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THE MOLLUSCA COLLECTED BY THE UNIVERSITY OF MICHIGAN-WILLIAMSON EXPEDITION IN VENEZUELA

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PART V

This paper is the fourth of a sequence of studies on the molluscan fauna of Venezuela, and finishes the description of the terrestrial members. It deals especially with the families Achatinidæ, Urocoptidæ, Clausiliidæ and Veronicellidæ; the arrangement and treatment are the same as those outlined in the forewords to parts III (1925, this series, no. 156) and IV (1926, this series, no. 167). Parts III to V also include notes on a collection of shells obtained by a University of Michigan Expedition to the sand hills and forests around Dunoon, near the mouth of the Demerara River, British Guiana. Usually, these notes are included in the discussion of related Venezuelan forms, and those names of extralimital species which do head divisions of this paper are preceded by an asterisk (*).

ACHATINIDÆ

All of the Venezuelan species belong to the subfamily Subulininæ (Stenogyrinæ auct.); the anatomy of this group seems to place it near the very base of the Holopod stem. In several genera, the foot has a rather definite peripodal sulcus (cf. Strebel & Pfeffer, 1882, Beitr. Kennt. Mex. V, fig. xviii–15), which seems to correspond to the furrow above the true pedal groove of the Aulacopoda (cf. part IV of this series, 5, fig. xvii–87). In addition, the kidney may also somewhat resemble those in certain Endodontidæ (cf. Connolly, 1925, Trans. R. Soc. S. Afr. XII, 140, 146, 147). In most Subulininæ, this last structure is quite triangular (cf. Pilsbry, 1905, M. C. XVII, 211, fig. lxv–44, and 1907, XVIII, 281, fig. xlv–8) as in the Bulimulidæ or even the Oleacinidæ (cf. Str., 1878, III, fig. v–2 with fig. xx–2 of this paper), but, when so shaped, is longer than the pericardium, as is not the case in the other two families. As will be detailed later, the kidney of Neosubulina (fig. xxii–9) is short and quite transverse so as to be quite similar to that in the Streptaxidæ (cf. Pils., 1908, XIX, p. x, fig. lii–5). On the other hand, the excretory organ of the typical Achatininæ (cf. Pils., 1905, p. xii, fig. lxiv–64) is distinctly elongated along the pulmonary vein so as to resemble the shape in the Helicidæ (Part IV, figs. xii–62, 65), Rhytidæ (Pils., 1908, p. xi, fig. lii–4) and Haplotrematidæ (*l.c.*, fig. 6). Thus, the pallial complex in the family Achatinidæ shows modifications which approach the conditions in most of the main evolutionary lines of the Holopoda (+ Agnathomorpha).

Subulina octona (Bruguière), and race *strebeli* von Martens

Bulimus octonus Brug. (1792, Encycl. Meth., I, 325), Guadeloupe and Saint Dominique. *Stenogyra octona* Mart. (1873, Festschr. Ges. Nat. Fr. Berlin, 191), Chino, Caracas, La Guaira, Merida, Ejido; Jousseaume (1889, Mèm. Soc. Zool. France, II, 237), Valencia; Wiegmann (1894, Zool. Erg. Reiss. Niederl. Ost-Ind., III, 210, figs. xv, 18–26, xvi, 1–7), anatomy. *Subulina trochlea* Str. & Pff. (1882, 115, figs. xviii–1, 12–16, 18–21), anatomy. *S. octona strebeli* Mart. (1898, Biol. Cent. Amer.,

299), Campeche, Mexico (giant race); Vanatta (1915, Naut., XXIX, 83), Cariaquita. *S. octona* Pils. (1906, M. C. XVIII, 222, figs. xxxix, 28–37, 39, 40), Puerto Cabello.

One shell from Rio Macuto (H, I, b, 1) and twenty-three animals from coconut nursery at Boquerón (H, III, 27). Dunoon, British Guiana: numerous specimens. The shells from Boquerón, although sexually mature, are much smaller than those from the other localities.

Dimensions[1]

	Shell		Aperture		Whorls
	alt.	diam.	alt.	diam.	
H, III, 27; largest	14.3	27(3.8)	22(3.1)	68(2.1)	9
Dunoon, B. G.; largest	23.3	22(5.1)	21(4.9)	63(3.1)	9½

Wiegmann (*l.c.*) has very thoroughly described and figured the dentition of this species; it is especially characterized by the almost complete dominance of the tricuspid condition, which reaches practically to the margins of the ribbon, where a few of the teeth may develop an accessory ectocone. I have also examined the radula of a dried specimen from Boquerón.

The anatomy of two specimens from Dunoon is also quite similar to that detailed by Wiegmann (*l.c.*). The posterior region of the kidney is very similar in shape to that of Leptinaria (my fig. xx–2) and has a similar short truncation against the hindgut, but the anterior angle extends forward along the pulmonary vein so that the entire organ is at least three times as long as the pericardium. However, the structure which Wiegmann described and figured as the actual penis is only a heavy, muscular sheath which surrounds its swollen base. This sheath (fig. xx–99) is formed by a stout band of muscle which branches off from the right snout retractor (*i.e.*, the ventral branch of the right free retractor, which also gives off the smaller right ocular); the unattached portion of this sheath-retractor is short and stout, but it can

[1] See note 33, page 34; Occ. Pap. Mus. Zool. Univ. Mich., no. 152. As they are the same throughout the Achatinidæ, the descriptive headings will be omitted from the tables of dimensions which follow.

be separated from the cluster of snout retractors back to near the origin of the right ocular. The stout vas deferens comes down the side of the uterine stalk, forms coarse convolutions in the crotch between the latter and the penis, is caught into the sheath-retractor, and then proceeds up along the slender portion of the penis, which it at first equals in diameter. The parallel portions of the vas deferens and penis are bound loosely together by a very delicate, easily broken sheath, composed of interlacing fibers. The actual penis consists of three regions: a flagellar appendix, a long, slender region, and a swollen base inside of the heavy sheath. The apical appendix is about 1/6 the length of the entire organ; it has thick, internally plicate walls and a quite large cavity, which opens into the lumen of the penis on one side of the penial papilla. The vas deferens enters the penial wall a little above the base of the flagellum and opens into the cavity of the penis through a rather elongate papilla. The slender region of the penis is about 2/3 of its length and has a relatively large, simple lumen with quite thin walls. The basal portion forms the remaining 1/6 and is 4 or 5 times the diameter of the slender region; it develops a large lumen and thick, muscular walls, which are complexly folded internally. The penial retractor is over half as long as the entire copulatory organ, arises from the diaphragm near the base of the uterus, and inserts on the apex of the flagellum. This complicated apparatus appears to be a remarkably efficient structure instead of a vestigial one, as suggested by Wiegmann (pp. 214–5); nevertheless, I am inclined to agree with him that this species is probably protandrous.

Obeliscus (Stenogyra) octogyrus (Pfeiffer)

Bulimus octogyrus Pfr. (1856, Mal. Bl., III, 45), Caracas. *Stenogyra plicatella* Guppy (1868, Ann. Mag. N. H., (4) I, 434), Trinidad. *Opeas octogyrum* Pils. (1906, 206, figs. xxix, 75, 77, 79). *O. octogyrum plicatellum* Vanatta (1915, 82), Cariaquita.

Twenty specimens from Estación Táchira and La Fría (H, II, b, 35, 38, 40, 41). Dunoon, British Guiana: seven examples.

Since the publication of the Manual (1906, 269), Dr. Pilsbry has decided that this species is closer to Obeliscus than to Opeas; its general form, columellar twist and radula (see below) do seem to relate it distinctly with the subgenus Stenogyra. At present, I can see no reason for the recognition of *plicatella* even as a subspecies, but larger series might show minute differences between the Venezuelan and Trinidad specimens.

		Dimensions			
octogyrus (Pfr.)	12.5	21(2.7)	24(3)	50(1.5)	8
plicatella (Guppy)	13	27(3.5)	23(3)		8–9
	15	23(3.5)	13(2)		
H, II, b, 38; largest	12.4	24(3.0)	24(3.0)	57(1.7)	8
Dunoon, B. G.; largest	14.2	21(3.0)	23(3.2)	56(1.8)	8½

The radular formula (fig. xxi–5) of a dried specimen of *O. (Stenogyra) homalogyrus* ("Shuttl." Pfr.) from Sancti Spiritus, Cuba (A. N. S. P. 95042) is $26 + 1 + (18/3 + 8/4_{+})$. The central is not unlike that of Opeas although the mesocone is relatively more prominent. The inner laterals are also similar to those of both Subulina and Opeas, but they too show this dominance of the mesocone. However, the outer laterals become distinctly asymmetric and slightly more elongate in form. The tricuspid condition is maintained until the 19th tooth; the remainder are more symmetric and may split the major cusps into several minor ones, although usually the tricuspid facies remains evident to the edge of the ribbon. This radula appears closer to those of Subulina and Synopeas than to that of Opeas s.s., but it is also much like that of Neosubulina (see below). The jaw is similar to that in Neosubulina (1924, this series, no. 152, fig. xvi–64), although somewhat straighter (i.e., less strikingly crescentic).

The dentition of a dried specimen of *O. octogyrus* from Estación Táchira (H, II, b, 35) is practically the same as in *O. homalogyrus,* but the teeth are more minute and less numerous, as might be expected in a smaller species. The radular formula is $21 + 1 + (14/3 + 7/4_{+})$.

Obeliscus (Rectobelus) rectus, new species and section

Two shells from leaf mould in heavy, lowland forest at La Fría (H, II, b, 40).

Shell (fig. xxiii–15): subcylindric, with very stout, obtuse apex; ivory horn-colored, almost opaque (dead). Whorls: 11 (maximum observed), with shallow suture. Nepionic whorls: 1½, rapidly expanding; growth striae very weak; practically no spiral sculpture. Neanic whorls: slightly decrease in diameter so that third whorl is narrower than second. Later whorls: flattened; macroscopically smooth and shining; growth striae scarcely arcuate, faint and widely separated on sides but more deeply impressed above so as to slightly but distinctly crenulate the suture; no definite spirals. Aperture: lanceolate, with long axis noticeably oblique to that of shell. Peristome: simple and sharp. Columella: with a low, but definite, spiral thickening which makes it appear slightly subtruncate; reflected so as to completely close umbilicus.

Dimensions

O. rectus, type	10.6	35(2.38)	27(1.82)	69(1.25)	11
O. subuliformis (Moric.)	22	14(3)	.....	.....	14

This species may be rather closely related to the much larger *Helix subuliformis* Moricand (1836, Mém. Soc. Phys. Genève, VII, 427, fig. II–3), from near Bahia, Brazil. The new section **Rectobelus** (genotype *O. rectus*) agrees with Lyobasis Pils. (1903, M. C., XV, 175; 1907, 274) of Cuba, and with Ischnocion Pils. (1907, 324) from Colombia, in its remarkably large and obtuse apex. It also approaches Lyobasis, of which I tentatively consider it a subdivision, in the development of a columellar callus, but has much less prominent growth sculpture and less oblique aperture than does that Cuban group. In form and sculpture it more closely resembles Ischnocion, which also seems to be a subgenus of Obeliscus rather than of Leptinaria, but *O. rectus* lacks both parietal and palatal lamellæ.

Opeas (Synopeas) beckianum (Pfeiffer)

Bulimus beckianus Pfr. (1846, Symb., III, 82), Opara (*sic*). *B. caraccasensis* Reeve (1849, Con. Icon., V, fig. xix–580), Caracas. *Stenogyra micra* Mart. (1873, 191). *Opeas caracasensis* Str. & Pff. (1882, 101, figs. xviii–4, 10, 11), anatomy. *Synopeas caracasensis* Jouss. (1889, 239), Valencia; type of Synopeas. *S. simoni* Jouss. (1889, 239, fig. ix–1), Colony Tovar, Caracas; smaller form. *S. carinulata* Jouss. (1889, 240, fig. ix–6), Caracas; juvenile. *O. beckianum* Pils. (1906, 189, figs. xxvii, 40–46, 54, 55); Vanatta (1915, 82), Cariaquita; H. B. Baker (1923, this series, no. 135, 8, fig. I–6), radula.

Eighty-two specimens from Rio Macuto, San Esteban, Palma Sola, Aroa, Estación Táchira and La Fría (H, I, II, abc, 1, 2, 20, 22, 23, 35, 36, 40, 41); the most widely disseminated Achatinid in the region. Dunoon, British Guiana: seven individuals. This species varies considerably with the locality; as a rule, the specimens from among rocks in the mountains are smaller and have relatively heavier sculpture than those from the leaf mould of the lowland forests. The radula is more like that of Subulina than like that of the typical group of Opeas.

		Dimensions			
beckianum (Pfr.)	9	39(3.5)	30(2.7)	55(1.5)	9
carinulata (Jouss.)	6	37(2.25)	.....	.....	7½
simoni (Jouss.)	7	36(2.5)	.....	.....	8½
H, I, a, 23; largest.....	7.2	35(2.5)	25(1.8)	83(1.5)	8½
Dunoon, B. G.; largest.....	8.6	37(3.2)	27(2.3)	78(1.8)	8½

Opeas (Synopeas) gracile (Hutton)

Bulimus gracilis Hutton (1834, Jour. As. Soc. Bengal, III, 84, 93), India. *Stenogyra subula* Mart. (1873, 192), Caracas. *Subulina panayensis* Semper (1870–93, Reisen, II–III, figs. viii–15, xi–17, 21), anatomy of variety. *Stenogyra panayensis* Wiegm. (1894, 223, figs. xvi, 8–10), radula. *O. gracile* Pils. (1906, 198, fig. xxviii–70), Maracaibo.

Seven specimens from Rio Macuto, Palma Sola, Boquerón and Estación Táchira (H, I, b, 1; II, b, 20, 28, 35).

Wiegmann (*l.c.*) has already very adequately figured and described the radula of this species; like that of *O. beckianum*

and *Subulina octona,* it carries the dominance of the tricuspid teeth to very near the margin of the entire ribbon. I have verified this peculiarity by the examination of Venezuelan material, and so am tentatively including *O. gracile* in Synopeas, despite the considerable divergence in shell characters.

	Dimensions				
gracilis (Hutton)	13.6	.....	.....	.....	12
H, II, b, 20; largest.....	12.9	24(3.1)	21(2.7)	70(1.9)	9

Opeas pumilum (Pfeiffer)

Bulimus pumilus Pfr. (1840, Arch. Naturg., I, 252), Cuba. *O. goodalli* Pils. (1906, 200, figs. xxviii, 72–74), Venezuela.

I did not obtain this species in Venezuela, but have examined the radula of a dried specimen from San Juan Bautiste, Tabasco, Mexico (A. N. S. P. 63343). Radular formula (fig. xxi–3) : $21 + 1 + (9/3 + 12/4_{+})$. The central has three conical cusps which project only a short distance beyond the heavy support; its base is coffin-shaped as in most Subulininæ. The inner laterals are tricuspid and almost symmetrical. The teeth gradually decrease in size out to the 6th, and then more rapidly diminish out to the 10th, which develops an accessory ectocone. Beyond this, they become shorter but relatively broader and develop numerous, minute cusps. In the central and lateral regions, the transverse rows are almost straight, but they curve obliquely anteriad near the 7th tooth.

Albers (1850, Die Hel., 175) established Opeas to include a number of species. Two years later, Herrmannsen (1852, Ind. Gen. Mal., Suppl., 96) gave *Bulimus subula* (= *O. gracile*) as the sole example, but did not definitely designate that species as type. Thus, Albers-Martens (1861, Die Hel., 265) made the first actual choice of genotype, *Stenogyra goodalli,* which is a synonym of *O. pumilum.*

As already indicated, the radula of Synopeas (and Subulina) retains the tricuspid type of tooth to near the outer margins of the ribbon. On the other hand, the radula of Opeas s.s. (as used in this paper) shows a marked differentiation

into tricuspid laterals and broad, multicuspid marginals. In addition, the shell of Opeas s.s. usually has quite prominent and more or less arcuate growth wrinkles.

Opeas pellucidum (Pfeiffer)

Bulimus pellucidus Pfr. (1847, P. Z. S., 231), Prov. Merida, New Granada; Rve. (1849, fig. lxviii–487). *O. pellucidum* Pils. (1906, 206, fig. xxix–80).

Four examples from leaf mould in heavy forest near La Fría (H, II, b, 40, 41). In addition, two young specimens from Dunoon, British Guiana, are nearer to this species than to any other yet described.

The size of *O. pellucidum* is approximately that of *O. gracilis,* but the whorls of the former are noticeably more convex and the apex is relatively larger and more obtuse, somewhat as in *O. micra.* The growth wrinkles are stronger than in *O. gracilis,* but weaker and much more closely spaced than in *O. micra*; near the upper margin of each of the later whorls, they increase in prominence (as indicated in Reeve's figure) and distinctly crenulate the suture. The apical whorls are broader and much less convex (i.e., with shallower suture) than those of *Pseudopeas translucidum* (figs. xxiii–17, 20); their traces of spiral sculpture are very weak and irregular as in most species of Opeas.

	Dimensions				
pellucidum (Pfr.)	11.5	35(4)	35(4)	50(2)	7
H, II, b, 41; largest	11.1	31(3.4)	27(3.0)	60(1.8)	7½

The radular formula (fig. xxi–4) of a dried specimen from La Fría (H, II, b, 40) is $23 + 1 + (7/3 + 16/4_{+})$. The dentition is very similar to that of *O. pumilum,* but the central is relatively larger, the outer laterals are slightly more asymmetric, and the intermediate teeth between the laterals and marginals (8th to 10th) are multicuspid. The jaw, from the same specimen, is thin and crescentic; it is composed of numerous, very narrow plaits, which appear to be firmly soldered together although their ends give a jagged outline to the margin.

Opeas micra (D'Orbigny)

Helix micra Orb. (1835, Guer. Mag., 9), Bolivia. *Stenogyra octonoides* Mart. (1873, 192), Caracas. *O. micra* Pils. (1906, 193, figs. xxvii–49, 56, 57); Vanatta (1915, 82), Cariaquita.

Ten young specimens from Rio Macuto and La Fría (H, I, b, 1; II, b, 40, 41). Dunoon, British Guiana: one juvenile.

The radular formula of a slightly immature, dried specimen from La Fría (H, II, b, 41) is $17+1+(6/3+11/4_{+})$. The dentition is very similar to that of *O. pellucidum,* but the teeth are much smaller and less numerous.

Pseudopeas (Dysopeas) translucidum, new species and subgenus

Twelve specimens from leaf mould in heavy forest at Estación Táchira and La Fría (H, II, b, 38, 40, 41). Type locality: near Rio Lobaterita at Estación Táchira (H, II, b, 38).

Shell (fig. xxiii–17): subulate, faintly greenish in color and translucent. Whorls: 8½ (maximum observed), with deep suture. Nepionic whorls (fig. xxiii–20): globose with 2 to 2¼ convex whorls separated by deep suture; growth wrinkles very weak and crossed by numerous (about 35 visible near beginning of second whorl), fine, but prominent and regular, spiral ridgelets, which extend down from the very apex. Later whorls: uniformly convex; growth wrinkles low, but angular, scarcely arcuate, slightly narrower than their interspaces, gathered into small and irregular tufts so as to crenulate upper suture of each whorl: spiral sculpture weaker, mainly visible between the riblets, becoming very weak on last whorl. Aperture: elliptic, with long axis slightly oblique to that of shell. Peristome: simple and sharp. Columella: almost straight, with a very low, spiral thickening or callus; slightly revolute so as to render umbilicus rimate.

Dimensions

P. viviparum (Miller)	6	50(3)	42(2.5)	60(1.5)	5½
P. translucidum, type	10.2	45(3.21)	32(2.28)	73(1.65)	8¼
P. subopacum, type	10.4	46(3.13)	33(2.28)	73(1.67)	8

The radular formula (fig. xxi–6) of a dried animal from La Fría (H, II, b, 41) is $23+1+(10/3+13/4_{+})$. The tricuspid central has quite long and aculeate cusps. The first lateral is slightly asymmetric and the outer ones are elongate and have the entocone distinctly raised on the mesocone. The 11th tooth is multicuspid and the outer teeth are broad with deep backs and numerous minute cusplets. The transverse rows are shaped much as in Obeliscus.

The dentition (fig. xxi–7) of a dried specimen of *P. saxatile stanleyvillense* Pilsbry from Stanleyville, Congo, West Africa (A. N. S. P. 118775) is very similar but the outer laterals are less markedly asymmetric and the teeth are fewer in number. The formula is $21+1+(9/3+12/4_{+})$. The jaw of the same specimen is slender and elongate, but agrees with those of Opeas and Obeliscus in general structure.

The new subgenus Dysopeas, genotype *P. translucidum,* is distinguished from Pseudopeas s.s. by: 1) the greater prominence of the spiral sculpture on the protoconch, 2) the extension of these spirals over the later whorls, and 3) by the greater asymmetry of the outer laterals in the radula. Besides the type and *P. subopacum* (see below), this South American group may include *Opeas viviparum* Miller (1878, Mal. Bl., 197; 1879, fig. vi–4) from Ecuador, although the shape of this shell and the description of the apical spiral sculpture seem to approach the conditions in Leptopeas (see below). Although none of my specimens contain embryos, the relatively large embryonic shell appears to indicate that the Venezuelan species are also ovoviviparous.

Pseudopeas (Dysopeas) subopacum, new species

Eighteen specimens from San Esteban, Aroa and Boquerón (H, I, b, 4, 23; II, b, 2, 26, 29; III, 27). Type locality: leaf mould in heavy forest near Boquerón (H, II, b, 26). This species is quite similar to *P. translucidum* and is compared to the latter in the following description.

Shell (fig. xxiii–18): subulate-ovate; much heavier, nearly opaque and more distinctly greenish in color. Whorls: 8

(maximum observed). Later whorls: distinctly flattened in outline; last whorl subangulate below, at least in slightly immature specimens; growth riblets higher, so as to appear broader than their interspaces; sutural tufts less prominent; spiral sculpture also heavier, so as to distinctly crenulate the sides of the riblets, even on the last whorl. Aperture: slightly more oblique. Columella: more uniformly thickened, so as to obscure the spiral callus. Other characters as in *P. translucidum.*

P. subopacum looks a little like the figure of *Subulina* (*Nothus*) *urichi* E. A. Smith (1896, J. of C., VIII, 235, fig. viii–2), but has neither the subtruncate columella nor the relatively smooth surface indicated in the description of that Trinidad species.

**Neosubulina scopulorum* H. Burrington Baker

N. scopulorum H. B. Baker (1924, 89, figs. xvi–60, 63), Aruba, Dutch Leeward Islands; compare *N. harterti* H. B. Baker (1924, 87, figs. xiv–53, xvi–64) for jaw and radula.

In the paper cited above, Neosubulina is separated from Leptinaria on the basis of radular differences. *N. scopulorum* and the typical group, to which it belongs, are not known from the mainland, but certain South American species do have somewhat similar radulae, so the description of the anatomy of this Aruban species may not be out of place.

Foot: remarkably small in comparison to shell; abruptly pointed posteriad; sole of retracted specimen with smoothish central region, bounded on each side by wider zones with deep transverse furrows; side coarsely areolate with a visibly serrate, peripodal groove a short distance above edge of sole, so as to correspond in position and appearance with upper sulcus of *Scolodonta eudiscus* (H. B. Baker; part IV, 5, fig. xvii–87); top of tail flattened; caudal mucous pore practically terminal. This foot must be very similar to that of *Subulina octona* (Str. & Pff.; 1882, figs. xviii, 14–16).

Mantle edge (figs. xxii–9, 10): entire, widely thickened along palatal and basal margins, narrow and thin along parie-

tal; with two short but quite extensive lappets along palatal and basal edges, and a conspicuous body fold, which extends from parietal edge to dorsal and left sides of foot stalk.

Lung (fig. xxii–9): elongate, roof about 4 times as long as its posterior margin and 8 times length of pericardium, thin and transparent; occupying last two whorls. Heart and pericardium: small; auricle receives a renal vein, a ureteric vein from along primary ureter, and the large pulmonary vessel, which runs backward from near pneumostome; lung venation very weak, only visible near pericardium. Kidney: roughly oblong but with concave anterior and posterior borders; long axis almost at right angles to that of lung; base about equal in length to pericardium, against which it lies; apical side slightly shorter, against hindgut. Primary ureter: thin-walled, swollen near internal ureteric orifice; runs transversely along anterior side of kidney; continued by large secondary ureter; external ureteric orifice at apex of rather spacious pneumostomatic vestibule.

Ovotestis (fig. xxii–11): small, imbedded high in liver; composed of four conical groups of claviform tubules. Hermaphroditic duct: long, mainly straight, but thickened and closely convoluted at about 2/3 of its length; with a small, claviform talon near its anterior end. Albumen gland: relatively very large (enormously so in slightly immature animals), elongate and flattened; alveolar in structure. Uterus: very small in non-pregnant animals; swollen so as to be quite transparent in gravid ones, which may contain as high as four embryos. As already described (*l.c.*), each young shell is surrounded by a thin membrane, which becomes impregnated with granular material so as to form a fragile shell. Spermatheca: wrapped closely around uterine stalk; terminal sac small, ovoid and thin-walled; stalk very short, slender for about half its length but basally expanded into a large, thick-walled body. Vagina quite short. Prostate: short and quite broad in non-pregnant animals; attenuate in gravid ones; sperm duct apparently closed off from uterus. Free vas

deferens: extends down to angle between vagina and penis; coils around middle of latter and proceeds up other side to enter at apex of epiphallar portion. Penis: very small in relation to remainder of genitalia of gravid individuals, but not out of proportion to size of foot and vagina; surrounded by a sheath which tapers gradually towards apex, on which retractor inserts.

The internal structure of the male copulatory organ (fig. xxii–12) is described from a mount in glycerin jelly of the genitalia of a non-gravid but otherwise apparently mature individual (I suspect that this species is protandrous). The penial sheath invests the penis closely and is thicker at the base than at the apex. The penis consists of two portions: a cylindrical epiphallus at its apex, and a stouter penis proper, which is constricted a short distance below its apex. The former has a very narrow lumen which is slightly enlarged at about 2/3 of its length; it ends in a short, blunt penial papilla. The penis proper has a more spacious cavity and thick muscular walls, that internally develop a few, transversely crenulate, prominent, longitudinal plicæ, one of which seems to attain the dimensions of a pilaster.

Free retractor system: very similar to that in *Neobeliscus calcarius* (Pils., 1907, 281, fig. xlv–7) with exception of penial retractor, which arises separately from diaphragm. The right ocular retractor passes across the penial apex so as to be closely associated with the penial retractor although completely separate from it.

Leptinaria (Pelatrinia) helenæ Pilsbry

L. helenae Pils. (1907, 324, fig. xlvi–6, 7), Caracas. *Neosubulina helenae* H. B. Baker (1924, 86).

As already indicated, Ischnocion seems to belong in Obeliscus rather than in Leptinaria or Neosubulina. Pelatrinia, only known from the unique type shell, should perhaps be left in Leptinaria until the radula and anatomy have been studied; it appears closer to Leptopeas (see below) than to Leptinaria s.s.

**Leptinaria (Leptopeas) bequaerti* Pilsbry

L. bequaerti Pils. (1926, Naut., XXXIX, 79, fig. iv–1), Carvoeiro, Brazil.

Dunoon, British Guiana: eighteen specimens: some of these are adult, while the type appears to be an immature shell. An adult shell (fig. xxiii–16) has 6¼ whorls and develops a thin but definite callus just inside of the peristome; this callus is less prominent than that in *L. parana* Pils. (1926, 79, fig. iv–2), from Para, Brazil. *L. bequaerti* has a rather thick epidermis, which is covered with exceedingly fine, but regular, spiral striæ from its apex to its last whorl. *L. charlottei* Fred Baker[2] (1922, Naut., XXXVI, 32) is another quite similar, but smaller species; its type also seems to be an immature shell.

	Dimensions				
L. bequaerti Pils.	6.0	47(2.8)	42(2.5)	.....	5½
Dunoon, B. G.; adult	7.7	38(2.9)	32(2.5)	59(1.5)	6¼

The radular formula (fig. xxii–13) of a specimen from Dunoon is 27 + 1 + (8/3 + 19/4 +). The dentition and jaw are very similar to those of Neosubulina (*l.c.*); in fact, the central and inner laterals are almost identical with those of the island group. The outer laterals are similarly asymmetric, but decidedly more elongate. The 9th tooth, as in *N. scopulorum* (*l.c.*), usually acquires an accessory entocone. The marginals are also quite similar in shape, but have somewhat higher backs, are more numerous, and increase the number of cusplets until the tricuspid facies becomes quite obscure. The transverse rows are almost straight between the 7th laterals, but the outer ends curve obliquely anteriad to straighten out again near the margins of the ribbon.

For comparison, the radulæ of three Antillean species have been examined: *Leptinaria striosa abdita* (Poey), *L. salleana*

[2] This is *L. imperforata* Fred Baker (1913, P. A. N. S. Philadelphia, LXV, 646, fig. xxi–10), which is preoccupied in Leptinaria, but not in Neosubulina or Leptopeas.

(Pfr.) and *L. paludinoides* (Orb.). The shells of these have a much thinner epidermis than that of the South American species, so they appear glossy instead of horn-colored as in the latter. The spiral striæ are limited to the apical whorls and even there they are very weak.

The radular formula (fig. xxiv–23) of a dried specimen of *L. striosa abdita* from Marianao, Havana, Cuba (A. N. S. P. 77002; S. N. Rhoads!), is $22+1+(8/3+14/4_{+})$. The entire radula is very similar to that of Neosubulina (*l.c.*); the laterals have much shorter backs than those of *L. bequaerti.* The marginals retain more or less of the tricuspid facies, are rather broad with short backs, and develop numerous cusplets.

The dentition of a dried specimen of *L. salleana* from San Domingo City, San Domingo (A. N. S. P. 91433; Henry Prime!) is almost identical with that of *abdita,* but the 7th tooth commonly splits the ectocone. The formula is thus $22+1+(6/3+18/4_{+})$.

The radula (fig. xxiv–25) of a dried specimen of *L. paludinoides* without locality (A. N. S. P. 24096; Swift Collection) is also quite similar but the outer laterals are tilted inwards to a greater extent, and have relatively more slender mesocones. The formula is $23+1+(8/3+15/4_{+})$. This radula slightly approaches that of Lamellaxis (see below), but the outer laterals are considerably smaller than the inner ones as is the case with Neosubulina and the species just discussed.

As indicated, the radulæ of all of these species agree more closely with that of Neosubulina (or even Pseudopeas) than with that of Leptinaria s.s. (or even Lamellaxis). In *L. bequaerti* and Neosubulina, the apical whorls have very fine, but regular, spiral striæ and the columella is basally expanded to form a very oblique lamella. In the Antillean species, the texture of the shell and epidermis approaches that in Lamellaxis; the spiral sculpture appears much reduced; and the columellar lamella is heavier and lower. However, in Neosubulina, *L. bequaerti* and the Antillean species, the columella is much longer than in Lamellaxis or Leptinaria s.s., so that the spiral lamella is much more oblique and emerges quite near the base of the columellar wall of the aperture.

Unfortunately, the soft parts of all of these apparently intermediate species are unknown. As the shell characters do intergrade through a series of species so as to closely approach those in Lamellaxis, my new subgenus **Leptopeas,** genotype *L. bequaerti,* is retained in the genus Leptinaria, although I suspect that some of its members, at least, will be found to have more in common with Neosubulina or Pseudopeas than with Leptinaria s.s. As defined in the following key, Leptopeas includes both the Antillean and South American species just discussed.

A′ Apical whorls slender, with prominent growth sculpture; later whorls more bulimoid ..... Subg. *Pelatrinia* Pils.

A″ Apical whorls with weak growth sculpture; all whorls with uniform increase in diameter ..... (B)

B′ Sixth lateral of radula distinctly shorter than first; mesocones of all laterals not much longer than bases of same teeth; marginals transverse or squarish; shell with long columella, so that spiral lamella, when present, is very oblique and emerges near base of columellar wall of aperture ..... Subg. *Leptopeas,* new

B″ Sixth lateral of radula distinctly longer than first; mesocones of outer laterals much longer than bases of same; marginals with elongate, rounded reflections; shell with relatively short columella, so that spiral lamella or cord is less oblique and emerges near middle of columellar wall of aperture ..... (C)

C′ All laterals of radula with small but distinct entocones; parietal lamella absent; columellar armature usually a spiral cord ..... Subg. *Lamellaxis* Str.

C″ Some laterals without separate entocones; parietal lamella present and columellar lamella extensive (at least in young shells) ..... Subg. *Leptinaria* s. s.

Leptinaria (Leptopeas) venezuelensis (Pfeiffer)

Spiraxis venezuelensis Pfr. (1856, Mal. Bl., III, 47), Caracas. *Lamellaxis venezuelensis* Str. & Pff. (1882, 112, fig. vii–19). *Leptinaria venezuelensis* Pils. (1907, 305). *L. intermedia* Pils. (1907, 304, fig. xl–12), Venezuela.

I did not obtain this shell in Venezuela, but the collection from Dunoon, British Guiana, contains four specimens that appear to belong to the same species as the type of *L. inter-*

media. After examination of Strebel's figure and description of Pfeiffer's type, Dr. Pilsbry himself suggested the identity of *venezuelensis* and *intermedia.*

Dimensions

L. venezuelensis, type (Strebel)	11.4	41(4.7)	33(3.7)	51(1.9)	6½
L. intermedia Pils.	9.7	39(3.8)	32(3.1)		6½
Dunoon, B. G.; largest	10.3	35(3.6)	33(3.4)	56(1.9)	6¾
Embryonic shell	1.25	93(1.16)	65(0.81)	102(0.83)	2

The radular formula (fig. xxii–14) of a dried specimen from Dunoon is $27+1+(9/3+18/4_{+})$. The central has an aculeate mesocone with a minute cusp on either side. The first lateral is strikingly asymmetric, as the entocone is considerably larger than the ectocone. The 2nd to 6th laterals slightly increase this asymmetry, while the 7th to 9th are very divergent, with the entocone high on the mesocone. Beyond this, the teeth decrease greatly in size and tend to split the major cusps, although they usually retain at least a trace of the tricuspid facies. The transverse rows are similar in shape to those of *L. bequaerti.*

This radula diverges still more than that of *L. bequaerti* from the primitive type in the Subulininæ, but it does not especially approach that of Lamellaxis. The shell is remarkable for the simplicity of its columella; it also has a thick epidermis, but the spiral striæ appear to be almost limited to the apical whorls. *L. venezuelensis* is ovoviviparous, as one specimen contains several embryos; the shells of these (fig. xxiii–19) are more globose than those of Neosubulina (*l.c.*), but have similar weak spiral sculpture.

Leptinaria (Leptopeas) elata, new species

Two specimens from Dunoon, British Guiana, "under log in woods on sand reef."

Shell (fig. xxvi–E): slender bulimoid with quite obtuse apex; translucent but rather dull; pearly in color but with a distinct horny tinge. Whorls: 7¼ (maximum observed),

scarcely convex but slightly shouldered above with well impressed suture; apical 1½ with weak spiral striations and indistinct growth lines; remainder with low, subequal, quite arcuate growth wrinkles and almost obsolete traces of spirals. Aperture: lanceolate with long axis at about 20° to that of shell. Peristome: simple and sharp; palatal wall distinctly arcuate as viewed in profile. Columella: quite long so that very weak and oblique spiral cord emerges at 2/3 length of columellar wall of aperture; revolute above so as to render umbilicus broadly rimate.

	Dimensions				
Type shell	14.2	42(6.0)	37(5.1)	67(3.4)	7¼

The shell of *L. elata* is the largest yet described in Leptopeas. The weak columellar cord distinctly approaches the almost obsolete condition in *L. venezuelensis*, but the shell is not quite so slender in form and somewhat resembles that of Lamellaxis in texture.

Leptinaria (*Leptopeas*) *simplex* (Guppy)

Spiraxis simplex Guppy (1868, Ann. Mag. N. H. (4), I, 438), Trinidad. *L. simplex* Pils. (1906, 301, fig. xl–14); Vanatta (1915, 82), Cariaquita.

This peculiar species with widely spaced thread-costae has comparatively distinct, although rather widely separated, spiral ridgelets on the otherwise smooth apical whorls. The aperture is more elongated than is usual in Leptopeas, so the oblique, thickened lamella emerges rather high on the columellar wall, although considerably below its middle. The structure of the lamella and the glassy texture of the shell resemble those of the Antillean species.

A fragmentary radula (fig. xxiv–24) from a half-grown, dried specimen in the Cariaquita lot (A. N. S. P. 105211; Stewardson Brown!) has been examined. The tricuspid central develops an aculeate mesocone and a peculiarly acuminate, anterior projection. The other teeth are like those of Neo-

subulina or the Antillean group of Leptopeas, but the 7th tooth acquires an accessory ectocone. The marginals can not be counted in my preparation, but have squarish backs and numerous cusplets, as do those of the groups just mentioned. The number of the tricuspid teeth probably increases in mature individuals, and some change in their form may also take place.

Leptinaria (Lamellaxis) martensiana, new species

Thirty-eight specimens from Estación Táchira and La Fría (H, II, b, 35, 38, 40, 41), and one rather divergent shell from San Esteban (H, I, a, 3). Type locality: flats of a small brook near Rio Lobaterita, about one kilometer above Estación Táchira (H, II, b, 35).

Shell (fig. xxiii–22): elongate ovate, with swollen last whorl and small apex; translucent and glassy. Whorls: 6 (maximum observed), with well impressed suture; apical 1½ practically smooth; remainder with quite prominent, scarcely arcuate, widely spaced thread-costæ, which are only distinct on the upper curvature of the last whorl and which have weaker growth-wrinkles in their interspaces. Aperture: lanceolate, with long axis at about 30° to that of shell. Peristome: simple and sharp, but with a very thin, whitish callus just inside basal and lower palatal edges. Columella: short (as in the subgenus), so that the quite prominent, angular, spiral cord emerges near middle of columellar wall of aperture; revolute and slightly swollen above so as to render umbilicus narrowly perforate.

	Dimensions				
L. martensi (Pfr.)	9.3	48(4.5)	43(4)	58(2.3)	6
L. martensiana, type	8.5	51(4.31)	43(3.63)	65(2.35)	6
L. martensiana parva, type	6.1	53(3.20)	44(2.65)	66(1.75)	5½

This species is very similar in appearance to *L. martensi* (Pfr.; 1856, P. Z. S., 318) from Córdoba, Mexico, but has a more prominent and angular, columellar cord, and more evenly rounded whorls; the specimens from western Venezuela also

have a narrower umbilical slit but the one shell from San Esteban is as widely perforate as the Mexican species. Future collections may show the two forms to be connected by intermediates.

The radular formula (fig. xxiv–26) of a dried paratype is $28+1+(11/3+17/4_{+})$. The central has a narrow reflection, an aculeate mesocone with a very small cusp on either side, and a coffin-shaped base with the widest portion considerably higher than in the preceding species. The first lateral is noticeably asymmetric and its mesocone extends considerably beyond the posterior edge of the base. Both the asymmetry and the length of the mesocone increase out to the 6th or 7th tooth, although the bases gradually diminish in size, so that these outer laterals are actually longer than the inner ones. The 12th tooth develops an accessory ectocone. The marginals usually have elongate oval reflections, with an aculeate entocone, a peculiarly spatulate mesocone, and a variable number of ectocones, but the outermost teeth often split the mesocone as well. The transverse rows are shaped much as in *L. lamellata* (fig. xxi–8), but are even straighter; the marginals are less definitely arranged in echelon.

For comparison, the radula of a dried specimen of *L.* (*Lamellaxis*) *panamensis* Pilsbry, from Panamá City, Panamá (A. N. S. P. 45234; J. Zetek) has been examined. The formula is $28+1+(10/3+18/4_{+})$, and the dentition is almost identical with that of *L. martensiana.*

Leptinaria (Lamellaxis) martensiana parva, new subspecies

Ten specimens from Palma Sola (H, II, b, 20, 22). Type locality: near Caño Minapam (H, II, b, 20).

This is a considerably smaller shell (fig. xxiii–21) than typical *martensiana.* The thread-costæ are relatively weaker, but much more closely spaced and noticeably arcuate above. The aperture is slightly flattened basally and its upper palatal wall is distinctly arcuate as viewed in profile. The type does

not represent the full development of the shell, as a broken paratype has six whorls.

Leptinaria (*Lamellaxis*) *pachyspira* Pilsbry

L. pachyspira Pils. (1907, 305, figs. xlvi–8, 11), San Esteban.

Three juvenile specimens that appear to be this species, from San Esteban (H, II, b, 2) and Aroa (H, I, a, 23).

Leptinaria lamellata (Potiez et Michaud), and var. *concentrica* (Reeve)

Achatina lamellata P. & M. (1838, Gal. Moll. Douai, I, 128, fig. xi–7, 8). *Tornatellina funcki* Pfr. (1847, P. Z. S., 232), Merida Prov., New Granada; Jouss. (1889, 236), Valencia. *L. lamellata* Pils. (1907, 288, figs. xlii–39, 40, xliii–50); Vanatta (1915, 82), Cariaquita.

Achatina concentrica Rve. (1849, C. I. V, fig. xix–106), Bolivia. *L. lamellata concentrica* Pils. (1907, 290, figs. xlvi, 1, 3); long variety Pils. (p. 291, figs. xlvi–2, 4).

Nineteen specimens from Rio Macuto, San Esteban, Bejuma, Palma Sola, Aroa and La Fría (H, I, II, ab, 1, 2, 5, 7, 20, 22, 23, 40, 41). Dunoon, British Guiana: thirty-one examples. All of my shells have the thread-costæ of *concentrica,* although a specimen of typical *lamellata* is among those from Cariaquita. Most of the Venezuelan individuals are immature; the largest adult from San Esteban (H, II, b, 2) and all of the fully developed shells from Dunoon are representative of the long variety of Pilsbry. This large form with weak parietal lamella appears to deserve at least subspecific rank, although the immature individuals are only distinguishable from typical *lamellata* by their *concentrica* sculpture. However, *L. perforata* (cited below) agrees closely with this long variety in everything except size, and, in fact, the original measurements of *lamellata,* if correct, also indicate the longer shell. Large series of mature and immature individuals will be necessary in order to define clearly the geographic variation in this group.

		Dimensions			
L. lamellata (P. & M.)	15	43(6–7)			6
L. perforata (Pfr.)	18	42(7.5)	39(7)	50(3.5)	7
Long var. Pils. (A.N.S.P.2409)	16.1	40(6.4)	39(6.2)	66(4.1)	6¾
H, II, b, 2; largest	15.8	42(6.6)	40(6.3)	65(4.1)	6¾

The radular formula (fig. xxi–8) of a dried, half-green individual of the long variety from Dunoon, British Guiana, may be expressed as: $27+1+(5/3+2/2+2/3+18/4_{+})$. The central has a more nearly oblong base than in most of the preceding species, and its mesocone is very prominent as compared to the minute cusp on either side. The first lateral is practically bicuspid, as the entocone is only represented by a notched shelf on the side of the mesocone. The other laterals greatly increase the length of the mesocone and the weakness of the entocone until the 6th, and the crowded teeth in its vicinity, have almost the appearance of Oleacinid laterals. The 8th tooth again separates the entocone by a weak notch, and beyond this the teeth decrease rapidly in size. The 10th usually splits the ectocone. The marginals have elongate, roughly oval, transparent backs and numerous minute cusplets; the outer ones lose all trace of the tricuspid facies and are arranged in echelon.

The radula (fig. xxiv–27) of a dried paratype of *L. livingstonensis* Hinkley (A. N. S. P. 107609, A. A. Hinkley) from Livingston, Guatemala, is very similar to that of *L. lamellata.* The central has a deep notch in its anterior border and even smaller side cusps. The remainder of the laterals approach the Oleacinid condition even more closely than does *L. lamellata*; the 2nd to 10th teeth are bicuspid, their mesocones are still more aculeate, and the 12th tooth splits the ectocone. The formula is thus $33+1\,(1/3+9/2+1/3+22/4_{+})$.

The following anatomical account is based on a single specimen of typical *L. lamellata,* which was sent me from Trinidad, B. W. I., by Mr. W. E. Broadway. Although the animal survived the trip north, my description gives its appearance after preservation in alcohol.

Animal: almost colorless, even when alive. Foot: relatively much larger than that of Neosubulina, but rather similar in structure; sole more rounded posteriad, with central region poorly marked; peripodal groove still more irregular; dorsum of tail more evenly rounded. Mantle edge: also similar, but with weaker lappets and narrower parietal region; in addition, a heavy, broadly crescentic reflection extends over base of columella.

Lung (fig. xx–2): a little over five times as long as pericardium, occupying slightly more than last whorl. Pericardium and heart: elongate; auricle receives a renal, a ureteric and a large pulmonary vein, which arises near pneumostome and runs diagonally across lung; venation weak but quite evident, especially near pneumostome. Kidney: roughly triangular, with longest side along ureter; cardiac border slightly longer than pericardium and about equal to that along slightly oblique, visceral base; angle against hindgut slightly truncate; anterior portion thin and transparent. Primary ureter: swollen apically; continued by large secondary ureter along hindgut; external ureteric orifice at apex of pneumostomatic vestibule. As the kidney is shorter than is usual in the family (although longer than in Neosubulina), this pallial complex distinctly approaches that in the Oleacinidæ.

Ovotestis (fig. xx–1): small, imbedded in middle of liver; composed of three conical lobes, each of which consists of comparatively few, claviform tubules. Hermaphroditic duct: shorter than in Neosubulina but with similar coarse convolutions near its middle; apparently expanded at base, inside of albumen gland, into a small, ovoid lobe, which may represent a talon. Albumen gland: voluminous, but much stouter and shorter than in Neosubulina. Uterus: enormously swollen by nine large eggs, so that its walls, which consist of interlacing fibers, are very thin and transparent. Each egg is surrounded by a thin shell membrane and contains a large mass of yolk; embryonic development is evident but no shell rudiment is

present, although this may take place before oviposition. Spermatheca: coiled around uterine stalk; terminal sac small, thin-walled, and almost spherical; stalk slender apically but gradually swollen towards base; confluence with uterus very near penis (i.e., vagina scarcely recognizable). Prostate: short, but quite stout, composed of numerous claviform lobules; prostatic portion of sperm duct apparently closed off from uterus (it would require stained sections to be sure of this point). Free vas deferens: very stout, coarsely convoluted in crotch between penis and uterine stalk; enters penial sheath near base of same. Male copulatory organ; remarkably long and slender (although much less so than in Subulina), largely surrounded by a sheath. Penial retractor: almost as long as entire copulatory organ; arises as a broad band from dorsal surface of tail retractor (see below) on floor of haemocoele, passes dorsad between right and left groups of free retractors, becomes very slender, and inserts on apex of penial flagellum.

The internal structure of the male copulatory organ (fig. xx–100) is described from a mount of the genitalia in glycerin jelly, made after removal of the eggs. The organ itself is composed of two parts: a slender, apical flagellum, and a subulate penis, which is constricted just below its apex. The flagellum is quite similar in structure to the epiphallus of Neosubulina, but is relatively longer and more slender; it is not traversed by the vas deferens and opens into the penial cavity on one side of the penial papilla. The penis is invested closely by a thin sheath, which may also extend over the flagellum, as I can not recognize its upper limits in my preparation. The vas deferens runs up inside of the sheath and opens into the apex of the penial cavity through a very low papilla. The lumen of the penis is remarkably slender and apparently quite simple.

The free retractor system is fundamentally similar to that of most members of the Subulininae. At a little over twice the length of the buccal mass from the anterior end of the

haemocoele, the columellar muscle gives off from its dorsal surface a right band and a larger left one, and then broadens out into the fan-shaped system of tail retractors. The right band divides into a short ocular muscle and a stout retractor of the snout; the right ocular passes over the constriction near the apex of the penis. The left band gives off a short, stout pharyngeal retractor, which splits to insert on either side of the posterior end of the buccal mass, and then divides like the right band. The penial retractor, as already indicated, arises from the dorsal surface of the broad tail retractor, between and a short distance anteriad from the origins of the right and left free retractors.

As may be seen from the foregoing description, the radula and anatomy of Leptinaria s.s. are very different from those of Neosubulina, and can scarcely belong to members of the same genus. The considerable differences in the soft parts seem to give grounds for a hope that the future study of Lamellaxis and Leptopeas, which apparently have intermediate shell-characters and even radulae, will clear up their confessedly dubious relationships.

Leptinaria perforata (Pfeiffer)

Tornatellina perforata Pfr. (1856, P. Z. S., 336), Venezuela, unfigured.

Pfeiffer's dimensions indicate a species which is almost two millimeters longer than the largest specimen of the long variety of *L. lamellata* yet described; otherwise the characters of *L. perforata* agree very closely with those of the peculiarly South American form.

*Leptinaria gigas, new species

One specimen from "roots of perching plant in woods on sand reef" near Dunoon, British Guiana, and five young shells from nearby places.

Shell (fig. xxvi–F): ovate-conic, translucent but heavy, pearly horn in color. Whorls: 6½, swollen and rapidly ex-

panding so that last whorl is four times as high as remainder of spire. Growth sculpture: apical and subapical whorls much as in *L. lamellata concentrica*; last two whorls with regular, closely spaced, low and rounded wrinkles which are noticeably arcuate above. Spiral sculpture: practically absent on protoconch as usual in subgenus; last whorl with a few, macroscopic, impressed lines, which are irregularly spaced and may be due to some malformation. Aperture: broad, subauricular; palatal wall slightly flattened. Peristome: sharp but with weak internal callus; palatal edge distinctly arcuate in profile; ends connected along parietal wall by rather prominent callus, in which parietal lamella (prominent in younger shells) is indicated by a very weak and narrow thickening. Columella: revolute above so as to leave a funnelform umbilicus; lamella heavy but relatively low and rounded (extensive and sharp in young specimens).

	Dimensions				
Type	18.3	56(10.2)	48(8.8)	58(5.1)	6½

L. gigas looks like a magnified specimen of *L. lamellata,* although shells of same altitude as the latter are much more globose. It is approached in size by *L. perforata,* but is a much more globose and heavier shell, with a superficial resemblance to the genus Bulimulus.

Urocoptidæ

Brachypodella leucopleura (Menke)

Cylindrella leucopleura Mke. (1847, Zeit. Mal., IV, 2), habitat unknown. *B. leucopleura* Pils. (1903, M. C., XVI, 74, figs. xv, 9, 10, 14–16), Puerto Cabello, Caracas. *B. hanleyana* H. B. Baker (1923, part II, 26, 27), Aroa, Quebrada Seca.

Numerous specimens from vertical rock surfaces in damp places along mountain quebrada near Aroa (H, I, a, 23), and on rocks in dry arroyo near Quebrada Seca (H, II, a, 28). The young specimens aestivate with their shells practically

at right angles to the surface on which they are attached, but the adults hold the shell parallel to their support. The shells from Aroa develop a lesser number of whorls and are smaller than those from Quebrada Seca; the last whorl in the former also has weaker riblets but this is a characteristic of the penultimate whorls in the larger form. The following anatomical account is based on two animals from Quebrada Seca.

	Dimensions			
	alt.	diam. spire	alt. apert.	whorls
B. leucopleura (Pfr.)	13.5	20(2.7)	15(2)	15
H, II, a, 28 (complete).....	12.7	17(2.1)	15(1.9)	20½
H, I, a, 23 (complete).....	11.5	18(2.0)	15(1.7)	18½

Foot: small for size of shell; short but broad, rounded posteriad; sole transversely rugose in retracted animals; no distinct peripodal groove; sides with rather thick and coarsely pebbled, pigmented epidermis. Mantle edge: complete, but very narrow and deeply emarginate in columellar region; heavy in palatal and basal regions, with especially broad thickenings outside of pneumostome and on columellar side of anus, so as to separate a shallow vestibule (fig. xxv–29); with a very short lappet in lower palatal region; no distinct body fold; collar and visceral stalk of small diameter, pigmented.

Lung (figs. xxv–29, 30): long and narrow; roof over eight times as long as pericardium, thin and transparent, occupying 4½ whorls; surface between principal vein and hindgut 24 times length of its greatest breadth. Pericardium: small, elongate; imbedded in lesser curvature of kidney. Principal pulmonary vein: long and remarkably large for such a small heart; with a few visible tributaries near pneumostome, mainly on side opposite hindgut. Kidney: shaped like a wedge bent into a crescent; almost twice as long as pericardium. Primary ureter: thin-walled, slightly swollen near internal ureteric orifice; extending back along kidney for about ¾ length of latter, then abruptly recurved and con-

tinued along hindgut. Secondary ureter: complete, considerably swollen in last 1/3 of its length, where it is covered with a rich vascular network that is supplied from rectal vessel by transverse veins across hindgut; external ureteric orifice on anal side near tip of a heavy fold which partially separates a small anal atrium from inner end of pneumostomatic vestibule.

Ovotestis (fig. xxv–31): composed of 4, quite widely separated lobes, each of which consists of a few claviform tubules; terminal lobe less than 3 whorls from apex of animal. Hermaphroditic duct: very long, weakly convoluted in lower portion; talon swollen fusiform at base with narrower apical portion; base of duct and talon with jet black pigment. Uterus: very long and slender; apical ¾ quite thin-walled and rendered sacculate by transverse folds; basal portion (uterine stalk) narrower, with thicker walls, which are quite smooth externally. Spermatheca: closely bound into uterine sheath; terminal sac small, ovoid, imbedded in base of albumen gland; stalk very slender and elongate, imbedded on columellar side of uterus and between last and prostate; basal opening some distance above base of penis, so vagina is about as long as cloaca. Prostate: imbedded on columellar side of apical half of uterus. Free vas deferens: quite long; at first swollen but becoming very slender; proceeds down side of uterus to base of spermatheca, curves around base of this and extends straight to apex of epiphallar portion of penis. Penis (fig. xxv–32): very long and slender, more so than in *B.* (*Apoma*) *chemnitziana* Pils. (1903, 41, fig. xiv–3); apical 3/10 (epiphallus) with thick, apparently glandular walls, terminated by a short penial papilla; penis proper (basal 7/10) swollen apically with large lumen, tapered towards base where it again enlarges abruptly; walls with weak internal folds. Penial retractor: slender and longer than penis; arises from diaphragm in 4th whorl from base and inserts around vas deferens on apex of epiphallus. Cloaca exceptionally long.

The columellar muscle divides into two branches, a tail-retractor and a free retractor, near base of albumen gland. The tail-retractor is double for a considerable portion of its length, but the two divisions again unite to form the usual fan-shaped sheet. About one whorl below its origin, the free retractor splits into a right ocular and another muscle that almost immediately divides into the pharyngeal and left ocular retractors. The five long ribbons are closely coiled together around the columella. Terminally, each ocular gives off a ventral band, which is larger than the ocular proper; this band is considerably broader on left side than on right and gives off retractors to side of foot and a band to the snout. The ventral branch of the right ocular also gives off fine strands to the base of the uterus and penis. This retractor system is very similar to that of *B. chemnitziana* (*l.c.*), but the columellar ribbons appear to be longer.

Digestive system: very similar to that of *Urocoptis brevis* (Pfr.) Pils. (1902, M. C., XV, 108, fig. xxvii–45) with similar differences as those noted for *B. chemnitziana* (*l.c.*). Buccal mass: short ovoid, flattened dorsoventrally; large in proportion to size of foot. Radular pouch: very slender and five times length of buccal mass; recurved distally so as to appear considerably thicker. Salivary glands: flattened fusiform, closely attached to each other by their median surfaces; attached on ventral side of oesophagus but latter is twisted so they actually lie on its right side; right gland considerably larger than left, about twice as long as buccal mass. Oesophagus: very long and slender. Stomach: relatively small, in 6th and 7th whorls from base. Liver: fills cavity of apical whorls and extends along stomach, on side towards lower suture of whorl, to apex of albumen gland. Intestine: leaves lower end of stomach, loops down to upper end of pallial cavity along oesophagus and runs transversely across; then turns back as far as apex of albumen gland, where it becomes thin-walled; finally curves sharply back on itself, is imbedded along side of albumen gland and continues as hindgut to anus.

Nervous system: not studied in detail, apparently quite similar to that of *B.* (*Mychostoma*) *agnesiana* (C. B. A.) Pils. (1903, 42, fig. xiv–1); cerebral commissure short; pedal and pleural connectives fairly long; buccal connectives as long as buccal mass.

The kidney of *B. leucopleura* (and other Urocoptidæ) is rather similar in shape to that prevalent in the Subulininæ while the penis is fundamentally quite like that of Neosubulina. In most Urocoptidæ, as in the Streptaxidæ and to a lesser extent the Achatinidæ, the right ocular retractor is comparatively free from the genitalia, i.e., it is not bound closely into the crotch between the uterus or vagina and the penis. For these reasons, I am inclined to believe that the Urocoptidæ branched off from the primitive Achatinid stalk, perhaps somewhere in the vicinity of the Streptaxidæ. The family is especially characterized by its highly specialized shells and radulæ.

Brachypodella hanleyana (Pfeiffer)

Cylindrella hanleyana Pfr. (1847, Zeit. Mal., IV, 16), Prov. Cumana. *Microstoma hanleyanum* Jouss. (1889, 247), Valencia. *B. hanleyana* Pils. (1903, 73, figs. vi, 7–9, 21, 22), Caracas, Puerto Cabello.

Three specimens included in the Aroa lot of *B. leucopleura* (H, I, a, 3).

Brachypodella nidicostata Spence

B. nidicostata Spence (1920, J. of C., XVI, 86, figs. ii, 1–3), Chichirivichi, near mouth of Rio Tocuyo (L 11, 68.5).

**Microceramus bonairensis arubanus* H. Burrington Baker

M. bonairensis arubanus H. B. Baker (1924, no. 152, 97, fig. xvii–77), Aruba, D. W. I.; see subsp. *curacoanus* H. B. Baker (1922, no. 137, 7, fig. 1–5) for radula.

As this species from the Dutch Leeward Islands has already been discussed in these studies (Part I), I may be excused

for the inclusion here of an anatomical description of paratypes of the largest subspecies.

Foot: fairly large; sides mainly simple and thin-walled but weakly pebbled just above sole and on dorsum of tail; otherwise similar to Brachypodella. Mantle edge: collar and visceral stalk of greater diameter. Visceral stalk: slender for the size of the shell, due to chalky deposit which lines latter and forms an especially thick layer in apical whorls.

Lung (fig. xxiv–28): elongate; roof about seven times as long as pericardium, thin and transparent; occupying a little less than 2½ whorls; diaphragm thin but darkly pigmented. Pericardium: small, ovoid. Heart: ventricle much larger than auricle, which overlies posterior end of kidney and receives usual renal, ureteric and pulmonary veins. Kidney: as in B., but more irregular in outline; approximately 1½ times pericardial length. Primary ureter: much as in B., but with acuminate caecum at abrupt bend. Secondary ureter: incomplete, slightly longer than kidney; first 2/3 quite thick-walled; external ureteric orifice about one pericardial length in front of kidney.

The major portion of the roof of the lung has no distinct venation except the principal vein, but a very definite zone with numerous cross-veins (branches of rectal vessel) lies along the secondary ureter and a short distance in front. Between this zone and the pulmonary vein is another which is twice as wide and relatively opaque; microscopic examination of this region shows a fine network of capillaries, which are apparently without walls and lie between the cells that compose the lining of the roof. This arrangement would appear to be an excellent adaptation for existence in a semi-desert; evidently only the inner end of the lung is specialized for aeration, while the major portion of the roof must function principally as an apparatus for the utilization of moisture.

Ovotestis (fig. xxv–33): small, imbedded high in liver; composed of two conical groups of few and coarse, claviform tubules. Hermaphroditic duct: shorter than in Brachypo-

della, thickened near middle and weakly convoluted in lower 2/3 of its length; terminally expanded into a globose reservoir with a tongue-shaped talon. Albumen gland: more voluminous than in B. with coarser lobules; occupying apical half of 3rd and extending slightly into 4th whorl from base. Uterus: quite thick-walled, transversely folded; uterine stalk tapered and almost as long as penis. Spermatheca: similar to that of B.; apical sac claviform with recurved tip; confluent with cloaca very close to base of penis. Prostate: closely attached to uterus from apex to near base of folded portion of same; composed of claviform tubules. Free vas deferens: relatively short; extends from near base of prostate to apex of penis without usual loop into notch between latter and uterine stalk. Penis (fig. xxv–34): ovoid, very short and stout; surrounded by a thick, muscular sheath which receives a short, heavy, apical retractor and several smaller fibers from right ocular muscle; walls thick and apparently glandular, internally thrown into a few, heavy, mainly longitudinal plicae; upper half of wall on side towards uterine stalk with large pilaster, through apical end of which is opening of vas deferens. No distinct epiphallus or free penial papilla is present.

The columellar muscle splits near the upper end of the 4th whorl from base into three branches: a right and left free retractor and a pharyngeal muscle. Each of the free retractors divides almost immediately into a narrow ocular and a broader tail-retractor; these five long ribbons are closely coiled around columella. The pharyngeal muscle splits near buccal mass to insert on both sides of its apex. The two tail-retractors reunite to form a broad, fan-shaped sheet, from which radiate the individual foot-retractors. Each ocular gives off a very fine muscle to the side of the foot and another to the side of the snout. The right ocular passes under the apex of the penis and along its left side; the origin of the retractors of the penial sheath has already been mentioned.

Digestive system: very similar to that of *Urocoptis brevis* (*l.c.*). Salivary glands: quite slender, about as long as buccal

mass and directly behind it; separated above by almost complete width of oesophagus but adjacent (although separate) on lower side of same. Stomach: broadly fusiform, imbedded above albumen gland in 4th whorl from base.

Nervous system: cerebral ganglia in close juxtaposition; pedal and pleural connectives much longer than in Brachypodella; buccal connectives almost as long as buccal mass.

Clausiliidæ

Nenia dohrni (Pfeiffer)

Clausilia dohrni Pfr. (1860, Mal. BL, VII, 213, figs. ii, 1–3), Venezuela.

I did not obtain any species of this family in Venezuela; although the exact localities of the three species cited are unknown, I suspect that the Clausiliidæ occur at higher altitudes than those collected.

Nenia geayi Jousseaume

N. geayi Jouss. (1900, Bull. Soc. Phil. Paris (9), II, 14, figs. 1–2, 3), Venezuela.

Nenia cyclostoma (Pfeiffer)

Clausilia cyclostoma Pfr. (1849, P. Z. S., 135; 1854–60, Nov. Conch., I, 79, no. 135, figs. xxii, 15–18), Korean Archipelago (*sic*); Clessin (1881, Nom. Hel. viv., 407), Venezuela (on what grounds?).

Veronicellidæ

Vaginulus (*?*) *coerulescens* Semper

Vaginula coerulescens Smpr. (1885, Reisen, II–III, 293, figs. xxvi–9, 10), Caracas. *Cylindrocaulus coerulescens* Hffm. (1925, Jena. Zeitschr., LXI, 155, 236, fig. v–45d, 4), synonymy probably too inclusive.

This peculiar choanocaul species appears to be related to three other named forms: *Vaginula minuta* Srth. (1913, Mém. Soc. Neuchat., V, 318, figs. xiii, 87–98) from near Angelopolis, Colombia, *V. calcifera* Srth. (1913, 320, figs.

xiv, 99–107) from Rio Branco (mainly Brazil), and *V. attenuata* Colosi (1921, Atti Soc. It. Sc. Nat., V, 159; 1922, An. Mus. Nac. Hist. Nat. Buenos Aires, XXXI, 511, figs. 48–50) from Carandasinho, Matto Grosso, Brazil. Hoffmann (*l.c.*) combines the last two as synonyms of *V. coerulescens*, but neither he nor Semper has described the spermathecal relations in this Venezuelan slug. For both of his species, Simroth describes and figures the entrance of the canalis junctor into the base of the spermathecal stalk, which is about as long as the diameter of the subspherical sac; this condition seems closer to that in Veronicella than to that in Vaginulus. On the other hand, Colosi describes the spermathecal sac of *V. attenuata* as spherical and sessile, with the entrance of the canalis junctor on its side. In face of these conflicting data, I am in doubt as to even the generic position of these species, which I have never had the opportunity to dissect.

Vaginulus (*Latipes*) *pterocaulis* Simroth

Vaginula pterocaulis Srth. (1913, 316, figs. xiii, 79–86), Merida, Brienco; Colosi (1922, 502, fig. 29), Merida. *Belocaulus pterocaulus* Hffm. (1925, 247, fig. vi–45h, 3).

Vaginulus (*Latipes*) *occidentalis occidentalis* (Guilding)

Onchidium occidentale Gldg. (1825, Trans. Linn. Soc., XIV, 323, figs. ix, 9–12), St. Vincent (Lesser Antilles). *Vaginula occidentalis* Fischer (1871, Nouv. Arch. Mus. Paris, VII, 164), Caracas. *Cylindrocaulus occidentalis* Hffm. (1925, 235), Las Trincheras (L 10, 68). *Vaginulus occidentalis* H. B. Baker (1925, Proc. Acad. Nat. Sci. Philadelphia, LXXVII, 174, figs. v, 18–20).

I have seen no Venezuelan specimens with the maculate hyponotum and papillate verge of typical *occidentalis*, but the collection from Dunoon, British Guiana, contains two adults that are certainly this form and one juvenile with fairly typical coloration. One of the adults was apparently caught in the act of oviposition, as the vial contains a number of large eggs and a few still remain in the uterus.

Vaginulus (*Latipes*) *occidentalis bielenbergii* Semper

Vaginula bielenbergii Smpr. (1885, 298, figs. xxiv–3, 9, xxvi–6), Puerto Cabello. *V. bielenbergi* Colosi (1922, 478). *? Cylindrocaulus olivaceus* Hffm. (1925, 233), St. Estéban (Venezuela ?). *Vaginulus bielenbergii* H. B. Baker (1925, 176, figs. v–21, 22).

Vaginula immaculata Smpr. (1885, 300, figs. xxvi–11, 13), Puerto Cabello, Caracas; apparently founded on bleached specimens with immature or retracted glans.

Ten specimens, none quite mature, from near San Estéban (H, II, b, 2) and Palma Sola (H, II, b, 20). The larger animals all represent the dark color form shown in Semper's fig. 9. The smaller animals are lighter in color and so approach Semper's fig. 3.

	Animal		Foot	Female Distance	Opening from
	long	wide	wide	ant. end	foot
H, II, b, 20	43.0	28(12.1)	10(4.4)	54(23.2)	25(4)
	45.4	22(10.2)	9(3.8)	53(24.2)	25(4)

In the largest specimen, the female organs are very rudimentary while the male organs are much better developed although still immature. In the next largest individual, the female organs are much better developed and the male genitalia are apparently almost mature. The reproductive organs are very similar to those of *V. occidentalis,* but the canalis junctor is relatively shorter, the two divisions of the spermathecal sac are more distinct (due largely to lack of distension), and the verge lacks the papillae (H. B. Baker, *l. c.*). The dart gland of the more mature example consists of 18 tubules; two of these are very short and at least two cases of bifurcation are present.

I am rather doubtful as to the exact status of *bielenbergii,* as I have seen no specimens of *occidentalis* which show such a well-developed glans without papillae. However, I have examined an adult from British Guiana which has the typical papillae on the verge but almost entirely lacks the hyponotal maculation.

PLATE XX

Scales in lower left hand corner represent lengths of one millimeter; uppermost is for fig. 2, middle one for fig. 1, and lowest for figs. 99 and 100.

Fig. 99. *Subulina octona.* Male copulatory organ of specimen from Dunoon, British Guiana; mounted in glycerin jelly and viewed by transmitted light. Sheath which connects vas deferens with slender portion of penis is broken away; retractor of basal sheath is cut. Diagrammatic, but accurate as to proportions.

Fig. 100. *Leptinaria lamellata.* Male copulatory organ of specimen from Trinidad, B. W. I.; mounted and viewed as in fig. 99. Only base of penial retractor is shown.

Fig. 1. *L. lamellata.* Genitalia of same specimen as fig. 100. Organs are separated and a portion of albumen gland is dissected away to show base of hermaphroditic duct.

Fig. 2. *L. lamellata.* Ventral view of roof of lung and pallial complex of same specimen. Pericardium is shown as more transparent than is actually the case. Lung is somewhat distorted in order to represent it on plane surface; long axis of pericardium should be more nearly parallel to that of lung.

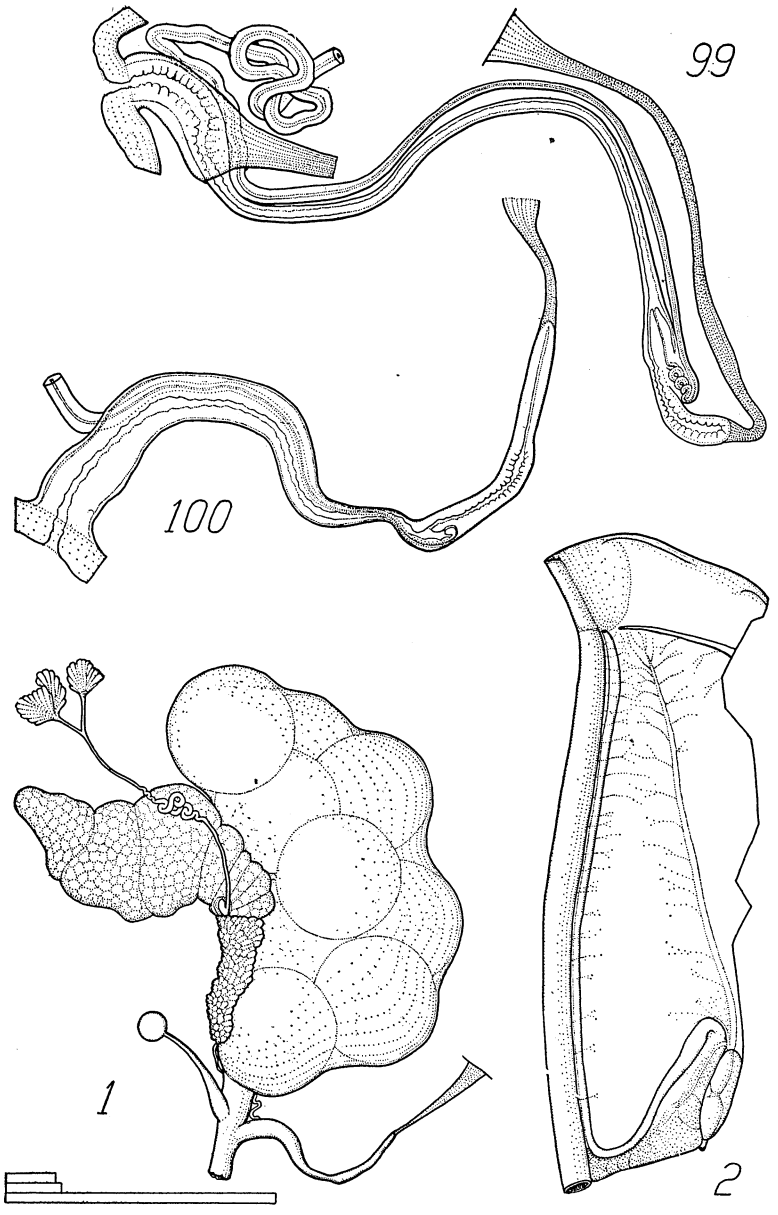

99
100
1
2

PLATE XXI

Scales in lower left hand corner represent lengths of 20 microns (.02 mm.); uppermost is for fig. 8, middle one for fig. 5, lowest for figs. 3, 4, 6 and 7. Central and first laterals are shown in usual relations to each other; remainder of teeth are simply oriented in respect to longitudinal axis of radula. Hairlines give shape of right half of transverse row with positions of central, each 7th tooth and outer margin of ribbon marked.

Fig. 3. *Opeas pumilum.* Radula of dried specimen from Tabasco, Mexico; central, 1st, 7th, 10th and 19th teeth.

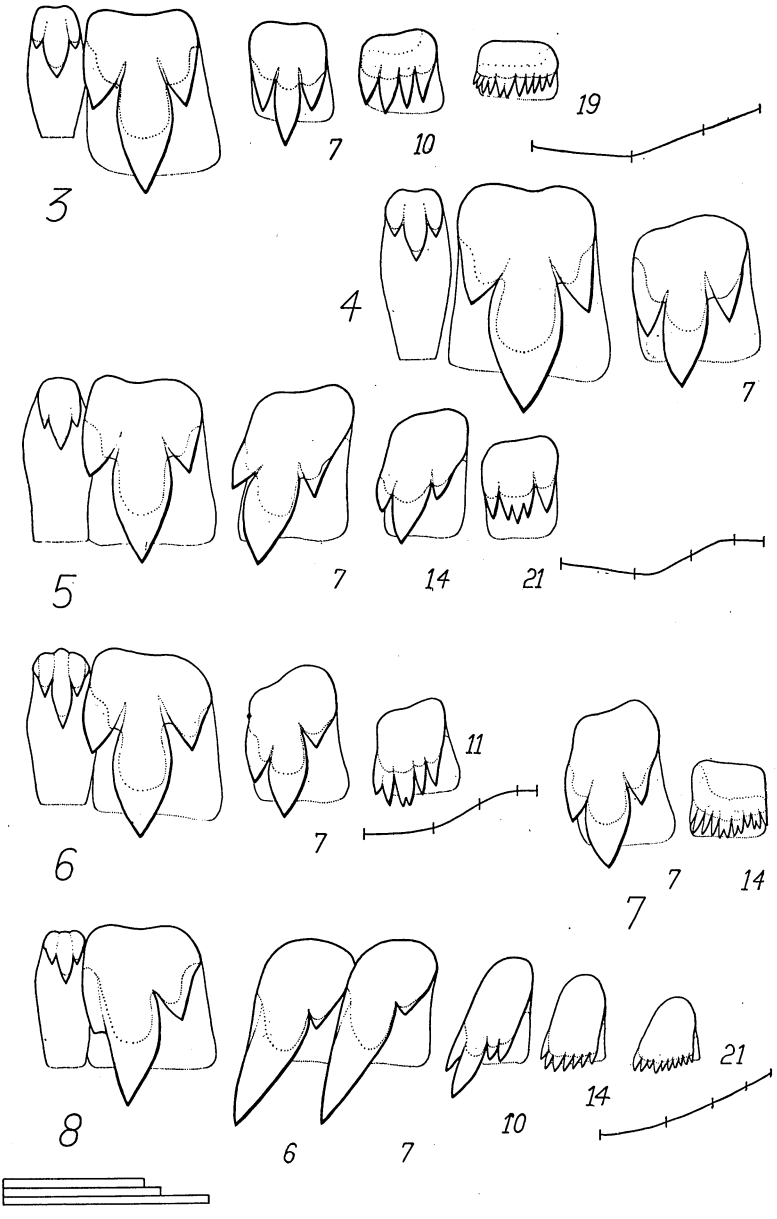
Fig. 4. *Opeas pellucidum.* Radula of dried specimen from La Fría, Ven.; central, 1st and 7th teeth.

Fig. 5. *Obeliscus* (*Stenogyra*) *homalogyrus.* Radula of dried specimen from Sancti Spiritus, Cuba; central, 1st, 7th, 14th and 21st teeth.

Fig. 6. *Pseudopeas* (*Dysopeas*) *translucidum.* Radula of dried specimen from La Fría, Ven.; central, 1st, 7th and 11th teeth.

Fig. 7. *Pseudopeas saxatile stanleyvillense.* Radula of dried specimen from Stanleyville, Congo, west Africa; 7th and 14th teeth.

Fig. 8. *Leptinaria lamellata.* Radula of dried specimen from Dunoon, British Guiana; central, 1st, 6th and 7th (in usual relations), 10th, 14th and 21st.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21

PLATE XXII

Scales in center of plate represent lengths of one millimeter; uppermost is for fig. 9, middle one for figs. 10 and 11, and lowest for fig. 12. That in lower left hand corner represents 20 microns and is for figs. 13 and 14.

Fig. 9. *Neosubulina scopulorum.* Ventral view of lung and pallial complex of a non-gravid individual from Aruba, D. W. I. Pericardium is shown as more transparent than is actually the case.

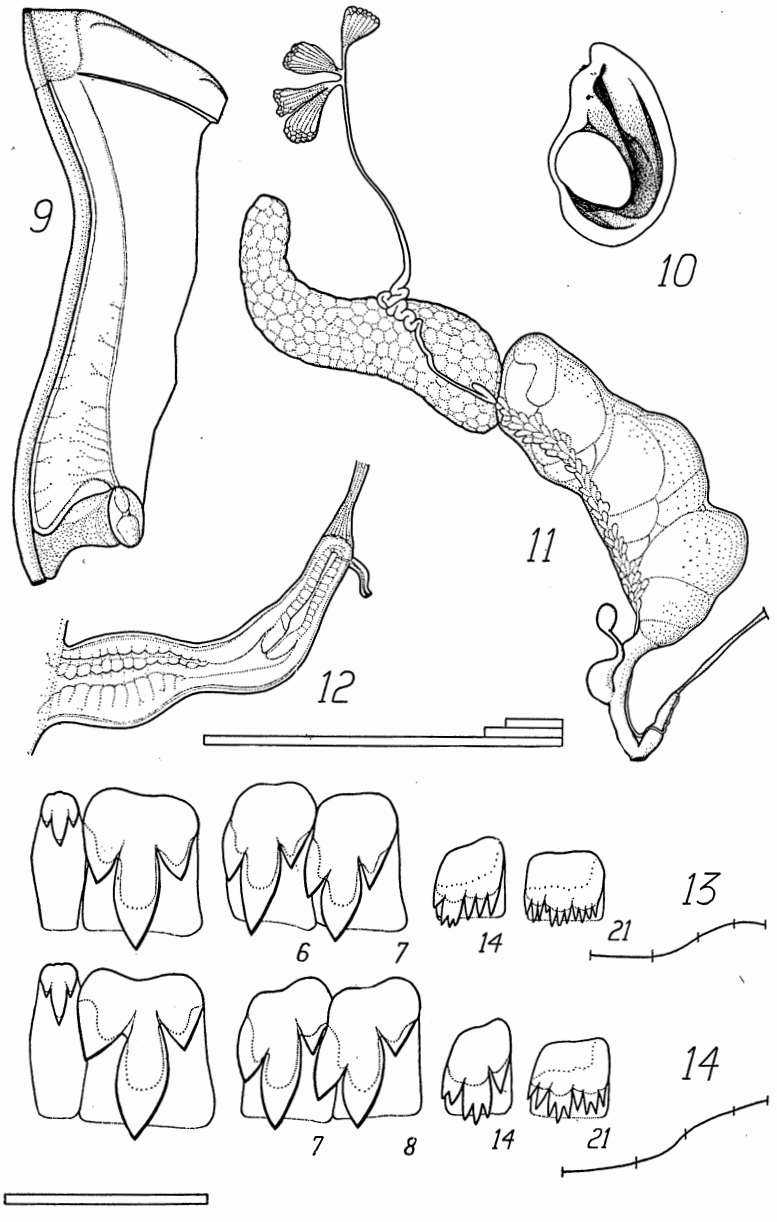
Fig. 10. *N. scopulorum.* Mantle edge of immature animal after foot has been cut off at visceral stalk.

Fig. 11. *N. scopulorum.* Dissection of genitalia from gravid individual.

Fig. 12. *N. scopulorum.* Male copulatory organ of non-gravid, but quite mature animal; mounted and viewed as in fig. xx–99. Only terminations of vas deferens and penial retractor are shown.

Fig. 13. *Leptinaria* (*Leptopeas*) *bequaerti.* Radula of dried specimen from Dunoon, British Guiana; central, 1st, 6th and 7th (in usual relations), 14th and 21st teeth.

Fig. 14. *Leptinaria* (*Leptopeas*) *venezuelensis.* Radula of dried specimen from Dunoon, British Guiana; central, 1st, 7th and 8th (in usual relations), 14th and 21st teeth.


9
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14

PLATE XXIII

Scales in lower left hand corner represent lengths of one millimeter; uppermost is for figs. 21 and 22, although magnification of these is not exactly the same (see tables of dimensions), second is for figs. 15 to 18 of which the same is true, third for fig. 19 and lowest for fig. 20.

Fig. 15. *Obeliscus* (*Rectobelus*) *rectus.* Type shell from La Fría, Ven.

Fig. 16. *Leptinaria* (*Leptopeas*) *bequaerti.* Adult shell from Dunoon, B. G.

Fig. 17. *Pseudopeas* (*Dysopeas*) *translucidum.* Type shell from La Fría, Ven.

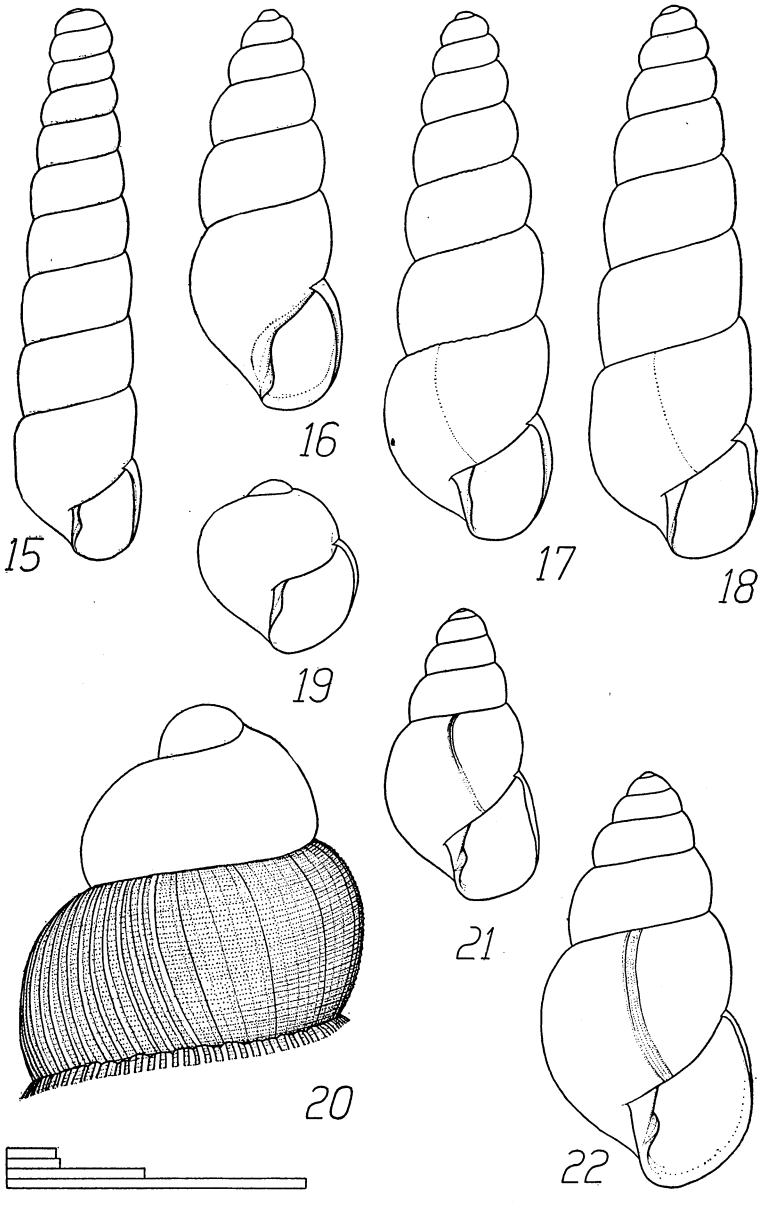
Fig. 18. *Pseudopeas* (*Dysopeas*) *subopacum.* Type shell from Boquerón, Ven.

Fig. 19. *Leptinaria* (*Leptopeas*) *venezuelensis.* Embryonic shell from dried adult, collected near Dunoon, British Guiana.

Fig. 20. *Pseudopeas* (*Dysopeas*) *translucidum.* Apical whorls of young paratype.

Fig. 21. *Leptinaria* (*Lamellaxis*) *martensiana parva.* Type shell from Palma Sola, Ven., with two of growth riblets represented to show their spacing.

Fig. 22. *Leptinaria* (*Lamellaxis*) *martensiana.* Type shell from Estación Táchira, with growth riblets as in fig. 21.


15
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17
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19
20
21
22

PLATE XXIV

Uppermost scale in lower right hand corner represents one millimeter and is for fig. 28; middle one indicates a length of 20 microns and is for fig. 27; lowest is also for 20 microns and is for figs. 23 to 26. Radulae arranged as in Plate XXI.

Fig. 23. *Leptinaria* (*Leptopeas*) *striosa abdita.* Radula of dried specimen from Marianao, Cuba; central, 1st, 6th and 7th (in usual relations), and 9th teeth.

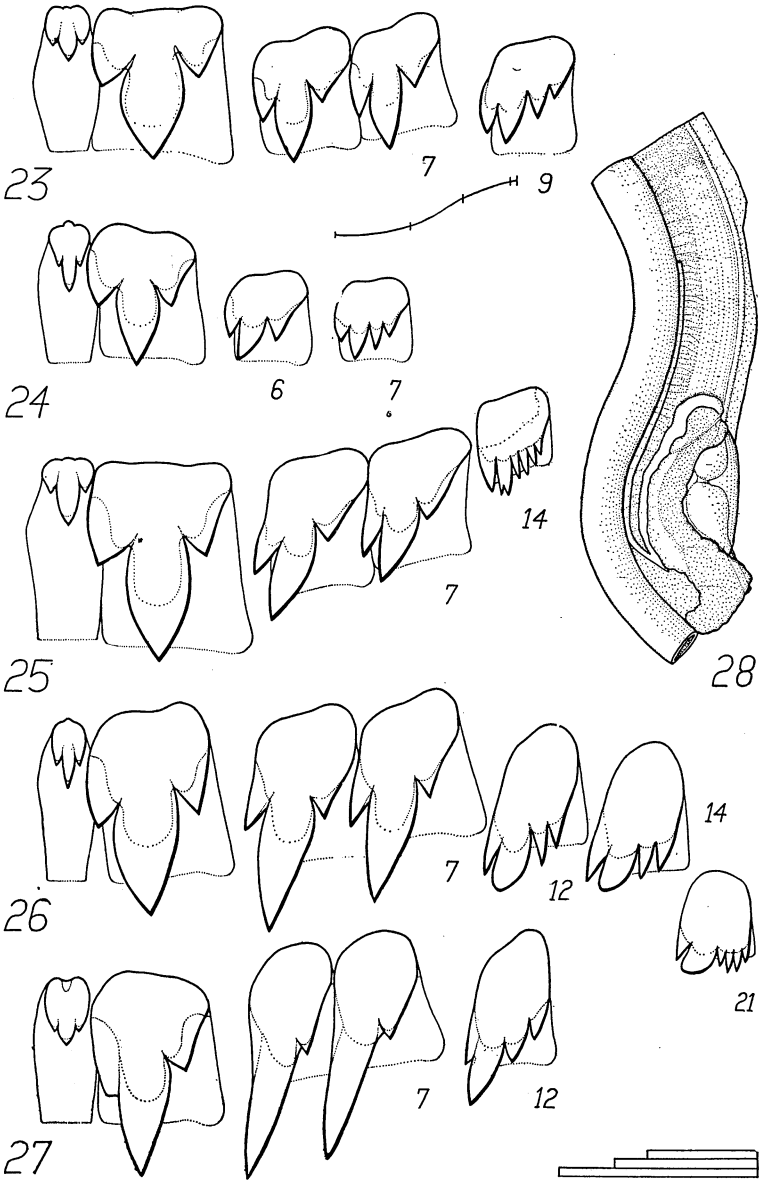
Fig. 24. *Leptinaria* (*Leptopeas*) *simplex.* Radula of dried specimen from Cariaquita, Ven.; central, 1st, 6th and 7th teeth.

Fig. 25. *Leptinaria* (*Leptopeas*) *paludinoides.* Radula of dried specimen without locality; central, 1st, 6th and 7th (in usual relations), and 14th teeth.

Fig. 26. *Leptinaria* (*Lamellaxis*) *martensiana.* Radula of dried paratype; central, 1st, 6th and 7th (in usual relations), 12th, 14th and 21st teeth.

Fig. 27. *Leptinaria livingstonensis.* Radula of dried paratype from Livingston, Guatemala; central, 1st, 6th and 7th (in usual relations) and 12th teeth.

Fig. 28. *Microceramus bonairensis arubanus.* Ventral view of posterior half of roof of lung and pallial complex from a paratype in alcohol. Kidney and pericardium represented as more transparent than is actually the case.


23
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12

PLATE XXV

Scales in upper left hand portion of plate represent lengths of one millimeter; uppermost is for fig. 30, next for fig. 33, third for fig. 31, fourth for fig. 29, fifth for fig. 34 and lowest for fig. 32.

Fig. 29. *Brachypodella leucopleura.* Ventral view of anterior ¼ of roof of lung from mature animal which is not quite ripe sexually, collected near Boquerón, Ven.

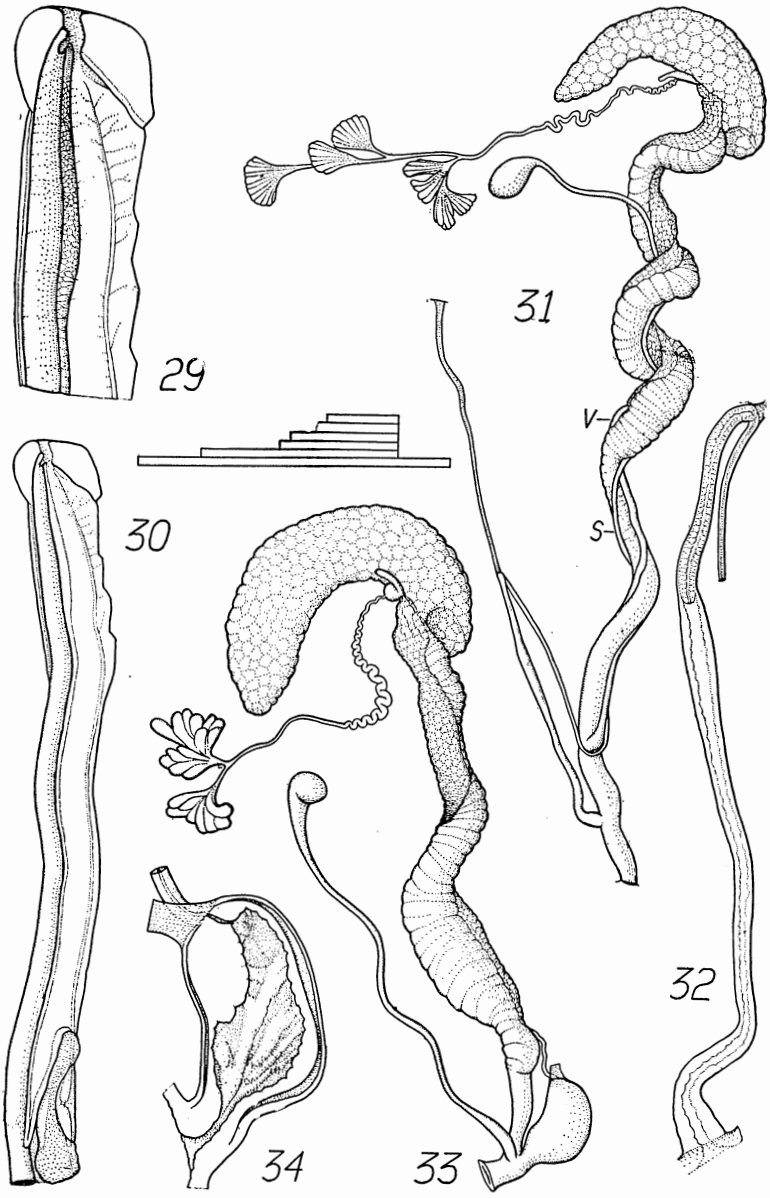
Fig. 30. *B. leucopleura.* Entire roof of same lung with pallial complex. Kidney and pericardium are represented as slightly more transparent than is actually the case.

Fig. 31. *B. leucopleura.* Genitalia of a slightly smaller individual than that in figs. 29 and 30. Spermatheca is only separated distally.

Fig. 32. *B. leucopleura.* Penis of same individual as in fig. 31, from mount in glycerin jelly, viewed by transmitted light and represented in somewhat diagrammatic optical section.

Fig. 33. *Microceramus bonairensis arubanus.* Genitalia of same specimen as in fig. xxiv–28. Uterus is much straightened so that it appears longer than spermatheca; retractor of penial sheath is cut at origin from ocular muscle.

Fig. 34. *M. bonairensis arubanus.* Penis of same specimen, mounted and viewed as in fig. 32, but represented as if split longitudinally.


29
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V
S
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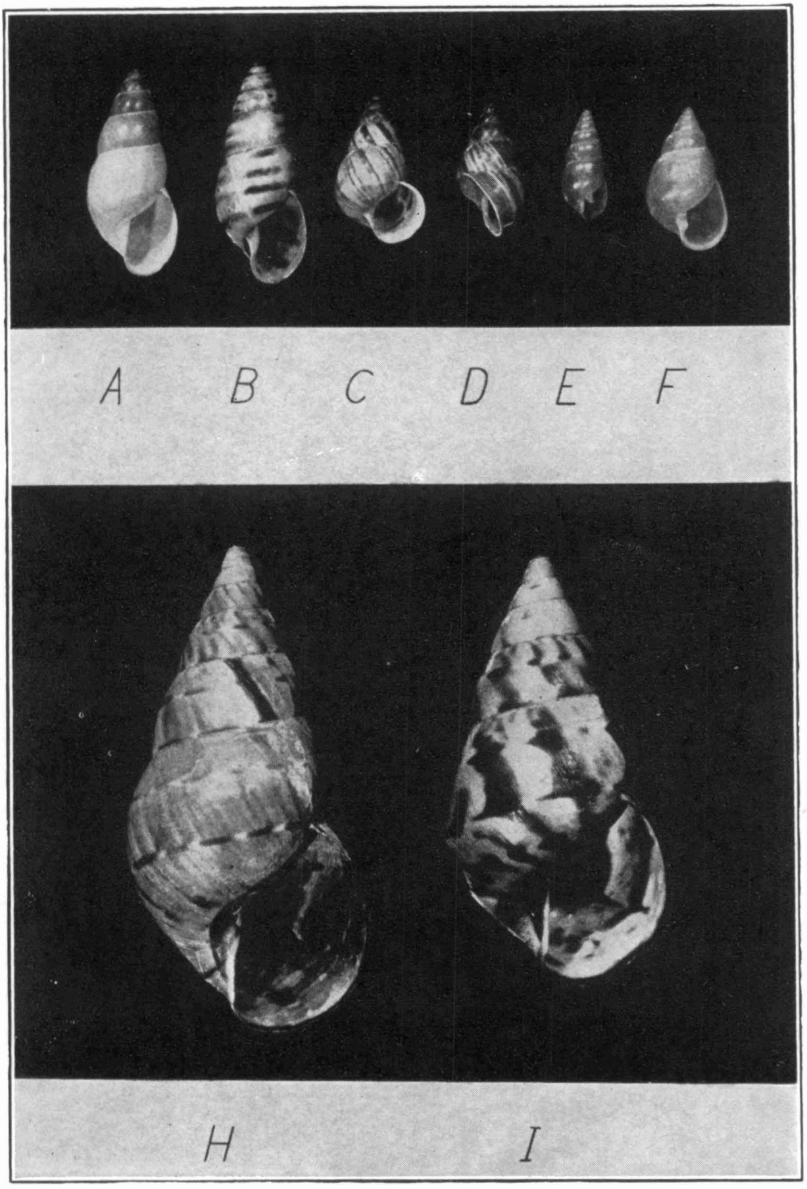
32
34
33

PLATE XXVI

All of the shells on this plate are from Dunoon, British Guiana; those in the upper row are slightly enlarged, while the two lower are somewhat reduced in size. Dimensions of Bulimulidæ are given in Part IV (this series, no. 167, p. 48).

Fig. A. *Drymaeus demerarensis.* Albino shell.
Fig. B. *D. demerarensis.* Banded shell.
Fig. C. *Drymaeus* (*Leiostracus*) *ruthveni.* Type shell.
Fig. D. *D. ruthveni.* Profile view of smallest adult shell.
Fig. E. *Leptinaria* (*Leptopeas*) *elata.* Type shell.
Fig. F. *Leptinaria gigas.* Type shell.
Fig. H. *Oxystyla bensoni.* Largest specimen.
Fig. I. *O. bensoni.* Next largest shell (third in table of dimensions).


A B C D E F
H I