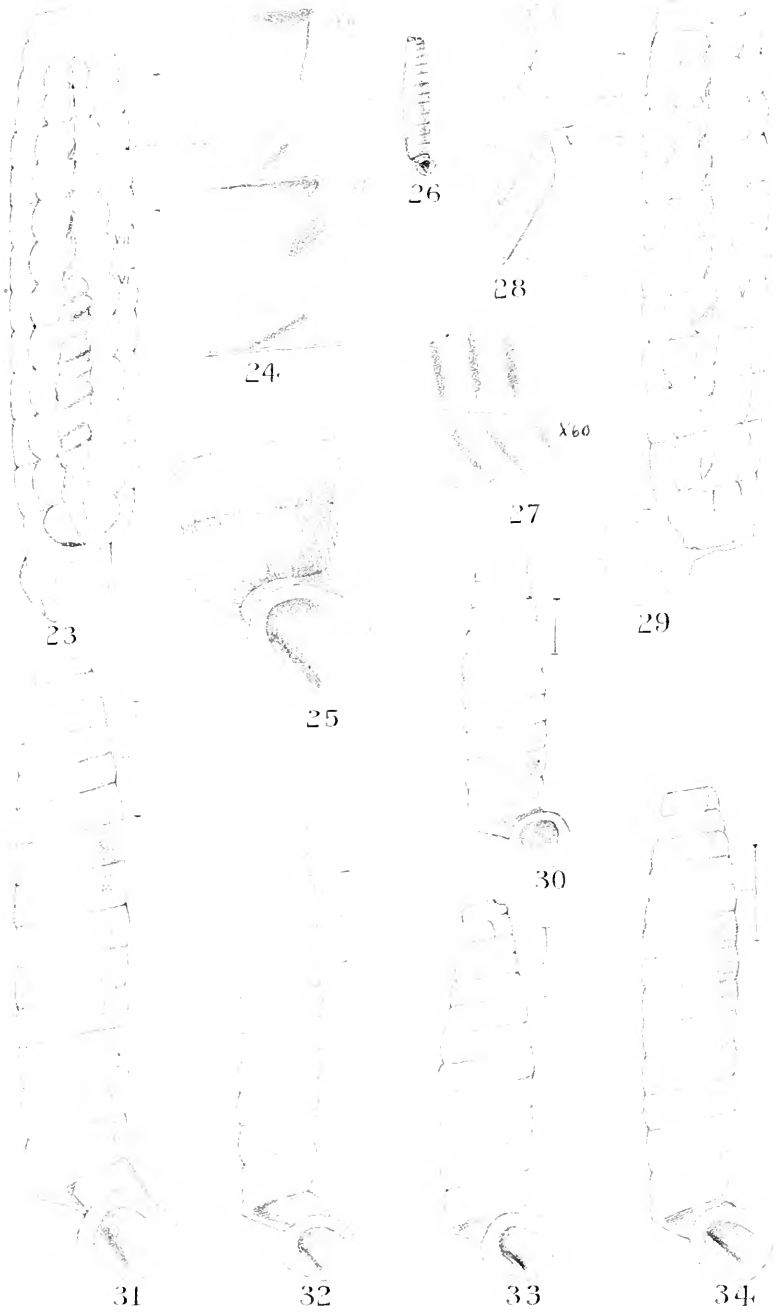
DATES OF ISSUE OF THE PARTS OF VOL. XVI.

Part 61, pp. 1-64, plates 1-18, Oct. 6, 1903.
Part 62, pp. 65-128, plates 19-31, Nov. 28, 1903.
Part 63, pp. 129-192, plates 1-15, Jan. 8, 1904.
Part 64, pp. 193-329, plates 16-37, February, 1904.
Title-page, Contents and Introduction, February, 1904.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
×60


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21


23
24
25
26
27
28
29
30
31
32
33
34
x60

35

40

36

38

39

41

42

43

37

44

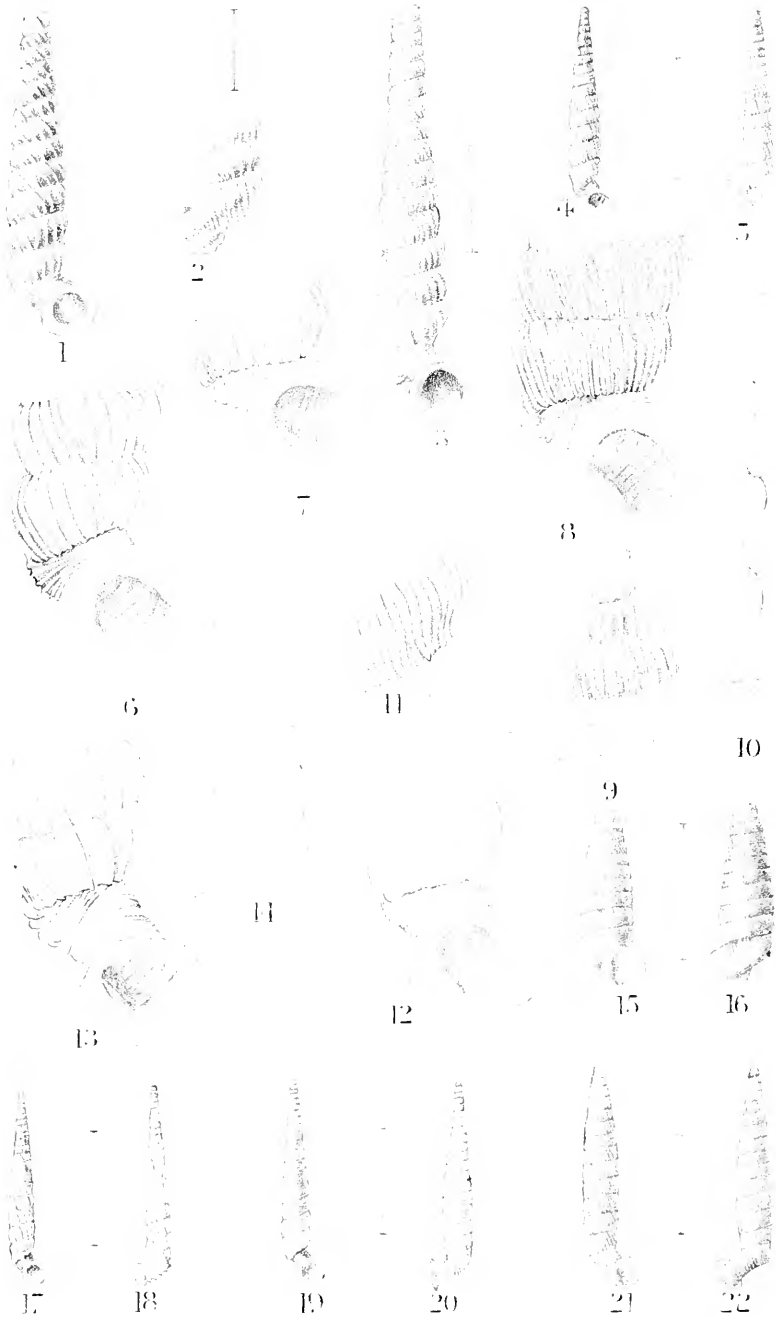
45

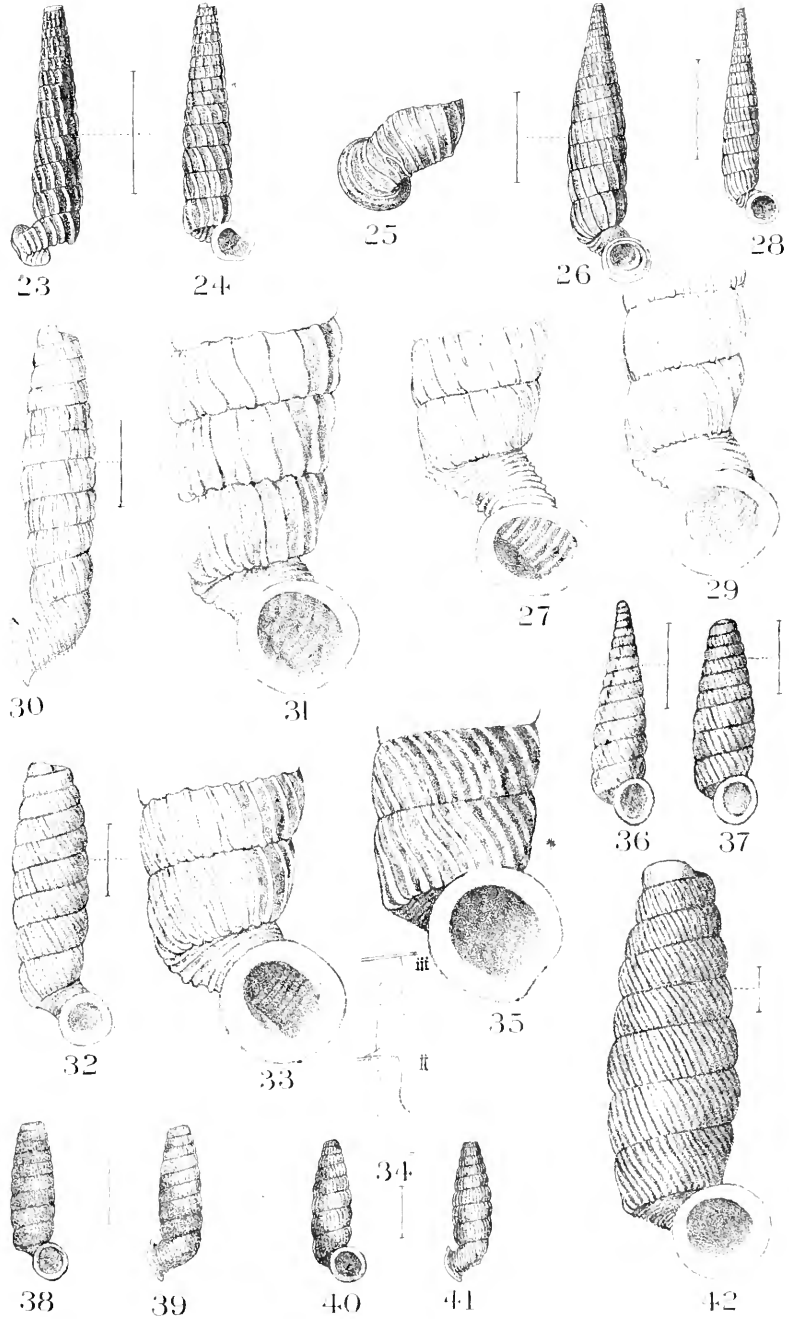
46

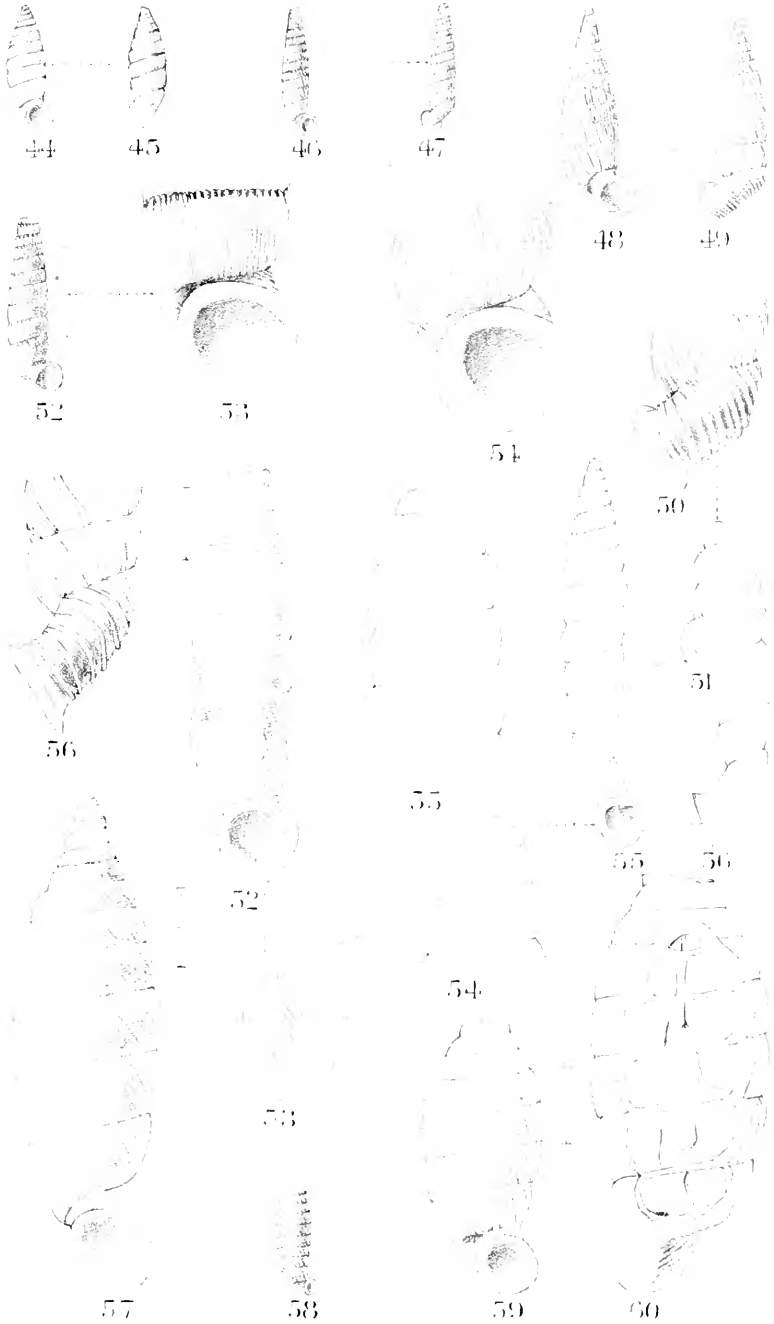
47

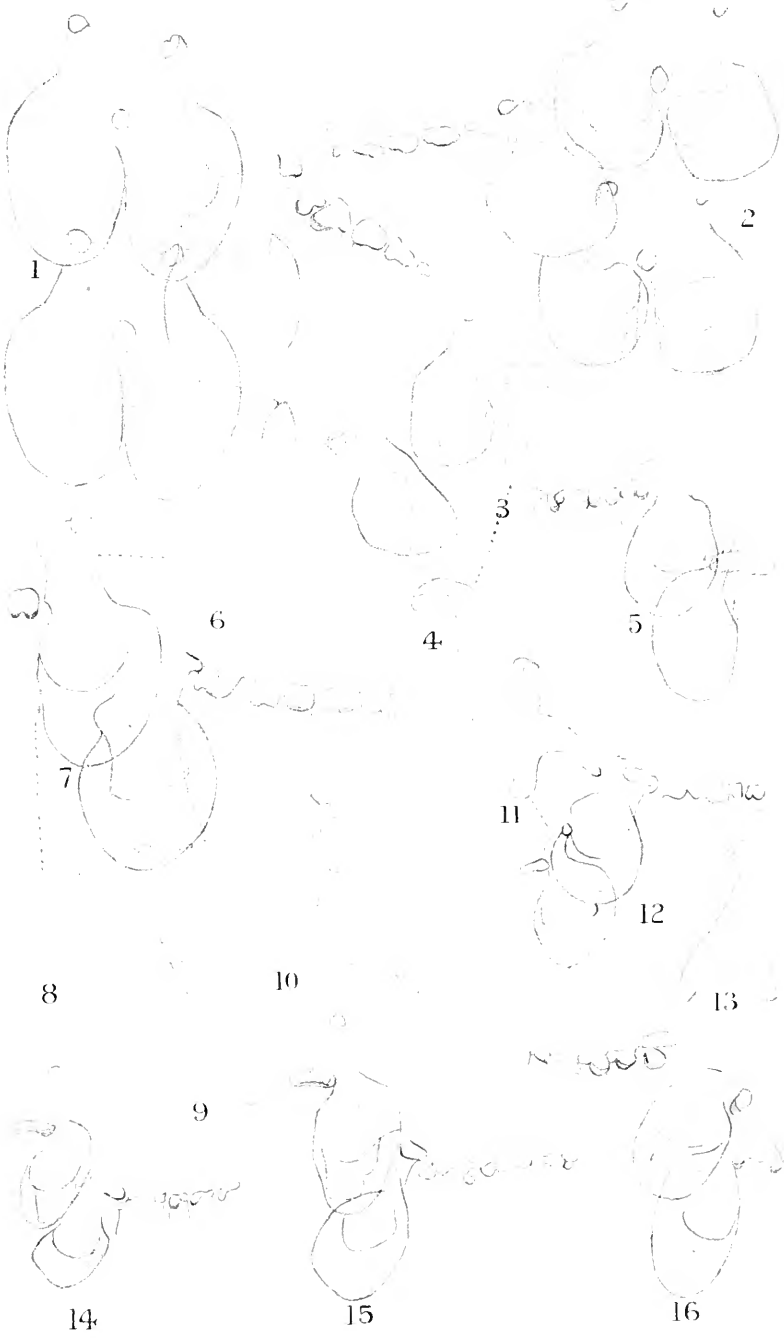
48

49


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

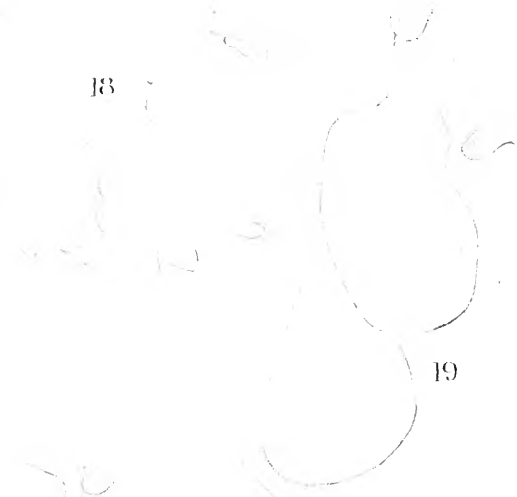

23
24
25
26
28
29
27
30
31
36
37
iii
35
32
33
ii
34
38
39
40
41
42


44
45
46
47
48
49
52
53
54
50
56
51
55
56
52
54
53
57
58
59
60


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

17

18



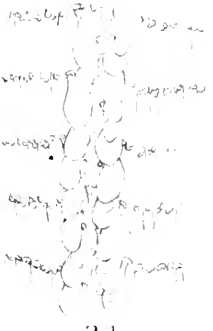
19

21

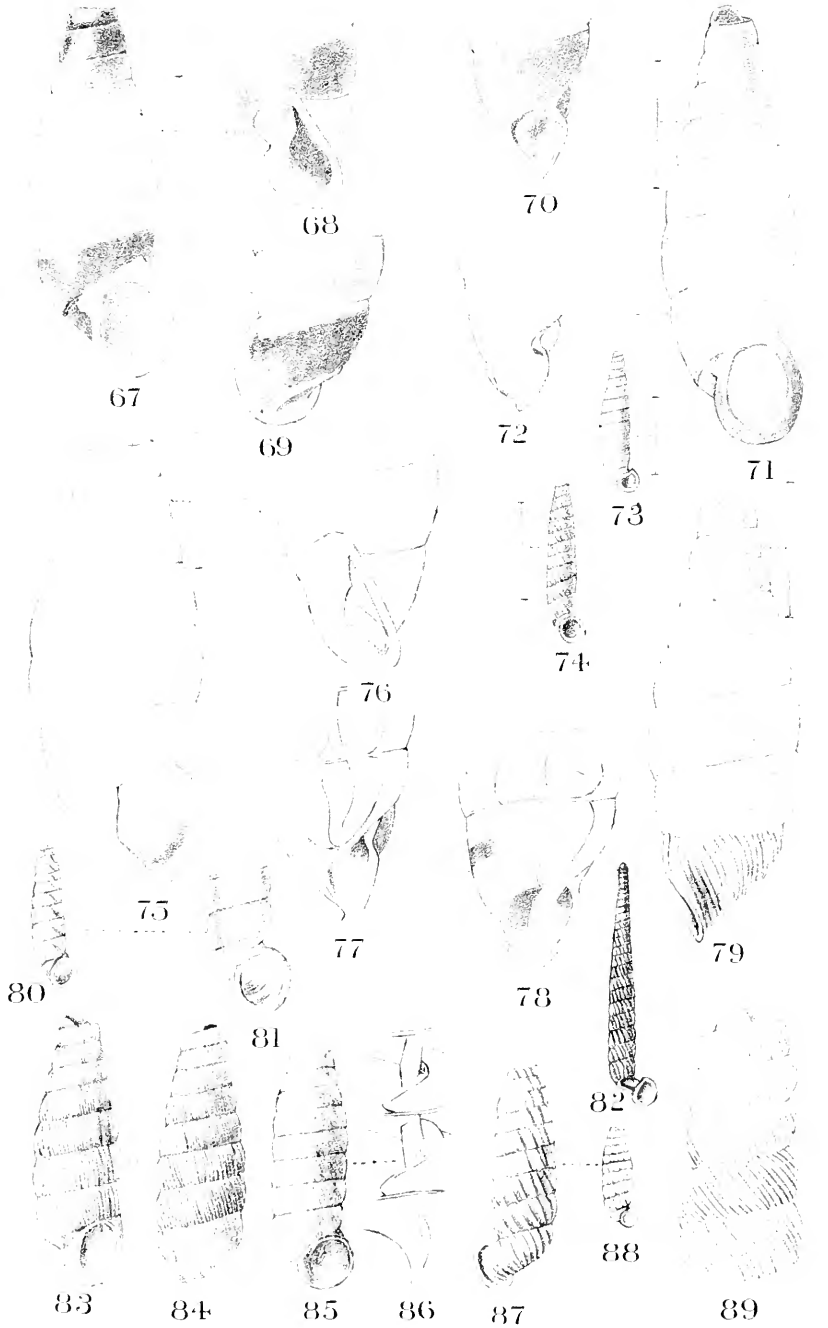
20

22

23



24


67
68
69
70
72
73
71
74
76
75
77
78
79
80
81
82
83
84
85
86
87
88
89

50

51

52

53

54

55

58

56

60

59

57

63

61

64

65

62

66

1

2

13

12

5

3

4

6

9

7

8

10

11

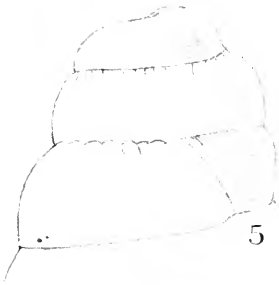

c
ped
pl
par.
v
1
r.
2
f.
ph
3
sp.
v.d.
ut.
col.
r.o.
sp.d.
p
ph
4
5
spd
6
7
c
8
31
29
9
10


1

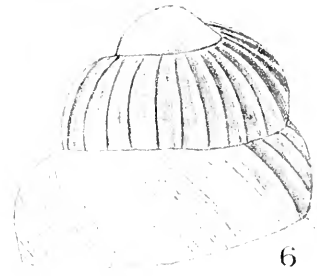

2


3


4


5


10


6


7

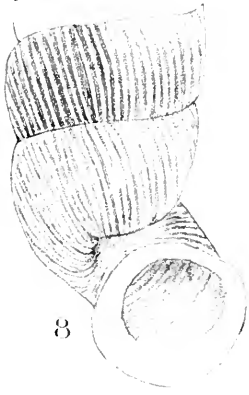

11


9


12

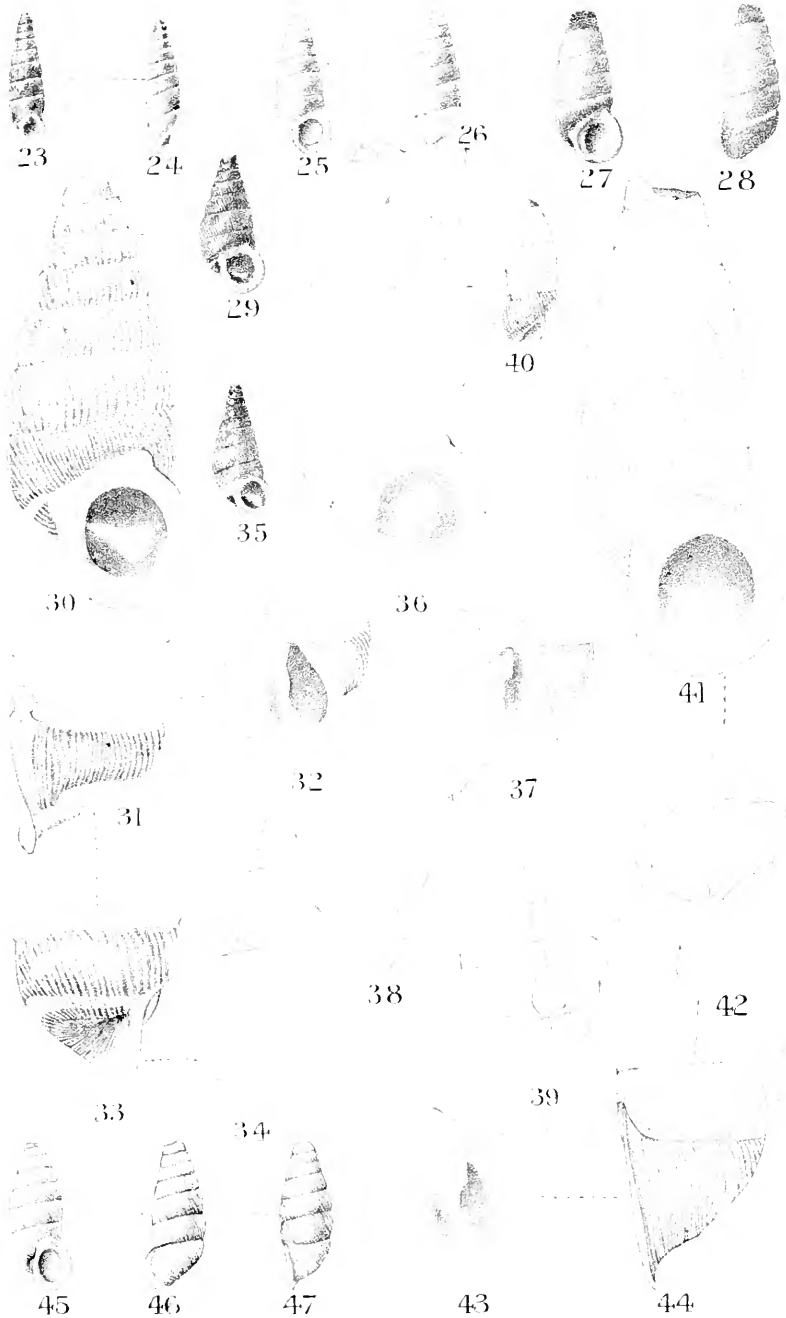

13

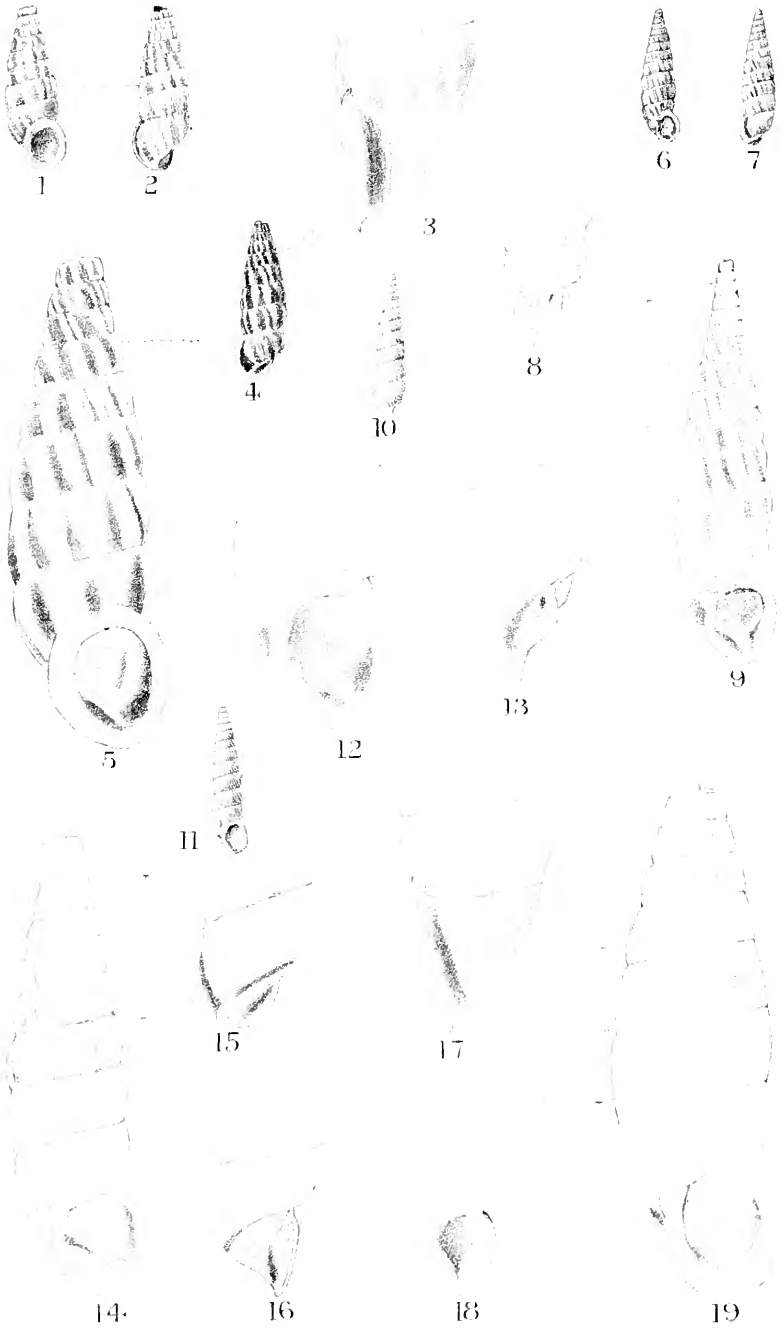

14


8

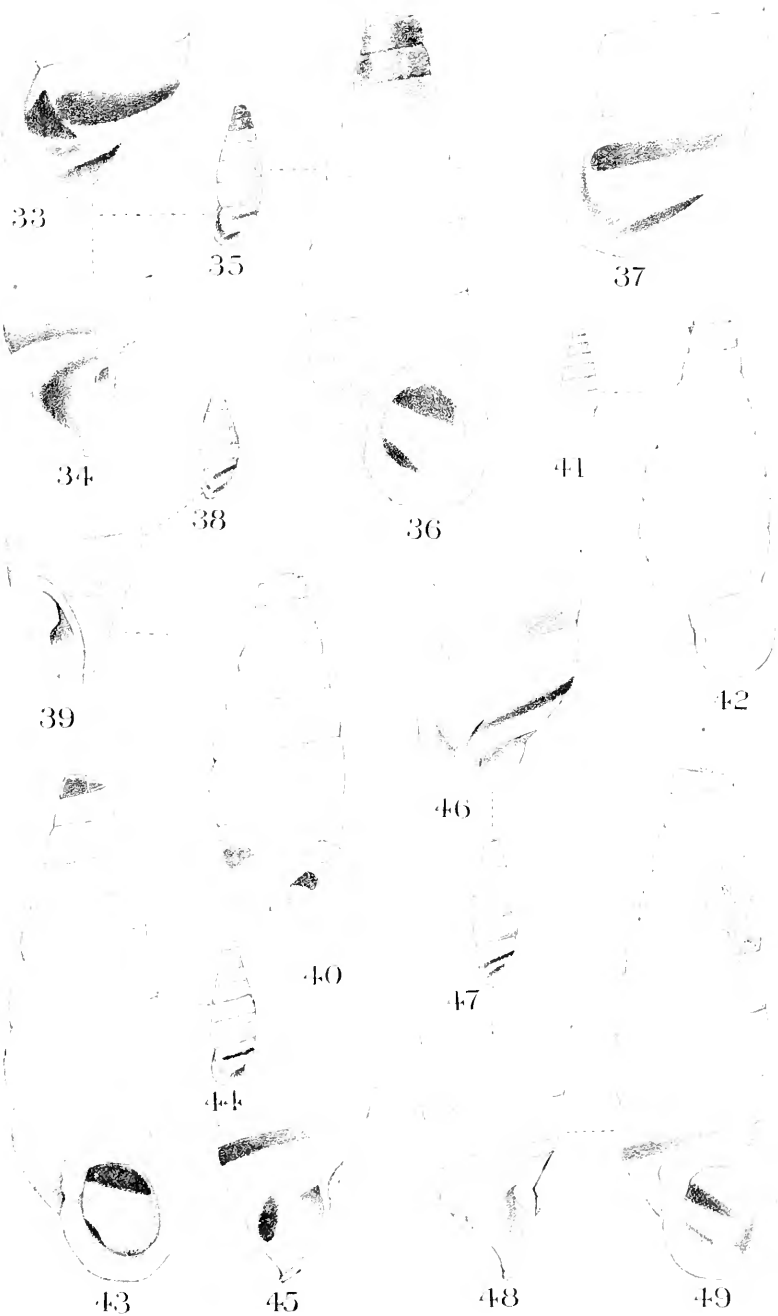

15

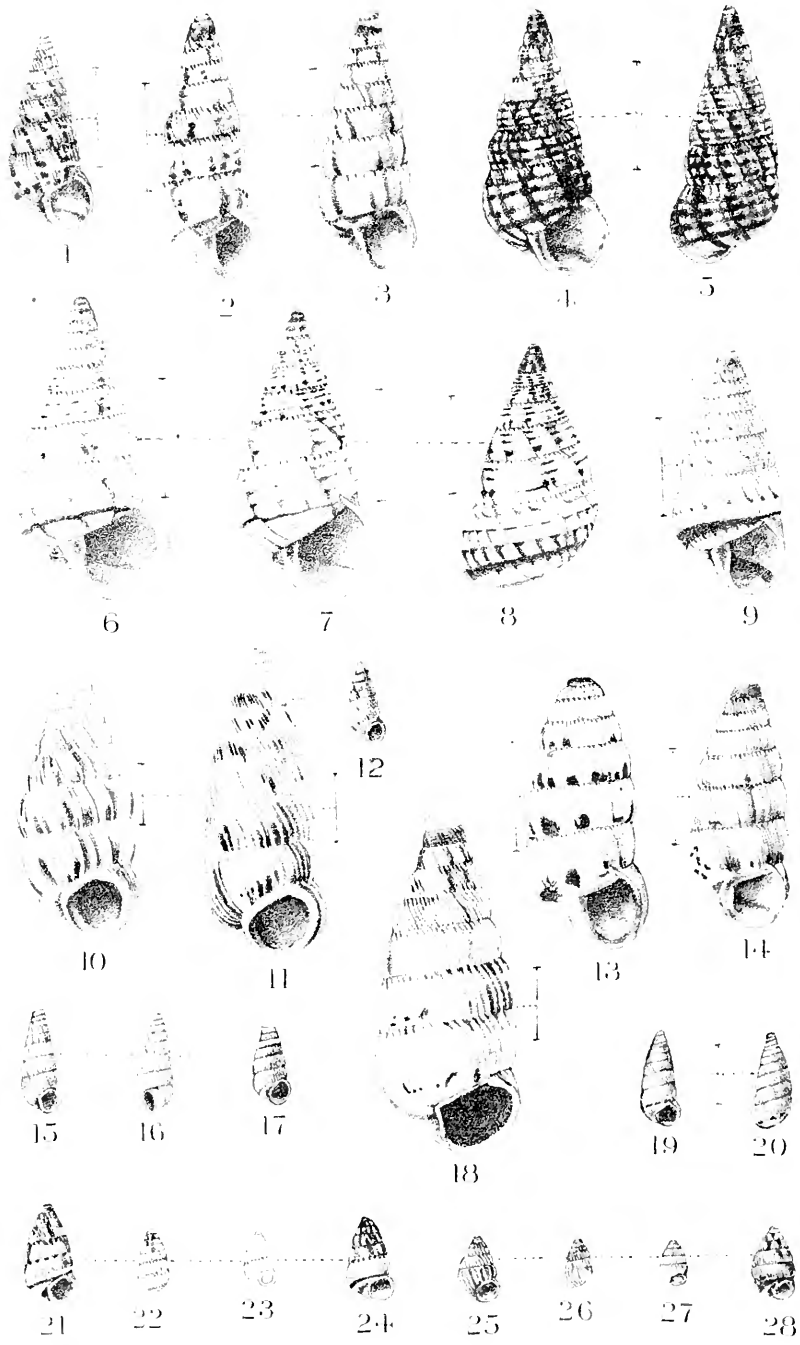

16

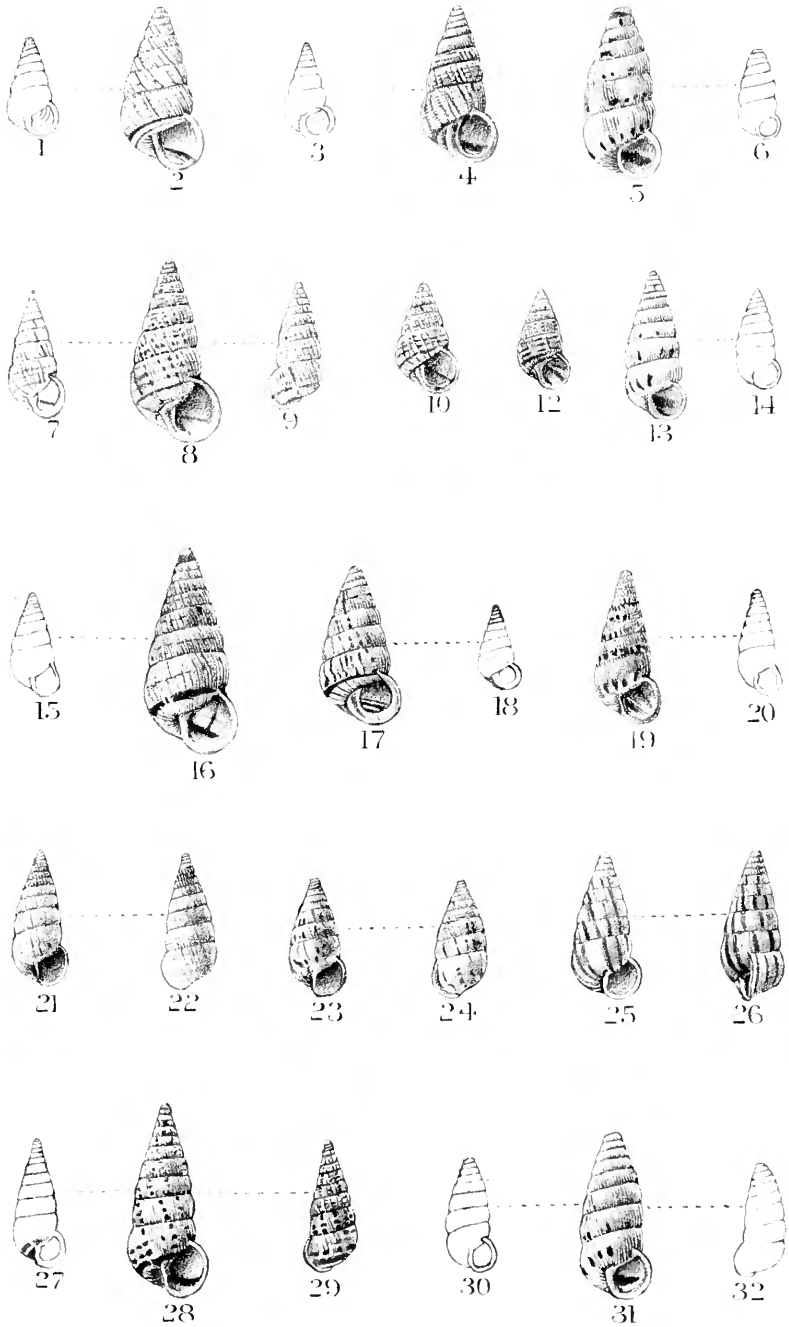

23
24
25
26
27
28
29
40
35
30
36
41
32
37
31
38
42
33
34
39
45
46
47
43
44

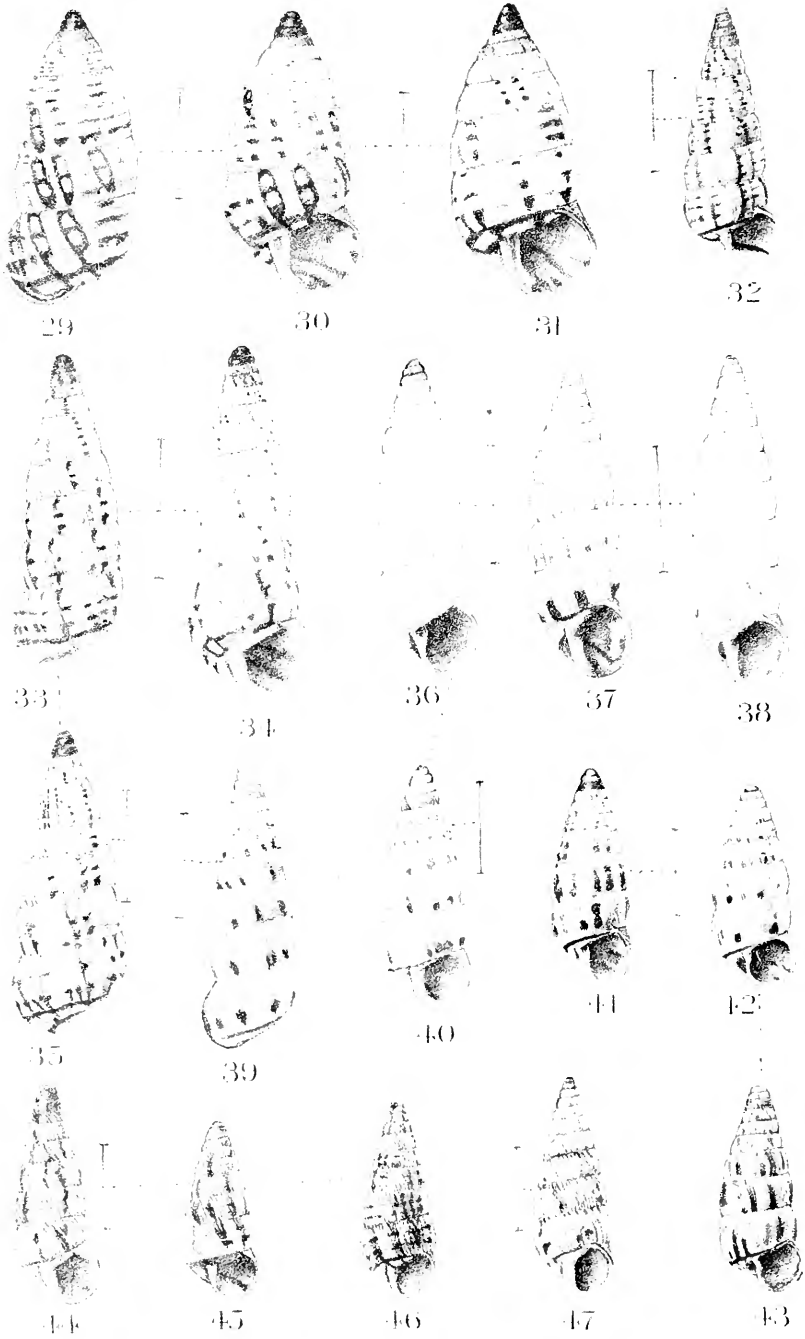

1
2
3
6
7
4
10
8
5
12
13
9
11
15
17
14
16
18
19


21
22
20
23
24
31
25
28
32
30
27
26
29
33


33
35
37
34
38
36
41
42
39
46
40
47
44
43
45
48
49


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28


1
2
3
4
5
6
7
8
9
10
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32


29
30
31
32
33
34
36
37
38
35
39
40
41
42
44
45
46
47
43

48

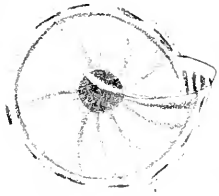
49

50

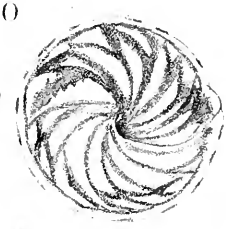
52

54

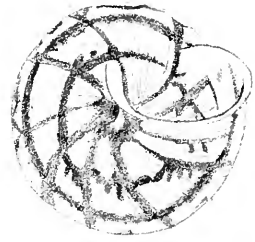
55



57



51



53

56

58

59

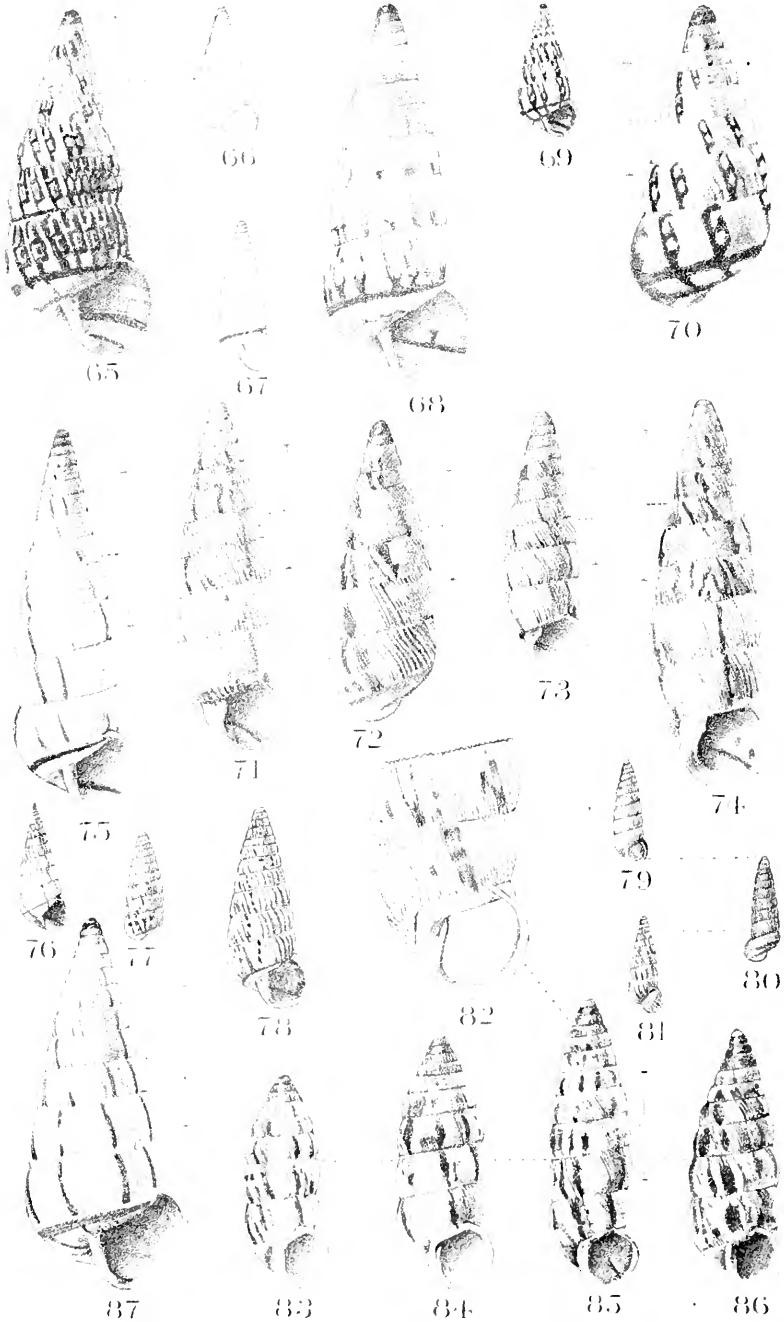
60

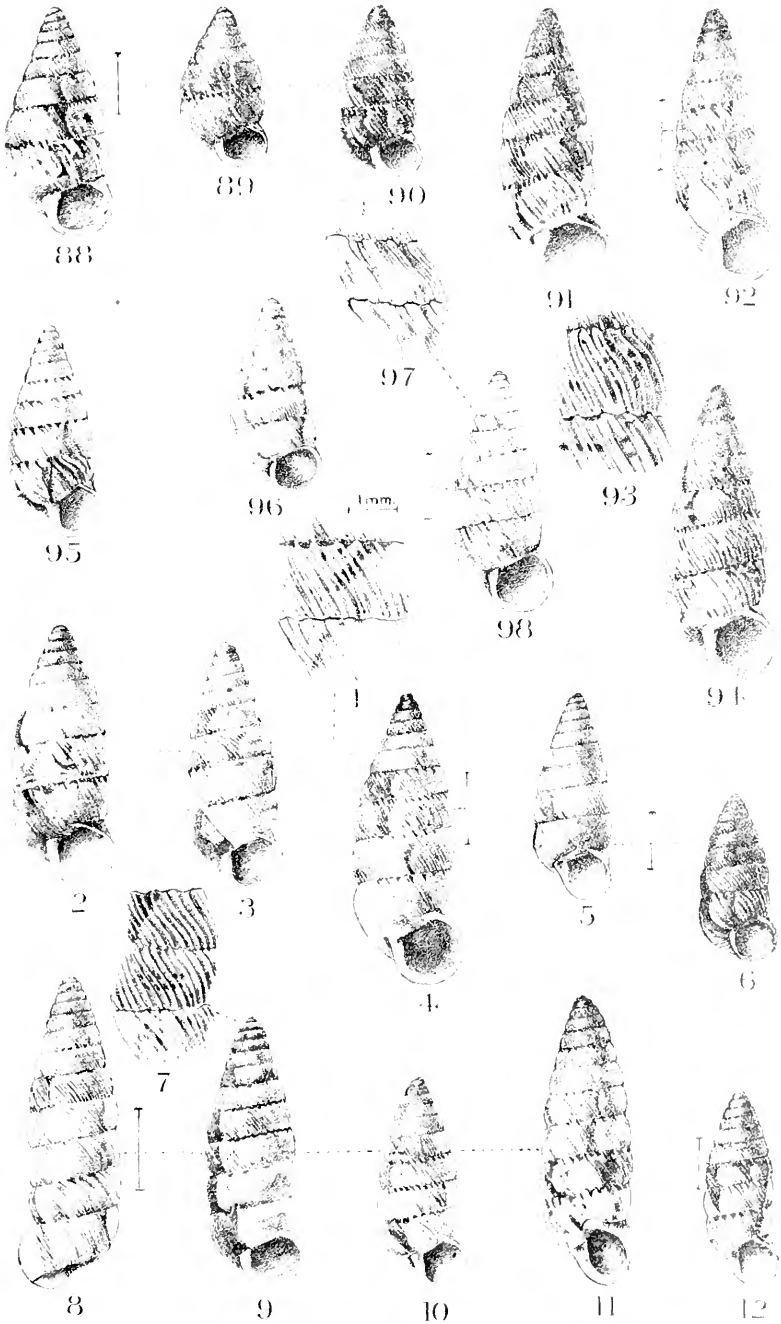
61

62

63

64


65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87


88
89
90
91
92
95
96
97
93
98
94
1
2
3
4
5
6
7
8
9
10
11
12

13

14

15

16

17

18

19

20

21

25

23

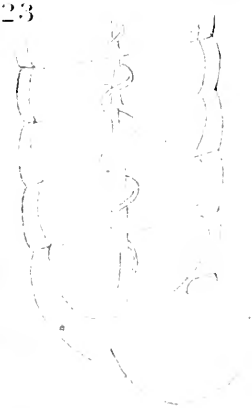
24

22

26

27

28



29

30

31

32

35

33

34

36

37

38

39

40

41

42

43

44

45

46

47

48

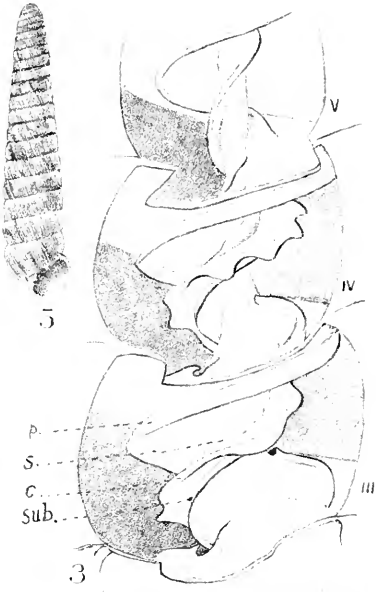
49

50

1

2

5

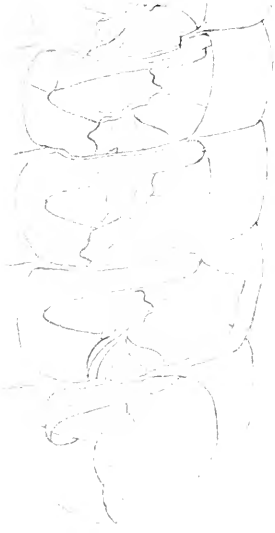


3

×5

4

7



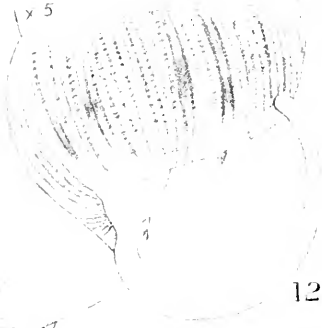
6

9

8

10

11



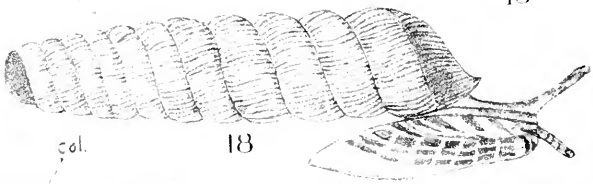
12

13

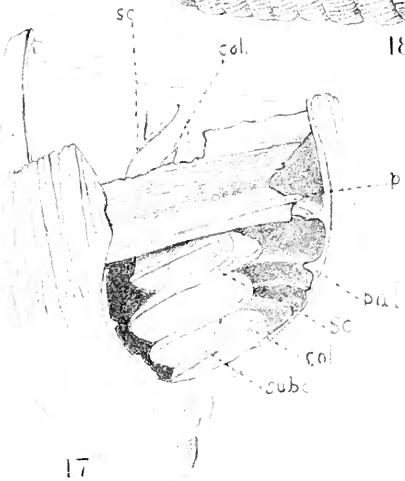
16

14

15

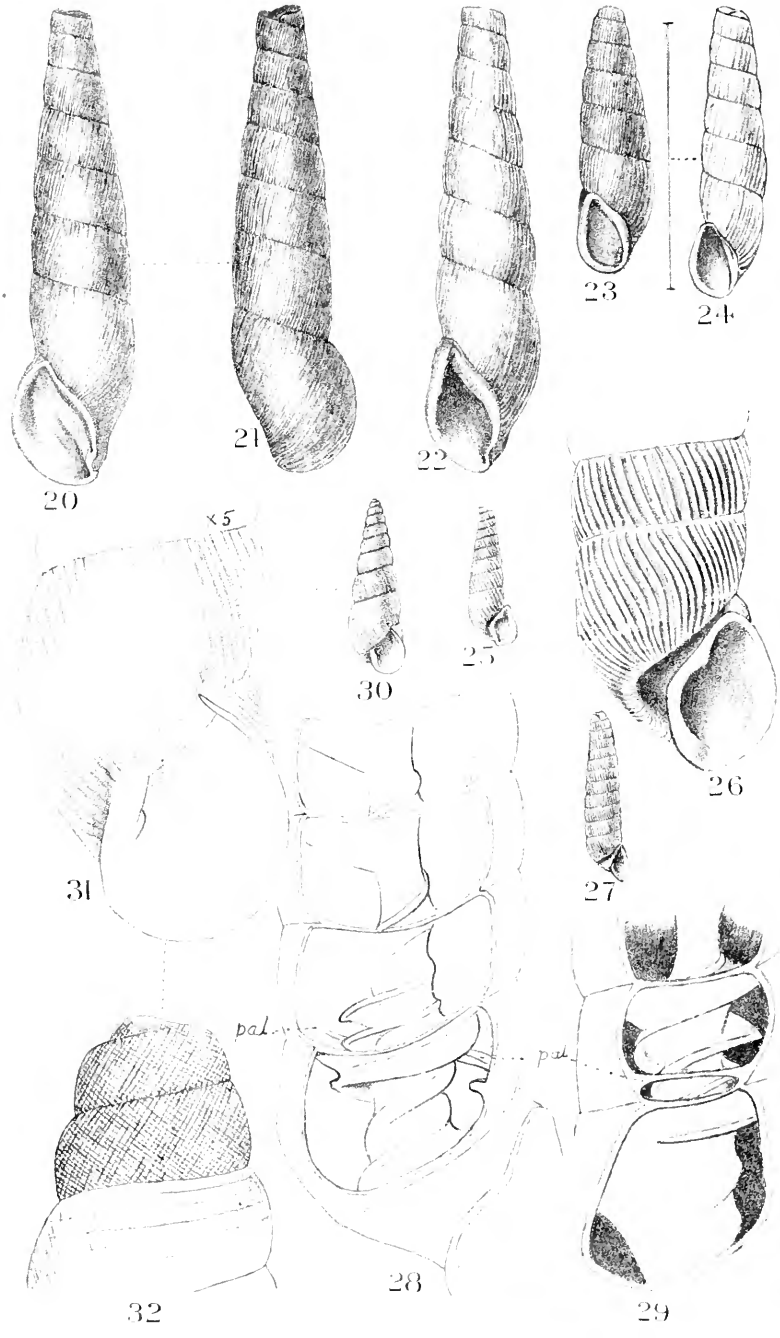


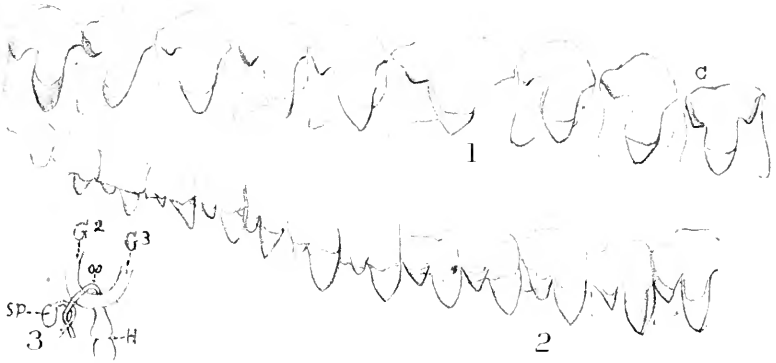
18



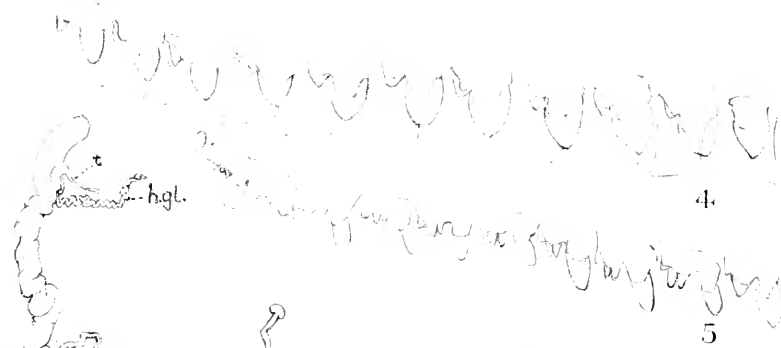
17

19


20
21
22
23
24
×5
30
25
26
31
27
pal.
pal.
32
28
29



3 2

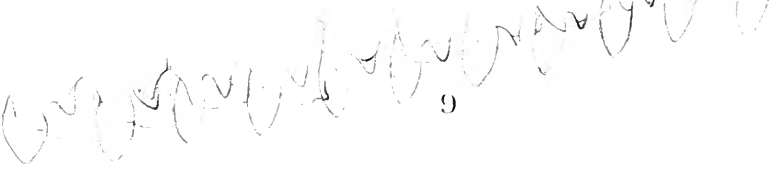


4

5

7 6

8



9

1

2

3

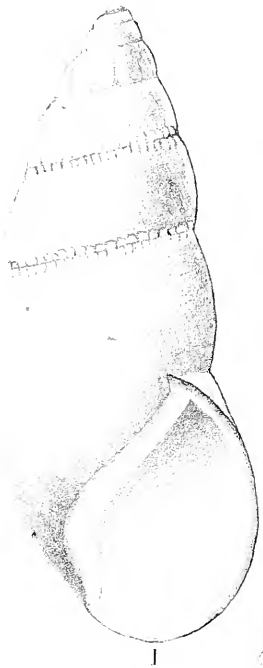
6

4

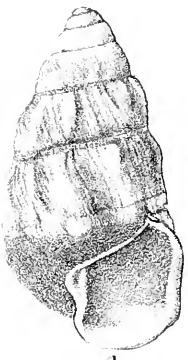
7

5

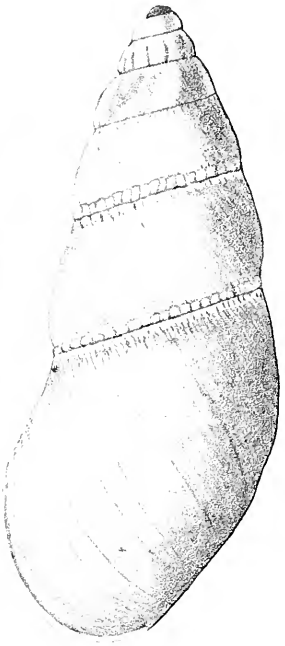
8



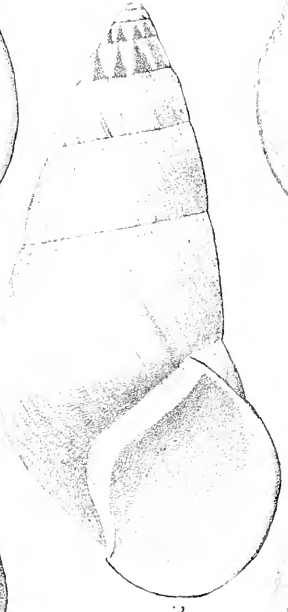
1



4

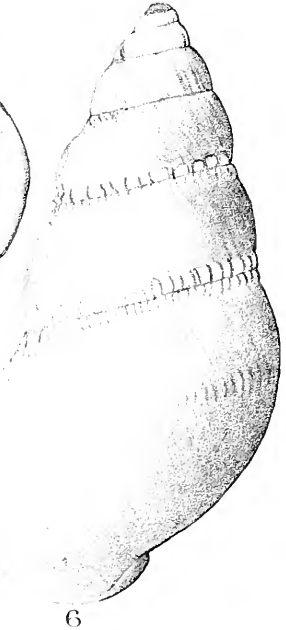


2



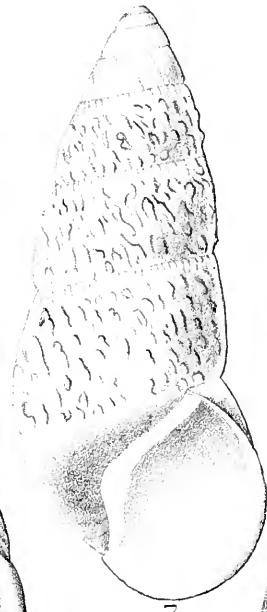
3

5

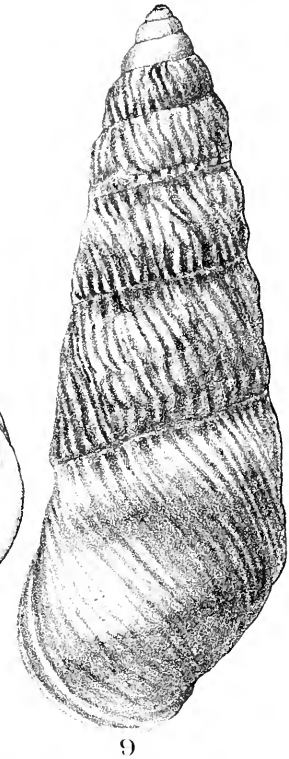


6

8

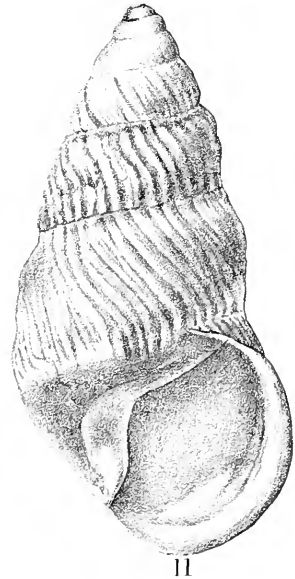


7

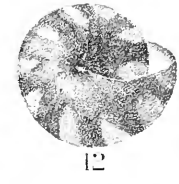


9

10

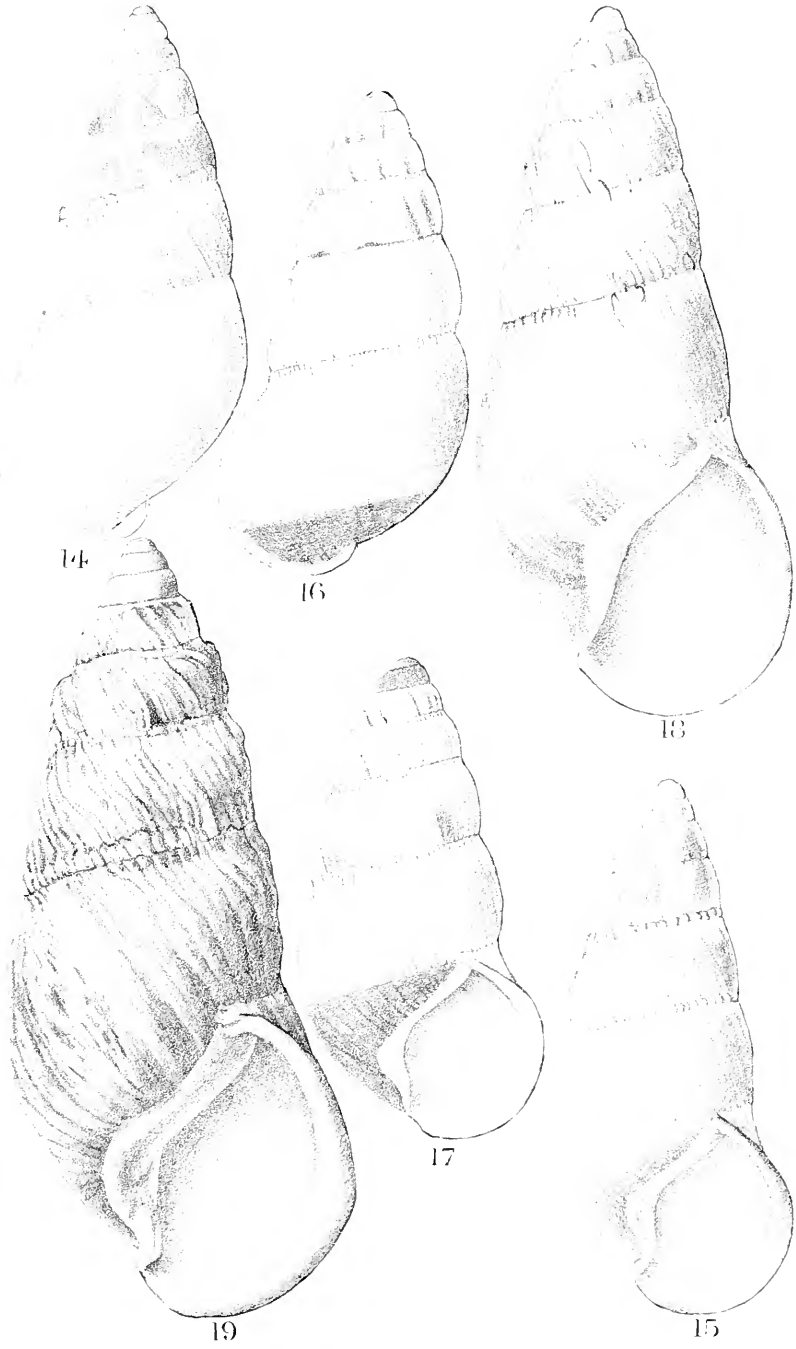


11

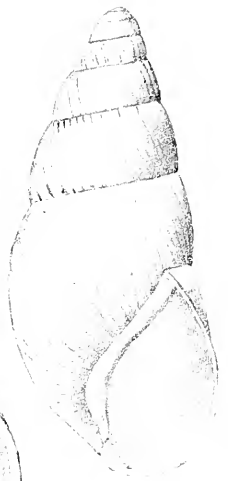


12

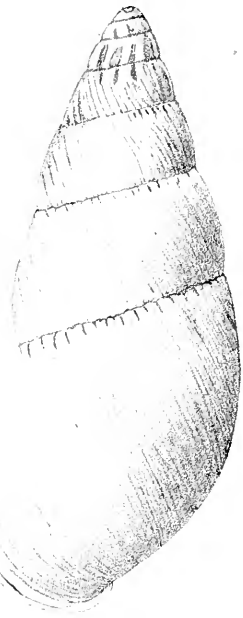
13


14
16
18
19
17
15

20

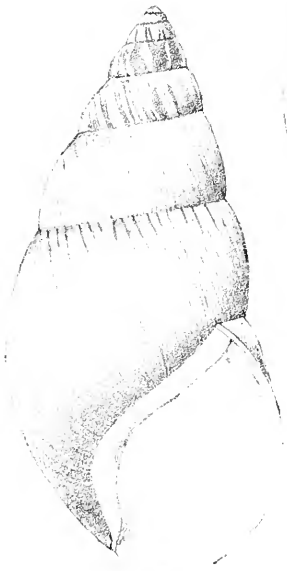


22

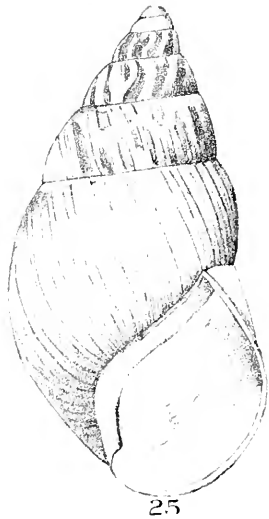


21

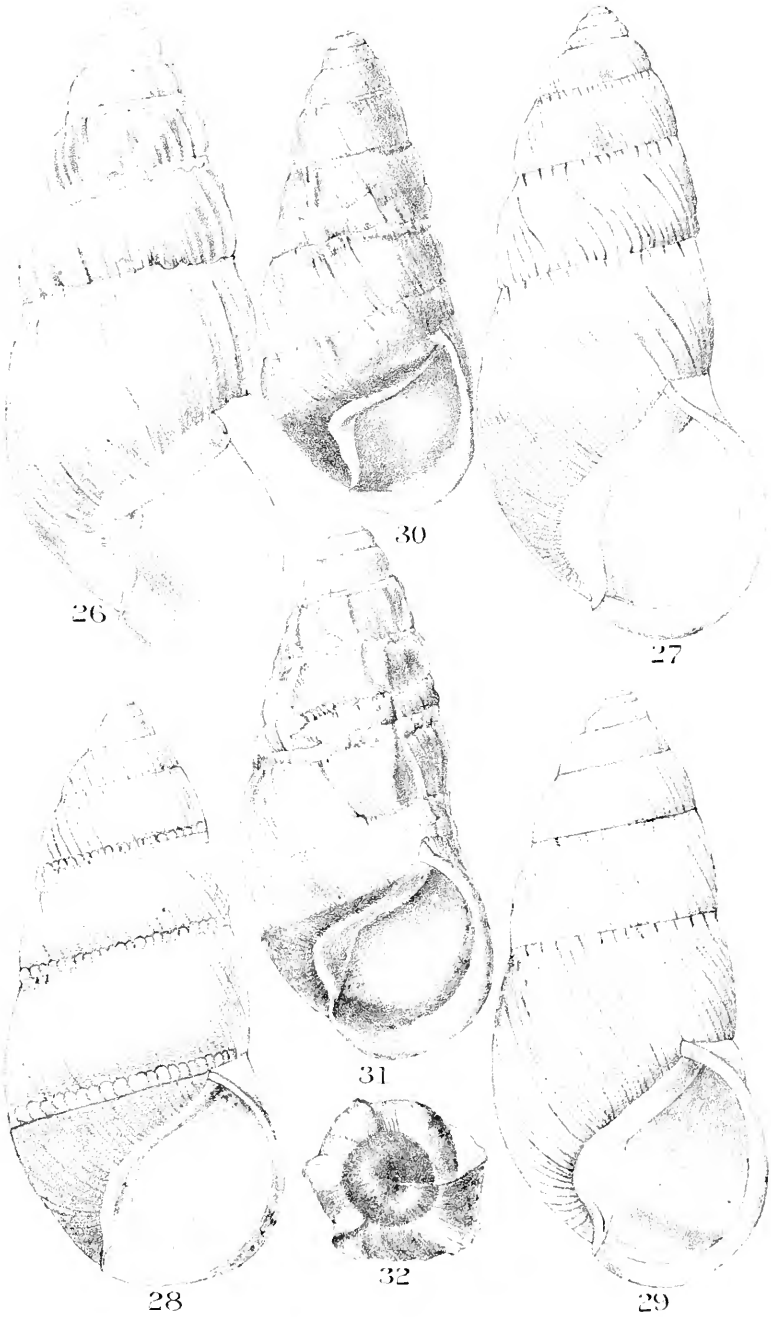
23

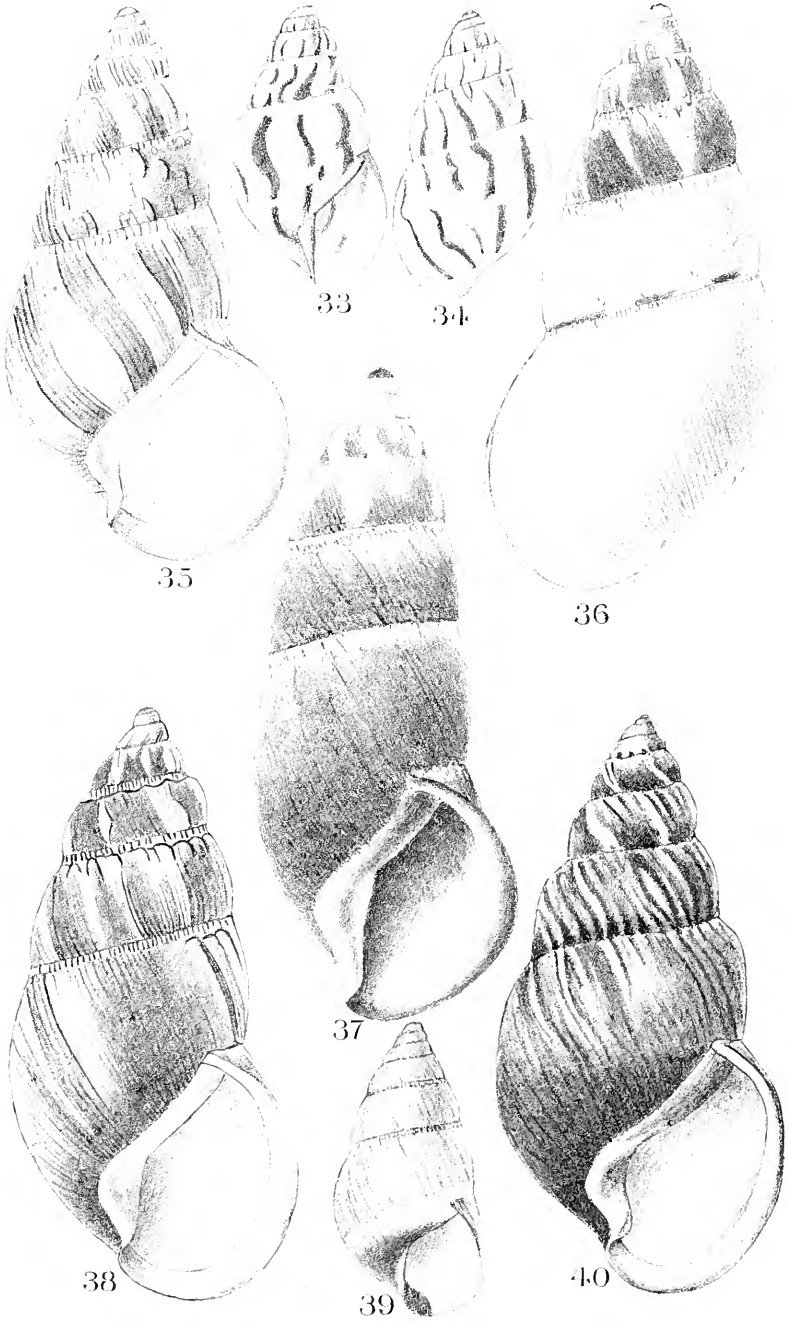


24



25

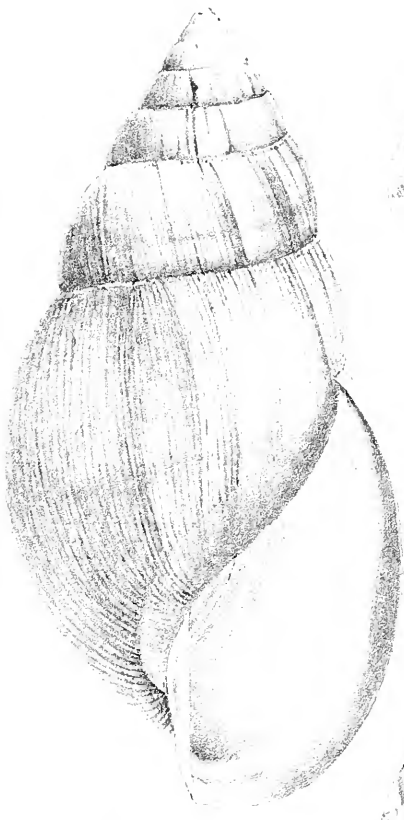

30
26
27
31
28
32
29


33
34
35
36
37
38
39
40

41

42

43



45

44

46

47

48

1

3

2

4

5

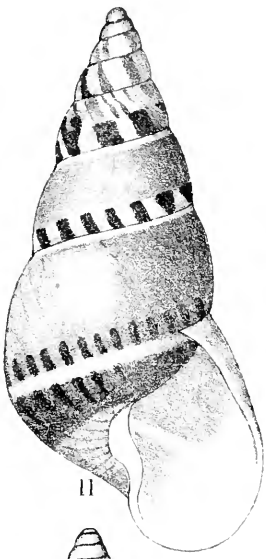
6

7

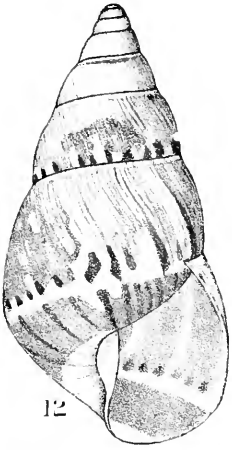
8

9

10

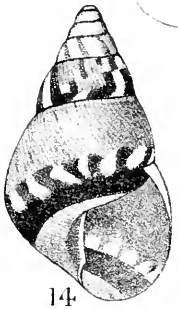


11



12

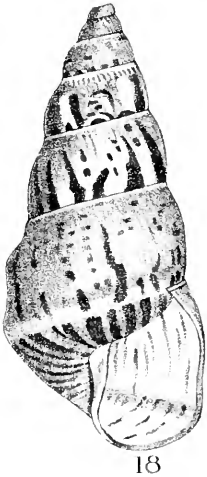
13



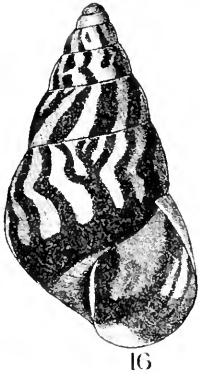
14

15

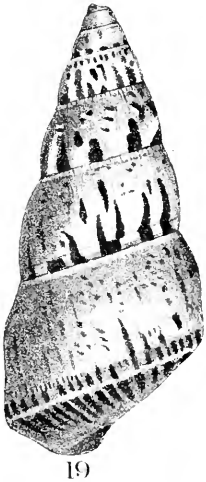
17



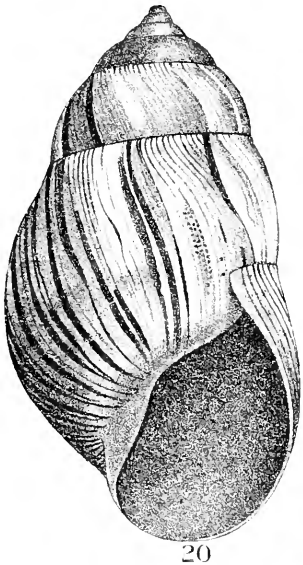
18



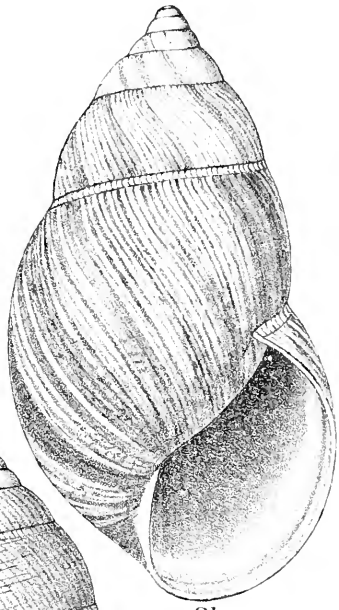
16



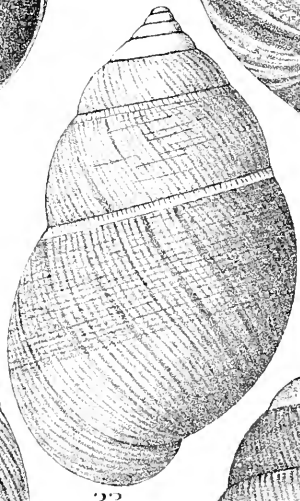
19



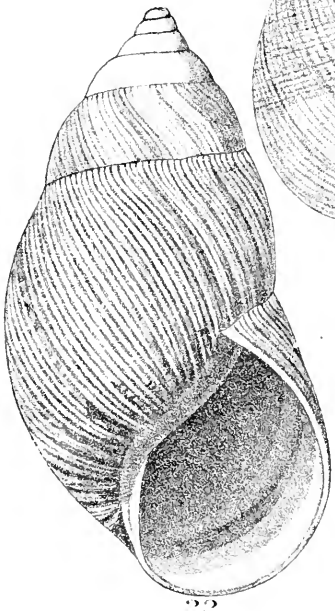
20



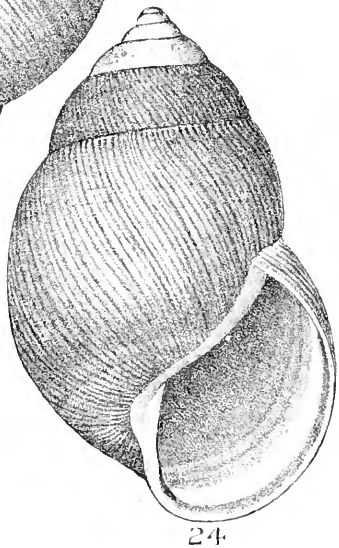
21



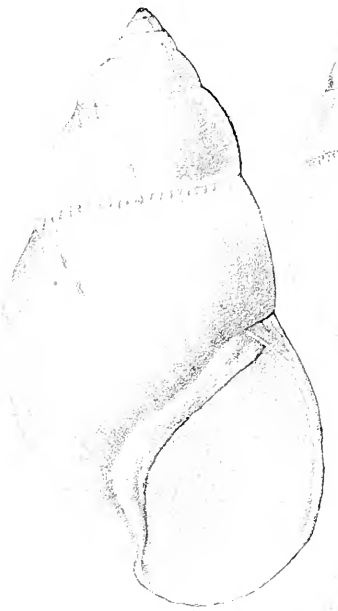
23



22



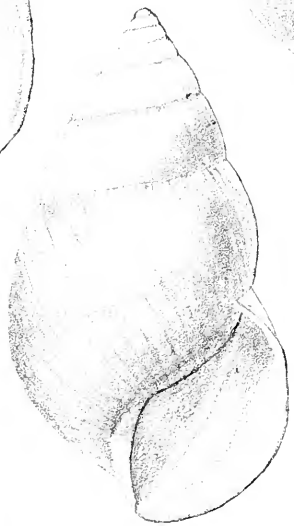
24



25

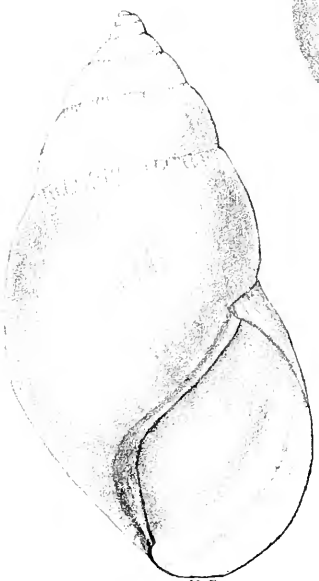
29

26



27

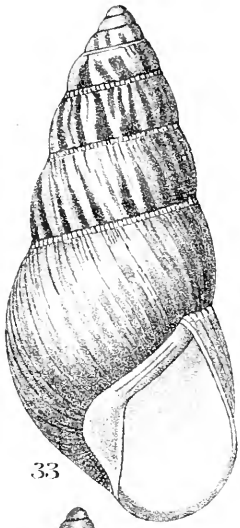
30

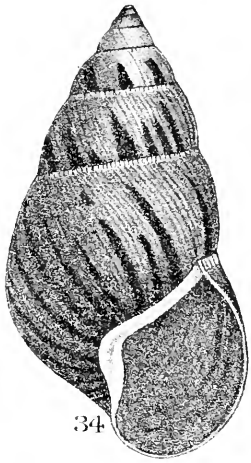


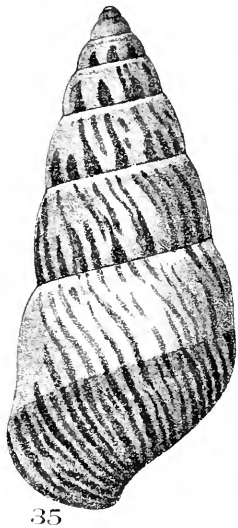
28

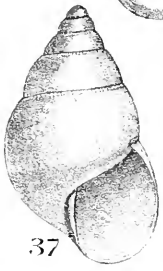
31

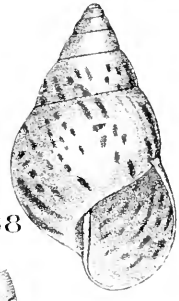
32


33

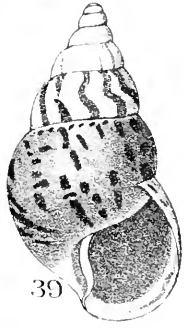

34

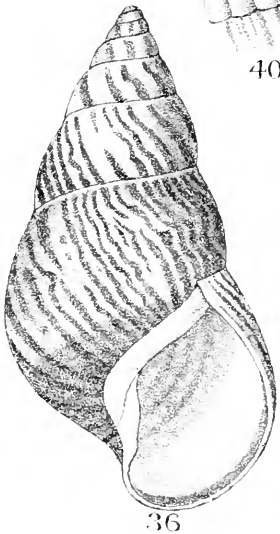

35

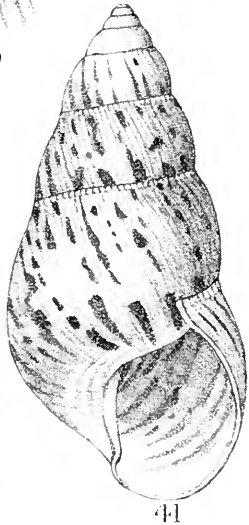

37


38


40

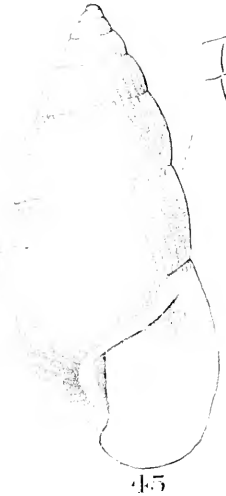

39


36


41


42

43



45

46

47

48

49

50

51

52

53

54

54

55

56

57

58

59

60

61

62

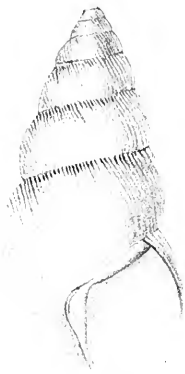
63

64

65

66

67

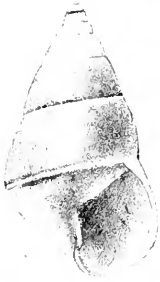


68

69

70

71



72

73

74

75

76

77


78

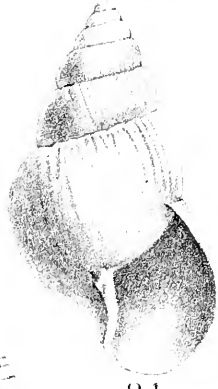

79


80


81


82


83


84


85


86


87

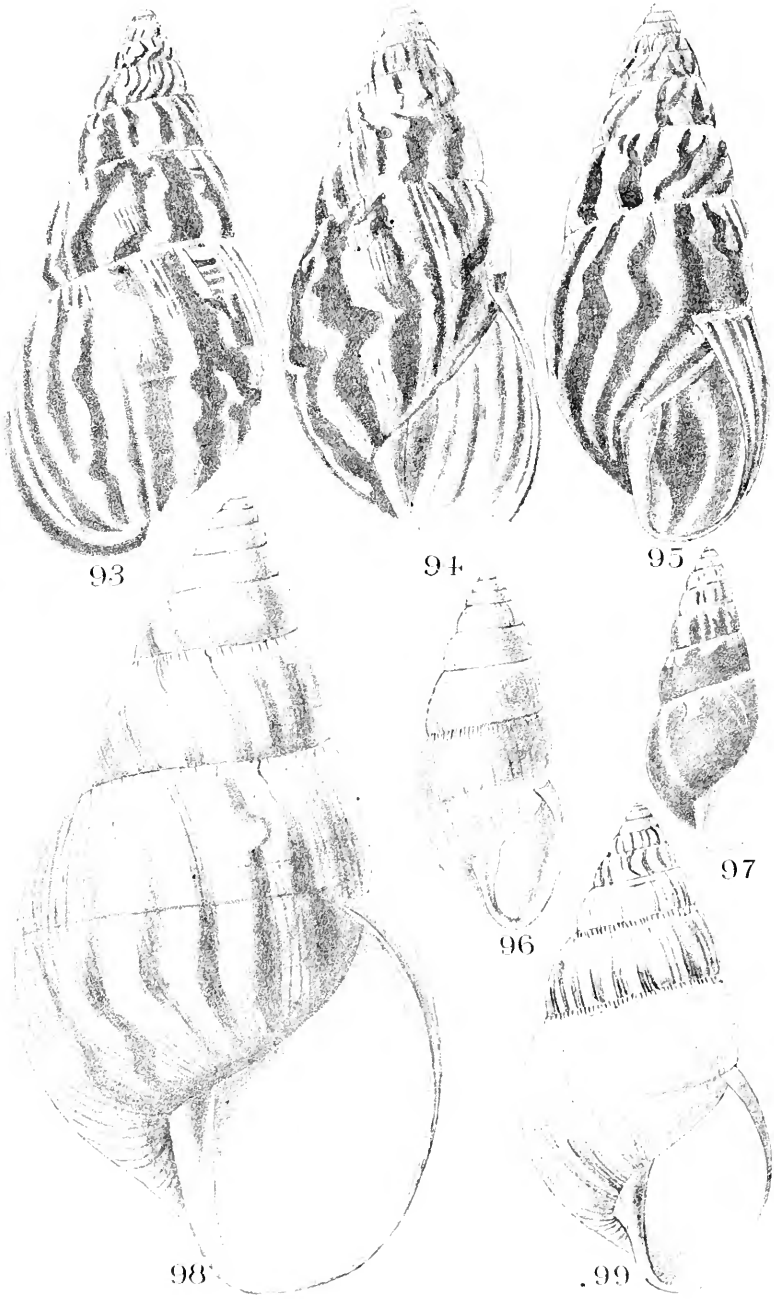

88

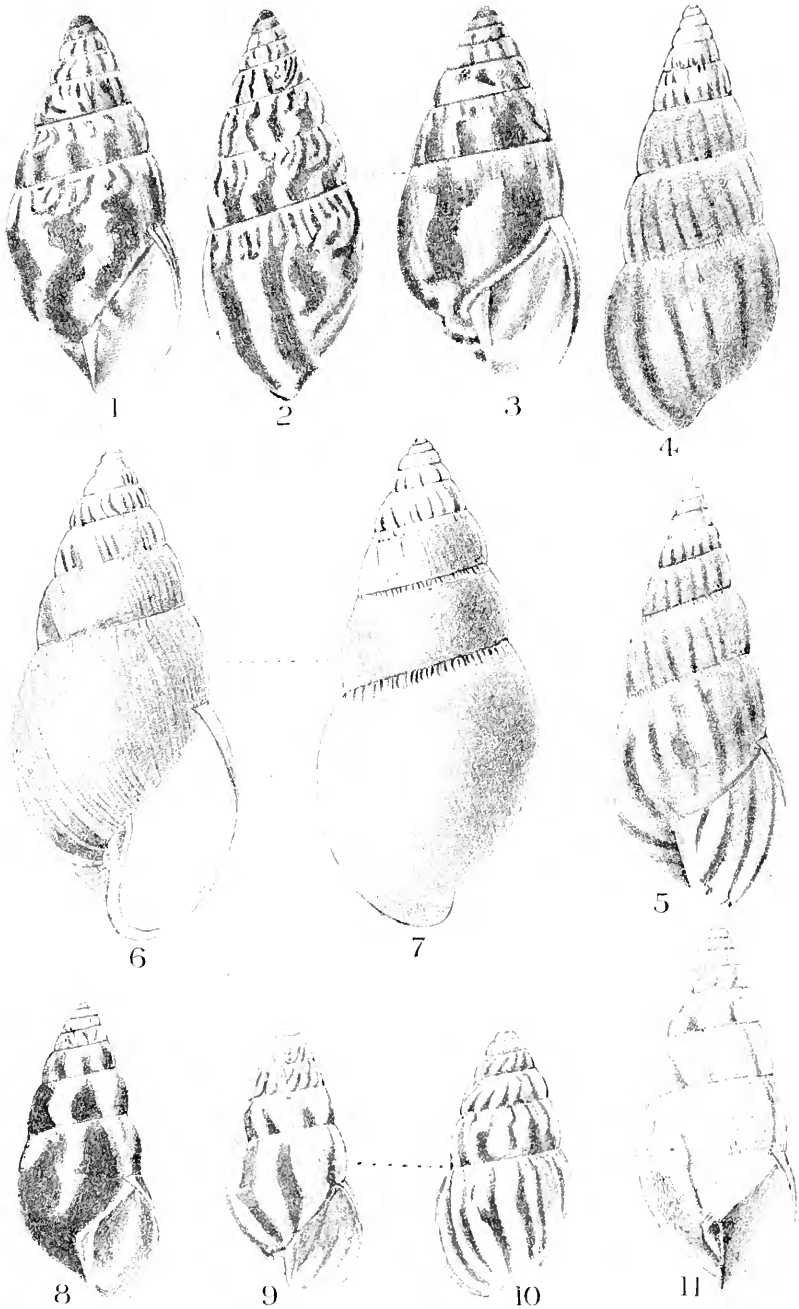

89

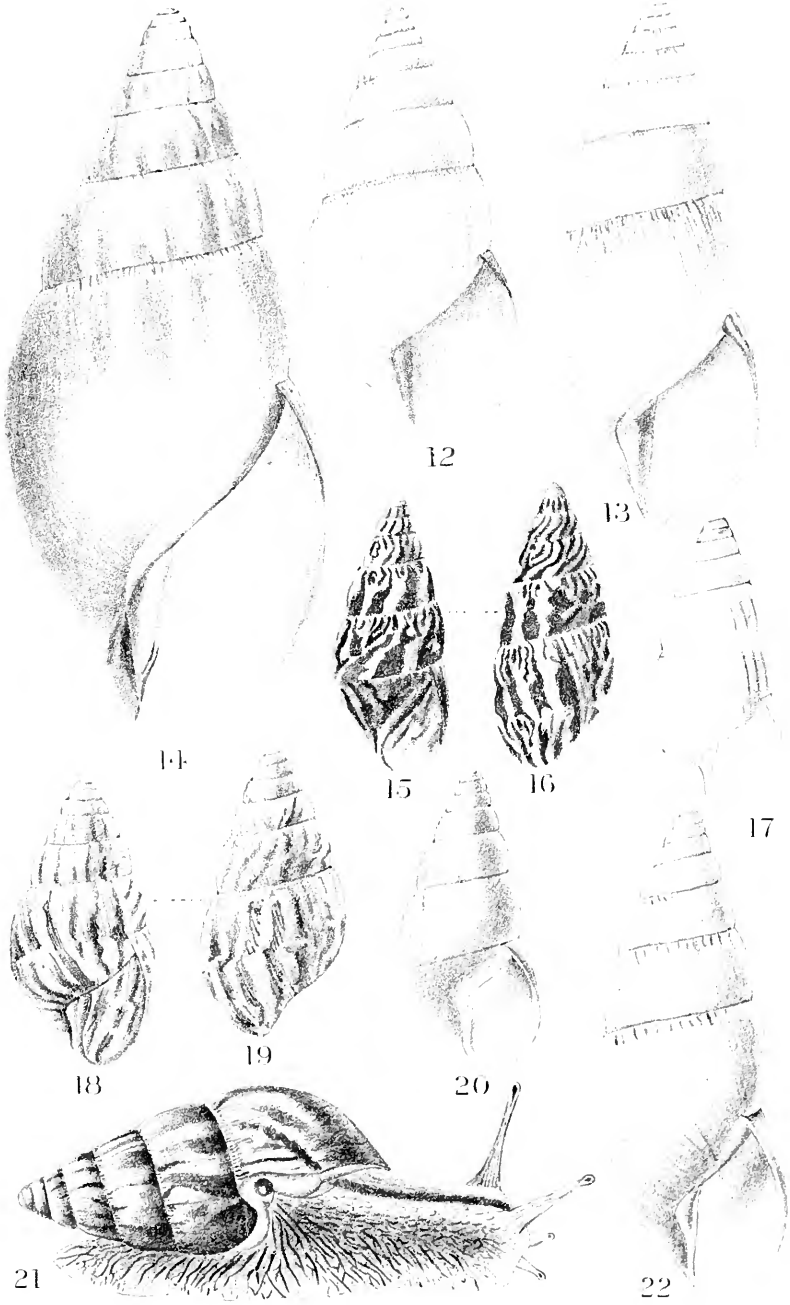

90

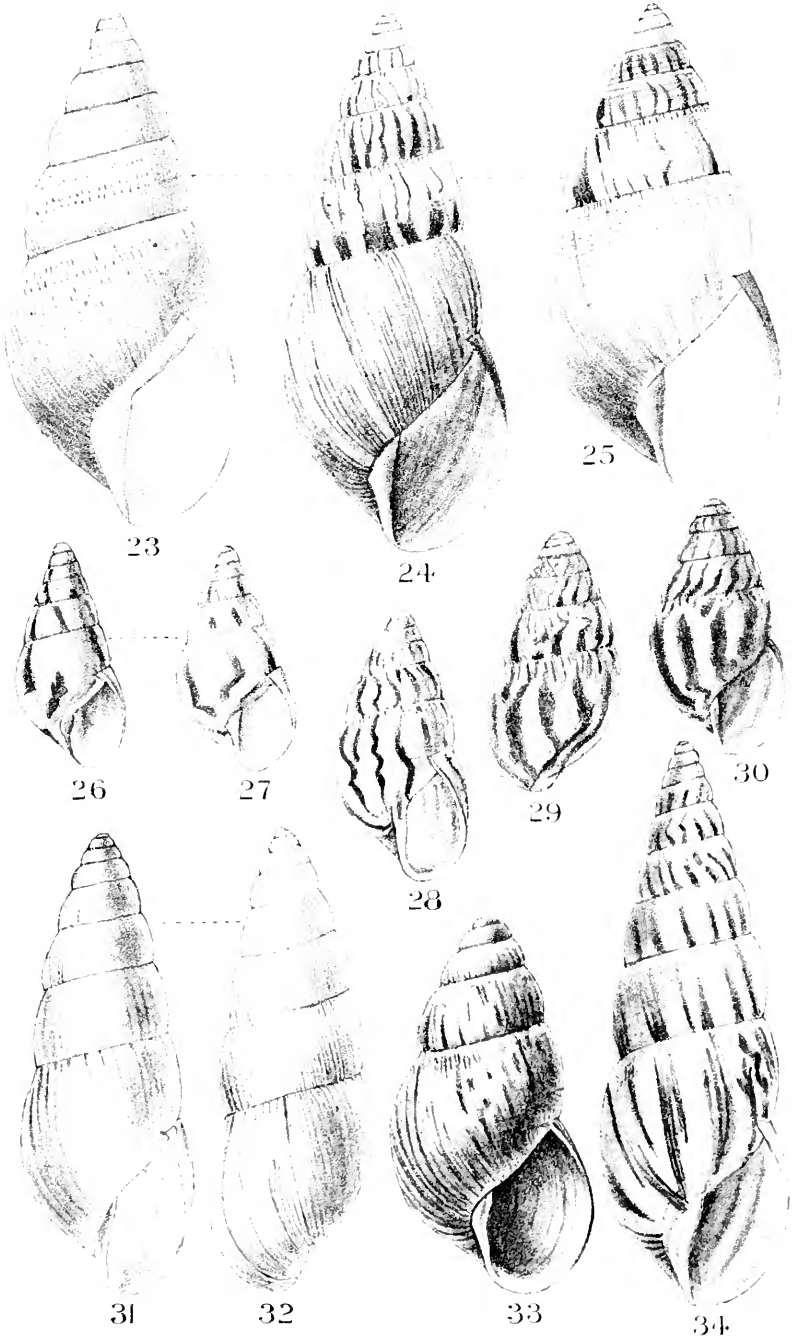

91

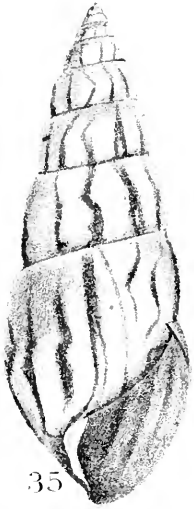

92


93
94
95
96
97
98
99


1
2
3
4
5
6
7
8
9
10
11


12
13
14
15
16
17
18
19
20
21
22


23
24
25
26
27
28
29
30
31
32
33
34


35


36


37


38


39


40

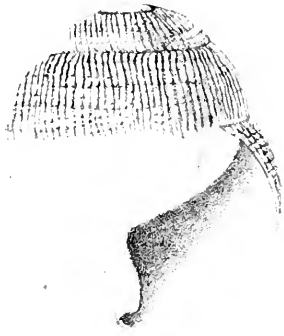

41


42


43


44


45



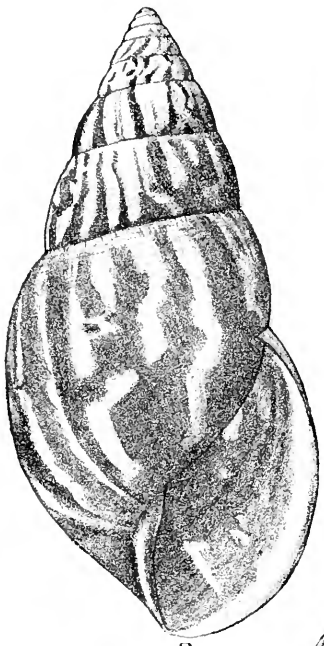
46

47

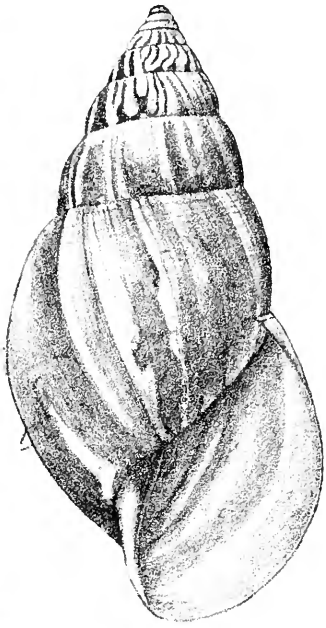
48

49

1

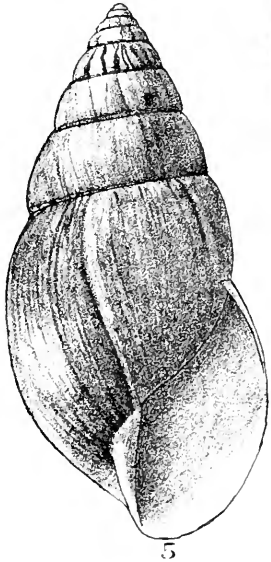


2

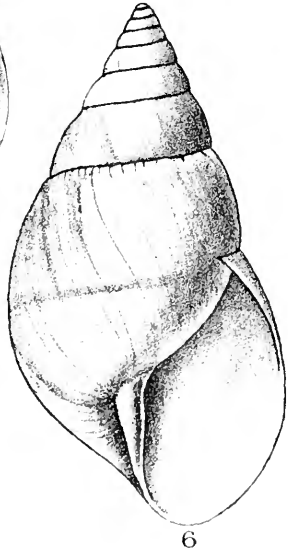


3

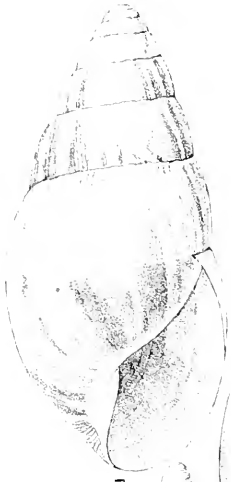
4



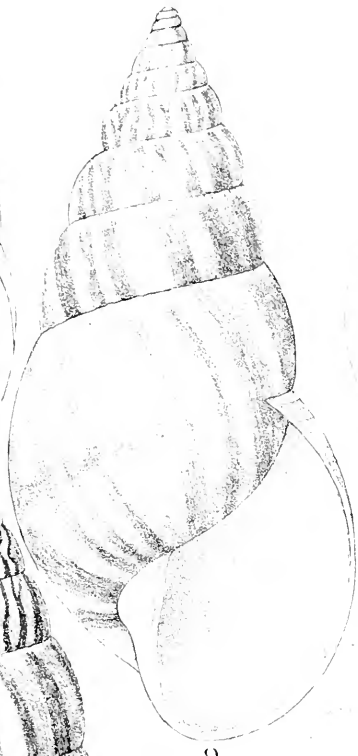
5



6

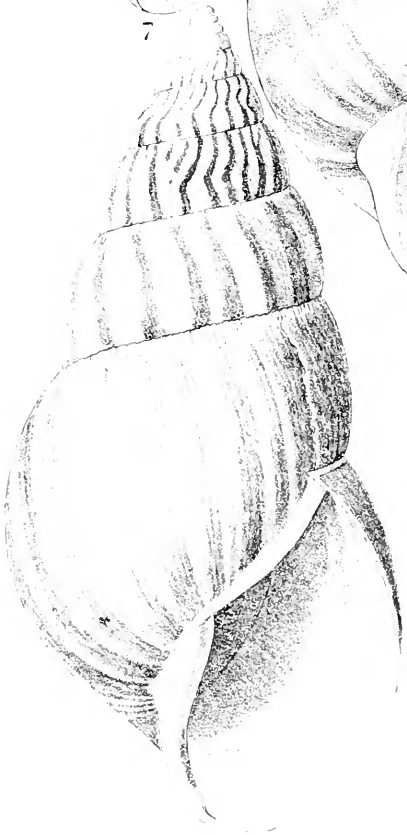


7

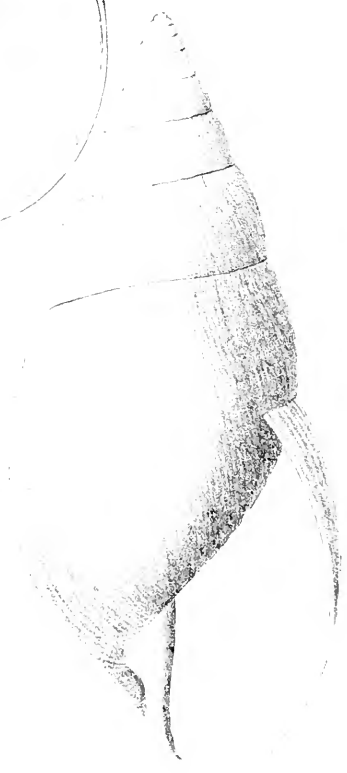


9

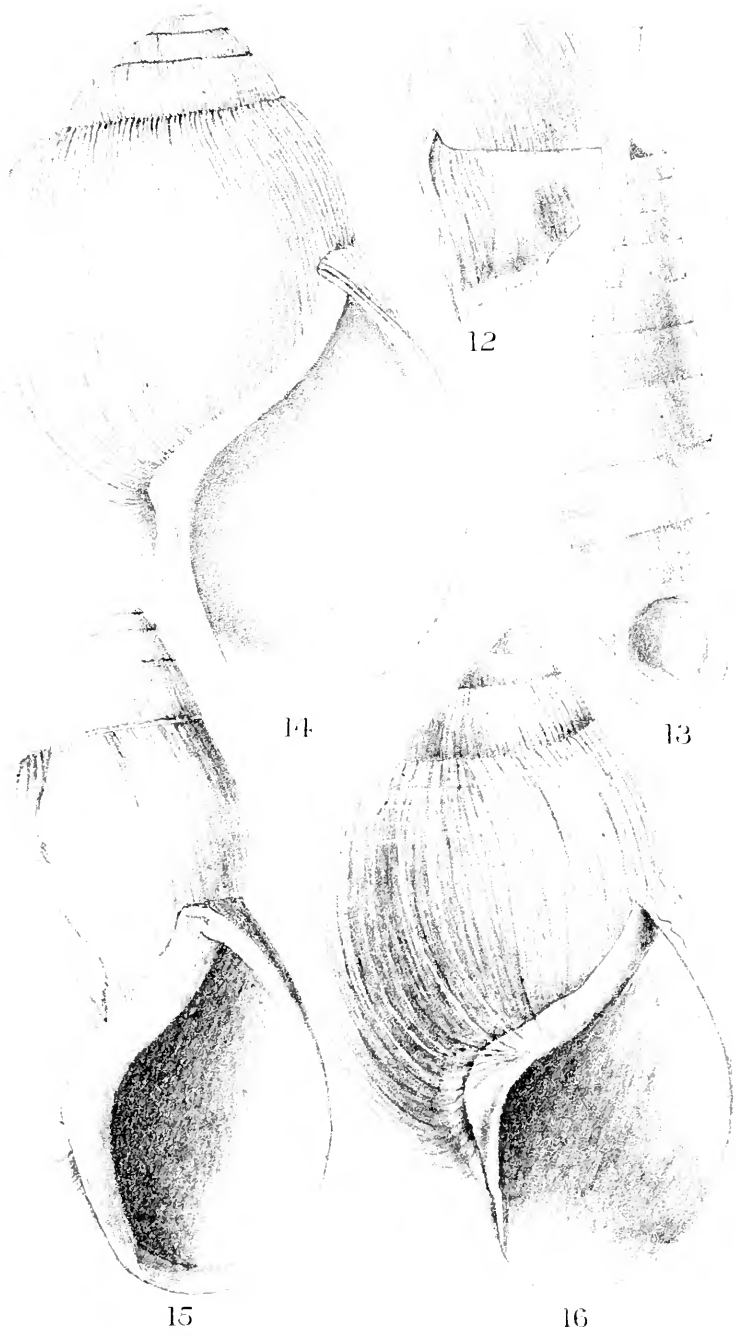
8



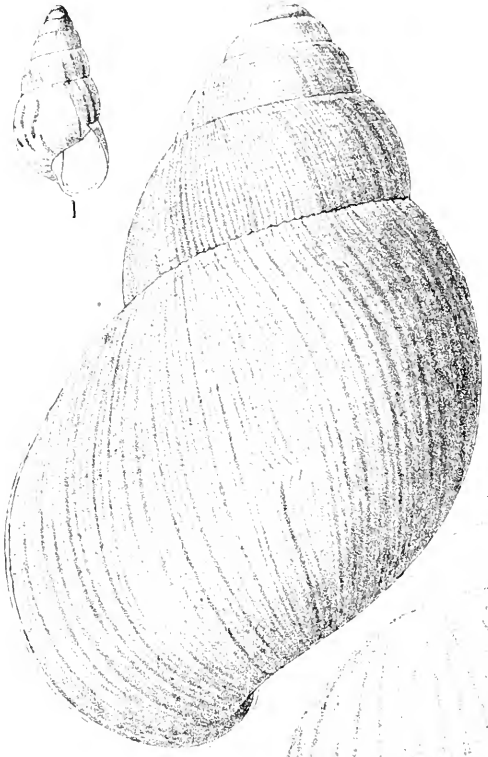
10



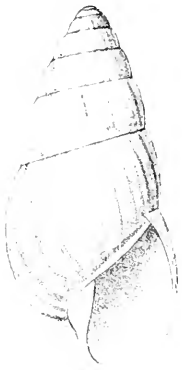
11


12
14
13
15
16

1

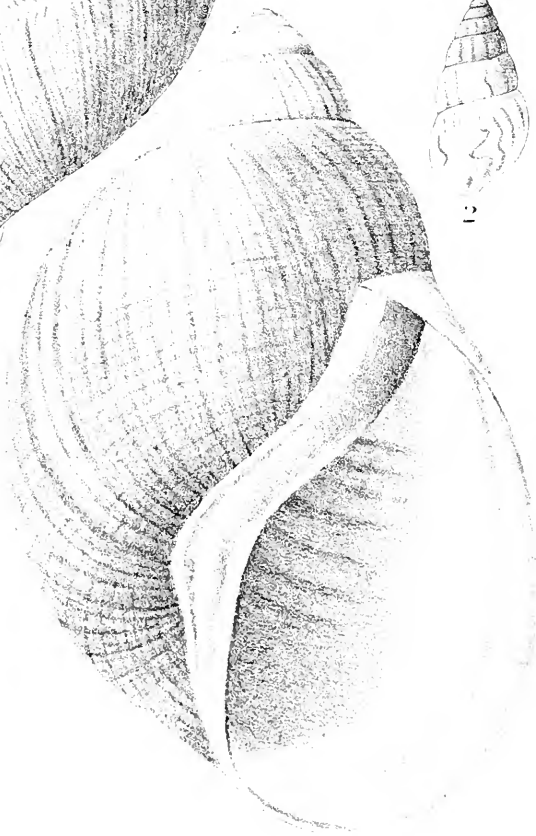


5



3

2



6

4

24

25

26

27

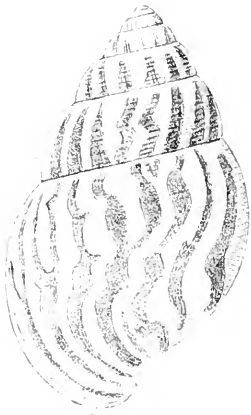
28

29

30

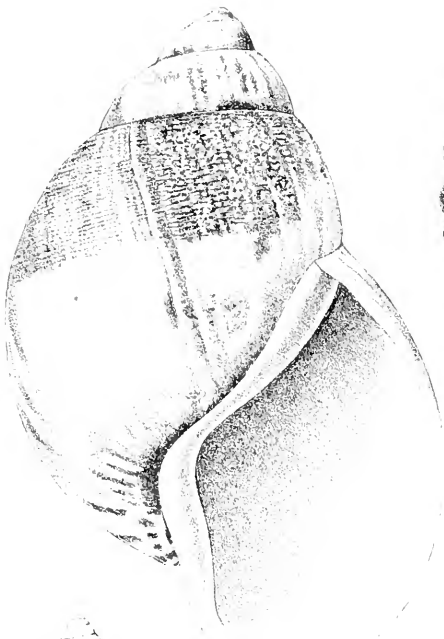
31

32



33

34



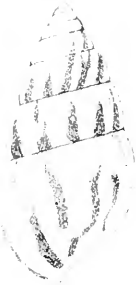
7

9

10

11

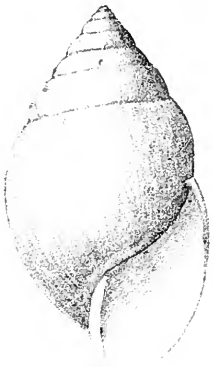
12



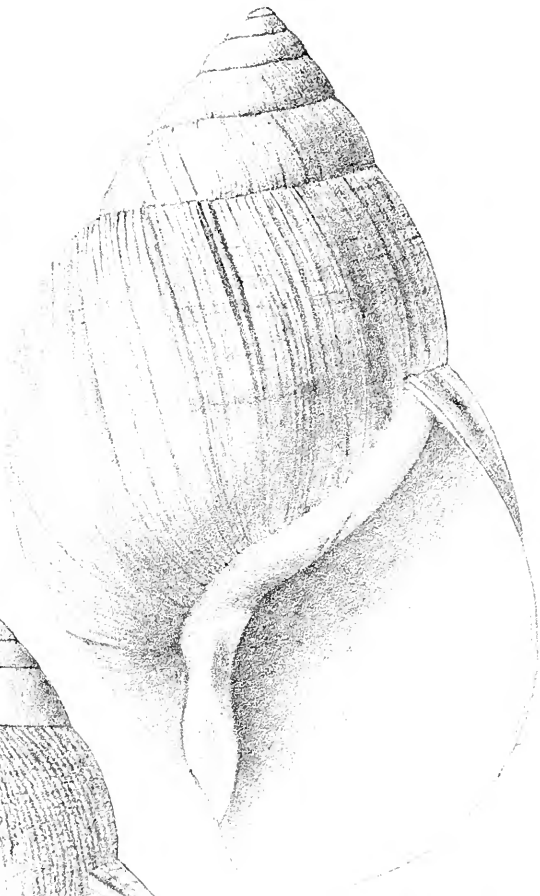
13

14 15

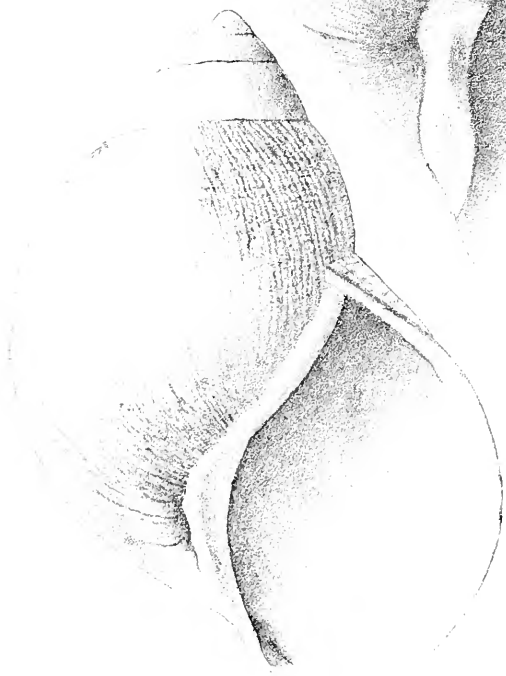
8



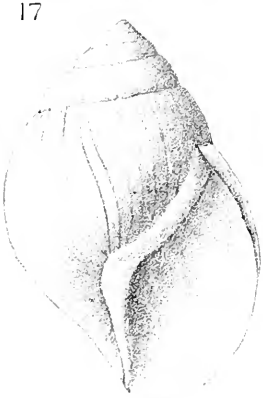
16



17



18



19

1

2

3

4

5

6

7

8

9

10

11

12

13

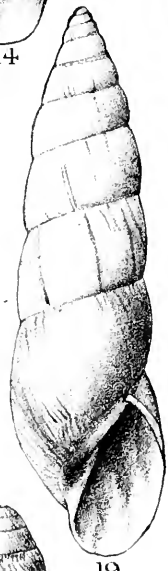
14

15

16

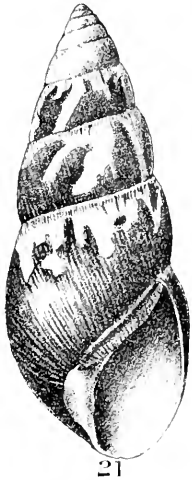
17

18



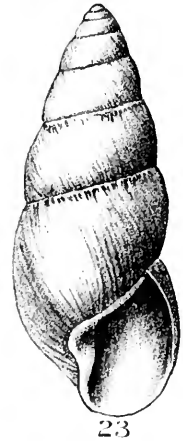
19

20



21

22



23


23

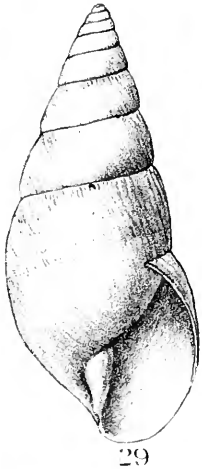

24

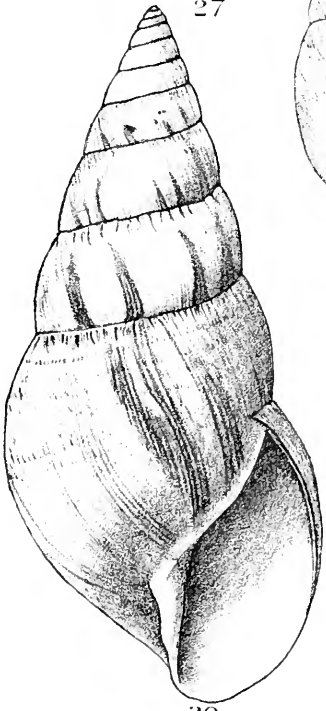

25


26

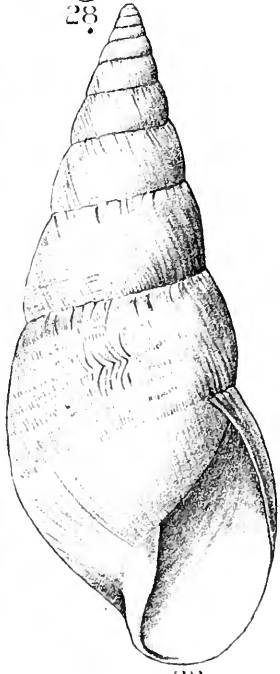

27


28


29


30


31


32

33

34

35

36

37

38

39

40

41

42

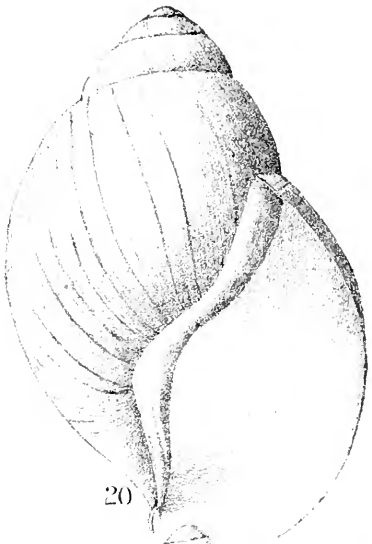
43

44 45

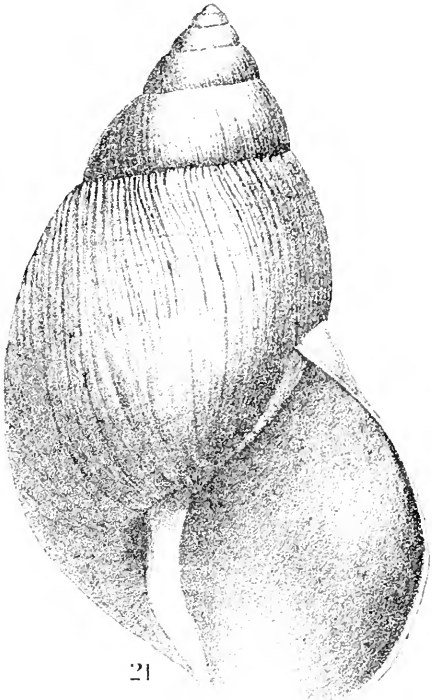
46

47

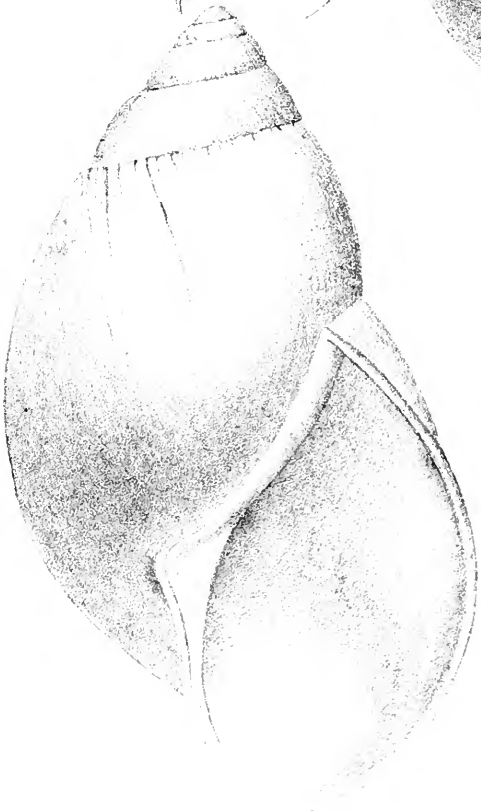
48



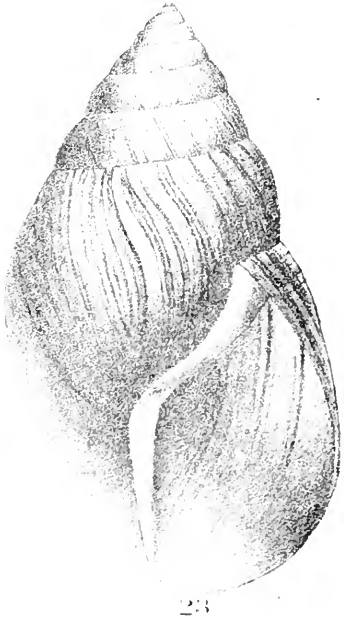
20



21



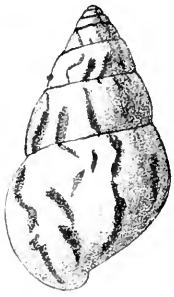
22



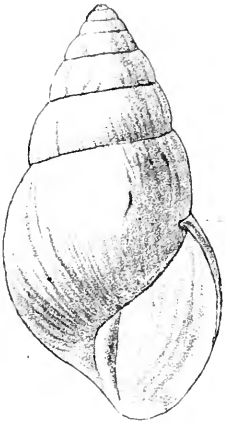
23

1

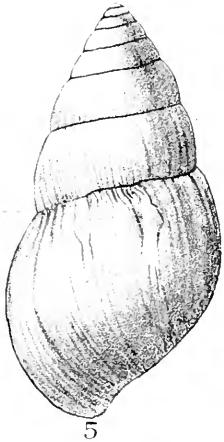
2



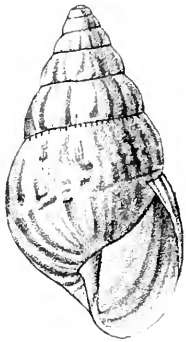
3



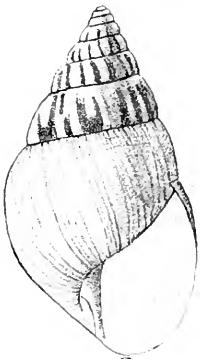
4



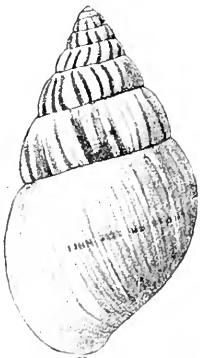
5



6

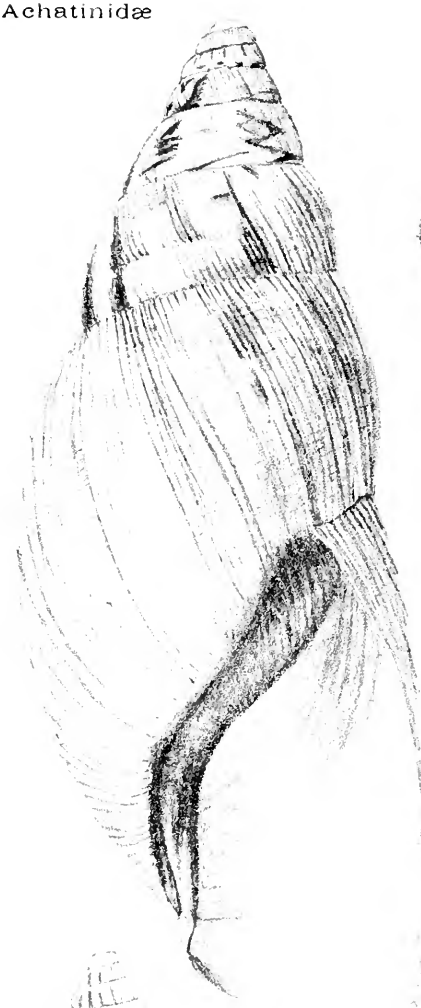


8



9

7

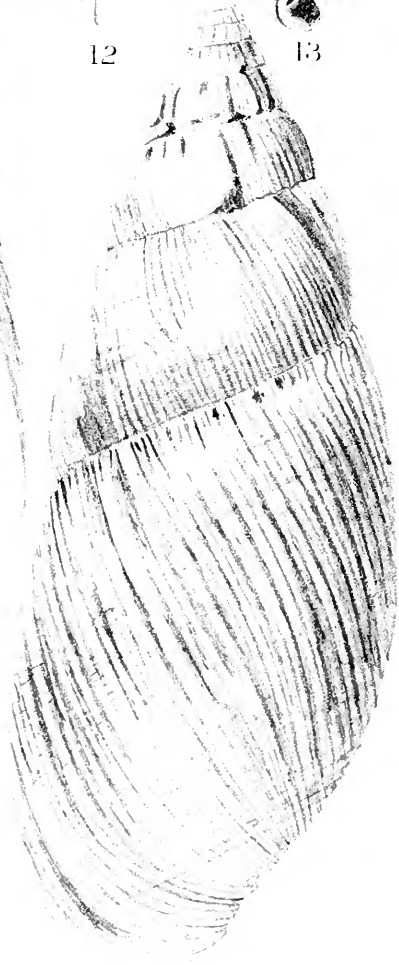


10

12

13

14



11